# FINAL TECHNICAL REPORT

Klamath Hydroelectric Project
(FERC Project No. 2082)

Recreation Resources

PacifiCorp
Portland, Oregon

Version: February 2004

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## 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* (a 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 |

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|---|---|
| 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 |
| $ft\text{-}lb/s/ft^3$ | 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 |

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|---|---|
| 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 |

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|---|---|
| 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 |

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|---|---|
| W&SR | Wild and Scenic River |
| WSE | water surface elevation |
| 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

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|---|---|
| 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).<br><br><u>Range of alternatives</u><br>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)<br><br><u>Reasonable alternatives</u><br>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)<br><br><u>No Action Alternative</u><br>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). |

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| 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 | <u>Doctrine of Prior</u><br>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.<br><br><u>Process Water</u><br>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. |

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| 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. |

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| 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.

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| 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 | The operation of two or more interconnected electrical systems to achieve |

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| operation | 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 |

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| | 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 |

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| | 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 saturation. |
| 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. |

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| 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. |

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| 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: |

1. Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact

2. Aid an agency's compliance with the Act when no environmental impact statement is necessary

3. 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))

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| 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). |

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| 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))

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| 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. |

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| 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.<br><br>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. |

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| Fish ladder | A structure that 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. |

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| 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 flood-plain 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. |

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| 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. |

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| 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. |

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| 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. |

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| 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. |

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| 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 | An important location from which project facilities or operations are |

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| point (KOP) | 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. |

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| 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). |

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| 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.<br><br>1. Avoiding the impact altogether by not taking a certain action or parts of an action. |

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| | 2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.<br><br>3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.<br><br>4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.<br><br>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)<br><br>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 |

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| | 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. |

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| 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.<br>• Forced outage—the shutdown of a generating unit, transmission line, or other facility, for emergency reasons<br>• 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. |

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| 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. |

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| 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. |

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| 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.<br><br>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. |

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| 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. |

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| 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. |

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| 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. |

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| 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. |

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| 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. |

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| 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. |

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| 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 beneficial 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) provisions for antidegradation of existing high-quality or unique waters. |

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| 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.<br>• Ampere—the unit of measurement of electrical current produced in a circuit by 1 volt acting through a resistance of 1 ohm<br>• 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.<br>• 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 |

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| | 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. |

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# 1.0 INTRODUCTION

## 1.1 SCOPE OF WORK

Five recreation resource studies have been conducted to address recreational issues related to PacifiCorp's Klamath Hydroelectric Project (Project) (FERC Project No. 2082). The five studies included the following:

- Recreation Flow Analysis
- Recreation Visitor Surveys
- Regional Recreation Analysis
- Recreation Needs Analysis
- Recreation Resource Management Plan (Draft) Annotated Outline

The majority of these studies were initiated in 2001. Most data collection associated with these studies was completed in 2002, though some recreation flow analyses occurred in spring/summer 2003. This document provides a summary of methods, observations, and findings associated with these recreation studies. This Final Technical Report (FTR) is not intended to provide an impact assessment of the Project or to recommend protection, mitigation, and enhancement (PM&E) measures. The final documentation of this information will be a component of Exhibit E of the Federal Energy Regulatory Commission (FERC) final license application.

## 1.2 OVERVIEW OF RECREATION RESOURCES

The study area for the five recreation studies generally consists of recreation sites (developed and dispersed undeveloped), use areas, project reservoirs, the immediate river corridor, and a ¼-mile buffer around each reservoir (Keno reservoir/Lake Ewauna, J.C. Boyle reservoir, Copco reservoir, and Iron Gate reservoir) (Figure 1.1-1). The developed recreation sites located within or adjacent to the FERC Project boundary include (Figure 1.1-2):

- Link River Nature Trail
- City of Klamath Falls' Veteran's Memorial Park/Boat Launch
- Oregon Department of Fish and Wildlife's (ODFW) Miller Island Boat Launch
- Keno Recreation Area
- Sportsman's Park
- Pioneer Park (East and West units)
- U.S. Bureau of Land Management's (BLM) Topsy Campground
- BLM's Upper Klamath River (Spring Island) Boater Access
- BLM's Klamath River Campground
- Stateline take-out (PacifiCorp and BLM)
- Fishing Access Sites 1-6
- Mallard Cove
- Copco Cove
- Fall Creek Trail
- Fall Creek

- Jenny Creek
- Wanaka Springs
- Camp Creek
- Juniper Point
- Mirror Cove
- Overlook Point
- Long Gulch
- Iron Gate Hatchery Public Use Area

The dispersed recreation sites located within or adjacent to the FERC Project boundary include:

- J.C. Boyle reservoir—seventeen dispersed use areas
- Upper Klamath River/Hell's Corner reach—four dispersed use areas (including Frain Ranch)
- Copco reservoir—two dispersed use areas
- Iron Gate reservoir—four dispersed use areas (including Long Gulch Bluff)

The Recreation Flow Analysis Study focused on the following six specific river reaches or bypasses in the study area:

- Link River bypass reach
- Keno reach
- J.C. Boyle bypass reach
- Upper Klamath River/Hell's Corner reach
- Copco No. 2 bypass reach
- Below Iron Gate dam/Middle Klamath River reach (added in 2002)

The regional recreation study area was broader and encompassed major water-based recreation destinations that offer similar types of reservoir and river recreation opportunities within several hours' drive of the Project. This radius was expanded somewhat for whitewater boating and shoreline fishing activities to include several regional river corridors, listed below:

- Klamath River (Lower)
- Rogue River
- Salmon River (California)
- Pit River
- Scott River
- Trinity River
- Smith River
- Upper Sacramento River
- Clear Creek
- McCloud River

The following flatwater lakes and reservoirs were also included in the regional study area:

- Agency Lake

- Applegate reservoir
- Emigrant Lake
- Fourmile reservoir
- Howard Prairie reservoir
- Hyatt Lake
- Lake of the Woods
- Medicine Lake
- Shasta Lake
- Trinity Lake
- Upper Klamath Lake (UKL)
- Whiskeytown Lake

In addition, the regional recreation analysis considered related recreation resources at federal (U.S. Forest Service [USFS], BLM, National Park Service [NPS], and U.S. Fish and Wildlife Service [USFWS]), state (California and Oregon), county (Klamath and Jackson counties, Oregon, and Siskiyou County, California), local (city of Klamath Falls, Oregon), and private (R Ranch) recreation areas within several hours' drive of the Project.

Figure 1.1-1. Project recreation study area.

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Figure 1.1-2. Project recreation sites

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# 2.0 RECREATION FLOW ANALYSIS

## 2.1 DESCRIPTION AND PURPOSE

This study identifies river-based recreation opportunities on the upper and middle reaches of the Klamath River in the vicinity of the Klamath Hydroelectric Project. The Recreation Flow Analysis also develops relationships between flows and the quality of those recreation opportunities and assesses the possible effects of existing and potential Project operations. Information is organized for six river reaches in the Recreation Flow Analysis study area:

- Link River bypass reach (from Link River dam on Upper Klamath Lake to Lake Ewauna/Keno reservoir)
- Keno reach (from Keno dam to J.C. Boyle reservoir)
- J.C. Boyle bypass reach (from J.C. Boyle dam to J.C. Boyle powerhouse)
- Hell's Corner reach (from the J.C. Boyle powerhouse to Copco No. 1 reservoir)
- Copco No. 2 bypass reach (from Copco No. 2 dam to Iron Gate reservoir, including Fall Creek)
- Below Iron Gate dam – Middle Klamath River reach (from Iron Gate dam to confluence of the Salmon and Klamath rivers)

Study plans guiding this research were developed in collaboration with land-managing agencies and recreation stakeholders. The study was designed to be conducted in two phases. Phase I included a review of existing information, interviews with resource managers and experienced river users, and on-site reconnaissance (PacifiCorp, 2002a; see methods below in Section 2.4), and it provided sufficient information for some river reaches and opportunities. For other reaches and opportunities, additional information was judged necessary to meet overall study goals and objectives. In these cases, a second study plan was developed for collecting that information in Phase II (PacifiCorp, 2002b).

## 2.2 OBJECTIVES

Overall objectives for this two-phased study are stated below. The level of detail for each objective differs by reach or type of recreation opportunity.

- Identify recreation opportunities on the different reaches. Boating opportunities may vary by craft, skill level, preferences for different types of whitewater conditions, or specific segments within a reach. Other opportunities may include fishing, swimming, or other general river recreation.
- Identify flow-related attributes for each of those opportunities, including a description and classification of key rapids or other important recreation features.

- Develop relationships between flow levels and experience quality for each opportunity. The resulting "flow evaluation curves" will help identify acceptable and optimal flow ranges for each opportunity, as well as potential threshold "minimum" and "optimum" flows.

- Assess relative impacts of providing flows for specific opportunities on other river recreation opportunities.

- Assess potential effects of different flow regimes on recreation use levels. Integrate that information with recreation impact and carrying capacity information being developed by BLM as part of its ongoing planning effort for the draft Upper Klamath River Management Plan (includes Upper Klamath Wild and Scenic River [WSR]/Oregon State Scenic Waterway [OSSW] segment) (BLM, 2003).

## 2.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The results of this study will provide information necessary to satisfy FERC license application requirements specific to Project-related recreation flows and effects on the Upper Klamath Wild and Scenic River. More specifically, PacifiCorp will use study results to help assess the relative importance and tradeoffs of various flows and potential recreation opportunities and the relative costs and feasibility of providing Project flows for other resources.

Study information will be used to help shape proposed Project operations schedules to be developed by PacifiCorp. Proposed operations schedules will consider not only whitewater boating or fishing needs, but also fisheries, water quality, power generation, and other needs. Information from this study may be integrated with other cultural and biological resource information to help determine whether boating or angler flows may be considered. However, it is beyond the scope of this study to comprehensively assess specific impacts on fish, wildlife, vegetation, or cultural resources from the potential implementation of boating or angler recreation flows.

Information from this study also will be used in the development of a draft Recreation Resource Management Plan (RRMP) for the Project (the RRMP is discussed in Section 6.0 of this Final Technical Report [FTR] and in Study Plan 3.5).

## 2.4 METHODS AND GEOGRAPHIC SCOPE

Methods for the flow-recreation studies were conducted in two phases, as discussed above. Phase I work was conducted for all reaches; it included a review of existing information, interviews with a limited number of resource managers and experienced river users, and on-site reconnaissance. Phase II work included more detailed hydrology analysis, additional interviews with experienced users, controlled flow studies, or demonstration flows on specific reaches. The following section describes methods involved in each.

### 2.4.1 Phase I Methods and Geographic Scope

Phase I information for the five "Upper River" reaches (Link River, Keno, J.C. Boyle bypass, Hell's Corner, and Copco No. 2 bypass) was summarized in a report completed in spring 2002 (PacifiCorp, 2002c). The content of that report has been reorganized into this document. Phase I information for the Middle Klamath River reach was completed and inserted into this document in spring 2003. Phase I work was based on several sources: (1) existing literature about the river (reports and other documents, including hydrology information); (2) structured interviews with people who know about recreation and flows on the river; and (3) on-site reconnaissance of recreation areas along the river. Additional information about each is presented below.

#### 2.4.1.1 Existing Literature

An examination of existing reports and other documents is a useful first step for understanding recreation opportunities and the ways that flows may affect them. Key management reports include the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic Study (BLM, 1990) and the Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement (BLM, 1994). Two research efforts with useful information include a comparative analysis of whitewater boating resources in Oregon (Shelby, Johnson, and Brunson, 1990) and a recreation analysis of the Upper Klamath by the Oregon Parks and Recreation Department (1990).

Guidebooks describing various boating opportunities on the river are an additional source of information. For this study, researchers examined six boating guidebooks: Handbook to the Klamath River Canyon (Quinn and Quinn, 1983); Paddling Oregon (Keller, 1998); Soggy Sneakers: A Guide to Oregon Rivers (Willamette Kayak and Canoe Club, 1994); California Whitewater (Cassady and Calhoun, 1995); The Best Whitewater in California (Holbek and Stanley, 1998); and The Canoer's Guide to the Wild and Scenic "Middle" Klamath River (Rucker, 2001).

Internet Web pages sometimes offer interesting information about recreation uses on a river, or allow researchers to understand how recreation users retrieve information about flows. For this study, researchers examined several outfitter/guide, agency, utility, and user websites with information about the upper and middle reaches of the Klamath River.

Hydrology information was critical in assessing potential Project effects on recreation resources. This information was often complex and was developed from several sources, including U.S. Geological Survey (USGS) gage data, PacifiCorp operations data, a PacifiCorp report on operational issues (PacifiCorp, 2002d), and the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic Study (BLM, 1990). Details about data sources and their limitations are provided as findings are presented for each reach.

#### 2.4.1.2 Interviews

Interviews with knowledgeable resource users are a useful method for learning about recreation and flow-recreation relationships (Whittaker et al. 1993). Researchers conducted more than 50 phone interviews with boaters, anglers, resource managers, and others who may know about flows and their relationship to recreation on the various river reaches. Appendix 2A lists Phase I interviewees and the reaches and opportunities they discussed. Appendix 2B provides the interview structure.

Boating interviews followed a structured format organized by reach. The interviews focused on several types of information:

- User characteristics and information about recreation opportunities. This included questions about which reaches and boats people use, when they take trips, etc. For commercial users, researchers also asked about customer costs, proportion of business on the Klamath relative to other rivers, and the types of trips they offer.

- Evaluations of different flow levels for various opportunities. This included rating different flows for certain types of opportunities and specifying acceptable and optimum ranges of flows for those opportunities.

- Flow timing issues. This included questions about how long trips take at certain flows and when trips would start and end under certain timing scenarios.

- Preferences for facility development. This included questions about users' preferences for new or improved facilities (e.g., road improvements, trails, launches, and restrooms) or other recreation management issues. Results were designed to assist BLM in its river management planning process (see Appendix 2C).

In all, 34 interviewees offered information about boating on the upper five reaches of the Klamath River, with 33 offering information on the Hell's Corner reach. A total of 33 boaters were interviewed about the Middle Klamath River reach. When qualitative information from specific boaters is used, the source is identified in parentheses.

The fishing interviews also followed a structured format organized by reach. Interviews with anglers focused on three types of information:

- Fishing opportunity characteristics. Anglers were asked to identify target species for each reach, describe typical size of caught fish, and evaluate the fisheries on a 1 to 5 scale (from poor to excellent) in comparison with other regional opportunities. Anglers were also asked to describe when and where they fish, and which type of tackle they use (e.g., spinners, plugs, bait, or flies).

- Flow evaluations for opportunities. Anglers were asked to identify acceptable and optimal flow ranges for fishing for each reach, and provide comments about how they perceive irrigation or hydropower operations may be affecting fishing quality. In all cases, researchers attempted to have anglers separate evaluations about biophysical issues from fishability issues. The former are the subject of biological studies that are part of the relicensing process; here researchers were focused on how flows affect the ability to fish (assuming there was a good fishery).

- Preferences for facility development. This included questions about users' preferences for new or improved facilities (e.g., road improvements, trails, launches, and restrooms) or other recreation management issues. Results were designed to assist BLM in its river management planning process (see Appendix 2C).

In all, 17 interviewees offered information about fishing on upper reaches, while 18 offered fishing information on the Middle Klamath River reach. In addition, researchers requested and received a letter summarizing similar information from board members of the Klamath Country Flycasters (KCF), a local fishing club. When qualitative information from specific anglers is used in the report, the source is identified in parentheses.

#### 2.4.1.3 Resource Reconnaissance

Targeted field work and systematic flow need evaluations are other useful methods for conducting flow-recreation studies (Whittaker et al. 1993). On-site work for the upper river reaches focused on a weeklong site visit in September 2001. Field work for the Middle Klamath River reach was conducted in August 2002. Dates and flows observed during the field work are summarized below. Confluence Research and Consulting (CRC) researchers and PacifiCorp staff were present for all field work; agency staff, EDAW consultants, and stakeholders were also present during much of the field work and boated or hiked along several reaches.

Field work involved assessing various recreation environments along the river, identifying areas and features discussed by interviewees or existing documents, evaluating the observed flow level for various opportunities, and estimating how alternative flow levels are likely to affect those opportunities.

The Phase I field work was performed in September 2001 (upper five reaches) and August 2002 (Middle Klamath River reach below Iron Gate dam). Table 2.4-1 summarizes reconnaissance by date, flow, and mode of transport.

Table 2.4-1. Phase I reconnaissance summary.

| **Reaches** | **Date**[1] | **Observed Flow (cubic feet per second [cfs])**[2] | **Mode of Transport** |
|---|---|---|---|
| Link River Bypass Reach | Sept. 9-10 | 350-390 | Kayak, on foot |
| Keno Reach | Sept. 9 | 698 | Kayaks, rafts, inflatable kayaks (IKs) |
| J.C. Boyle Bypass Reach | Sept. 8 | 366 | Kayaks, IK, on foot |
| Hell's Corner Reach | Sept. 7 | 1,570 | Kayaks, rafts, catarafts |
| Copco No. 2 Bypass Reach | Sept. 10 | < 10 | On foot |
| Middle Klamath River Reach: | | | |
| – Iron Gate Dam to Snag Hole | Aug. 13 | 662 | Kayaks and cataraft |
| – Tree of Heaven to Gottville | Aug. 14 | 665 | Kayaks, rafts, catarafts, and IKs |
| – Sluice Box to China Point | Aug. 15 | 665 | Kayaks, rafts, catarafts, and IKs |
| – Indian Creek to Ferry Point | Aug. 16 | 665 | Kayaks, rafts, catarafts, and IKs |
| – Ferry Point to Coon Creek | Aug. 17 | 663 | Kayaks, rafts, catarafts, and IKs |

Source: CRC 2003.
[1] All dates for upper reaches in 2001; all dates for Middle Klamath River reaches in 2002.
[2] Flows at primary gage on each reach; all Middle Klamath River reach flows at Iron Gate dam.

Integrating Information

Final steps in the Phase I process were to (1) integrate information from multiple sources and develop flow evaluation curves (when possible) for each flow-dependent recreation opportunity, and (2) assess whether current flow management regimes are likely to affect those opportunities.

Developing Flow Evaluation Curves. Flow evaluation curves are a key output for flow-recreation studies, showing how incremental changes in flows are related to recreation quality. The curves are drawn on a graph that shows flow along the horizontal axis (in cubic feet per second [cfs] at the relevant gage) and recreation quality along the vertical axis (the evaluation scale runs from totally unacceptable to totally acceptable with a midpoint at "marginal"). On the basis of previous research, flow evaluation curves often have a bell shape that identifies marginal threshold flows at both the low and high ends (defining an acceptable range for that opportunity), as well as an optimal flow or range of flows where the curve peaks (Shelby et al. 1992; Whittaker et al. 1993).

Opportunities examined on the Upper Klamath River include boating, fishing, and general river recreation (hiking, camping, day use, and so on along the river's banks). General information about flow evaluation curves for these opportunities is provided below. In all cases, curves should be considered preliminary, as additional Phase II information may help improve and validate them.

*Boating Opportunities.* Curves for boating opportunities were generally developed from professional judgments that considered all available information (existing literature, interviews, and site reconnaissance). The exception was for Hell's Corner reach whitewater boating, where more extensive quantitative interview data were the primary source. For the Hell's Corner reach whitewater opportunities, researchers also had additional quantitative information about preferred flow ranges for various opportunities and other flow-recreation issues.

On the Hell's Corner and J.C. Boyle bypass reaches, separate curves were developed for "standard" and "big water" boating opportunities, and for rafts and kayaks. While both standard and high-challenge trips on those reaches provide Class IV rapids, standard trips feature less intimidating flows, while big water trips feature stronger hydraulics of interest to skilled, challenge-oriented boaters. Differences between standard and big water trips, or between craft types, were not considered significant on the Link River bypass, Keno, or Copco No. 2 bypass reaches.

For the Hell's Corner reach, researchers also developed a flow evaluation curve for lower flow "technical" trips. Technical trips differ from standard trips by offering more "rock-dodging," tighter lines through rapids, greater boatability problems, and less powerful hydraulics. They are generally less desirable than standard trips, but some boaters take them when higher flows are not available because they offer access to the canyon.

On the Link River and Keno reaches, flow evaluation curves were also developed for "locational playboating" (where kayakers use a wave or hydraulic to practice "rodeo" or "freestyle" skills). These differ from other trips in their dependence on a specific play feature (a wave or hydraulic). Additional information about playboating and the specific play features on those reaches are presented in the findings.

*Fishing Opportunities.* Curves for fishing opportunities (fishability) were developed from professional judgments that considered all available information, with particular attention to interview information (when available). In general, these curves follow from previous research suggesting that lower flows tend to provide better quality fishing conditions, as long as those flows do not create biological problems for fish (e.g., reduce the number or size of fish, make them listless, or lower their feeding activity). It is obvious that good fishing opportunities begin with quality fisheries, which are the purview of biological researchers. This study focuses on the flows considered good for fishing only. In general, we try to use the terms "fishability" and "angler habitat" to help distinguish the conditions that anglers can evaluate from aquatic habitat conditions that are the focus of biological studies.

Although fishability evaluations may differ by type of "fishing habitat" (e.g., pools, runs, or pocket water), fishability on many western rivers is generally best when there is good wadeable access; lower velocities in riffles, runs, and pools; and less turbulence in the rapids; and when fish are concentrated in fishable water. Previous research suggests there may be substantive differences among flow requirements for fly, spin, and bait fishing (with the latter two available for a wider range and at higher flows than wading-based fly fishing). When Phase I information is too coarse to make these judgments, a single fishing flow evaluation curve is provided for each reach.

Previous research also suggests that some anglers have concerns about biological impacts from various flow regimes (Whittaker and Shelby, 2002a), some of which may confound fishability evaluations. In general, we believe anglers were able to separate these evaluations by explicitly acknowledging their biological concerns during focus group discussions. These concerns are "perceived" biological issues; they have been included in the report for completeness. They are not intended to supplant biological studies of fisheries.

*General Riverside Recreation.* Camping, hiking, picnicking, and similar forms of general riverside recreation occur at numerous defined locations on the Upper Klamath. These recreation activities are generally flow enhanced rather than flow dependent, and flows tend to have smaller or more indirect effects on their quality compared with boating and fishing (Whittaker et al. 1993). The exception is the potential impacts associated with aesthetics.

Many riverside recreation activities are enhanced by river aesthetics, which may be related to flows. Many riverside recreation opportunities focus on the aesthetics of moving water (Moore et al. 1990), although other opportunities may focus on other features of the environment (e.g., forests and other plant life, wildlife). Similarly, while flows may be only one important factor in people's evaluations of scenic quality in a riverscape (topographic relief, vegetation, color, and weather conditions are also likely to play important roles), research shows that many recreation users can specify their evaluations of flow levels (Land and Water Associates 1992; Shelby et al. 1995). Research also shows that flows have significant effects on overall scenic evaluations (Brown and Daniel, 1991).

A review of river aesthetics research is beyond the scope of this report, but findings generally show aesthetic ratings can vary with different channel features (even on the same river reach), and that medium flows are rated best (Shelby et al. 1992). Two studies also indicate that ratings improve more dramatically when flow increases cover the bottom of the channel (Whittaker and Shelby, 2002b).

General riverside flow evaluation curves were developed from professional judgments during consideration of this previous research. In general, this meant drawing a curve that begins in the unacceptable range at very low flows and crosses the "marginal line" at the flow that would cover most of the bottom of the channel and reaches optimal levels soon afterward. It remains at optimal levels until flows reach "bankfull" levels, when turbidity and lack of definition become issues.

Assessing Project-Related Effects. Project-related effects on recreation opportunities were assessed in two ways. The initial focus was on determining whether Project-related changes in flows would be "noticeable." Hydrologists generally acknowledge a 10 percent margin of error with single discharge measurements, so we assume that recreation users would generally be unable to detect change until there is about a 20 percent change.

Assuming this "20 percent rule," a second focus was on whether Project-related flow changes would shift opportunities from optimal to suboptimal to unacceptable levels (and for how long). In general, we analyzed hydrology data to illustrate the frequency of days in each category. Because the hydrology for some reaches is complex (with variation by day, type of year, and over the history of the Project), additional discussion of hydrology information and project effects calculations is presented with reach results.

Information Limitations

For some opportunities, Phase I information was insufficient to develop accurate flow evaluation curves until a range of flows had been observed. In these cases, researchers have not provided a curve. Similarly, for some project effects, it is difficult to assess impacts until an operating scenario is specified with greater accuracy than past hydrology. In these cases, researchers organized discussion around options for developing better information during Phase II, or after operating scenarios have been specified.

### 2.4.2 Phase II Methods and Geographic Scope

Phase II involved additional studies on specific reaches. The bulk of Phase II work was associated with controlled flow assessments at the J.C. Boyle bypass and Hell's Corner reaches conducted in the fall of 2002. Additional reconnaissance on the Copco No. 2 bypass reach was also conducted in September 2003. Additional information collection and analysis may be considered for the Link River bypass reach (staff gage development and interviews with locational playboaters) and the Keno reach (additional analysis of hydrology information and possible reconnaissance) should these reaches be reconsidered for the proposed Project. A summary of methods (or planned methods) for each is presented below.

#### 2.4.2.1 Controlled Flow Assessments on Hell's Corner and J.C. Boyle Bypass Reaches

The Phase I report summarized preliminary flow-recreation relationships for technical, standard, and big water boating, fishing, and general river recreation on both the Hell's Corner and J.C. Boyle bypass reaches (see findings below). It also recommended additional work to refine flow-recreation relationships on these reaches via controlled flow assessments, with a focus on boating and fishing.

Controlled flow assessments were conducted in September 2002. The idea was to release known quantities of water and then describe and evaluate conditions for various kinds of recreation through survey instruments and focus groups. In this case, the focus was on whitewater boating opportunities using kayaks and rafts, but it included assessments of fishing using flies and spinning tackle. The study involved assessments at four different flows on each reach, as summarized in Table 2.4-2. Logistical considerations for the study are outlined below by topic area.

Table 2.4-2. Recreation-controlled flow study reaches, dates, times, and flows.

| Reach | Date | Time Period | Target Flow (cfs) | Range Provided (cfs) | Evaluated Flow (cfs) |
|---|---|---|---|---|---|
| Hell's Corner Reach | September 13 | Morning | 1,700 | 1,738 – 1,781 | 1,750 |
| | September 13 | Afternoon | 1,300 | 1,350 – 1,360 | 1,360 |
| | September 14 | Morning | 1,000 | 1,050 – 1,065 | 1,060 |
| | September 15 | Afternoon | 700 | 635 – 731 | 730 |
| J.C. Boyle Bypass Reach | September 16 | Morning | 1,000 | 943 – 958 | 960 |
| | September 16 | Afternoon | 1,300 | 1,220 – 1,230 | 1,230 |
| | September 17 | Morning | 1,500 | 1,350 – 1,480 | 1,480 |
| | September 17 | Afternoon | 700 | 688 – 720 | 690 |

Source: CRC 2003.

Flow Choices

Phase I information for Hell's Corner reach suggested a need for more precise information about flows up to 1,700 cfs (one turbine generation plus 325 cfs from the J.C. Boyle bypass springs and fish flows). The controlled flow assessment examined four flows, including 1,700 cfs (to "standardize" evaluations), as shown in Table 2.4-2. Higher flows were not assessed because of dry-year water availability and operational constraints. Phase I information provides reasonably precise evaluations of those higher flows for boating and fishing.

Phase I information for the J.C. Boyle bypass reach suggested a need for more information about the full range of flows, with a particular focus on fishing and both technical and standard boating trips. These opportunities appeared likely to occur at flows less than 1,500 cfs. The controlled flow study examined four flows from about twice base flows (700 cfs) to 1,480 cfs. Higher boating flows were not assessed because of dry-year water availability and operational constraints. Phase I information provides some information about evaluations of those higher flows for boating and fishing.

Study Timing and Daily Logistics

The controlled flow assessments were conducted September 13-17, 2002, just before a planned maintenance effort on the J.C. Boyle powerhouse canal. This allowed evaluation of several flows in a short period to improve boater participation. Operational considerations required short releases (2 to 4 hours for any given flow), as well as two releases on three of the five days (Table 2.4-2). This increased logistical complexity, but it still allowed sufficient time for participants to observe key parts of the river at each flow and make informed evaluations.

At each flow on the Hell's Corner reach, boaters ran the primary whitewater rapids between Caldera rapid and Stateline take-out (PacifiCorp and BLM). On the J.C. Boyle bypass reach, boaters ran the river from the bridge below J.C. Boyle dam to the Upper Klamath River (Spring

Island) Boater Access. At the end of each run, boaters completed a flow evaluation form at the take-out (or back at the put-in after shuttling was completed). They also participated in a focus group meeting to discuss the flow(s) they observed.

Anglers were not required to observe flows at any specific locations in the reach, but they were encouraged to travel to and fish the areas they would likely use at the observed flow. Information was provided about the duration of each observed flow at specific locations, so anglers could be sure about the flows they were evaluating. At the end of each flow, they were asked to complete a flow evaluation form. At the end of the study, anglers were interviewed about the flows they observed (some on site and others by phone).

Flows, dates, and times are listed below. More specific information about the timing and duration of study flows at specific locations (e.g., Upper Klamath River (Spring Island) Boater Access, Frain Ranch, Stateline take-out, and Fishing Access Sites 1-6) was provided to participants during the study. Note: Operational fluctuations occurred during the study and have been noted in the "range provided" column of Table 2.4-2; the "evaluated flow" column lists the flow most likely to have been observed by boaters during each evaluation period.

<u>Participants</u>

Logistics increase exponentially with numbers of participants, so researchers recommended participation of less than 30 total users for any given flow. In most cases, this limit was not exceeded.

<u>Boating</u>

For boating, the study participation goal was about ten people in single-person craft (kayaks, inflatable kayaks, or small catarafts) and at least two raft teams (one 14-foot raft with up to six people; one 12- to 13-foot raft with up to four people) per flow. These goals were met (see Table 2.4-3). Private boating participants were selected and organized by American Whitewater (AW) and informally organized local boating groups. Commercial rafting participants were invited through local outfitters (all of the permitted companies on the Hell's Corner reach were notified by e-mail, and the companies with higher use days were contacted again by phone or follow-up e-mails). Appendix 2D provides the names of participants.

Table 2.4-3. Recreation-controlled flow study participation.

| Reach | Flow (cfs) | Boaters | | | | Anglers | |
|---|---|---|---|---|---|---|---|
| | | **Kayakers** | **Catarafters** | **Rafters** | **Total** | **California** | **Oregon** |
| Hell's Corner Reach | 1,750 | 6 | 1 | 6 | 13 | 2 | 2 |
| | 1,360 | 5 | 1 | 5 | 11 | 3 | 2 |
| | 1,065 | 5 | 1 | 6 | 12 | 1 | 2 |
| | 730 | 5 | 1 | 10 | 16 | 2 | 7* |
| Completed close-out* | | **5** | **1** | **11** | **17** | **4** | **7** |
| J.C. Boyle Bypass Reach | 960 | 12 | 2 | 20 | 34 | -- | 5 |
| | 1,230 | 5 | 1 | 4 | 10 | -- | 0 |
| | 1,480 | 9 | 2 | 16 | 27 | -- | 5 |
| | 690 | 7 | 2 | 0 | 9 | -- | 2 |
| Completed close-out* | | **9** | **2** | **14** | **25** | **--** | **7** |

Source: CRC 2003.
*Or were interviewed by telephone.

## Fishing

For fishing, the study participation goal was four to eight total anglers per flow per reach, with at least one who would focus on spin and/or bait fishing. Because the Hell's Corner reach includes sections in both California and Oregon, participation from anglers in both states was also desirable. CRC invited local anglers to participate in the study on the basis of phone contacts with anglers developed during Phase I. This included anglers from agencies, local boating clubs such as KCF, and local tackle shops. These anglers were contacted by e-mail and phone, and several received packages of information about the study by e-mail or regular mail.

Despite considerable effort to encourage anglers to observe the study releases, few directly participated during the study, particularly at higher flows. In some cases, scheduling conflicts were the primary reason given (e.g., vacation plans, work commitments on weekdays, or guiding commitments in response to an unusually strong run of steelhead on the Rogue River and other nearby regional rivers). In other cases, anglers appeared to have *a priori* preferences for lower flows and felt it was unnecessary to observe the planned higher flows in the study. This was particularly relevant for the Hell's Corner reach, where anglers have observed base flows and higher flows for many years; however, few anglers showed much interest in observing higher flows on the J.C. Boyle bypass reach, either. Angler participation is shown in Table 2.4-3; names of participants are provided in Appendix 2D. To bolster the study sample, additional interviews were conducted with study boaters who also fish and with anglers who frequently fish the reach and may have observed the river during the 730 cfs steady flows in September 2002.

In response to this limited participation, researchers (1) contacted several anglers who happened to be fishing on the river and conducted short interviews on site, and (2) conducted a few follow-up interviews with known anglers who may have had the opportunity to fish the ~700-cfs flows that were provided for more than 3 weeks after the study (because of planned maintenance).

Safety and Liability

Prior to the study, PacifiCorp developed a boating safety plan with review from AW and CRC. This plan provided additional detail about boating safety responsibilities, and generally outlined possible hazards and issues. The safety plan generally covered responsibilities of the boaters (e.g., good equipment, self-rescue skills, and responsible decisionmaking) and the utility (e.g., provide communications in case of an accident).

All boating participants signed liability waivers and took appropriate safety measures before getting on the river. PacifiCorp developed liability waivers in consultation with AW and CRC. Boaters were generally strong Class IV to V boaters with commensurate self-rescue skills.

There were a few minor boating incidents during the study (e.g., a few rafters and kayakers fell out of their boats, or boats became stuck on rocks for short periods). However, no one was hurt during these incidents (which are common during whitewater boating), and equipment was generally not damaged by them. Local law enforcement and rescue personnel were not needed on site during the study.

Anglers were also encouraged to be safety conscious on the river. Most of the anglers who participated noted that they were skilled waders, or that they would avoid wading in deeper water at higher flows to minimize safety risks. No fishing safety problems were reported during the study.

Survey Instruments

Primary information from the study was developed from surveys (boaters and anglers) or interviews (anglers) with participants, who answered questions before the study, after each flow, and after they had observed the full series of flows. Survey question format and content followed from several previous studies (see surveys in Appendix 2E).

Focus Group Meetings

Boater focus group meetings occurred at the end of each run (Stateline take-out) or the Frain Ranch area for the Hell’s Corner reach. On the J.C. Boyle bypass reach, focus group meetings were held at the Upper Klamath River (Spring Island) Boater Access. Key issues during focus groups were to identify the advantages and disadvantages of each flow, and to suggest how flows might differ at higher or lower levels. The final “close-out” focus group also explored other management issues (e.g., access, development needs, and carrying capacity concerns) as well as identified similar river segments to the two reaches. Because of logistical considerations, anglers were interviewed rather than scheduled for focus groups.

Video and Still Camera Documentation

Video/photographic documentation was conducted during the study to show how major rapids or other key river features changed at different flows. Three on-land boating video stations were established on the Hell’s Corner reach (at Caldera, Satan’s Gate, and Hell’s Corner Rapids). Two on-land boating video stations were also established on the J.C. Boyle bypass reach (at Sidecast Slide and Heart of the J.C. Boyle bypass reach). In addition, boaters took video and still footage at several other locations to illustrate key rapids or other features that change with flows; focus group meeting comments were captured for integration into the documentation video. Photographers also shot video and still footage of anglers during the study to illustrate how those opportunities change at different flows.

Video and still photography was recorded digitally. Video footage was edited and integrated into a scripted video that describes the project and study results (estimated length: 15 to 20 minutes). The script was prepared by CRC and PacifiCorp. A photo gallery from the still images was also developed (Appendix 2F).

Shuttles, Rafts, Food, and Accommodations

PacifiCorp contracted various services and equipment from outfitters to conduct the study. The outfitters provided kitchen equipment and evening meals for camping participants, lunches for all participants on all days of the study, rafts and related gear for several rafting teams, and shuttle buses and trailers. Camping for participants was available in the Frain Ranch area during the Hell's Corner reach component and at BLM's Topsy Campground during the J.C. Boyle bypass reach component.

Survey Analysis

Data were analyzed using descriptive statistics (e.g., means, medians, interquartile ranges, and frequency distributions) or graphical devices (e.g., flow evaluation curves) following from previous research. More detailed information about analysis techniques and statistics is presented as results are given.

#### 2.4.2.2 Gage Development and Locational Playboating Interviews on Link River

Phase I results summarized preliminary flow-recreation relationships for fishing, boating, general river recreation, and locational playboating on this reach. However, additional precision was recommended for threshold levels for playboating if purposely provided bypass flows are considered.

A controlled flow assessment for this opportunity has significant logistical, operational, and biological impact challenges. A less difficult and more cost-effective approach focused on interviewing additional boaters who use the Link River for playboating after a "user gage" was installed to help them specify the flows they prefer. Boaters currently have to estimate flows from Link River U.S. Geological Survey (USGS) information and subtract estimated East Side flows.

A "staff" gage was installed near the Link River playboating wave in late March 2003, prior to the only high-flow releases from UKL that spring. It was designed to allow boaters to calibrate with a reliable gage. Unfortunately, high flows were available only for about a week, and few local boaters were able to become "calibrated." An interview with one local kayaker who became familiar with the new gage was used to revise acceptable and optimal flow ranges, but wider surveys were unlikely to be productive and were not conducted.

If the Link River bypass reach has locational boating flows available when researchers are in the area for other studies, additional short reconnaissance will also be arranged. Results from the interviews and reconnaissance will be used to revise the flow evaluation curves and discussion of project effects on locational playboating.

#### 2.4.2.3 Flow-Recreation Analysis and Additional Reconnaissance on Keno Reach

Phase I summarized preliminary flow-recreation relationships for fishing, boating, locational playboating, and general river recreation. It also recommended collecting information to more precisely estimate the lowest acceptable and optimal flows for standard boating and boat-based fishing.

This additional precision would make sense if flow management for recreation was planned (e.g., if PacifiCorp decided to modify flows by using the 1.5 feet of Keno reservoir fluctuation allowed by USBR in the current contract). Similarly, additional precision would be useful if Keno reach flows ever became more predictable (e.g., if irrigation return flows to the reservoir were gauged), allowing boaters to take advantage of daily flow changes.

The recent exclusion of the Keno reach from the Project boundary and lack of plans to fluctuate Keno reservoir to provide flows for recreation make this additional precision unnecessary. Work identified in Phase I (additional reconnaissance and supplemental analyses of daily fluctuations during summer), therefore, was not conducted.

The effort also includes additional analysis of historical flow data for the reach, with a particular focus on daily minimum and maximum flows (as well as their duration). On the basis of Phase I information, attention toward daily and hourly variation when daily averages are in the 700- to 1,200-cfs range may be critical. At these levels, the goal is to quantify the frequency and duration that short periods of higher flows may be providing standard boating opportunities. Similarly, if PacifiCorp considers using some of the potential active storage in Keno reservoir in the future (by fluctuating reservoir levels), additional analysis of these regimes will be necessary to assess whether they will add or subtract days of various recreation opportunities.

#### 2.4.2.4 Demonstration Flow Reconnaissance on the Copco No. 2 Bypass Reach

Phase I results estimated rough preliminary flow-recreation relationships for boating and general river recreation on the Copco No. 2 bypass reach. Additional precision was recommended for both opportunities if “demonstration” flows were provided in this short reach (as recommended by researchers for other resources). This occurred in September 2003.

The effort involved evaluations at three flows: 175 cfs, 650 cfs, and 1,200 cfs. The flows were requested and measured by other resource specialists. Participants in the reconnaissance included recreation researchers, PacifiCorp staff, BLM staff, and whitewater boating advocates. Flows, dates, and participation by craft are listed below:

- **175 cfs.** September 10. Shelby (kayak), Whittaker (12-foot cataraft), Howison (inflatable kayak), and Stookesberry (kayak)

- **650 cfs.** September 12. Shelby (kayak), Whittaker (12-foot cataraft), Ellis and Buckingham (12-foot paddle raft), and Stookesberry (kayak)

- **1,200 cfs.** September 13. Shelby (kayak), Whittaker (12-foot cataraft), Stookesberry (kayak), Seymour (kayak), and Weidenbach (kayak)

Reconnaissance focused on confirming potential recreation opportunities, identifying acceptable and optimal flow ranges for each, and describing other issues related to recreation on the reach. Notes were taken after each run, and a small focus group meeting was conducted among participants after all flows were observed. Still photographs of key features (e.g., rapids, scenery, access locations) were taken at all three flows; video footage was also taken at the 650- and 1,200-cfs flows.

## 2.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The 11-mile segment of the Klamath River from the J.C. Boyle powerhouse to the Oregon-California stateline (the Hell's Corner reach) was designated by the Secretary of the Interior as a BLM- and Oregon state-administered component of the National Wild and Scenic River system, pursuant to Section 2 (a)(ii) of the National Wild and Scenic Rivers Act. The information collected and analyzed in this study helped PacifiCorp and the stakeholders assess project effects on the Outstandingly Remarkable Values (ORVs) identified for the Upper Klamath WSR reach. In addition, this information helped identify optimal flows for recreation that are balanced with desired flows for other resource areas, including aquatic resources. Finally, this information is valuable to BLM as it develops a new river management plan for the Upper Klamath River between the J.C. Boyle and Copco developments (BLM, 2003). This plan has not yet been adopted.

Recreation flow information gathered in this study was also used to assess consistency with the policies and recommendations in the Klamath Falls Resource Area (KFRA) Resource Management Plan (RMP) and Record of Decision (ROD), and the Redding Resource Area (RRA) RMP and ROD.

FERC requires that a licensee analyze potential project effects on eligible and adopted WSR reaches. The Klamath River has two applicable reaches: the Upper reach between J.C. Boyle and Copco, and the Middle/Lower reach from Iron Gate dam to the Pacific Ocean. The information collected and analyzed will be used to analyze the potential project effects on these reaches, as well as on four other Project-affected river reaches or bypasses (18 *Code of Federal Regulations* (CFR) Section 4.51 F[5]).

FERC requires that a licensee develop an estimate of existing and potential recreational use of the Project area (18 CFR Section 4.51 F[5]). Information collected in this study will be used to help develop these estimates, which are the specific focus of Section 3.0 of this FTR.

## 2.6 TECHNICAL WORK GROUP COLLABORATION

The Recreation Flow Analysis study received significant attention throughout the development of the license application. The study plan was modified several times in response to stakeholder concerns or ideas, and working groups met regularly to review progress and findings.

Significantly, a Phase I analysis was added for the Middle Klamath River reach below Iron Gate dam based on federal and state agency comments subsequent to the initial Phase I work on the upper reaches. The Middle Klamath River reach work was guided by concerns expressed during a collaborative agency meeting on July 9, 2002, in Yreka, California; during collaborative field work on the river in August 2002; and at a recreation work group meeting in Yreka on March 4, 2003. This coordination is continuing.

Phase I results for the upper river reaches were formally presented at a recreation work group meeting in June 2002. Preliminary reports about the Middle Klamath River reach reconnaissance and the September 2002 controlled flow studies were presented at a work group meeting in December 2002. The Phase I information below Iron Gate dam and the Phase II information for Hell's Corner and J.C. Boyle bypass reaches was formally presented in March 2003. Phase II information was also presented at Aquatics and Recreation work group meetings in September and October 2003. For more information on stakeholder collaboration, please see the Comprehensive Coordination Report (Kearns and West, 2003).

## 2.7 STUDY OBSERVATIONS AND FINDINGS

The draft Phase I study report from the Recreation Flow Analysis was posted on the PacifiCorp Klamath Project website in June 2002. The findings and discussion sections of that report have been reorganized to fit the format of this FTR, as presented below. These results were updated following agency and stakeholder review. Phase II information has also been integrated into this document, usually in the reach-by-reach findings.

The "findings" section begins with an overview of the Recreation Flow Analysis study area, including summaries of river and reservoir segments, as well as Project facilities. While this information may be available in other technical reports, a concise version for recreation readers is presented here. An overview of Project operations and recreation-relevant hydrology for each reach is also included in the study area description. This provides the context for flow-recreation findings to follow, and links with assessments of Project effects on recreation.

The second half of the section focuses on reach-by-reach findings. For each reach, we describe the setting, identify recreation opportunities, and then associate "flow requirements" for each opportunity (e.g., a flow evaluation curve and both acceptable and optimal ranges). When Phase II information is available, it is presented separately in the reach-by-reach findings. Finally, we integrate that information to discuss Project effects and future information needs based on all available information (Phase I and Phase II).

### 2.7.1 Study Area

Figure 2.7-1 shows a map with reach and reservoir locations on the Upper Klamath River. The Middle Klamath River reach begins downstream of Iron Gate dam; a separate map showing this reach is provided in Figure 2.7-2. Additional reach-specific maps are provided in the results and discussion section for each reach; those maps include more detailed information such as launches and other recreation facilities.

Figure 2.7-1. Project area with upper river reaches.

Back side of Figure 2.7-1

Figure 2.7-2. Middle Klamath River reaches.

Back side of Figure 2.7-2

#### 2.7.1.1 River and Reservoir Reaches

The Upper Klamath River is divided into five distinct river reaches (Table 2.7-1) and six reservoirs (Table 2.7-2). Table 2.7-1 includes basic information about reach length, typical flow ranges (more detailed hydrology information will be provided below), and how the reach is currently used for recreation. Table 2.7-2 shows reservoir size (in acre-feet [ac-ft]) and provides additional comments about reservoir surface area (at full pool) or other features.

Table 2.7-1. Summary of river reaches on the Upper Klamath River.

| Reaches | Length (miles) | Typical Flow Ranges (cfs) | Current Recreation Opportunities |
|---|---|---|---|
| Link River Bypass | 1.5 | 250 to 2,500+ | Hiking, fishing, whitewater kayaking, wildlife viewing |
| Keno Reach | 5.0 | 400 to 4,000+ | Fishing, whitewater boating, wildlife viewing |
| J.C. Boyle Bypass | 4.3 | 320 base; spills up to 5,000+ | Fishing, whitewater boating (rare) |
| Hell's Corner | 16.4 | 320 base; up to 3,000 daily peaks; spills up to 5,000+ | Whitewater boating, fishing, camping |
| Copco No. 2 Bypass | 1.3 | 10 base; rare spills | Hiking (rare) |

Source: CRC 2003.

Table 2.7-2. Summary of lakes and reservoirs on Upper Klamath River.

| Reservoirs | Total storage (ac-ft) | Size at full pool (ac) | Comments |
|---|---|---|---|
| Upper Klamath Lake (non-Project) | 629,780 | 90,000 | Relatively shallow but large lake (controlled by Link River dam). 486,830 ac-ft of active storage. |
| Lake Ewauna/ Keno Reservoir | 18,500 | 2,475 | Long, large reservoir with several narrow sections. Contract with USBR allows fluctuations up to 1.5 feet, but it is generally held flat at 1.5 feet below full pool for irrigation purposes. No active storage. |
| J.C Boyle Reservoir | 3,495 | 420 | Small, narrow reservoir. Possible fluctuation up to 3.5 feet; daily fluctuation is 2.0 feet or less. 1,724 ac-ft of active storage. |
| Copco No. 1 | 46,867 | 1,000 | Medium-size reservoir. Possible fluctuation up to 5 feet, daily fluctuation is usually under 0.5 foot. 6,235 ac-ft of active storage. |
| Copco No. 2 | 73 | 40 | Small, narrow reservoir tied to Copco No. 1 operations. Daily fluctuation is less than 0.5 foot per day. |
| Iron Gate | 58,794 | 944 | Medium-size reservoir; fluctuates up to 8 feet seasonally. Daily fluctuation is 1 foot or less. 3,790 ac-ft of active storage. |

Source: CRC 2003.

The Middle Klamath River reach, which has no dams or power facilities associated with the Project, is more difficult to divide into obvious reaches like the Upper Klamath. With a road along its entire length and at least 25 commonly recognized access points, there are also few clear dividing lines based on where people take their trips. However, there are some distinct reaches segmented by major tributaries that appear to provide slightly different opportunities, as shown in Table 2.7-3 (which shows reach length, typical flow ranges, and current recreation opportunities). Appendix 2G provides a list of access points, rapids, and other major recreation landmarks along the Middle Klamath River reach.

Table 2.7-3. Summary of river segments on the Middle Klamath River reach.

| Reaches | Length (miles) | Typical flow ranges (cfs) | Current recreation opportunities |
|---|---|---|---|
| Iron Gate Dam to Shasta River | 13 | Summer lows at Iron Gate: 650 to 1,500 cfs<br>Typical nonsummer flows: 2,000 to 4,000, with occasional peaks over 10,000 | Fishing (especially from boats), tubing and swimming, whitewater boating (rare) |
| Shasta River to Scott River | 34 | | Fishing, canoeing, whitewater boating, locational playboating |
| Scott River to Indian Creek | 36 | Summer lows at Seiad 700 to 2,000 cfs<br>Typical nonsummer flows: 3,000 to 5,000, with occasional peaks over 15,000 | Fishing, canoeing, whitewater boating |
| Indian Creek to Salmon River | 40 | | Fishing, whitewater boating, canoeing, hiking |

Source: CRC 2003.

### 2.7.1.2 Project Description

The Klamath Development consists of six generating facilities (between river mile [RM] 190 and RM 254) and a re-regulation dam with no generation facilities along the main stem of the Upper Klamath River. It also includes one generating facility on Fall Creek, a tributary to the Klamath River at about RM 196. The eight major Project facilities are listed in Table 2.7-4; the table gives their location, size, and comments about how they operate. Figure 2.7-3 shows a (not-to-scale) schematic of the Project facilities.

Table 2.7-4. Summary of hydroelectric facilities on Upper Klamath River.

| Development Facility | River Mile | Size (megawatts [MW]) | Comments |
|---|---|---|---|
| Link River Dam/ East Side Powerhouse (ph) | 254.0 (dam)<br>252.7 (ph) | 3.2 | Associated with Link River dam (owned by USBR); water diverted through a wooden pipe (diversion varies up to 1,200 cfs). |
| Link River Dam/ West Side Powerhouse | 254.0 (dam)<br>252.5 (ph) | 0.6 | Associated with Link River dam; water diverted through canal/penstock (diversion is 0 or 250 cfs). |
| Keno Dam | 233.0 | None | Nongenerating – operates as a re-regulating facility; buffers changes from USBR irrigation diversions and East Side/West Side discharge. |
| J.C. Boyle Dam and Powerhouse | 225.0 (dam)<br>220.4 (ph) | 80.0 | Storage for daily peaking operations at J.C. Boyle powerhouse (two turbines). Each turbine can produce up to 1,100 and 1,425 cfs outflow (2,525 cfs total). This does not include 325 cfs in J.C. Boyle bypass (100 cfs fish release + 225 cfs from springs). |

Table 2.7-4. Summary of hydroelectric facilities on Upper Klamath River.

| Development Facility | River Mile | Size (mega-watts [MW]) | Comments |
|---|---|---|---|
| Copco No. 1 Dam and Powerhouse | 198.8 | 20.0 | No bypass reach; water flows from dam through penstock to powerhouse. Total capacity is 3,200 cfs. |
| Copco No. 2 Dam and Powerhouse | 198.6 (dam)<br>197.3 (ph) | 27.0 | Water diverted through a tunnel to a powerhouse 1.3 miles downriver. Total capacity is 3,200 cfs. Operated in concert with Copco No. 1. |
| Fall Creek | 196.0 | 2.2 | Facility on tributary to the Klamath; water also diverted for fish hatchery and water supply in Yreka, CA. Total capacity is 50 cfs. |
| Iron Gate Dam and Powerhouse | 190.0 | 18.0 | Operated as a re-regulation facility; outflows specified by USBR (750 to 1,100 base flows in recent years). No bypass reach. Total hydraulic capacity is 1,750 cfs. |

Source: CRC 2003.

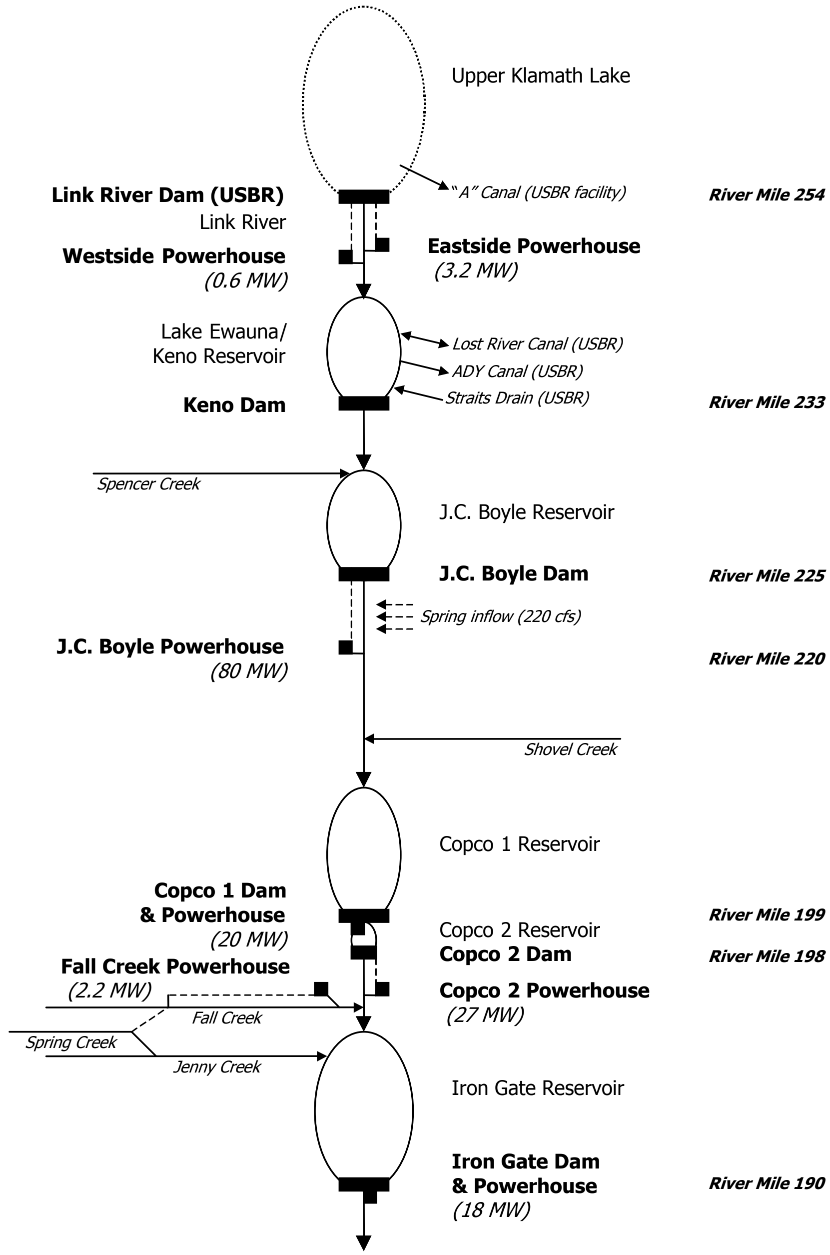
#### 2.7.1.3 Overview of Project Operations

The operation of the PacifiCorp power generation and USBR irrigation projects on the Upper Klamath River is complex. The following summary is designed to provide an overview of the system and suggest how it affects specific flows in the reaches covered in this report. For more detailed information about the project and river hydrology, please review PacifiCorp's report on Project Facilities and Operations (PacifiCorp, 2002b) and the Water Use and Quality FTR.

Historically, the Upper Klamath River system was operated primarily to provide irrigation and power generation, and to meet minimum flow needs for various river and lake/reservoir resources (e.g., fish, and--to a lesser extent--whitewater boating flows). It also provided some short-term flood control. However, as a result of the Endangered Species Act (ESA) listing of two species of sucker fish in UKL and of coho salmon below Iron Gate dam, recent operational priorities have shifted. Currently, there is greater emphasis on managing UKL levels for suckers, and flows below Iron Gate dam for coho, while still providing irrigation and power generation.

Four major factors influence system operations and drive hydrology of the reservoirs and river reaches: (1) seasonal storage in UKL, (2) irrigation diversions and return flows from the Upper Klamath basin, (3) minimum flow requirements below Iron Gate dam for endangered coho, and (4) short-term storage and peaking operations through J.C. Boyle, Copco Nos. 1 and 2, and Iron Gate Developments.

The only significant storage in the system is in UKL. In wet or above average water-years, the Upper Klamath operates as a run-of-the-river system from midwinter through spring. Even in average years, once UKL is full, facilities are generally operated as a run-of-the-river system. However, the short Link, J.C. Boyle, and Copco No. 2 bypass reaches do not receive releases beyond base flows unless the hydraulic capacities of power diversions are exceeded. These "spill flows" into the J.C. Boyle and Copco No. 2 bypass reaches occur only during peak runoff in wet water-years.




Not to scale.
Source: PacifiCorp and CRC, 2003.

Figure 2.7-3. Schematic drawing of Upper Klamath River hydroelectric facilities.

When spill at Link River dam is not occurring, UKL is drawn down for irrigation diversions and to pass water through the PacifiCorp power generation facilities (meeting minimum flow needs in the reaches and below Iron Gate dam for salmon). Active storage in UKL is estimated at about 97 days at 1,000 cfs, although this does not consider USBR changes in its minimum lake levels to protect endangered suckers.

Irrigation diversions from UKL and Keno reservoir/Lake Ewauna provide water for approximately 240,000 acres of farmland, as well as some wildlife refuge lakes and marshes. Irrigation diversions can exceed 1,200 cfs from UKL and Keno reservoir, although return flows to Keno reservoir may exceed 400 cfs. Irrigation diversions are highest in spring and during the summer growing season. Many farmers also flood their fields in winter to control nematodes or other pests. In some recent dry years, summer irrigation diversions have been reduced because of USBR requirements to maintain higher UKL levels for suckers.

At times when no spill is occurring at UKL, there are minimum flow needs for below Iron Gate dam for coho salmon. Required minimum flows below Iron Gate dam have varied over the years and are currently in flux. In general, minimum flows have been higher than 1,000 cfs in normal or wet years, but they have dropped into the 400 to 750 cfs range for extended periods of time in dry years.

Within these general parameters (dictated by run-of-the-river spill in wet periods, and by minimum pass through water and irrigation return flows during drier periods), PacifiCorp operates its facilities to maximize power generation. Short-term storage in J.C. Boyle reservoir is the driving factor here, and it allows J.C. Boyle powerhouse to follow power demand (peaking during the day or early evening). This water, in turn, then continues through Copco Nos. 1 and 2 Developments (which also are operated as peaking facilities) and into Iron Gate reservoir, where it is re-regulated to provide sustained minimum flows. There are also peaking opportunities at East Side powerhouse, although this is a much smaller plant and has other constraints (see below).

#### 2.7.1.4 Recreation-Relevant Hydrology

Link River Hydrology

There is a USGS gage (No. 11507500) located in the Link River reach between the East Side and West Side hydropower facilities, but this includes East Side water and thus is a poor indicator of flows in the bypassed reach. For any given time, hydrologists can subtract estimated East Side flows (based on operations data) from gage information to describe what is in the bypass reach. They can also add West Side flows to the gage amount to describe the total amount of water released from UKL. However, developing this information on a daily basis (or for shorter time periods) over the period of record has proven challenging because of inconsistencies in operations data. The following discussion is thus provided at a general level based on preliminary data (Kelly, pers. comm., 2002).

During high runoff periods when inflows to the upper basin exceed the capacity of the turbines (a spill condition), PacifiCorp's Project operates as a "run of the river" system. While operational constraints leave relatively stable base flows in the Link River (spill gates on Link River dam must be operated manually and are changed as infrequently as possible), flows in the East Side diversion are modified frequently to maintain Keno reservoir/Lake Ewauna at a stable level (see discussion about that reservoir below). However, once UKL is full and power diversions are at full capacity, excess water is typically released through the Link River channel.

During the summer, fall, and early winter (or at other times when the Project is not spilling), UKL to Iron Gate reaches are no longer operated as a “run of the river” system. During these times, available active storage in UKL is managed for ESA-listed suckers, and then used to provide irrigation withdrawals (the A-1 Canal takes up to 1,100 cfs) and partially meet minimum flow needs below Iron Gate dam (after considering the amount that springs, tributaries, and irrigation return flows are likely to provide). During these periods, total flows through the Link River component of the system (including the two power diversions, and minimum flow released into the bypass reach) exceed inflow into the system (i.e., active storage is being depleted).

The total inflow to the system does not equate with the flow in the Link River bypass channel. East Side and West Side hydropower diversions have the potential to diminish flows in the bypass channel, and they do so to varying degrees both daily and seasonally. The West Side facility is either on or off and draws 250 cfs when it is operating; in recent years this facility has been operated infrequently. The East Side facility, in contrast, can vary its diversion, taking as much as 1,200. The A-1 Canal may also reduce available water for downstream purposes during the irrigation season (although return flows from irrigation into Keno reservoir can exceed 400 cfs). Hydropower or irrigation effects on recreation in the Link River depend on when these diversions occur and whether they change the type or quality of opportunities.

There are minimum flow requirements for the Link River bypass reach. Flows must be at least 90 cfs year-round (ODFW agreement), and recent year-by-year agreements with USBR require 250 cfs during the summer per (USFWS) 2001 Biological Opinion (BO). Below East Side powerhouse, a USFWS 1996 BO stipulates minimum flows of 450 cfs, although this requirement applies only to the last 0.25 mile of the Link River.

PacifiCorp has modified Link River operations to minimize the number of sucker fry that are drawn into diversion intakes (neither of which is screened). During late summer and early fall, diversions generally occur during the daytime only. Outside that period, PacifiCorp operates facilities to maintain stable flows in the Link River (to avoid stranding fish) and to keep Lake Ewauna/Keno reservoir at stable levels throughout the year (although the FERC license allows Keno reservoir fluctuations up to 1.5 feet).

Minimum flows in the Link River bypass generally have been higher than 90 cfs, even in dry years (although lower flows may have occurred on rare occasions due to operational errors). They are commonly in the 250 to 600 cfs range from May through December. During the winter and spring, “typical” outflow from UKL ranges from 1,500 to 3,000 cfs, with the bypass generally receiving about 500 to 1,500 cfs and the power diversions about 1,100 to 1,400 cfs (note: full hydraulic capacity is slightly greater than the water right for the diversion). During higher spill periods that typically last a week or more (but that may occur several times from January through May during wetter years), outflows from UKL may approach or even exceed 5,000 cfs, with the bypass channel receiving about 3,000 to 4,000 cfs.

Keno Reach Hydrology

There are no power generation facilities associated with Keno dam, and all flows are passed through this reach (it is not a bypass reach). However, UKL storage, USBR irrigation withdrawals and returns, and minimum flow requirements below Iron Gate dam for endangered coho salmon all affect the amount and timing of water available in the Keno reach compared with "unimpaired regimes" (if there were no dams or diversions on the river). PacifiCorp has little influence over these variables (PacifiCorp, 2002b).

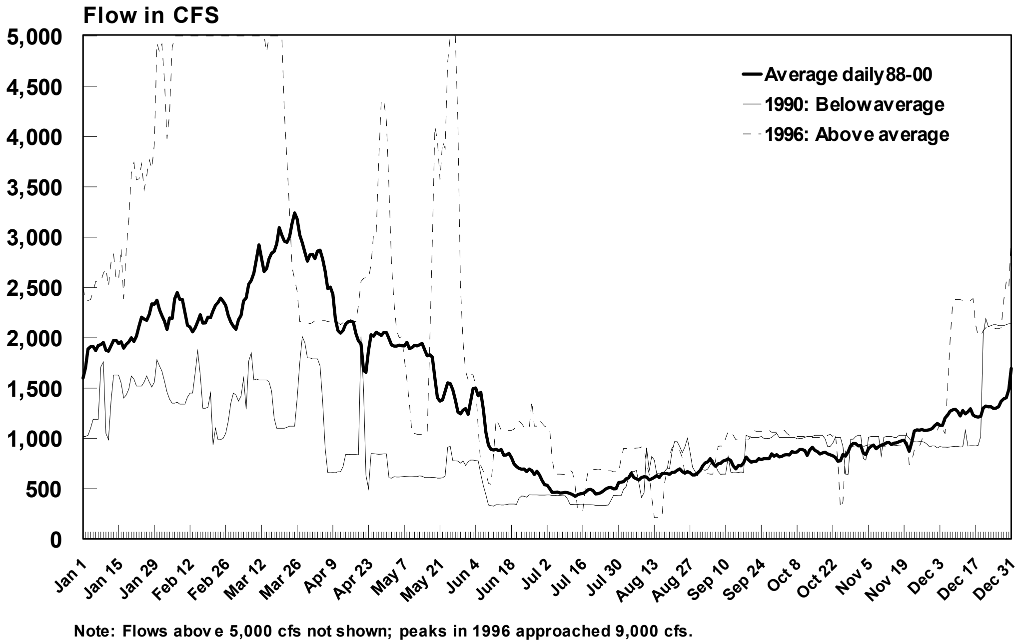
Minimum instream flows in the reach are 250 cfs, per an agreement with ODFW, but base flows are often much higher. Three additional factors help determine how Keno dam can be operated. First, much of the water provided to meet minimum requirements below Iron Gate (minus downstream accretion) has to pass through the reach. Second, PacifiCorp's USBR contract requires that Lake Ewauna/ Keno reservoir remain within 1.5 feet of full pool. Third, PacifiCorp has informal agreements with irrigators and a wildlife refuge to maintain Keno reservoir at a steady elevation (+ or - 0.1 foot) at 1.5 feet below full pool (so intakes for pumps remain submerged).

Taken together, these factors cause Keno dam to be operated as if it has no active storage, and flows in the river are varied to re-regulate fluctuating releases from UKL, East Side and West Side facilities, and USBR irrigation diversions and return flows. Without Keno dam, Klamath River flows would fluctuate as much as USBR diversions vary, and the current planned source of water for J.C. Boyle power generation would be compromised (PacifiCorp, 2002b). Resultant flows in the Keno reach thus vary both seasonally and daily/hourly, as discussed below.

Seasonal Variation. Average daily flows in the Keno reach from 1988 to 2000 are presented in Figure 2.7-4, along with daily flows from example wet (1996) and dry (1990) years. Data come from the USGS gage (No. 11509500) that is located about one mile downstream of Keno dam. This hydrograph provides a general understanding of seasonal flow variation on the river and demonstrates how differences can be substantial from year to year.

Winter/spring base flows in average or wet years are commonly between 1,000 and 3,000 cfs, but peaks near 5,000 cfs are possible. In drier years, base flows during winter/spring rarely exceed 2,000 cfs, and higher peaks are rare. In summer and fall months, differences between wet and dry years narrow, as UKL storage is sent through the system to meet minimum flows below Iron Gate dam. Flows during these periods typically range between 500 and 1,000 cfs – usually well above the required minimum 250 cfs.

Average daily flows provided in the Keno reach from UKL releases by the USBR and PacifiCorp Projects are probably lower in late summer and early fall than pre-Project levels, although these comparisons are complex (USBR, 2003). As noted above, storage capacity of UKL, evaporation losses, and irrigation return flows (about 400 cfs in summer) influence Upper Klamath flows in different ways depending upon the water year. More detailed information is available in Section 5 of the Water Resources FTR and in Exhibit E, Section E3, Water Use and Quality.




Sources: USGS, PacifiCorp, and CRC, 2002.

Figure 2.7-4. Average daily flows on Keno reach (1988-2000) and in a wet (1996) and dry (1990) year.

Daily or Hourly Variation. Seasonal variation is not the only effect on Keno flows from PacifiCorp and USBR projects. A second effect is associated with daily or hourly changes to keep Keno reservoir levels flat, while re-regulating USBR diversion return flows for use through the J.C. Boyle reservoir and powerhouse. The average daily flows shown in Figure 2.7-4 mask this variation, requiring a closer examination of the frequency and rate of daily and hourly fluctuations.

During high-flow periods (January through May), flow changes in the Keno reach may exceed 500 cfs per hour, although that is the PacifiCorp self-imposed maximum hourly change during medium- to low-flow periods (PacifiCorp, 2002b). Data from water years 1995 through 2001 suggest that hourly changes average about 20 to 30 cfs, but there may be 30 to 40 times per year when flows change at rates between 100 and 350 cfs per hour, while there are seven to 12 times per year when flows change more than 350 cfs per hour. In drier months (June through December), the average hourly change is 5 to 9 cfs, but hourly flow changes between 100 and 350 cfs occurred about 20 times per year, and hourly flow changes greater than 350 cfs occurred about five times per year. This substantial hourly variation, for example, may mean that an average daily flow of 750 cfs produces flows that may be 100 to 200 cfs higher or lower for parts of any given day (although the fluctuation is likely to be smaller during summer and fall).

J.C. Boyle Bypass Reach Hydrology

Hydrology in the J.C. Boyle bypass reach is relatively simple compared with other Upper Klamath reaches, although there is no gage in the reach (base flows are known and spill flows are calculated by subtracting estimated outflows from the powerhouse from changes in storage at J.C. Boyle reservoir). Power generation associated with the J.C. Boyle Development generally diverts all but minimum flows from the J.C. Boyle bypass reach, with spills occurring only when upstream storage capacity is full (J.C. Boyle reservoir, Keno reservoir, and UKL) and the hydraulic capacity of the powerhouse (about 2,500 cfs) is exceeded.

Minimum instream flows in the reach are 100 cfs per the current FERC license, and the springs add about 225 cfs (starting about a half-mile below the dam). Total base flows in the reach are thus about 325 cfs. Spill amounts in the reach have ranged from a few hundred cfs to more than 10,000 cfs, but most spill periods create flows from 1,000 to 5,000 cfs. When they do occur (usually in the period from January to April), they are likely to last for several days (and sometimes several weeks).

In all but wet years, spills in the J.C. Boyle bypass reach do not occur at all. In very wet years, spills may occur for more than 100 days. Before the mid-1990s, J.C. Boyle bypass spills may have occurred less often because UKL was typically drawn down to handle run-off events as high as 10,000 cfs. However, since UKL sucker recovery efforts have begun, UKL drawdowns have been smaller and essentially eliminate UKL storage for spring runoff flood control (PacifiCorp, 2002b). Accordingly, spill events in J.C. Boyle bypass reach during wet and average years in the future may become more frequent and higher than they were prior to the mid-1990s.

Hell's Corner Reach Hydrology

Hydrology in the Hell's Corner reach is complex, and it varies seasonally and daily. Flows in the reach are equal to J.C. Boyle bypass reach base and spill flows (see above), plus the outflows from J.C. Boyle powerhouse. The powerhouse is operated to follow power demand when UKL is not spilling (using J.C. Boyle reservoir to store water at night and drawing from it during the day).

The J.C. Boyle powerhouse has two turbines with a maximum flow capacity of 2,525 cfs. Unit 1 can generate more power and produces 1,200 to 1,425 cfs outflow at capacity, depending on the level of J.C. Boyle reservoir; Unit 2 generates only 800 to 1,100 cfs at capacity. Unit 1 offers greater efficiency and is generally used first. Neither unit works as efficiently below the outflow ranges given here, so operators try to ramp up to those levels if they are going to use a unit at all. It takes about 3 hours to ramp from base flows to one turbine, and an additional hour and a half to ramp to two turbines given the current FERC ramp rate of 9 inches per hour.

During wet times of the year (winter and spring), flows in the Hell's Corner reach often approach 2,850 cfs (325 cfs from J.C. Boyle bypass reach plus 2,525 cfs from J.C. Boyle outflows). This is commonly known among boaters and anglers as the "two turbine" flow. If there are additional spill flows in J.C. Boyle bypass, flows in the Hell's Corner reach may range from 3,000 to 4,000 cfs. Peak spill amounts may approach 10,000 cfs, but more often they peak at about half that amount.

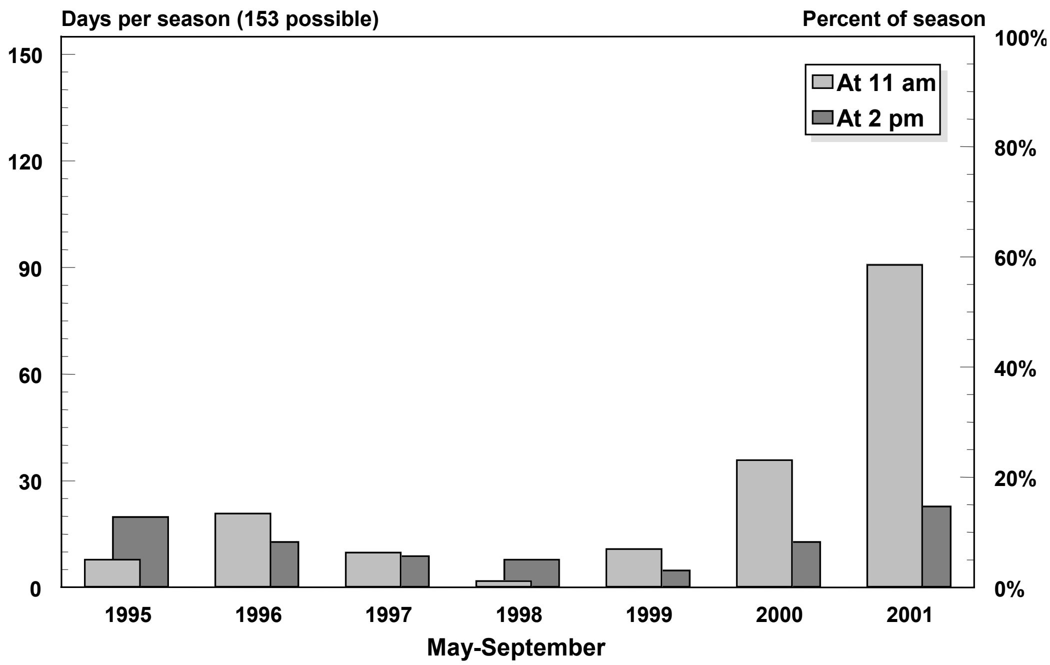
In nonspill periods, flows in the Hell's Corner reach vary through the day from base flows (325 cfs from J.C. Boyle bypass reach) up to 2,850 cfs (two turbines plus base flows). During most of the summer and fall, there may not be sufficient water from UKL or irrigation return flows to run both turbines, so a single unit is operated. This typically provides peaking flows of about 1,500 to 1,750 cfs in the reach, which is commonly known by boaters and anglers as the "one turbine" flow.

Figures 2.7-5, 2.7-6, and 2.7-7 present a preliminary analysis of 1995-2001 flow data examining the number of days that Hell's Corner reach has flows (1) less than one turbine, (2) one turbine or more, and (3) two turbines or more, respectively. Results characterize the frequency of days with different flows.

In most years, the majority of days provide at least one turbine (at least 1,400 cfs) for several hours, but the timing of those peaking flows has changed in recent years. Figure 2.7-5 shows the number of days with flows *below 1,400 cfs* at 11 a.m. and 2 p.m. during the May to September period when these "no turbine" days are likely to occur. Data suggest that, before 2000, there were relatively few days (always less than 20 and usually less than 10) when no turbines were operated during the middle of the day (from 11 a.m. to 2 p.m.). However, there were nearly 40 days in 2000 and more than 90 days in 2001 when one turbine was not provided by 11 a.m. On all but 15 to 20 of those days in each year, one turbine was provided by 2 p.m. However, the data support the notion that, in recent years, peaking at the J.C. Boyle Development has shifted to later in the day, when electric demand is highest.

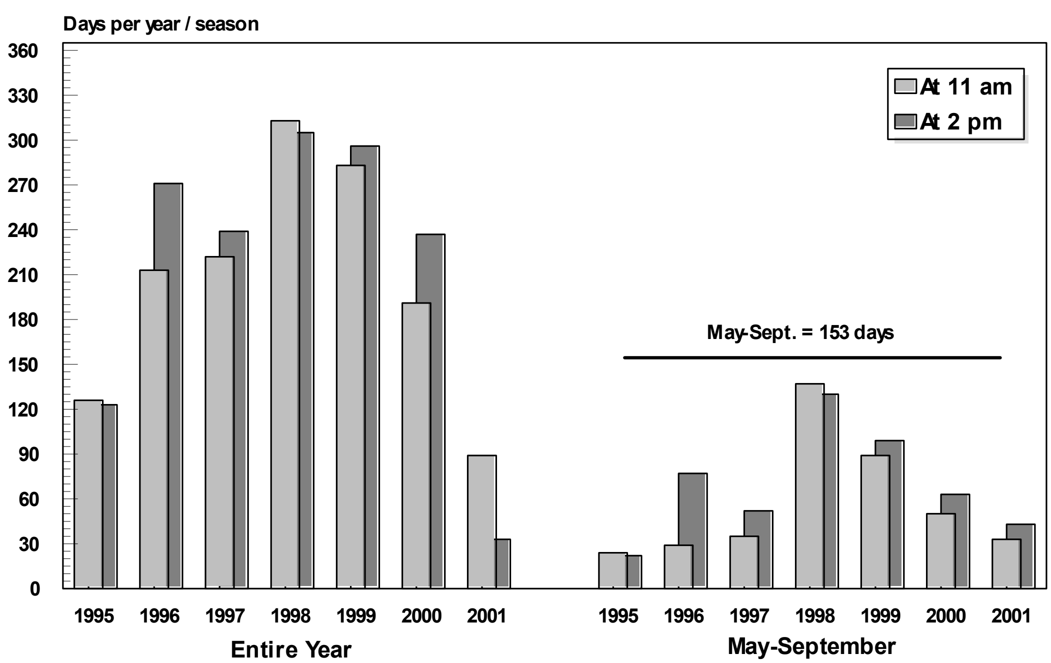
On most days in the winter and spring, more than one full turbine (more than 1,700 cfs) is often provided, and in wetter years these higher flows are common for significant proportions of the May to September period as well. Figure 2.7-6 shows the number of days per year from 1995-2000 when flows at 11 a.m. and 2 p.m. *exceeded 1,700 cfs* (over one turbine). In wetter years (e.g., 1996 to 1999), there may be 200 to 300 days a year when more than one turbine is operated during the middle of the day. In drier years (e.g., 1995, 2000, and 2001), less than 100 days offer flows greater than 1,700 cfs and less than 50 of those days occur from May to September.

While much of the year offers flows in excess of one full turbine, relatively fewer days offer flows at or more than two full turbines (2,800 cfs). Figure 2.7-7 shows the number of days per year from 1995 to 2000 when flows at 11 a.m. and 2 p.m. *exceeded 2,800 cfs* (near or greater than two turbines). In most wet years (e.g., 1996 to 1998), there are about 150 days when two turbines are operated during the middle of the day, although they were operated more than 200 days in 1999. In drier years such as 1995 and 2001, there were about 50 or fewer days with two turbines, although in another dry year (2000), two turbines were provided for more than 140 days.



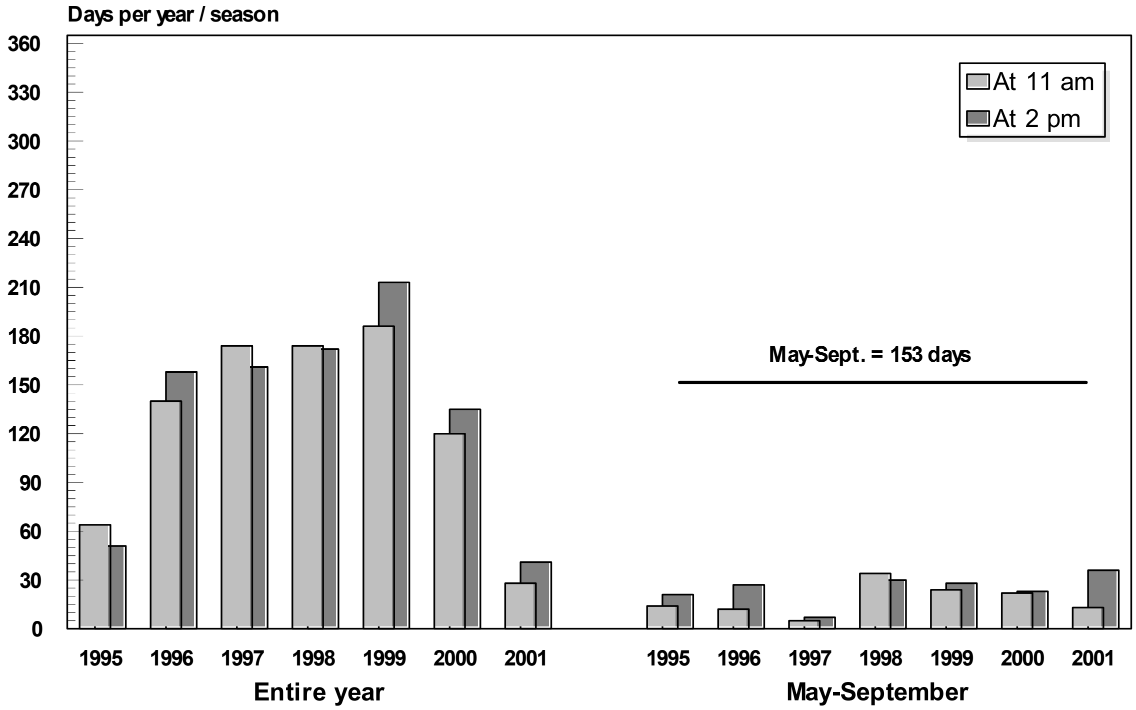

Sources: USGS, PacifiCorp, and CRC, 2002.

Figure 2.7-5. Number of days with flows (at 11 a.m. and 2 p.m.) lower than 1,400 cfs (less than one turbine) for May-September seasons, 1995-2001.




Sources: USGS, PacifiCorp, and CRC, 2002.

Figure 2.7-6. Number of days with flows (at 11 a.m. and 2 p.m.) higher than 1,700 cfs (more than one full turbine) for each year and May-September season, 1995-2001.




Sources: USGS, PacifiCorp, and CRC, 2002.

Figure 2.7-7. Number of days with flows (at 2 p.m.) higher than 2,800 cfs (near two full turbines or higher) for each year and May-September season, 1995-2001.

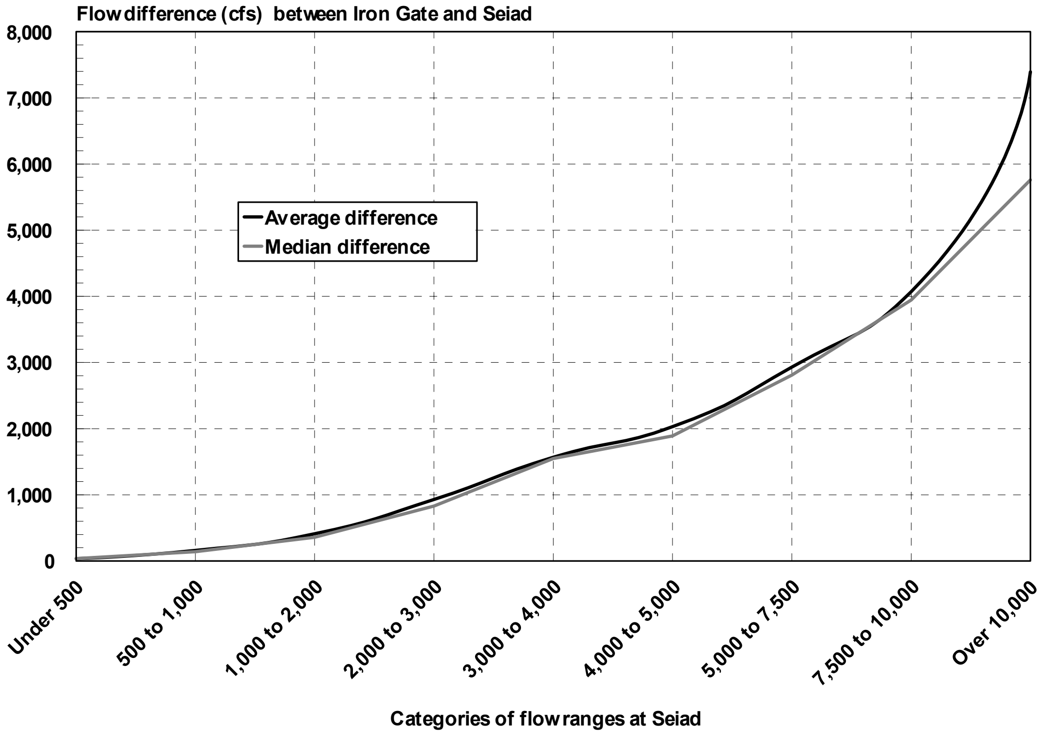
## Copco No. 2 Bypass Reach Hydrology

PacifiCorp commonly provides a minimum flow of 10 cfs in the Copco No. 2 bypass reach, although this is not part of the FERC license. Spills occur in the reach, but they are infrequent except in very wet years or when maintenance is required. The frequency, duration, and magnitude of spill events are currently being summarized as part of the re-licensing hydrology study, but they are not yet available.

## Below Iron Gate Dam/Middle Klamath River Reach Hydrology

Hydrology below Iron Gate dam is less complex than most of the upstream reaches. Iron Gate reservoir is generally used as a “re-regulating” storage facility, releasing stable daily outflows below the dam even when daily peaking occurs at the J.C. Boyle or Copco Development reaches. By re-regulating these flows, Iron Gate dam releases equate to all the Upper Klamath inflows (from UKL, irrigation return flows, tributaries, and springs) minus reservoir evaporation. The resulting hydrology essentially creates a run-of-the river system during spill periods (when UKL is full), with stable base flows during nonspill periods.

Because of the length of the Middle Klamath River reach, tributary accretion becomes substantial as one moves downstream. Accordingly, we have used two gages to help characterize flows; they are the USGS gages immediately downstream of Iron Gate dam (No. 11516530) and about halfway through the segment at Seiad Valley (No. 11520500). The correlation between the two gages (from 1981 to 2002) is 0.89, suggesting a systematic relationship that allows one to understand flows in the reach from either gage. Figure 2.7-8 represents that relationship, showing average and median differences between flows at the two gages. The graph illustrates how Seiad flows are similar to Iron Gate during low-flow periods (i.e., when tributary accretion is small), but that accretion inputs rise at an increasing rate as flows increase. For example, when Seiad is running 2,000 cfs, about 1,500 cfs is from Iron Gate. When Seiad flows are greater than 5,000 cfs, however, more than 3,000 cfs is from tributary inputs and only 2,000 cfs is from Iron Gate.

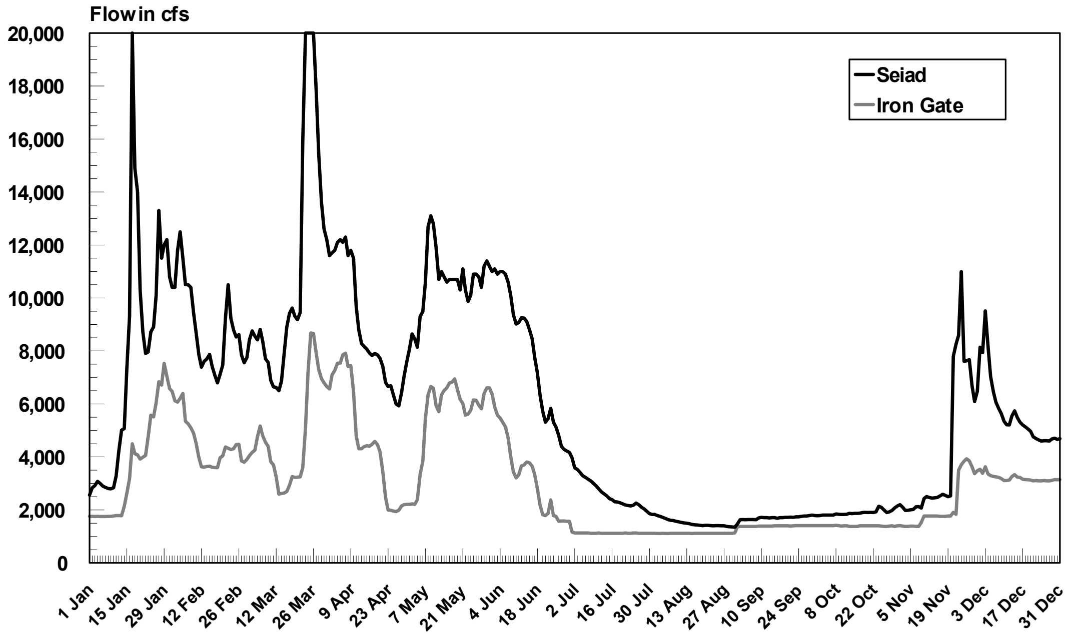



Sources: USGS and CRC, 2002.

Figure 2.7-8. Average and median differences between Iron Gate and Seaid flows.

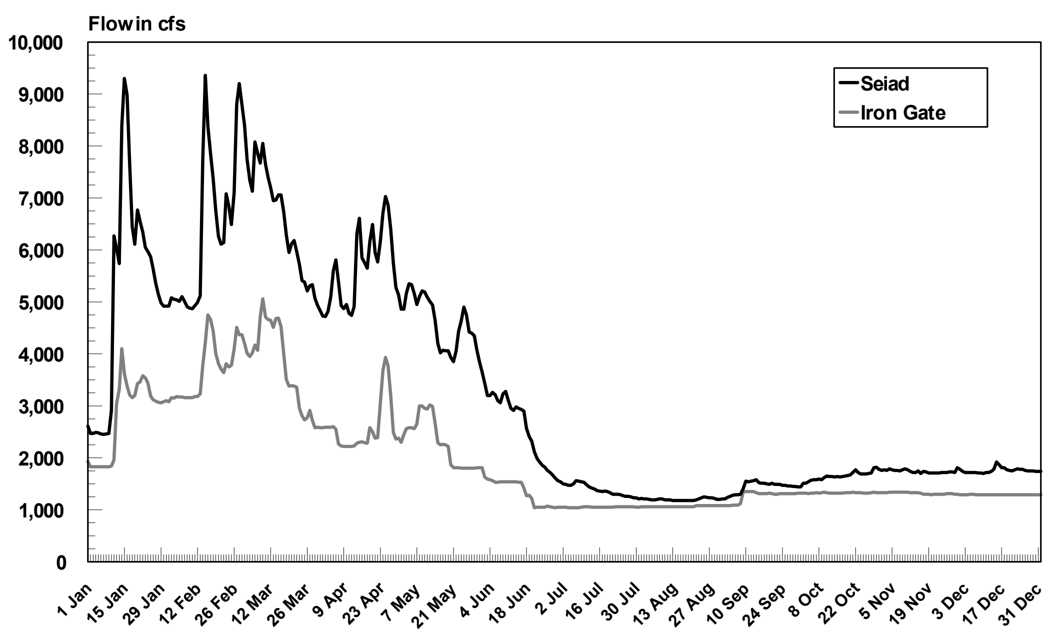
Seasonal and Annual Variation

The magnitude of flows differs substantially at Iron Gate and Seiad during different times of the year and in different types of year (wet, dry, or average). Figures 2.7-9 to 2.7-11 illustrate mean daily flows in 1998 (wet year), 2000 (average year), and 2002 (dry year) at both gages. The characterization of years is based on rank ordering average annual flows from 1981 through 2002. Readers should note the scale differences on each graph (the wet year runs to 20,000 cfs; the average year to 10,000 cfs; and the dry year to 5,000 cfs).



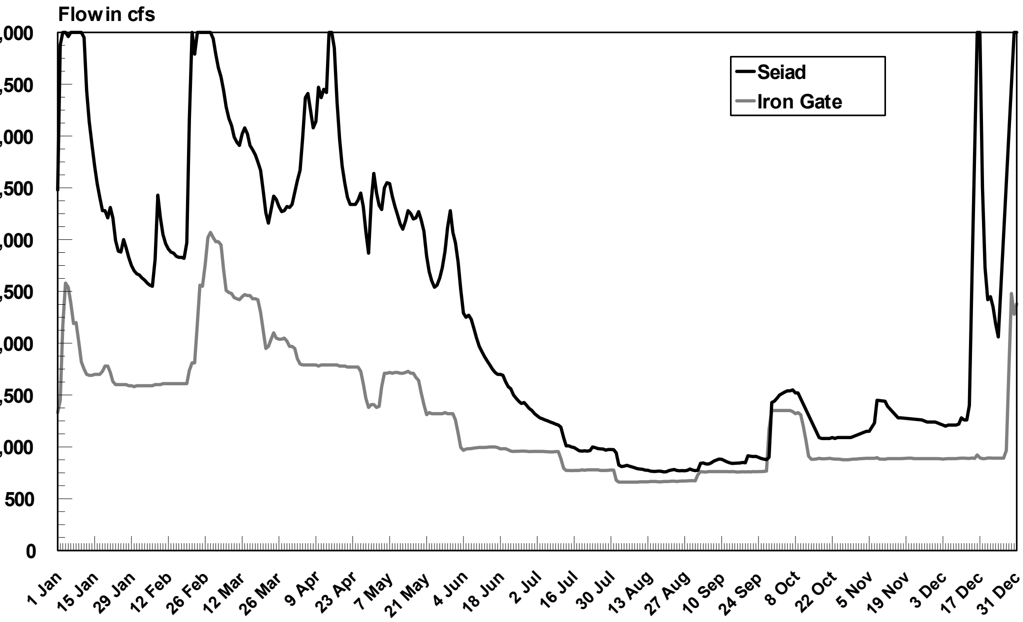

Sources: USGS and CRC, 2003.

Figure 2.7-9. Mean daily flows at Seiad and Iron Gate in 1998 (a wet year).




Sources: USGS and CRC, 2003.

Figure 2.7-10. Mean daily flows at Seiad and Iron Gate in 2000 (an average year).




Sources: USGS and CRC, 2002.

Figure 2.7-11. Mean daily flows at Seiad and Iron Gate in 2002 (a dry year).

Several 1- to 3-day peaks have also been truncated in these graphs to avoid stretching the scales further. Taken together, these graphs and other hydrology statistics illustrate several fundamental features of the hydrology of the Middle Klamath River reach.

- High flows on the river generally occur between December and June, and they can be associated with both rain and snow-melt events. In wet and average years, flows at Iron Gate are usually higher than 3,000 cfs during this entire period (with much higher flows downstream at Seiad). In dry years, the peaks are often higher than 3,000 cfs, but flows at other times range from about 1,000 to 3,000 cfs.

- There is a reliable "falling limb of the hydrograph" during the summer, with the lowest flows occurring in late August. In some dry years, low flows continue well into the fall.

- Iron Gate base flows in summer and fall provide most of the flow at Seiad, with tributaries adding little additional water. In contrast, several Seiad peaks during the winter are independent from Iron Gate, which can remain near "base levels." In these cases, regional precipitation may cause tributaries to rise downstream of Iron Gate (while it is captured and stored upstream in the Upper Klamath River system).

- Base flows in the low-flow periods of the year are different in wet, dry, and average years. In wet years, Iron Gate base levels approach 1,000 cfs only for a few weeks and rarely drop lower. In average years, base flows of about 1,000 cfs at Iron Gate occur for several months in the summer and early fall. In dry years, these base levels occur as soon as early June and may be lowered substantially below 1,000 cfs from July through the fall. Specific recent periods with lower flows include:

- June to September 1992 400 to 500 cfs
- July to August 1994 570 cfs
- July to September 2002 660 to 760 cfs

These flows are probably lower than the lowest pre-Project August flows, although there has been some debate about pre-Project hydrology. Hardy and Addley (2001) estimate pre-Project low flows to have been about 1,100 to 1,400 cfs, but recent USBR simulations of pre-Project hydrology for the Upper Klamath suggest they may have been much lower in very dry years (USBR, 2003). Prior to the Project and extensive upstream irrigation development, the Klamath Lake basin had substantial marshes and other wetlands that probably moderated flows through the year and had lower evaporation rates, absorbing some of the winter peaks and maintaining relatively higher flows later into the late summer. With the current hydroelectric and irrigation development in place, UKL is the only substantial storage facility, and it appears to have less capacity than the marshes, but there is debate about the magnitude of these differences.

- Upstream irrigation and hydroelectric development have also modified the total flow available through the year. Estimated mean annual flow below Iron Gate dam before the Project was 2,575 cfs (Hardy and Addley, 2001). With the Project and irrigation systems in place, mean annual flow at Iron Gate dam is about 2,156 cfs, a total reduction of about 16 percent.

#### 2.7.1.5 Link River Bypass Reach Findings

This river reach, about 1.5 miles long, flows from the Link River dam (the outlet of UKL) to Keno reservoir (also known as Lake Ewauna). Figure 2.7-12 shows the river and various recreation features. The river drops approximately 40 feet per mile, and the steepest part of the reach occurs in a single rapid at the upstream end. There is also a ledge about halfway down the river that forms a large standing wave at higher flows. The river has multiple channels near the dam, but it forms a single channel below an island halfway through the reach. Most of the river corridor is on PacifiCorp-owned land, although there are some private homes on river left (the East Side).

The reach's landscape is dominated by a large, wood-stave pipeline on river left that delivers water to the East Side hydroelectric facility. The pipe diverts up to 1,200 cfs, depending on power needs. On river right, a diversion canal leads from the dam to a penstock above the West Side hydropower facility; a service road parallel to the canal is open to public use as a designated greenway trail. It is gated to allow only service vehicles and foot traffic (no bikes, horses, or motorized use allowed).

Vegetation is relatively thick along the riparian zone and up the valley slopes. Some vegetation is impassable, with blackberries or other thorny species. Recreation users (mostly anglers and children/teenagers) use several informal, nonmaintained trails to the river from this main trail; most of these are steep, have low overhanging vegetation, and end in small riverside clearings with noticeable litter. However, at least two spur trails have received some management attention. These are toward the downstream end of the reach and lead to larger clearings on the river's edge; they are also slightly easier to recognize as river access options (one has metal stairs down a steep part at the top of the trail).

Figure 2.7-12. Link River bypass reach.

Back side of Figure 2.7-12

Recreation Opportunities

Recreation opportunities in the Link River bypass reach corridor include locational trout fishing, playboating, and general recreation along the service road that functions as a trail.

Fishing. The Link River bypass reach has a wild native trout fishery, which attracts mostly local Klamath Falls anglers. Although there are significant water quality issues associated with UKL, as well as less-than-natural aesthetics along this reach (hydroelectric facilities and homes are visible from most places in the corridor), the river has a fair fishery and is close to town. Fishing on this reach is most popular from January into March, when larger migrants (up to 15 to 20 pounds) from the Keno reach make their spawning run (Smith, pers. comm., 2002). However, smaller (usually 10 to 14 inches), nonmigratory fish are also available and fished through the rest of the year, particularly in the fall. Anglers may use a variety of tackle, including spinners, plugs, flies, or bait. Bank fishing access appears to be easiest from the service road and spur trails on the West Side. Boat anglers also row or motor upriver from Keno reservoir (Lake Ewauna) to the bottom of the first riffle above the West Side powerhouse.

Locational Playboating. Boating use is generally limited to kayaks and inflatable kayaks, although boating in small rafts and catarafts appears possible at higher flows (see below). The short reach has only one short Class III/IV rapid and another Class II/III ledge drop; these typically would not attract many whitewater boaters, except that the latter creates a well-known playboating feature (a large breaking wave) at higher flows. The popularity of locational playboating (also known as “park and surf,” rodeo, or freestyle boating) has increased dramatically in the past decade (Bennett, 1999), and play waves close to urban areas have the potential to attract substantial use. In this case, use appears relatively low and limited to local kayakers. They gain access to the wave by paddling downstream from the dam, or by carrying their boats upstream from the West Side powerhouse and using one of the informal spur trails to get to the play area, floating out when they are finished.

General Recreation. The service road (Link River Nature Trail) on the West Side of the Link River bypass reach appears popular among local Klamath Falls residents for hiking, walking, jogging, bird watching, dog walking, berry picking, and so on. While the road offers relatively distant views and no close access to the river, spur trails allow visitors to get to the water, particularly at the two ends of the reach. There is a bird-watching blind located on the lake accessible from the service road trail. On the basis of the site visit and limited discussions with people using the area, most people appear to stay on the road. However, neighborhood children appear to have good knowledge of the spur trails and the informal, dispersed recreation opportunities they provide.

Flow Requirements Based on Phase I Information.

Fishing. Bank anglers appear to use the Link River bypass reach at a few well-defined sites leading from spur trails, while boat-based anglers use the last quarter mile of the reach below the swifter water. On the basis of reconnaissance and limited interviews with Link River anglers (particularly Smith, Fortune, pers. comm., 2002), these opportunities are best from January to March because of the availability of larger Keno migrants. At these times, flows in the river generally range between 500 and 1,500 cfs, although there may be several short periods (usually less than a week at a time) where spills reach 3,000 to 4,000 cfs. Occasional large spills greater than 4,000 cfs are also possible, although these tend to occur for very short periods (a day or two at a time).

Higher winter flows greater than about 1,500 cfs are probably less than optimal (and possibly unacceptable) for both types of fishing. These flows would make wading hazardous for bank anglers, and it would increase the difficulty of rowing or motoring against the current from Lake Ewauna for boat-based anglers. While fishing from boats at the edge of the river and reservoir is probably possible at even the highest flows, turbidity and swift currents might also make conditions less acceptable at levels above 1,500 cfs.

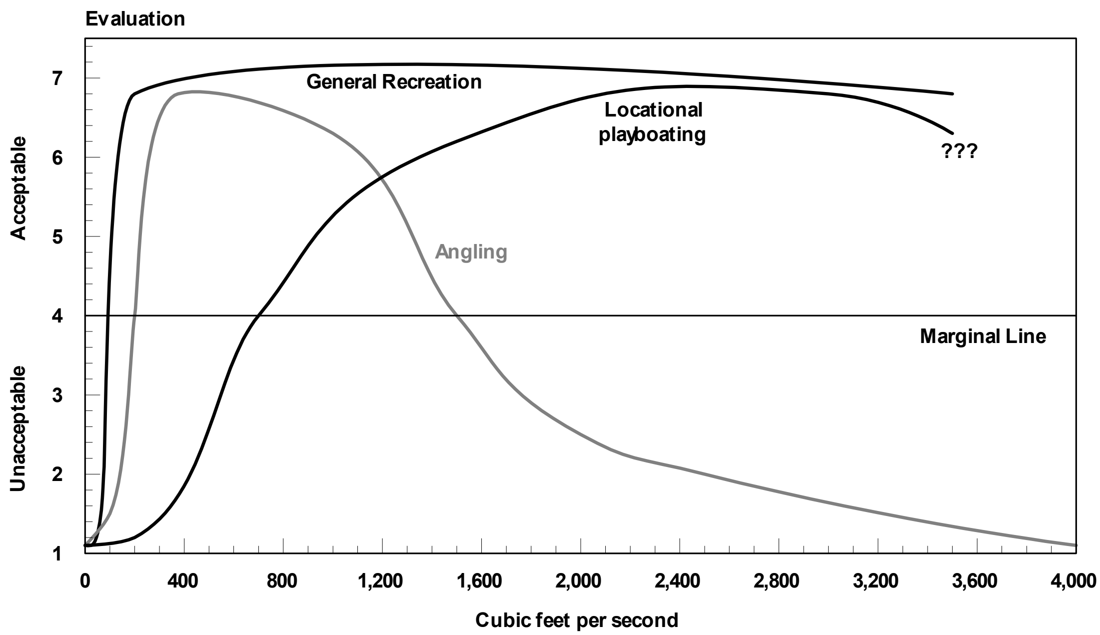
For bank fishing, lower summer and fall flows also offer much more bank and wading access to the river, while improving water clarity and providing higher concentrations of fish in deeper pools and runs. If flows are too low, however, fish may be under stress from higher water temperatures and fish concentration in those pools, which may lower their feeding activity (and, thus, fishing success). The summer/fall fishery (which does not feature the larger Keno migrants) also has fewer fish than the winter/spring fishery in this reach.

A flow evaluation curve for fishing is provided in Figure 2.7-13; it is preliminary and based on limited interviews, the shapes of curves from other studies, and professional judgments about when flow levels are likely to inundate the thicker vegetation and make wading more difficult. It shows acceptable flows from about 100 to 1,500 cfs, with optimum flows at the lower end from about 200 to 1,000 cfs.

Locational Playboating. The Link River bypass reach is boatable in kayaks at about 350 to 400 cfs (Shelby kayaked the river at an estimated 350 to 390 cfs during reconnaissance), but the steep drop at the top of the run presents some pinning hazards at that level. The river also does not offer any playboating features at those flows. Only four interviewees had specific knowledge of the Link River bypass reach (Weidenbach, Lehman, Gutermuth, and Pribble, pers. comm., 2002), although four others reported having heard of the wave and intended to use it in the future. Of the four with Link River experience, three use the river for playboating in kayaks, while Pribble reported a single trip in a raft at very high flows.

Among the kayakers, one boater (Lehman, pers. comm., 2002) reported that the wave begins to provide playboating at flows as low as 600 to 800 cfs (there are apparently two smaller merging waves at those levels). However, there was general consensus that the wave provides higher quality play at about 1,500 to 2,000 cfs. The wave appears to increase in size and quality as flows increase, but information about flows above 3,000 cfs is less available. Pribble’s rafting trip may have been at flows in the 4,000 to 5,000 cfs range, and he reported that the breaking wave was quite large and could have flipped his boat if he had not aggressively hit its weakest point. All flows are estimates from the boaters themselves; accurate flow information for the reach is generally not available (see below).

A preliminary flow evaluation curve for playboating is provided in Figure 2.7-13; it is based on interview and reconnaissance information. It shows acceptable playboating beginning around 700 cfs, and optimal flows are from 1,500 cfs to 3,000 cfs. This curve declines only slightly at flows higher than 3,000 cfs. Additional information is necessary to better define this end of the curve, but it may be less important than improving accuracy of the curve from acceptable to optimal levels (700 to 2,000 cfs). Note that no curve is developed for "standard" boating trips, because few boaters appear to use the river for point-to-point boating.




Sources: CRC, 2003.

Figure 2.7-13. Phase I flow evaluation curves for recreation opportunities on the Link River.

General Riverside Recreation. As discussed in Section 2.4, general riverside recreation is enhanced by certain flows rather than dependent on them. People using the Link River Nature Trail for walking, running their dogs, bird watching, picking berries, or other similar day use activities are unlikely to consider flows unacceptable as long as the river appears to have some water covering the bottom of the channel and appears to be moving. On the basis of reconnaissance at 350 to 390 cfs, this likely occurs as low as 100 cfs. A flow evaluation curve for general riverside recreation is also given in Figure 2.7-13, and it shows dramatic improvement from 100 to 200 cfs, with ratings remaining high through estimated "bankfull" levels. At that point, aesthetics might decrease marginally as the river is likely to become more turbid, inundate vegetation, or lose definition in rapids or eddies.

Preliminary Revision of Playboating Flow Requirements Based on Phase II Information.

Additional precision regarding flows for locational playboating was recommended during Phase I; a threshold level for quality playboating could be important if purposely provided bypass flows are considered for this opportunity.

One method for gaining this precision would have been to conduct a controlled flow study (where boaters evaluate several flows in a short period of time), but this option was rejected due to operational constraints (little controllable upstream storage when UKL outflows are available and imprecise manually operated spill gates) and difficulty in predicting and scheduling the study during high-flow events.

A simpler and more cost-effective approach focused on interviewing boaters who used the wave after installation of an on-site staff gage in March 2003. As high flows occur, the goal is to calibrate actual flows in the reach with the new staff gage, allowing follow-up interviews with boaters to improve the accuracy of the playboating flow evaluation curve. However, with lower-than-average precipitation in the Klamath River basin in 2002-2003, higher flows in the reach occurred only for a few days in early April. Few boaters were able to assess them or become calibrated to the new gage.

An interview with a boater (Weidenbach, pers. comm., 2002) who ran the reach several times after the new staff gage was installed suggests that stage heights of about 0.5 foot (1,515 cfs) provide acceptable Class II/III playboating opportunities good for beginning rodeo boaters. At this level, there are glassy, “green” waves on either side of a small, 1- to 2-foot breaking wave or “pile” in the center. It is relatively shallow, however, and is best for basic surfing maneuvers. The eddy for access is on river right.

At about 1.0 foot (estimated 2,000 cfs), the “pile” in the center becomes somewhat larger (2 feet or more) and more retentive, allowing boaters to attempt more complex maneuvers such as spins, cartwheels, or “endos.” Flows up to 2.0 feet are likely to continue improving the play features for skilled boaters.

Taken together, information from Weidenbach suggests the low end of the acceptable range is probably closer to 1,000 than 700 cfs (as developed from Phase 1 information). In addition, 1,500 cfs may be the start of the optimal range for beginning playboaters, but 2,000 cfs is probably required for more skilled boaters (another change from Phase I). These revisions should be considered preliminary, contingent on information from more boaters after they have become calibrated to the new gage.

Project Effects

In general, minimum flows in the Link River bypass reach have been higher than 90 cfs in even the driest periods, and they are often in the 250 to 600 cfs range from May through December. While these flows do not provide acceptable locational playboating, they are in the optimal ranges for both fishing and general recreation. Accordingly, Project power diversions appear to be having few if any negative effects on those opportunities during summer and fall.

During the winter and spring, higher “base” flows in the bypass (500 to 1,500 cfs) provide optimal general recreation and optimal or near-optimal fishing; power diversion effects are thus beneficial because the Project generally prevents even higher flows. For example, if 1,150 cfs from East Side power diversions were added to a typical winter base level of 1,000 cfs, flows would probably be too high for good fishing. When higher spills occur during winter and spring, however, fishing conditions are probably unacceptable even if the power diversions remove 1,150 cfs.

In contrast, effects on locational playboating from power diversions are likely to be detrimental during the winter and spring. For example, if 2,000 cfs is released through the system from UKL and 1,150 cfs is diverted for power, only 850 cfs remains in the channel and playboating opportunities are limited. Similarly, if 2,500 cfs is released from UKL and 1,150 cfs is diverted, Link River receives only 1,350 cfs—acceptable but probably sub-optimal for playboating. If

Link River facilities are taking their full diversions, UKL must be releasing more than 3,000 cfs into the system to provide near-optimal playboating.

In general, high-quality locational playboating is *ensured* only during higher flow periods when total UKL outflow exceeds about 3,000 cfs. On the basis of preliminary available hydrology information, this could happen up to 70 or 90 days in an average year, but it may not occur at all during dry winters (e.g., 2001 and 2002). On the other hand, it may occur over 120 days in a wet winter (e.g., 1998 and 1999). If power diversions never took 1,450 cfs from January to May, an additional 10 to 40 days of playboating (up to 150 total days) might occur in an average year.

This discussion implies there may be opportunities to purposely provide flows for playboating in the future by diminishing power diversions and sending the water down the Link River as spill. This would be most effective when 2,000 cfs or more is to be released from UKL during the winter or spring. If these "enhanced" Link River spills were to occur for whitewater boating, the spike flows would probably need to be provided only occasionally and for a few hours at a time (e.g., for a 3-hour "session" on a weekday evening or weekend afternoon) to meet boater demand. Purposeful whitewater flows would result in lost power generation, may be difficult to provide because of operational constraints (manually operated dam gates), and would need to be considered in light of potential impacts on Link River fisheries. As more information about potential operating scenarios of these facilities becomes available, it will be possible to assess specific impacts on the frequency and quality of locational playboating opportunities on the reach.

Future Study Needs and Options

It is possible to develop more precise flow evaluation curves for all three Link River opportunities, but there does not appear to be a compelling need for that additional precision, particularly for fishing or general recreation. Project effects on these two opportunities are unlikely to be noticeable (and may be beneficial); additional precision is unlikely to modify that conclusion or help in developing proposed PM&E flow scenarios.

Additional precision for locational playboating is also possible given the development of the new staff gage near the Link River wave. If higher flows occur through the reach in 2003-2004 and boaters become calibrated to the new gage, short interviews with boaters may help determine the feasibility and potential benefits of purposely provided bypass flows for playboating opportunities.

Recreation researchers also may take additional "opportunistic" reconnaissance trips on the river if playboating flows are available to ground-truth findings. Link River flows in the crux range of 1,000 to 2,000 cfs may occur when future recreation work is being conducted, so it would be relatively easy and efficient to run the reach and assess play wave characteristics at those flows.

#### 2.7.1.6 Keno Reach Findings

This river reach is about 5 miles long, extending from Keno dam (outlet of Keno reservoir/Lake Ewauna) to J.C. Boyle reservoir (Figure 2.7-14). The river has a gradient of approximately 50 feet per mile, most of which is concentrated in a series of six to seven drops in the upper third of the reach (including the largest one, known as "Cotton Gin"), and at a single large rapid at the downstream end (suggested name: "Teetering Rock Rapid"). The river spreads out into a wider channel for about a mile and a half in the middle of the reach, but otherwise it features a relatively narrow, single-thread channel with a pool/drop character. The river has relatively steep banks and cliffs with a few sheer walls, but the canyon is generally less than about 200 feet above the river. The cliffs, river, and associated riparian areas appear to offer superlative shorebird habitat, and the abundance of birds (e.g., cormorants, pelicans, herons, and eagles) can be remarkable. According to local anglers and fish biologists (Ostenson, Hale, Fortune, Smith, pers. comm., 2002), the reach also features an excellent wild native trout fishery. Most of the river corridor is on PacifiCorp-owned land, although there are some county public lands as well.

The reach's landscape features few signs of development except for the dam and associated service road. This service road accesses an informal boating put-in a few hundred feet below the dam, but the road is in very poor condition (although it is less than a half mile long), offers limited parking, and does not provide an obvious ramp to the river (boaters scramble down the banks).

Two power lines cross the reach at RM 230.5 and RM 231.5; these appear to be two of the key access points for bank anglers. There are no obvious user trails visible from the river, although anglers report several informal, unmaintained trails and 4-wheel-drive roads that approach the river (one at the downstream power line crossing may allow vehicles to reach the immediate river vicinity). At the end of the reach there is gravel road access from Sportsman's Park near J.C. Boyle reservoir, including one road that travels close to a couple of obvious boat take-out areas (although there are no developed ramps).

Recreation Opportunities

Recreation opportunities in the Keno reach corridor include fishing, standard boating, locational playboating, and general riverside recreation.

Fishing. The Keno reach offers high-quality trout fishing opportunities, apparently among the best in the Klamath Falls region (Ostenson, Hale, Smith, Fortune, pers. comm., 2002). Although the reach has difficult access (limited to small boats or the informal trails) and significant water quality issues associated with UKL, the canyon features high-quality scenery, solitude, good variety of fishing water, and trophy-sized native trout. Fish that exceed 20 inches are occasionally caught, although the average size is apparently closer to 15 to 17 inches (Smith, pers. comm., 2002). From January to March, some spawning fish migrate upstream into Lake Ewauna and the Link River bypass reach (Keno dam has a fish ladder).

Fishing regulations allow anglers to keep one fish per day in fall, winter, and spring, but the river is closed during the summer (June 15 to September 30). No bait is allowed, and anglers appear to use both flies and spinners in roughly similar proportions. Some anglers wade in the river while fishing (particularly fly anglers and particularly in the wider/shallower middle part of the river), but many others fish from the shore (Smith, pers. comm., 2002).

The most common access points are from the road near the dam (it runs for about a half mile along the river), from the trails to the power line crossings, and from Sportsman's Park. Some boat-based anglers may also fish the river tail-out by motoring up from J.C. Boyle reservoir, while others may take rafts or pontoon catarafts down the reach. The periods of highest fishing use are apparently from April through early June, and again in the fall.

Figure 2.7-14. Keno reach.

Back side of Figure 2.7-14. Keno reach.

Standard Boating. The Keno reach offers a short Class II/III whitewater run that is boatable at medium to high flows. It appears to attract occasional use from local boaters, including boat-based anglers looking for access to a reach with limited, informal trails. Two outfitters (Lee, Hague, pers. comm., 2002) reported taking or contemplating commercial trips on this reach as an alternative to the more challenging whitewater run on Hell's Corner reach, or as part of a 2- or 3-day "package" that included runs on Hell's Corner reach. Both noted that the canyon is undeveloped and has good wildlife viewing, with less challenging whitewater. Most boaters are likely to run the river as a day trip, although camping might be possible at several upland locations (there are few beaches).

Locational Playboating. There is a well-known playboating wave/hydraulic (the "Keno Wave") at the start of the reach, allowing kayakers to "park and surf" without running the entire reach. The popularity of playboating has increased significantly in the past decade (Bennett, 1999), and play waves of this type have the potential to attract considerable use. In this case, use appears relatively low and limited to local kayakers from the Klamath Falls and Ashland area. They gain access to the wave from the end of the road that goes to Keno dam.

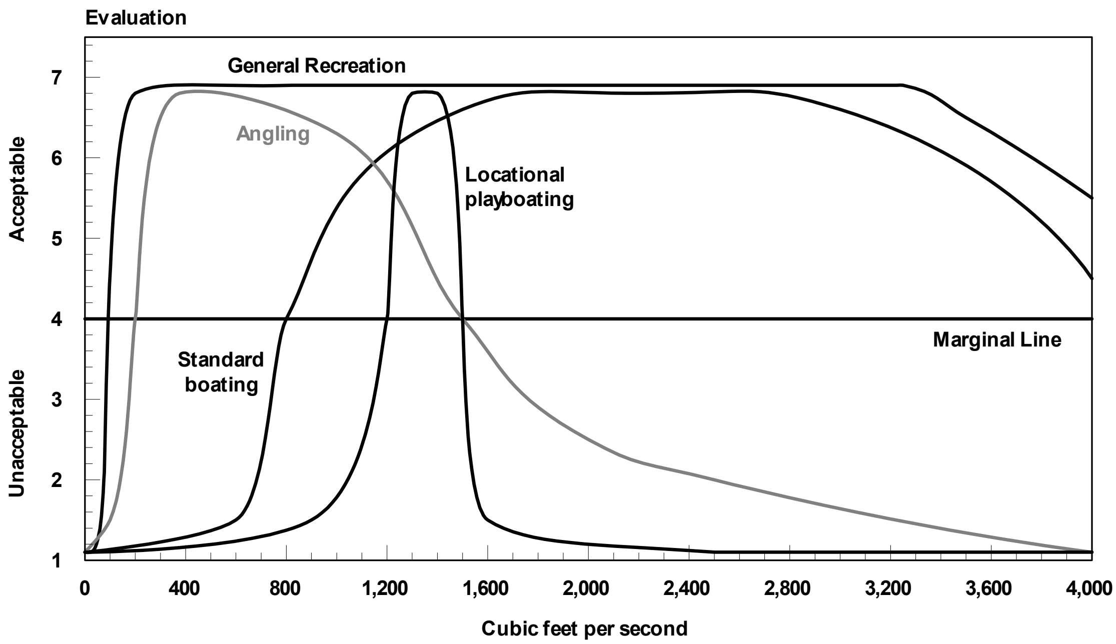
General Recreation. Although there is access at the top and bottom of the reach, as well as at the power line crossing, few people appear to use the Keno reach for general riverside recreation (walking, hiking, mountain biking, berry picking); this may result from the absence of formal trails. However, there is probably good off-trail hiking along some parts of the river and superlative bird viewing for interested users.

Flow Requirements Based on Phase I Information

Fishing. Nine interviewees reported about fishing on the Keno reach, including three (Ostenson, Smith, and Fortune, pers. comm., 2002) who provided detailed information. KCF also provided information about this reach. On the basis of interviews, many anglers appear to use the Keno reach from a few sites leading from nonmaintained trails (particularly those from the power line crossing or the road that ends just downstream of the dam). A few may also take boat-based fishing trips (Hale, Ostenson, pers. comm., 2002), while others may have fished incidentally while on standard boating trips (Munroe, Lee, Hague, pers. comm., 2002).

Interviewees suggest that bank-based fishing is generally best at lower flows, when water is below riparian vegetation and there is better access for bank or wading anglers (Swisher, Ostenson, Smith, pers. comm. 2002). Bank anglers also generally prefer lower flows for improved clarity and higher concentrations of fish in deeper pools and runs (Ostenson, Smith, pers. comm., 2002).

On the Keno reach, Ostenson reports that flows between 300 and 600 cfs are "spectacular" and that conditions remain good as high as 1,000 cfs. At that level and higher, he reports that fishing quality declines steadily until about 2,000 cfs, when he would not fish because the current is too fast. Smith noted that anglers can adapt their fishing techniques to these higher flows, but agreed that wading fishing in all but the wider, middle part of the river is difficult to impossible once flows exceed 900 cfs; his optimal range for the Keno reach was from 600 to 900 cfs. The KCF letter identifies flows up to 1,200 cfs as acceptable, with an optimal flow of 800 cfs. Other interviewees had less specific information about when fishing was best, but concurred that lower flows under 1,000 cfs offered good conditions (Hague, Hale, Fortune, pers. comm., 2002). A flow evaluation curve for fishing is provided in Figure 2.7-15 and generally follows from these recommendations. It shows acceptable flows from about 200 to 1,500 cfs, with optimum flows from about 300 to 900 cfs.




Source: CRC, 2003.

Figure 2.7-15. Phase I flow evaluation curves for recreation opportunities on the Keno reach.

Flow evaluations for boat-based fishing have not been shown explicitly, but they can be inferred by "combining" the fishing and standard boating curves. Boat-based anglers may be willing to tolerate some boatability problems at lower flows (i.e., from 500 to 800 cfs) in order to gain access to the river at good fishing flows, but the best combination of boating and fishing is likely to occur from 800 to 1,000 cfs. At flows less than about 800 cfs, small "sport-cats" (9- to 12-foot catarafts designed for a single person that are becoming popular among some anglers) would be a better choice than standard 13- and 14-foot rafts. Flows below 500 cfs probably require considerable boat dragging in all craft except kayaks.

<u>Standard Boating</u>. On the basis of study reconnaissance, the reach is boatable in kayaks or lightly loaded small rafts (under 15 feet) at about 600 to 700 cfs, but these flows offer little whitewater challenge or "playboating." At these flows, the middle section of the river with its wider, shallower channel causes several boatability problems such as "hits" (where boats make contact with rocks but continue downstream), "stops" (where rocks stop forward momentum and boaters have to push off to continue moving), and "boat drags" (where boaters get out of their boats to pull them off rocks).

A few of the steeper rapids at the beginning and end of the run appear to have enough gradient and constriction to offer Class III challenge and playboating opportunities at medium to high flows (about 1,200 to 3,000 cfs). At these flows, there are likely to be relatively strong hydraulics at several steeper rapids near the start of the run, at a rapid that careens into a wall about a third of the way down the reach, and at the final rapid where the river reaches J.C. Boyle reservoir. At very high flows (more than 3,000 cfs), only the final rapid (which features large bus-sized mid-channel rocks and more constriction from canyon walls) is likely to have very powerful hydraulics and perhaps approach Class IV difficulty. Most of the other rapids are short, steep chutes with smaller rocks that are unlikely to significantly change difficulty at higher flows (they may even wash out and become easier).

Interview information from five rafters who have run the reach suggests similar conclusions. Below 1,000 cfs, the wider and shallow middle section of the river is “boney,” can hang up rafts, and prevent driftboat use. However, some respondents report “clean runs” (no boatability problems) at flows above 1,000 cfs and good whitewater at flows in the 2,000 to 4,000 cfs range (Pribble, Hague, pers. comm., 2002).

A flow evaluation curve for standard boating opportunities is provided in Figure 2.7-15. It suggests that flows below about 800 cfs are marginal, with little whitewater challenge and noticeable boatability problems. Conditions improve steadily with additional flow above 1,000 cfs, with optimal conditions appearing from about 1,200 to 3,000 cfs. After this level, ratings decline as the river is likely to become more “pushy” for Class III boaters and the length of the trip is likely to be very short (the trip takes 2 to 3 hours at lower flows, but it may take less than an hour of river time at higher flows). By 4,000 cfs (the typical peak flows likely to occur on the reach except in extreme flood), conditions for standard trips probably approach marginal levels.

<u>Locational Playboating</u>. The Keno Wave is a well-known playboating feature among Southern Oregon kayakers. When the wave is “in,” it may rival the quality of other Oregon play areas, such as Bob’s Hole on the Clackamas River. At optimum levels, the wave is apparently 3 to 4 feet high, has a 6-foot face, and is about 10 feet wide with a surging pile that has some “retention” for hole-based maneuvers. There are eddies on either side of the wave, and a “friendly” deep pool immediately below the wave for rolling if kayakers are capsized during their maneuvers. Six interviewees had specific knowledge of the Keno Wave (Weidenbach, Lehman, Gutermuth, Stookesberry, Kirwin, and Ellis, pers. comm., 2002), although two others reported knowing about the wave and intended to use it in the future.

There was consensus among the interviewees about when the wave first appears (from 1,000 to 1,200 cfs), when it is optimal (1,250 / 1,300 to 1,400 cfs), and when it begins to “wash out” or becomes too fast for most rodeo maneuvers (1,450 to 1,500 cfs). All flows refer to the Keno USGS gage, which is available on the web.

A flow evaluation curve for playboating, based primarily on interview information, is provided in Figure 2.7-15. It shows that flows less than 1,000 cfs are clearly submarginal, that acceptable playboating begins around 1,100 cfs, and that optimal flows are from 1,300 to 1,400 cfs. The curve then declines sharply from 1,400 cfs, becoming unacceptable at 1,500 cfs.

<u>General Riverside Recreation</u>. On the basis of reconnaissance, flows as low as 200 cfs are likely to cover the bottom of the Keno reach channel (except in the wider shallow section) and provide adequate aesthetics for general recreation. A flow evaluation curve for general riverside recreation is given in Figure 2.7-15, and it shows dramatic improvement from 100 to 200 cfs, with ratings remaining high through estimated bankfull levels. At that point, aesthetics might decrease as the river becomes more turbid, inundates vegetation, or loses some definition in rapids.

Flow Requirement Revisions Based on Phase II Information

Additional discussions with Grant Weidenbach, BLM recreation specialist and local kayaker, suggest minor revisions of the Keno flow curves for standard and locational boating opportunities. Weidenbach boated the entire reach and the Keno Wave several times in the winter and spring of 2002-2003. He noted that the wave remains near-optimal at higher flows than was previously thought. A revised acceptable range for this opportunity is from 1,100 to 1,800 cfs (it was previously 1,100 to 1,500); an optimum range for this opportunity is from 1,300 to 1,600 cfs (it was previously 1,300 to 1,400 cfs). Similarly, he noted that standard boating on the entire reach is probably not acceptable until about 1,000 cfs (higher than 800 cfs as previously suggested).

Project Effects

Project effects can be categorized as either seasonal or short-term variation issues. Seasonal flow variation caused by PacifiCorp and USBR projects is unlikely to significantly affect recreation opportunities on the reach during winter and spring months. Once UKL is full, water sent through the Keno Development is very similar to what would occur without the irrigation and power Projects. These flows may sometimes be too high for optimal fishing, but they provide acceptable to optimal standard boating opportunities and are optimal for general recreation as well. Locational playboating also would occur within its narrow range (1,300 to 1,600 cfs) at about the same frequency.

In contrast, during summer and fall months, average daily flows created by the Projects are generally higher than those that would exist without them, primarily because of storage capacity in UKL, the irrigation return flows (about 400 cfs in summer), and the minimum flows to be provided below Iron Gate dam. These higher flows may slightly diminish fishing opportunities (because 300 to 900 cfs appears better than higher flows), but they are still near-optimal for both fishing and general recreation (and fishing is closed from June 15 to October 1, in any case). For these two opportunities, Project effects may therefore be noticeable but not substantial.

For boating, Project-enhanced summer and fall flows are also unlikely to have substantial effects. The higher flows during these periods are generally not enough to provide better quality standard boating than would otherwise occur, and locational playboating opportunities during this period are rare in any case. For example, because springs and accretion provide about 250 cfs below J.C. Boyle dam even during dry months in dry years, about 300 to 500 cfs from UKL plus 300 to 400 cfs in irrigation return flows is sufficient to produce 1,000 cfs minimum flows below Iron Gate. If this 600 to 900 cfs were provided in the Keno reach on a constant basis, it would still produce only marginal standard boating (although these flows are better than if UKL storage were not providing minimum flows for Iron Gate).

In addition to seasonal variation effects, short-term variation in Keno reach flows may also affect the frequency or quality of recreation opportunities. During high-flow periods (January through May), flow changes in the Keno reach may exceed 500 cfs per hour, although that is the maximum hourly change allowed during medium- to low-flow periods (PacifiCorp, 2002b). This substantial hourly variation, for example, may mean that an average daily flow of 750 cfs produces flows that may be 100 to 200 cfs higher or lower for parts of any given day (although the fluctuation level is less likely to be that large during summer and fall).

During winter months, this substantial short-term variation is unlikely to have important effects on recreation aside from locational playboating. Flows are typically too high for fishing when this variation is likely to occur, and changes are likely to be noticeable but within the optimal range for standard boating. With the narrow range applicable to playboating on the Keno Wave, however, daily and hourly variation of even 100 cfs per hour may frequently, and unpredictably, move flows in and out of the optimal range.

During summer and fall months, daily and hourly variation is unlikely to have substantial effects on fishing and general recreation because those would likely remain within optimal ranges even with 100 to 200 cfs of variation per day. However, this variation could produce acceptable flows for standard boating that otherwise would not exist if boaters knew about them and could plan to be on the water at those times.

For example, a 750 cfs average daily flow could include periods of 5 to 6 hours with flows as high as 950 cfs, balanced by flows around 550 cfs through the rest of the day. If boaters had a schedule of these changes and the higher flows were provided during the day, they might be able to take advantage of the opportunity. At present, however, predicting daily variation for Keno is virtually impossible. Predictability is tied to understanding substantial USBR irrigation return flows to Keno reservoir, which are a function of hundreds of individual irrigation decisions by farmers. Gages on return-flow canals could serve as better indicators of those return flows.

Future Study Needs and Options

It is possible to develop more precise flow evaluation curves for all four Keno reach opportunities, but there does not appear to be a compelling need for that additional precision for fishing, general recreation, or locational playboating. For fishing and general recreation, Project effects on these opportunities are unlikely to be substantial; for fishing and locational playboating, information is already relatively precise.

Additional precision for standard boating is also possible, and it may make sense if more proactive management of flows for this opportunity is contemplated. For example, if PacifiCorp considers using the 1.5 feet of Keno reservoir fluctuation allowed by USBR in the current contract to modify fluctuations in the Keno reach, more information about acceptable flows for boating might be useful. Similarly, if information about Keno reach flows becomes more predictable, PacifiCorp might assist boaters in taking advantage of those flows by providing the information.

Options for developing additional information about boating flows focus on (1) conducting a controlled flow study, (2) conducting more interviews with boaters who use the reach, or (3) having recreation researchers conduct additional reconnaissance trips on the river at higher flows than the 2001 field work. The most precise information would be developed from a controlled flow study, but operational constraints make this choice logistically challenging and it has been rejected. During the time of year when boating flows of interest are likely to be available, control over those flows is limited and one would have to be lucky to observe a desired range of flows in a short period. Additional interviews are likely to help further define a flow evaluation curve for boating (as was the case during interviews with Weidenbach in July 2003), but current boating use on the reach appears low. It is also unlikely that we could develop a sufficiently large interview sample with information about flows and boating on the reach to substantively improve the precision of the existing curve.

In addition, improved analysis of historical flow data will help better understand Project effects on recreation. In particular, recreation researchers remain interested in hourly variation in the Keno reach flows when daily averages are in the 700 to 1,000 cfs range. At these levels, it would be useful to quantify the frequency and duration of periods when fluctuations may provide short-duration higher flows for standard boating opportunities. This would be particularly important if PacifiCorp considered using some of the potential active storage in Keno reservoir in the future (by fluctuating reservoir levels). If this is further considered, additional analysis of those new flow regimes is also recommended.

#### 2.7.1.7 J.C. Boyle Bypass Reach

This river reach is approximately 4.3 miles long, extending from J.C. Boyle dam (outlet of J.C. Boyle reservoir) to J.C. Boyle powerhouse (Figure 2.7-16). The river has a gradient of approximately 96 feet per mile, with slightly steeper sections at the end of the reach. At base flows (100 cfs is released from the dam and springs add about 225 cfs), the upper mile of the river has some small braided channels, but otherwise it is a narrow single-thread channel with a pool/drop character. The rapids are quite steep, with large car- to house-sized boulders that sometimes create sieves. The river has steep banks and cliffs with a few sheer walls, some of which rise a few hundred feet above the river. Boaters have offered potential names for major identifiable rapids on the river; these are given with Phase II focus group notes in Appendix 2H.

The reach has development associated with the Project. This includes the dam and its adjacent service road bridge across the river; a concrete diversion canal and a second service road; a tunnel and penstock; an emergency spillway from the canal (that has caused considerable canyon wall erosion from spill events); a service road to the powerhouse; and the powerhouse itself.

Despite the development, the corridor offers interesting scenery with steep canyon walls, large basaltic boulder fields, pine forests, a natural-appearing riparian zone (with grasses and sedges as well as thicker forest and brush), clear spring-fed water, and several rapids. According to local anglers and a fish biologist (Ostenson, Hale, KCF, Smith, Emery, pers. comm., 2002), the reach also has a native trout fishery. Most of the river corridor is on BLM-managed land, although some is on PacifiCorp-owned land.

<u>Recreation Opportunities</u>

Recreation opportunities in the J.C. Boyle bypass reach include trout fishing, three types of whitewater boating opportunities, and general riverside recreation.

Figure 2.7-16. J.C. Boyle bypass reach.

Back side of Figure 2.7-16. J.C. Boyle Bypass Reach.

Fishing. The J.C. Boyle bypass reach offers good trout fishing opportunities, but the size of the average fish appears to be smaller than below J.C. Boyle powerhouse, and much smaller than in the Keno reach (Smith, KCF, pers. comm., 2002). According to KCF, there are abundant fish in the 5- to 14-inch range (these same anglers report that Keno reach fish may approach 25 inches, while fish below the powerhouse may reach 20 inches, but are usually 8 to 14 inches). Fisheries studies as part of relicensing are likely to better quantify these differences.

Fishing regulations allow anglers to keep one fish per day in fall, winter, and spring, but the river is catch-and-release during the summer (June 15 to September 30). No bait is allowed, and anglers appear to use flies and spinners in roughly equal proportions. Some anglers (particularly fly anglers) may wade in the river while fishing, but most fish from the bank (Emery, Smith, pers. comm., 2002).

The reach generally has difficult access except near the dam and at the powerhouse. According to Smith, Weber, and Emery (pers. comm., 2002), the majority of anglers fish close to the powerhouse, using the network of informal trails that run up the river for about half a mile. To access the middle part of the river, there are some informal steep routes down from the service road to the powerhouse (particularly near the canal tunnel and after the emergency spillway), as well as sporadic informal trails along the river right bank. On the basis of field reconnaissance, use of this area appears light, probably because of its difficult access (i.e., considerable brush and large boulders to bushwhack through or over).

Whitewater Boating. The J.C. Boyle bypass reach offers a 5-mile Class III to IV whitewater run that is boatable at medium to high flows and is similar to the “gorge” section on the Hell’s Corner reach. A few rapids have enough gradient and constriction to offer Class IV/V challenge at higher flows, while most rapids and lower flows are Class III/IV difficulty.

On the basis of Phase I information, flow needs for two boating opportunities were developed. A “standard” trip does not feature the large and powerful hydraulics that might occur at higher flows; this trip is generally the choice for Class IV boaters, who are not interested in greater difficulty. Big-water trips occur when higher flows raise the difficulty of the reach; these are the focus for solid Class V boaters who are interested in greater difficulty. Phase II studies included a controlled flow assessment on this reach that collected more precise information about technical, standard, and big-water boating, as well as commercial rafting opportunities (see below).

Boating flows are rarely available except during spill periods, so relatively few boaters have run the reach. Most appear to have used the short reach as a day trip, although it could be linked with the Hell’s Corner reach for a longer day or overnight trip. There are a few forested benches that could provide good camping (particularly around Big Bend), but no obvious beaches or gravel bars.

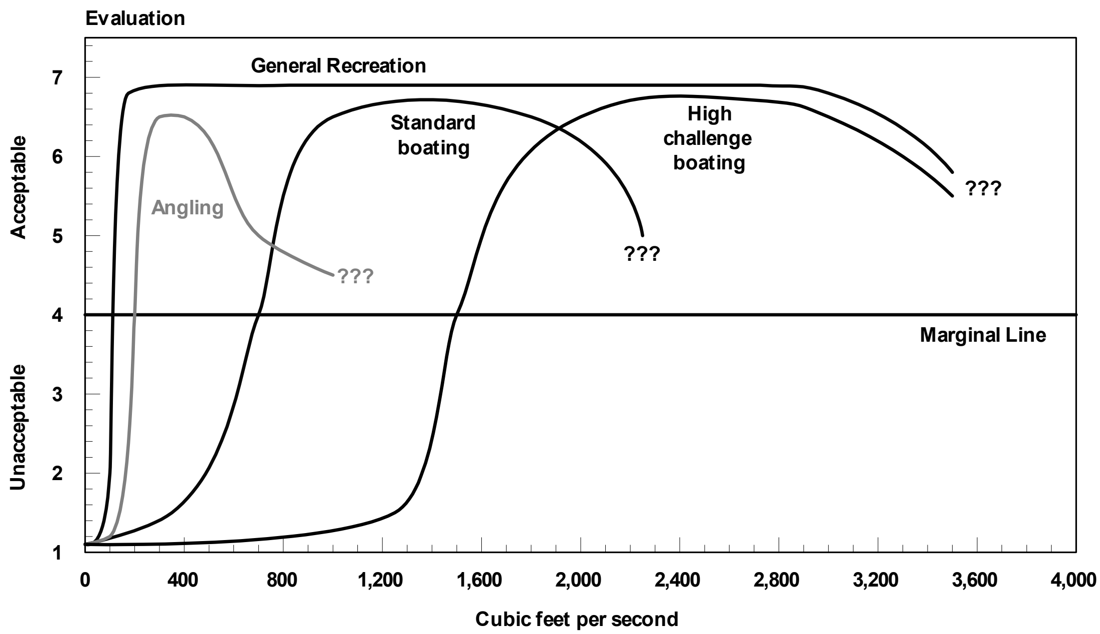
General Riverside Recreation. Few people appear to use the J.C. Boyle bypass reach for general riverside recreation (walking, hiking, berry picking), although there is access at the top and bottom of the reach. However, there is some good off-trail hiking along parts of the river, and a few benches and other clearings in the riparian zone offer places to enjoy the river. The springs that provide the bulk of the water in the reach are relatively cold, so swimming is unlikely to be an attraction (except during extremely hot periods of the summer). Water clarity at base flows is excellent, and there are a few inviting pools and runs.

Flow Requirements Based on Phase I Information

Fishing. Four Phase I interviewees reported about fishing on the J.C. Boyle bypass reach (Ostenson, Smith, Emery, Fortune, pers. comm., 2002), and the KCF letter provided additional information. Interviews suggest that fishing is generally best at 320 cfs base flows (100 cfs from the dam and 220 cfs from springs), which occurs most of the time (see below). These flows provide opportunities to wade in the river and good pocket water in the swifter runs and rapids. They also provide excellent water clarity below the springs, as well as higher concentrations of fish in deeper pools and runs (Ostenson, Smith, pers. comm., 2002). As Smith noted, anglers are used to this level, but it does not mean that higher flows might not improve the fishery from a biological perspective. He also suggested that higher flows may provide good fishability after anglers have adapted to the new conditions (i.e., learned how to fish them). KCF appears to concur with this concept, noting that flows up to 500 cfs would be acceptable (although KCF reported that 350 cfs was optimal).

A fishing flow evaluation curve based on Phase I information is shown in Figure 2.7-17. It shows acceptable fishing dramatically improving from about 200 cfs, with optimal flow levels about 300 to 400 cfs (current base flows). The curve then declines steadily toward marginal levels around 700 cfs, with question marks to indicate that flows for this part of the curve are more difficult to evaluate (although flows above 1,000 cfs are probably unacceptable). Limited interview information and on-site reconnaissance during the Phase II controlled flow assessment suggested no substantive changes to this curve.

Standard and Big-Water Boating. The J.C. Boyle bypass reach is boatable in kayaks and inflatable kayaks at about 320 cfs (base flows). However, during the Phase I September 2001 reconnaissance trip, kayakers occasionally were grounded and had to exit their boats in the first mile of the run (until the springs provided more water). The boaters also had numerous hits and stops in boulder-choked rapids toward the end of the run, and the rapids had very little power or quality play. This was clearly a marginal trip, even if one were willing to define it as a technical opportunity. Our reconnaissance-based assessment is that flows of 600 to 800 cfs are necessary to provide acceptable quality “technical” whitewater boating.




Source: CRC, 2003.

Figure 2.7-17. Flow evaluation curves for recreation opportunities on the J.C. Boyle bypass reach based on Phase I information.

During Phase I interviews, nine boaters reported having taken previous trips on the reach (two at base flow levels, five at flows from 1,000 to 2,500 cfs, one at flows above 3,000 cfs, and one who has taken several trips at flows from 1,500 to 5,500 cfs). Seven other boaters reported hearing about trips or having scouted the reach at base flows and expressed a desire to run the river if higher flows were available. Only four boaters offered specific estimates of acceptable ranges for standard and high challenge trips (Weidenbach, Kauffman, Ellis, Hague, pers. comm., 2002).

On the basis of Phase I information, it appears that quality standard trips are available by about 1,000 cfs, and they continue to about 2,000 to 2,500 cfs, offering mostly Class IV rapids (few boaters had knowledge of flows between base levels and 1,000 cfs). These trips have been taken in kayaks and rafts (although the latter were used by highly skilled guides). At flows around 2,000 cfs and higher, the hydraulics appear to become more powerful, and the trip may require Class V skill (a big-water trip). These flows may be more suited to kayaks than rafts, although rafts have taken them as well. It is unclear how high the river can be boated, but one skilled kayaker (Gutermuth, pers. comm., 2002) aborted his run at flows estimated to be above 3,000 cfs because of its difficulty, and Hague (pers. comm., 2002) took a raft trip at flows that may have exceeded 5,500 cfs (8,000 cfs below the powerhouse with both turbines running); he described the trip as “life threatening” and noted that he would not go at that level again.

Flow evaluation curves for standard and big-water boating based on Phase I information are provided in Figure 2.7-17. The standard curve suggests that acceptable boating begins about 600 to 800 cfs, with steady improvement until flows reach about 1,000 cfs; optimal standard trips are from about 1,000 to 2,000 cfs, with ratings declining above that level. The question marks suggest that additional information may be necessary to develop this curve with greater accuracy, particularly at higher flows. The big-water curve shows those trips become acceptable about

1,500 cfs, with optimal levels from about 2,250 to 3,000 cfs. More information would better define the top end of this curve, although the "epic" high-flow trips reported by some interviewees suggest that 3,000 to 4,000 cfs may be the limit for most boaters. For both opportunities, there may be some differences for rafts and kayaks that could be represented in separate curves, but existing reconnaissance and interview information is insufficient for this level of precision.

Phase II information helped refine these curves for standard boating, create a new curve for technical boating, and distinguish between kayaking and rafting curves. The following section summarizes key findings from that controlled flow assessment.

*General riverside recreation.* On the basis of reconnaissance, flows as low as 200 cfs are likely to cover the bottom of the J.C. Boyle bypass reach channel and provide adequate aesthetics for general recreation. The 100 cfs dam release above the springs, in contrast, does not provide the quality aesthetics associated with the flows below the springs. A flow evaluation curve for general riverside recreation is given in Figure 2.7-17, and it shows dramatic improvement from 100 to 300 cfs, with ratings remaining high through estimated bankfull levels. At that point, aesthetics decrease as the river becomes more turbid and inundates vegetation.

<u>Boating Flow Requirement Revisions Based on Phase II Information</u>

The Phase II controlled flow study suggested some flow requirement revisions for whitewater boating on the J.C. Boyle bypass reach. Sections below provide a general description of study flows and summarize flow evaluation curves and specified flows for various opportunities. Appendices provide additional Phase II study results.

<u>General Description of Study Flows for Boating.</u> Boating conditions varied widely over the four study flows, as discussed below. Appendices include reconnaissance and focus group notes that formed the basis for these descriptions.

*690 cfs.* This was the lowest (and last) flow during the controlled flow study; it produced marginal technical boating, particularly in the first half of the run. Kayaks and small catarafts were able to negotiate the reach, but nearly all boaters had to portage Sidecast Slide, a distinct rapid about 1.5 miles from the dam that is created by channel constriction from canal Sidecast rocks. The catarafts also became stopped several times, and they sometimes required "boat-drags" to continue. Most rapids involved numerous hits, and route options were limited, particularly in the upper part of the reach (which had some vegetation encroachment). There were few playboating features.

*960 cfs.* This was the initial flow in the study, and it produced good technical opportunities for kayaks, acceptable technical opportunities for small rafts, but submarginal standard trips for rafts and kayaks. All craft were able to run the reach, but most of the rafts portaged or were lined through Sidecast Slide. Rapids had more power and a few more route options than 690 cfs, but the channel was still very rocky in major rapids, with limited oar space for rowing rigs. Several rafts had numerous hits and stops; a few rafts also became stuck or had people fall out after contact with rocks. Despite these minor problems, the river was not too "pushy," allowing boaters to scout all the major rapids on a reach that most had not run before. There were some playboating features, but these were not exceptional.

*1,230 cfs.* This flow provided markedly improved boatability and power in the river compared with 960 cfs. Rapids were less rocky and there were more route options. The size of waves and holes also increased, without any substantial loss of definition in rapids and without becoming too “pushy.” There were a few more playboating opportunities, but they were not common. Rafting lines were cleaner at this flow, and all boats were able to run Sidecast Slide. While some rapids remained “technical,” this flow defined the start of good “standard” whitewater trips, particularly for kayaks. It was acceptable but not optimal for rafting, and was near the low end of the acceptable range for commercial rafting (assuming five to six passengers plus a guide).

*1,480 cfs.* This was the highest flow in the study, and it provided near-optimal “standard” boating for both kayaks and rafts. There were no substantial boatability problems and considerable power in hydraulics, as well as more route options in rapids. Definition remained in most rapids, although a few became noticeably “pushier” or had shorter recovery areas. A few playboating opportunities were available, although rapids were more distinctive for their length or complexity than easily accessible playboating features. Commercial rafting would be viable at this flow, particularly after lines through the more difficult rapids become known (as in the Hell’s Corner reach). While some rapids had hydraulic power, the river was less powerful than the two-turbine, big-water run on Hell’s Corner.

<u>Rating Whitewater Difficulty.</u> On the six-class International Scale, boaters confirmed that the J.C. Boyle bypass reach was a Class IV run at most flows, although some boaters rated it IV+ or V-. While the highest flow (1,480 cfs) had more hydraulic power, most boaters did not think it was “pushy” enough to be labeled Class V; at very high flows (above 3,000 cfs), the difficulty could increase to Class V in a few constricted drops.

In contrast, several boaters noted that the lower flows were technically more difficult. At lower flows, there are limited route options, more rocks to hit, less oar space for rafts, and less water for rolling kayaks or swimming in case of mishaps. Several boaters noted that swimming in the reach at any flow was dangerous because of the sharp rocks, but there was general agreement that swimming hazards were heightened at 960 cfs, which had a combination of power in the steeper drops and many exposed rocks. At 690 cfs, there were more rocks but less power.

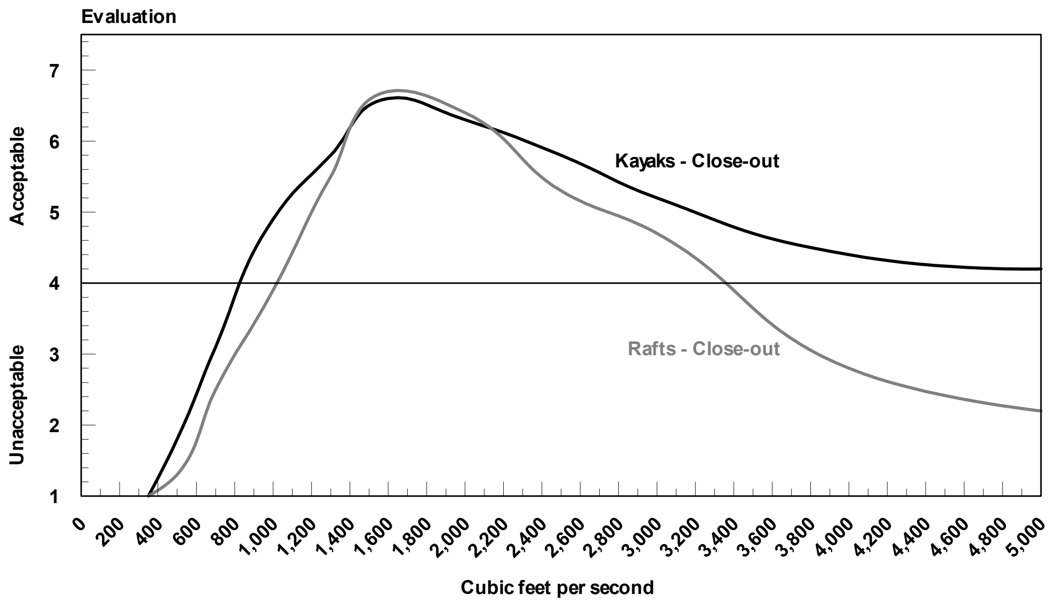
The difficulty of the J.C. Boyle bypass reach is similar to the Hell’s Corner reach downstream, although some boaters thought the Hell’s Corner run easier because it is more familiar. If boaters had more opportunities to run the J.C. Boyle bypass reach, they would probably learn the lines through rapids and find few substantial differences.

<u>Post-Run Boating Evaluations.</u> Following each run, boaters were asked to report the number of boatability problems they had, and to evaluate nine attributes of whitewater boating trips (including providing an overall evaluation). While boatability reports and attribute evaluations help boaters focus on key attributes and the ways flows affect them, post-run results are generally less useful than evaluations made after boaters have observed all of the study flows (see below). Post-run results have been summarized in Appendix 2H, and we focus on the close-out survey information here.

<u>Flow Comparison Information.</u> At the end of the study, boaters were asked to complete a “close-out” survey with questions that compared study flows with the full range of flows that might be available in the reach. Results help develop “flow evaluation curves” that relate flows and

overall recreation quality, and that help define acceptable and optimal ranges for specific opportunities. Additional questions asked boaters to identify specific acceptable and optimal ranges for different types of opportunities.

*Flow Evaluation Curves.* Boaters were asked to rate a series of 11 flows from 350 to 5,000 cfs using a seven-point acceptability scale (1 = unacceptable, 4 = marginal, and 7 = acceptable). Results are given in Figure 2.7-18 for rafts and kayaks. The figure shows flow along the horizontal axis and acceptability evaluations along the vertical axis; curves describe the relationship between flows and overall boating quality.




Source: CRC, 2003.

Figure 2.7-18. Flow evaluation curves for whitewater boating opportunities on the J.C. Boyle bypass reach based on Phase II close-out survey information.

The overall evaluation curves show the characteristic bell shape found in many previous studies (Whittaker and Shelby, 2002b), and they indicate that boating could probably occur on the reach at a fairly wide range of flows. While flows below about 800 to 1,000 cfs are rated unacceptable (depending on the craft), ratings improve consistently from 1,000 to 1,600 cfs before gradually declining (although they remain in the acceptable range for rafts through 3,400 cfs and for kayaks through 5,000 cfs). On the basis of these data, the optimum range for both craft would occur between 1,400 and 2,000 cfs, but flows above 750 cfs and 1,000 cfs are acceptable for kayaks and rafts, respectively.

*Specified Flow Ranges for Different Opportunities.* A series of "specified flow" questions asked boaters to identify flows or ranges that provide a variety of different opportunities. The specific questions are given in Appendix 2H. Table 2.7-5 shows mean and median responses for kayaks and rafts; Figure 2.7-19 summarizes "range bars" for key opportunities (based on medians). Results are discussed below.

Table 2.7-5. Descriptive statistics for "specified flow" questions (in cfs).

| Specified Flow | Kayaks | | Rafts | |
|---|---|---|---|---|
| | Mean | Median | Mean | Median |
| Minimum boatable flow | 644 | 500 | 1,000 | 1,000 |
| | | | | |
| Lowest acceptable technical boating | 767 | 800 | 1,017 | 1,000 |
| Low end of optimal technical boating | 938 | 900 | 1,133 | 1,000 |
| High end of optimal technical boating | 1,200 | 1,200 | 1,428 | 1,300 |
| | | | | |
| Lowest acceptable standard boating | 1,350 | 1,300 | 1,350 | 1,300 |
| Low end of optimal standard boating | 1,267 | 1,250 | 1,347 | 1,300 |
| High end of optimal standard boating | 1,778 | 1,800 | 1,800 | 1,700 |
| | | | | |
| Lowest acceptable big-water boating | 1,900 | 1,700 | 1,688 | 1,600 |
| Low end of optimal big-water boating | 1,933 | 2,000 | 1,777 | 1,800 |
| High end of optimal big-water boating | 3,294 | 3,000 | 2,563 | 2,300 |
| | | | | |
| Lowest acceptable standard rafting | 1,370 | 1,500 | 1,338 | 1,300 |
| Low end of optimal standard rafting | 1,388 | 1,450 | 1,382 | 1,500 |
| High end of optimal standard rafting | 2,344 | 2,000 | 1,906 | 1,800 |
| | | | | |
| Lowest acceptable "low flow" rafting | 1,129 | 1,000 | 992 | 1,000 |
| Low end of optimal "low flow" rafting | 1,243 | 1,300 | 1,188 | 1,200 |
| High end of optimal "low flow" rafting | 1,588 | 1,500 | 1,519 | 1,500 |
| | | | | |
| Highest safe flow | 3,611 | 3,000 | 2,278 | 2,000 |

Source: CRC, 2003.

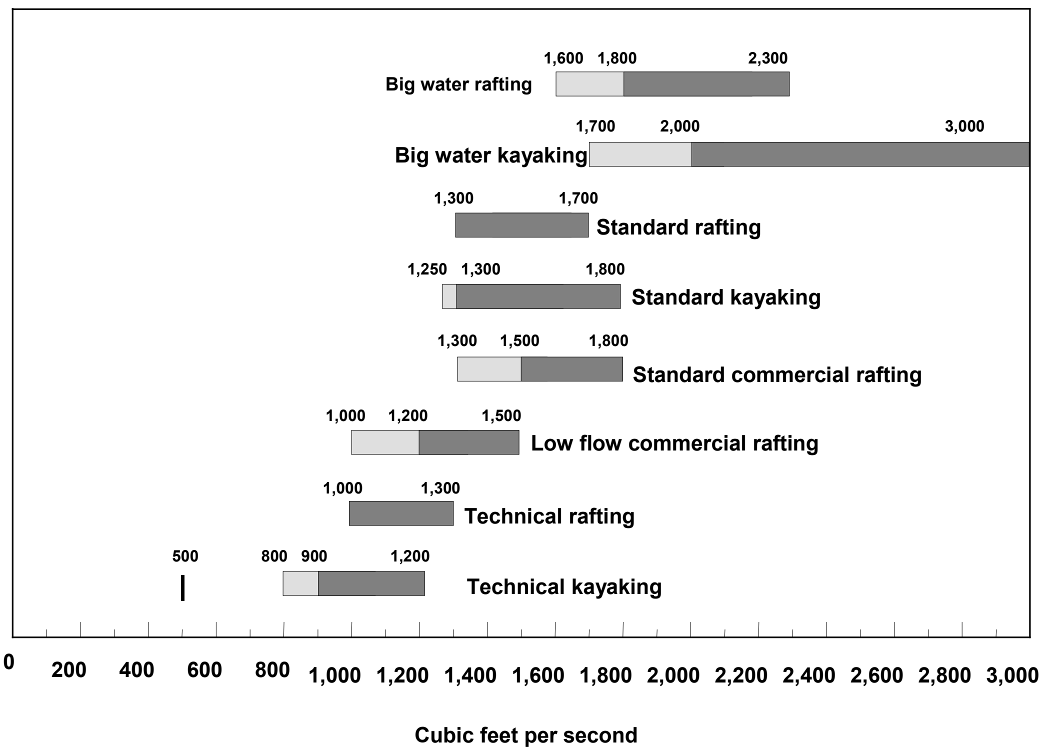
- Kayakers identified flows lower than the lowest in the study (690 cfs) as a minimum to use the river for transportation, but recognized that quality "technical trips" are not provided until flows are above 800 cfs. An optimal range for "technical kayaking trips" is from about 900 to 1,200 cfs.

- Rafts require more water to get down the river, with 1,000 cfs a starting point for acceptable quality. While the two single-person catarafts were able to run the river at 690 cfs, no other rafters were willing to run larger boats with more people at that level.

- Boaters in rafts and kayaks recognize differences between "technical" and "standard" trips, with flows around 1,200 to 1,300 cfs defining the transition between these two opportunities.

- Standard opportunities for both craft appear acceptable at about 1,300 cfs, and they are optimal from that flow to about 1,600 or 1,700 cfs.

- Boaters also recognize differences between "standard" and "big-water" trips, with flows about 1,700 to 2,000 cfs defining the transition between these two opportunities.




Source: CRC, 2003.

Figure 2.7-19. Specified flow ranges for whitewater boating opportunities on the J.C. Boyle bypass reach based on Phase II close-out survey information.

- Big-water opportunities for kayakers appear optimal from about 2,000 to 3,000 cfs; for rafters they are optimal in a more narrow range from 1,800 to 2,000 cfs. Rafters expressed some concerns about the lack of recovery areas at higher flows.

- The high end of the big-water range is similar to the "highest safe flow" for each craft. The study did not provide flows higher than 1,480 cfs, although Phase I information suggested that several boaters have run the reach at considerably higher levels. Phase II information does not add more information about these higher flows than was learned in Phase I.

- Those with rafting experience were asked to specify flows for standard and low-flow commercial rafting trips. The latter are distinguished by smaller boats, fewer passengers, and a focus on access to the reach rather than on powerful hydraulics and big, "splashy" waves. Standard commercial rafting becomes acceptable about 1,300 to 1,400 cfs and optimal between 1,400 to 2,000 cfs. Low-flow commercial rafting appears possible about 1,000 cfs, and it transitions into standard commercial rafting between 1,300 and 1,400 cfs.

- Variation (based on a review of standard deviations; not shown) was greater for the high end of the standard range and all of the big-water variables compared with data for technical and the low end of standard opportunities. Probable explanations focus on (1) the lack of experience with higher flows on the reach, and (2) differences in skill levels or whitewater preferences among respondents. This is similar to findings from other controlled-flow studies, where there is more agreement about minimum boatable, technical, and the start of standard boating flows than for other specified flows (Whittaker and Shelby, 2002b).

- When asked to specify a single flow that should be provided for whitewater (results not shown), no boater identified a flow higher than 1,800 cfs, and two-thirds listed 1,500 cfs (the highest flow in the study).

- When asked to specify two flows that should be provided for whitewater (results not shown), boaters tended to list one in the technical range (900 to 1,200 for kayaks; 1,000 to 1,300 cfs for rafts) and one in the standard range (1,600 to 2,000 cfs). Unlike the single flow results, there was no clear modal response.

<u>Fishing Flow Requirements Based on Phase II Information</u>

Resource reconnaissance and interviews with J. C. Boyle anglers and boaters who fish largely confirm Phase I information regarding flow requirements for fishing. The study flows represented a substantial change from the 350 cfs base flows to which anglers have become accustomed. No angler reported that any of the study flows would provide high-quality fishing. Key attributes affected by the higher flows are discussed below.

- Increased turbidity at higher flows (particularly evident at 1,480 cfs) appears to decrease fishing success and aesthetics. However, turbidity would probably stabilize at a lower level if higher flows were provided over longer time frames.

- Higher flows decrease wadeability (even at 690 cfs), with each study flow providing fewer places in the constricted channel where anglers could safely wade or cross the river to fishing areas. The effect of high flows on wading was exacerbated by encroaching vegetation, which has adjusted to the low base flow channel. The exception to this problem is the reach immediately upstream of the powerhouse, which has a lower gradient than the rest of the reach and is more likely to be fished at higher flows (Emery, pers. comm., 2002).

- Higher flows create swifter velocities in runs, riffles, and pocket water that are more difficult to fish. Anglers would probably have to increase the weight of their tackle to get lures down in the swifter water at higher flows, which could then increase the chances of snagging rocks or vegetation in the channel. This problem interacts with difficult wading, crossing, and vegetation encroachment to substantially diminish the amount of shore-based or wading-based fishable water. The swift water and difficult rapids also minimize places for boat-based fishing.

On the basis of observations during the study, flows greater than about 1,000 cfs substantially limit available fishing water to the slower runs and pools, and they are probably unacceptable to most current anglers. While there were more available pools and runs at 690 cfs, this still offers marginal fishing compared with the 300 to 400 cfs base flows, which are easily wadeable in many places and thus provide access to considerably more fishable water. While it is likely that anglers could adapt their fishing techniques to higher flows over time, study information cannot confirm this conclusion for several reasons:

- Anglers may have difficulty separating flow evaluations for fishing (recreational flow requirements) from those for the fishery (biological flow requirements). This potential confound has been noted in previous studies (Whittaker and Shelby, 2002a, 2003) and appears relevant for the Klamath, too. Several anglers noted concerns about the effects of varied or high whitewater releases on fish populations, feeding behavior, or spawning success; these may color their recommendations regarding flows for fishing.

- It is difficult to evaluate study flows that are provided for a few hours only. Most anglers develop evaluations for fishing conditions over multiple visits that vary by fishing location, tackle, and technique, which further interact with other variables to influence fishing success. Perhaps more important, the study flows do not allow fish enough time to adjust to a new regime, so anglers are not confident that fish are behaving as they would if flows were provided over the long term.

- Anglers have become familiar with certain flow regimes and have adapted their fishing techniques to maximize success under those conditions. New and different flows may require substantial changes from these traditions, and many anglers are likely to be resistant to learning how to fish them.

- Some anglers may prefer certain reaches or flows because they are not popular with other anglers. This may confound assessments of flow regimes that might increase a fishery's "public visibility" and potentially correlated use levels.

Project-Related Effects

Project-related effects have generally enhanced fishing in the reach by providing stable base flows for most of the year (about 100 cfs at the start and 320 cfs at the end of the reach). Fish habitat might be improved with higher base flows (to be determined by fisheries studies), and anglers could probably adapt their tackle and techniques to somewhat higher levels (flows up to 1,000 cfs). But it is clear that anglers prefer lower levels, and most spill or whitewater flows are considered too high.

Project-provided base flows in combination with spring flows are within the optimal range for general recreation. Without Project diversions, higher flows would probably lower water quality in the reach as higher proportions of the water would be from UKL than the springs. However, pre-Project flows were probably also within the optimal range for general recreation through most of the year.

In contrast, Project-related effects on boating have been substantial. Base flows are clearly too low for quality boating opportunities, and taking advantage of spill events is difficult because spill flows are (1) unpredictable, (2) usually too high, and (3) often during the colder winter or early spring months. In some years, no spills occur. Additional analysis of spill flows could be conducted to quantify the frequency of spill amounts in different ranges. That analysis could also be compared with pre-Project estimates of flows in the J.C. Boyle bypass reach, which are likely to provide flows between 1,000 and 3,000 cfs for several months each year (probably from late spring to midsummer, and then again from late fall to early winter).

Under current flow regimes, whitewater boating is provided only during short-duration spills or unpredictable maintenance events, while flows better for wading-based fishing and general recreation are available for the rest of the year. With a regulated river, it may be possible to alter the frequency of these various opportunities to provide greater diversity or enhance particular opportunities and resource values. Future management is tied to understanding the impacts and trade-offs of these choices.

It is beyond the scope of this report to recommend specific alternative flow regimes that could provide greater diversity, or to analyze the specific impacts and trade-offs implied by each. However, it is possible to identify several key considerations that could help with crafting alternative flow regimes if the applicant or stakeholders were interested.

- Boating and fishing occupy different niches in the hydrograph, and there is no "compromise" flow that would provide quality versions of both at the same time. While some types of spin and bait fishing could occur within the lower boating flow ranges (700 to 1,000 cfs), these are distinct from the wading- and shore-based fishing that has developed in response to low base flows from current operational regimes.

- If higher flow whitewater opportunities are provided, the timing of those releases is likely to have varying effects on fishing and the level of boater use. Boaters would prefer weekend whitewater releases in summer and early fall when fewer alternative rivers are available. Anglers also prize weekend days, particularly in the summer and fall. This is a classic resource allocation dilemma, with no obvious "elegant" solution.

- Many anglers tend to fish in early morning and late evening, so midday whitewater flows (e.g., from 10 a.m. until 4 p.m.) would have less impact than if whitewater releases were provided for an entire day (e.g., from 8 a.m. to 8 p.m.). While ramping up and down from target flows would extend these periods, short daily releases could minimize the loss of fishing opportunities and power generation, while providing boating during the warmest time of day.

- Whitewater flows in summer and fall may have a variety of biophysical impacts (many of which are addressed by other studies for this relicensing). From a fishing perspective, key issues focus on timing releases to minimize long-term effects on water quality habitat and insect productivity. Anglers are also concerned about the duration of impacts on fish feeding activity (e.g., will whitewater releases diminish fishing success for several hours or days after releases and thus exacerbate the loss of fishing days?). Monitoring is critical to examine these hypothesized effects.

- When integrating recreation information with ecological flow needs, considerable attention is likely to focus on designing whitewater releases to mimic natural (unimpaired) high-flow events and thus serve various ecological purposes (e.g., channel maintenance, gravel cleaning). Historically, these high-flow events occurred between January and June. Under current operations, high flows may still occur during this period in wetter years (although with smaller peaks than if flows were unimpaired). However, if supplemental whitewater releases were scheduled during these times, relatively fewer boaters would probably use them because other rivers are also likely to be available. If ecological concerns require boatable high flows to be released between January and June, the later months are better from a boater perspective (because the weather is warmer).

- Whitewater releases provided in the reach remove water from the hydropower generation system. While lost generation capacity from such releases can be calculated in megawatts, the cost depends on several variables, including the size, duration, and timing of the release (both seasonally and by time of day), ramping rate requirements, and the base flow from which releases would be "built." Market conditions for power, which can fluctuate as a result of a variety of factors, may also influence the value of foregone power. Until some of these unknowns are further specified, it is premature to estimate lost generation for providing whitewater releases on the reach.

- Whitewater releases might also affect reservoir levels in the J. C. Boyle or Keno reservoir. The size of reservoir drawdowns can also be calculated depending on the size, duration, and timing of the release (both seasonally and by time of day), the ramping rate requirements, and the base flow from which releases would be built. As some of these variables are specified, it will be possible to assess potential effects on the reservoirs. Other reports on Klamath River recreation issues (PacifiCorp, 2003) have identified potential impacts from reservoir level changes, including availability of beach areas, navigability of shallow areas, lake fishing success rates, facility usability, and overall aesthetics. If whitewater releases are proposed and defined, information in this and the reservoir recreation reports can be integrated to examine specific impacts on reservoir recreation opportunities.

- If higher base flows are contemplated to enhance or protect biological resources, there may be lower quality or lost fishing opportunities if new base flows are too high. It is unclear how anglers or fishing organizations will respond to proposals that might improve the fishery but diminish fishability, but these data suggest that most current anglers prefer current base flows and probably would not fish flows over 500 cfs, or, at least, not in the way they do at present. In general, some anglers appear to fish the J.C. Boyle bypass reach because it stays low when the downstream Hell's Corner reach is too high as a result of hydropower peaking.

- Experience with other rivers suggests that anglers would adapt their tackle and techniques to successfully fish higher base flows (particularly after the riparian vegetation adjusts to those new levels and provides a more open shoreline). However, it is also clear that those new opportunities might be dramatically different from current ones. On the basis of this study, higher base flows are likely to substantially alter fishing opportunities.

In conclusion, balancing boating and fishing flows is likely to be challenging. Providing flows for one will cause the loss of days or quality for the other. Ecological resources may also be affected by any change in the flow regime, although some fish and riparian resources may be improved by well-timed "pulse" releases or higher base flows. Finally, hydropower generation will be affected by changes intended to provide greater recreation diversity. The purpose of this report is to provide information to help stakeholders and license applicants consider these trade-offs.

Future Study Needs and Options

More precise flow evaluation curves were developed for J.C. Boyle bypass reach whitewater boating opportunities based on the controlled flow study, but limited angler participation did not substantially revise Phase I fishability findings. While greater precision may be desirable for this opportunity, it is unclear whether additional controlled flow studies or other efforts would be useful. As discussed above, local anglers who currently use the reach prefer lower flows, and some anglers are skeptical that a few days of higher flows are sufficient to evaluate fishability under new flow regimes in any case (Smith, Ostenson, pers. comm., 2002). More important, many anglers suggested that biological implications of any new flow regimes may be substantial and should probably “trump” fishability concerns. There may be opportunities to integrate fishability and fish habitat findings as Upper Klamath River studies are completed.

Additional future work may also focus on the implications of potential new operating scenarios and their likely effects on hydrology in the reach. As these operating regimes are described, information in this report can be used to assess effects on the quality or frequency of various recreation opportunities.

2.7.1.8 Recreation Flow Assessment for the Hell’s Corner Reach

Hell’s Corner reach is about 16 miles long, extending from J.C. Boyle powerhouse to Copco No. 1 reservoir (Figure 2.7-20). The river has a gradient of 51 feet per mile, with a steeper, 6-mile reach (sometimes called “the gorge”) that averages about 77 feet per mile. The river is mostly a single-thread channel, although there are some islands and wider areas with boulder gardens or braids (particularly at lower flows). The river has some steep banks and cliff walls, but it generally flows through a more open canyon than the J.C. Boyle bypass reach, particularly downstream of the California-Oregon border.

The 11-mile segment of the reach from J.C. Boyle powerhouse to the Oregon border was designated an Oregon State Scenic Waterway in 1988 and a National Wild and Scenic River (part of the federal Wild and Scenic River System) in 1994; the designations came in response to various Salt Caves Hydroelectric Project proposals and a formal Wild and Scenic River Study (BLM, 1990). Designation assigned federal management responsibilities to BLM, which has considerable land in the corridor (along with PacifiCorp), although the segment was designated under the 2a (ii) section of the Act and calls for cooperative state/federal management.

The river was designated for its “outstandingly remarkable” recreation, fish, wildlife, historical, prehistoric, scenic, and traditional Native American values. Descriptions of these values are extensively cataloged in the Wild and Scenic River Study (BLM, 1990). Relevant resources for flow and recreation focus on fishing, whitewater boating, and the aesthetics of the river, as briefly summarized below.

The fishery on the Hell’s Corner reach is considered excellent; the Wild and Scenic River Study describes it as “one of the better fly fishing rivers in Oregon” (BLM, 1990). Fish are generally larger native trout than in the J.C. Boyle bypass reach, but smaller than the trophy-sized fish in the Keno reach. The largest fish may run 16 to 18 inches, with an average closer to 12 to 14 inches (Smith, pers. comm., 2002). Mid-1980s studies completed by the City of Klamath Falls as part of the proposed Salt Caves Hydroelectric Project proposals suggest that densities of native trout larger than 7.8 inches between J.C. Boyle powerhouse and Frain Ranch were 890 fish per mile, with populations in the gorge estimated at more than 1,900 fish per mile (BLM, 1990). These compare with densities of 1,500 fish per mile on the Lower Deschutes River, widely recognized as among the most productive native trout fisheries in Oregon (BLM, 1990).

The rapids on the reach can be quite steep, with boulders that generally range in size from beach balls to small cars. The rocks are basaltic, notoriously angular, and generally resistant to erosion. Resultant rapids can create chaotic hydraulics and unusual rock placements in the drops. According to the Wild and Scenic River Study (BLM, 1990), there are 25 Class II, 16 Class III, three Class IV, and two Class V rapids on the river. Rapids are generally continuous in the gorge (all of the harder rapids except for three Class III drops are in the gorge), but they are more pool/drop in character outside of the gorge. Most of the rapids on the river have been named, described, and rated in various guidebooks (Quinn and Quinn, 1983; Keller, 1998; Willamette Kayak and Canoe Club, 1994; Cassady and Calhoun, 1995; and Holbek and Stanley, 1998).

The reach's landscape features limited development associated with the hydroelectric project and some ranching activity. Below the vicinity of the J.C. Boyle powerhouse, the only signs of development are gravel roads, ranching buildings or fences (some active; others historical), and a few remnant bridge pilings or low-head diversion weirs on the lower river. There are also several recreation facilities at boater and angler access sites on the river (e.g., toilets, informal parking and camping areas, fire rings).

BLM has actively managed the river since the advent of increased recreation use about 25 years ago. Facilities include the boater put-in downstream of J.C. Boyle powerhouse (at Upper Klamath River [Spring Island] Boater Access), which features paved parking, associated picnic sites, changing rooms, and toilets. Camping is not permitted at this location. BLM also operates its Klamath River Campground, a 3-unit, developed campground downstream from the put-in. BLM has developed a draft River Management Plan and Environmental Impact Statement (EIS) for the Upper Klamath River, including the designated reach (BLM, 2003). Information collected for this study about management issues pertinent to the EIS was shared with BLM and has been included in Appendix 2C.

Dispersed camping and day use occur on property owned by BLM and PacifiCorp along the river. BLM and PacifiCorp are working collaboratively to manage these dispersed camping and day use areas. PacifiCorp also has developed six public fishing access points along the south side of the river, adjacent to a county-maintained gravel access road (Ager-Beswick Road). All of these access points were provided through a voluntary agreement with California Department of Fish and Game (CDFG) by PacifiCorp and are not currently associated with the Project license.

Recreation Opportunities

Fishing. As noted above, the Hell's Corner reach offers excellent trout fishing opportunities, although they may not be as superlative as those on the Keno reach. There are abundant fish in the 7- to 16-inch range, with the most common size around 12 to 14 inches (Smith, KCF board letter, Ostenson, Kauffman, pers. comm., 2002). The fish below the J.C. Boyle powerhouse appear to be generally larger than in the J.C. Boyle bypass reach, although they may not be as

Figure 2.7-20. Hell’s Corner reach.

Back side of Figure 2.7-20. Hell's Corner reach.

abundant (Smith, Swisher, Ostenson, pers. comm., 2002). Only one angler (Pribble, pers. comm., 2002) reported he preferred fishing in the J.C. Boyle bypass reach compared with the Hell's Corner reach. Fisheries studies as part of relicensing may quantify these potential differences.

Oregon fishing regulations allow anglers to keep one fish per day in fall, winter, and spring, but the river is catch and release during the summer (June 15 to September 30). No bait is allowed, and anglers appear to use both flies and spinners in roughly equal proportions (Smith, Emery, pers. comm., 2002). Many anglers wade in the river while fishing (particularly fly anglers), but others fish from the shore (Smith, Swisher, Ostenson, pers. comm., 2002). A few anglers may fish the reach by boat (Hague, Swisher, pers. comm., 2002), usually from rafts. At least one guide has used a driftboat, but he does this rarely and runs only the section from Upper Klamath River (Spring Island) Boater Access to Frain Ranch (Swisher, pers. comm., 2002).

Access to the upper part of the reach can occur along gravel roads on both sides of the river. The majority of Oregon anglers fish the 2 to 3 miles of river in the vicinity of the Frain Ranch, which is at the top of the gorge about 5 miles below the powerhouse (Smith, Fortune, Swisher, Kauffman, Walters, pers. comm., 2002). A few anglers may also fish in the gorge (usually gaining access by walking, or via mountain bikes or all-terrain vehicles, although some may fish while taking whitewater trips). There are informal angler trails to the river from Topsy Grade Road, which deteriorates into a rugged 4-wheel-drive road between Frain Ranch and the Stateline take-out (PacifiCorp and BLM) turnoff in California. Access to the California parts of the reach is from Ager-Beswick Road, and it includes the six river access sites originally developed by PacifiCorp in cooperation with CDFG. Of these, one guide reports that more use occurs at Fishing Access Sites 5 and 6 than at the others (Kauffman, pers. comm., 2002). A few anglers may take inflatable kayaks down this reach to facilitate fishing (Cloward, pers. comm., 2003). In general, more use appears to occur on the Oregon segment (Ostenson, Emery, pers. comm., 2002).

<u>Boating</u>**.** The Hell's Corner reach offers well-known Class III to IV+ rafting and kayaking whitewater opportunities that are boatable at medium to high flows provided by peaking flows from J.C. Boyle powerhouse. On the basis of Phase I information, different flows from the powerhouse appear to create at least two distinct types of boating trips. A "standard" trip is available at medium flows (1,500 to 1,750 cfs total in channel) and does not feature the large and powerful hydraulics that occur at higher flows. This trip is generally the choice for boaters with appropriate skills (Class IV boaters) who are not necessarily interested in testing beyond those skills. At these flows, runs feature more rock dodging and "technical" routes through the rapids.

Big-water trips occur when additional flows raise the power of the river by an order of magnitude; these are the focus for more highly skilled boaters (solid Class IV-V boaters) who are interested in more challenging water. At these flows, rapids are more continuous and the major challenges are associated with powerful hydraulics and large waves rather than rock dodging.

A third type of opportunity might be labeled a "technical" or low-flow trip. This type of trip occurs at distinctly lower flows than standard trips, and it has even more rock dodging and technical routes. These trips may increase pinning/wrapping hazards, and they may include some level of boatability problems (hits, stops, and boat drags). Most boaters would prefer standard or high-challenge trips, but they might take these low-flow trips to gain access to the canyon if higher flows are not available. They also may take smaller craft (kayaks, inflatable kayaks, and small rafts or catarafts [less than 13 feet]), or rig their boats differently to facilitate this type of trip (e.g., run paddle trips only, load more lightly). Additional discussion of this trip and its flow needs is provided in the next section and with information collected during Phase II.

Boating generally can occur year-round, and some interviewees reported taking at least some trips in every month of the year. However, most trips occur in the warmer times of the year from March/April through October. The median reported earliest and latest months for guided trips was April to September, while the median reported "prime season" for guided trips was from June through August. Among private boaters, the median earliest and latest months for trips was March through October, while the median reported "prime season" was from July through September. In general, these data suggest that the private season may be slightly longer and later than the guiding season.

Private use probably composes less than 10 percent of the total use on the river (when asked, 12 of the 30 boaters offered estimates of the percentage of private use, and all but one reported 15 percent or less; the median response was 10 percent). One guide (Kauffman, pers. comm., 2002) noted that weekend use might be as high as 20 percent private, but that weekday use was 90 o 95 percent guided. BLM annual use statistics are provided below.

Most boating trips on Hell's Corner reach over the years have been day trips, although there was slightly more overnight than day use in the past. About 54 percent of all trips from 1982 to 1988 were overnighters, compared with about 12 percent in the past 7 years and only 7 percent in 2001.

The most common day trip for rafters is from Upper Klamath River (Spring Island) Boater Access to Fishing Access Site 1, the full 16-mile trip. However, shorter trips are offered by many guides when power generation schedules limit the time higher flows will be available; these trips may end at Stateline take-out (PacifiCorp and BLM) (an 11- mile trip) or Fishing Access Site 6 (a 12-mile trip). Additional information about the effects of flow on trip timing is discussed in greater detail later in the Phase I findings.

When commercial overnight trips are offered, boaters typically run from Upper Klamath River (Spring Island) Boater Access through the gorge to Stateline take-out (PacifiCorp and BLM) on the first day, and then camp there or travel back upstream on Topsy Grade Road and camp at Frain Ranch. On the second day, they re-run the gorge and continue to the end of the reach. These "double run" trips provide passengers two runs through the most exciting whitewater, and they allow outfitters to leave camping gear in vehicles rather than having to carry it on rafts (lightening boats and providing more room for clients). In the past, a few outfitters offered 3- or 4-day trips on this type of schedule (but this composed less than 2 percent of all trips).

A few outfitters have also offered more traditional overnight trips where they carry all camping gear and food, and thus do not take two runs through the gorge (Lee, Munroe, pers. comm., 2002). These trips typically run from Upper Klamath River (Spring Island) Boater Access to Fishing Access Site 1, and they camp in the gorge, usually just below Hell's Corner Rapid. Gear boats are often used on these trips to allow clients to travel in paddle rafts.

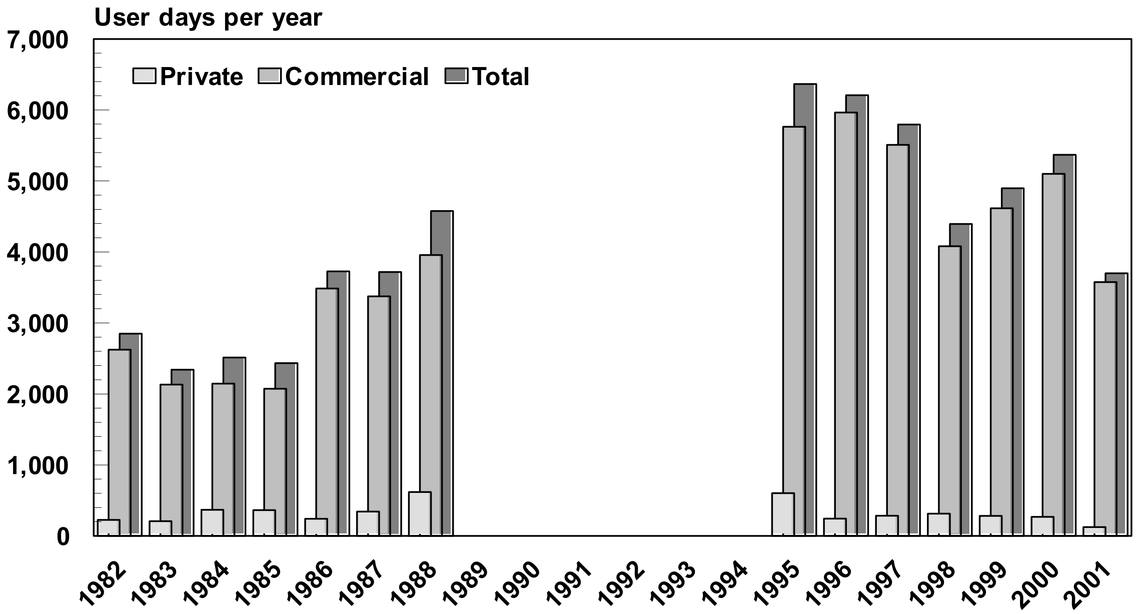
Private boaters (particularly kayakers) often run only the gorge section of the river from Frain Ranch to Stateline take-out (PacifiCorp and BLM), accessing the river and using both Ager-

Beswick and Topsy Grade roads to do their shuttle (sometimes by mountain bike). This is roughly a 5- to 6-mile trip.

Most commercial trips are taken in rafts, usually 13- to 14-foot models with self-bailing floors (although the trip was pioneered in the late 1970s and early 1980s in non-self-bailing "bucket boats"). At higher flows, some commercial outfits offer trips in 15- to 16-foot rafts. Rafts are typically rigged as paddle boats (five to six paddling passengers and a guide) or as "stern-drives" (five to six paddling passengers and a guide in a stern rowing frame). The latter setup allows guides to have slightly more control over the boat, particularly in high flows, although most guides acknowledge that an experienced paddle captain with competent paddlers can usually negotiate a paddle boat as well as a stern-drive. Relatively few commercial outfitters offer trips in boats with standard rowing rigs (where passengers do not paddle and guides control the boat from a central rowing station). It is very rare for commercial outfitters to offer inflatable kayaks in the Hell's Corner reach.

Private use occurs in both rafts and kayaks, and rarely in inflatable kayaks. Rafts are typically 13- to 15-foot self-bailers, sometimes rigged for paddling but more commonly with a central rowing station. Small catarafts (up to 16 feet) are also common. A variety of kayaks are used on the river, with lower volume playboats becoming increasingly popular, especially at lower flows. At higher flows, larger volume kayaks are more common.

BLM has collected use data for the river since at least 1982; Figure 2.7-21 shows private, commercial, and total annual use on the river from 1982 to 1988 (BLM, 1990) and again from 1995 to 2001 (provided by BLM). Data show that use increased significantly in the late 1980s, peaked in the mid-1990s at around 6,000 visitor-days per year, and has fluctuated between about 4,000 and 5,000 user-days per year in the recent past. Use in 2001 was about 30 percent lower than 2000 levels, and average use levels over the past 4 years (4,590) are about 25 percent less than the average use levels from 1995 to 1997 (6,122). Additional discussion about potential Project-related effects on these use levels is provided below.




Source: BLM, 2002

Figure 2.7-21. Annual boating use on Hell's Corner reach from 1982-1988 and 1995-2001.

General Riverside Recreation. Some people use the Hell's Corner reach for general riverside recreation rather than for boating or fishing (e.g., walking, hiking, camping, mountain biking, hunting, berry picking). There is access on both sides of the river, several informal trails, as well as some good off-trail hiking along parts of the river. Camping and all-terrain vehicle (ATV) use in the Frain Ranch area appear to be common on summer weekends, and again during the fall hunting season. Water quality from UKL and irrigation runoff does not encourage swimming, but there are some inviting pools and runs for cooling off during hot summer days.

Flow Requirements Based on Phase I Information

Fishing. Seventeen interviewees reported about fishing on Hell's Corner reach, with four providing information focused primarily on fishing. The KCF letter provided additional information. Interviews suggest that fishing is generally best at 320 to 350 cfs base flows (320 cfs from the J.C. Boyle bypass reach plus accretion and tributary inflows). These flows provide opportunities to wade in the river and good pocket water in the swifter runs and rapids. They also provide better water clarity and appear to concentrate fish in deeper pools and runs (Ostenson, Smith, pers. comm., 2002).

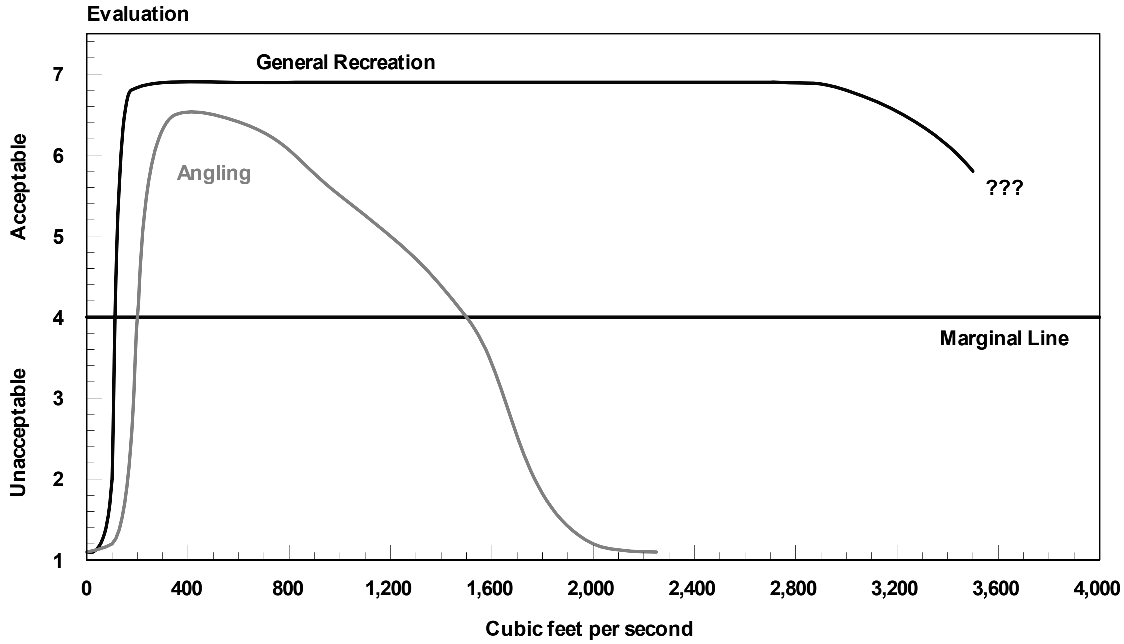
Two whitewater guides who also fish (Lee, Hague, pers. comm., 2002) indicated that fishing remains good or even improves as base flows are increased by J.C. Boyle powerhouse outflow, up to about one turbine, which brings total flows to about 1,600 cfs. While these flows are probably more difficult for wading anglers, the anglers who like them note that rising flows may increase food in the river and stimulate feeding. Flows of this size are also needed for improved boatability for boat-based anglers.

Most interviewees indicated that flows above one turbine provide lower quality fishing, although three noted that if base flows were at higher levels, both fish and people would probably adapt (Smith, Hague, Hale, pers. comm., 2002). Smith also noted that somewhat higher flows might improve the fishery from a biological perspective, and that it was the ramping from peaking flows that might be a more substantial limiting factor (noting that fish studies for relicensing should address this). Complaints about ramping effects on fish were echoed by the KCF board and other anglers (Ostenson, Fortune, pers. comm., 2002), including some whitewater guides (Lee, Munroe, Hale, pers. comm., 2002).

The KCF letter reported that acceptable flows were from 350 to 1,000 cfs, with an optimal flow around 500 cfs. Averages of four whitewater boaters that provided specific acceptable ranges defined an optimal range from base flows to 1,188 cfs. A fishing flow evaluation curve based on all information is provided in Figure 2.7-22. It shows acceptable fishing starting from about 200 cfs to 400 cfs, with optimal flows from about 300 to 500 cfs. The curve then declines to marginal levels about 1,500 cfs; ratings reach totally unacceptable levels by about 2,000 cfs.

The timing of peaking flows was also an issue for several anglers and the KCF. Some noted that evening was the best time for fishing on the Upper Klamath River (Ellis, Lee, pers. comm., 2002), and therefore tolerated the midday peaking more common in the 1980s and early to mid-1990s than in recent years, when peaking flows have occurred later in the day (and sometimes into dark). In contrast, morning anglers noted that recent later peaks allowed them to fish longer (Hale, Ostenson, pers. comm., 2002). Whitewater guides who also fish obviously have conflicting interests in the flows (preferring lower flows for fishing and higher flows for boating), but it appears that on some trips (especially overnight trips) they get both and enjoy them (Lee, Munroe, Hague, pers. comm., 2002).

<u>General Riverside Recreation</u>. On the basis of reconnaissance, base flows of about 320 cfs are likely to cover the bottom of the Hell’s Corner reach channel and provide adequate aesthetics for general recreation, although slightly higher flows (about 500 cfs) might be required to provide better aesthetics. A flow evaluation curve for general riverside recreation is provided in Figure 2.7-22; it shows dramatic improvement from 200 to 350 cfs, with ratings remaining high through estimated bankfull levels. At that point, aesthetics might decrease marginally as the river becomes more turbid and inundates vegetation.




Source: CRC, 2003.

Figure 2.7-22. Flow evaluation curves for fishing and general riverside recreation on the Hell's Corner reach.

Whitewater Boating. Thirty whitewater boaters provided information about flow needs for boating in Hell's Corner reach during Phase I. This sample size allowed for more extensive statistical analysis than for other reaches and opportunities, including the development of quantifiable flow evaluation curves. The following section presents results from those interviews and analyses, organized by type of question. The section also summarizes information from guidebooks and other reports.

Five guidebooks provide information about the Hell's Corner reach, as summarized in Table 2.7-6. Except for the Quinn and Quinn book (1983), which is of older vintage (before the advent of self-bailing rafts and a dramatic evolution in skills and river running equipment), the rest of the guidebooks acknowledge the acceptability of runs at both one and two turbines (about 1,300 to 3,000 cfs). The guide most focused on kayaking notes that the trip may be acceptable for those craft at flows as low as 600 cfs, while all the others note a starting flow of 1,200 cfs or higher. Note that the traditional flow level equated with one turbine in all books is about 1,500 cfs, which may be an imprecise assumption (see additional discussion below).

Table 2.7-6. Summary of guidebook flow recommendations for Hell's Corner reach.

| Guidebook | Acceptable Range (cfs) | Optimal Range (cfs) | Notes |
|---|---|---|---|
| Keller (1998) | 1,500 to 3,000 | 1,500 | Recommends late summer use. Rates rapids Class IV+ except at high water. |
| Willamette Kayak and Canoe Club (1994) | 1,200 to 3,400 | 1,500 | Class V at two turbines. |
| Holbek and Stanley (1998) | 600 to 3,000 | 3,000 | Rates rapids Class IV+. Notes poor clarity, sharp volcanic rocks, oddly placed rocks. |
| Cassady and Calhoun (1995) | 1,400 to 3,000 | 1,500 to 2,700 | Rates rapids Class IV+. |
| Quinn and Quinn (1983) | ~1,650 | | Provides extensive historical and natural history information. Suggests two turbines is "too dangerous to run." |

Source: CRC, 2003.

At the upper end of the acceptable range, most books recommend flows around 3,000 cfs as a cutoff. Some guidebook authors are obviously more conservative than others about recommending higher flows, but it is notable that most of the guidebooks rate the reach Class IV+ rather than Class V, except at very high flows. This provides support for our distinction between standard and big-water trips.

None of the guidebooks discuss the availability of low-flow technical trips, even though Holbek and Stanley (1998) report that 600 cfs is boatable (while they recommend going at two turbines). Boaters clearly prefer flows higher than minimum boatable levels in Hell's Corner reach, and several guidebooks highlight the safety issues and equipment wear-and-tear that can result from encounters with the river's sharp, angular, volcanic rocks.

<u>Flow Recommendations/Requirements from Reports.</u> The Oregon Water Resources Department conducted a Scenic Waterway Recreation Analysis for the Upper Klamath in 1990, part of the proposed Salt Caves Hydroelectric Project proposals and subsequent studies (OPRD, 1990). The study included an assessment for recreation stream flow, the fundamental task in this FTR. In general, however, its primary sources were other reports and letters from BLM and six rafting outfitters.

This document notes that 380 cfs is necessary to run rafts from Upper Klamath River (Spring Island) Boater Access to the top of the gorge (based on City of Klamath Falls Salt Caves FERC application, 1986), and that 1,500 cfs is the minimum raftable flow for the reach in general (OPRD, 1990, quoting a 1989 BLM letter). Guide information ranged from minimum levels of 1,200 to 1,800 cfs, often with accompanying descriptions of those flows. In general, excerpts from these sources suggest that flows less than 1,500 cfs are less exciting and have greater navigation hazards for rafts, and that higher quality trips occur at flows above 1,500 cfs. The high end of the range (5,900 cfs) was determined from a single high-flow trip taken by N. Hague.

Final recommended flow needs for boating in Hell's Corner reach in the Scenic Waterway Recreation Analysis report (OPRD, 1990) were 1,500 to 3,200 cfs for "general" boating, and

3,200 to 5,900 cfs for “expert” boating. Season of use for general boating was from May to September; expert boating was described as potentially occurring year-round.

The report also offers information about required flows for fish and fishing, including summaries of ODFW responses to proposed Salt Caves Hydroelectric Project proposals regarding minimum flows. These note that best fishing flows may occur during periodic maintenance periods for J.C. Boyle powerhouse, which typically result in flows about 650 cfs. A Tennant (1976) analysis also showed that flows about 570 cfs would be a minimum continuous flow for the reach. Fisheries studies conducted for this relicensing are likely to offer more precise information about these issues. The final flow recommendation for fishing in the Scenic Waterway Recreation Analysis report was 550 to 3,000 cfs.

Gage Use. Every boating respondent during Phase I interviews reported that they pay attention to flows on the river, and more than 70 percent reported that they know flows in terms of both turbines and cfs. Another 23 percent say they know flows only in terms of turbines, while the remaining 7 percent know only cfs.

Most boaters (84 percent) obtain their flow information from PacifiCorp’s flow phone (56 percent), web page (12 percent), or both (16 percent). Only one reported consulting USGS flow information from other web pages (e.g., USGS, Pat Welch’s Oregon flows page). However, others (12 percent) hear about flows by word of mouth or after arriving at the put-in and looking at the staff gage.

PacifiCorp currently reports J.C. Boyle powerhouse outflows for 3 days in advance during the main recreation season. When asked, 67 percent of respondents thought this provided an acceptable time frame for forecasting flows. However, about 17 percent reported that they would prefer forecasts for a week in advance, and one outfitter noted that he needed to know flows nearly 4 months in advance to use the information for scheduling trips.

In contrast with PacifiCorp data, USGS-based information focuses on instantaneous information from the recent past and does not forecast future flows. As flow information sources, both have potential problems for boaters or flow researchers trying to determine what flows have been or are going to be.

Not all boaters may understand that PacifiCorp outflow amounts do not equate with total flow in the channel (which is what the USGS gage provides). An additional 320 cfs base flow is already in the river from J.C. Boyle bypass reach throughout the year, spill levels through that reach may be even higher, and there is some accretion in the reach before the major rapids. The PacifiCorp flow phone and the web page both note this additional base flow amount, but it is unclear whether all boaters add this. Some interviewees reported flows around 1,200 or 1,250 cfs in various contexts, and we suspect at least some were confusing 1,200 cfs outflows from J.C. Boyle powerhouse (a common amount) with the total flow in the river (which is rarely at 1,200 cfs for long, generally occurring for short periods on the way up or down from one turbine; see below).

A second problem is that guidebooks and convention suggest that each turbine has a maximum flow capacity of 1,250 cfs (total 2,500 cfs), while the reality is more complex. As discussed in the hydrology section of this report, Unit 1 can generate more power and produces 1,200 to

1,425 cfs outflows, depending on the level of J.C. Boyle reservoir; Unit 2, in contrast, can generate only 800 to 1,100 cfs. Unit 1 offers greater efficiency and is generally used first. This means that one turbine does not always provide 1,250 cfs, and commonly will provide 100 to 200 cfs more. Conversely, when Unit 2 is added, total outflows may be less than 2,500 cfs. This may confuse some boaters who think largely in terms of turbines alone, as “one turbine flows” typically range from 1,200 to 1,425 cfs (1,520 to 1,745 cfs in channel), and two may range between 2,000 and 2,525 cfs (2,320 to 2,845 cfs in channel). Some guides appear sensitive to this and distinguished between a “skinny turbine” (at or below about 1,500 cfs in channel) versus a “fat” or “juiced” turbine (over about 1,600 cfs in channel).

Finally, during winter and spring spill periods, estimates of Hell’s Corner reach flow based on turbine outflows is likely to be imprecise because there may be more than 320 cfs coming down the bypass channel. In these cases, USGS data are probably more accurate, although they do not project into the future for trip planning.

<u>Knowledge of Flow Levels</u>. Despite these potential problems, boaters appear confident of their ability to calibrate conditions on the river with flows they learn about from gages or power forecasts. We asked boaters to estimate their accuracy at guessing the flow during a trip if they did not know the flow. Of the 82 percent who answered this question, 74 percent reported that they would know the flow within 20 percent of the actual amount, and 44 percent reported they would know it within 10 percent. Of the remainder, 7 percent reported that they might not know the flow, but they could describe whether the flow was from one or two turbines, and another 11 percent reported that they probably could identify whether it was one or two.

<u>Highest and Lowest Flows Boated.</u> The Hell’s Corner reach has been boated at or near base flows (about 350 cfs) in kayaks (Kauffman, pers. comm., 2002) and rafts (Lee, Hale, pers. comm., 2002), but no one suggested that these flows provided a quality whitewater experience. The median “lowest flow” seen by all boaters was 1,200 cfs, suggesting that most boaters have relatively little familiarity with flows below one turbine. Several other boaters reported that they have run the top of the reach to Frain Ranch at base flows, or have finished the trip from Stateline take-out (PacifiCorp and BLM) to Fishing Access Site 1 as flows were dropping substantially below one turbine, but most wait for better flows or try to “ride the wave” of higher flows when in the gorge.

The highest flow reported by any boater was 7,000 cfs (Munroe, pers. comm., 2002) with several other boaters reporting trips between 5,000 cfs and 6,700 cfs (Lee, Hague, Pribble, Ellis, pers. comm., 2002). Most of these were guides on private trips. The median “highest flow” reported was 3,400 cfs, which indicates two turbines plus some spill from the J.C. Boyle bypass reach.

<u>Minimum Boatable Flows.</u> Boaters were asked to specify the lowest flow that would allow a boater to use the river for transportation, a level we have labeled “the minimum boatable flow.” This type of trip may be arduous and involve some boatability problems, but it still provides access to the canyon. The median response to this question for all boaters was 1,100 cfs, although some boaters reported flows as low as base flows and others were as high as 1,500 cfs; the inter-quartile range of responses was between 900 and 1,200 cfs, a likely range for identifying this threshold. Variance in these results was not attributable to craft types (rafts vs. kayaks) or type of boater (commercial vs. private). It appears that some respondents simply believe it is possible to get down the river at lower flows than others.

Notably, 75 percent of the respondents reported that they would not take a trip in Hell's Corner reach at these minimum boatable flows, with another 4 percent reporting that they might take a trip and 21 percent saying they would. Flows that simply provide access to the canyon do not provide the same kind of whitewater experience that most boaters are seeking.

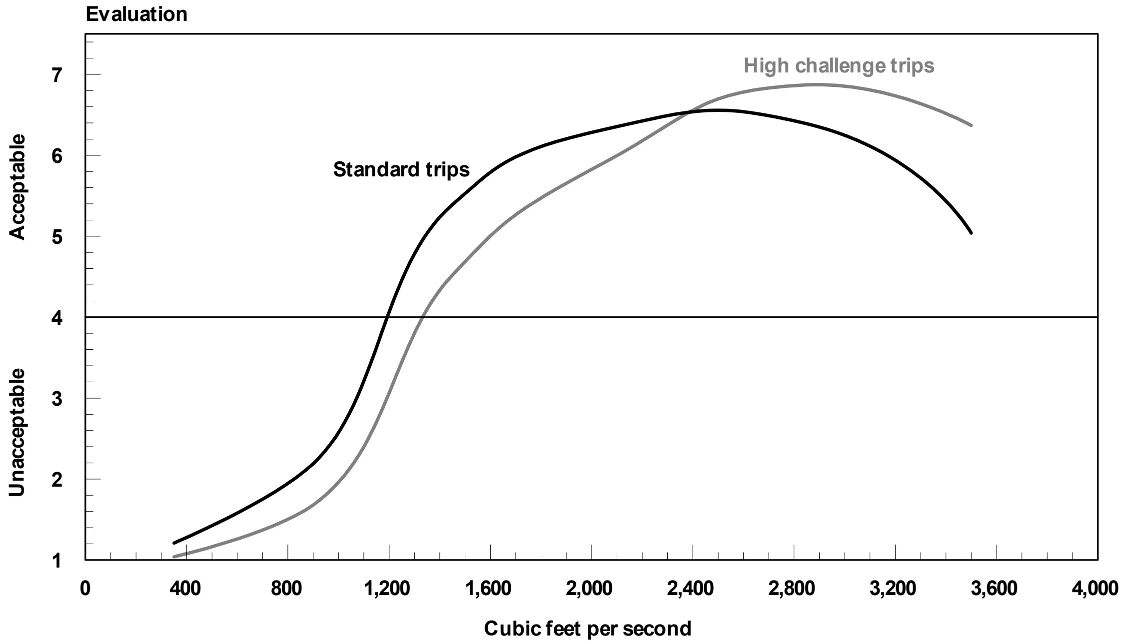
<u>Flow Evaluation Curves for Standard and Big-Water Trips.</u> Boaters were asked to rate six specific flows on the Hell's Corner reach for two different types of opportunities (standard, big-water) on a scale of 1 (totally unacceptable) to 7 (totally acceptable), with a "marginal" midpoint. The six flows given were as follows:

- Base fish flows (about 350 to 400 cfs in the channel, 0 cfs from powerhouse)
- Half a turbine (about 900 cfs in the channel, 600 cfs from powerhouse)
- A full turbine (about 1,500 cfs in the channel, 1,200 cfs from powerhouse)
- A turbine and a half (about 2,100 cfs in the channel, 1,800 cfs from powerhouse)
- Two turbines (about 2,900 cfs in the channel, 2,500 cfs from powerhouse)
- Over two turbines (about 3,500 cfs in channel, 2,500 cfs from powerhouse + spill)

Flow evaluation curves for standard and big-water trips based on Phase I information are provided in Figure 2.7-23. These curves show a classic bell shape, and they help identify acceptable and optimal flows for two opportunities that appear to have slightly different flow needs.

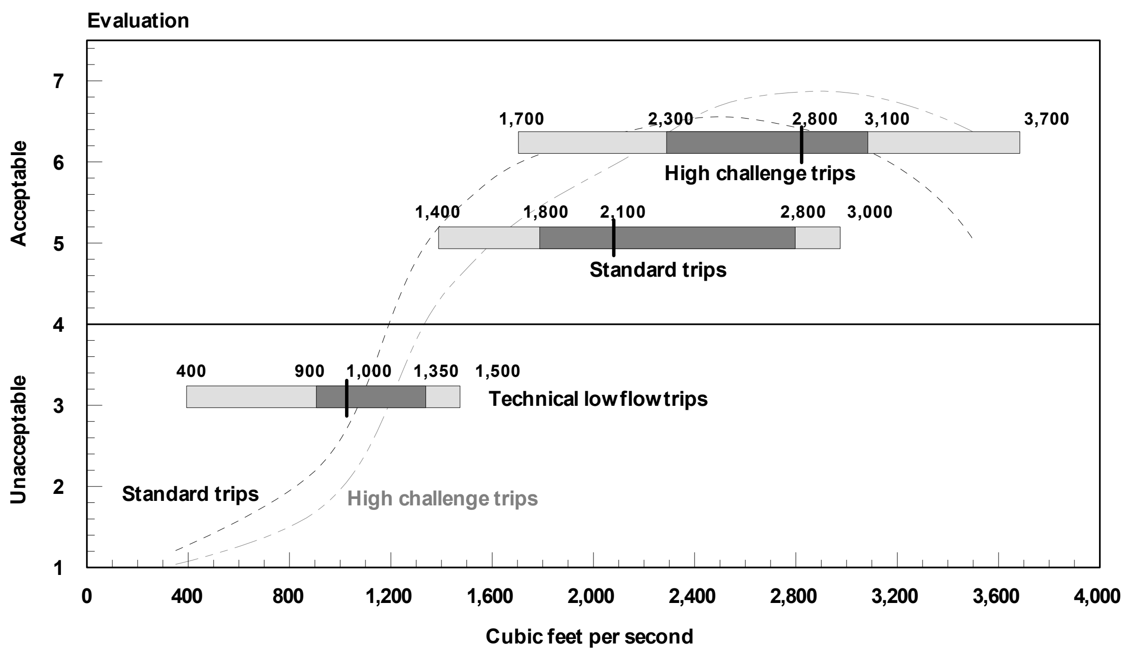
On the basis of these data, standard trips are submarginal until flows reach about 1,100 cfs, but small amounts of water at those levels may substantially improve quality (the curve rises steeply). By about 1,500 cfs (one turbine), flows are near-optimal, but quality still improves slightly with more flow until about 2,500 cfs. Above this flow, standard trips begin to decline toward marginal levels, but even 3,500 cfs was rated acceptable. For big-water trips, the flow evaluation curve essentially shifts to the right about 200 to 300 cfs at low to medium flows, and it peaks at flows about 500 cfs higher than standard trips.

<u>Specified Flows for Standard, Big-Water, and Technical Opportunities.</u> For various opportunities, boaters were also asked to specify the flows that define acceptable ranges, optimal ranges, or single optimal flows. Figure 2.7-24 shows "range bars" defined by median specified flows for technical, standard, and big-water trips. Figure 2.7-24 also shows the flow evaluation curves provided in Figure 2.7-23 for comparison purposes.




Source: CRC, 2003.

Figure 2.7-23. Flow evaluation curves for standard and big-water trips for all boaters on Hell's Corner reach.




Source: CRC, 2003.

Figure 2.7-24. Flow evaluation curves and "range bars" defined by median specified flows for technical, standard, and big-water boating on the Hell's Corner reach based on Phase I information.

Specified flow information shows that "range bars" are slightly more compressed than ranges implied by flow evaluation curves. For example, while curves suggest that standard trips are acceptable from 1,100 to 3,500 cfs (ratings above the marginal line), specified flow information suggests that a standard acceptable range is from 1,400 to 3,000 cfs. Similarly, curve ratings for big-water trips were acceptable as low as about 1,300 cfs, while specified flows suggest that 1,700 cfs is necessary for an acceptable big-water trip.

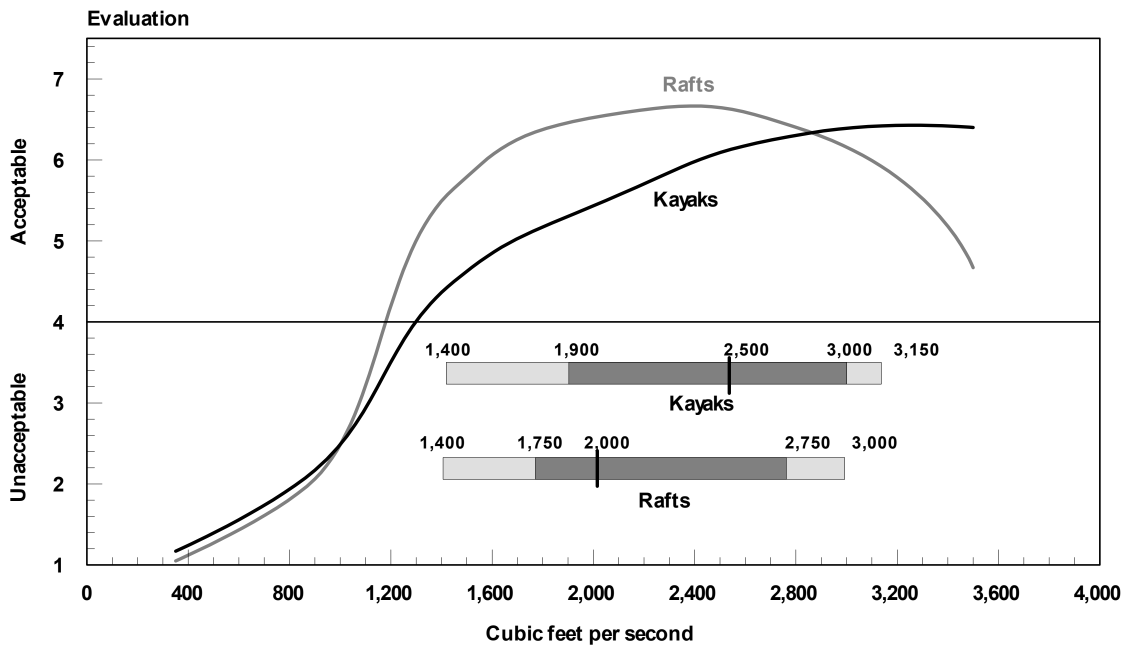
These are relatively subtle differences, and the general pattern of responses is similar in the standard and big-water opportunities. Both kinds of data show there is considerable overlap between these two opportunities, implying that there is a range of flows (from about 1,700 to 3,000 cfs based on specified data) that are acceptable for both, as well as a more narrow range (from about 2,300 to 2,800 cfs) when both are near-optimal. Having noted this, the median best flow for big-water trips (2,800 cfs) is 700 cfs more than the best flow for standard trips (2,100 cfs).

Range bar results for technical trips illustrate the flow ranges associated with lower flow trips. The low end of the acceptable range for technical trips (400 cfs) is actually lower than the median minimum boatable flow (1,100 cfs). This is partly because of smaller sample sizes for the technical trip questions (n = 5; Lee, Kauffman, Lewis, Cochran, and Weidenbach, pers. comm., 2002), which were only asked if boaters reported interest in those types of opportunities. Because most people prefer the higher flow standard or big-water opportunities (and 75 percent would not go at minimum navigable flows), the technical opportunity data are somewhat limited.

Given these caveats, these data support our conceptualization of technical trips as a second-best choice if standard flows are not available. The acceptable range for technical trips ends as standard trips become acceptable, and the optimal range for technical trips is in the higher end of the acceptable range. Some people may still take these trips if flows are low and unlikely to increase, but they would clearly prefer a standard trip.

<u>Differences Between Rafts and Kayaks.</u> There were few important differences between commercial and private rafters for flow evaluation curves or specified flow results. However, there were interesting differences between rafters and kayakers, as illustrated in Figure 2.7-25 (shows flow evaluation curves and range bars for standard trips for both craft types). In general, results suggest that optimal flow ranges for kayakers are slightly higher than for rafters, and the single best flow for kayakers (2,500 cfs) is about 500 cfs more than the single best for rafters (2,000 cfs). One possible explanation focuses on the continuous nature of the gorge rapids at higher flows, which may be more difficult for rafts than kayaks (kayakers are more adept at catching smaller eddies along the banks at higher flows).

<u>Trips Under One Turbine.</u> Possible changes in Project operations could substantially limit the number of days when one "full" turbine or more is provided (e.g., if fisheries enhancements require less peaking, lower peaks, and/or higher base flows). Accordingly, we asked boaters whether they currently took trips down the Hell's Corner reach at flows below one turbine, and if not, could they do so in the future if that was all that was available some of the time.




Source: CRC, 2003.

Figure 2.7-25. Phase I flow evaluation curves and "range bars" defined by median specified flows for standard trips for rafts and kayaks.

Only 18 out of 30 were willing to answer these questions (the remaining 12 [40 percent] simply were not interested in considering these types of trips). Responses reflected answers given to the specified flow questions for technical trips and minimum boatable flows, but with more qualitative information about what types of boats and trips could be offered at flows under one turbine (1,400 cfs).

Of the 18 people who answered these questions, 13 were outfitters, three were private boaters, and two were agency personnel. Among the commercial outfitters, 38 percent reported that they had been on trips of this sort or could take them in the future, 38 percent said they could take these types of trips but would not offer them commercially, 15 percent reported that they might be able to take them but they would need to see the precise flow levels, and 8 percent flatly stated that they would not be commercially viable. Among the private boaters, two reported they might take such trips, and one said he would not. The two agency personnel reported they could take these types of trips.

Among those who said trips under a turbine were possible, comments focused on the need to use different craft and take fewer people. One outfitter noted that "we've been spoiled having [1,500 cfs] for 13- and 14-foot boats, which are safer and carry more," and suggested that 10- to 12-foot boats with two to four passengers might make lower flows boatable. Another rigging suggestion for "under one turbine" trips included having clients wear wetsuits for protection from rocks in case of a swim even in summer (several guides reported that lower flows increased the risk of passengers falling out of the boat as rafts hit exposed rocks).

Among those who reported that "under one" trips were not possible or commercially viable, comments focused on (1) safety and liability issues (passengers falling out of boats, less water for missing rocks if a passenger swims); (2) equipment damage (from more contact with the sharp rocks); (3) the lack of powerful hydraulics and bigger waves; and (4) the change in profitability from having fewer passengers per raft as necessitated by lighter or smaller boats.

Flow Timing Issues. A final flow issue focused on the timing of peaking flows, which has been the major complaint of outfitters following the 2000 and 2001 seasons. In those years, peaking flows were generally provided later in the day, particularly in July and August, the prime boating season (see hydrology section for details). To help understand this issue, boaters were asked questions about common lengths of trips at one and two turbines, the time commercial boaters take for hiking or lunch breaks, the preferred time of day for taking out, and whether they would be willing to take shorter trips if flows were not available for longer ones. We also asked boaters the earliest they might start their trips before one full turbine was provided (assuming ramping from base flows to 1,500 cfs takes 3 hours), noting that some outfitters do not require a full turbine to run the 5-mile reach before Frain Ranch (they can have lunch or hike in that area while waiting for the water to arrive). Results for these questions are given in Table 2.7-7.

Table 2.7-7. Responses to trip timing questions for Hell's Corner reach.

| Question | Median (hr:min) | Range (hr:min) | Comments |
|---|---|---|---|
| Length of trip at 1,500 cfs | 4:30 | 3:45 to 6:30 | Upper Klamath River (Spring Island) Boater Access to Fishing Access Site 1. |
| Length of trip at 3,000 cfs | 4:00 | 3:25 to 5:00 | Upper Klamath River (Spring Island) Boater Access to Fishing Access Site 1. |
| Typical break time | 1:00 | 0:45 to 1:30 | Includes lunch, hiking (not short scouts). |
| Length of trip at 1,500 cfs (kayakers) | 2:12 | 1:30 to 2:30 | Frain Ranch to Stateline take-out (PacifiCorp and BLM). |
| Preferred latest take-out time | 4:30 | 2:30 to 6:00 | Assumes day trips. |
| Latest take-out to return clients to Ashland for theatre | 4:30 | 4:30 to 5:00 | Relevant for Ashland area outfitters only. May not allow preferred time at Copco Store or to order photos from WOA. |
| Hours before flow peak you are willing to start trips | 0:55 | 0:00 to 2:00 | Boaters putting in at Upper Klamath River (Spring Island) Boater Access only. |
| Percent have taken/willing to take shorter trip if necessary | 47% | -- | Assumes take-out at Stateline take-out (PacifiCorp and BLM) or Fishing Access Site 6. |

Source: CRC, 2003.

Results suggest that most day trips from Upper Klamath River (Spring Island) Boater Access to Fishing Access Site 1 take about 4 to 5 hours (not including lunch), with "one turbine" trips taking about a half hour more than "two turbine" trips. Most commercial outfitters take about an hour for lunch or hiking, making the entire put-in to take-out time about 5 to 6 hours. Private boaters (particularly kayakers) often run only from Frain Ranch to Stateline take-out (PacifiCorp and BLM) (the gorge segment); this shorter run typically takes about 2 hours.

Preferred take-out times ranged from 2:30 p.m. to 6:00 p.m., but 4:30 p.m. was the median response. The earliest time was for a Klamath Falls outfitter who reported that his return from the take-out is substantially longer than for Ashland outfitters. Ashland outfitters were also specifically asked what time they had to take-out to return clients to Ashland in time for Shakespeare Festival theatre obligations; responses ranged from 4:30 to 5:00 p.m. but were accompanied by reports that these late take-out times constrain the time clients spend at the Copco Store or to order photographs from WOA (an organization that photographs boaters as they run through a rapid in the gorge and then offers them for sale).

Because it is possible to run to the top of Caldera Rapid (the start of the gorge) on less than one turbine, some boaters put-in at Upper Klamath River (Spring Island) Boater Access in front of the peak to (1) avoid crowding, (2) start their trips earlier, or (3) be the first trip on the river and thus have a better chance at seeing wildlife. The median time that boaters were willing to leave in front of the peak was just under an hour and no boater was willing to go more than 2 hours before.

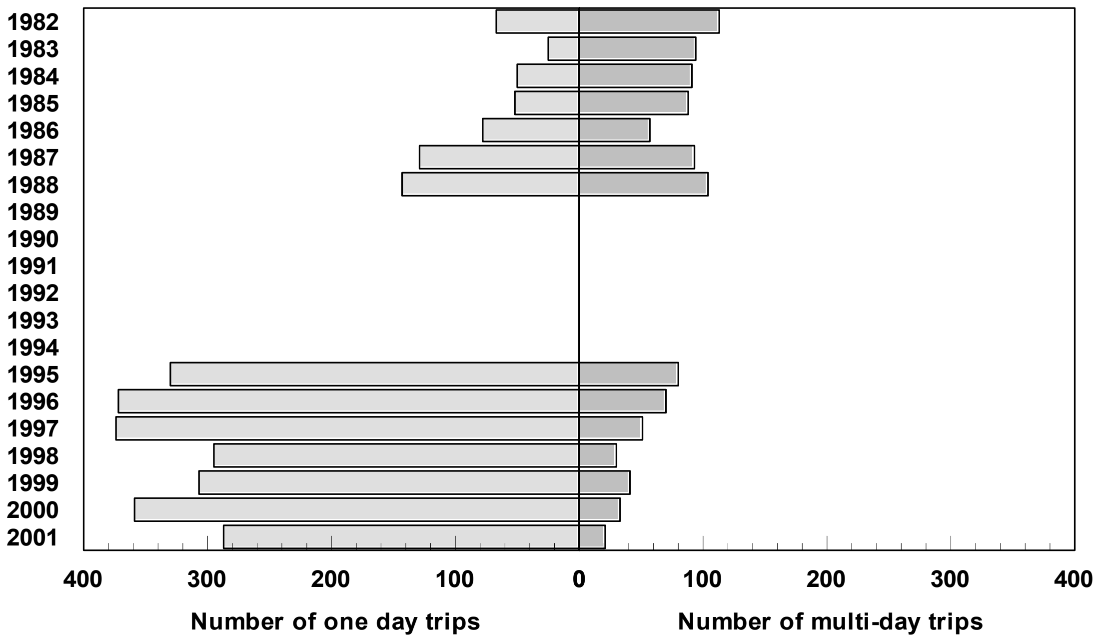
A parallel question focused on the latest hour that boaters would be willing to put-in if they knew that flows were about to ramp down to base flows by 5:00 p.m. Most boaters had difficulty expressing quantifiable answers to this question, with some reporting that they just “stay on the wave.” Among boaters providing more quantifiable responses, most indicated that few problems occur as long as boaters start through the gorge about an hour before down-ramping occurs (assuming they have no rescue situations or other delays).

Taken together, timing information suggests that boatable flows provided from about 10:00 a.m. through 4:00 p.m. would be ideal for most boaters. This would allow staggered put-ins starting as early as about 9:00 a.m. (thus ameliorating crowding), and it would ensure that most trips started before noon could take-out by 5:00 p.m. For private boaters taking trips through the gorge only, trips could probably start as late as 4:00 or 5:00 p.m. With later peaking flows in recent years, the 10:00 a.m. peak is less frequently provided than in the past; in general, this is the most common complaint by commercial outfitters about PacifiCorp operations.

On the basis of these data, providing 1,500 cfs by 10:00 a.m. would be ideal. However, flows that peaked by 1:00 p.m. would probably still allow most outfitters to provide day trips on an acceptable schedule (because they could start up to an hour before the peak, lunch or hike at Caldera while waiting for higher flows, and still take-out about 4:00 or 5:00 p.m.). If peaks do not appear by 2:00 p.m., outfitters warn clients that they will not be able to make evening plans, and take-out times shift into the early evening (5:00 to 7:00 p.m.). A few outfitters reported that these schedules also increase safety risks, as delays in the gorge for rescues could mean boating in the dark.

Overnight Camping Issues. Later peaking flows during recent years also potentially affect overnight trips, particularly because most overnight boaters take “double runs” through the gorge (see above for a description). People camping at Frain Ranch have to wait about an hour after peak flows are provided at J.C. Boyle powerhouse to begin running the gorge, so post-noon peaks mean overnight boaters do not start boating on their second day until the middle of the afternoon. Some outfitters reported that this provides a lot of “down time” in camp for most boaters interested in a whitewater trip.

Use data support the notion that later peaks may be affecting the numbers of overnight trips. BLM commercial use data from 1982-1988 (from BLM, 1990) and from 1995-2001 (provided by BLM) help characterize the proportion of single-day versus multi-day trips (Figure 2.7-26). In the 1980s, the number of outfitted overnight trips approached about 100 per year, while by the mid-1990s that number rarely exceeded 50 trips. In 2001, there were only 21 commercial overnight trips. Comparable data for private boaters from 1982-1988 are not available, but records from 1995-2001 suggest that only 11 percent of all private trips were overnight trips (and none in 2001).




Source: CRC, 2003.

Figure 2.7-26. Number of one-day and multi-day commercial boating trips on the Hell's Corner reach from 1982-1988 and 1995-2001.

More than two-thirds (68 percent) of the Hell's Corner reach interviewees reported having taken camping trips and most reported they might take such trips in the future. Nearly all expressed preferences for the "double run" trips through the gorge, and most avoid scheduling trips if they expect peaks to be unavailable until the afternoon. A few outfitters, in contrast, reported that it is possible to take overnight trips regardless of when peaking flows will be available by simply planning more nonboating activities (Lee, Munroe, pers. comm., 2002)

Flow Requirements Based on Phase II Information

The Phase II controlled flow study suggested some flow requirement revisions for whitewater boating on the Hell's Corner reach. Phase II information provided greater precision, allowing us to better define technical and standard opportunities for rafts and kayaks and standard and "low-flow" commercial rafting trips. Sections below provide a general description of study flows, and summarize evaluation curves and specified flows for various opportunities. Appendices provide additional Phase II study results.

General Description of Study Flows for Boating. Boating conditions varied widely over the four study flows. Appendices include reconnaissance and focus group notes that formed the basis for these descriptions.

*730 cfs.* This was the lowest flow (and last flow to be boated) during the controlled flow study; it produced unacceptable technical boating. Kayaks, small catarafts, and lightly loaded rafts were able to negotiate the reach, but no boater reported quality whitewater conditions in the rapids (with the exception of Caldera, which is steep and constricted enough to offer some power even at this flow). All craft had numerous hits, and the rafts and catarafts had to be dragged off rocks several times. Route options were very limited through the major rapids, and there were few playboating features. This flow helped define the low end of the boatable range, but few thought it would attract much use, and it probably does not provide commercial rafting opportunities (even for lightly loaded rafts with skilled passengers).

*1,060 cfs.* This flow produced acceptable technical boating, but it lacked the power and "splashiness" of higher flows. All craft were able to run the reach without "boat-drags," but some rafts became stopped in a few shallow riffles, and hits were common. Rapids had more power and greater margin for error than 730 cfs, but the channel was very rocky, with limited oar space for rowing rigs. Because the water was not "pushy," boaters generally had adequate time to pick their way through the boulder gardens. There were few playboating features. This flow might be commercially viable as a "low flow" or technical opportunity, but boats would probably have to be small (12 to 13 feet) and carry fewer people (three to four passengers plus a guide). Passengers might also have to be more skilled or physically fit to offset increased safety hazards associated with more frequent hits and the possibility of inadvertent swims.

*1,360 cfs.* This flow provided improved boatability and power in the river compared with 1,060 cfs. Rapids were less rocky and there were many more route options; while many boats still hit rocks, there were few stops and no boat drags. The size of waves and holes increased, improving whitewater challenge. While some rapids remained "technical," this flow defined the start of standard whitewater trips, particularly for kayaks and small rafts. It was acceptable but not optimal for rafting, and was near the low end of the acceptable range for commercial rafting (assuming five to six passengers plus a guide). As a technical, "low-flow" commercial rafting opportunity (using smaller rafts and fewer people), this flow was within the optimal range.

*1,750 cfs.* This was the highest flow in the study and was the high end of the range commonly referred to as a "one turbine" flow. It provides near-optimal standard boating for kayaks and rafts. There were no substantial boatability problems and considerable power in hydraulics, as well as more route options in rapids. Definition remained in most rapids, although a few became noticeably "pushier" or had shorter recovery areas. A few playboating opportunities were available, although rapids are more distinctive for their length or complexity. Commercial rafting with larger rafts and full passenger loads (usually five to six) is clearly viable at this flow, offering an exciting trip. The flow still does not provide the hydraulic power and playboating features associated with big-water trips that are available with two turbines generating.

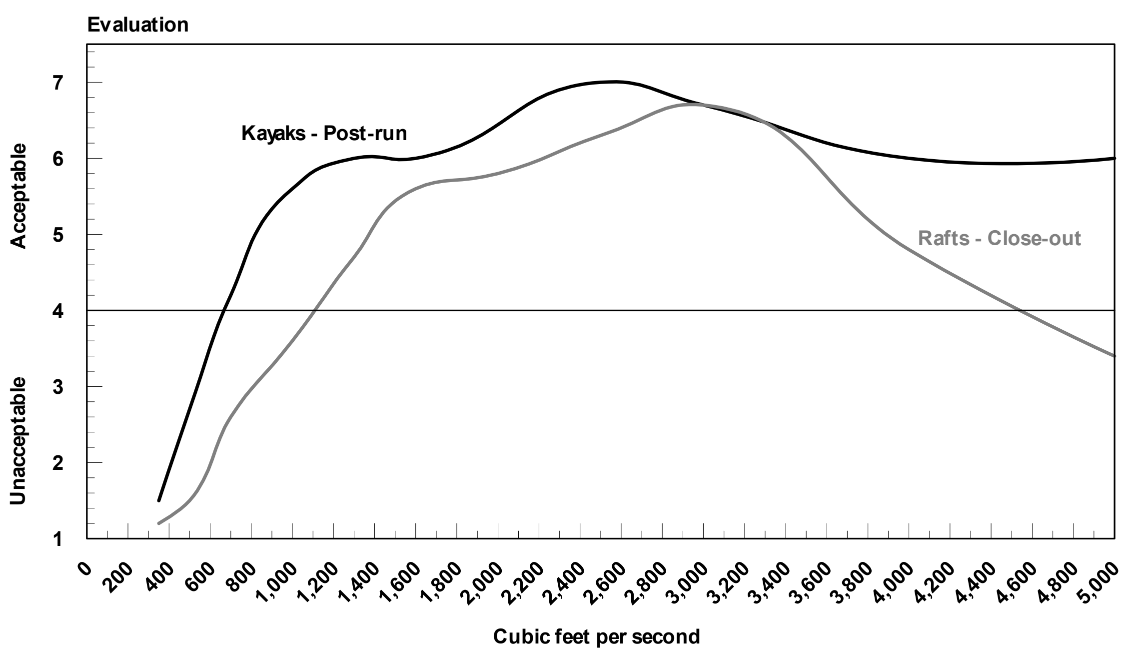
<u>Rating Whitewater Difficulty.</u> On the six-class International Scale, most boaters confirmed that the Hell's Corner reach was a Class IV run at the four study flows, although some boaters rated it IV+ and one rated it Class V at all flows. Two boaters rated all the flows as Class III+. Participants did not rate difficulty at higher flows, which are commonly rated as Class IV/V by local outfitters.

While the highest flow (1,750 cfs) had more hydraulic power, several boaters rated the lowest flow (730 cfs) more difficult, with four participants reporting that flow to be Class V. At lower flows – even though the water is less pushy – there are limited route options, more rocks to hit, less oar space for rafts, and less water for rolling kayaks or swimming in the case of mishaps. Several boaters noted that swimming in the reach at any flow was dangerous because of the sharp rocks, and there was general agreement that the potential to swim was heightened at the lower flows because of the number of exposed rocks, which can flip a kayaker or knock a rafter out of the boat.

<u>Post-Run Boating Evaluations.</u> Following each run, boaters were asked to report the number of boatability problems they had, and to evaluate nine attributes of whitewater boating trips (including an overall evaluation). While these ratings help boaters focus on key attributes and the ways flows affect them, post-run results are generally less useful than evaluations made after boaters have observed all of the study flows (see below). Accordingly, post-run results have been summarized in Appendix 2I, while we focus on the close-out survey information here.

<u>Flow Comparison Information.</u> At the end of the study, boaters were asked to complete a "close-out" survey with questions that compared study flows with the full range of flows that might be available in the reach. Results help develop "flow evaluation curves" that relate flows and overall recreation quality, and that help define acceptable and optimal ranges for specific opportunities. Additional questions asked boaters to identify specific acceptable and optimal ranges for different types of opportunities.

*Flow Evaluation Curves.* Boaters were asked to rate a series of 11 flows from 350 to 5,000 cfs using a seven-point acceptability scale (1 = unacceptable, 4 = marginal, and 7 = acceptable). Results are provided in Figure 2.7-27 for rafts and kayaks. The figure shows flow along the horizontal axis and acceptability evaluations along the vertical axis; curves describe the relationship between flows and overall boating quality.




Source: CRC, 2003.

Figure 2.7-27. Flow evaluation curves for whitewater boating opportunities on the Hell's Corner reach based on Phase II close-out survey information.

The overall evaluation curves show the characteristic bell shape found in many previous studies (Whittaker and Shelby, 2002b). They also indicate that quality boating can occur through a wide range of flows. Flows below about 600 cfs for kayaks and 1,200 cfs for rafts are rated unacceptable. For kayaks, ratings are near-optimal about 1,000 to 5,000 cfs, with slightly higher ratings between 2,000 and 3,000 cfs. There is no marked drop-off in ratings through the highest flow that boaters were asked to evaluate. For rafts, near-optimal ratings occur from about 1,500 to 3,000 cfs, above which they steadily decline (becoming unacceptable at about 4,000 cfs). The highest rating for rafts is about 3,000 cfs, a “two turbine” flow. On the basis of these data, the optimal range for both craft is about 1,500 and 3,000 cfs, with flows above 600 cfs acceptable for kayaks and 1,200 cfs acceptable for rafts. Results are consistent with the Phase I interview and guidebook results.

*Specified Flow Ranges for Different Opportunities.* A series of “specified flow” questions asked boaters to identify flows or ranges that provide different opportunities, offering more precise information than the overall curves. The specific questions are provided in Appendix 2I. Table 2.7-8 shows mean and median responses for kayaks and rafts; Figure 2-7.28 summarizes “range bars” for key opportunities (based on medians). Results suggest several findings, as discussed below.

Table 2.7-8. Descriptive statistics for "specified flow" questions (in cfs).

| Specified Flow | Kayaks | | Rafts | |
|---|---|---|---|---|
| | Mean | Median | Mean | Median |
| Minimum boatable flow | 500 | 500 | 868 | 700 |
| | | | | |
| Lowest acceptable technical boating | 750 | 700 | 844 | 700 |
| Low end of optimal technical boating | 840 | 800 | 882 | 900 |
| High end of optimal technical boating | 1,080 | 1,200 | 1,600 | 1,400 |
| | | | | |
| Lowest acceptable standard boating | 1,300 | 1,300 | 1,445 | 1,500 |
| Low end of optimal standard boating | 1,475 | 1,450 | 1,445 | 1,500 |
| High end of optimal standard boating | 2,175 | 2,100 | 2,650 | 2,800 |
| | | | | |
| Lowest acceptable big-water boating | 2,475 | 2,450 | 2,400 | 2,400 |
| Low end of optimal big-water boating | 2,160 | 2,200 | 2,375 | 2,400 |
| High end of optimal big-water boating | 3,700 | 3,500 | 3,691 | 3,500 |
| | | | | |
| Lowest acceptable standard commercial rafting | 1,250 | 1,250 | 1,325 | 1,300 |
| Low end of optimal standard commercial rafting | 1,550 | 1,550 | 1,380 | 1,450 |
| High optimal standard commercial rafting | 2,225 | 2,000 | 2,270 | 2,000 |
| | | | | |
| Lowest acceptable low-flow rafting | 1,000 | 1,000 | 963 | 1,000 |
| Low end of optimal low-flow rafting | 1,025 | 1,000 | 1,030 | 1,000 |
| High end of optimal low-flow rafting | 1,375 | 1,350 | 1,350 | 1,300 |
| | | | | |
| Highest safe flow | 4,610 | 3,250 | 3,318 | 3,300 |

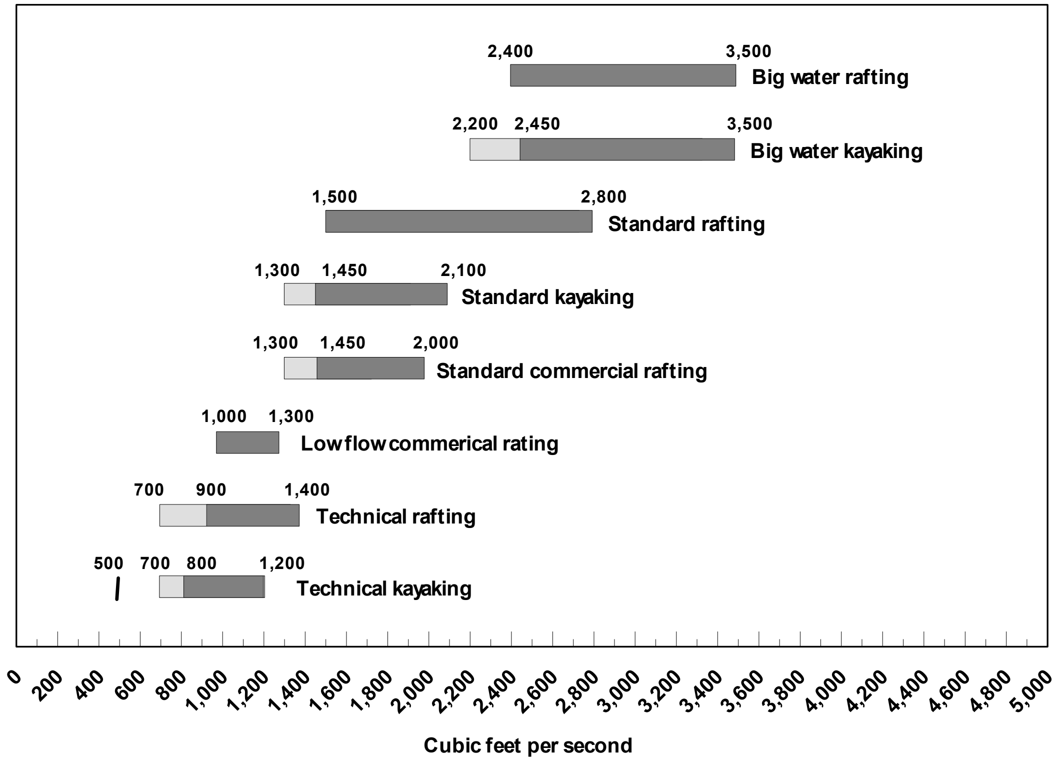
Source: CRC, 2003.

- Kayakers identified 500 cfs, a flow lower than the lowest in the study (730 cfs), as a minimum flow to use the river for transportation. However, they indicated that quality technical trips are not provided until flows are above 700 cfs. An optimal range for technical kayaking is from about 800 to 1,200 cfs.

- Rafts require more water to get down the river (at least 700 cfs), and slightly more appears necessary for acceptable technical trips. An optimal range for technical rafting is about 900 to 1,400 cfs.

- Boaters recognize differences between technical and standard trips. The transition between these trips is about 1,200 to 1,300 cfs for kayaks, and about 1,400 to 1,600 cfs for rafts.

- Standard opportunities for rafting become optimal at about 1,450 cfs. Standard opportunities for kayaking are acceptable at 1,300 cfs, but they require about 1,450 cfs to be optimal.




Source: CRC, 2003.

Figure 2.7-28. Specified flow ranges for whitewater boating opportunities on the Hell's Corner reach based on Phase II close-out survey information.

- Boaters recognize differences between standard and big-water trips, with flows about 2,200 to 2,800 cfs defining the transition between these two opportunities. Big-water opportunities appear optimal from about 2,300 to 3,500 cfs. Study flows did not offer new information about these opportunities.

- The high end of the big-water optimal range is similar to the "highest safe flow."

- Those with rafting experience were asked to specify flows for standard commercial rafting trips, as well as for low-flow commercial rafting trips. The latter are distinguished by smaller boats, fewer passengers, and a focus on access to the reach rather than powerful hydraulics and big, "splashy" waves. Standard commercial rafting becomes acceptable at about 1,250 to 1,300 cfs and is optimal from 1,400/1,500 cfs to 2,000 cfs. Low-flow commercial rafting appears acceptable at about 1,000 cfs, and it transitions into standard commercial rafting about 1,300 cfs.

- Variation (based on a review of standard deviations; not shown) was greater for the high end of the standard range and all of the big-water categories. Probable explanations focus on (1) the lack of experience with higher flows on the reach, and (2) differences in skill levels or whitewater preferences. This is similar to findings from other controlled flow studies (Whittaker and Shelby, 2002b).

- When asked to specify a single flow that should be provided for whitewater (results not shown), modal responses tended to be around the one or two turbine flows that have traditionally been provided. No one specified a flow less than 1,500 cfs, indicating relatively little interest in technical or low-flow opportunities if there is a choice.

- When asked to specify two flows that should be provided for whitewater (results not shown), responses were also congregated around the one- and two-turbine flows.

Fishing Flow Requirements Based on Phase II Information

Resource reconnaissance and interviews with Hell's Corner reach anglers generally confirm Phase I information regarding fishing flow requirements. Data from anglers who participated in the Phase II assessment suggest that the higher study flows do not provide high-quality, wading-based fishing, and that flows substantially below one turbine (especially base flows) are best for wading-based fishing (particularly in the Frain Ranch area). Sections below describe study flows, and they also summarize flow evaluation curves and specified flows for fishing opportunities.

General Description of Study Flows for Fishing. Fishing conditions varied over the four study flows. Appendices include angler comments that formed the basis for these descriptions.

*350 cfs.* This well-known base flow provides high-quality, wading-based fly fishing opportunities. It is easy to cross the river at several locations in the Frain Ranch area, and it provides extensive fishable water, very little turbidity, and cooler temperatures (because it is mostly spring water from accretion). It may provide slightly lower quality conditions for spin or bait fishing in the Frain Ranch area because of shallow riffles; the California segment has more pools and runs and appears to have quality fly, spin, and bait fishing at this flow.

*730 cfs.* This was the lowest release during the controlled flow study, and a similar flow was also provided for several days after the study during canal maintenance. It appears to provide acceptable quality fly, spin, and bait fishing. Crossing and wading into the middle of the river may not be possible at these flows (particularly in the gorge), but there are numerous wadeable areas at Frain Ranch and the California fishing access sites. Turbidity and water temperatures begin to increase, which may begin to limit places to find fish. Current speed also increases in steeper parts of the river, requiring fly and spin anglers to use more weight and increase the potential for snagging the bottom of the channel.

*1,060 cfs.* This flow continues to decrease fishable area because crossing is probably impossible and wading area is limited to the margins of the river. Fly fishing is diminished more than spin or bait fishing, primarily because it becomes more difficult to wade into the stream to get casting space. Spin and bait fishing are more appropriate in the pools and runs found downstream of the California border.

*1,360 cfs.* Conditions for fly fishing become unacceptable by this flow, which is faster, deeper, and more turbid (particularly in the gorge). There are still some pools and runs for spin and bait anglers at Frain Ranch and the California fishing access sites, but these are limited to a few specific locations.

*1,750 cfs.* This was the highest flow in the study, at the high end of the range commonly referred to as a "one turbine" flow. Fly fishing is generally considered poor at this flow, particularly in the Frain Ranch and gorge areas. While some pools and runs may still be fished with spinning or bait gear, these opportunities are limited by poor wadeability, turbidity, and fast, deep water. There are places to fish at this flow (particularly pools below Stateline), but these are best for bait anglers who can reach fish deeper in the water.

Flow-Related Issues for Anglers. Similar to the J.C. Boyle bypass reach, higher flows affect fishing in several ways, as listed below:

- Increased turbidity at higher flows (particularly evident at 1,750 cfs) decreases fishing success and aesthetics. While turbidity would probably stabilize if higher flows were provided over longer time frames than a few hours, current peaking regimes provide this level of turbidity on a daily basis. In general, it appears that turbidity on the Hell's Corner reach is lower than at similar flows on the J. C. Boyle bypass reach.

- Higher flows substantially decrease wadeability. Each higher flow increment provided less wadeable area, and even 730 cfs precludes most river crossings, which substantially diminishes the places where anglers can fish. Unlike the J.C. Boyle bypass reach, however, diminished wadeability is not substantially compounded by vegetation encroachment (which has been prevented by daily peaking).

- Higher flows create swifter velocities in runs, riffles, and pocket water that are more difficult to fish. Anglers fishing for trout generally increase the weight of their tackle to get lures down, which then increases the chances of snagging rocks or vegetation in the channel. This problem interacts with difficult wading and crossing to substantially diminish the amount of shore-based or wading-based fishable water. The swift water and difficult rapids also minimize opportunities for boat-based fishing.

- Higher flows do not concentrate fish in specific locations as well as low flows, possibly decreasing fishing success.

Close-Out Survey Flow Evaluation Curves. Anglers were asked to rate a series of nine flows from 350 to 5,000 cfs using a seven-point acceptability scale (1 = unacceptable, 4 = marginal, and 7 = acceptable). Results are provided in Figure 2.7-29 for fly and spin/bait fishing. The figure shows flow along the horizontal axis and acceptability evaluations along the vertical axis; curves describe the relationship between flows and overall fishing quality.

The curves indicate that quality fishing occurs at lower flows. Acceptable flows are below about 1,200 to 1,300 cfs, but optimal flows are below 800 cfs. The curves also highlight differences between wading-based fly fishing and spin/bait fishing. Fly fishing continues to decrease in quality with any additional flow above base levels, while spin/bait fishing remains near-optimal until flows rise above 800 cfs. This is consistent with the Phase I interview information.

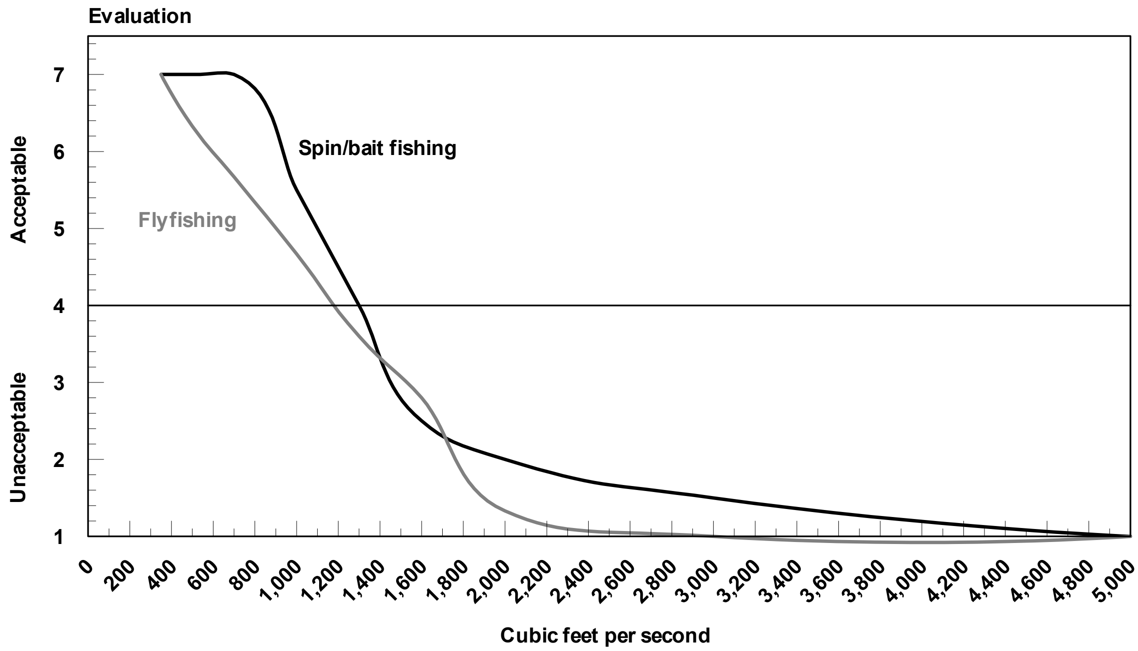



Figure 2.7-29. Flow evaluation curves for fishing opportunities on the Hell's Corner reach based on Phase II close-out survey information.

Specified Flow Ranges for Different Fishing Opportunities. Anglers were also asked to specify acceptable and optimal ranges for fly and spin/bait fishing, which generally support conclusions from the flow evaluation curves. The acceptable range for fly fishing was 240 to 1,120 cfs, while the median optimal range was from 370 to 670 cfs. For spin/bait fishing, the median acceptable range was 350 to 900 cfs, while the optimal range was from 600 to 800 cfs.

Potential Confounds Regarding Fishing Evaluations. Fishing evaluations in Phase II generally support conclusions learned in Phase I, but both kinds of information are subject to potentially confounding factors. Flow changes have direct and indirect effects on fishing, some of which are difficult to evaluate over the short term. For example, wadeability is directly affected by flows, but fishing success may be related to longer term effects relating to fish population levels, food availability, interactions with hatches, etc. As a result, it is more challenging for anglers to rate flows based on short-term flows and observations. Specific issues are listed below:

- Anglers may have difficulty disentangling flow evaluations for fishing (recreational flow requirements) from those for the fishery (biological flow requirements). This potential confound has been noted in previous studies (Whittaker and Shelby, 2002a, 2003) and appears relevant in the Klamath evaluations. Anglers have noted concerns about the effects of varying or high whitewater releases on fish populations, feeding behavior, or spawning success, and these may affect their recommendations regarding flows for fishing.

- It is difficult to evaluate study flows that are provided only for a few hours. Most anglers develop evaluations for fishing conditions over multiple visits that vary where they fish and the tackle and techniques they use; these factors further interact with weather, time of season, time of day, availability of a hatch, or other variables to influence fishing success. Perhaps more important, fish may not have had sufficient time to adjust to study flows, so anglers do not know whether fish are behaving as they would if flows were provided over the long term.

- Anglers have become familiar with certain flow regimes and have adapted their fishing techniques to maximize success under those conditions. New and different flows may require substantial changes from these traditions, and anglers may resist learning how to fish them.

- Some anglers may seek rivers with lower fishing pressure and potentially higher fishing success. This may confound assessments of flow regimes that might increase a fishery's "public visibility" and, possibly, their use levels.

Project-Related Effects

Flows in the Hell's Corner reach are strongly influenced by Project-related effects (see hydrology section). Because of UKL storage, the Hell's Corner reach has periods of higher flows in summer and fall (and lower in dry-year winters and springs) than would be provided without the PacifiCorp and USBR Projects. Because of PacifiCorp peaking operations, these high flows are balanced by periods of base flows that are substantially lower than would occur without the Projects.

These daily peaking events have small effects on general recreation, but they largely determine the frequency and quality of boating and fishing. In general, peaking flows of 1,500 to 1,700 cfs ("one turbine") provide high-quality boating but preclude high-quality fishing. Off-peak base flows, in contrast, are not good for boating but provide quality fishing.

Predictable daily boating flows have fostered substantial commercial boating recreation on the river. There are usually fewer than 20 days from May through September when one-turbine flows are not available, and many days with flows over a full turbine (usually in May and early June). If the Project did not exist, the Upper Klamath would probably provide only technical or low-flow boating opportunities after midsummer (similar to other unregulated rivers in the region).

Changes in the timing of peaking flows (as occurred in 2000 and 2001) can also have substantial impacts on the whitewater boating industry. Total use levels during those years were down almost a third from peak levels in the late 1990s, and the number of overnight trips dropped substantially. While changes in peaking releases are certainly a factor in decreasing use levels, other factors may have included public perceptions of the basin-wide drought and a generally declining regional economy. As peaking flows shifted to later in the day, outfitters had to take shorter trips or return clients to town much later.

Timing effects on fishing were the converse. As peaking flows shifted to later in the day, anglers received better conditions during the morning base flows, but less time during the evening.

Fish habitat might improve with higher base flows or decreased variation from peaking (to be determined by fisheries studies), and anglers would probably adapt tackle and techniques to somewhat higher levels. However, most anglers prefer to fish the low flows that exist during off-peak times. If run-of-the-river flow regimes were instituted on the reach (no daily peaking; flows would follow the seasonal hydrograph determined by outflows from UKL), spring and early summer flows would probably produce unacceptable fishing conditions for current fly and spin/bait anglers. Even late summer and fall flows would probably remain above 700 cfs, with none of the optimal wading-based fly fishing now provided for parts of each day.

Under current management, boating and fishing are provided at near-optimal levels on most days in the summer and fall – but at different times of the day. Altered flow regimes with different timing or reduced variation due to peaking would alter the frequency and quality of these opportunities. Future management is tied to understanding the impacts and trade-offs of these choices.

It is beyond the scope of this report to recommend alternative flow regimes, or to analyze the impacts and trade-offs implied by them. However, it is possible to identify key considerations that could help with crafting alternative flow regimes if the applicant or stakeholders were interested:

- Whitewater boating and fishing occupy different niches in the hydrograph, and there is no "compromise" flow that would provide quality versions of both at the same time. While some types of spin and bait fishing could occur in the lower boating flow ranges (700 to 1,300 cfs), these are different from the wading- and shore-based fishing that has developed at low base flows from the current operational regime.

- If power peaking and whitewater recreation opportunities are provided, the timing of those releases affects both fishing and boating use. Boaters prefer midday peaking in summer and early fall when fewer other rivers are available, and they would probably prefer weekends vs. weekdays (if a choice were required). However, anglers also value weekend days, particularly in the early summer and fall. This is a classic resource allocation dilemma, with no obvious "elegant" solution.

- Anglers tend to fish in early morning and late evening, so shorter midday whitewater flows (e.g., from 10 a.m. until 4 p.m.) would have less impact than a longer release (e.g., from 8 a.m. to 8 p.m.). While ramping up and down from target flows would extend these periods, short daily releases could minimize the loss of fishing opportunities, while providing boating during the warmest time of day.

- Whitewater flows in summer and fall may have a variety of biophysical impacts (many of which are being addressed by other biological studies for this relicensing). However, anglers also have concerns about these issues. From a fishing perspective, key issues focus on timing releases to minimize long-term effects on habitat and insect productivity. Anglers are also concerned about the duration of impacts on fish feeding activity (e.g., will whitewater releases diminish fishing success for several hours after releases and thus exacerbate the loss of fishing time?). In all cases, monitoring is critical to examine these hypothesized effects.

- When integrating recreation information with ecological flow needs, considerable attention may focus on designing whitewater releases to mimic natural (unimpaired) high-flow events and thus serve ecological purposes. Historically, these higher flow events occurred between January and June. Under current operations, "two turbines plus spill" high-flow events still occur during this period in wet years (although with smaller peaks than if flows were unimpaired). However, if high-flow releases were scheduled during these times, fewer boaters would use them because other rivers are available. If ecological concerns lead to high boating releases between January and June, the later in the year they occur is better from a boater perspective (because the weather is warmer).

- Whitewater releases in the Hell's Corner reach provide hydropower generation. While generation outputs from such releases can be calculated in megawatts, the cost depends on several variables, including the size, duration, and timing of the release (both seasonally and by time of day), ramping rate requirements, and the base flow from which releases would be "built." Market conditions for power, which can fluctuate because of a variety of factors, may also influence the value of power. Until some of these unknowns are further specified, it is premature to estimate how much generation is provided from whitewater releases of different sizes and duration.

- Whitewater/power releases also affect reservoir levels in the J.C. Boyle or Keno reservoir. The size of reservoir drawdowns can also be calculated depending on the size, duration, and timing of the releases (both seasonally and by time of day), ramping rate requirements, and the base flow from which releases would be built. As some of these variables are specified, it will be possible to assess potential effects on the reservoirs. Other reports on Klamath River recreation issues (PacifiCorp, 2003) have identified potential impacts from reservoir level changes, including availability of beach area, navigability of shallow areas, lake fishing success rates, facility usability, and overall aesthetics. If whitewater releases are proposed and defined, information in recreation reports can be integrated to examine specific impacts on reservoir opportunities.

- If higher base flows are contemplated to enhance or protect biological resources, there may be lower quality or lost fishing if new base flows are too high. It is unclear how anglers or fishing organizations will respond to proposals that might improve the fishery but diminish fishability, but current fly anglers prefer low base flows, and few would fish base flows above 1,000 cfs.

- Experience with other rivers suggests that anglers would adapt their tackle and techniques to successfully fish higher base flows. However, those new opportunities might be dramatically different from current ones.

In conclusion, balancing boating and fishing opportunities on the Hell's Corner reach is likely to be challenging. Providing flows for one will cause the loss of days or quality for the other. Ecological resources and hydropower generation may also be affected by any change in the flow regime. The purpose of this report was to provide information to help stakeholders and license applicants consider these trade-offs.

Potential Future Studies and Options

More precise flow evaluation curves were developed for Hell's Corner reach boating opportunities based on the controlled flow study, and angler participation (although limited) largely confirmed Phase I fishability findings. While greater precision may be desirable for fishing opportunities, it is unclear whether additional controlled flow studies or similar efforts would be useful. Local anglers who currently use the reach or fishing advocates clearly prefer lower flows, and at least one was skeptical that a day or more of higher flows is sufficient to evaluate fishability under new flow regimes because the fish have not had time to adjust to them

(Smith, pers. comm., 2002). Many anglers also suggested that biological implications of any new flow regimes may be substantial, and they should probably "trump" fishability concerns. There may be opportunities to integrate fishability and fish habitat findings as Upper Klamath River studies are completed.

Other future work may focus on the implications of potential operating scenarios and their effects on hydrology in the reach. As these operating regimes are described, information in this report can be used to assess the number of days when various opportunities would be provided.

#### 2.7.1.9 Copco No. 2 Bypass Reach and Fall Creek

This river reach is about 1.3 miles long, extending from Copco No. 2 Dam to the Copco No. 2 powerhouse (Figure 2.7-30). The river has a gradient of approximately 67 feet per mile. At base flows (about 10 cfs is released from the dam), the river is generally a narrow, single-thread channel with a pool/drop character. The steeper drops sometimes have channel-wide bedrock ledges, but other rapids are created by boulder gardens, and a few may be constricted by steeper canyon walls at higher flows. The river has relatively steep banks and a thickly forested riparian zone, although one can walk along the river's bank or low benches parallel to the stream at the 10 cfs base flows (these may be part of the channel at higher flows). Canyon walls are generally a few hundred feet above the river; the most prominent walls are at the end of the reach with scenic columnar basalt formations (diverted water from Copco No. 2 runs through a tunnel in the formation on river left).

The reach has development associated with the hydroelectric project, including the dam, a road to the dam from river right, and another service road on river left that leaves the river to follow the tunnel/pipeline and penstock. However, the powerhouse and power lines are around the corner from the Copco No. 2 bypass reach, and the riparian vegetation effectively screens other development from the river. Most of the land along the reach is owned by PacifiCorp, with a single block of BLM-managed land.

About a half mile from the river, the Fall Creek area has a fish hatchery, powerhouse, day use area, and a short trail to waterfalls on Fall Creek. There is also a small diversion structure providing domestic water to the city of Yreka, California. This area also features a number of interesting basalt formations.

Figure 2.7-30. Copco No. 2 bypass reach

Back side of Figure 2.7-30. Copco No. 2 Bypass Reach

Recreation Opportunities

Hiking and General Riverside Recreation**.** There are no developed trails on the Copco No. 2 bypass reach, but hikers willing to wade the river and bushwhack along the shore can gain access to numerous pools and riffles at base flows (about 10 cfs). There are several places with wider views of the canyon, shade trees, and potentially good swimming/wading holes (at base flows) or picnic areas. With some trail development, hikers could link trips on the Copco No. 2 bypass reach with hiking to the Fall Creek area, which offers interesting basalt formations and waterfalls/cascades with a few short trails. There are also scenic basalt formations at the downstream end of the Copco No. 2 bypass reach.

Fishing. Current base flows do not appear to support a game fishery in the Copco No. 2 bypass reach (although anglers apparently fish upstream of the dam in the short river-like Copco No. 2 reservoir, which has trophy-sized trout). If a downstream fishery were developed with adequate flows for fishing, the reach would likely offer some opportunities for bank fishing in pools and pocket water. Anglers also fish the river-like reach below the powerhouse tail race down to Iron Gate reservoir, usually for warm-water fish.

Boating. Current base flows are insufficient for boating, but this opportunity is potentially available during rare spill events. At least one interviewee (Cross, pers. comm., 2002) had scouted parts of the river during a spill (April 24, 2000; estimated flow was 1,000 to 1,400 cfs) and thought it might create Class IV opportunities. Phase I reconnaissance suggested a similar general conclusion, but boating was difficult to assess at that flow (10 cfs). Phase II reconnaissance at demonstration flows confirmed the availability of these boating opportunities, as discussed below.

Flow Requirements Based on Phase I and Phase II Reconnaissance

After brief descriptions of conditions during the reconnaissance flows (base flow and the three demonstration flows), acceptable and optimal ranges are identified for each recreation opportunity.

General Descriptions of Reconnaissance Flows

*10 cfs.* This flow nearly filled the bottom of the channel, and it provides adequate aesthetics for riverside hikers or picnickers. It also created a few pools that are 3 to 4 feet deep, providing potential wading areas for family groups. However, this flow is inadequate for fishing or boating.

*175 cfs.* This flow substantially filled the main channel and inundated some bankside vegetation, but many rocks in the rapids remained exposed. It provided marginal technical boating for kayaks and inflatable kayaks, with a few interesting bedrock rapids, but limited route options, and kayaks hit about 80 to 100 times during the run (most hits were in the boulder garden rapids). The flow was totally unacceptable for a small cataraft, which became repeatedly grounded (two in-channel portages, 12 boat drags, 25 stops, and 300+ hits). If a fishery existed, this flow is likely to offer good fishing conditions, with pools, runs, and extensive pocket water. Crossings would be possible at several locations, particularly at the end of the reach, but this flow may limit some hiking and fishing by constraining crossings or inundating vegetation on the bank. This is probably an optimal flow for swimming several pools, but runs and rapids are too swift and rocky for this activity.

*650 cfs.* Compared with 175 cfs, this flow offered improved boatability for kayaks and small rafts, although a boulder-choked rapid at the end of the run grounded rafts (slicing a hole in one). Bedrock rapids in the first half of the run had considerable power and started to offer more standard boating opportunities. Boulder garden rapids at the end of the reach were more technical. Wading-based fishing would be more difficult at this flow, which probably identifies the high end of the fishing range (if a fishery existed). Swimming opportunities are very limited at this flow, and crossing would be very difficult (limiting potential hikers or anglers to one side or the other, depending on their point of access).

*1,200 cfs.* This flow provided strong hydraulics and challenging rapids in the first half of the run, and it appears to define the transition between a standard and big-water boating opportunity. It also inundated large trees on the banks, limiting the size of recovery eddies and creating potential hazards for inadvertent swimmers. In the second half of the run, where the channel is wider and more boulder-choked, rapids were reminiscent of the Hell's Corner reach at 1,300 cfs, which is at the transition between technical and standard opportunities. This flow is also too fast for fishing, with encroaching vegetation and poor wadeability. Crossings are probably not possible at this flow, further limiting hiking or fishing access.

General Recreation. In general, the 10 cfs base flow provides acceptable aesthetics for hiking, as well as some limited swimming areas. Higher flows would probably improve most of the swimming areas, while still allowing some crossings. By 300 cfs, however, crossing options are limited, and swimming in all but a couple of pools would be difficult. Aesthetics are likely to remain acceptable through at least 1,500 cfs. In summary, the acceptable range for general recreation is probably from 10 to 1,500 cfs, but optimal conditions occur from about 50 to 300 cfs.

Fishing. If a fishery existed, wadeability is likely to be a key issue; on the basis of reconnaissance, wading would be possible in many places through 300 cfs, but optimal wading would occur at slightly lower flows. Crossings also would be difficult above 300 cfs. Bank fishing is possible at higher flows, but by 600 cfs, most of the river is fast and would offer lower quality bank-based fishing. Flows above 600 cfs are probably not fishable on this steep stream, as even the pools would be difficult to access given inundated vegetation. In summary, acceptable fishing flows probably range from 50 to 600 cfs, with optimal wading-based fishing between 50 and 300 cfs.

Whitewater Boating. The Copco No. 2 bypass reach provides a Class IV whitewater run, with a surprising number of rapids in its short length. The first half of the run has several interesting bedrock rapids that are substantially different from many others on the Upper Klamath. The boulder garden rapids through the second half of the run are more similar to those on the Hell's Corner and J.C. Boyle bypass reaches. The reach is boatable in a kayak with as little as 175 cfs, but this is a low-quality technical run. Flows of 300 cfs are needed for a quality technical kayaking opportunity, while 500 cfs is required for small rafts. Acceptable standard trips for both craft occur from about 500 to 1,500 cfs, with optimal standard trips from 800 to 1,200 cfs. At flows above 1,200 cfs, the upper rapids have stronger hydraulics that start to transition into a big-water opportunity. Commercial rafting in larger boats (five to six passengers plus a guide) probably requires flows above 1,000 cfs, although rafts will probably have several hits in the boulder garden rapids. If flows are much higher than 1,200 cfs, the power in the upper bedrock rapids and hazards from encroaching vegetation (a gallery of trees that are inundated) may limit commercial rafting opportunities. The reach is also very short for commercial rafting, although outfitters on a few other rivers offer similarly short trips (e.g., Upper Kern, Upper Deschutes).

Project-Related Effects

Recreation in this reach is substantially affected by Project operations, which generally provide 10 cfs throughout the year (spill events are rare). The frequency, duration, and magnitude of spill events are currently being summarized as part of the relicensing hydrology study. In general, a 10 cfs base flow provides acceptable general recreation opportunities only; boating and fishing cannot occur at these levels.

If higher base flows are contemplated to establish a fishery or achieve other biological objectives, they are likely to improve recreation opportunities. Base flows up to 300 cfs would improve hiking, swimming, general recreation, and wading-based fishing (if a fishery existed). Even higher base flows (up to about 600 cfs) would offer some bank fishing, but lower quality wading-based fishing or swimming. Hiking along the reach would be acceptable at any base flow from 10 to 1,500 cfs, but flows above 300 cfs would limit crossings and access. Higher base flows are not likely to provide standard boating opportunities unless they exceed 600 cfs, but quality technical kayaking would be available about 300 cfs.

If occasional whitewater boating releases are contemplated, demand for this short but challenging run is unlikely to be high. Although local boaters appear likely to show considerable initial curiosity about the reach's scenery and rapids, the run is generally too remote and short to attract much repeat use. A few hours of releases on a day or two per year are probably sufficient to meet local demand.

If these releases (or other access to the reach) are considered, access to the put-in and general safety issues will need management attention. The road to the put-in is gated, there is limited parking near the dam, and only informal trails provide access to the water. One possibility is to manage whitewater releases as an "event," with appropriate management of private vehicles and access to the reach. Coordinated shuttles have been successful on a reach on the North Fork of the Feather River in California with similar access issues.

PacifiCorp is concerned about safety in the reach if the powerhouse "trips" and emergency spill flows up to 3,200 cfs are released while recreation users (either hikers or boaters) are present. Some parts of the channel are constricted, and warning time would be short given the length of the reach; this probably necessitates an alarm system to warn users.

Regardless of flow regime changes, the Copco No. 2 bypass reach has considerable recreation potential from an aesthetic perspective. It has several interesting geologic formations and outstanding scenic vistas that would be appreciated by hikers, picnickers, anglers, or boaters if access were encouraged.

Future Study Needs and Options

Additional precision in defining flow needs for Copco No. 2 bypass reach recreation opportunities is possible but appears unnecessary. The short length of the reach diminishes its potential for attracting considerable whitewater boating use, and there appears to be sufficient information about the flows needed to provide boating. Unless a game fishery is developed, there seems little reason to more precisely define flow needs for a fishing opportunity that is currently absent.

2.7.1.10 Middle Klamath River Reach (Below Iron Gate Dam)

This reach is approximately 123 miles long, extending from Iron Gate dam to the confluence with the Salmon River. The entire river to its confluence with the Pacific Ocean was included in the California Wild and Scenic River system in 1972 and added as a 2a(ii) river in the national system in 1981. The only identified "outstandingly remarkable value" was its anadromous fisheries (steelhead and salmon), but the Wild and Scenic Rivers Act also provides protection for related scenic, recreational, fish and wildlife, historical, cultural, or similar values that occur on designated segments (even if they are not identified as specifically "outstandingly remarkable"). Throughout this section, we have assumed that fishing, whitewater boating, swimming, camping, and other similar riverside recreation are important recreation opportunities on the reach, and flow information is provided for each.

Given the long length of this reach, it is not simple to characterize the channel. However, much of the river is single-thread channel, with a few larger islands and braided areas. The rapids are generally short drops or boulder gardens separated by long runs or pools. The river has relatively steep banks and cliffs, and several reaches have sheer rock walls. In general, the deeper canyons are farther downstream. There are several creeks and a few major river tributaries (e.g., the Shasta, Scott, and Salmon). Beaches are sparse and generally smaller for the first half of the reach; they become larger and more frequent below Happy Camp. The river has fair trout fishing, but it is well known for its salmon and steelhead runs.

Most of the river corridor is Forest Service land, although there are some county and city lands as well. There are pockets of private land near the I-5 corridor, in Seiad Valley, at Happy Camp, and near the mouth of the Salmon at Somes Bar. In general, these areas have several homes and associated rural development, but they are not densely populated. The dominant human features in the corridor are: (1) the road that is adjacent to the river for much of its length; (2) small developed access points for boaters and anglers; and (3) a few developed Forest Service or private campgrounds. Appendix 2G lists each of the major access points and campgrounds. There are a few user trails along the river or up tributaries; the trail from the river to Ukonom Falls is one popular example.

<u>Recreation Opportunities</u>

Recreation opportunities on the Middle Klamath River reach include bank- and boat-based fishing; technical, standard, and big-water boating; locational playboating; and general riverside recreation.

<u>Fishing</u>. Trout fishing on the Middle Klamath River reach is generally unremarkable compared with other opportunities in the region, but the river has well-known steelhead and salmon fishing, which is directly linked to the "outstandingly remarkable value" for which the river was designated Wild and Scenic. Anglers fish from boats and the bank (a few also fish while wading). Most of the boat fishing occurs from drift boats or rafts. The common drift boat is 16 or 17 feet long and made of aluminum. Rafts are typically in the 13- to 15-foot range. Jetboats

occasionally use the lower sections of the river (below Coon Creek). These are likely to be flat-bottom boats less than about 22 feet with outboard motors.

Fishing regulations allow anglers to keep up to five trout per day; most of this activity occurs in summer and fall. Limits on salmon and steelhead anglers have varied over the years; for salmon, they depend on whether the caught fish is wild or from the hatchery at Iron Gate. Most anglers catch and release steelhead. Anglers may use flies, spinners, and bait for all species. While steelhead can be in the river year-round, most salmon and steelhead fishing is focused in the fall, winter, and spring.

There are several places to access the river for both bank- and boat-based fishing. The more popular boat-fishing reaches for steelhead and salmon are from Iron Gate dam to Klamathon Bridge (near I-5), the Tree of Heaven reach, and in Seiad Valley. Some guides also run drift-boat or raft-based fishing trips below Happy Camp, which features more whitewater. Bank fishing appears to be more prevalent on the upper segment of the reach, although there are many bank-fishing access areas along the entire river.

<u>Technical, Standard, and Big-Water Boating.</u> The Middle Klamath River reach offers a diversity of Class II/III whitewater runs that are boatable in rafts, kayaks, inflatable kayaks, and open canoes at low, medium, and higher flows. Some whitewater guides advertise the reach as an alternative to the more challenging run on Hell's Corner reach (Hague, pers. comm., 2002), while others focus on the combination of moderate whitewater, scenery, swimming, and camping (Payne, Kirwin, McDermott, Demerest, Smith, pers. comm., 2002). A few offer kayak or canoe instruction on the reach with less challenging whitewater available during low to moderate flows in summer (Kirwin, Rucker, Welch, pers. comm., 2002).

Few whitewater boaters consider the reaches on the Middle Klamath River reach to be particularly challenging for rafts and kayaks, but there are a few rapids that are sometimes rated Class IV, including Hamburg and Upper Savage on the Otter's Playpen run; Rattlesnake on the day use run below Happy Camp; and Dragon's Tooth between Ferry Point and Coon Creek Access (also below Happy Camp). The two segments with the most rapids are from Portuguese Creek to Seattle Creek (the Otter's Playpen run) and below Happy Camp (Indian Creek to Coon Creek). The Tree of Heaven run on the upper part of the reach also has some good whitewater at medium to higher flows, and it can be a good reach for beginning kayaker instruction (Kirwin, pers. comm., 2002). The easier Class I and II reaches better suited for open canoes include the Tree of Heaven run and continue downstream to Sara Totten Campground, or downstream of Coon Creek (Rucker, 2001).

Whitewater trips are often run as day trips, but many boaters also camp. The availability of an access road and multiple access points along the river's length allows boaters to craft trips of different lengths to suit their needs. Many boaters (and guides) use vehicles to shuttle camping gear (thus avoiding having to load their rafts), taking multi-day combination car camping/rafting trips. Kayak and canoe instruction groups may also base camp out of a single developed campground and run different segments of the river as their skills improve (Rucker, pers. comm., 2001; Kirwin, pers. comm., 2002).

The primary whitewater boating season is in summer, when water temperatures are warm and families have more vacation time. However, the river can be boated in most months of the year.

Trips in late fall, winter, and spring often have a fishing focus, and camping is less common. It is noteworthy that local tribes hold religious ceremonies on the section of river downstream from Clear Creek (in the popular Happy Camp day use segment) for about 2 weeks in midsummer. During these periods, Forest Service officials strongly advise boaters to use other segments, and camping and commercial use is prohibited. In recent years, almost all boaters appear to respect these ceremonies and do not use the segment during these times.

Several guidebooks offer more detailed information about the various runs, rapids, access points, and camping options typically associated with whitewater boating opportunities on the river. Of particular note are the detailed descriptions in Rucker (2001). Although written from the perspective of an open canoeist, the guidebook includes considerable information about each rapid and the full range of access options. A summary of the mile-by-mile information is presented in Appendix 2G.

Locational Playboating. There is a well-known kayak playboating wave/hydraulic (the "School House Wave") at Mile 24 between Skehan Bar and Gottville. Local kayakers (usually from Mount Shasta, Klamath Falls, and Medford/Ashland) use this rapid to "park and surf" without running the entire reach. The popularity of playboating has increased significantly in the past decade (Bennett, 1999), and play waves of this type have the potential to attract significant use. The wave is typically available during low to moderate summer flows.

General Recreation. There are considerable opportunities to camp, swim, picnic, or relax along the Middle Klamath River reach, and there are some good opportunities for hiking, walking, or biking along the river as well. There are also a few superlative short hikes from the river up tributaries (particularly Ukonom and Clear Creek); many of these attract both boating and vehicle-based users. These tributaries also feature some good swimming holes in summer (the water is considerably less turbid but colder than the main Klamath River).

Flow Requirements

Fishing. Eighteen interviewees provided information about fishing on the Middle Klamath River reach, including six fishing-focused guides and four private anglers; other interviewees included agency and nongovernmental organization (NGO) staff, and whitewater boaters who also fish. Interviewees suggest that bank-based fishing is generally best at lower flows when water is below riparian vegetation, and there is better access for bank or wading anglers. Bank anglers also generally prefer lower flows for improved clarity and higher concentrations of fish in deeper pools and runs.

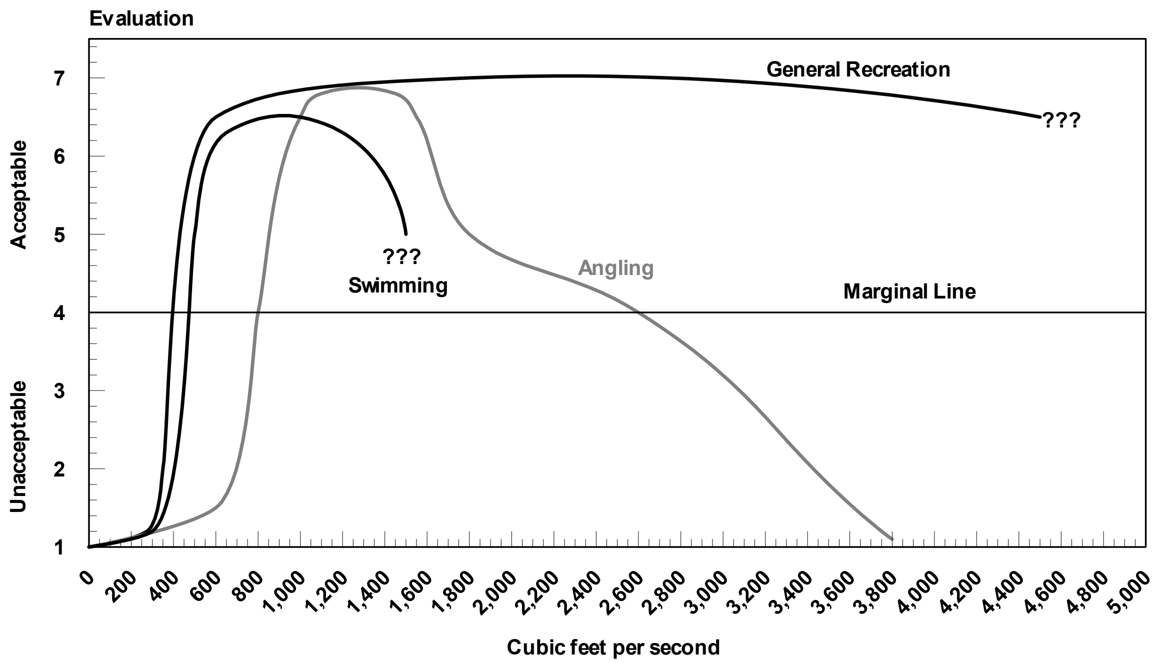
For boat-based fishing, which is the focus of all the fishing guides we interviewed, there may be a slight confound between the best flows for fishing and the best flows for getting down the river in a drift boat or raft. On the popular Iron Gate dam to Klamathon Bridge run, for example, there are substantial boatability issues for drift boats at flows less than 1,000 cfs. While reconnaissance suggests that the reach is boatable in rafts or drift boats at least as low as 660 cfs, this was a near-marginal level and aluminum markings on numerous rocks suggest that drift boats make frequent contact with rocks even in the deepest parts of the channel. This is probably exacerbated when boats have a full complement of anglers (usually two or three people plus the guide).

While one angler reported that he needed greater than 1,000 cfs to run this reach (Welch, pers. comm., 2002), the more common “minimum” for a relatively clean run in a drift boat appears to be about 700 to 800 cfs (Anderson, Ricard, Trout, pers. comm., 2003; Kutzkey, pers. comm., 2002). At these levels, heavily loaded boats may still hang up on rocks and thus create a safety hazard (because anglers are often standing and casting while the boat is moving) or increase equipment damage (Trout, pers. comm., 2003).

Optimum fishing flows appear to occur from 1,000 to 1,500 cfs. In addition to boat passage improvements on the Iron Gate dam to Klamathon segment, several anglers noted general improvements in the amount of fishable water throughout the segment. The river is still relatively clear at these levels (with some but not too much “color”), but it has slightly faster and deeper water in riffles (Schroeder, Trout, Weber, pers. comm., 2003). Lures and tackle are less likely to snag on obstacles in the channel, depths in pools and runs increase, and riffles may provide more cover for fish and encourage feeding (Kutzkey, pers. comm., 2002; Trout, Ricard, pers. comm., 2003).

Once flows begin to get higher than 1,500 cfs, the river may become more turbid and riffle areas increase their velocities. This may limit the places where anglers can wade, and provides more places for fish to spread out from deeper pools and runs (Watson, Trout, pers. comm., 2003; Kutzkey, pers. comm., 2002). Anglers appear to prefer the low-moderate flows that concentrate the fish (as long as they are not too low and have biological implications such as high temperatures or low dissolved oxygen issues; see below). In general, flows as high as 2,500 cfs are still acceptable for fishing, but just not optimal (Kutzkey, pers. comm., 2002). At higher flows, there may be a few places to fish, but the higher velocities and turbidity are not desirable.

A flow evaluation curve for fishing is provided in Figure 2.7-31 and generally follows from these recommendations. It shows dramatically improving flows from about 650 cfs; acceptable flows from about 800 to 1,000 cfs; optimum flows from about 1,000 to 1,500 cfs; and a gradual decline through 2,500 cfs, with worsening and generally unacceptable ratings at higher flows.




Source: CRC, 2003.

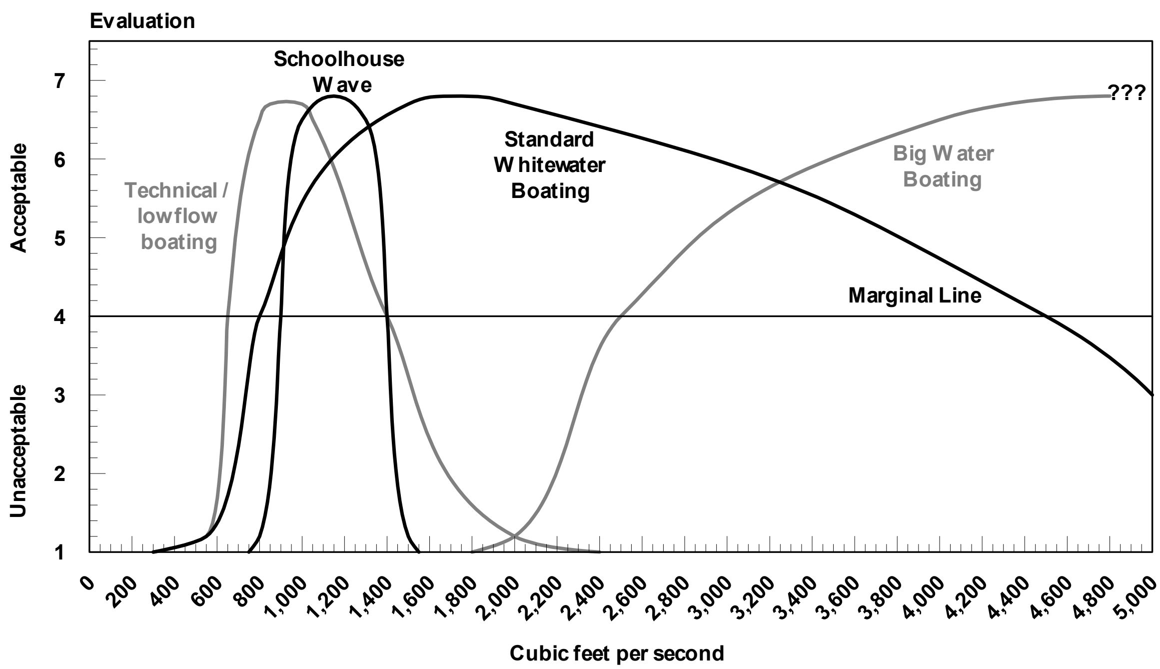
Figure 2.7-31. Flow evaluation curves for fishing and other opportunities on the Middle Klamath River reach.

A potential confound for anglers is related to perceived biological issues. Nearly all anglers expressed concerns about the biological effects of low base flows on aquatic species, particularly the salmon. In the fall of 2002, there was a substantial salmon die-off in the lower Klamath (estimates from interviewees ranged from 20,000 to 30,000 fish and were apparently based on newspaper reports), which many anglers attributed to low base flows (about 650 to 750 cfs). While we leave it to the biologists to develop and test such hypotheses, it is clear that many anglers believe in the connection, and they typically report that flows about 1,000 cfs are required to maintain a healthy fishery. Accordingly, even if some of these anglers preferred lower flows for fishing, they might report higher flows because they think those are better for the fish.

Technical Boating. On the basis of study reconnaissance, the reach is boatable in kayaks or lightly loaded small rafts (less than 15 feet) at about 600 to 700 cfs, but these flows offer little whitewater challenge or "play." At these flows, most of the major rapids have little hydraulic power, and many riffles or boulder gardens have tortuous paths and involve frequent "hits" or "stops." A few rapids (e.g., Otter's Play Pen, Dragon's Tooth) are particularly technical at this flow and may cause less skilled boaters to become stuck or flip. The consequences of these events may not be particularly serious because of the lack of power, but they can affect the quality of trips. At these flows, there are risks for unskilled boaters trying to master basic maneuvers. For example, one kayak instructor (Kirwin, pers. comm., 2002) who uses the Tree of Heaven run for his courses prefers not to bring students below 800 cfs because they are more likely to hit rocks if they capsize or swim (his optimal flow for instruction is about 1,500 cfs). The travel time between rapids is also substantially increased at technical levels.

Few boaters appear to prefer technical trips, but the river remains boatable and still offers access to good swimming, camping, tributary hiking, and a few interesting rapids. There are also long stretches of pools and runs that are similar at technical and standard levels. Interview information suggests that technical boating exists from about 600 to 1,000 cfs, where it begins to transition into standard trips; by 1,500 cfs, boating on most of the reach is no longer technical. A flow evaluation curve for technical boating opportunities is provided in Figure 2.7-32.

Standard Boating. Standard trips offer more powerful hydraulics, fewer boatability problems, and faster rates of travel between rapids. For kayak and canoe instruction, there is less likelihood of hitting rocks if one capsizes or swims, as well as more route options through riffles or boulder gardens (Kirwin, McDermott, Rucker, pers. comm., 2002). For most reaches, standard trips may be acceptable at about 750 to 800 cfs, but they continue to improve until flows reach about 1,500 cfs. They are optimal from about 1,500 to 2,000 cfs, where they begin to decline. The transition between standard and big-water trips appears to occur between 2,500 and 4,000 cfs, with differences depending on type of watercraft, boater skill levels, and preferences for stronger hydraulics. Many of the rapids on the Klamath River wash out at higher flows, but waves and hydraulic power in the remaining rapids certainly increase. A flow evaluation curve for standard boating opportunities is provided in Figure 2.7-32.




Source: CRC, 2003.

Figure 2.7-32. Flow evaluation curves for whitewater boating opportunities on the Middle Klamath River reach.

Interview results are generally consistent with guidebook recommendations for the Middle Klamath River reach. The most detailed guidebook for the river (Rucker, 2001) suggests that flows as low as 550 cfs or as high as 12,000 cfs are boatable in a canoe, but he would not recommend either for that craft. Instead, he identifies a range of 1,000 to 2,000 as best for canoes, although flows up to about 3,500 cfs are acceptable for that craft. The Quinn and Quinn (1983) guidebook does not recommend a specific flow range, but it notes that 1,300 to 2,000 are “average summer flows” good for boating. More recent guidebooks recommend 1,500 to 15,000 cfs at Orleans (Cassady and Calhoun, 1995) or note that there are different levels of difficulty at different flows, suggesting 1,000 to 3,000 cfs at Orleans for a Class II/III trip, 3,000 to 5,000 cfs for a III/III+ trip, and greater than 5,000 cfs for a IV- trip (Holbek and Stanley, 1998).

Big-Water Boating. Because of the low gradient and generally lower challenge rapids on the Middle Klamath River reach (mostly Class II and III), relatively few boaters appear interested in big-water opportunities there. When high flows exist on the Middle Klamath River reach, the California Salmon, Illinois, Scott, and Upper Klamath rivers are all likely to have more challenging big-water opportunities that would appear to attract higher use. However, flows higher than about 3,000 to 5,000 cfs appear to offer a distinct type of boating, with more powerful hydraulics and larger waves than are available at lower flows. A few boaters may seek these out, particularly if the California Salmon River or other runs are too high. Various boaters report using and enjoying these types of trips at flows up to 30,000 cfs. A flow evaluation curve for big-water boating opportunities is provided in Figure 2.7-32.

Locational Playboating. The School House Wave is a playboating feature well known among Southern Oregon kayakers. The wave does not appear to be in the same class as Bob's Hole on the Clackamas River or even the Keno Wave on the Upper Klamath River, but it can be reliable for long periods during the summer and thus attracts considerable use. At optimum levels, the wave is apparently 2 to 3 feet high and has enough retention to conduct a variety of freestyle or "rodeo" moves. Seven interviewees had specific knowledge of the School House Wave and generally agreed that it was acceptable between 900 and 1,400 cfs, and best between 1,000 and 1,300 cfs. At higher flows it washes out, while at lower flows it has less power and little retention. A flow evaluation curve for this opportunity is provided in Figure 2.7-32.

Swimming and Water Play. Relationships between flows and swimming depend on the type of swimming opportunity at issue, which differs for swimmers of different skill levels and with different interests. If one prefers swimming in low-velocity pools, those remain deep and slow through a relatively wide range of flows on the Middle Klamath River reach (although they may appear stagnant at very low flows). If one is interested in a swimming/wading/water play area in an eddy next to a beach, higher flows may substantially increase velocities and create safety risks. If one is a highly skilled swimmer and wearing a personal flotation device, swimming even high flows through a Class II or III rapid may be acceptable or optimal.

Given the general focus of summer Middle Klamath River reach trips on lower challenge whitewater and camping, we have developed a curve for swimmers of basic skills interested in the use of pools and runs near beaches. In general, for this type of swimming (see evaluation curve in Figure 2.7-31), there is substantial improvement with small increments of water starting from 400 cfs, and by 600 cfs it is near-optimal. Ratings then begin to decline as the river approaches standard boating levels, creating safety issues for unskilled swimmers and children. The question marks in the graph reflect uncertainty about how higher flows change velocities next to important swimming beaches; these are probably specific to individual sites.

General Riverside Recreation. On the basis of reconnaissance, flows as low as 400 cfs are likely to cover the bottom of the Middle Klamath River reach channel (except in wider shallow riffles) and provide adequate aesthetics for general recreation. A flow evaluation curve for general riverside recreation is provided in Figure 2.7-31 and shows dramatic improvement from 400 to 600 cfs, with ratings remaining high through estimated bankfull levels. At that point, aesthetics might decrease as the river becomes more turbid, inundates vegetation, or loses some definition in rapids.

Water Quality Issues. Few interviewees mentioned water quality issues without prompting, but at the end of each interview we asked them to describe any problems they may have had with water quality during their trips. A summary of their responses follows.

A few whitewater boaters mentioned noticeable "soap suds" or "foam" in eddies below rapids. In some cases, "suds balls" can be 2 to 3 feet high or several feet in diameter. This phenomenon, which is even more pronounced upstream in the Hell's Corner reach, is known to have natural origins in the chemistry and biology of the Upper Klamath River basin, but it may be exacerbated by irrigation return flows and reservoir storage. Water quality studies are specifically addressing these issues. No boater associated the amount of suds with any noticeable flow level.

After prompting, several anglers discussed noticeable problems from water quality changes that appear to be exacerbated at low flows. During extended low-flow periods, water plant growth in fishing holes appears more extensive, which causes more snagging of tackle. Algae blooms also become more noticeable, which limits fishing in some places. Anglers specifically complained that algae can stick to fishing line and possibly diminish success, that it "gums up" fishing equipment, and that it generally causes a loss of fishing area (because anglers will not cast into or near large algae blooms). Algae also appear to be a perceived biological indicator; larger algae blooms generally occur at low-flow times and make the river appear more stagnant. No anglers were able to specify relationships between flow levels and algae blooms, but several generally agreed they were more common during low-flow periods.

Swimming may also be affected by algae blooms or similar water quality issues in specific areas. On the basis of reconnaissance at relatively low (660 cfs) levels, parts of some pools that might have been used for swimming were less inviting because of algae blooms or stagnant-appearing water. In addition, some biting insects inhabit thicker algae blooms and rangers advise people not to walk through the blooms barefoot (although these micro ecosystems may well be biologically important (Payne, pers. comm., 2002). In any case, even at 660 cfs, there were extensive areas along the river reach with high-quality swimming (e.g., deep pools, adequate velocity, no algae blooms).

Project Effects

Hydroelectric Project effects on the Middle Klamath River reach (below Iron Gate dam) are fundamentally difficult to quantify because they are confounded by base flow requirements currently set by USBR. As discussed in the hydrology section for this reach, the combination of irrigation withdrawals, the loss of marshes in the Upper Klamath River basin, and increased evaporation from hydroelectric Project reservoirs has reduced the total amount of water released downstream of Iron Gate dam. Similarly, irrigation storage, withdrawals, and return flows have modified the timing of flows through the season (generally minimizing peak flows in winter during storage periods, and releasing steady, lower base flows through the summer and fall). Without assigning responsibility for base flow releases to the irrigation system or hydroelectric Project, it is possible to broadly describe their effects on recreation in the Middle Klamath River reach.

Fishing. Current flow regimes have generally not affected (and may enhance) fishing opportunities during wet years or in most high-flow periods during average years. During these times, flows are rarely lower than optimal levels for fishing, and UKL storage may help reduce flows that would otherwise be too high. When the river is spilling, flows are higher than optimal levels for fishing, although those higher flows would have been present with or without the irrigation or hydroelectric Projects.

In contrast, minimum flows can have substantial effects on fishing recreation in dry years or in the drier periods during average years. These are the periods when minimum base flows determine the quality of fishing. If minimum flows are set below about 800 cfs, some boating-based fishing opportunities become unacceptable (particularly on the upper reaches of the reach from Iron Gate dam through the Seiad Valley). If they are set below about 1,000 cfs, these same opportunities are suboptimal (although still acceptable). Many anglers are also very concerned about the potential deleterious effects on the fishery from low flows during these periods, but those biological issues are the purview of fisheries studies.

Whitewater Boating. As with fishing, current flow regimes have generally not affected whitewater boating opportunities during wet years or in most high-flow periods during average years. During these times, flows provide optimal versions of either standard or big-water boating about as often as they would have occurred without the Project.

However, minimum flows can have substantial effects on boating in dry years or in the drier periods during average years (which includes the main summer season). These are the periods when minimum base flows determine the type and quality of boating trips. If minimum flows are set below 1,500 cfs, standard trips are suboptimal and offer less whitewater challenge. If they are set below 1,000 cfs, trips become even more technical in nature; by 800 cfs, standard trips are no longer acceptable. In years where base flows are in the 600 to 700 cfs range, even technical trips are suboptimal, and below 500 cfs there may be reaches that become unraftable without extensive stops and drags (although it is likely that kayaks or canoes could still negotiate the river).

Swimming, General Recreation, and Water Quality. Current flow regimes (even in very dry years) probably provide flows within the optimal range for general recreation and swimming, providing more than adequate aesthetics. During periods of very low base flows (less than 500 cfs), suboptimal swimming or water quality issues may be noticeable in some specific areas, but there are many other miles of river where the swimming is optimal and water quality issues are not noticeable.

### Potential Future Studies and Options

It is possible to develop more precise flow evaluation curves for several Middle Klamath River reach opportunities. The best option for developing additional information about boating flows and boat-based fishing would be to conduct a formal survey of a greater number of guides, private boaters, or anglers than during the limited Phase I interviews. We think the population of experienced boaters and anglers who know flows is sufficiently large to employ a “flow comparison” methodology, and it is likely to improve the precision and defensibility of the resultant flow evaluation curves. Such an effort might also help distinguish between flow requirements for opportunities on more specific segments of the 123-mile reach.

However, it is unclear whether there is a compelling need to develop additional precision for any specific opportunity. As discussed in the section above on Project effects, the central flow-related issue on the Middle Klamath River reach focuses on minimum base flows during drier periods, which are currently set by the USBR independent of hydroelectric Project operations. If the USBR reviews its minimum flow decision process, this additional precision may well be critical; without this focus, however, it is unclear how additional precision will help ascertain Project effects or suggest PM&E measures. USBR has suggested that it may begin a formal EIS-level review of the Upper Klamath River system that may include a review of minimum flows below Iron Gate dam. If that effort becomes a reality, there may be opportunities to integrate efforts to understand flows and recreation opportunities.

Finally, there appear to be continuing water quality concerns for the Middle Klamath River reach, with specific interest in determining a minimum flow where water quality problems become "noticeable." Other PacifiCorp studies reported in Section 5 of the Water Resources FTR or in Exhibit E, Section E3, Water Use and Quality, specifically assess "below Iron Gate dam" water quality issues from a chemical and biological standpoint, and generally ascertain the specific impacts on water quality levels from the Project.

In general, these studies suggest that Middle Klamath River reach water quality is largely independent of flow during dry periods. While water quality may be lower at low flows, this is influenced more by temperature and algae blooms in upstream reservoirs (which occur at the same times). If temperatures are warm and algae blooms are occurring in the reservoirs, water quality below Iron Gate dam is unlikely to be improved simply by raising flow releases a few hundred cfs. In general, water quality issues in the Upper Klamath River Basin are more systemic in nature, and small changes in base flows appear unlikely to be very helpful.

#### 2.7.2 Options for Whitewater Economic Valuation

PacifiCorp economists are addressing this topic in the Socioeconomics FTR.

### 2.8 DISCUSSION

#### 2.8.1 Characterization of Existing Conditions

Previous sections of this report have described existing or potential recreation opportunities on various reaches of the river, and defined flow requirements (acceptable and optimal flow ranges) for each. The following section summarizes those findings for each reach in Table 2.7-9. In the table, flows based on less precise data are shown in italics, and some ranges are not specified (denoted by --) when uncertainty is too high. Recreation quality generally changes incrementally with more or less flow, so thresholds are simplifications of the point when a recreation opportunity becomes acceptable or optimal.

Previous sections also describe Project-related effects on those recreation opportunities, as well as key issues to address if alternative flow regimes are considered. Those issues are summarized briefly for each reach.

Table 2.7-9. Summary of acceptable and optimal flow ranges (in cfs) for Klamath River recreation opportunities.

| Reach/Opportunity | Acceptable Range | | Optimal Range | |
|---|---|---|---|---|
| **Link River Bypass Reach** | | | | |
| Fishing | 100 | 150 | 200 | 1,000 |
| Locational playboating | *1,000* | *3,000* | *2,000* | *3,000* |
| General recreation | 100 | 3,000 | -- | -- |
| **Keno Reach** | | | | |
| Fishing | 200 | 1,500 | 300 | 900 |
| Locational playboating | 1,100 | 1,800 | 1,300 | 1,600 |
| Standard whitewater boating | *1,000* | *4,000* | *1,200* | *3,000* |
| General recreation | 200 | 3,000 | -- | -- |
| **J.C. Boyle Bypass Reach** | | | | |
| Fishing | 200 | 1,000 | 300 | 400 |
| Technical kayaking | 800 | 1,300 | 900 | 1,200 |
| Technical rafting | 1,000 | 1,500 | 1,200 | 1,500 |
| Standard whitewater boating | 1,300 | 1,800 | 1,300 | 1,700 |
| Big-water rafting | 1,600 | 2,300 | 1,800 | 2,300 |
| Big-water kayaking | 1,700 | 3,000 | 2,000 | 3,000 |
| General recreation | 200 | 3,000 | ? | ? |
| **Hell's Corner Reach** | | | | |
| Fishing | 200 | 1,500 | 300 | 500 |
| Technical kayaking | 400 | 1,500 | 900 | 1,400 |
| Technical rafting | 700 | 1,400 | 900 | 1,400 |
| Low-flow commercial rafting | 1,000 | 1,300 | 1,000 | 1,300 |
| Standard whitewater boating | 1,400 | 3,000 | 1,800 | 2,800 |
| Standard commercial rafting | 1,300 | 2,000 | 1,500 | 2,000 |
| Big-water boating | 1,700 | 3,700 | 2,300 | 3,100 |
| General recreation | 200 | 3,500 | ? | ? |
| **Copco No. 2 Bypass Reach** | | | | |
| General recreation | 10 | 1,500 | 50 | 300 |
| Fishing | 50 | 600 | 50 | 300 |
| Technical kayaking | 200 | 600 | 300 | 600 |
| Standard whitewater boating | 600 | 1,500 | 800 | 1,200 |
| Big-water whitewater boating | 1,200 | ? | 1,500 | ? |
| **Middle Klamath River Reach** | | | | |
| Fishing | 800 | 2,500 | 1,000 | 1,500 |
| Technical whitewater boating | 600 | 1,500 | 800 | 1,500 |
| Standard whitewater boating | 800 | 4,000 | 1,500 | 2,000 |
| Big-water boating | 2,500 | *30,000* | 5,000 | *20,000* |
| General recreation | 500 | 5,000 | ? | ? |

Source: CRC, 2003.

#### 2.8.1.1 Link River Bypass Reach

Current Project operations generally maintain low to moderate flows in the Link River bypass reach, providing optimal flows for fishing and general recreation for most of the year. During the winter and spring, power diversions may slightly improve fishing opportunities (although not necessarily fish habitat) by decreasing flows that would otherwise be too high. In contrast, power diversions lower the quality and frequency of quality locational playboating (subtracting about 10 to 40 days in an average year), although the opportunity still exists for more than 2 months in an average year.

Flow augmentations (diminishing diversions and sending the water down the channel) could enhance the quality or provide more days of locational playboating. These would be effective only when UKL outflows are already substantial (above 2,000 cfs, with 500 or more in the channel), which typically occurs for short periods in late winter and spring. If these augmentations are considered, they could probably be provided occasionally (e.g., for 3-hour sessions on a couple of weekday evenings or weekend afternoons) to meet local boater demand.

#### 2.8.1.2 Keno Reach

Current Project operations affect flows in the Keno reach both seasonally and daily. Seasonal effects on recreation are generally small. Winter and spring spill flows (which occur after UKL is filled) may be too high for optimal fishing or locational playboating, but they generally occur about as often as with "natural" regimes. Similarly, average daily flows in summer and fall are slightly higher than pre-Project flows, but their effect on fishing and general recreation is small (both remain within optimal ranges under current managed regimes). Slightly higher summer flows created by the Project may allow some boating to occur more often, but these are marginal boating opportunities.

However, Project operations also affect daily variation in the reach, and this could be managed to provide or enhance whitewater boating or boat-based fishing opportunities. The Keno reach is currently varied to maintain a constant Keno reservoir level, and flow can change substantially in a given day. If Keno reservoir were allowed to fluctuate in response to irrigation return flows (up to 1.5 feet of variation is allowed but not used under the current license), river flows could be enhanced for short periods in the middle of the day to provide better boating. This type of flow augmentation would be most beneficial to recreation users during fishing seasons (spring and fall) and at times when average flows in the reach are about 700 to 1,000 cfs (and a few hundred cfs additional flow would make a difference).

#### 2.8.1.3 J.C. Boyle Bypass Reach

Current Project operations have generally enhanced fishing in this reach by providing a stable base flow (about 325 cfs) through most of the year. While fish habitat may be improved by higher base flows (the focus of fishery studies), current anglers prefer lower levels for wading-based fishing. Current operations have either enhanced or had no effect on general recreation. In contrast, upstream storage and diversions to the J. C. Boyle powerhouse have substantially changed the frequency and quality of boating opportunities in the bypass reach. Base flows are too low for boating, and spill flows are unpredictable, usually too high, and occur for a few days in the winter and early spring (if at all).

If operations were modified to provide additional boating opportunities, flows of about 1,300 to 1,500 cfs would probably attract the most use (providing high-quality standard rafting and kayaking opportunities), particularly if they occurred in summer or early fall when other regional whitewater opportunities are in short supply. If these were scheduled on weekends, many boaters would probably link trips on the J.C. Boyle bypass reach with those on Hell's Corner reach (offering an overnight opportunity). Because of the relatively short length of the reach, providing flows for a 2- to 4-hour window from mid-morning to early afternoon would probably be sufficient. These whitewater releases would probably eliminate fishing during those times, along with forgone power generation.

#### 2.8.1.4 Hell's Corner Reach

Because of UKL storage, the Hell's Corner reach has smaller runoff flows and higher flows in summer and fall than without the PacifiCorp and USBR Projects. More important, peaking operations of the J.C. Boyle powerhouse in the Hell's Corner reach vary flows each day through much of the year, generally increasing from base flows (350 cfs) to about 1,500 to 1,700 cfs (one turbine) during low- and moderate-flow periods, and increasing to about 2,800 cfs (two turbines) if there is sufficient outflow from UKL.

Daily peaking has small effects on general recreation, but it determines the frequency and quality of boating and fishing opportunities. In general, peaking flows of one turbine or more provide high-quality boating, while those same flows preclude quality fishing (and may have long-term effects on the fishery or short-term effects on fishing after a peak event). Fishability is enhanced by a peaking regime because current anglers prefer the low base flows, even as they dislike flows greater than about 700 to 1,000 cfs.

Predictable daily boating flows have fostered a substantial commercial boating industry on the river. If the Project did not exist, the Upper Klamath would probably provide only technical or low-flow boating opportunities after midsummer. Changes in the timing of peaking flows in 2000 and 2001 (which generally occurred later in the day) also had substantial impacts on that industry, probably causing use decreases and affecting the quality and timing of trips (outfitters took shorter trips or returned clients to town later). Timing effects on fishing were the converse of those for boating. As peaking flows shifted later in the day, anglers had more fishing time in morning, but less during the evening.

Fish habitat may improve with higher base flows or decreased variation from peaking (to be determined by fisheries studies), and anglers would probably adapt tackle and techniques to somewhat higher levels. However, most anglers prefer to fish the "artificially" low flows that exist during off-peak times. Similarly, whitewater boaters can run Hell's Corner reach at lower flows than one turbine, but these provide a different boating opportunity and their quality declines substantially as flows drop below about 1,300 to 1,500 cfs. Commercial rafting operations are likely to change substantially if peak flows were lower than this threshold (switching to smaller boats and fewer people per boat).

Under current flow regimes, whitewater boating and fishing are provided at near-optimal levels on most days in the summer and fall—just at different times of the day. Altered flow regimes with different timing or less variation because of peaking (including no variation or run-of-the-river regimes) would alter the frequency and quality of these opportunities. Future management is tied to understanding the impacts and trade-offs of these choices.

2.8.1.5 Copco No. 2 Bypass Reach

Recreation in this reach is substantially affected by Project operations, which generally provide 10 cfs throughout the year except during rare spill events. In general, base flows provide general recreation opportunities only; boating and fishing cannot occur at these levels.

If higher base flows are contemplated to establish a fishery or achieve other biological objectives, they are likely to improve recreation opportunities. Base flows up to 300 cfs would improve hiking, swimming, general recreation, and wading-based fishing (if a fishery existed). Higher base flows are not likely to provide standard boating opportunities unless they exceed 600 cfs, but quality technical kayaking would be available above 300 cfs.

Occasional higher releases might also be considered for whitewater boating. Demand for this short but challenging run is unlikely to be high, but local initial curiosity about the reach's scenery and rapids would sustain some use. Releases for a few hours on a day or two per year are probably sufficient to meet this demand. If these releases are considered, access to the put-in will need management attention.

Regardless of flow regime changes, the Copco No. 2 bypass reach has considerable recreation potential from an aesthetic perspective. It has several interesting geologic formations and outstanding scenic vistas that would be appreciated by hikers, picnickers, anglers, or boaters if access were encouraged.

2.8.1.6 Middle Klamath River Reach (Below Iron Gate dam)

Hydroelectric Project effects on the Middle Klamath River reach (below Iron Gate dam) are difficult to quantify because they are confounded by base flow requirements currently set by USBR. Irrigation withdrawals, agricultural development, and increased evaporation from Project reservoirs all contribute to reduced total flows released from Iron Gate. Similarly, irrigation storage, withdrawals, and return flows have modified the timing of flows through the season (minimizing peak flows during winter storage and releasing steadier but higher base flows in summer and fall). Without assigning responsibility to these individual components, however, it is possible to describe overall effects on recreation.

During wet years or most high-flow periods in average years, current flow regimes have generally not affected whitewater and fishing opportunities. When UKL is spilling, fishing and whitewater recreation opportunities occur about as often as they would have occurred without the two Projects.

In contrast, minimum flows have substantial effects on fishing and boating in dry years or in the drier periods during average years (including the main summer season). Minimum flows below 1,500 cfs begin to affect standard boating opportunities; below 1,000 cfs, they also affect boat-based fishing. When minimum flows are below 800 cfs, both fishing and boating opportunities are substantially affected. In years where base flows are in the 600 to 700 cfs range, even technical trips are suboptimal, and below 500 cfs there may be reaches that become unboatable without extensive stops and drags.

Current flow regimes (even in very dry years) probably provide flows within the optimal range for general recreation and swimming, with more than adequate aesthetics. During periods of very low base flows (under 500 cfs), suboptimal swimming or water quality issues may occur in specific areas, but there are many miles of river where the swimming is optimal and water quality issues are not noticeable.

### 2.8.2 Characterization of Future Conditions

Flow needs for various recreation opportunities will be compared with other Project and resource flow needs to develop proposed PM&Es, which may include flow regime alterations. Proposed PM&E measures are presented in Exhibit E of the license application.

# 3.0 RECREATION VISITOR SURVEYS

## 3.1 DESCRIPTION AND PURPOSE

The purpose of this study is to analyze current and anticipated future recreation visitation and visitor perceptions in the Klamath Hydroelectric Project (Project) study area. This study focuses on visitors at existing developed recreation facilities and undeveloped dispersed sites in or adjacent to the Project boundary (Figure 1.1-1). This study also focuses on understanding use levels and visitor characteristics and preferences in the study area. The study provides data necessary for use in several follow-on studies (4.0 Regional Recreation Analysis, 5.0 Recreation Needs Analysis, and 6.0 Recreation Resource Management Plan).

## 3.2 OBJECTIVES

The objectives and key questions this study addresses include the following:

- What are the recreational demand and use pressures on individual recreation sites and larger use areas, such as reservoirs, in the study area?
- Are there recreational user conflicts?
- Quantify demand for water-based recreation facilities in the study area.
- How many people use recreational facilities in the area? How often? Estimate the number of recreation visitor days per year at the existing developed recreation facilities and undeveloped dispersed sites in the study area.
- How many people will use recreational facilities in the area in the future? Develop projections of future visitation in the study area.
- Collect information on visitor perceptions and needs in the study area.

## 3.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The results of this study provide the data necessary to better understand how the study area is used for recreation purposes. Before the study, little detailed information, such as visitor survey results, was available regarding visitor use and perceptions of the study area. In addition, there were no detailed user counts at recreation facilities and sites in the study area. This study was intended to provide this missing visitor information, to establish a baseline of visitor data that may be compared in future years during the term of the new license, and to provide information to be used in the development of the draft Recreation Resource Management Plan.

## 3.4 METHODS AND GEOGRAPHIC SCOPE

The study methods involve several subtasks described below in more detail. Table 3.4-1 summarizes the sites included in the visitor survey and user counts and the methodologies that were employed at each site.

Table 3.4-1. Recreation visitor survey and user count sites and methodologies.

| Sites/Areas | Resource Types: Day Use | Camping | Boat Ramp | Methodology: Recreation Visitor Survey | Instantaneous Counts | 3-Hour Use Observations |
|---|---|---|---|---|---|---|
| ***Link River/Lake Ewauna/Keno Reservoir Area*** | | | | | | |
| Link River Nature Trail | • | | | • | • | Expanded |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | • | | • | • | • | Limited |
| ODFW's Miller Island Boat Launch | | | • | • | • | Limited |
| Keno Recreation Area | • | • | • | • | • | Limited |
| ***J.C. Boyle Reservoir Area*** | | | | | | |
| Sportsman's Park | • | | | Mail Back | Count Data Requested | |
| Pioneer Park (East and West) | • | | • (U) | • | • | Expanded |
| BLM's Topsy Recreation Area | • | • | • | • | • | Limited |
| ***Upper Klamath River/Hell's Corner Reach Area*** | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | • | | • | | BLM Count Data | |
| BLM's Klamath River Campground | | • (U) | | | BLM Count Data | |
| Stateline take-out (PacifiCorp and BLM) | • | • (U) | • (U) | • | • | Limited |
| Public Fishing Access Sites 1-6 | • | | • (U) | • | • | Limited |
| ***Copco Reservoir Area*** | | | | | | |
| Mallard Cove | • | • (U) | • | • | • | Expanded |
| Copco Cove | • | • (U) | • | • | • | Expanded |
| ***Iron Gate Reservoir Area*** | | | | | | |
| Fall Creek Trail | • | | | • | • | Limited |
| Fall Creek | • | • (U) | • (U) | • | • | Expanded |
| Jenny Creek | • | • (U) | | • | • | Expanded |
| Wanaka Springs | • | • (U) | | • | • | Expanded |
| Camp Creek | • | • | • | • | • | Expanded |
| Juniper Point | • | • (U) | | • | • | Expanded |
| Mirror Cove | • | • (U) | • | • | • | Expanded |
| Overlook Point | • | • (U) | | • | • | Limited |
| Long Gulch | • | • (U) | • | • | • | Expanded |
| Iron Gate Hatchery Public Use Area | • | | • (U) | • | • | Expanded |
| ***Study Area Dispersed Sites (including Frain Ranch*** | • (U) | • (U) | • (U) | • | • | |

Source: EDAW, Inc.
U = undeveloped dispersed campsite and day use site, or undeveloped boat launch. The 3-hour use observations column involves monitoring use over time at recreation sites and extrapolating to determine average daily, seasonal, or annual use and activity types. Expanded = at least 17 days of observation. Limited = at least 8 days of observation. BLM provided user data for sites in Hell's Corner reach. Sportsman's Park provided data for their facility. The R Ranch is addressed in the Regional Recreation Analysis (Section 4.0).

The following subtasks were conducted in this study:

- Recreation Visitor Survey (Questionnaire)
- Estimation of Annual Recreation Use in the Study Area (User Counts)

- Projection of Future Recreation Use Levels

### 3.4.1 Recreation Visitor Survey

A Recreation Visitor Survey was conducted through the use of a questionnaire to assess the attitudes, preferences, and characteristics of the primary visitor user groups in the study area. This survey focused on Project-related visitors, including boaters, shoreline day users, campers, and anglers (whitewater boaters and river anglers were primarily surveyed in the Recreation Flow Analysis [Section 2.0]). The questionnaire obtained basic information about the respondents' visit, including areas visited, length of visit, and other trip characteristics. The survey also determined visitor demand for water-based recreation facilities and conflicts with other users. Sections of the survey addressed the specific issues and concerns of important user groups such as anglers and boaters. The following items are included in the survey form (see Appendix 3A):

- Socio-demographic characteristics (for example, age and gender)
- Socioeconomic characteristics
- Visitor activities (general and primary)
- Trip characteristics (for example, group size, length of trip, and sites visited)
- Crowding and capacity issues
- Use and opinion of adequacy/condition of recreation facilities (especially water-based)
- Desired facilities and services
- Seasonal use
- Location of primary residence (city, county, state, postal Zip Code)

Visitors were contacted on randomly selected days at the recreation sites and facilities in the study area (see Table 3.4-1, Figure 1.1-2). Survey days at each site included: (1) three weekend survey days at each site in the early shoulder season (late April to just prior to Memorial Day weekend), (2) 12 survey days at each site during the peak use period (Memorial Day to Labor Day weekend, with six midweek survey days and six weekend survey days at each site), and (3) two weekend survey days at each site in the late shoulder season (after Labor Day weekend to the end of September). The survey was conducted from July 2001 to September 2002 and included more than 1,750 hours of survey time in the field. Sampling was stratified to ensure that a sufficient number of respondents from early, middle, and late season, as well as from weekdays and weekends, were selected. This sampling scheme was used to ensure that visitors from different areas of the study area and from different seasons throughout the year were sampled proportionally.

Sites surveyed included developed campgrounds and day use areas, as well as undeveloped dispersed sites in the study area (see Table 3.4-1). Sampling intensity was determined in advance for each site. However, at undeveloped and lower use sites, all visitors were sampled to ensure an adequate sample size for those areas. By sampling at both day use and overnight sites and facilities, an adequate sample of boaters, campers, and anglers was obtained and considered.

The visitor survey was patterned after surveys routinely administered by researchers for other similar hydroelectric projects. Additional questions were added or modified to address Project-specific needs and issues, as well as needs and issues associated with other relicensing studies.

However, the number of questions asked was limited so that the survey form did not become too long thereby reducing the visitor response rate. The survey was reviewed by BLM, the Oregon Parks and Recreation Department (OPRD), and NPS prior to its administration. Problems of clarity were resolved. A brief pretest of the user survey was conducted in the field prior to full implementation of this survey. Again, only minor revisions were made.

At developed recreation sites and facilities, visitors were approached by researchers and asked to complete the survey form. The number of visitors surveyed at each site was determined after the final sample strategy was approved. For dispersed use areas along the reservoirs and river reaches, popular sites were surveyed using a different methodology. Locations where visitors regularly park their vehicles along roads near the reservoirs or river reaches were identified. Surveys were distributed at these locations by placing survey forms on vehicle windshields if no people were around. Visitors were asked to mail back the survey form using a pre-addressed stamped envelope.

The number of completed surveys that are collected is designed to capture an adequate sample of visitors necessary to generalize results about each reservoir or river reach with a high degree of confidence, as well as results about the study area as a whole (Salant and Dillman, 1994). The number of completed surveys is dependent on the estimated population size and desired confidence level in the survey results. A 95 percent confidence level and a 5 to 10 percent sampling error is typically used in social science research. Assuming a 95 percent confidence level, 10 percent sampling error, and a population of at least 25,000 visitors at each resource area (Link River/Lake Ewauna/Keno reservoir, J.C. Boyle reservoir, Upper Klamath River/Hell's Corner reach, Copco reservoir, and Iron Gate reservoir), approximately 96 completed surveys are necessary from each resource area. This number of completed surveys would also result in a 95 percent confidence level and 5 percent sampling error for the entire study area. Additionally, a 65 percent response rate is anticipated in order to reduce the potential for nonresponse bias.

Survey data that were collected in this subtask were entered into a database for analysis purposes. It was assumed that at least 480 complete surveys would be entered. The data were subject to quality assurance/quality control (QA/QC) procedures, including review of the data obtained focusing on consistency between survey data and the resulting database. A statistical software package called Statistix was used to analyze the data. This package allowed researchers to query the data and to help answer key questions.

At Sportsman's Park, visitors voluntarily completed a mail-back survey that was available at the sign-in kiosk. On-site operators were asked to encourage visitors to complete and mail in the survey form.

#### 3.4.2 Estimation of Annual Recreation Use in the Study Area

This subtask provides an estimate of Project-related annual recreation visitation to recreation sites and use areas within the study area. Recreation visitation was estimated in recreation days (RD) on a seasonal and annual basis for each recreation site/area. An RD is the desired unit of measurement by FERC and is defined as a visit by one person to a recreation area for any portion of a single day (Appendix 3B).

Visitation and activity participation were estimated through the use of instantaneous counts and observations, as well as by monitoring use at recreation sites over a longer period of time. Instantaneous counts are a snapshot of use intended to identify the amount of use and the activities of visitors at a particular point of time. Sites were sampled at different levels depending on their estimated level of use (see Table 3.4-1). All sites noted received instantaneous counts during visitor survey contacts (see Appendix 3A). Additionally, reservoir boat counts were also collected during instantaneous counts (see Appendix 3A).

For higher use sites, an expanded methodology was used to develop use observation estimates, including user counts, length of stay, and people per vehicle. Researchers traveled to these sites and monitored use for 3-hour periods on a total of 17 different days during 2001 and 2002 (see Appendix 3A). Sample days for each site included: 3 weekend survey days at each site in the early shoulder season (May) prior to Memorial Day weekend, 12 survey days at each site during the peak use period (Memorial Day to Labor Day weekend, with 6 mid-week survey days and 6 weekend survey days at each site), and 2 weekend survey days at each site in the late shoulder season (after Labor Day weekend to late September). On each of these 17 survey days at each site, researchers spent approximately 3 hours on site observing how the site was being used. Data gathered consisted of the number of visitors and their activities, as well as the number of vehicles at the site. While at each site, researchers noted activities occurring at the site, the presence of user conflicts and under what conditions, and any backups of boats being launched, among other observation variables.

For lower use sites, a more limited methodology was used. Researchers traveled to these sites and monitored use for approximately 3 hours on a total of 8 different days during 2001 and 2002. Sample days included one survey day in the early shoulder season, 6 survey days during the peak use period, and 1 survey day in the late shoulder season after Labor Day weekend.

During the remaining time of the year (October through late April), use levels are much lower than during the summer season. As a result, a lower level of effort is needed during this timeframe. For this study, PacifiCorp employees traveled through the study area and collected instantaneous count information similar to the summer season counts. Survey days were randomly selected to include both weekday and weekend use and occurred approximately once per week. However, some sites during this off-season period were closed and therefore, were not surveyed. PacifiCorp employees who observed recreational use during the fall to spring timeframe also were interviewed to better understand how the study area was used by visitors during this period.

At Sportsman's Park, on-site operators were asked to share their user count information, including sign-in data.

At BLM-managed recreation sites in the Upper Klamath River/Hell's Corner reach (Upper Klamath River Boaters Access and BLM's Klamath River Campground), BLM employees collected visitor count information during their normal visits to these sites.

Annual visitation numbers were estimated by site or use area. The data collected in this subtask were used to calculate the annual and seasonal visitor use of the study area by recreation site/area.

Outside of the study area at the popular R Ranch below Iron Gate dam, recreation information was requested from the owner/operator as part of the Regional Recreation Analysis and is reported in Section 4.0.

### 3.4.3 Projection of Future Recreation Use and Demand

The starting point for this study was the results of the previous subtask, the Estimation of Annual Use in the Study Area (User Counts). Using data gathered in subtasks 3.4.3.1, 3.4.3.2, and 3.4.3.4 (detailed below), recreation use was projected out to the end of the anticipated license term (assumed to be 30 years at this time) based on composite county growth rates and composite changes in activity participation levels. These steps are described below.

#### 3.4.3.1 Assessment of Population Growth

The first step was to assess population growth in the areas where visitors reside. This information is used to help project recreation use into the future. Specifically, population projections of the counties where the study area recreation visitors originated were investigated. These areas were identified based on the results of the Recreation Visitor Survey (Questionnaire) subtask (Section 3.4.1). The county, state, and country of origin of visitors were obtained from the user survey results. Using this information, existing recreation use was segregated by the visitor's county of origin. Projected county growth rates were obtained for selected counties in California and Oregon from the State of California Department of Finance (CDF) and the Center for Population Research and Census at Portland State University (CPRC). Demand for various recreation activities can be assumed to be sustained or mirroring *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) projections if county populations in visitor origin locations are also on the rise at reasonable levels and not on the decline or at static levels.

#### 3.4.3.2 Assessment of Trends in Recreation Activities

The second step was to review recreation activity demand trends for specific activities occurring in the study area. Annual historical trends in fishing license sales were investigated using CDFG and ODFW historical permit and license data and other appropriate sources. Survey results from the *Public Opinions and Attitudes on Outdoor Recreation in California* by the California Department of Parks and Recreation (CDPR) (CDPR, 1994 and 1998) and SCORP data from OPRD (2003) were reviewed. Additionally, data from *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends* (Cordell et al. 1999) were also considered. These reviews focused on identifying recent annual activity participation rates and anticipated annual increases in demand by activity type for the region and for activities that occur in the study area. The relative importance of each activity, in terms of percentage participation, was also considered using the results from the Recreation Visitor Survey.

#### 3.4.3.3 Consideration of Regional Context

In the final step, the results from the Regional Recreation Analysis (Section 4.0) also were considered. It is important to understand the context of the study area's recreation resources and how this context may affect future recreation use in the study area. Factors that were considered include other opportunities in the region that also may help satisfy recreation demand, particularly water-based recreation, and future plans for accommodating (or not accommodating) recreation use in the surrounding areas.

## 3.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The following relationships have been identified in the Recreation Visitor Surveys and are summarized below:

- FERC requires that a licensee develop a recreation plan for the project area for the term of the new license (18 CFR Section 4.51 F[5]). The plans and programs included in the draft RRMP will accomplish this requirement (see Section 6.0). To help develop the draft RRMP, visitor use and survey data were collected and analyzed to help generate a recreation needs analysis. In addition, existing and projected use levels were estimated for the study area. The results of this study, plus other studies, helped fulfill these requirements.
- FERC requires that potential project effects on WSR systems need to be analyzed. The 11-mile segment of the Upper Klamath River was designated on September 22, 1994, as a BLM- and Oregon state-administered component of the National WSR system, pursuant to Section 2 (a)(ii) of the National Wild and Scenic Rivers Act. Proposed actions included in the draft RRMP should be consistent with plans for the Upper Klamath WSR reach. Also, FERC and other agencies will need to consider potential effects on the Lower Klamath WSR reach below Iron Gate dam. Recreation use and visitor survey data collected in this river reach were used to help develop the draft RRMP. These data were also shared with BLM as BLM developed its Draft Upper Klamath River Management Plan (BLM, 2003). This plan has not yet been adopted.

## 3.6 TECHNICAL WORK GROUP COLLABORATION

Following Stage 1 and agency review and comment of the First Stage Consultation Document (FSCD), the study plan was expanded substantially to collect an adequate level of survey and use count data. Based on agency consultation, this visitor survey was extended to Labor Day 2002 because of environmental conditions in 2001. Study results were shared with stakeholders as they became available and incorporated into a working Draft Technical Report and then this Final Technical Report (FTR).

## 3.7 STUDY OBSERVATIONS AND FINDINGS

This section describes the results of the Recreation Visitor Surveys. Results from the visitor survey questionnaire and user counts are presented. Additionally, this section provides an estimate of current recreation use in the study area and projects future recreation use in the study area through the anticipated term of the new license.

### 3.7.1 Recreation Visitor Survey

Visitor surveys were distributed to visitors at study area recreation sites on preselected dates during 2001 and 2002 (see Appendix 3A). The survey period for 2001 began in late June and continued through late September, while the survey period for 2002 began in early May and continued through early September. Survey dates were stratified to ensure that visitors from different areas and in different seasons throughout the survey periods were sampled proportionally to actual use levels.

Visitor surveys were either handed out to visitors to complete at the site or left on vehicle windshields to be mailed in when completed. At Sportman's Park, visitor surveys were left with the site operator and visitors were provided the opportunity to complete a mail-back survey. During the 2001 and 2002 survey periods, 1,461 visitors were given the opportunity to complete a survey. In total, 694 completed surveys were returned. This corresponds to a 48 percent response rate, which is considered adequate for the study area (see Table 3.7-1).

Table 3.7-1. Visitor questionnaire response rates.

| Year | Visitors Contacted | Returned Surveys | Response Rate |
|---|---|---|---|
| 2001 | 963 | 397 | 41 percent |
| 2002 | 498 | 297 | 60 percent |
| **Total** | **1,461** | **694** | **48 percent** |

Source: EDAW, Inc.

While considered adequate for purposes of this study, the response rate to the visitor survey was lower than originally estimated. Researchers have noted a national trend of declining survey participation in recent years. Researchers have also noted that individuals with lower education levels tend to be less likely to respond (Wellman et al. 1980; Kubota, 2002, pers. comm.); in addition, if the level of interest in a survey topic is low, the response rate is also likely to be low (Baas et al. 1984; Baas, 1986). Field conditions (i.e., drought in 2001 and fire/smoke in 2002) contributed to fewer visitors to the study area (e.g., a reduction in potential survey participants) compared with nondrought and non-forest fire conditions.

However, despite a lower than estimated response rate, a sufficient number of completed surveys were returned to achieve a 95 percent confidence level and a sampling error of 5 percent for the entire study area (Table 3.7-2). A 95 percent confidence level is typically used in social science research and is indicative of sample population accuracy (e.g., if 20 different samples were drawn from the entire population, in 19 of those samples the results would not vary significantly from the entire population). A 5 to 10 percent sampling error is also typically used in social science and is a measure of sample data accuracy (e.g., considering a 10 percent sampling error, results derived from the sample would be ± 10 percent of the true value derived from the entire population).

Additionally, assuming low variance at the resource area level, a sufficient number of completed surveys were returned to achieve a 95 percent confidence level with a sampling error of 10 percent at all resource areas except Copco reservoir (Table 3.7-2).

Table 3.7-2. Completed surveys by resource area and corresponding sampling error.

| Resource Area | Returned Surveys | Percent of Total | Sampling Error (Low Variance)[1] |
|---|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir | 98 | 14 | ± 7.9 |
| J.C. Boyle Reservoir | 141 | 20 | ± 6.6 |
| Upper Klamath River/Hell's Corner Reach | 63 | 9 | ± 9.9 |
| Copco Reservoir | 30 | 4 | ± 14.3 |
| Iron Gate Reservoir | 318 | 46 | ± 4.4 |
| Other[2] | 44 | 6 | N/A |
| **Study Area (Total)** | **694** | **100** | ± **2.9** |

Source: EDAW, Inc.

[1] Low variance in responses (e.g., 80 percent true and 20 percent false in response to a True/False questions) is characteristic of more homogenous populations.

[2] Corresponds to surveys in which a primary location could not be identified for a variety of reasons (location notation was torn off, location line was not filled in, etc.). Several of these surveys are likely to be from Sportsman's Park.

It should be noted that throughout the survey results section, results are generally reported for the study area, as well as the resource areas for some questions. Results for the resource areas are provided for comparison purposes. Resource area results are also provided due to the large number of completed surveys from Iron Gate reservoir, which may bias overall study area results to some extent.

### 3.7.1.1 General Visitor Demographics

A majority of visitor survey respondents were men (59 percent); approximately 41 percent of respondents were women. This proportion of male and female visitors is common in outdoor recreation surveys. The mean age of respondents was 44 (minimum = 11, maximum = 83, standard deviation [sd] = 15.5). Just over 50 percent of respondents were over 40 years of age (Table 3.7-3).

Table 3.7-3. Age distribution of visitors to the study area.

| **SURVEY QUESTION:** *What is your age?* | | |
|---|---|---|
| **Age[1]** | **Percent** | **n** |
| **< 25** | 13 | 87 |
| **26-40** | 31 | 204 |
| **41-60** | 40 | 268 |
| **> 61** | 16 | 103 |
| **Total** | **100** | **662** |

Source: EDAW, Inc.

[1] Age categories were created for analysis purposes. The actual survey question was open-ended.

Most survey respondents were either from Oregon (61.6 percent) or California (35.2 percent) (Table 3.7-4). Visitors from study area counties (Klamath, Oregon, and Siskiyou, CA) accounted for nearly 50 percent of all survey respondents, indicating that at least half of the use in the study area is from residents of local counties. Approximately 34 percent of visitors were from Klamath County, Oregon, the most visitors from a single county. Jackson County, Oregon, accounted for the second most visitors from a single county (15.1 percent), while Siskiyou County, California, accounted for the third most (14.5 percent). The county of origin of the remaining visitors was fairly evenly distributed over several other Oregon and California counties, as well as several other states (Table 3.7-4).

As seen in Table 3.7-4, the majority of visitors to each resource area are generally from the state where the resource area is located. The one exception to this is Iron Gate reservoir where, despite being located in California, a slight majority of visitors come from Oregon, likely from Medford and Ashland. In general, this would indicate that most use of a specific resource area is from local residents. This is important because local use (within 1 to 2 hour driving time) of a recreation area is usually related to demand for more day use facilities, unlike nonlocal use which is typically related to demand for more of both overnight and day use facilities.

#### 3.7.1.2 General Visitor Characteristics

The average group size in the study area is 6.8 visitors (minimum = 1, maximum = 52, sd = 7.2). This is generally considered a fairly large group size. Approximately 60 percent of groups in the study area consisted of five or fewer visitors (Table 3.7-5). An additional 21 percent of groups had between six and ten visitors. Several large groups resulted in an inflated average group size. The median group size in the study area was four visitors and is likely a more accurate estimate of group size.

The majority of groups using each resource area generally consist of between one and five visitors (Table 3.7-5). Along the Upper Klamath River/Hell’s Corner reach, however, group size tended to be much larger than at the other resource areas. Approximately 25 percent of groups to the Upper Klamath River/Hell’s Corner reach reported having over 20 visitors. The high number of visitors per group to this resource area is due to whitewater boating groups who use the river. These groups tend to consist of multiple boats, with several visitors (six to eight) per boat.

The average number of vehicles per group in the study area was 2.7 (minimum = 0, max = 60, sd = 3.6). As with group size, several high numbers of reported vehicles per group (60) slightly magnified the mean number of vehicles per group. The median number of vehicles per group is two, which is generally consistent with the average group size.

Table 3.7-4. County of residence of study area survey respondents.

| **SURVEY QUESTION:** *What is the postal Zip Code of your primary residence?* | | | | | | |
|---|---|---|---|---|---|---|
| | **Resource Areas** | | | | | |
| **County/State**[1] | **Link River/Lake Ewauna/Keno Reservoir** | **J.C. Boyle Reservoir** | **Upper Klamath River/Hell's Corner Reach** | **Copco Reservoir** | **Iron Gate Reservoir** | **Study Area Total** |
| Klamath | 79.6 percent | 78.4 percent | 25.9 percent | 6.7 percent | 3.9 percent | 33.6 percent |
| Jackson | - | 6.0 percent | 3.4 percent | - | 28.6 percent | 15.1 percent |
| Josephine | 1.1 percent | - | - | - | 14.1 percent | 6.7 percent |
| Lane | - | 0.7 percent | 12.1 percent | - | 0.7 percent | 1.8 percent |
| Other[2] | 5.4 percent | 0.7 percent | - | - | 6.3 percent | 4.4 percent |
| **Oregon** | **86.0 percent** | **85.8 percent** | **41.4 percent** | **6.7 percent** | **53.6 percent** | **61.6 percent** |
| Siskiyou | 1.1 percent | 3.0 percent | 12.1 percent | 53.3 percent | 21.1 percent | 14.5 percent |
| Shasta | - | 0.7 percent | - | 3.3 percent | 6.3 percent | 3.5 percent |
| Sacramento | - | - | 10.3 percent | - | 0.7 percent | 1.5 percent |
| Alameda | 3.2 percent | - | 5.2 percent | - | 0.7 percent | 1.5 percent |
| Contra Costa | - | 1.5 percent | 1.7 percent | 3.3 percent | 1.0 percent | 1.2 percent |
| Los Angeles | - | 1.5 percent | 3.4 percent | - | 1.0 percent | 1.2 percent |
| Del Norte | - | - | - | - | 2.0 percent | 1.1 percent |
| Other[3] | 8.8 percent | 2.3 percent | 24.2 percent | 23.4 percent | 11.3 percent | 10.7 percent |
| **California** | **12.9 percent** | **9.0 percent** | **56.9 percent** | **83.3 percent** | **44.1 percent** | **35.2 percent** |
| **Washington** | **-** | **2.2 percent** | **-** | **-** | **1.0 percent** | **1.2 percent** |
| **Other States**[4] | **1.1 percent** | **2.8 percent** | **1.7 percent** | **10.0 percent** | **1.3 percent** | **2.0 percent** |

Source: EDAW, Inc.

1 Counties and states included in table account for at least 1 percent of study area visitors each.

2 Other counties in Oregon include: Clackamas, Curry, Deschutes, Douglas, Lake, Linn, Marion, Multnomah, and Washington.

3 Other counties in California include: Butte, Calaveras, Humboldt, Marin, Nevada, Placer, Plumas, Riverside, San Bernardino, San Diego, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, and Sutter.

4 Other states include: Idaho, Hawaii, Maine, Nevada, Ohio, and South Dakota.

Table 3.7-5. Average group size in the study area.

| **SURVEY QUESTION:** *How many people in your group today, including yourself, are visiting this area?* | | | | | | |
|---|---|---|---|---|---|---|
| | **Resource Areas** | | | | | |
| **Group Size**[1] | **Link River/Lake Ewauna/Keno Reservoir** | **J.C. Boyle Reservoir** | **Upper Klamath River/Hell's Corner Reach** | **Copco Reservoir** | **Iron Gate Reservoir** | **Study Area Total** |
| **1 – 5** | 84.4 percent | 66.0 percent | 30.2 percent | 63.3 percent | 58.5 percent | **61.0 percent** |
| **6 – 10** | 9.4 percent | 22.0 percent | 22.2 percent | 30.0 percent | 23.6 percent | **21.0 percent** |
| **11 – 15** | 2.1 percent | 5.7 percent | 3.2 percent | - | 10.7 percent | **7.0 percent** |
| **16 – 20** | 4.2 percent | 2.1 percent | 19.0 percent | - | 4.4 percent | **5.0 percent** |
| **> 20** | - | 4.3 percent | 25.4 percent | 6.7 percent | 2.8 percent | **6.0 percent** |
| **Total** | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | **100.0 percent** |

Source: EDAW, Inc.

[1] Group size categories were created for analysis purposes. The actual survey question was open-ended.

Approximately 70 percent of visitors reported using one to two vehicles to access the study area (Table 3.7-6). Resource areas with higher average group sizes also tended to have higher average vehicles per group (Upper Klamath River/Hell's Corner reach, Copco reservoir, and Iron Gate reservoir).

Table 3.7-6. Number of vehicles per group in the study area.

| **SURVEY QUESTION:** *How many vehicles did your group use to come to this area?* | | | | | | |
|---|---|---|---|---|---|---|
| | **Resource Areas** | | | | | |
| **Number of Vehicles**[1] | **Link River/Lake Ewauna/Keno Reservoir** | **J.C. Boyle Reservoir** | **Upper Klamath River/Hell's Corner Reach** | **Copco Reservoir** | **Iron Gate Reservoir** | **Study Area Total** |
| **0** | 3.1 percent | - | - | - | 0.3 percent | **0.7 percent** |
| **1 – 2** | 86.7 percent | 82.0 percent | 54.8 percent | 67.9 percent | 63.5 percent | **70.0 percent** |
| **3 – 5** | 5.1 percent | 12.9 percent | 33.9 percent | 32.1 percent | 25.7 percent | **20.5 percent** |
| **6 – 20** | 5.1 percent | 4.3 percent | 11.3 percent | - | 10.2 percent | **8.3 percent** |
| **> 20** | - | 0.7 percent | - | - | 0.3 percent | **0.4 percent** |
| **Total** | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | **100.0 percent** |

Source: EDAW, Inc.

[1] Vehicle categories were created for analysis purposes. The actual survey question was open-ended.

Over half of the survey respondents (60 percent) reported staying overnight in the study area. On average, overnight visitors spent 3.6 nights in the study area (minimum = 1, maximum = 40, sd = 3.4). Table 3.7-7 displays the range of nights that respondents to the visitor survey spent in the study area. At J.C. Boyle reservoir and Iron Gate reservoir, over 10 percent of visitors reported spending more than 7 days on their trip to the study area. These two resource areas also have the majority of developed camping opportunities in the study area.

Table 3.7-7. Number of nights visitors spent on current overnight trip in the study area.

| **SURVEY QUESTION:** *How many nights will you stay on this trip?* | | | | | | |
|---|---|---|---|---|---|---|
| | **Resource Areas** | | | | | |
| **Number of Nights[1]** | **Link River/Lake Ewauna/Keno Reservoir** | **J.C. Boyle Reservoir** | **Upper Klamath River/Hell's Corner Reach** | **Copco Reservoir** | **Iron Gate Reservoir** | **Study Area Total** |
| **1 – 3** | 82.1 percent | 70.6 percent | 98.0 percent | 47.1 percent | 65.3 percent | **70.9 percent** |
| **4 – 7** | 15.4 percent | 17.6 percent | 2.0 percent | 47.1 percent | 23.3 percent | **20.4 percent** |
| **> 7** | 2.6 percent | 11.8 percent | - | 5.9 percent | 11.4 percent | **8.7 percent** |
| **Total** | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | **100.0 percent** |

Source: EDAW, Inc.

[1] Night categories were created for analysis purposes. The actual survey question was open-ended.

Of those respondents staying overnight in the study area, most (77 percent) reported staying at a campground. Of the remaining overnight visitors, approximately 20 percent reported staying at a private residence and only 1 percent reported staying overnight in a hotel or motel. Additionally, 3 percent of overnight visitors reported staying somewhere else, with responses generally indicating dispersed use areas. It should be noted that the question regarding where overnight visitors spent the night was on the 2002 visitor survey only; however, respondents to the 2001 visitor survey were also given the opportunity to describe where they were spending the night while in the study area.

Approximately 25 percent of survey respondents did not stay overnight in the study area, while an additional 15 percent reported living near the study area. On average, these day users reported spending approximately 4.9 hours (minimum = 1, maximum = 20, sd = 2.7) per visit in the study area (visitors were asked how many hours they will be in the study area on their current trip). Table 3.7-8 displays the range of hours respondents to the visitor survey reported spending in the study area. In general, approximately three-fourths of day use visitors reported spending under 6 hours in the study area on their current trip.

Table 3.7-8. Number of hours spent in the study area.

| **SURVEY QUESTION:** *How many hours will you be in the area?* | | | | | | |
|---|---|---|---|---|---|---|
| | **Resource Areas** | | | | | |
| **Hours[1]** | **Link River/Lake Ewauna/Keno Reservoir** | **J.C. Boyle Reservoir** | **Upper Klamath River/Hell's Corner Reach** | **Copco Reservoir** | **Iron Gate Reservoir** | **Study Area Total** |
| **1 – 2** | 71.4 percent | 18.5 percent | 16.7 percent | 11.1 percent | 3.5 percent | **19.4 percent** |
| **3 – 4** | 14.3 percent | 50 percent | 16.7 percent | 66.7 percent | 10.5 percent | **30.0 percent** |
| **5 – 6** | 4.8 percent | 18.5 percent | 16.7 percent | 11.1 percent | 52.6 percent | **28.8 percent** |
| **7 – 8** | 4.8 percent | 7.4 percent | 33.3 percent | 11.1 percent | 22.8 percent | **14.4 percent** |
| **9 – 10** | - | 5.6 percent | - | - | 5.3 percent | **4.4 percent** |
| **> 10** | 4.8 percent | - | 16.7 percent | - | 5.3 percent | **3.1 percent.** |
| **Total** | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | 100.0 percent | **100.0 percent** |

Source: EDAW, Inc.

[1] Hour categories were created for analysis purposes. The actual survey question was open-ended.

### 3.7.1.3 Recent Visitation to Regional Recreation Areas

Visitors to the study area were asked about other regional recreation areas in southern Oregon and northern California they had visited during the past 12 months, including study area recreation areas. Half of the respondents indicated that they had visited Iron Gate reservoir (Table 3.7-9). Other regional recreation areas visited by a relatively large percentage of survey respondents included Shasta Lake (36 percent), Lake of the Woods (36 percent), Rogue River National Forest (33 percent), Klamath National Forest (33 percent), and Crater Lake National Park (32 percent).

When asked which southern Oregon or northern California regional recreation area was their favorite, over a quarter (28 percent) of the visitors responded that it was Iron Gate reservoir. The top five regional recreation areas reported by visitors to the study area are listed in Table 3.7-10. Two of the top five regional recreation areas are located in the study area (Iron Gate reservoir and J.C. Boyle reservoir). Reasons respondents gave for preferring one regional recreation area over another included:

- Quality of fishing
- Vicinity/close to home
- Solitude and quiet
- Scenery/wildlife viewing opportunities
- Camping opportunities
- Water quality/temperature
- Waterskiing and boating opportunities
- Lack of bugs

Table 3.7-9. Respondents' visits to southern Oregon and northern California regional recreation areas during the past 12 months.

| **SURVEY QUESTION:** *Of the places listed below, which places have you visited in the past 12 months?* | | |
|---|---|---|
| **Regional Recreation Areas** | **Percent[1]** | **n** |
| Iron Gate Reservoir | 50 percent | 349 |
| Shasta Lake | 36 percent | 251 |
| Lake of the Woods | 36 percent | 249 |
| Rogue River National Forest | 33 percent | 226 |
| Klamath National Forest | 33 percent | 232 |
| Crater Lake National Park | 32 percent | 219 |
| Upper Klamath Lake/Agency Lake | 26 percent | 177 |
| Howard Prairie Reservoir | 26 percent | 182 |
| Upper Klamath National Wildlife Refuge | 25 percent | 170 |
| Copco Reservoir | 25 percent | 171 |
| Lower Klamath National Wildlife Refuge | 24 percent | 166 |
| Lake Ewauna/Keno Reservoir | 24 percent | 164 |
| Winema National Forest | 23 percent | 161 |
| J.C. Boyle Reservoir | 21 percent | 145 |
| Lake Shastina | 18 percent | 123 |
| Emigrant Reservoir | 17 percent | 118 |
| Willow Lake | 15 percent | 105 |
| Hyatt Reservoir | 14 percent | 99 |
| Trinity Lake | 12 percent | 83 |
| Whiskeytown Lake | 12 percent | 83 |
| Gerber Reservoir | 10 percent | 70 |
| Six Rivers National Forest | 8 percent | 52 |
| Round Lake | 8 percent | 52 |
| Horseshoe Ranch Wildlife Area | 5 percent | 33 |
| Cascade-Siskiyou National Monument | 5 percent | 37 |
| Aspen Lake | 5 percent | 36 |
| Buck Lake | 4 percent | 27 |
| Other[2] | 12 percent | 82 |

Source: EDAW, Inc.

[1] Responses do not sum to 100 percent since this was a multiple response question.

[2] Other regional recreation areas provided by respondents included Fish Lake, Four Mile Lake, Lost Creek, Hat Creek, Siskiyou Lake, Trinity Lake, Tule Lake National Wildlife Refuge, and Applegate reservoir.

Table 3.7-10. Top five regional recreation areas reported by visitors to the study area.

| **SURVEY QUESTION:** *Of the places listed below, which place do you prefer the most?* | | |
|---|---|---|
| **Regional Recreation Areas** | **Percent** | **n** |
| Iron Gate Reservoir | 28 percent | 195 |
| Shasta Lake | 7 percent | 45 |
| Lake of the Woods | 6 percent | 44 |
| Crater Lake National Park | 5 percent | 32 |
| J.C. Boyle Reservoir | 5 percent | 31 |

Source: EDAW, Inc.

Visitors to the study area were also asked what their primary destination in the region was on their current trip. The top four primary regional destinations reported by respondents were in the study area including Iron Gate reservoir (33 percent), J.C. Boyle reservoir (10 percent), Lake Ewauna/Keno reservoir (6 percent), and Copco reservoir (5 percent). This would indicate that study area recreation sites are the destination of over half (54 percent) the visitors to the study area (e.g., visitors are not on their way to another regional recreation area). The remaining 46 percent of visitors surveyed considered other locations as their primary destination thereby highlighting the fact that there are many regional recreation destinations to choose from.

#### 3.7.1.4 Participation in Recreation Activities in the Study Area

Participants in the visitor survey were asked about the activities they participated in while in the study area. As shown in Table 3.7-11, the activity with the highest overall participation was resting/relaxing (60 percent). Resting/relaxing is typically one of the most popular activities at outdoor recreation areas. The second most popular activity was swimming (46 percent). Other activities that received high responses include picnicking (39 percent), sightseeing (39 percent), and tent camping (36 percent). Horseback riding (3 percent) was the least popular activity according to survey respondents.

Resting/relaxing was also the most participated in activity at three of the five study area resource areas: Link River/Lake Ewauna/Keno reservoir, J.C. Boyle reservoir, and Iron Gate reservoir (Table 3.7-11). Whitewater boating was the most participated in activity along the Upper Klamath River/Hell's Corner reach, while fishing from a boat was the most participated in activity at Copco reservoir. In general, the most participated activities in each resource area correspond to the types of recreation opportunities found in each area (i.e., whitewater boating in the Upper Klamath River/Hell's Corner reach; swimming, powerboating, and fishing from a boat at Iron Gate reservoir).

In addition to providing a list of all the activities that visitors participated in, survey participants were also asked to rank the top three activities that they participated in while in the study area. In general, responses for the top three activities were highly variable. For the entire study area, respondents indicated that boat fishing was their primary activity. Resting/relaxing and hiking were the second and third most participated in activities, respectively, according to survey respondents (Table 3.7-12).

Table 3.7-11. Study area activity participation by resource area.

**SURVEY QUESTION:** *Which of the following activities are you and/or members of your group participating in during your visit to this area?*

| Activity | Percent Participation by Resource Area | | | | | |
|---|---|---|---|---|---|---|
| | Link River/Lake Ewauna/Keno Reservoir | J.C. Boyle Reservoir | Upper Klamath River/Hell's Corner Reach | Copco Reservoir | Iron Gate Reservoir | Study Area[1] |
| Resting/relaxing | **62**[2] | **59** | 59 | 63 | **59** | **60** |
| Swimming | 28 | 53 | 38 | 13 | 54 | **46** |
| Sightseeing | 58 | 40 | 46 | 30 | 32 | **39** |
| Picnicking | 41 | 45 | 35 | 37 | 36 | **39** |
| Tent camping | 33 | 23 | 62 | 30 | 40 | **36** |
| Fishing—bank | 17 | 31 | 49 | 53 | 37 | **34** |
| Sunbathing | 19 | 37 | 33 | 10 | 39 | **33** |
| Hiking | 57 | 28 | 49 | 17 | 19 | **31** |
| Fishing—boat | 4 | 21 | 10 | **77** | 46 | **31** |
| RV camping | 24 | 17 | 2 | 37 | 45 | **30** |
| Wildlife viewing | 38 | 21 | 30 | 20 | 27 | **28** |
| Powerboating | 9 | 14 | - | 17 | 43 | **26** |
| Waterskiing | 11 | 19 | - | - | 39 | **25** |
| Tubing | 7 | 20 | 11 | - | 28 | **20** |
| Bicycling | 11 | 12 | 8 | 3 | 11 | **11** |
| Riding off-highway vehicles | 2 | 13 | 10 | 10 | 11 | **10** |
| Whitewater boating | 4 | 2 | **64** | 10 | 2 | **10** |
| Canoeing/kayaking | 15 | 4 | 24 | 13 | 5 | **9** |
| PWC use | 5 | 8 | - | 3 | 14 | **9** |
| Target shooting | 2 | 17 | 3 | - | 7 | **8** |
| Hunting | 6 | 6 | 3 | 3 | 6 | **6** |
| Mountain biking on trails | 2 | 6 | 13 | - | 4 | **5** |
| Horseback Riding | - | 4 | 2 | - | 4 | **3** |
| Other[3] | 32 | 13 | 10 | 13 | 16 | **17** |

Source: EDAW, Inc.

[1] Responses do not sum to 100 percent since this was a multiple response question.

[2] Percentage in bold identifies activity with the highest participation in each specific resource area.

[3] Other responses included model airplane flying (radio control), walking/training dogs, driving for pleasure, bird watching, wake boarding, and partying/drinking.

Table 3.7-12. Top three activities in the study area by resource area.

| **SURVEY QUESTION:** *Of the activities you checked above, what are the top three (3) that you're participating in during your visit?* | | | |
|---|---|---|---|
| **Resource Area** | **Primary Activity** | **Second Activity** | **Third Activity** |
| Link River/Lake Ewauna/Keno Reservoir | Resting/Relaxing | Sightseeing | Hiking |
| J.C. Boyle Reservoir | Resting/Relaxing | Picnicking | Swimming |
| Upper Klamath River/Hell's Corner Reach | Whitewater boating | Tent camping | Resting/Relaxing |
| Copco Reservoir | Boat fishing | RV camping | Resting/Relaxing |
| Iron Gate Reservoir | Boat fishing | RV camping | Resting/Relaxing |
| **Study Area** | **Boat fishing** | **Resting/Relaxing** | **Hiking** |

Source: EDAW, Inc.

Responses for the top three activities in each resource area were highly variable and a small percentage of responses (<25 percent) often constituted a majority. Resting/relaxing was the primary activity at Link River/Lake Ewauna/Keno reservoir and J.C. Boyle reservoir, while boat fishing was the primary activity at Copco reservoir and Iron Gate reservoir (Table 3.7-12). Whitewater boating was the primary activity at the Upper Klamath River/Hell's Corner reach. The second most participated-in activities at the other resource areas varied from recreational vehicle (RV) (Copco and Iron Gate reservoirs) and tent (Upper Klamath River/Hell's Corner reach) camping to sightseeing (Link River/Lake Ewauna/Keno reservoir) and picnicking (J.C. Boyle reservoir). Additionally, resting/relaxing was the third most participated in activity at three resource areas (Upper Klamath River/Hell's Corner reach, Copco reservoir, and Iron Gate reservoir), while hiking and swimming were the third most participated in activity at the remaining two resource areas (Link River/Lake Ewauna/Keno reservoir and J.C. Boyle reservoir, respectively).

Visitors were also asked if there were any activities currently unavailable in the study area that they would like to participate in, but cannot due to facility limitations. Only about 14 percent of survey respondents indicated that there were activities they would like to participate in but currently cannot. Table 3.7-13 displays the most commonly reported additional activities. Nearly half of the comments received were about facility needs rather than activity needs. The most reported study area activity needs included motorized water sports (waterskiing, wake boarding, tubing, etc.), hiking, and swimming. The most reported study area facility needs included toilets, showers, and boat rentals.

Table 3.7-13. Additional activities and facilities desired by visitors to the study area.

| **SURVEY QUESTION:** *Are there any activities that you are currently unable to participate in due to special facility needs but would like to do? If yes, please list these activities.* | |
|---|---|
| **Resource Area (n)** | **Response (percent)** |
| Link River/Lake Ewauna/Keno Reservoir (12) | • Activities (67 percent): motorized water sports, swimming, and bird watching<br>• Facilities (17 percent): RV hookups and pave Link River Nature Trail<br>• Other (16 percent): have a campfire |
| J.C. Boyle Reservoir (16) | • Activities (56 percent): hiking, swimming, and other<br>• Facilities (44 percent): boat rentals, RV hookups, showers, and ADA access |
| Upper Klamath River/Hell's Corner Reach (12) | • Facilities (67 percent): toilets, bridge over river, and remove dams<br>• Activities (17 percent): fishing and whitewater boating<br>• Other (16 percent): refreshments provided, toilets expanded |
| Copco Reservoir (1) | • Activities (100 percent): fishing |
| Iron Gate Reservoir (33) | • Facilities (45 percent): showers, toilets, boat rentals, and RV hookups<br>• Activities (42 percent): hiking, motorized water sports, OHV use, and skeet shooting<br>• Regulations (7 percent): allow fires and allow long-term camping<br>• Other (6 percent): boat parking close to shore, provide a play park |
| Study Area (77) | • Facilities (47 percent): toilets, showers, boat rentals, and other<br>• Activities (42 percent): motorized water sports, hiking, swimming, and other<br>• Other (8 percent): have a campfire, Pelican Butte Resort, refreshments, toilets expanded, boat parking close to shore, and provide a play park<br>• Regulations (3 percent) |

Source: EDAW, Inc.

#### 3.7.1.5 Recreation Areas Used in the Study Area

Visitors to the study area were asked several questions to determine which areas they use for recreation. Visitors were first asked which areas they generally visit. Visitors were then asked to provide the primary destination of their current trip to the study area. Finally, visitors were asked if the recreation facilities in the areas they used were adequate to meet their needs and if the recreation facilities there were adequately maintained.

When asked which areas they generally visited in the Klamath River area, approximately 50 percent of survey respondents indicated Iron Gate reservoir (Table 3.7-14). Approximately one-quarter of respondents indicated that they generally visit the Upper Klamath River/Hell's Corner reach, while approximately 20 percent of visitors indicated they generally visit Keno reservoir, J.C. Boyle reservoir, and Copco reservoir, respectively. Less than 10 percent of visitors indicated that they generally visit the area below Iron Gate dam to I-5 (this is likely an indicator of the influence of R Ranch visitor responses).

Table 3.7-14. Areas visitors to the study area generally visit.

| **SURVEY QUESTION:** *When you make a trip to the Klamath River area, which of the following areas do you generally visit?* | |
|---|---|
| **Area** | **Percent[1]** |
| Link River | 15 percent |
| Lake Ewauna | 11 percent |
| Keno Reservoir | 21 percent |
| J.C. Boyle Reservoir | 19 percent |
| Copco Reservoir | 19 percent |
| Iron Gate Reservoir | 50 percent |
| Below Iron Gate dam to I-5 | 8 percent |
| Upper Klamath River | 23 percent |
| Other | 6 percent |

Source: EDAW, Inc.

[1] Responses do not sum to 100 percent since this was a multiple response question.

When asked what their primary destination was in the study area, a majority of survey respondents (35 percent) replied Iron Gate reservoir. This is likely due to the fact that nearly half of the returned visitor surveys were collected from visitors to Iron Gate reservoir.

At all resource areas, a majority of visitors replied that their primary destination in the study area was the resource area where they were contacted. The following percentages of visitors at each resource area replied that the resource area they were contacted in was their primary destination in the study area:

- 82 percent—Link River/Lake Ewauna/Keno reservoir
- 58 percent—J.C. Boyle reservoir
- 74 percent—Upper Klamath River/Hell's Corner reach
- 65 percent—Copco reservoir
- 85 percent—Iron Gate reservoir

The majority of respondents (84 percent) felt that the recreation facilities provided in the study area were adequate to meet their needs. Additionally, 90 percent of respondents felt that facilities were adequately maintained to meet their needs. These large percentages indicate that visitors are generally satisfied with the type of recreation facilities provided and maintained in the study area.

Those respondents (16 percent) who did not feel that existing recreation facilities were adequate to meet their needs indicated that facility needs in the study area included:

- More restroom/showers (43 percent)
- More campsites (12 percent)
- Improved boat ramps/docks (6 percent)

Specific facility needs by resource area are displayed in Table 3.7-15.

Table 3.7-15. Recreation capital facility needs in the study area.

| **SURVEY QUESTION:** *Are the current recreation facilities provided in the area adequate to meet your needs? If no, please explain.* | |
|---|---|
| **Resource Area (n)** | **Responses of Those Who Indicated "No" (percent)** |
| Link River/Lake Ewauna/Keno Reservoir (15) | • Facilities (RV electricity hookups) (33 percent)<br>• Winter Activities (ski-resort/winter access) (27 percent)<br>• Keep quiet/undeveloped (13 percent)<br>• Other nonfacility comments (27 percent): Keno Park closes in the winter, open Pelican Butte Resort, and kids need skateboard facilities |
| J.C. Boyle Reservoir (17) | • Facilities (bathrooms/showers/good potable water) (29 percent)<br>• Conflict (too crowded/too loud) (18 percent)<br>• Campground issues (18 percent)<br>• Warning signs needed (no diving from shore) (12 percent)<br>• Other recreation facilities (4WD roads/swim facilities) (12 percent)<br>• Other nonfacility comments (11 percent): people dumped garbage, camp hosts should be more respectable |
| Upper Klamath River/Hell's Corner Reach (12) | • Facilities (restrooms) (58 percent)<br>• Improved roads (17 percent)<br>• More camp sites/areas (17 percent)<br>• Other nonfacility comments (8 percent): the reservoirs get in the way of rafting |
| Copco Reservoir (4) | • Facilities (Restrooms) (50 percent)<br>• Campsites needed (25 percent)<br>• Water pollution present (25 percent) |
| Iron Gate Reservoir (46) | • Facilities (restrooms/water/showers/dumps at campsites/campgrounds (57 percent)<br>• Need additional campsites (13 percent)<br>• Improve boat launch/docks (13 percent)<br>• Other nonfacility comments (17 percent): bathrooms smell, too crowded, and too many bass tournaments |

Source: EDAW, Inc.

Those few respondents (10 percent) who did not feel that existing recreation facilities were adequately maintained indicated that maintenance concerns in the study area included dirty restrooms (29 percent) and litter accumulation (23 percent). Specific maintenance concerns are displayed in Table 3.7-16 by resource area.

Table 3.7-16. Recreation facility maintenance needs in the study area.

| **SURVEY QUESTION:** *Are the recreation sites in the area adequately maintained to meet your needs? If no, please explain.* | |
|---|---|
| **Resource Area (n)** | **Response (percent)** |
| Link River/Lake Ewauna/Keno Reservoir (9) | • Litter (22 percent)<br>• Trail maintenance (22 percent)<br>• Sites need upgrading (RV hookups/additional ground cover needed) (22 percent)<br>• Other (34 percent): winter facilities are in need of development, site management (good) |
| J.C. Boyle Reservoir (12) | • Litter (33 percent)<br>• Dirty restrooms (17 percent)<br>• Water/shoreline (rocks and stumps in water/algae need to be removed) (17 percent)<br>• Other (33 percent): insufficient experience, Sportsman's Park needs a better maintenance schedule on archery ranges, and eliminate radios and unruly dogs |
| Upper Klamath River/Hell's Corner Reach (8) | • No restrooms (63 percent)<br>• Roads need maintenance (25 percent)<br>• Litter (12 percent) |
| Copco Reservoir (1) | • Toilet paper/litter (100 percent) |
| Iron Gate Reservoir (29) | • Dirty restrooms (27 percent)<br>• Litter (23 percent)<br>• Campsites (need to be level/need more) (10 percent)<br>• Boat ramps need maintenance (10 percent)<br>• Other (30 percent): too much poison oak, need to cut the weeds back to prevent fire, lots of rattlesnakes (killed three already), no toilet paper, and site maintenance (good) |

Source: EDAW, Inc.

### 3.7.1.6 Boating and Water-related Issues in the Project Area

A portion of the visitor survey was devoted to gathering information on boating and other water-related issues in the study area. In terms of boating-related questions, visitors were first asked which boat launches they generally use and which one boat launch they use most often. Over half of the survey respondents (53 percent) indicated that they had used a boat launch in the study area. Table 3.7-17 presents the general use of boat launches in the study area by those survey respondents who go boating.

Forty-five percent of respondents to the visitor survey who reported using a boat launch in the study area replied that they generally use Iron Gate Access (Table 3.7-17). However, despite providing a map, it is unlikely that this percentage of visitors uses the boat launch with this name, located across the river from the Iron Gate fish hatchery (see Figure 1.1-2). In all likelihood, the high percentage of responses for this site is an indicator of the use of any boat launch on Iron Gate reservoir.

Table 3.7-17. General use of boat launches in the study area by site.

| **SURVEY QUESTION:** *When you boat in the Klamath River area, which of the following boater access sites/launches do you generally use?* | |
|---|---|
| **Boat Launch** | **Percent**[1] |
| Iron Gate Access (Iron Gate Hatchery Public Use Area) | 45 |
| BLM's Topsy Campground | 18 |
| Mirror Cove | 16 |
| Keno Recreation Area | 15 |
| BLM's Upper Klamath River (Spring Island) Boater Access | 15 |
| Camp Creek | 14 |
| Copco Cove | 9 |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 8 |
| ODFW's Miller Island Boat Launch | 8 |
| Mallard Cove | 8 |
| Stateline take-out (PacifiCorp and BLM) | 6 |
| Copco Store | 5 |
| Frain Ranch | 5 |
| Fall Creek | 4 |
| Fishing Access Site 1 | 2 |
| Long Gulch | 2 |
| Pioneer Park | 1 |
| Other | 7 |

Source: EDAW, Inc.

[1] Responses do not sum to 100 percent since this was a multiple response question.

This same problem was encountered in the responses to which boat launch visitors used most often. To partially eliminate the influence of Iron Gate Access responses, results for the most often used boat launch are presented by resource area in Table 3.7-18. Except for Iron Gate reservoir, Table 3.7-18 is a good indicator of which boat launch is the primary boat launch in each resource area.

Table 3.7-18. Most often used boat launch in each resource area of the study area.

| **SURVEY QUESTION:** *When you boat in the Klamath River area, which of the following boater access sites/launches do you use most often?* | |
|---|---|
| **Resource Area** | **Boat Launch (Percent)** |
| Link River/Lake Ewauna/Keno Reservoir | Keno Recreation Area (45 percent) |
| J.C. Boyle Reservoir | BLM's Topsy Campground (58 percent) |
| Upper Klamath River/Hell's Corner Reach | BLM's Upper Klamath River (Spring Island) Boater Access (30 percent) |
| Copco Reservoir | Mallard Cove (41 percent) |
| Iron Gate Reservoir[1] | Iron Gate Access (56 percent) |

Source: EDAW, Inc.

[1] Other popular Iron Gate reservoir boat launches include Mirror Cove (19 percent) and Camp Creek (12 percent).

Visitors were also asked if they generally had to wait to launch a boat. Of those survey respondents who provided a reply to this question (n = 442), 91 percent did not have to wait to use their primary boat launch. On average, those respondents who did have to wait to use their primary boat launch (9 percent) indicated that they had to wait 7.6 minutes (minimum = 2, maximum = 30, sd = 4.9) to use their primary boat launch.

Additionally, visitors were asked how the number of watercraft on the reservoir or river reach affected their ability to enjoy recreation activities. In general, the number of watercraft does not seem to affect visitor enjoyment of recreation activities at this time (Table 3.7-19). Only 5 percent of study area visitors perceived the number of watercraft to be unacceptable or totally unacceptable in terms of their enjoyment of recreation activities. In addition, fewer than 5 of visitors at each resource area, except J.C. Boyle reservoir, perceived the number of watercraft to be unacceptable or totally unacceptable. At J.C. Boyle reservoir, 8 percent of visitors perceived the number of watercraft as unacceptable or totally unacceptable.

Table 3.7-19. Perceived effect of the number of watercraft on enjoyment of recreational activities in the study area.

| **SURVEY QUESTION:** *How would you rate the number of watercraft on the lake or river you visited today in terms of how this condition affected your ability to enjoy recreation activities?* | | | | | | |
|---|---|---|---|---|---|---|
| **Resource Area** | **Totally Acceptable (percent)** | **Acceptable (percent)** | **Neutral (percent)** | **Unacceptable (percent)** | **Totally Unacceptable (percent)** | **Doesn't Apply to Me (percent)** |
| Link River/Lake Ewauna/Keno Reservoir | 34 | 35 | 9 | 4 | - | 18 |
| J.C. Boyle Reservoir | 26 | 35 | 18 | 6 | 2 | 13 |
| Upper Klamath River/Hell's Corner Reach | 23 | 54 | 13 | 2 | 2 | 7 |
| Copco Reservoir | 40 | 57 | 3 | - | - | - |
| Iron Gate Reservoir | 32 | 46 | 16 | 3 | 1 | 2 |
| **Study Area** | **30** | **42** | **15** | **3** | **2** | **8** |

Source: EDAW, Inc.

In terms of water-related issues, visitors were asked about water level (two questions) and also water quality (one question). The two questions on water level focused on enjoyment and safety as they relate to water level. In general, water level does not seem to affect enjoyment or safety at this time (Table 3.7-20 and Table 3.7-21). Approximately 8 percent of study area respondents felt water level was either unacceptable or totally unacceptable in terms of enjoyment of recreation activities, while only 4 percent of study area respondents perceived water level as unacceptable or totally unacceptable in terms of safety. In addition, less than 10 percent of survey respondents at each resource area (except Upper Klamath River/Hell's Corner reach), perceived water level to be unacceptable or totally unacceptable in regard to both enjoyment and safety respectively.

Along the Upper Klamath River/Hell's Corner reach, nearly one-quarter of survey participants (22 percent) felt water level was either unacceptable or totally unacceptable in terms of enjoyment of recreation activities (Table 3.7-20). This higher percentage of unacceptable responses is likely because activities along the river reach are more affected by water flows compared with activities at the study area reservoirs. In addition, near drought conditions were present during the survey.

Table 3.7-20. Perceived effect of water level on enjoyment of recreational activities in the study area.

| **SURVEY QUESTION:** *How would you rate the lake or river water level today in terms of how it affected your ability to enjoy recreation activities?* | | | | | | |
|---|---|---|---|---|---|---|
| **Resource Area** | **Totally Acceptable (percent)** | **Acceptable (percent)** | **Neutral (percent)** | **Unacceptable (percent)** | **Totally Unacceptable (percent)** | **Doesn't Apply to Me (percent)** |
| Link River/Lake Ewauna/Keno Reservoir | 44 | 34 | 10 | 4 | 1 | 7 |
| J.C. Boyle Reservoir | 26 | 44 | 16 | 5 | 4 | 7 |
| Upper Klamath River/Hell's Corner Reach | 19 | 41 | 17 | 19 | 3 | - |
| Copco Reservoir | 28 | 62 | 3 | 7 | - | - |
| Iron Gate Reservoir | 45 | 38 | 11 | 5 | 1 | 1 |
| **Study Area** | **37** | **40** | **12** | **6** | **2** | **3** |

Source: EDAW, Inc.

Table 3.7-21. Perceived effect of water level on recreation visitor safety in the study area.

| **SURVEY QUESTION:** *How would you rate the lake or river water level today in terms of how safe it is to use for your recreational activity?* | | | | | | |
|---|---|---|---|---|---|---|
| **Resource Area** | **Totally Acceptable (percent)** | **Acceptable (percent)** | **Neutral (percent)** | **Unacceptable (percent)** | **Totally Unacceptable (percent)** | **Doesn't Apply to Me (percent)** |
| Link River/Lake Ewauna/Keno Reservoir | 37 | 35 | 12 | 5 | - | 12 |
| J.C. Boyle Reservoir | 25 | 46 | 15 | 4 | 4 | 8 |
| Upper Klamath River/Hell's Corner Reach | 20 | 53 | 20 | 4 | 4 | - |
| Copco Reservoir | 35 | 62 | - | 4 | - | - |
| Iron Gate Reservoir | 47 | 42 | 8 | 1 | 1 | 1 |
| **Study Area** | **37** | **43** | **12** | **3** | **1** | **4** |

Source: EDAW, Inc.

Visitors who replied that water level was unacceptable (unacceptable and totally unacceptable) in terms of enjoyment and safety were given the opportunity to describe why the water level was unacceptable. Visitors who thought water level was unacceptable for their enjoyment of recreation activities (68 visitors provided a text response) provided the following responses:

- Water level was too low (54 percent)
- Too much algae in the water (10 percent)
- The water was dirty/smelly (10 percent)
- The farmers needed more water (9 percent)

Visitors who replied that water level was unacceptable for their safety (31 visitors provided a text response) provided the following responses:

- The water level was too low (26 percent)
- The water was dirty (16 percent)
- There were too many exposed rocks (13 percent)
- The farmers needed more water (10 percent)

Visitors to the study area were also asked if water quality ever affected their visit to the study area. Overall, just over one-third (38 percent) of the survey respondents replied that water quality had affected their visit to the study area (Table 3.7-22). In addition, approximately one-third of respondents at each resource area (except the Upper Klamath River/Hell's Corner reach), also replied that water quality had affected their visit to their respective resource area.

Table 3.7-22. Perceived effect of water quality on recreational visits in the study area (yes/no).

| **SURVEY QUESTION:** *Has water quality ever affected your visit to the Klamath River area?* | | |
|---|---|---|
| **Resource Area** | **Yes (percent)** | **No (percent)** |
| Link River/Lake Ewauna/Keno Reservoir | 32 | 68 |
| J.C. Boyle Reservoir | 39 | 61 |
| Upper Klamath River/Hell's Corner Reach | 61 | 39 |
| Copco Reservoir | 35 | 65 |
| Iron Gate Reservoir | 32 | 68 |
| **Study Area** | **38** | **62** |

Source: EDAW, Inc.

Slightly more than 60 percent of survey respondents in the Upper Klamath River/Hell's Corner reach felt that water quality had affected their visit to the area. This would indicate that whitewater river users are more affected than reservoir users by water quality problems.

Respondents who replied that water quality had affected their visit to the study area were asked (on a scale from "Detracts a lot" to "Adds a lot") how water quality had affected their visit. These survey respondents were also asked to write-in where, when, and how water quality had potentially affected their visit. Overall, more than two-thirds of visitors felt that water quality had detracted a lot or a little from their visit to the study area (Table 3.7-23). Additionally, at least 70 percent of visitors at each resource area also felt that water quality detracted a lot or a little from their visit.

Table 3.7-23. Perception of how much water quality affected recreational experiences in the study area.

| **SURVEY QUESTION:** *Please indicate how reservoir or river water quality has affected the quality of your experience?* | | | | | |
|---|---|---|---|---|---|
| **Resource Area** | **Detracts a Lot (percent)** | **Detracts a Little (percent)** | **No Effect (percent)** | **Adds a Little (percent)** | **Adds a Lot (percent)** |
| Link River/Lake Ewauna/Keno Reservoir | 48 | 33 | 15 | - | 4 |
| J.C. Boyle Reservoir | 30 | 41 | 17 | 2 | 9 |
| Upper Klamath River/Hell's Corner Reach | 55 | 36 | 6 | - | 3 |
| Copco Reservoir | 60 | 10 | 20 | - | 10 |
| Iron Gate Reservoir | 32 | 38 | 24 | 3 | 4 |
| **Study Area** | **36** | **33** | **15** | **2** | **4** |

Source: EDAW, Inc.

Table 3.7-24 summarizes open-ended responses to "where, when, and how" questions about water quality in the study area. Only those respondents who replied that water quality had affected their visit to the study area were asked to complete this question. Responses are grouped by the area each respondent indicated was the location of their water quality issue. It is important to note that many of the respondents did not complete all of the open-ended response area for this question (approximately 133 visitors completed the "where" water quality question).

Table 3.7-24. Perceived water quality issues in the study area.

| **SURVEY QUESTION:** *Has water quality ever affected your visit to the Klamath River area? If yes, please explain….* | | |
|---|---|---|
| **Where (n)** | **When (percent)** | **How (percent)** |
| Link River/Lake Ewauna/Keno Reservoir (20) | • Summer (30 percent)<br>• Always (25 percent)<br>• Last year—2001 (10 percent) | • Algae (40 percent)<br>• Smell (15 percent)) |
| J.C. Boyle Reservoir (16) | • Summer (25 percent)<br>• Always (25 percent)<br>• Now (19 percent) | • Algae (56 percent)<br>• Dirty (31 percent) |
| Upper Klamath River/Hell's Corner Reach (19) | • Summer (32 percent)<br>• Now (16 percent)<br>• Always (11 percent)<br>• Last year—2001 (11 percent) | • Not enough water (32 percent)<br>• Inconsistent flows (32 percent)<br>• Algae (26 percent) |
| Copco Reservoir (8) | • Always (38 percent)<br>• Summer (25 percent)<br>• Last year—2001 (25 percent) | • Dirty (38 percent)<br>• Algae (25 percent) |
| Iron Gate Reservoir (56) | • Summer (38 percent)<br>• Late summer/fall (30 percent)<br>• Last year—2001 (9 percent)<br>• Spring (7 percent) | • Algae (48 percent)<br>• Low water (11 percent)<br>• Dirty (7 percent)<br>• Smell (5 percent) |
| Below Iron Gate Dam (4) | • Summer (50 percent)<br>• Winter (25 percent) | • Low water (50 percent)<br>• High water (25 percent) |
| Upper Klamath Lake (10) | • Last year—2001 (60 percent)<br>• Late summer (30 percent) | • No water for farmers (50 percent)<br>• Algae (3 percent) |

Source: EDAW, Inc.

### 3.7.1.7 Perceptions of Crowding in the Study Area

Visitors to the study area were asked to rate, on a nine-point scale (1 being not at all crowded, 9 being extremely crowded), how crowded they felt at the area they were visiting (Shelby and Heberlein, 1986). The mean crowding score for the entire study area was 3 (minimum = 1, maximum = 9, sd = 2.2). This is a low to moderate crowding score and likely indicates that visitors to the study area generally do not feel crowded while participating in recreation activities at this time. Table 3.7-25 displays the range of responses to the perceived crowding survey question for the study area and for each resource area.

Iron Gate reservoir had the highest mean crowding score (3.7 or slightly crowded) of the five resource areas, while Link River/Lake Ewauna/Keno reservoir had the lowest mean crowding score (2 or not to slightly crowded). The mean crowding score at the remaining three resource

Table 3.7-25. Visitor crowding perceptions in the study area.

| **SURVEY QUESTION:** *How crowded do you feel at the area you are currently visiting?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1------------2-----------3-----------4-----------5-------------6-----------7-----------8------------9** | | | | | | | | |
| | **Not at All Crowded** | | **Slightly Crowded** | | | **Moderately Crowded** | | | **Extremely Crowded** |
| **Resource Area** | **Percent Response** | | | | | | | | |
| Link River/Lake Ewauna/Keno Reservoir | 52 | 22 | 13 | 6 | 4 | 3 | - | - | - |
| J.C. Boyle Reservoir | 34 | 16 | 14 | 17 | 4 | 11 | 1 | 2 | - |
| Upper Klamath River/Hell's Corner Reach | 47 | 26 | 13 | 5 | 2 | 7 | - | - | 2 |
| Copco Reservoir | 37 | 23 | 17 | 7 | 3 | 3 | 10 | - | - |
| Iron Gate Reservoir | 29 | 14 | 12 | 10 | 7 | 16 | 6 | 2 | 5 |
| **Study Area** | 35 | 17 | 13 | 10 | 5 | 11 | 4 | 1 | 3 |

Sources: EDAW, Inc.; Shelby and Heberlein, 1986.

areas was below 3 at each area (2.9 at J.C. Boyle reservoir, 2.7 at Copco reservoir, and 2.2 at the Upper Klamath River/Hell's Corner reach). These mean crowding scores are generally low, except at Iron Gate reservoir, and indicate that visitors at these areas generally do not perceive high levels of crowding. The mean crowding score at Iron Gate reservoir could be an indicator that visitors feel slightly crowded while recreating in the area. This perception may be caused by the facility design, activity types, natural site conditions, and/or other factors.

Mean crowding scores at developed recreation sites in the study area were further analyzed to determine if differences existed between visitors to sites with boat launches and visitors to sites without boat launches, as well as monthly and yearly differences in responses. For developed recreation sites with boat launches in the study area, respondents to the visitor survey reported a mean perceived crowding score of 3.3. At developed recreation sites without a boat launch, respondents reported a mean perceived crowding score of 2.6. These crowding scores had statistically significant differences between boat launch means and non-boat launch means (i.e., t-test of means [statistical comparison of means] using separate variance estimates and $p < 0.05$ [p-value is a measure of statistical significance]). A statistically significant difference between boat launch site mean visitor crowding scores (4.0) and non-boat launch site mean visitor crowding scores (2.9) also was found at Iron Gate reservoir developed recreation sites. This indicates that visitors to sites with boat launches tend to perceive higher levels of crowding than visitors at sites without boat launches. This can be explained by the additional traffic, congestion, noise, and activity associated with a boat launch compared with sites without a boat launch.

Temporal differences in perceived crowding are also found in the study area. The mean crowding score in 2001 (2.8) was significantly different from the mean crowding score in 2002 (3.4) (t-test of means using separate variance estimates and $p < 0.05$). Additionally, monthly mean crowding scores differ over the 5 months of surveying (2001 and 2002). Perceived crowding scores in late spring/early summer tended to be higher than scores from late summer/early fall. This can be explained by the higher use levels the study area experienced in late spring/early summer compared with the late summer/early fall possibly due to the drought conditions in 2001 and the forest fires in 2002. Table 3.7-26 displays the monthly mean crowding scores at developed recreation sites in the study area.

Table 3.7-26. Mean crowding scores by month in the study area.

| Month | Mean Crowding Score |
|---|---|
| May[1] | 3.4 |
| June[1, 2] | 3.2 |
| July[1] | 3.5 |
| August[2, 3] | 2.3 |
| September[3] | 2.8 |

[1, 2, 3] Means do not differ significantly at $p < 0.05$ level.

Source: EDAW, Inc.

In addition to perceived crowding, visitors to the study area were asked additional questions regarding their crowding expectations and their coping strategies for dealing with crowding. These additional crowding questions, taken in conjunction with visitor perceptions of crowding, are useful in developing a more complete picture of social opportunities and constraints in the study area.

Overall, the majority of visitors (61 percent) to the study area felt that the number of people they encountered was about what they expected (Table 3.7-27). Approximately 60 percent of visitors at each resource area also felt the level of crowding was about what they expected. This indicates that many visitors have become accustomed to the current level of crowding at each resource area and in the study area.

Table 3.7-27. Visitor expectations of crowding in the study area.

| **SURVEY QUESTION:** *How would you compare the level of crowding today with what you expected to experience?* | | | | |
|---|---|---|---|---|
| **Resource Area** | **Less Crowded** | **About as I Expected** | **More Crowded** | **I Didn't Know What to Expect** |
| Link River/Lake Ewauna/Keno Reservoir | 34 | 58 | 5 | 2 |
| J.C. Boyle Reservoir | 20 | 60 | 15 | 6 |
| Upper Klamath River/Hell's Corner Reach | 22 | 62 | - | 16 |
| Copco Reservoir | 23 | 67 | 10 | - |
| Iron Gate Reservoir | 24 | 62 | 12 | 3 |
| **Study Area** | 24 | 61 | 10 | 5 |

Source: EDAW, Inc.

Nearly one-quarter of visitors to the study area thought the level of crowding was less than they expected. Only 10 percent of study area visitors thought the area was more crowded than they expected.

Visitors to the study area were also asked how the number of people present at their primary recreation destination affected the overall enjoyment of their visit. Many visitors surveyed (42 percent) felt that the number of people did not really affect the overall enjoyment of their visit. However, approximately 30 percent of visitors felt the number of people present added (a little or a lot) to their enjoyment, while an additional 30 percent felt the number of people detracted (a little or a lot) from their enjoyment. This indicates that visitors surveyed vary greatly in their tolerance and acceptance of the number of people they encounter while participating in recreation activities in the study area.

Finally, visitors surveyed were asked whether they had ever changed their visits to the study area to avoid crowding. Approximately 40 percent of the survey respondents replied that they had changed their visits to help avoid crowding. This indicates that a portion of visitors may have been displaced from their originally desired recreation destination or desired time of choice. Displacement occurs when a visitor’s desired experience can no longer be achieved at their primary recreation destination and thus they choose an alternative time to visit the site (temporal displacement) or a new recreation site (intersite displacement). High levels of displacement may be indicative of problems (social, ecological, facility, etc.) at existing recreation sites and may influence perceived crowding rates at recreation sites (e.g., displaced visitors are replaced by more crowding-tolerant visitors) (Manning, 1999).

Visitors who replied that they had changed their visit to the study area to avoid crowding were asked to indicate how they had modified their visits. Visitors were provided with several typical coping strategies (e.g., methods of dealing with crowding) and asked to indicate which, if any, strategy that they had used to help avoid crowding.

In general, temporal coping strategies were employed by visitors more than intersite strategies (Table 3.7-28). The most commonly reported crowding coping strategy was avoiding holiday weekends (59 percent). Other commonly employed coping strategies included seeking out quiet places (49 percent), visiting the area on weekdays instead of weekends (42 percent), and visiting the area earlier or later in the year (37 percent) (Table 3.7-28).

Table 3.7-28. Coping strategies employed by visitors to avoid crowding in the study area.

| **SURVEY QUESTION:** *Have you ever changed your visits to the Klamath River area to avoid crowding? If YES, I sometimes….* | |
|---|---|
| **Coping Strategy** | **Percent**[1] |
| Visit the area earlier or later in the year. | 37 percent |
| Visit the area on weekdays instead of weekends. | 42 percent |
| Avoid holiday weekends. | 59 percent |
| Seek out quiet places in the area to avoid other crowded locations. | 49 percent |
| Come earlier or later in the day to avoid busy times. | 27 percent |
| Go to other places in the region when this area is too crowded. | 29 percent |
| Use another campground or day use site when my first choice location is full. | 24 percent |
| Use undeveloped campsites or day use sites along roads when my first choice location is full. | 23 percent |

Source: EDAW, Inc.

[1] Responses do not sum to 100 percent since this was a multiple response question.

### 3.7.1.8 Visitor Preferences for Recreation Development and Management in the Study Area

To help gauge visitor preferences for potential recreation development and management options in the study area, visitors were asked to rate a series of possible development and management alternatives on a five-point scale from “Strongly Oppose” to “Strongly Support.” Table 3.7-29 displays the list of potential management options and range of responses for the study area.

Table 3.7-29. Visitor support for potential management options in the study area.

| **SURVEY QUESTION:** *How much do you support or oppose each of the following possible management options in the Klamath River Area?* | | | | | |
|---|---|---|---|---|---|
| | **Position on Options**[1] | | | | |
| **Potential Management Options** | **Strongly Oppose** | **Oppose** | **Neutral** | **Support** | **Strongly Support** |
| Provide additional day use facilities in the area. | 13 percent | 9 percent | **35 percent** | **25 percent** | 18 percent |
| Provide additional shoreline access opportunities. | 13 percent | 8 percent | **29 percent** | **29 percent** | 21 percent |
| Provide low-speed or no-wake zones on the reservoirs. | 17 percent | 9 percent | **36 percent** | **24 percent** | 14 percent |
| Provide more boat launches on the reservoirs. | 15 percent | 12 percent | **38 percent** | **24 percent** | 12 percent |
| Provide more developed campgrounds in the area. | 14 percent | 12 percent | **26 percent** | **31 percent** | 18 percent |
| Collect fees at campgrounds to be used to improve quality. | **29 percent** | 16 percent | **26 percent** | 22 percent | 7 percent |
| Collect fees at day use sites to be used to improve quality. | **35 percent** | **25 percent** | 19 percent | 15 percent | 6 percent |
| Increase law enforcement patrols in the area. | 18 percent | 16 percent | **38 percent** | **21 percent** | 8 percent |
| Provide additional trails in the area. | 11 percent | 9 percent | **42 percent** | **26 percent** | 12 percent |
| Implement a partial campground reservation system to reserve some campsites in the area. | **24 percent** | 18 percent | **35 percent** | 17 percent | 7 percent |
| Provide group day use/picnic facilities in the area. | 12 percent | 8 percent | **41 percent** | **28 percent** | 11 percent |
| Provide group campsites in the area. | 12 percent | 10 percent | **38 percent** | **27 percent** | 13 percent |

Source: EDAW, Inc.

[1] The two highest response percentages are noted in bold.

In general, most potential management options received neutral to strong support, though several potential options received a significant amount of opposition. The three potential management options that received the most support (support and strongly support combined) in the study area included provide additional shoreline access opportunities (50 percent), provide more developed campgrounds in the area (49 percent), and provide additional day use facilities in the area (43 percent) (Table 3.7-29). The remaining potential management options received varying levels of support ranging from 40 percent (provide group campsites in the area) to 21 percent (collect fees at day use sites to be used to improve quality). Overall, respondents seemed to support some new recreation development in the study area, as long as fees are not charged.

The three potential management options that received the most opposition (oppose and strongly oppose combined) in the study area included collect fees at day use sites to be used to improve quality (60 percent), collect fees at campgrounds to be used to improve quality (45 percent), and implement a partial campground reservation system to reserve some campsites in the area (42 percent). The remaining potential management options received varying levels of opposition ranging from 34 percent (increase law enforcement patrols in the area) to 20 percent (provide additional trails in the area and provide group day use/picnic facilities in the area). Overall, respondents seemed to oppose increased recreation management and regulations, such as user fees, campground reservations, and law enforcement.

### 3.7.1.9 Visitor Expenditures in the Study Area

A survey question was added to the visitor survey in 2002 to help estimate visitor expenditures in the study area. Visitors were asked how much they spent as a group during their current trip on accommodations, meals/food, gas/fuel, supplies, guide/outfitter, and other expenses. In total, most (70 percent) respondents in 2002 indicated that they had spent some money on their current trip in the study area. On average, each survey respondent group in 2002 (including zero responses) spent approximately $125 (Table 3.7-30). Many respondents did not specify expenditures for all items. All expenditures that were left blank were assumed to be zero.

Table 3.7-30. Estimated group visitor expenditures in the study area.

| **SURVEY QUESTION:** *During this trip, approximately how much did you spend as a group on the following items?* | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Expenditure Items** | | | | | | |
| **Criteria** | **Accommodations** | **Meals/ Food** | **Gas/Fuel** | **Supplies** | **Guide/ Outfitter Fees** | **Other[1]** | **Total** |
| N[2] | 37 | 153 | 177 | 95 | 4 | 13 | 190 |
| Average | $13.25 | $49.30 | $35.45 | $19.71 | $3.00 | $4.52 | $125.21 |
| Minimum | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| Maximum | $800.00 | $500.00 | $350.00 | $500.00 | $600.00 | $400.00 | $1,350.00 |
| Median | $0.00 | $5.00 | $10.00 | $0.00 | $0.00 | $0.00 | $30.00 |

Source: EDAW, Inc.

[1] The most commonly reported other expense was alcohol (beer, wine, booze).

[2] N indicates the number of visitors who provided a response to each item. A total of 297 visitors were asked this question.

Meals/food accounted for the highest average expenditures ($49.30), while guide/outfitter fees resulted in the lowest average expenditures ($3.00) (Table 3.7-30). The second highest average expenditure was for gas/fuel ($35.45). More detail on socioeconomic issues in the study area, including expenditure information, can be found in the FTR for Socioeconomics.

### 3.7.1.10 Whitewater Angler and Boater Interviews

In addition to the visitor questionnaire, whitewater angler and boater interview forms were also used to elicit information from river users along the Upper Klamath River/Hell's Corner reach (Appendix 3A). In total, 24 interviews were completed with visitors to the Upper Klamath River/Hell's Corner reach (17 boater interviews and seven angler interview forms). More detail on whitewater boating and fishing can be found in the Recreation Flow Analysis (Section 2.0 of this Recreation FTR).

<u>Whitewater Boater Interview Results</u>

Seventeen whitewater boater interviews were completed in 2001 and 2002. The majority (82 percent) of interviewed whitewater boaters were on single day trips. The average time whitewater boaters spent on the river during day trips was 4 to 6 hours. Three of the interviewed whitewater boaters were on a multiday trip. These interviewees reported spending 2 days on their current trip to the Upper Klamath River/Hell's Corner reach and all spent a night camping at Frain Ranch.

Approximately three-fourths (76 percent) of whitewater boater interviewees used rafts to boat the Upper Klamath River/Hell's Corner reach. The remaining interviewees used whitewater kayaks, including inflatables. Two interviewees mentioned the use of both kayaks and rafts on their current trip. Approximately 82 percent of interviewees described themselves as private whitewater boaters (i.e., boaters who had not paid a river guide to lead the trip). Private whitewater boaters are typically more experienced than those who take commercial trips. Boaters taking commercial trips tended to decline taking the survey as they were quickly organized and shuttled in and out of the study area in comparison with private boaters who tended to be less constrained by time.

Whitewater boater interviewees were asked to describe their level of experience with whitewater boating. They were asked to choose from the following experience levels: novice (comfortable running Class I and II whitewater), intermediate (comfortable running Class III whitewater), advanced (comfortable running Class IV whitewater), and expert (comfortable running Class V whitewater). Forty-seven percent of whitewater boater interviewees defined their level of experience as intermediate. Smaller percentages of interviewees described their level of experience as either advanced or expert (26 and 20 percent, respectively). Only one interviewee described himself as a novice.

Whitewater boater interviewees were asked about the number of other boats and shoreline visitors they encountered on their current trip along the Upper Klamath River/Hell's Corner reach. The number of other boats encountered on the reach ranged from no boats to as many as 30, while the number of shoreline visitors ranged from four to 15. Whitewater boating interviewees generally felt that encounters with other boaters and shorelines visitors did not negatively impact their current trip along the reach. In fact, several interviewees felt encountering other boaters and shoreline visitors had a positive impact on their current trip (e.g., "Glad to see so many people enjoying the resource" and "It was nice to see other nonmotorized travelers"). However, two interviewees were negatively impacted by encounters with other boats and shoreline visitors. At least one of these interviewees had a stated preference for recreation opportunities that offered solitude.

Whitewater boaters were asked to rate the river flow level with regard to their overall experience on a five-point scale from "Totally Unacceptable" to "Totally Acceptable." The majority of interviewees (76 percent) rated the river flow as "Acceptable" or "Totally Acceptable." The remaining interviewees rated the river flows as "Marginal" (one interviewee) or "Unacceptable" (three interviewees). These four whitewater boaters were all interviewed on the same date in September, 2001. The drought conditions in 2001 may have contributed to their unfavorable ratings of river flows.

Seventy-one percent of whitewater boater interviewees reported that water conditions had affected their current trip on the Upper Klamath River/Hell's Corner reach. Of these, only one interviewee felt that water conditions had positively affected their trip ("Nice flows"). The remaining interviewees felt that water conditions had negatively affected their current trip along the reach. Interviewee responses to how water conditions had negatively affected their whitewater boating trip included: "lots of foam/scum" (four responses), "too polluted from agricultural runoff" (three responses), "water is nasty" (two responses), and "too much algae" and "illness as a result of ingesting river water" (one response each).

Whitewater boaters were also asked if the current recreation facilities along the river reach were adequate to meet their needs. Approximately 59 percent of interviewees responded that the current recreational facilities were not adequate to meet their needs. Interviewee responses to what types of recreation facilities are needed included (some interviewees provided multiple needs): “better roads” (five responses), “better maintained toilets” (five responses), “need changing blinds at takeout” (two responses), and “need running water at sites along reach” (one response).

Angler Survey Information

Seven river angler interviews were completed in 2001 and 2002. Most angler interviewees (86 percent) were day users and reported spending an average of 4 hours along the Upper Klamath River/Hell’s Corner reach. Only one angler interviewee reported staying overnight in the study area.

Anglers along the river reach were asked if they were fishing from shore or if they waded in the river. Three interviewees reported fishing from shore, while two reported wading in the river. The other two angler interviewees reported fishing from shore and wading in the river. Anglers were also asked how many watercraft had passed them on the river while they were fishing and if the watercraft had affected their experience. The number of observed watercraft ranged from zero to eight. Only one angler interviewee reported that watercraft on the river had affected their fishing experience (“disrupts the fish”).

River anglers were asked to rate the river flow level with regard to their overall experience on a five-point scale from “Totally Unacceptable” to “Totally Acceptable.” A slight majority of interviewees (57 percent) rated the river flow as “Acceptable.” The remaining interviewees rated the river flows as “Marginal” (one interviewee) or “Unacceptable” (three interviewees). Those interviewees who felt that the river flow was marginal or unacceptable stated that the flows were too high.

Four angler interviewees felt that water conditions had not affected their trip. The three angler interviewees who did state that water conditions had affected their trip reported that high flows made the fishing slow (two responses) and that the flows were generally inconsistent (sometimes too low, sometimes too high).

Finally, angler interviewees were asked if the current recreation facilities along the river reach were adequate to meet their needs. Four interviewees felt the current recreation facilities were adequate to meet their needs. The remaining three interviewees felt the current facilities were inadequate to meet their needs. Angler interviewee responses to what types of recreation facilities are needed included more designated campsites at Frain Ranch (including fire pits and toilets) (two responses) and better/improved facilities along the Upper Klamath River/Hell’s Corner reach (one response).

### 3.7.2 Estimation of Annual Recreation Use in the Study Area

As part of assessing existing use levels, this study identified the types, levels, and distribution of recreational use in the study area. Measures of use included people-at-one-time (PAOT), vehicles-at-one-time (VAOT), boats-at-one-time (BAOT), and recreation days (RDs). Existing recreation use is estimated in RDs, the preferred unit of recreation measurement of FERC. These commonly utilized measures are useful for managers as they consider present conditions while planning for future recreation needs in the study area.

Estimates of PAOT, VAOT, BAOT, and RDs were made based on instantaneous counts and 3-hour observations taken during the 2001 and 2002 field seasons, as well as during the off season (late October through April). Field researchers observed recreational use on a random stratified basis at the recreation sites and facilities in the study area during the 2001 and 2002 field seasons. The 2001 field observation period began in late June and continued through late September, while the 2002 field season began in early May and continued through early September. PacifiCorp employees regularly monitored and recorded recreation use (through the use of instantaneous count forms [Appendix 3A]) in the study area from October, 2001, through the end of April, 2002. Results in this analysis are derived from field counts completed during these observation periods.

For purposes of this analysis, the existing use estimates reported below are categorized by season. The year was split into four seasons including the early shoulder season (mid-April though just prior to Memorial Day), the peak season (Memorial Day through Labor Day), the late shoulder season (just after Labor Day through late October), and the off season (prior to the early shoulder season and after the late shoulder season). This was done to facilitate comparisons of use between seasons; however, most recreational use of the study area occurred during the peak season, as is typical at most outdoor recreation areas in the region.

### 3.7.2.1 Study Area Activity Counts

A component of the instantaneous counts was to count the number of visitors engaged in specific activities at each recreation site in the study area. The activities, mean number of PAOT, and maximum number of PAOT observed at each recreation site and resource area during the peak season are presented in Table 3.7-31. It should be noted that mean PAOT represents a “snapshot in time” and is not an estimate of total daily use. However, daily recreation use, commonly estimated in RDs for hydroelectric relicensing projects, can be extrapolated using PAOT and other field observations.

In total, except for two sites, the average number of peak season PAOT (weekday and weekend combined) in the study area was approximately 300 (Table 3.7-31). This estimate does not include recreational use at Sportsman’s Park and BLM’s Upper Klamath River (Spring Island) Boater Access (per study methodologies, counts were not performed at these sites). Annual estimates of use were provided for these sites by site managers and are discussed in Section 3.7.2.4.

The resource area with the most observed peak season use (PAOT) at developed recreation sites in the study area was Iron Gate reservoir (48 percent). The other resource areas each accounted for less than 20 percent of total observed peak season use at developed recreation sites in the study area, while dispersed recreation use (including Frain Ranch) only accounted for approximately 4 percent of total observed use.

Table 3.7-31 also displays the maximum observed peak season PAOT for each recreation site in the study area, except for Sportsman’s Park and BLM’s Upper Klamath River (Spring Island) Boater Access. The maximum number of observed peak season PAOT in the study was approximately 900. This is about three times as large as the average observed PAOT and indicates that many sites experience large influxes of use on several occasions during the peak season.

Similar to the results of the recreation visitor surveys (Section 3.7.1.4), resting/relaxing was also the most observed activity during the peak season (Table 3.7-31). Resting/relaxing accounted for approximately 28 percent of observed visitors in the study area. RV camping was the second most observed activity (12 percent), while swimming/sunning was the third most observed activity (9 percent). Resting/relaxing was the most observed activity at all five resource areas. Based on mean PAOT, the top three recreation activities at each resource area include:

- Link River/Lake Ewauna/Keno reservoir—resting/relaxing (28 percent), hiking (26 percent), and bank fishing and picnicking (4 percent, respectively)
- J.C. Boyle reservoir—resting/relaxing (27 percent), swimming/sunning (19 percent), and RV camping (15 percent)
- Upper Klamath River/Hell's Corner reach—resting/relaxing (48 percent), bank fishing (19 percent), and whitewater boating (10 percent)
- Copco reservoir—resting/relaxing (23 percent), RV camping (18 percent), and multiple activities (5) with 9 percent respectively
- Iron Gate reservoir—resting/relaxing (27 percent), RV camping (15 percent), and boat fishing (11 percent)

The top three observed activities in the study area and the resource areas, measured in PAOT, differed slightly from the visitor survey results for several reasons. First, respondents to the visitor survey were given the choice of 24 activities to choose from, while field observations focused on 16 activities. Second, field observations were focused primarily on the activities occurring at specific recreation sites, while visitors were able to report activities that they participated in at areas other then developed sites, including the reservoir surface. Third, field researchers only spent a limited amount of time at each recreation site (i.e., a few minutes for instantaneous counts, 3 hours for extended observations) and likely only observed a certain percentage of all of the activities at any given site. Despite these differences, however, survey and field observation results were relatively similar.

#### 3.7.2.2 Study Area Vehicle Counts

A second component of the instantaneous counts was to count the number of vehicles at each recreation site in the study area. The mean number of VAOT observed at each recreation site and resource area during each season are presented in Table 3.7-32. The maximum VAOT observed during any season are also presented in Table 3.7-32. These data represent a "snapshot in time" of the average number of vehicles at study area recreation sites at any given time. Similar to PAOT, VAOT are an important factor in estimating RDs at each recreation site and resource area.

Table 3.7-31. Mean and maximum peak season PAOT at recreation sites in the study area.

| Resource Area/Recreation Site | Mean PAOT by Activity | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Boat Fishing | Bank Fishing | Picnicking | Swimming/ Sunning | Biking | Hiking | Rest/Relax | Hunting/ Shooting | Equestrian | Power-boating | Waterskiing | PWC Use | Whitewater Boating | Car-top Boats | RV Camping | Tent Camping | Total (Maximum) |
| Link River/Lake Ewauna/Keno Reservoir | | | | | | | | | | | | | | | | | |
| Link River Nature Trail | 0 | 4 | 1 | 0 | 0 | 14 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 (170) |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 0 | 0 | 2 | 0 | 2 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 10 (36) |
| ODFW's Miller Island Boat Launch | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 7 (21) |
| Keno Recreation Area | 0 | 0 | 1 | 1 | 0 | 0 | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 2 | 15 (32) |
| **Subtotal** | **1** | **4** | **4** | **2** | **2** | **14** | **15** | **0** | **0** | **2** | **3** | **1** | **0** | **2** | **2** | **2** | **54 (259)** |
| J.C. Boyle Reservoir | | | | | | | | | | | | | | | | | |
| Sportsman's Park[1] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Undefined |
| Pioneer Park (East and West) | 1 | 1 | 3 | 3 | 1 | 1 | 5 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 20 (57) |
| BLM's Topsy Campground | 1 | 1 | 1 | 6 | 0 | 0 | 8 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 6 | 2 | 28 (36) |
| **Subtotal** | **2** | **2** | **4** | **9** | **1** | **1** | **13** | **1** | **1** | **2** | **2** | **1** | **0** | **0** | **7** | **2** | **48 (93)** |
| Upper Klamath River/Hell's Corner Reach | | | | | | | | | | | | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access[1] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Undefined |
| BLM's Klamath River Campground | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 (11) |
| Stateline take-out (PacifiCorp and BLM) | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 7 (21) |
| Fishing Access Sites 1 – 6 | 1 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 (15) |
| **Subtotal** | **1** | **4** | **0** | **1** | **1** | **0** | **10** | **0** | **0** | **0** | **0** | **0** | **2** | **0** | **1** | **1** | **21 (47)** |
| Copco Reservoir | | | | | | | | | | | | | | | | | |
| Mallard Cove | 2 | 1 | 1 | 1 | 1 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 1 | 16 (54) |
| Copco Cove | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 6 (13) |
| **Subtotal** | **2** | **2** | **2** | **1** | **1** | **0** | **5** | **0** | **0** | **2** | **0** | **0** | **0** | **1** | **4** | **2** | **22 (67)** |
| Iron Gate Reservoir | | | | | | | | | | | | | | | | | |
| Fall Creek Trail[2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fall Creek | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 7 (13) |
| Jenny Creek | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 8 (34) |
| Wanaka Springs | 0 | 1 | 1 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 4 | 14 (60) |
| Camp Creek | 7 | 4 | 1 | 3 | 1 | 0 | 16 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 9 | 1 | 45 (115) |
| Juniper Point | 1 | 1 | 1 | 1 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 14 (24) |
| Mirror Cove | 1 | 1 | 2 | 4 | 0 | 1 | 9 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 7 | 2 | 31 (47) |
| Overlook Point | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 8 (29) |
| Long Gulch | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 11 (22) |
| Iron Gate Hatchery | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 (11) |
| **Subtotal** | **15** | **12** | **6** | **13** | **2** | **1** | **38** | **1** | **0** | **7** | **5** | **5** | **1** | **1** | **21** | **13** | **141 (355)** |
| Dispersed Sites (including Frain Ranch)[3] | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 11 (71) |
| **Study Area Total** | **22** | **25** | **17** | **27** | **7** | **16** | **82** | **2** | **1** | **14** | **10** | **8** | **4** | **5** | **36** | **21** | **297 (892)** |

Source: EDAW, Inc.

[1] Per methodologies described in the study plans, instantaneous counts were not performed at Sportsman's Park and BLM's Upper Klamath River (Spring Island) Boater Access. The site operator provided an annual estimate of use at Sportsman's Park and BLM provided an annual estimate of use at BLM's Upper Klamath River (Spring Island) Boater Access.

[2] Fall Creek Trail was gated (locked) during 2002 field counts.

[3] Observed use at all dispersed sites in the study area was combined, as use at most individual sites was very low (mean PAOT <0.1).

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Table 3.7-32. Mean and maximum VAOT at recreation sites in the study area.

| Resource Area/Recreation Site | Mean VAOT by Season | | | | | Maximum VAOT |
|---|---|---|---|---|---|---|
| | Early Shoulder Season | Peak Season Weekday | Peak Season Weekend | Late Shoulder Season | Off Season | |
| Link River/Lake Ewauna/Keno Reservoir | | | | | | |
| Link River Nature Trail | 4 | 5 | 4 | 5 | 1 | 21 |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 5 | 5 | 9 | 4 | 2 | 53 |
| ODFW's Miller Island Boat Launch | 4 | 1 | 5 | 4 | Closed[1] | 8 |
| Keno Recreation Area | Closed | 4 | 10 | 5 | Closed | 22 |
| **Subtotal** | **13** | **15** | **28** | **18** | **3** | **104** |
| J.C. Boyle Reservoir | | | | | | |
| Sportsman's Park[2] | Undefined | Undefined | Undefined | Undefined | Undefined | Undefined |
| Pioneer Park (East and West) | 6 | 7 | 8 | 6 | 1 | 22 |
| BLM's Topsy Campground | Closed | 4 | 7 | Closed | Closed | 12 |
| **Subtotal** | **6** | **11** | **15** | **6** | **1** | **34** |
| Upper Klamath River/Hell's Corner Reach | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access[2] | Undefined | Undefined | Undefined | Undefined | Undefined | Undefined |
| BLM's Klamath River Campground[2] | Undefined | Undefined | Undefined | Undefined | Undefined | Undefined |
| Stateline take-out (PacifiCorp and BLM) | - | 2 | 5 | - | - | 8 |
| Fishing Access Sites 1 – 6 | 1 | 1 | 3 | 1 | - | 14 |
| **Subtotal** | **1** | **3** | **8** | **1** | **-** | **22** |
| Copco Reservoir | | | | | | |
| Mallard Cove | 4 | 3 | 8 | 3 | Closed | 26 |
| Copco Cove | 1 | 1 | 1 | 1 | Closed | 3 |
| **Subtotal** | **5** | **4** | **9** | **4** | **0** | **29** |
| Iron Gate Reservoir | | | | | | |
| Fall Creek Trail[3] | Closed | Closed | Closed | Closed | Closed | Undefined |
| Fall Creek | 2 | 2 | 3 | 2 | 1 | 7 |
| Jenny Creek | 2 | 2 | 3 | 2 | 1 | 11 |
| Wanaka Springs | 2 | 2 | 7 | 2 | Closed | 22 |
| Camp Creek | 18 | 16 | 21 | 14 | 1 | 73 |
| Juniper Point | 3 | 4 | 6 | 2 | 1 | 19 |
| Mirror Cove | 3 | 12 | 17 | 8 | 1 | 25 |
| Overlook Point | 1 | 2 | 1 | 1 | Closed | 10 |
| Long Gulch | 2 | 3 | 6 | 3 | 1 | 16 |
| Iron Gate Hatchery | 1 | 1 | 2 | 4 | 1 | 7 |
| **Subtotal** | **34** | **44** | **66** | **38** | **7** | **190** |
| Dispersed Sites (including Frain Ranch)[4] | 2 | 1 | 2 | 1 | 1 | 26 |
| **Study Area Total** | **65** | **78** | **128** | **76** | **12** | **305** |

Source: EDAW, Inc.

[1] Closed indicates a site was not open to public use during the specified season.

[2] Per methodologies described in the study plans, instantaneous counts were not performed at Sportsman's Park, BLM's Upper Klamath River (Spring Island) Boater Access, and BLM's Klamath River Campground. The site operator provided an annual estimate of use at Sportsman's Park, and BLM provided an annual estimate of use at BLM's Upper Klamath River (Spring Island) Boater Access and BLM's Klamath River Campground.

[3] Fall Creek Trail was gated (locked) during 2002 field counts.

[4] Observed vehicles at all dispersed sites in the study area were combined, as vehicle counts at most dispersed sites were very low (mean VAOT < 0.5)

In total, the combined yearly average number of VAOT in the study area was 359 (excluding Sportsman's Park, BLM's Upper Klamath River (Spring Island) Boater Access, and BLM's Klamath River Campground), while the maximum number of observed VAOT during any season was 305. Similar to PAOT, the resource area with the highest combined yearly mean VAOT in the study area was Iron Gate reservoir with 189 (53 percent). The Link River/Lake Ewauna/Keno reservoir resource area had the second highest combined yearly average number of VAOT with 77 (21 percent). The other resource areas each accounted for less than 15 percent of total observed VAOT in the study area. Vehicles at dispersed recreation sites (including Frain Ranch) only accounted for approximately 2 percent of the total observed VAOT in the study area.

The peak season average number of VAOT in the study area was 206 (excluding Sportsman's Park, BLM's Upper Klamath River (Spring Island) Boater Access, and BLM's Klamath River Campground) (Table 3.7-32). The number of peak season VAOT is likely a more accurate estimate of use at one time than PAOT (Table 3.7-21), as PAOT counts fail to capture visitors who park at a site, but do not directly participate in activities at that site (e.g., visitors who park at a site and then participate in boating or hiking away from the site).

Similar to the combined yearly average of VAOT, peak season VAOT were highest at Iron Gate reservoir (110) and lowest at the Upper Klamath River/Hell's Corner reach (11). In general, peak season VAOT (weekday and weekend combined) accounted for approximately 57 percent of the combined yearly observed vehicles in the study area. The percentage of peak season VAOT was highest at the Upper Klamath River/Hell's Corner reach resource area (85 percent) and lowest at the Link River/Lake Ewauna/Keno reservoir resource area (56 percent). This range of peak season use may be due to the seasonality of recreation activities, proximity to population centers, ease of access, and weather, among other factors.

#### 3.7.2.3 Study Area Reservoir Boat Counts

A third component of the instantaneous counts was to count the number of boats on the four study area reservoirs. The maximum number of observed boats and the mean number of PAOT observed at each reservoir during the peak season are presented in Table 3.7-33. Boat counts from the shoulder and off seasons are not reported as boat use during these seasons was generally low. However, several bass fishing tournaments were observed on Iron Gate reservoir during the early shoulder season.

Table 3.7-33. Peak season BAOT on study area reservoirs.

| Reservoir | Mean BAOT | MAX BAOT |
|---|---|---|
| Keno Reservoir | 1.7 | 7 |
| J.C. Boyle Reservoir | 3.1 | 10 |
| Copco Reservoir | 2.3 | 11 |
| Iron Gate Reservoir | 22.1 | 76 |

Source: EDAW, Inc.

Powerboats accounted for approximately 95 percent of observed boats during the peak season in the study area. On each reservoir, powerboats accounted for more than 90 percent of observed boats (Keno reservoir—93 percent, J.C. Boyle and Copco reservoirs—94 percent, and Iron Gate reservoir—96 percent). Observed powerboat activities in the study area included powerboat fishing, waterskiing/tubing, powerboating for pleasure, and personal watercraft (PWC) use. Powerboat fishing was the most observed powerboat activity on three of the four study area reservoirs (Keno, Copco, and Iron Gate reservoirs). Waterskiing/tubing was the most observed powerboat activity on J.C. Boyle reservoir and was also highly observed on Iron Gate reservoir.

Iron Gate reservoir had the highest mean BAOT, while Keno reservoir had the lowest. The substantial difference between mean BAOT on Iron Gate reservoir and the remaining three reservoirs is due to the regional popularity of Iron Gate reservoir for certain boating-related activities and its proximity to I-5. Based on field observations, several waterski clubs use the reservoir heavily during the summer months, especially when school is out (June through August). Additionally, several fishing tournaments were observed on the reservoir starting in May and continuing through the end of the peak season (early September). Both waterskiing and boat fishing events attract many powerboat users to Iron Gate reservoir, resulting in a higher mean BAOT than at other reservoirs in the study area.

#### 3.7.2.4 Estimate of Current Recreational Use of the Study Area

Existing recreational use of the study area was estimated in RDs. An RD is defined as a visit by a person to an area for recreation purposes during any portion of a 24-hour period and is the FERC's preferred unit of recreation measurement. RDs were estimated for the entire study area, as well as by site and resource area. Additionally, RDs were estimated by season of use (early shoulder season, peak season, late shoulder season, and off season). The number of RDs at each site, resource area, and in the study area is an estimate that provides a "ballpark" use figure to base current and future management decisions regarding recreational use of the study area.

RDs were estimated based primarily on VAOT (see Section 3.7.2.2), though PAOT and BAOT were also considered. In addition to VAOT averages, 3-hour observation data and survey results were also used to develop RD estimates. These additional data sources were used to estimate people per vehicle and length of stay. People per vehicle and length of stay, in conjunction with the VAOT estimates, are necessary to develop estimates of existing use (RDs) in the study area. In general, people per vehicle and length of stay estimates were derived from survey results and field checked during the 3-hour observation periods.

Survey results from two questions were used to develop a people per vehicle average. Visitors were first asked how many people were in their group and then asked how many vehicles their group used to access the study area. Specific results from each question are discussed in Section 3.7.1.2. The following equation was applied to the results to arrive at average people per vehicle:

$$\frac{\text{Average People per Group}}{\text{Average Vehicles per Group}} = \text{Average People per Vehicle}$$

Table 3.7-34 lists the average people per vehicle estimates that were calculated from the survey results. These results were then compared with 3-hour observation data. Based on 3-hour observations, the average number of observed people per vehicle in the study area was 2.7. This is generally consistent with the averages derived from the visitor questionnaire results.

Table 3.7-34. Average people per vehicle at recreation sites in the study area.

| Resource Area/Recreation Site | Average People per Vehicle |
|---|---|
| Link River/Lake Ewauna/Keno Reservoir | |
| Link River Nature Trail | 2.3 |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 2.8 |
| ODFW's Miller Island Boat Launch | 2.0 |
| Keno Recreation Area | 2.7 |
| J.C. Boyle Reservoir | |
| Sportsman's Park | 2.3 |
| Pioneer Park | 3.2 |
| BLM's Topsy Campground | 4.0 |
| Upper Klamath River/Hell's Corner Reach | |
| BLM's Upper Klamath River (Spring Island) Boater Access[1] | NA |
| BLM's Klamath River Campground[1] | NA |
| Stateline take-out (PacifiCorp and BLM) | 3.4 |
| Fishing Access Sites 1 – 6 | 2.5 |
| Copco Reservoir | |
| Mallard Cove | 2.2 |
| Copco Cove | 1.7 |
| Iron Gate Reservoir | |
| Fall Creek Trail[2] | NA |
| Fall Creek | 2.6 |
| Jenny Creek | 2.7 |
| Wanaka Springs | 2.5 |
| Camp Creek | 2.0 |
| Juniper Point | 2.5 |
| Mirror Cove | 2.0 |
| Overlook Point | 3.0 |
| Long Gulch | 2.6 |
| Iron Gate Hatchery Public Use Area | 1.8 |
| Study Area Dispersed Sites (including Frain Ranch) | 2.5 |

Source: EDAW, Inc.

[1] Per methodologies described in the study plans, surveys were not distributed at BLM's Upper Klamath River (Spring Island) Boater Access and BLM's Klamath River Campground. BLM provided an annual estimate of use at these two sites.

[2] Fall Creek Trail was gated (locked) during 2002 field observation and survey periods.

As part of the visitor questionnaire, visitors to the study area were also asked about their length of stay in the study area on their current trip. Summarized responses to this question are discussed in Section 3.7.1.2. Length of stay averages for each resource area were developed based on survey results and used to estimate the turnover rate of a site. A turnover rate is defined as the number of times during the day that a new vehicle replaces one that has left a site. Turnover rates were developed for each season (early and late shoulder season, peak season, and off season) based on the typical number of daytime hours per day during each season and the length of stay averages. The following equation was used to derive the turnover rate of a recreation site:

$$\frac{\text{Daytime Hours per Day Site is Open}}{\text{Average Length of Stay}} = \text{Turnover Rate}$$

The typical number of daytime hours per day by season was assumed to be 14 hours during the peak season, 12 hours during both the early and late shoulder season, and 10 hours during the off season. Table 3.7-35 lists the turnover rates by season for each resource area. These results were then compared with data collected during the 3-hour observation periods. Length-of-stay estimates from the 3-hour observations were calculated based on the number of vehicles entering a site, exiting a site, and other field researcher observations. Based on 3-hour observations, the length- of-stay estimate for the study area was 3.6 hours. In generally, this estimate is similar to results derived from the visitor questionnaire results.

Table 3.7-35. Turnover rates at study area resource areas.

| | Turnover Rates | | |
|---|---|---|---|
| **Resource Area** | **Early and Late Shoulder Seasons** | **Peak Season** | **Off Season** |
| Link River/Lake Ewauna/Keno Reservoir[1] | 4.4 | 5.2 | 3.7 |
| J.C. Boyle Reservoir[1] | 2.8 | 3.3 | 2.4 |
| Upper Klamath River/Hell's Corner Reach | 1.6 | 1.9 | 1.3 |
| Copco Reservoir | 3.0 | 3.5 | 2.5 |
| Iron Gate Reservoir[1] | 1.9 | 2.3 | 1.6 |
| Study Area Dispersed Sites (including Frain Ranch) | 2.3 | 2.8 | 1.9 |

Source: EDAW, Inc.

[1] Separate turnover rates were developed for Keno Recreation Area, BLM's Topsy Campground, and Camp Creek. These sites were examined separately because of they are used primarily for camping. The following turnover rates were developed for these three sites: shoulder seasons—1.7, peak season—2.0, and off season—1.5.

Seasonal RDs at most sites were calculated by multiplying VAOT averages (Table 3.7-32), people per vehicle averages (Table 3.7-34), turnover rates (Table 3.7-35), and the number of days per season (VAOT * people per vehicle * turnover rate * days per season = RDs). Due to the large number of walk-in visitors to the Link River Nature Trail and City of Klamath Falls' Veteran's Memorial Park/Boat Launch, RD estimates were doubled at these sites based on field observations. Additionally, peak-season RDs were adjusted to account for environmental factors (i.e., drought conditions in 2001 and forest fires in 2002) that affected recreational use of the study area. Historical peak-season data from PacifiCorp and BLM were reviewed and peak-season RDs were increased by 25 percent due to recent (1997 to present) decreases in recreational use. At three sites (Sportsman's Park, BLM's Upper Klamath River (Spring Island) Boater Access, and BLM's Klamath River Campground), an annual estimate of use was provided by the site manager. Seasonal estimates of use were made based on information from the site operator at Sportsman's Park and BLM at BLM's Upper Klamath River (Spring Island) Boater Access and BLM's Klamath River Campground.

Table 3.7-36 displays the seasonal and yearly estimates of RDs at recreation sites and resource areas in the study area. In total, it is estimated that annual recreational use of the study area is approximately 192,150 RDs (Table 3.7-36). Overall use of the study area appears to be moderate, though heavier use is experienced during the peak season.

Table 3.7-36. Estimated recreation days for the study area.

| Recreation Site/Resource Area | RECREATION DAYS[1] | | | | | |
|---|---|---|---|---|---|---|
| | Early Shoulder Season[2] | Peak Season[2] Weekday | Peak Season[2] Weekend | Late Shoulder Season[2] | Off Season[2] | Total |
| Link River/Lake Ewauna/Keno Reservoir | | | | | | |
| Link River Nature Trail[3] | 3,110 | 7,852 | 5,700 | 5,881 | 2,740 | 25,283 |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch[3] | 4,751 | 9,597 | 15,675 | 5,750 | 6,697 | 42,470 |
| ODFW's Miller Island Boat Launch | 1,382 | 698 | 3,167 | 2,091 | Closed | 7,338 |
| Keno Recreation Area | Closed | 1,431 | 3,246 | 1,360 | Closed | 6,037 |
| **Subtotal** | **9,243** | **19,578** | **27,788** | **15,082** | **9,437** | **81,128** |
| J.C. Boyle Reservoir | | | | | | |
| Sportsman's Park[4] | 1,890 | 3,150 | 4,410 | 1,890 | 1,260 | 12,600 |
| Pioneer Park | 2,112 | 4,974 | 5,159 | 3,194 | 1,241 | 16,680 |
| BLM's Topsy Campground | Closed | 2,160 | 3,430 | Closed | Closed | 5,590 |
| **Subtotal** | **4,002** | **10,284** | **12,999** | **5,084** | **2,501** | **34,870** |
| Upper Klamath River/Hell's Corner Reach | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access[4] | 788 | 1,313 | 2,363 | 788 | 0 | 5,252 |
| BLM's Klamath River Campground[4] | 150 | 250 | 450 | 150 | 0 | 1,000 |
| Stateline take-out (PacifiCorp and BLM) | 0 | 846 | 1,919 | 0 | 0 | 2,765 |
| Fishing Access Sites 1–6 | 156 | 947 | 2,291 | 236 | 0 | 3,630 |
| **Subtotal** | **1,094** | **3,356** | **7,023** | **1,174** | **0** | **12,647** |
| Copco Reservoir | | | | | | |
| Mallard Cove | 1,039 | 1,573 | 3,807 | 1,179 | 0 | 7,598 |
| Copco Cove | 195 | 395 | 358 | 296 | 0 | 1,244 |
| **Subtotal** | **1,234** | **1,968** | **4,165** | **1,475** | **0** | **8,842** |
| Iron Gate Reservoir | | | | | | |
| Fall Creek Trail[5] | - | - | - | - | - | - |
| Fall Creek | 385 | 778 | 1,058 | 583 | 680 | 3,484 |
| Jenny Creek | 408 | 823 | 1,120 | 617 | 720 | 3,688 |
| Wanaka Springs | 379 | 765 | 2,431 | 574 | Closed | 4,149 |
| Camp Creek | 2,443 | 4,320 | 5,145 | 2,874 | 479 | 15,261 |

Table 3.7-36. Estimated recreation days for the study area.

| Recreation Site/Resource Area | RECREATION DAYS[1] | | | | | |
|---|---|---|---|---|---|---|
| | Early Shoulder Season[2] | Peak Season[2] | | Late Shoulder Season[2] | Off Season[2] | Total |
| | | Weekday | Weekend | | | |
| Juniper Point | 565 | 1,519 | 2,067 | 569 | Closed | 4,720 |
| Mirror Cove | 452 | 3,645 | 4,686 | 1,822 | 531 | 11,136 |
| Overlook Point | 226 | 911 | 413 | 342 | Closed | 1,892 |
| Long Gulch | 385 | 1,166 | 2,117 | 875 | 680 | 5,223 |
| Iron Gate Hatchery Public Use Area | 135 | 273 | 496 | 820 | 478 | 2,202 |
| **Subtotal** | **5,378** | **14,200** | **19,533** | **9,076** | **3,568** | **51,755** |
| Study Area Dispersed Sites (including Frain Ranch)[6] | 454 | 459 | 833 | 344 | 800 | 2,890 |
| **TOTAL** | **21,406** | **49,845** | **72,340** | **32,234** | **16,306** | **192,131** |

Source: EDAW, Inc.

[1] Recreation day estimates are based on VAOT (Table 3.7-32), people per vehicle (Table 3.7-34), turnover rates (Table 3.7-35), and days per season.

[2] Days per season assumptions: early shoulder season (April 15-May 23)—39 days, peak season (May 24-September 2)—103 days (54 weekdays and 49 weekend days), late shoulder season (September 3-October 31)—59 days, and off season (November 1-April 14)—165 days. Based on historical trend data provided by PacifiCorp and BLM, peak season use was increased by 25 percent to account for environmental factors that affected recreational use levels in 2001 and 2002.

[3] Recreation day estimates at the Link River Nature Trail and City of Klamath Falls' Veteran's Memorial Park/Boat Launch are based on the assumption that visitors arrive by vehicle and by foot. A 50/50 (50 percent by vehicle and 50 percent by foot) split was assumed based on field observations.

[4] Per methodologies described in the study plans, counts were not performed at Sportsman's Park, BLM's Upper Klamath River (Spring Island) Boater Access, and BLM's Klamath River Campground. The site operator provided an annual estimate of use at Sportsman's Park and BLM provided an annual estimate of use at BLM's Upper Klamath River (Spring Island) Boater Access and BLM's Klamath River Campground.

[5] Fall Creek Trail was gated (locked) during 2002 field observation and survey periods.

[6] Recreation day estimates at dispersed sites in the study area were combined, as counts at most dispersed sites were very low.

Peak-season use represents approximately 64 percent of annual recreational use of the study area (Table 3.7-36). Peak-season recreation use is typically higher than at other times of the year, as the weather tends to be better during the summer months and people often take vacations during the summer, among other reasons. During the peak season, weekend use accounts for 59 percent of recreation use in the study area, while weekday use accounts for 41 percent of use. Similar to peak-season use, higher weekend use of recreation areas is typical. Separate estimates of weekday and weekend recreation use are provided for the peak season because of FERC Form 80 reporting requirements (Appendix 3B).

At each resource area, peak-season use accounted for the majority of annual recreation use. The peak-season percentage of annual use was highest at the Upper Klamath River/Hell's Corner reach resource area (82 percent—assuming approximately 70 percent of annual use at BLM sites occurs during the peak season) and lowest at the Link River/Lake Ewauna/Keno reservoir resource area (58 percent). The lower peak-season percentage of annual use in the Link River/Lake Ewauna/Keno reservoir resource area is due to the location of the Link River Nature Trail and City of Klamath Falls' Veteran's Memorial Park/Boat Launch in the city of Klamath

Falls. This location results in heavier use of this resource area during the shoulder (early and late) and off seasons compared with other resource areas.

The Link River/Lake Ewauna/Keno reservoir resource area accounted for the highest number of annual RDs (approximately 81,130) of the five resource areas. Similar to peak-season use, this is due to the location of two developed recreation sites in Klamath Falls, resulting in increased shoulder (early and late) and off-season use compared with the other resource areas. The Copco reservoir resource area accounted for the lowest number of annual RDs (approximately 8,850). Recreational use of Copco reservoir is lower because of its location (i.e., the reservoir is less convenient to access compared with other study area reservoirs) and because there are only two developed recreation sites along its shoreline, among other reasons.

In addition to annual and peak-season use, FERC Form 80 reporting requirements call for an estimate of annual and peak weekend average daytime and nighttime (overnight) use. Daytime and overnight use at each resource area, except the Upper Klamath River/Hell's Corner reach, was calculated using the estimate of current use in Table 3.7-37 and several assumptions. The following assumptions were made in order to calculate daytime and overnight use:

- Days of use included in Peak Weekend Average assumed to be all weekends (Friday though Sunday) between Memorial Day and Labor Day.
- A daytime/overnight use estimate was developed for Link River separately due to PacifiCorp reporting requirements. All use at the Link River was assumed to be daytime use.
- All overnight use at Keno reservoir is assumed to occur at Keno Recreation Area. Approximately 60 percent of use at Keno Recreation Area is estimated to be overnight use based on observations.
- Overnight use at J.C. Boyle reservoir is assumed to occur only at BLM's Topsy Campground. Approximately 70 percent of use at BLM's Topsy Campground is estimated to be overnight use based on observations.
- Approximately 35 percent of annual use at Sportsman's Park is assumed to be peak weekend use.
- Overnight use at Copco reservoir is assumed to occur at both Mallard Cove and Copco Cove. Approximately 25 percent of use of Mallard Cove and 20 percent of use at Copco Cove is estimated to be overnight use based on observations.
- Overnight use at Iron Gate reservoir is assumed to occur at all developed recreation sites except Iron Gate Hatchery Public Use Area. Approximately 55 percent of total use at Iron Gate recreation sites is estimated to be overnight use.

Annual and peak weekend average daytime and overnight use in the study area is displayed in Table 3.7-37. In general, there is more daytime use of developed recreation sites than overnight use at all areas except Iron Gate reservoir. Approximately 26 percent of annual use is attributable to overnight use. At Iron Gate reservoir, overnight use accounts for a larger percentage (53 percent) of total use, likely because there are more camping facilities/opportunities at this reservoir compared with the other areas.

Table 3.7-37. Estimated daytime and overnight use in the study area.

| Area | Estimated Number of RD | |
|---|---|---|
| | **Annual** | **Peak Weekend Average** |
| Link River | | |
| **Daytime** | 25,282 | 349 |
| **Overnight** | - | - |
| Keno Reservoir/Lake Ewauna | | |
| **Daytime** | 52,223 | 1,233 |
| **Overnight** | 3,622 | 119 |
| J.C. Boyle Reservoir | | |
| **Daytime** | 30,957 | 649 |
| **Overnight** | 3,913 | 147 |
| Copco Reservoir | | |
| **Daytime** | 6,694 | 192 |
| **Overnight** | 2,148 | 63 |
| Iron Gate Reservoir | | |
| **Daytime** | 24,502 | 555 |
| **Overnight** | 27,255 | 641 |

Source: EDAW, Inc.

### 3.7.3 Projection of Future Recreation Use

This section presents the results of the Projected Recreation Use Analysis and discusses the following topics:

- Areas of visitor origin and projected changes in the population of these areas
- Participation trends (state, regional, and national) for recreation activities occurring in the study area
- Projection of recreational use in the study area through 2040
- The role of study area recreation resources in the region

#### 3.7.3.1 Population Growth

In order to address projected recreation use in the study area, it is important to evaluate current population data for the surrounding counties and counties of origin of visitors to the study area. Additionally, it is also important to evaluate forecasts for population changes in these counties and the potentially affect these changes may have on study area recreation. Zip codes from the visitor questionnaire survey (Section 3.7.1) were used to determine the state and counties of origin of visitors to the study area.

The majority (61.6 percent) of visitors to the study area were from Oregon (see Table 3.7-38). An additional 35 percent of visitors were from California, 1 percent from Washington, and 2 percent from other scattered states including Hawaii, Nevada, Texas, South Dakota, Ohio, and Maine. Study area counties (Klamath, Oregon, and Siskiyou, CA) accounted for nearly 50 percent of visitors to the study area, indicating that at least half of the recreational use of the study area is from local county residents. Approximately 34 percent of visitors were from Klamath County, Oregon, the most visitors from a single county. Jackson County, Oregon, accounted for the second most visitors from a single county (15.1 percent) and Siskiyou County, California, accounted for the third most visitors from a single county (14.5 percent). The county of origin of the remaining visitors was distributed over several other counties in Oregon and California, as well as several other states (Table 3.7-38).

Table 3.7-39 details population projections for visitor counties of origin in Oregon and California. Both states are projected to grow significantly by the year 2040. Oregon is projected to experience a population increase of about 52 percent by 2040 and California is expected to experience a population increase of approximately 51 percent by 2040. Additionally, Table 3.7-39 indicates that the rapid growth occurring in many of the counties of origin of visitors to the study area is projected to continue through the year 2040.

Table 3.7-38. Percentage of visitors to the study area by state and county of origin.

| **State/County**[1] | **Study Area Percentage** |
|---|---|
| Oregon | 61.6 |
| Klamath | 33.6 |
| Jackson | 15.1 |
| Josephine | 6.7 |
| Lane | 1.8 |
| Other | 4.4 |
| California | 35.2 |
| Siskiyou | 14.5 |
| Shasta | 3.5 |
| Sacramento | 1.5 |
| Alameda | 1.5 |
| Contra Costa | 1.2 |
| Los Angeles | 1.2 |
| Del Norte | 1.1 |
| Other | 10.7 |
| Washington | 1.2 |
| Other States | 2 |

Source: EDAW, Inc.

[1] States/counties included in table each account for at least 1 percent of study area visitors. States/counties with less than 1 percent were combined in “Other” categories.

Table 3.7-39. Population estimates and forecasts for selected counties in Oregon and California.

| State/County | 2000 Population | Estimated 2040 Population | 2000-2040 Population Change (percent) |
|---|---|---|---|
| **Oregon** | 3,421,400 | 5,193,000 | 51.8 |
| Klamath | 63,775 | 91,547 | 43.6 |
| Jackson | 181,269 | 264,933 | 46.2 |
| Josephine | 75,726 | 108, 190 | 42.9 |
| Lane | 322,959 | 505,236 | 56.4 |
| **California** | 34,735,000 | 52,340,761 | 50.7 |
| Siskiyou | 44,301 | 62,040 | 40.0 |
| Shasta | 163,256 | 294,289 | 80.0 |
| Sacramento | 1,223,499 | 2,122,769 | 73.5 |
| Alameda | 1,443,741 | 2,069,530 | 30.2 |
| Contra Costa | 948,816 | 1,264,400 | 33.2 |
| Los Angeles | 9,519,338 | 13,388,161 | 45.9 |
| Del Norte | 27,507 | 50,885 | 85.0 |

Sources: CDF (1998), State of Oregon OEA (1997), and EDAW, Inc.

The five counties with the highest existing use in the study area (Klamath, Jackson, Siskiyou, Josephine, and Shasta counties) are all projected to grow by over 40 percent by the year 2040. Projected increases in these counties range from 40 percent in Siskiyou County, California, to 80 percent in Shasta County, California, by 2040. It should be noted that these five counties do not have major urban and metropolitan centers. Additionally, many of these counties currently have relatively small populations and their projected 2040 populations will remain relatively small compared with counties having large urban areas. The counties with major urban centers (e.g., Los Angeles County, Sacramento County) are projected to experience much greater growth in absolute numbers than many of the study area counties. For example, Los Angeles County is projected to increase by nearly 4 million residents by 2040; this increase in population alone dwarfs the total population of the five counties that account for the majority of existing use in the study area. It is possible that as the population of highly urban counties increases, recreation sites near these centers may become increasingly crowded, displacing some visitors to recreation sites (e.g., Klamath River) that are farther from their county of origin.

Overall, the increase in state and county populations will likely provide continued increases in demand for recreation facilities and activities in the study area, not level or declining demand. In general, population increases in the counties closest to the study area tend to increase demand for day use facilities and activities, while population increases in counties farther from the study area tend to increase demand for overnight recreation opportunities. In the study area, population increases will likely result in increased demand for both day use and overnight facilities, though the demand for overnight facilities may be slightly higher based on higher levels of existing overnight use in the study area (see Section 3.7.1.2).

#### 3.7.3.2 Trends in Recreation Activities

Analyzing current and future recreation activity participation in the study area provides information needed to help identify the recreational needs of the study area. Statewide, regional, and national activity participation trends were compared with activity participation data from the visitor questionnaire survey and field observations. This comparison was used to understand existing and projected levels of participation in recreational activities commonly pursued in the study area. The following statewide, regional, and national activity trend reports were used in this analysis:

- Outdoor Recreation in American Life: A national assessment of demand and supply trends (Cordell et al. 1999)
- Public Opinions and Attitudes on Outdoor Recreation in California 1993 (CDPR, 1994)
- Public Opinions and Attitudes on Outdoor Recreation in California 1997 (CDPR, 1998)
- Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2003-2007 (OPRD, 2003)

These studies provide information regarding outdoor recreation in the United States, as well as California and Oregon. Cordell et al. (1999) provides the most comprehensive research regarding future trends in outdoor recreation participation. Using statistical models, projected changes in demographics are used to assess likely future trends of various outdoor recreation activities. Based on these activity participation trends from Cordell et al., annual changes in several recreation activities currently occurring in the study area were developed and are displayed in Table 3.7-40.

Table 3.7-40. Projected annual changes in activity participation in the study area.

| Activity | Cordell | CDPR[1] | OR SCORP[1] | Study Area Projection Classification[2] |
|---|---|---|---|---|
| Motor Boating/PWC use | 1.20% | 3.00% | 0.20% | Increase |
| Sightseeing | 1.31% | 3.45% | 1.30% | Increase |
| Whitewater boating[3] | 1.18% | -4.81% | 5.95% | Slight Increase |
| Wildlife viewing | 1.20% | 7.32% | 6.84% | Increase |
| RV camping | 1.07% | -4.19% | 4.57% | Increase |
| Tent camping | 0.70% | -4.19% | -1.40% | Slight Increase |
| Picnicking | 1.05% | -3.34% | -1.47% | Minimal Increase |
| Rest/relaxation | 1.01% | NA[4] | NA | Increase |
| Hiking | 1.22% | 7.04% | No change | Increase |
| Biking[5] | 1.01% | -1.31 | -5.70 | Minimal Increase |
| Swimming | 1.03% | 1.78% | 0.72% | Slight Increase |
| Fishing | 0.60% | -6.97% | 2.47% | Slight Increase |
| Hunting | -0.16% | NA | 3.58% | Minimal Increase |
| Beach use/Sunning | 1.00% | 1.02% | 0.71% | Slight Increase |
| Waterskiing | NA | -1.73% | 1.62% | Increase |
| Off-highway vehicle use | NA | 1.01% | 1.58% | Slight Increase |

Sources: Cordell et al. 1999; CDPR, 1994 and 1998; OPRD, 2003; and EDAW, Inc.

1 CDPR and OR SCORP annual changes assume past trends in participation will continue.

2 Study area projection classifications defined as Increase—greater than 1.2 percent annual increase, Slight Increase—annual increase between 0.7 and 1.2 percent, and Minimal Increase—annual increase between 0.0 and 0.6 percent.

3 Whitewater boating is included in the “kayaking, rowboating, canoeing, and rafting” activity category in CDPR 1994 and 1998.

4 NA indicates that the activity was not addressed in the study.

5 The CDPR 1993 SCORP (1994) did not measure off-road biking. The CDPR 1997 SCORP (1998) characterized statewide demand for mountain biking as low. The Oregon 2003 SCORP (2003) included all types of biking, including biking on hardened surfaces and off road.

Neither the CDPR reports (1994 and 1998) nor the Oregon SCORP (2003) provide projected future trends in recreation activity participation. The CDPR reports only provide data on existing use within the state. By comparing existing use from the two reports (1994 and 1998), an annual percent change was developed and is reported in Table 3.7-40. Similar to the CDPR reports, the Oregon SCORP (2003) also only provides existing recreation activity participation data for 1987 and 2002. Based on the difference in participation between these two years, annual percent change in activity participation was again developed and is also reported in Table 3.7-40.

In addition to assessing national and regional recreation trends, current study area conditions were also evaluated in terms of their affect on future study area recreation activity participation. Current study area conditions that were considered include field observations (PAOT, VAOT, and BAOT), the supply of existing recreation sites, and population changes in the counties of origin of visitors to the study area. These current study area conditions and recreation trends (both regional and national) were used to categorize future changes in recreation activities occurring in the study area (Table 3.7-40). Study area activity participation changes were classified using the following categories:

- Increase (greater than 1.2 percent annual increase)
- Slight increase (0.7-1.2 percent annual increase)
- Minimal increase (0.0-0.6 percent annual increase)

Table 3.7-40 indicates that many of the popular activities in the study area are projected to have high levels of participation in the future (waterskiing, resting/relaxing, hiking, sightseeing, picnicking, etc.). In addition, not only are these activities currently popular in the study area, but they will become increasingly popular at a faster rate than many other activities. It is important to note that a decrease is not projected for any activity currently occurring in the study area.

#### 3.7.3.3 Projected Use at Recreation Sites in the Study Area

The previous section projected future participation in various recreational activities that are currently popular in the study area. Using this projection information, this section estimates future use at existing recreation sites and use areas in the study area over the anticipated term of the new license (assumed to be through 2040 for planning purposes). Site-level projected use was assessed by applying the projected annual increases in participation in various activities (which incorporate recreation activity participation trends and existing study area conditions) (Table 3.7-40) to existing use estimates at each recreation site (Table 3.7-36). RDs at each recreation site and resource area were projected through 2040.

Table 3.7-41 provides projected RDs in 10-year increments for each recreation site and resource area in the study area through 2040. The RD projections in Table 3.7-41 focus on use during the peak season because of heavier use during the warmer summer months (June through August). Peak-season weekend use is also a FERC Form 80 reporting requirement. Due to heavier use during the peak season, it is important to plan for adequate capacity (parking spaces, campsites, picnic tables, etc.) to accommodate recreational use during this period. Additionally, annual projections of recreation use are provided in order to provide context to the peak season projections and because they are required for FERC Form 80 reporting (annual projections represent the sum of early shoulder, peak, late shoulder, and off season projected use). It is important to emphasize that RD projections are estimates of future use and should be revised on a regular basis to adjust for changes in activity demand, user types, setting preferences, natural conditions, and other factors that affect recreation participation rates.

Overall, recreational use of the study area is projected to increase by 2040. Use of the study area is projected to reach approximately 282,520 RDs by 2040. This represents a 47 percent increase from existing use levels in the study area. Peak-season use (weekday and weekend combined) will also increase by approximately 47 percent. These results indicate that some new and/or expanded recreational facilities and use areas will likely be needed by the estimated term of the new license (30 years) to continue to address increasing visitor demand while protecting the natural resources in the study area. Percent occupancy (facility capacity), an indicator of the need for new and/or expanded recreation facilities, is discussed in Section 5.7.3 of the Recreation

Table 3.7-41. Estimated recreation use in the study area through 2040.

| Recreation Site/Resource Area | Primary Activity[1] | 2002 Peak Season RD WD[2] | 2002 Peak Season RD WE[2] | 2002 Annual RD | 2010 Peak Season RD WD | 2010 Peak Season RD WE | 2010 Annual RD | 2020 Peak Season RD WD | 2020 Peak Season RD WE | 2020 Annual RD | 2030 Peak Season RD WD | 2030 Peak Season RD WE | 2030 Annual RD | 2040 Peak Season RD WD | 2040 Peak Season RD WE | 2040 Annual RD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir | | | | | | | | | | | | | | | | |
| Link River Nature Trail | Hiking | 7,852 | 5,700 | 25,282 | 8,638 | 6,271 | 27,814 | 9,733 | 7,065 | 31,338 | 10,966 | 7,960 | 35,308 | 12,355 | 8,969 | 39,781 |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | Sightseeing | 9,597 | 15,675 | 42,470 | 10,558 | 17,244 | 46,723 | 11,895 | 19,429 | 52,642 | 13,402 | 21,891 | 59,312 | 15,100 | 24,664 | 66,826 |
| ODFW's Miller Island Boat Launch | Fishing | 698 | 3,167 | 7,338 | 738 | 3,348 | 7,759 | 791 | 3,590 | 8,319 | 848 | 3,850 | 8,920 | 910 | 4,128 | 9,565 |
| Keno Recreation Area | Rest/Relax | 1,431 | 3,246 | 6,037 | 1,574 | 3,571 | 6,642 | 1,774 | 4,024 | 7,484 | 1,998 | 4,534 | 8,432 | 2,252 | 5,108 | 9,500 |
| **Subtotal** | | **19,578** | **27,788** | **81,128** | **21,508** | **30,435** | **88,938** | **24,193** | **34,108** | **99,783** | **27,215** | **38,234** | **111,972** | **30,617** | **42,868** | **125,672** |
| J.C. Boyle Reservoir | | | | | | | | | | | | | | | | |
| Sportsman's Park | Target Shooting | 3,150 | 4,410 | 12,600 | 3,226 | 4,517 | 12,906 | 3,325 | 4,654 | 13,298 | 3,426 | 4,796 | 13,702 | 3,530 | 4,942 | 14,119 |
| Pioneer Park | Rest/Relax | 4,974 | 5,159 | 16,680 | 5,473 | 5,675 | 18,350 | 6,166 | 6,394 | 20,675 | 6,947 | 7,204 | 23,294 | 7,827 | 8,117 | 26,246 |
| BLM's Topsy Campground | RV Camping | 2,160 | 3,430 | 5,590 | 2,376 | 3,773 | 6,150 | 2,677 | 4,252 | 6,929 | 3,017 | 4,790 | 7,807 | 3,399 | 5,397 | 8,796 |
| **Subtotal** | | **10,284** | **12,999** | **34,870** | **11,075** | **13,966** | **37,406** | **12,168** | **15,300** | **40,902** | **13,389** | **16,790** | **44,804** | **14,756** | **18,456** | **49,161** |
| Upper Klamath River/Hell's Corner Reach | | | | | | | | | | | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | Whitewater Boating | 1,313 | 2,363 | 5,250 | 1,388 | 2,498 | 5,551 | 1,488 | 2,679 | 5,952 | 1,596 | 2,872 | 6,382 | 1,711 | 3,080 | 6,844 |
| BLM's Klamath River Campground | Whitewater Boating | 250 | 450 | 1,000 | 264 | 476 | 1,057 | 283 | 510 | 1,134 | 304 | 547 | 1,216 | 326 | 587 | 1,304 |
| Stateline take-out (PacifiCorp and BLM) | Fishing | 846 | 1,919 | 2,764 | 894 | 2,029 | 2,923 | 959 | 2,175 | 3,134 | 1,028 | 2,332 | 3,360 | 1,102 | 2,501 | 3,603 |
| Fishing Access Sites 1 – 6 | Fishing | 947 | 2,291 | 3,629 | 1,001 | 2,422 | 3,838 | 1,073 | 2,597 | 4,115 | 1,151 | 2,785 | 4,412 | 1,234 | 2,986 | 4,731 |
| **Subtotal** | | **3,355** | **7,022** | **12,644** | **3,547** | **7,425** | **13,369** | **3,804** | **7,961** | **14,335** | **4,079** | **8,536** | **15,371** | **4,373** | **9,153** | **16,481** |
| Copco Reservoir | | | | | | | | | | | | | | | | |
| Mallard Cove | Fishing | 1,573 | 3,807 | 7,599 | 1,664 | 4,026 | 8,035 | 1,784 | 4,317 | 8,615 | 1,913 | 4,629 | 9,237 | 2,051 | 4,963 | 9,905 |
| Copco Cove | Fishing | 395 | 358 | 1,244 | 417 | 379 | 1,315 | 447 | 406 | 1,410 | 480 | 435 | 1,512 | 514 | 467 | 1,621 |
| **Subtotal** | | **1,968** | **4,165** | **8,842** | **2,081** | **4,404** | **9,349** | **2,231** | **4,723** | **10,025** | **2,392** | **5,064** | **10,749** | **2,565** | **5,430** | **11,526** |
| Iron Gate Reservoir | | | | | | | | | | | | | | | | |
| Fall Creek Trail | Hiking | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fall Creek | Sightseeing | 778 | 1,058 | 3,484 | 855 | 1,164 | 3,833 | 964 | 1,312 | 4,319 | 1,086 | 1,478 | 4,866 | 1,224 | 1,665 | 5,483 |
| Jenny Creek | Rest/Relax | 823 | 1,120 | 3,689 | 906 | 1,233 | 4,058 | 1,020 | 1,389 | 4,572 | 1,150 | 1,565 | 5,151 | 1,295 | 1,763 | 5,804 |
| Wanaka Springs | Waterskiing | 765 | 2,431 | 4,150 | 842 | 2,674 | 4,565 | 949 | 3,013 | 5,144 | 1,069 | 3,395 | 5,795 | 1,204 | 3,825 | 6,529 |
| Camp Creek | Fishing | 4,320 | 5,145 | 15,261 | 4,568 | 5,440 | 16,137 | 4,898 | 5,833 | 17,303 | 5,252 | 6,255 | 18,553 | 5,631 | 6,707 | 19,893 |
| Juniper Point | Waterskiing | 1,519 | 2,067 | 4,720 | 1,671 | 2,274 | 5,192 | 1,883 | 2,562 | 5,850 | 2,121 | 2,887 | 6,591 | 2,390 | 3,253 | 7,427 |
| Mirror Cove | Waterskiing | 3,645 | 4,686 | 11,135 | 4,010 | 5,155 | 12,250 | 4,518 | 5,808 | 13,802 | 5,090 | 6,544 | 15,551 | 5,735 | 7,373 | 17,521 |
| Overlook Point | Waterskiing | 911 | 413 | 1,892 | 1,002 | 455 | 2,082 | 1,130 | 512 | 2,345 | 1,273 | 577 | 2,642 | 1,434 | 651 | 2,977 |
| Long Gulch | Fishing | 1,166 | 2,117 | 5,223 | 1,233 | 2,238 | 5,523 | 1,322 | 2,400 | 5,922 | 1,418 | 2,573 | 6,350 | 1,520 | 2,759 | 6,809 |
| Iron Gate Hatchery Public Use Area | Picnicking | 273 | 496 | 2,203 | 301 | 546 | 2,424 | 339 | 615 | 2,731 | 382 | 693 | 3,077 | 430 | 781 | 3,466 |
| **Subtotal** | | **14,201** | **19,534** | **51,757** | **15,388** | **21,180** | **56,064** | **17,022** | **23,445** | **61,988** | **18,840** | **25,967** | **68,577** | **20,864** | **28,776** | **75,909** |
| Study Area Dispersed Sites (including Frain Ranch) | Fishing | **459** | **833** | **2,890** | **485** | **881** | **3,056** | **520** | **944** | **3,277** | **558** | **1,013** | **3,514** | **598** | **1,086** | **3,768** |
| **TOTAL** | | **49,845** | **72,340** | **192,131** | **54,086** | **78,290** | **208,182** | **59,938** | **86,481** | **230,310** | **66,473** | **95,604** | **254,986** | **73,773** | **105,768** | **282,516** |

Table 3.7-41. Estimated recreation use in the study area through 2040.

| Recreation Site/Resource Area | Primary Activity[1] | 2002 Peak Season RD WD[2] | 2002 Peak Season RD WE[2] | 2002 Annual RD | 2010 Peak Season RD WD | 2010 Peak Season RD WE | 2010 Annual RD | 2020 Peak Season RD WD | 2020 Peak Season RD WE | 2020 Annual RD | 2030 Peak Season RD WD | 2030 Peak Season RD WE | 2030 Annual RD | 2040 Peak Season RD WD | 2040 Peak Season RD WE | 2040 Annual RD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Source: EDAW, Inc.

[1] Primary activity at each site based on survey results and field observations. RD projections area based on an annual percent change associated with each activity (Table 3.7-40).

[2] Weekday (WD)/Weekend (WE).

Needs Analysis. Additionally, a facility occupancy/recreation use monitoring plan will be provided in the draft RRMP (Section 6.0) to describe what conditions must be met before new and/or expanded recreation sites are developed.

#### 3.7.3.4 Regional Context

The study area represents an important regional resource in terms of water-based resources and provides a significant amount of recreation facilities and opportunities. One exception, however, is developed camping opportunities; the study area provides a very small amount of regional camping opportunities. With the exception of the very large UKL to the north and Shasta and Trinity lakes to the south, the reservoirs in the study area have a similar amount of surface water acreage available for water-based activities compared with other regional lakes and reservoirs.

The study area has a comparable number of boat launches when compared with lakes and reservoirs of similar size (surface acres) in the region and has a large percentage of the developed picnic areas for the region (61 percent of the total). However, the study area has a much smaller percentage of the developed campsites in the region (6 percent). Although they were not factored in with the other lakes and reservoirs in the region for the purposes of this study, the three larger lakes in the regional study area (UKL, Shasta, and Trinity) provide a large number of campsites, boat launches, and picnic areas.

In terms of the physical setting, the study area reservoirs are similar to only a few other lakes or reservoirs in the region. The study area reservoirs are located among a number of different mountain ranges (Coast Range, Siskiyous, Sierras, and Cascades) and are thus a unique environment within the region. As the river slices through the ancient volcanic rock of this conglomeration of ranges a variety of arid landscapes is encountered, from steep forested canyons to rolling brush covered hills. Only nearby Upper Klamath and Agency lakes could be considered as having a similar physical setting to Project reservoirs because of their proximity to the Project study area; however, each is much larger in size and both are adjacent to or near the city of Klamath Falls, agriculture/grazing lands, and a wildlife refuge.

The majority of visitors to both the study area and regional recreation areas come from surrounding local communities and counties. Recreation areas farther north in the region typically receive a majority of visitors from southern Oregon, while recreation areas farther south in the region typically receive a majority of visitors from northern California. However, reservoirs or lakes that are close to major highways or have a unique attraction, such as an excellent fishery or houseboating, also tend to have a higher proportion of visitors who travel from farther away, including the Bay Area or Portland, Oregon, area.

From a facility use perspective, the study area is similar to most other recreation areas in the region. Study area facilities have similar visitor use patterns, although facilities are not used at the same high level as they are at Lake of the Woods, Emigrant Lake, Trinity Lake, or Shasta Lake. Peak season for the region is typically between Memorial Day and Labor Day, although somewhat fewer numbers of visitors come to the area to go whitewater boating in the spring, to hunt or view wildlife in the fall, and to participate in snow activities in the winter. It is typical for study area facilities to experience moderate to high use during peak-season weekends and holidays while the most popular destinations in the region are also reaching capacity or are at full capacity.

Water-based activities that are available in the study area include swimming, fishing, motorized boating, waterskiing, PWC use, nonmotorized boating, and whitewater boating. Houseboating does not occur in the study area, and boat-in camping seldom occurs compared with Shasta Lake and Trinity Lake. There are several lakes in the region that provide a more serene experience, either because they have boating speed restrictions, such as Applegate reservoir and Hyatt Lake, or allow no motorized boating altogether, such as the multitude of alpine lakes located within wilderness areas nearby. There are flatwater and whitewater fishing opportunities of varying quality throughout the region. Many of the alpine lakes have excellent trout fisheries and several lakes, such as Howard Prairie reservoir, are stocked with trout. Chinook and coho salmon, steelhead, brown, cutthroat, and native trout are found in regional rivers.

The study area provides a unique setting in which to experience a variety of recreation activities that also occur throughout the region. A significant percentage of the region's public boat launches that are on similar-sized lakes and reservoirs are located in the study area. However, camping opportunities in the study area are relatively few compared with lakes and reservoirs of similar size in the region. During peak season, study area facilities are not utilized to the extent that others in the region are, but they do experience the same pattern of use: busy during summer weekends and holidays. Facilities that are close to the I-5 corridor (Shasta Lake and Trinity Lake); near larger cities such as Medford and Ashland (Emigrant reservoir); or at places that are historically popular with local county users (Lake of the Woods) tend to be more popular.

Overall, reservoirs in the study area are an important water-based recreation resource in southern Oregon and northern California. They provide an extensive amount of surface water area and boat launches for water-based recreation, although some are more difficult to access from major state highways and I-5. In addition, with only 79 developed campsites, the study area contains only a small percentage (6 percent) of reservoir-related camping in the region. Difficult access and lack of camping facilities have most likely kept study area reservoirs from becoming as popular as some of the other lakes and reservoirs in the region. As recreational use increases in the future and other regional recreation areas are used to their capacity, it is estimated that the study area will absorb more regional use.

## 3.8 DISCUSSION

This discussion is intended to provide a general summary of results from the Recreation Visitor Surveys pertinent to existing and future condition of recreation resources in the study area. These results will be used to develop the Recreation Needs Analysis (Section 5.0). The results of the Recreation Needs Analysis will synthesize existing and future recreation supply, demand, capacity, and needs of the study area.

### 3.8.1 Characterization of Existing Conditions

This study examined the condition of existing recreational use in the study area through the use of a visitor survey questionnaire, field observations, and visitor counts. This section provides a summary of the results from these investigations.

#### 3.8.1.1 Visitor Survey Questionnaire Results Summary

Visitor surveys were distributed to visitors at study area recreation sites during the 2001 and 2002 field seasons. The visitor surveys were used to assess visitor demographics and characteristics, areas of use, activity participation, perceptions and reactions to crowding, and preferences for future recreation and development, among other factors. Summary results from the visitor survey are provided below.

General Visitor Demographics and Characteristics

- A majority of visitor survey respondents were men (59 percent).
- The mean age of survey respondents was 44.
- Most survey respondents were either from Oregon (61.6 percent) or California (35.2 percent).
- Visitors from study area counties (Klamath, Oregon, and Siskiyou, CA) accounted for nearly 50 percent of all survey respondents.
- The average group size in the study area is approximately 6.8 visitors, while the median group size is four visitors.
- The average number of vehicles per group in the study area was 2.7.
- Over half of the survey respondents (60 percent) reported staying overnight in the study area.
- On average, overnight visitors spent 3.6 nights in the study area.
- Approximately 25 percent of survey respondents did not stay overnight in the study area, while an additional 15 percent reported living near the study area.
- On average, day users spent approximately 4.9 hours per visit in the study area.

Areas of Recreational Use

- Approximately 50 percent of survey respondents indicated that Iron Gate reservoir was the most visited regional recreation area in the vicinity of the study area.
- Other popular regional recreation areas include Shasta Lake, Lake of the Woods, Rogue River National Forest, Klamath National Forest, and Crater Lake National Park.
- A third of survey respondents (35 percent) indicated that Iron Gate reservoir was their primary destination in the study area.
- Most survey respondents indicated that the resource area they were contacted in was also their primary destination in the study area.

Study Area Recreation Activities

- The activity with the highest overall participation in the study area was resting/relaxing (60 percent of survey respondents).

- The primary activities (three) of survey respondents in the Link River/Lake Ewauna/Keno reservoir resource area are resting/relaxing, sightseeing, and hiking.
- The primary activities (three) of survey respondents in the J.C. Boyle reservoir resource area are resting/relaxing, picnicking, and swimming.
- The primary activities (three) of survey respondents in the Upper Klamath River/Hell's Corner reach resource area are whitewater boating, tent camping, and resting/relaxing.
- The primary activities (three) of survey respondents in the Copco reservoir resource area are boat fishing, RV camping, and resting/relaxing.
- The primary activities (three) of survey respondents in the Iron Gate reservoir resource area are boat fishing, resting/relaxing, and hiking.

Visitor Perceptions and Reactions to Crowding

- The mean perceived crowding score of survey respondents was 3 (on a nine-point scale from 1—not crowded—to 9—extremely crowded).
- A mean perceived crowding score of 3 is a low to moderate score and indicates that visitors to the study area generally do not feel overly crowded while participating in recreation activities.
- Iron Gate reservoir had the highest mean perceived crowding score (3.7), while Link River/Lake Ewauna/Keno reservoir had the lowest mean score (2).
- The majority of survey respondents (61 percent) felt that the number of people that they encountered was about what they expected.
- Many survey respondents (42 percent) felt that the number of people did not affect their enjoyment of their visit to the study area.
- Approximately 40 percent of survey respondents had changed their visits to the study area to help avoid crowding.
- The most commonly reported coping strategy to deal with crowding was avoiding holiday weekends.

Visitor Preferences for Future Recreation Development and Management

- The majority of survey respondents (84 percent) felt that the recreation facilities provided in the study area were adequate to meet their needs.
- Those respondents (16 percent) who did not feel that existing recreation facilities were adequate to meet their needs indicated that facility needs in the study area included more restrooms/showers, more campsites, and improved boat ramps/docks.
- Approximately 90 percent of survey respondents felt that the existing facilities in the study area were adequately maintained to meet their needs.

- Those few respondents (10 percent) who did not feel that existing facilities were adequately maintained indicated that maintenance concerns in the study area included unclean restrooms and litter accumulation.

- The three potential management options that received the most support from survey respondents included provide additional shoreline access opportunities, provide more developed campgrounds, and provide more day use facilities in the study area.

- The three potential management options that received the most opposition from survey respondents included collect fees at day use sites to be used to improve quality, collect fees at campgrounds to improve quality, and implement a partial campground reservation system in the study area.

#### 3.8.1.2 Existing Recreation Use Summary

Existing recreation use in the study area was estimated based on field observation data, in conjunction with results from the visitor survey. Summary results of existing recreation use in the study area are provided below.

- In total, the average number of peak season PAOT in the study area was approximately 300 and the maximum was 900 (excluding Sportsman's Park and BLM's Upper Klamath River [Spring Island] Boater Access).

- The resource area with the most observed use (PAOT) at developed recreation sites in the study area was Iron Gate reservoir (141), while the Upper Klamath River/Hell's Corner reach had the least (21).

- In total, the average number of peak season VAOT in the study area was approximately 210.

- The resource area with the highest number of observed vehicles was Iron Gate reservoir.

- In total, it is estimated that annual recreational use of the study area is approximately 192,150 RDs.

- Approximately 64 percent of annual recreational use in the study area is attributable to the peak season, 17 percent to the late shoulder season, 11 percent to the early shoulder season, and 8 percent to the off season.

- The Link River/Lake Ewauna/Keno reservoir resource area accounted for the highest number of annual RDs of the five resource areas, partially due to its proximity to the city of Klamath Falls, OR.

### 3.8.2 Characterization of Future Conditions

This study also examined the condition of anticipated future recreational use in the study area by projecting use through the end of the anticipated new license (assumed to be approximately 2040). Recreation use projections were based on existing use levels, county population changes, activity participation trends, and regional considerations. Summary results of projected recreation use in the study area are provided below.

- Oregon is projected to experience a population increase of approximately 52 percent and California is projected to increase approximately 51 percent by 2040.
- The five counties with the highest existing use in the study area (Klamath, Jackson, Siskiyou, Josephine, and Shasta counties) are all projected to grow by over 40 percent by 2040.
- The increase in state and county populations will likely provide continued increases in demand for recreation facilities and activities in the study area.
- Many of the activities that are currently popular in the study area (waterskiing, resting/relaxing, hiking, sightseeing, picnicking, etc.) are projected to have high levels of participation in the future.
- The study area represents an important regional resource in terms of water-based resources and provides a significant amount of recreation facilities and opportunities.
- In total, recreational use of the study area is projected to increase by approximately half again as much (47 percent) by 2040.
- By 2040, peak-season use of the study area is estimated to be approximately 179,550 RDs.
- By 2040, annual use of the study area is estimated to be approximately 282,520 RDs.
- Some new and/or expanded recreational facilities and use areas will likely be needed by the anticipated term of the new license to continue to address increasing visitor demand while protecting the natural resources in the study area.

# 4.0 REGIONAL RECREATION ANALYSIS

## 4.1 DESCRIPTION AND PURPOSE

The purpose of this study is to analyze existing Klamath Hydroelectric Project recreation information related to the supply and demand of regional recreation resources near the Project and to place the Project in proper context. The analysis focuses on water-based recreation activities that are relevant to the Project. This analysis is an important step in assessing the role of the various recreation resources and opportunities in the study area for meeting a portion of the regional demand, and in planning for potential future recreation developments on or near Project lands. This study capitalizes on existing information and focuses only on those primary activities that are related to the Project, such as boating, shoreline camping, shoreline day use activities, and whitewater boating and fishing. Although this study obtained information from regional recreation providers, analysis of this information is strictly limited to Project recreation activities and their context in the region.

A separate objective of this analysis is to characterize the demand for various recreation activities and how this demand may change in the future. Information was obtained from various sources to determine predicted changes in demand for various outdoor recreation activities primarily associated with reservoirs and river reaches. This information was augmented with updated national and regional demand forecasts from other recent publications.

## 4.2 OBJECTIVES

The objectives and key questions addressed by this study are as follows:

- Identify regional, statewide, and national trends in various outdoor recreation activities that are popular in the region and are associated with the Project.
- What is the demand in the study area for popular outdoor recreation activities, especially water-based activities? How is the demand currently met in the region?
- Collect information at regional sites where these primary activities occur.
- What are the supply and demand trends at these regional sites?
- Analyze the similarities and differences between these regional sites and those in the study area.
- Based on these similarities and differences, describe the overall recreational context and role of the Project within the region.

## 4.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The Project represents one of several water-based recreation resources in the region. Visitors from adjacent areas of northern California and southern Oregon, as well as other states and countries, come to this area to enjoy the many recreation opportunities. The results of this study provide the data and analysis necessary to better understand the role of the Project within the context of the surrounding regional area. This study intends to help focus decisionmaking about what kinds of recreation facilities and services may be needed in the study area in the future. If certain facilities or opportunities are already provided in the region, perhaps they do not also need to be provided in the study area. Alternatively, if the Project provides unique opportunities that are not available elsewhere in the region, then perhaps they should become the focus of new recreation development.

## 4.4 METHODS AND GEOGRAPHIC SCOPE

The regional study area encompasses major recreation destinations that offer similar types of reservoir and river recreation opportunities within a few hours' driving time (approximately 2 hours) of the Project. In contrast to the regional study area, the study area within the Project generally consists of recreation sites (developed and dispersed undeveloped), use areas, Project reservoirs, the immediate river corridor, and a ¼-mile buffer around each reservoir (Keno reservoir, J.C. Boyle reservoir, Copco reservoir, and Iron Gate reservoir). This study is not intended to be an exhaustive analysis of all recreation alternatives to those in the study area. Rather, it is intended to focus on surrounding regional recreation resources that may affect the Project and that may provide alternatives for Project visitors. Specific nonwhitewater areas and water bodies to be analyzed in this regional recreation study include:

- Agency Lake (BLM Lakeview District, USFWS, and Klamath County)
- Applegate reservoir and River (Rogue River National Forest, USFS)
- Emigrant Lake (Jackson County Parks Department)
- Fourmile reservoir (Winema National Forest [USFS])
- Howard Prairie reservoir (BLM and Jackson County Parks Department)
- Hyatt Lake (BLM Medford District)
- Lake of the Woods (Winema National Forest [USFS])
- Medicine Lake (Modoc National Forest [USFS])
- Shasta reservoir (Shasta-Trinity National Forest [USFS])
- Trinity reservoir (Shasta-Trinity National Forest [USFS])
- Upper Klamath Lake (Winema National Forest, USFWS, Klamath County)
- Whiskeytown Reservoir (Shasta-Trinity National Forest [USFS])

In addition, because the Upper Klamath River/Hell's Corner reach is included in the study area, other rivers with whitewater boating opportunities within neighboring river basins and major Lower Klamath tributaries are included in the regional study area. It is acknowledged that the Upper Klamath River/Hell's Corner reach has a very broad area for visitor origins, extending perhaps from Seattle, Washington to San Francisco, California, or beyond. It is the intent of this study to focus on the surrounding regional area. However, recognizing that whitewater recreation does have a broader visitor origin area, the regional study area (approximately 2 hours of driving time) has been extended somewhat for this activity type. Specific rivers used for whitewater recreation in the region that will be considered in this analysis include:

- Clear Creek (California)
- Klamath River-Lower (California)
- Klamath River- Upper (California, Oregon)
- McCloud River (California)

- Pit River (California)
- Rogue River (Oregon)
- Salmon River (California)
- Scott River (California)
- Smith River (California)
- Trinity River (California)
- Upper Sacramento River (California)

4.4.1 Collect and Analyze Regional Data

Within the regional study area, information was obtained on recreation activities that are available in the region and are similar to those in the Project, particularly water-related activities. Regional activities that are assessed include powerboating, whitewater boating, PWC use, RV and tent camping, picnicking, fishing, hiking/walking, and swimming. Regional public recreation areas where similar types of recreation opportunities may occur in the region are considered and include:

- California State Parks in region (CDPR)
- Cascade-Siskiyou National Monument (BLM)
- Crater Lake National Park (NPS)
- Fremont National Forest (USFS)
- Jackson County Parks
- Klamath Basin National Wildlife Refuges (USFWS), including Bear Valley, Clear Lake, Klamath Marsh, Lower Klamath, Tule Lake, and Upper Klamath Wildlife Refuges
- Klamath County Parks
- Klamath National Forest (USFS)
- Lakeview District- Klamath Falls Resource Area (BLM)
- Lava Beds National Monument (NPS)
- Medford District (BLM)
- Modoc National Forest (USFS)
- Oregon State Parks in region (OPRD)
- Rogue River National Forest (USFS)
- Shasta-Trinity National Forest (USFS)
- Siskiyou County Parks
- Six Rivers National Forest (USFS)
- Winema National Forest (USFS)

Methods for this regional recreation analysis involved obtaining regional recreation supply and demand information. The following entities were contacted and their resources were reviewed as part of this study:

- PacifiCorp

- BLM—Lakeview District (including Klamath Falls Resource Area), Medford District, and Cascade-Siskiyou National Monument

- USFWS—Klamath Basin National Wildlife Refuges including Bear Valley, Clear Lake, Klamath Marsh, Lower Klamath, Tule Lake, and Upper Klamath Wildlife Refuges
- USFS—Winema National Forest, Fremont National Forest, Klamath National Forest, Rogue River National Forest, Modoc National Forest, Six Rivers National Forest, and Shasta-Trinity National Forest
- NPS—Crater Lake National Park and Lava Beds National Monument
- CDPR
- OPRD
- California Department of Boating and Waterways (CDBW)
- Klamath County, Oregon (available resources included county comprehensive plans)
- Jackson County, Oregon
- Siskiyou County, California (available resources included county comprehensive plans)
- City of Klamath Falls, Oregon
- Local fishing guides, outfitters, and tackle shops in the region
- R Ranch (privately owned membership recreation facility)

Recreation supply and demand information was obtained from these sources as available, with data collection focusing on water-based recreation and other possible connections between Project and regional recreation resources. The entities listed above were contacted and asked to provide three types of information regarding: (1) the extent of current facilities; (2) the level of utilization of these facilities; and (3) the recreational opportunities that can be pursued in their area (Appendix 4A). Anecdotal information was also collected regarding the perceived adequacy of regional facilities to meet potential increases in visitation. In addition, information collected in other sections of this report (for example, Section 3.0, Recreation Visitor Surveys, and Section 5.0, Recreation Needs Analysis) was used to characterize the Project recreation resources in order to establish the role of the Project within the region.

This study also characterizes the existing demand for various recreation activities and how this demand may change in the future (through the anticipated term of the new license). In order to determine predicted changes in demand for various outdoor recreation activities, information was collected and analyzed from SCORP documents (CDPR, 1988; 1994; 1998), particularly the Public Opinions and Attitudes on Outdoor Recreation in California survey (CDPR, 1998); Oregon SCORP (OPRD, 2003); and Oregon State Marine Board (OSMB, 1999).

### 4.4.2 <u>Describe the Results of the Regional Analysis</u>

The results of the regional analysis are discussed below in Section 4.7, Study Observations and Findings.

## 4.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The following regulatory relationships have been identified in the Regional Recreation Analysis and are summarized below:

- An 11-mile segment of the Upper Klamath River was designated on September 22, 1994, as a BLM- and Oregon state-administered component of the federal WSR system, pursuant to Section 2 (a)(ii) of the National Wild and Scenic Rivers Act, and OSSW System. The information collected and analyzed in this study was used to help PacifiCorp and the stakeholders identify the uniqueness of this river reach and its relationship to other river related recreation opportunities in the region.

- FERC requires that a licensee develop a recreation plan for the Project area (18 CFR Section 4.51 F[5]). The information collected in this study was used to help develop the draft RRMP (see Section 6.0) and helped to place the Project study area in proper context within the region.

- The California Water Quality Control Plan for the North Coast Region designates Iron Gate and Copco reservoirs as having existing beneficial uses that are to be protected. The recreation-related beneficial uses include commercial or sport fishing; water contact recreation; and noncontact water recreation.

## 4.6 TECHNICAL WORK GROUP COLLABORATION

Following Stage 1 and the FSCD, the Regional Recreational Analysis study plan was expanded several times to incorporate agency comments as described in the First Stage Consultation Document (PacifiCorp, 2000). Study expansions included additional lakes, reservoirs, and rivers, and a greater emphasis on whitewater boating and fishing.

## 4.7 STUDY OBSERVATIONS AND FINDINGS

### 4.7.1 Regional Recreation Supply

This regional recreation supply discussion focuses on identifying and comparing Project recreation resources and regional recreation resources. Project recreation resources were categorized into the following three groups: (1) general reservoir-based recreation opportunities, (2) whitewater boating opportunities, and (3) fishing opportunities. Regional recreation resources were categorized into the following four groups: (1) regional lakes and reservoirs of similar size to those in the Project; (2) regional rivers with whitewater boating opportunities; (3) regional rivers with fishing opportunities; and (4) general recreation areas (other than those with lakes, reservoirs, and rivers) in the region. The discussion begins with the following description of Project recreation resources, and continues with the characterization of regional recreation resources. The subsection concludes with a summary of the role of Project recreation resources in the region.

#### 4.7.1.1 Project Recreation Resources

The Project is located on the Upper Klamath River in both southern Oregon and northern California (Figure 4.7-1). The existing Project consists of six generating facilities along 64 miles of the mainstem Upper Klamath River, between RM 190 and RM 254 (PacifiCorp, 2000). The existing Project has resulted in four reservoirs (Copco No. 2 reservoir was not investigated due to general lack of access) of varying sizes that provide land- and water-based recreation opportunities (Table 4.7-1).

Table 4.7-1. Project reservoir dimensions.

| Reservoir | Surface Area (acres) | Length (miles) |
|---|---|---|
| Keno/Lake Ewauna | 2,475 | 22.5 |
| J.C. Boyle | 420 | 3.6 |
| Copco | 1,000 | 4.5 |
| Iron Gate | 944 | 8.2 |
| **Total** | **4,839** | **38.8** |

Source: PacifiCorp, 2000.

Figure 4.7-1. Recreation opportunities within Project area.

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Approximately 26 of the 64 miles of river (41 percent) within the existing Project area is free-flowing. The longest section is approximately 21 miles from the J.C. Boyle powerhouse downstream to Copco reservoir. This reach, commonly referred to as the Upper Klamath River/Hell's Corner reach, provides opportunities for whitewater boating and fishing, dispersed camping, swimming/water play, and viewing scenery and wildlife.

#### 4.7.1.2 General Reservoir-based Recreation Opportunities within the Study Area

Public recreational access to Project lands and waters is widely available and dispersed. Since its construction, the Project has provided the region with a variety of developed and dispersed recreation opportunities, including bank and boat fishing, hunting, power and nonpower reservoir boating, whitewater boating, developed and dispersed camping, sightseeing, swimming, picnicking, waterskiing, PWC use, viewing scenery and wildlife, mountain biking, hiking, and off-highway vehicle (OHV) use. For an in-depth discussion of how the Project influences scenic views in the study area, see the Land Use, Visual, and Aesthetic Resources FTR. For a discussion of the Project's current and historical influences on its recreational settings, activities, and use levels see also Section 2.0, Recreation Flow Analysis.

Demand for recreation resources and activities in the region has grown significantly over the years. Like many other recreation areas in the region, recreation use is generally higher during the summer peak season (Memorial Day to Labor Day) and lower during the remainder of the year. An important determinant of recreation use in the study area is the weather. However, fishing is popular in the spring months and hunting is popular in the fall months.

The study area contains a total of 42 recreation sites, including 29 developed recreation facilities accessible by car. A majority of these sites are on Project reservoirs, as well as the free-flowing Klamath River. (A detailed inventory of Project recreation facilities and services is included in Recreation Needs Analysis, Section 5.0 of this report.) Recreation facilities and use areas in the study area include the following:

- Seven developed camping areas with approximately 79 campsites
- Fourteen day use/picnic areas with approximately 95 picnic tables
- Ten developed boat launches with a total of 14 ramp lanes
- Eight boat docks and two fishing docks
- Twenty-seven undeveloped dispersed recreation sites
- Nine accessible restrooms meeting Americans with Disabilities Act (ADA) requirements
- Thirty non-ADA-accessible restrooms
- Several areas suitable for wildlife observation/photography
- Two recreation trails
- No designated swimming areas
- No group facilities

#### 4.7.1.3 Whitewater River Boating Opportunities within the Study Area

The Klamath River draws visitors from a very broad area for whitewater boating recreation, extending from central California to Washington and beyond (Figure 4.7-1). A majority of the Klamath River within the study area is not suitable for whitewater recreation because it has been inundated by the Project. However, there are five reaches containing just over 30 miles of river within the study area and a sixth reach containing 123 miles downstream of the study area that provide whitewater boating opportunities. Based on Klamath National Forest data, annual whitewater use totals for the sixth reach (below Iron Gate dam to the confluence with the Salmon River) are estimated to be 1,098 trips with 12,079 people served in 2001 (there were 623 commercial trip receipts for 2001, plus 475 estimated private boaters converted from a 2002 ocular count of 1,900 private boaters). Although in-depth quantitative data were not readily available for the Upper Klamath River/Hell's Corner reach, voluntary permit data representing up to 70 percent of whitewater boaters (commercial and private boaters combined) on the Klamath indicates that the total number of whitewater boat trips over an 8-year period beginning in 1994 ranged from a low of 332 in 2001 to a high of 482 in 1996 (Weidenbach, pers. comm., August 13, 2002). Quantitative use data generally do not exist for the four other reaches in the Project area (Link River bypass reach, Keno reach, J.C. Boyle bypass reach, and Copco No. 2 bypass reach). The whitewater boating opportunities on the six reaches of the Klamath River are briefly summarized below and are further discussed in Section 2.0, Recreation Flow Analysis, of this report.

Link River Bypass Reach

The first boatable reach is the Link River bypass reach (this reach is not included in the proposed Project). This bypass reach extends from the outlet of Link River dam on UKL to the backwater of Keno reservoir known as Lake Ewauna. The reach is approximately 1 mile in length. The Link River dam is owned by the USBR. PacifiCorp currently operates two small powerhouses (East Side and West Side) that partially divert the Link River bypass reach. Base flows for fishery resources are provided. The reach features an adjacent gravel road/bike path (Link River Nature Trail) that is commonly used by residents in the Klamath Falls area. The river itself has moderate gradient. At times of higher flows in the Link River bypass reach, a "play wave" forms in the reach is used by local kayakers. The reach may provide other opportunities such as tubing and bank fishing. The surrounding environment is essentially rural to suburban, with extensive private landholdings adjacent to the river.

Keno Reach

The second boatable reach in the study area is the Keno reach, a seldom-run section below the Keno dam in Oregon (this reach is not included in the proposed Project). This river reach runs from the outlet of Keno dam to the backwater of J.C. Boyle reservoir. Keno reservoir is essentially operated as a re-regulating project for USBR's Klamath Irrigation Project withdrawals. This river reach downstream of Keno dam features a steep canyon about 5 miles in length. There are no diversions along this river reach. This reach has Class III rapids and the gradient averages 50 feet per mile (fpm) (Cassady and Calhoun, 1995); in addition, there is a permanent "play wave" in this reach. Very few guidebooks mention this particular run, likely due to difficulty accessing this area, the short length of the run, and the sharp volcanic riverbed rock that is hard on boaters and their equipment.

J.C. Boyle Bypass Reach

The third boatable reach in the study area is the J.C. Boyle bypass reach. This bypass reach runs from the J.C. Boyle dam to the J.C. Boyle powerhouse. Power generation associated with the

J.C. Boyle Development generally diverts all but minimum flows from the J.C. Boyle bypass reach, with spills occurring only when upstream storage capacity is full (J.C. Boyle reservoir, Keno reservoir, and UKL) and the hydraulic capacity of the powerhouse (about 2,500 cfs) is exceeded. Minimum instream flows in the reach are 100 cfs, per the current FERC license, and springs add about 225 cfs (starting about a half-mile below the dam). Total base flows in the reach are thus about 325 cfs. About 5 miles long, the bypass reach is accessible by road near the dam and powerhouse only. A parallel road also is located upslope above the river in the canyon.

Recreation opportunities in the J.C. Boyle bypass reach include trout fishing, whitewater boating opportunities, and general riverside recreation. This reach offers a 5-mile Class III to IV whitewater run that is boatable at medium to high flows, and is similar to the "gorge" section on the Hell's Corner reach. A few rapids have enough gradient and constriction to offer Class IV/V challenge at higher flows, while most rapids and lower flows are Class III/IV difficulty. There are several opportunities for off-trail hiking along parts of the river, and a few benches and other clearings in the riparian zone offer places to enjoy the river. (See Section 2.7.1.7 of the Recreation Resources FTR).

<u>Hell's Corner Reach</u>

The fourth boatable reach in the study area is the Hell's Corner reach. This reach is much better known, as well as extremely challenging. This reach is 17 miles long and extends from the J.C. Boyle powerhouse in Oregon to the California border (11 miles) and from the border downstream to Copco reservoir (6 miles). This river reach is characterized as a swift river in a natural scenic setting with periodic shoreline access and proximity to population centers. As such, it receives significant use by commercial rafting outfitters, private whitewater boaters, and shoreline anglers. Boating typically occurs from April through October. The reach is considered to be Class IV+ on the International Scale of Whitewater Difficulty. When one J.C. Boyle powerhouse generator is running at optimum efficiency (typical summer conditions), the flow is usually about 1,500 cfs, including approximately 350 cfs accretion flow in the J.C. Boyle bypass reach. When two Project generators are running (winter, spring, sometimes summer and fall), the flow increases to about 2,700 cfs, including accretion flow. These flow levels are not continuous. The 11-mile reach in Oregon was designated by Congress in 1994 as a Wild and Scenic River (WSR) and classified as "scenic." This section of river has been rated by one guidebook as having very good scenery and solitude for whitewater boaters (Cassady and Calhoun, 1995). The Omnibus Oregon Wild and Scenic Rivers Act (1988) also designates this same 11-mile reach of the Klamath River within Oregon as an Oregon State Scenic Waterway (OSSW).

Hell's Corner reach contains 76 rapids, several of which are Class III or IV and two that are Class V (Quinn and Quinn, 1983). The first several miles of the run are Class III until the beginning of a reach called Hell's Corner, which begins with a Class V rapid. Whitewater then remains consistent as the river cascades through a gorge for 5 miles. This 17-mile reach of the Klamath River is usually run in one day. Boating opportunities exist year-round due to relatively stable flow rates provided by the operation of hydroelectric facilities upstream. However, flows are optimal from April through October, when the flow rate remains between 500 and 5,000 cfs (www.americanwhitewater.org). Approximately 90 percent of those who participate in whitewater boating activities in the study area do so through a private outfitter. The remaining 10 percent are private individuals.

This run is considered challenging due to the length of the whitewater, the lack of slack water between the rapids, and the sharp volcanic rock of the riverbed that is unforgiving on rafters and their equipment. Due to these factors, many guidebooks recommend that only advanced and expert boaters tackle this run in either rafts or kayaks, but not canoe (Cassady and Calhoun, 1995; Holbek and Stanley, 1998; Willamette Kayak and Canoe Club, 1994). The use of the Klamath River within the study area by whitewater boaters has historically been moderate to low relative to other rivers in the region. This is due to the reach's difficulty level and the boaters' unfamiliarity with the runs. In addition, access to this location is difficult and time consuming. However, the run has gained popularity in the last 10 to 20 years and several commercial raft outfitters now operate one- and two-day trips there. BLM permits over 20 outfitters along this reach.

Copco No. 2 Bypass Reach

The fifth boatable reach in the study area is the Copco No. 2 bypass reach. This reach is approximately 1.5 miles in length and is located in a fairly steep, remote canyon between the Copco No. 2 diversion dam and Iron Gate reservoir. The only access is by a steep gravel road to the Copco Nos. 1 and 2 dams, which are closed to public vehicles. This bypass reach may offer undocumented boating and fishing opportunities.

Below Iron Gate Dam/Middle Klamath River Reach

A sixth boatable reach, below Iron Gate dam, is primarily outside of the study area. This reach is approximately 123 miles long and encompasses a variety of terrain and recreation opportunities. A large private recreation complex (R Ranch) is located downstream of Iron Gate dam and receives use by casual boaters, tubers, and campers. Currently, these reaches are generally unaffected by Project operations (with flows dictated by accretion and USBR-directed releases). A more detailed discussion of the river below Iron Gate dam is provided in Section 2.0, Recreation Flow Analysis.

Recreation Facilities Associated with Whitewater Boating in Study Area

The Recreation Flow Analysis (Section 2.0 of this report) documents the recreation opportunities available in these six boatable reaches; identifies acceptable and optimal flow ranges for them; and determines potential impacts of flow changes during different times of the year.

River access for whitewater boating activities ranges from easy to difficult depending on the river reach. On the more popular Hell's Corner reach, BLM constructed BLM's Upper Klamath River (Spring Island) Boaters Access, a put-in site located a short distance downstream of the J.C. Boyle powerhouse. A paved parking lot and gravel access road provide convenient access to this put-in location and its associated picnic sites, changing rooms, and toilets. However, the last portion of the access road is steep and often in rough shape. Camping is not permitted at this location. BLM also operates the Klamath River Campground, a three-unit developed campground 2.5 miles downstream from the put-in. Put-in and take-out are permitted at BLM campground. Dispersed camping and day use also occurs on property owned by BLM and PacifiCorp along the river. A popular dispersed site and take-out along Hell's Corner reach called Frain Ranch is located downstream of BLM campground. PacifiCorp and BLM provide a semiprimitive (with toilets) take-out site near the California-Oregon border called Stateline take-out (PacifiCorp and BLM). This is the most frequently used take-out for rafters floating the Hell's Corner reach. PacifiCorp also provides six semiprimitive (toilets and parking) river access sites (Fishing Access Sites 1 through 6) between Copco reservoir and Stateline take-out (PacifiCorp and BLM). Fishing Access Site 1 (6 miles downstream of Stateline take-out [PacifiCorp and BLM]) is the only site that boaters are allowed to use to take out their boats, though permitted private outfitters are allowed to use Fishing Access 6 (for a fee).

Access to the Link River bypass reach is located adjacent to the Link River Nature Trailhead (North), as well as near the southern terminus of the trail. Access to the other river reaches is less obvious and/or more difficult. Access to the Keno reach is possible at the Keno dam and along a gravel road that parallels the river for about half its length (but remains relatively high above the river). The take-out is a couple miles west on J.C. Boyle reservoir where State Route (SR) 66 crosses the reservoir at Pioneer Park (Willamette Kayak and Canoe Club, 1994). Several unimproved boater take-out sites are located adjacent to Sportsman's Park on the upper end of J.C. Boyle reservoir. Remote access limits recreation use along this reach. Access to the J.C. Boyle bypass reach is via the road to the J.C. Boyle powerhouse. Access is even more difficult to the Copco No. 2 bypass reach via a steep road down to Copco Nos. 1 and 2 dams, which are closed to public access via vehicle.

#### 4.7.1.4 River Fishing Opportunities within the Study Area

Although in-depth quantitative data were not readily available, a survey conducted as part of the Recreation Visitor Survey Analysis (Section 3.0 of this report) indicates that 34 percent of visitors to the Project area participate in bank fishing (Figure 4.7-1). An angler survey was conducted along the river reach through Labor Day of 2002 to determine more specific details about fishing in the Project area and to see how the quality of this activity compares with other fishing opportunities in the region (Section 5.0).

Based on anecdotal evidence provided by local anglers and angler supply shops, fishing for trout on river reaches within the study area is considered very good (Miranda, Ramirez, Trophy Waters Fly Fishing Shop, pers. comm., 2002). Two popular fishing reaches are the Keno reach below the Keno dam and the J.C. Boyle bypass reach below the J.C. Boyle dam (Trophy Waters Fly Fishing Shop, pers. comm., 2002). According to BLM fisheries Web page, resident trout (*Oncorhynchus mykiss*) is the most common trout species and is a popular sport fish in the Klamath Basin (BLM website, 2002). Available data from a resident fish creel census summary show that trout ranging in size from 8 to 20 inches were caught each year between 1979 and 1982 on the reaches below the Keno and J.C. Boyle dams (Tolman, 1983). As previously noted, the Recreation Flow Analysis (Section 2.0) provides a discussion of how Project study area flows affect recreation activities in Project reaches.

<u>Link River Bypass Reach</u>

The Link River bypass reach is approximately 1 mile long and provides trout fishing areas near the city of Klamath Falls (this reach is not within the proposed Project). Based on observations made during field research, anglers appear to use the river at a few sites where there is access through thick riparian vegetation. During low flows, anglers walk along the exposed bank between the water and vegetation. ODFW regulations for the Link River bypass reach allow the use of bait and limit the catch to one trout per day. Fishing along this reach is allowed all year

(ODFW website, 2003). Anecdotal evidence provided by local anglers indicates that the primary trout fishery in the Link River bypass reach occurs in late winter through early spring, peaking typically in March. Reported trout sizes are large, averaging approximately 20 inches in length (Fortune, pers. comm., 2003).

Keno Reach

The Keno reach is 5 miles long and provides very good trout fishing opportunities in an undeveloped rural area (this reach is not within the proposed Project). The river is generally accessible by undeveloped roads below Keno dam and in Sportsman's Park near J.C. Boyle reservoir. There may be additional undeveloped angler access from SR 66 or gravel roads on the north bank of the river, but some of them may cross private or PacifiCorp lands. Based on anecdotal evidence from a local angler shop, the number of anglers on the Keno reach varies. There are often more anglers on the reach during public holidays (Trophy Waters Fly Fishing Shop, pers. comm., 2002). The reach is also popular because trophy-size native resident trout have been caught there. Available catch statistics indicate that, while angler success in Keno reach is consistently low, there are a greater percent of larger fish caught there than in the reaches between J.C. Boyle dam and powerhouse and from the J.C. Boyle powerhouse to the California border (Tolman, 1983). Trout caught in the Keno reach have typically ranged from 12 to 20 inches in length (Tolman, 1983). ODFW regulations for the Keno reach limit the catch to one trout per day. The season is open from January 1 through June 15 and from October 1 through December 31 (ODFW website, 2003). The Recreation Flow Analysis (Section 2.0 of this report) includes interviews with local anglers that help define when, where, and how anglers use the reach, and whether the quality of fishing is flow dependent.

J.C. Boyle Bypass Reach

The J.C. Boyle bypass reach is 5 miles long and provides good trout fishing opportunities in an undeveloped rural area. Based on conversations with local anglers and angler supply shops, this reach often has more anglers than the Link River bypass reach (Miranda and Trophy Waters Fly Fishing Shop, pers. comm., 2002). Available catch statistics indicate that, while angler success in the J.C. Boyle bypass reach is good, fish size has typically been smaller and rarely exceeds 16 inches (Tolman, 1983). ODFW regulations for the Keno reach limit the catch to one trout per day. The season lasts from January 1 through June 15 and from October 1 through December 31 (ODFW website, 2003). The Recreation Flow Analysis (Section 2.0) includes interviews with local anglers that help define when, where, and how anglers use the reach, and whether the quality of fishing is flow dependent.

Hell's Corner Reach

The Hell's Corner reach is approximately 17 miles long and provides trout fishing areas throughout the canyon. Based on observations made during field research, angler use in Hell's Corner reach appears low. This may be due to difficulty accessing the river within the canyon. Available catch statistics indicate that trout caught in this reach have typically ranged from 6 inches to 16 inches in length (Tolman, 1983). ODFW regulations for the Hell's Corner reach limit the catch to one trout per day. The trout fishing season lasts all year, with a catch and release period from June 16 through September 30 (ODFW website, 2003). CDFG regulations for the Upper Klamath River above Iron Gate dam set the bag limit for salmon or trout at 5 total per day (salmon and trout in combination). The fishing season (for all species) for the Upper Klamath River above Iron Gate dam begins the last Saturday in April and continues through November 15, except within 250 feet of the mouth of Shovel Creek, where the season begins June 16 and continues through November 15 (CDFG website, 2003). The Recreation Flow Analysis and Recreation Visitor Surveys include interviews with local anglers that help define when, where, and how anglers use the reach, and whether the quality of fishing is flow dependent or in conflict with boating use or flows (Sections 2.0 and 3.0 of this report, respectively).

Copco No. 2 Bypass Reach

The mile-long Copco No. 2 bypass reach primarily offers hiking and associated day use opportunities in a river setting. There are no developed trails on the Copco No. 2 bypass reach, but anglers willing to wade the river and bushwhack along the shore can gain access to numerous pools and riffles at base flows (about 10 cfs) (Recreation Flow Analysis, Section 2.0 of this report).

Below Iron Gate Dam Reach

The Klamath River below Iron Gate dam extends nearly 200 miles before flowing into the Pacific Ocean. The main Klamath River from 3,500 feet below Iron Gate dam and downstream to the mouth is open to fishing year-round. This reach attracts and supports several fishing outfitter services that focus on the salmon, steelhead, and trout fisheries. The main run of Klamath River Chinook salmon is normally over by mid-January each year. A considerable number of migrating salmon accumulate below the Iron Gate dam and are prevented from migrating to the Upper Klamath River drainage. This has occurred since the early 1900s due to dams on the Klamath River (BLM website, 2003). In late fall, during the peak of the salmon run, the fish tend to bunch up at Iron Gate dam because there is no passage over the dam. The steelhead fishery normally starts in November. The native trout on the Klamath River are a mixture of wild trout and hatchery steelhead, which naturalized.

Typically, the southern reaches in California are not as popular with anglers from Klamath Falls and other Oregon communities and vice versa. The time required to get from Klamath Falls to reaches in the lower Project area and the cost of a California fishing license make it less likely that Klamath Falls and surrounding community residents will fish the lower reaches (Ramirez, pers. comm., 2002).

Phase I whitewater recreation flow study results for below Iron Gate dam, including information on whitewater boating, fishing, and other recreational activities, are reported in Section 2.0 of this report (Recreation Flow Analysis).

#### 4.7.1.5 Regional Recreation Resources

This subsection details the regional recreation resources that offer facilities and experiences similar to those available in the study area and that may provide alternatives for Project visitors (Figure 4.7-2). Four categories of regional recreation resources are included in the following discussion: (1) regional lakes and reservoirs of similar size to those in the Project; (2) regional rivers with whitewater boating opportunities; (3) regional rivers with fishing opportunities; and (4) general recreation areas in the region. The focus of this subsection is primarily on publicly managed, water-based (including whitewater boating and fishing) recreation opportunities in southern Oregon and northern California within, but not limited to, a few hours' drive from the Project boundaries. A visitor survey conducted at the four Project reservoirs revealed that the following regional recreation areas are frequented by people who also visit the Project (Table 4.7-2).

Table 4.7-2. Regional recreation areas visited by people who also visit the study area.

| Area | Percentage of Those Surveyed Who Visited the Study Area |
|---|---|
| Iron Gate Reservoir* | 50% |
| Shasta Lake | 36% |
| Lake of the Woods | 36% |
| Crater Lake National Park | 32% |
| Klamath National Forest | 33% |
| Rogue River National Forest | 33% |
| Howard Prairie Reservoir | 26% |
| Upper Klamath National Wildlife Refuge | 25% |
| Upper Klamath Lake/Agency Lake | 26% |
| Lake Ewauna/Keno Reservoir* | 24% |
| Winema National Forest | 23% |
| Lower Klamath National Wildlife Refuge | 24% |
| Copco Reservoir* | 25% |
| J.C. Boyle Reservoir* | 21% |
| Lake Shastina | 18% |
| Emigrant Reservoir | 17% |
| Willow Lake | 15% |
| Hyatt Reservoir | 14% |
| Trinity Lake | 12% |
| Whiskeytown Lake | 12% |
| Gerber Reservoir | 10% |
| Round Lake | 8% |
| Six Rivers National Forest | 8% |
| Cascade-Siskiyou National Monument | 5% |
| Aspen Lake | 5% |
| Horseshoe Ranch Wildlife Area | 5% |
| Buck Lake | 4% |

Source: EDAW, Inc. (Survey data collected in 2001 and 2002; see Section 3.0 of this report).

[1] More than one area could be indicated.

* Reservoirs in the Project study area.

Figure 4.7-2. Recreation opportunities within the Klamath region.

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#### 4.7.1.6 Regional Lakes and Reservoirs of Similar Size to Those in the Project

Regional lakes vary in size and character (Figure 4.7-2). In Klamath County, Oregon, there are 32 boatable lakes and six boatable rivers containing a total of 25 improved and 13 unimproved boat ramps. In Jackson County, Oregon, there are 24 boatable lakes and three boatable rivers containing eight improved and 16 unimproved boat ramps (Boat Escape website, 2002). In Siskiyou County, California, there is vehicular access to over 30 boatable lakes and there are more than 180 high-elevation and wilderness lakes (Siskiyou County Visitor's Bureau website, 2002). These facilities, and the lands and waters they exist on, are owned and managed by private and public (federal, state, county, and local) entities.

As previously mentioned, the four reservoirs in the study area are relatively large (ranging between 420 and 2,475 acres, averaging approximately 800 acres). The regional lakes and reservoirs of similar size to those in Project are listed in Table 4.7-3 and discussed below.

Table 4.7-3. Regional lakes and reservoirs compared with those in the study area.

| Lake or Reservoir | Size (acres) | Managing Agency (land and facilities) |
|---|---|---|
| Agency Lake | 5,500 | BLM- Klamath Falls Resource Area, USFWS, Klamath County |
| Applegate Reservoir | 988 | USFS- Rogue River National Forest |
| Emigrant Lake | 806 | Jackson County, OR- Parks Department |
| Fourmile Lake | 740 | USFS- Winema National Forest |
| Howard Prairie Reservoir | 2,000 | Jackson County, OR- Parks Department |
| Hyatt Reservoir | 1,250 | BLM- Medford District |
| Lake of the Woods | 1,113 | USFS- Winema National Forest |
| Medicine Lake | 408 | USFS- Modoc National Forest |
| Shasta Lake | 29,500 | USFS- Shasta-Trinity National Forest |
| Trinity Lake Unit | 16,535 | USFS- Shasta-Trinity National Forest |
| Upper Klamath Lake | 85,120 | USFS- Winema National Forest, USFWS, Klamath County |
| Whiskeytown Lake | 3,200 | USFS- Shasta-Trinity National Forest |

Source: EDAW, Inc.

##### Agency Lake

Agency Lake (5,500 acres), which is north of UKL and connected by a mile-long inlet, has three improved and two unimproved boat launches. There are three private campgrounds and two county campgrounds (Henzel Park and Petric Park). It also has a wildlife viewing area (Wood River Wetland) at its northern end, which is owned and managed by BLM. The Upper Klamath Wildlife Refuge, managed by the U.S. Department of the Interior (USDI), USFWS, is adjacent to and southwest of Agency Lake.

##### Applegate Reservoir

The Applegate reservoir (988 acres) and Applegate River are located in the Applegate District of the Rogue River National Forest in south-central Oregon, west of Ashland. The U.S. Army

Corps of Engineers (USACE) constructed Applegate dam between 1976 and 1980. It is one of three multipurpose water resource projects authorized for the Rogue Basin. The reservoir provides irrigation and flood protection for the lower Applegate Valley and enhances the fishery by maintaining higher and cooler water levels in the lower river. The lake extends to the California border and a hiking trail follows the 18-mile shoreline. The USFS is responsible for the maintenance of ten campgrounds, one day use area, and three boat ramps. There is a 10-mph speed restriction for motorized boat use on the lake. Fishing is the primary activity and there is no waterskiing or PWC use. (Hutton, pers. comm., 2001). Facilities at Applegate reservoir see a moderate level of use on weekends and holidays during peak season, which is from early May to mid-September. Low use occurs during weekdays, a typical scenario. One campground stays open year-round (Ricketts, pers. comm., 2001). Near Applegate reservoir are Squaw Lake (48 acres) and Little Squaw Lake (20 acres). They are located 7 miles up Squaw Creek Road from Applegate reservoir and are popular camping and fishing lakes, although no developed campgrounds are available at either lake. No boat ramps exist and motorized boats are not allowed on these two lakes (USFS, 200l).

Emigrant Lake

Emigrant Lake (806 acres) is located in Jackson County, Oregon, 5 miles southeast of Ashland. It is one of Jackson County Parks' most popular destinations and has one county and one private campground, two designated swimming areas, picnicking areas, hiking, boating, canoeing, kayaking, and fishing. There is also a 280-foot, twin-flume waterslide. The day use areas are open year-round and the campgrounds from mid-March to mid-October. Overall, use of the campgrounds and facilities during the summer peak season is moderate, although use levels reach 100 percent capacity on weekends, and use of the lake for waterskiing and PWC activity is considered high. Over a million people use the parks and campgrounds in Jackson County each year (Hutton, pers. comm., 2001).

Fourmile Lake

Fourmile Lake (740 acres) is within the Winema National Forest and located less than 10 miles west of Klamath Lake. Fourmile Lake has one USFS campground and one unimproved boat ramp and receives over 18,000 visitors a year. There is no speed restriction, but motorized boat and PWC use is limited because the water is colder than nearby Lake of the Woods, which receives considerably more use (Johnson, pers. comm., 2001).

Howard Prairie Reservoir

Howard Prairie reservoir (2,000 acres) is located in Jackson County, Oregon, 15 miles east of Ashland. This lake has 1.6 miles of lake frontage and is a popular destination for boating, sailing, and fishing. It is considered one of the better trout fisheries in southern Oregon, as ODFW stocks the lake with 100,000 trout each year. The four county and two private campgrounds offer hundreds of tent sites with 185 trailer hookups. There are four improved boat ramps at Klum Landing, Willow Point, Grizzly Creek, and Howard Prairie Lake Resort, which also has a marina that is privately owned and managed. Use of the lake for waterskiing and PWC is considered to be low during peak season because of the lake's elevation at 4,500 feet. This lake is colder than other lakes in the county such as Emigrant Lake, which sits at an elevation of 2,241 feet. Day use and camping are typically open from mid-April to the first of November at the lake (Hutton, pers. comm., 2001).

Hyatt Reservoir

Hyatt Reservoir (1,250 acres) is in Jackson County, Oregon, and is located 15 miles east of Ashland. It is managed by the Medford District of BLM and provides opportunities for camping, hiking, fishing, and boating. The reservoir has three private campgrounds in addition to BLM full-service facility. BLM campground has approximately 60 sites and a day use facility and swimming area. There are two boat launches and dock facilities on the reservoir. Campgrounds open in late April after snow melts and closes in October before snow falls. Some sites can be used in the off season without charge, but facilities are closed and water is not available. There is a 10-mph speed restriction for motorized boat use on the reservoir. Fishing is the primary activity and there is little to no PWC use because of the speed restriction (Leffmann, pers. comm., 2002).

Lake of the Woods

Lake of the Woods (1,113 acres) is within the Winema National Forest and located less than 10 miles west of UKL. Lake of the Woods has two USFS-developed campgrounds, one private campground resort and marina, one day use area, three improved boat ramps, three designated swimming areas, and no speed restriction, thus attracting a high level of PWC and waterskiing use. It receives over 100,000 visitors a year and all facilities reach capacity use during peak season, which is typically Memorial Day to Labor Day (Johnson, pers. comm., 2001).

Medicine Lake

Medicine Lake (408 acres) is an alpine lake located in an area known as the Highlands near the western boundary of the Modoc National Forest in the southwestern corner of the Doublehead Ranger District. The Highlands are approximately 14 miles south of the Lava Beds National Monument and 35 miles southwest of Tulelake, California. There are four developed campgrounds, one day use area, and one designated swimming area associated with the lake. There is one boat ramp on the lake and no speed restrictions for boats. Fishing is the most popular activity on the lake due to its cold water. The peak season is typically from Memorial Day until Thanksgiving. Use of facilities in the fall coincides with hunting season. The campgrounds are open year-round but not managed during the off season. The campgrounds and lake are rarely, if ever crowded, and visitors come primarily from nearby local communities or the San Francisco Bay Area (Bay Area) to go camping and fishing (Worley, pers. comm., 2001).

Shasta Lake

Shasta Lake (29,500 acres) is the largest reservoir in the state and one of the most popular water-based recreation areas in California. It is also one of the most popular areas for houseboating in the West. Located entirely within the Whiskeytown-Shasta-Trinity National Recreation Area, most of the recreation facilities are operated by USFS, with the exception of several private marina facilities. There are approximately 300 developed campsites at the reservoir in addition to many other primitive boat-in camping areas scattered along the shoreline. The USFS manages 13 public campgrounds (including four group camp sites) and seven day use areas. The USFS maintains seven boat launches on the reservoir and there are several more at privately run marina facilities on the reservoir. Popular activities include motorized and nonmotorized boating (notably houseboating), swimming, fishing, camping, picnicking, and hiking. Waterskiing and PWC use is considered high during the peak season. Certain speed restrictions apply to shoreline areas and in narrow channels. Overall, visitor use of Shasta Lake facilities, especially water-based facilities such as boat launches, is considered high, particularly on summer weekends and holidays. The surface of the reservoir is considered crowded at these times as well (Adcock, pers. comm., 2001).

Trinity Lake Unit

Trinity Lake (16,535 acres) and Lewiston Lake (750 acres) are reservoirs that compose the Trinity Lake Unit. These lakes, separated by Trinity Dam, are located on the eastern base of the Trinity Alps and are at an elevation of 2,300 feet above sea level. The reservoir is in the Shasta-Trinity National Forest and part of the Whiskeytown-Shasta-Trinity National Recreation Area. Trinity Lake is the third largest reservoir in the state after Shasta Lake and Lake Oroville. Popular recreation activities include camping, houseboating, powerboating, PWC use, fishing, and swimming. Houseboating and fishing are two of the most popular activities that occur on the reservoir. There are five full-service marinas, seven boat ramps, and three boat-in camps on both reservoirs, a majority of the facilities being on Trinity Lake. The reservoir offers several types of camping (boat-in, group, and family) with over 450 campsites in 18 public and two private campgrounds. There are two public day use areas and several private resorts (Peckinpah, pers. comm., 2002).

Upper Klamath Lake

Upper Klamath Lake (85,120 acres) is located in southern Oregon and is by far the largest lake in Klamath County. The water level is regulated by a low dam constructed in 1917 by USBR, which maintains the surface elevation between 4,136 and 4,146 feet above sea level. Due to its shallow water depth, algae growth proliferates. Water from the lake is used for irrigation of agricultural land and for hydropower generation. Recreation use is thus somewhat limited on the lake. Efforts are under way by USBR to reduce the amount of nutrients, due primarily to runoff from agricultural lands at the north end of the lake, which should help limit the extent of algae growth in warm summer months.

There are six improved boat launches (Howard Bay, Rocky Point, Eagle Ridge Park, Moore Park, and Hagelstein Park) on the lake and several campgrounds. These facilities are managed by different entities (USFS, State Parks, county, city, and private) as varying land ownership exists around the lake. There are a few marinas located on the lake. One is located at privately owned Rocky Point Resort in the northwest corner of the lake, providing tent sites, RV sites, and cabins. There is no speed restriction for boats on the lake, but PWC use and waterskiing are considered limited. Fishing, wildlife viewing, and cruising are more popular boating activities on the lake. Dispersed camping also occurs along the shoreline of the lake. Over 37,000 visitors used Winema National Forest’s (USFS) campgrounds (Odessa and Eagle Ridge Park) and day use area on UKL last year (Johnson, pers. comm., 2001).

Whiskeytown Lake

Whiskeytown Lake (3,200 acres) is set in the mountainous backcountry of the Shasta-Trinity National Forest, is part of the Whiskeytown-Shasta-Trinity National Recreation Area, and provides many recreation opportunities. The reservoir has 36 miles of shoreline and provides opportunities for activities such as swimming, waterskiing, sailing, powerboating, and fishing. As of April 2002, PWC use is prohibited on the reservoir. There is one visitor center, two marinas, two designated swimming areas, and three boat ramps at the reservoir. There are also several types of camping available including tent, group, primitive, and RV camping. There are over 100 tent sites at the Oak Bottom Campground, which is run by a private concessionaire. There is also a day use picnic area. The peak season is typically from Memorial Day until Labor Day and the campgrounds are open year-round, although they are self-serve during the off season. The lake and its campgrounds, particularly Oak Bottom, receive high use during peak-season weekends and holidays. Fifty percent of visitors come from 20 miles away or less and 90 percent come from California, including the Sacramento area and Bay Area (Thede, pers. comm., 2002).

#### 4.7.1.7 Rivers with Whitewater Boating Opportunities within the Region

There are at least ten rivers in the region that provide a variety of opportunities and demand different levels of experience from whitewater boaters. These rivers, some of which are major tributaries of the Klamath, are shown in Figure 4.7-3 and listed in Table 4.7-4.

<u>Clear Creek</u>

Clear Creek is downstream of Whiskeytown reservoir, and its flows are dependent upon releases from the Whiskeytown dam. The 7-mile reach is close to Redding, although access to the river is difficult because the canyon is steep and rugged. This reach contains Class IV rapids and is often quite narrow, although rafts can run it (Holbek and Stanley, 1998).

Table 4.7-4. Rivers with whitewater boating opportunities in the region.

| River | State |
|---|---|
| Clear Creek | CA |
| Klamath River (reaches not within the Project study area) | CA |
| McCloud River (tributary of the Sacramento) | CA |
| Pit River (tributary of the Sacramento) | CA |
| Rogue River | OR |
| Salmon River (tributary of the Klamath) | CA |
| Scott River (tributary of the Klamath) | CA |
| Smith River | OR, CA |
| Upper Sacramento River | CA |
| Trinity River (tributary of the Klamath) | CA |

Source: EDAW, Inc.

<u>Lower Klamath River</u>

The second largest river in California, the Klamath River, begins in Oregon and flows through northern California and Redwood National Park as it drains over 4,000 square miles on its way to the Pacific Ocean. The Salmon, Scott, and Trinity rivers are tributaries of the Klamath River.

In 1981, Congress designated 286 miles of the Lower Klamath River from 3,600 feet below Iron Gate dam downstream to its mouth as a federal WSR. This designation classifies 12 miles as a wild resource, 25 miles as a scenic resource, and 250 miles as a recreational resource. Of the rivers addressed in this study, only the Klamath and Rogue rivers provide year-round flows adequate for whitewater boating. The other rivers discussed in this study are all considered seasonal runs.

Below Iron Gate dam, the Klamath River flows freely for almost 200 miles to the Pacific. Whitewater boating is available throughout this reach, providing a full range of experiences on runs for the novice and the expert. There are 100 miles of river containing Class III rapids, from Sarah Totten Campground downstream to Weitchpec, which are runnable year-round and provide opportunities for all experience levels. For more advanced boaters, the Ikes Falls run (7 miles long) is also runnable year-round and provides Class III-V rapids. Another challenging run, from Happy Camp to Dillon Creek Campground (21 miles), provides Class II-IV rapids. All boat types, (rafts, kayaks, and canoes) are recommended for use on these runs (Holbek and Stanley, 1998).

Overall, more than 122 miles of runnable water on the Klamath River have been described in whitewater guidebooks and Web-based guides (Cassady and Calhoun, 1995; Holbek and Stanley, 1998; Quinn and Quinn, 1983). There are currently several commercial raft outfitters who provide one- to seven-day trips. Boaters often overlook the Lower Klamath River, which is surprising because it is relatively easy to access and provides a wide range of experiences for all skill levels (Cassady and Calhoun, 1995). The Lower Klamath River may experience more use when boaters begin to discover it (Tuthill, pers. comm., 2001).

McCloud River

The McCloud River originates on the south side of Mt. Shasta and flows south into Shasta Lake. Overall, more than 35 miles of runnable river have been described in whitewater guidebooks and Web-based guides (Cassady and Calhoun, 1995; Holbek and Stanley, 1998). The first run is an 11-mile section above Lake McCloud called the Hearst Run because it flows through the privately owned Hearst family summer retreat. This reach flows through a beautiful canyon forested with pine. This reach has natural flows, and rafts can be used when spring flows are high enough. The second run is a 24-mile section from McCloud Lake to Shasta Lake that has dam-controlled flows. This reach contains Class IV flows but is best run in winter or spring because it often has too little water for rafts. Only kayaks are recommended (Holbek and Stanley, 1998).

Figure 4.7-3. Major rivers with whitewater boating opportunities within the region.

11” x 17”

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Figure 4.7-3. Major rivers with whitewater boating opportunities within the region.

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Figure 4.7-3. Major rivers with whitewater boating opportunities within the region.

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Figure 4.7-3. Major rivers with whitewater boating opportunities within the region.

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Pit River

The Pit River originates in northeast California on the western side of the Warner Mountain Range and flows into Shasta Lake before joining the Sacramento River. Overall, more than 34 miles of runnable river have been described in whitewater guidebooks and Web-based guides (Cassady and Calhoun, 1995; Holbek and Stanley, 1998). The run from Nubieber to Pittville is 24 miles, has a significant amount of flatwater, and is best run in the spring because of natural flows. Downstream of Fall River Mills to the town of Big Bend, the river contains several Pacific Gas and Electric Company (PG&E) hydroelectric facilities, with a few shorter runs among them. The Pit is less popular because of its general location, its long reaches of flatwater above Fall River Mills, and its fragmented nature and lack of water below Fall River Mills. Due to these factors, the river is never crowded (Tuthill, pers. comm., 2001). PG&E recently conducted whitewater recreation studies in the area of the Pit 3, 4, and 5 hydroelectric projects in 2002.

Rogue River

The Rogue River is located in southwestern Oregon and emerges from the western slopes of the Cascade Range near Crater Lake. In 1968 Congress designated over 84 miles of the Lower Rogue River as a federal WSR, from the mouth of the Applegate River downstream to the Lobster Creek Bridge. Almost 34 miles are classified as a wild resource, over 7 miles as a scenic resource, and over 43 miles as a recreational resource. In 1988 Congress designated over 40 miles of the Upper Rogue River as a federal WSR, from the Crater Lake National Park boundary downstream to the Prospect area, classifying 6 miles as a wild resource and 34 miles as a scenic resource.

A 35-mile reach from Grave's Creek downstream to Foster bar is one of the most renowned whitewater runs in the country (Willamette Kayak and Canoe Club, 1994). This beautiful section flows through the Siskiyou Mountains and has been preserved in its pristine state. It is runnable year-round, has several nice beach pullout spots for camping, and its dam-controlled flows are relatively consistent (about 2,000 cfs). Because of these factors, it has become a popular run and crowds of boaters are not uncommon, especially during the summer months (Willamette Kayak and Canoe Club, 1994).

There are several other popular runs on Rogue River and its tributaries. Eight runs, in addition to the one previously described, are listed and described in Soggy Sneakers (Willamette Kayak and Canoe Club, 1994). A wide range of experience is available for boaters of all skill levels. These runs wind through forested canyons, rock gorges, wooded hillsides, remote wilderness, and near residential development. The runs range in length from 2 miles, containing Class IV rapids and being easily accessible from Nugget Falls, to 31 miles, containing Class IV and V rapids in a remote section of the Illinois River tributary.

Overall, more than 114 miles of runnable river on the Rogue have been described in whitewater guidebooks and Web-based guides (Willamette Kayak and Canoe Club, 1994). There are currently several commercial raft outfitters who provide trips of differing length and requiring differing skill levels. Because of its popularity and the other factors mentioned previously, certain runs on the Rogue River are busy during the peak season, although a permit system has kept them from becoming severely overcrowded.

Upper Sacramento River

The Upper Sacramento River originates on the eastern slopes of the Trinity Mountains and runs into Shasta Lake. The reach that is popular with whitewater boaters runs from the Box Canyon Dam on Siskiyou reservoir south to Shasta Lake, a distance of 36 miles. This reach is usually divided into four excellent individual whitewater runs, each of which has Class III-IV rapids (www.creekin.net). The typical boating season is in spring from April to June. Even though I-5 and a railroad follow this reach, the solitude is good and the scenery very good, except for a stretch near Dunsmuir (Cassady and Calhoun, 1998).

Salmon River

The Salmon River and its two major forks, the North and South Forks, originate in the Salmon-Trinity Alps Primitive Area of California and are a major tributary of the Klamath River. Several sections of the Salmon River have been designated as part of the Klamath WSR System. They include: the Salmon River from its confluence with the Klamath upstream to the confluence of the North and South Forks; the North Fork of the Salmon River from the Salmon River confluence to the southern boundary of the Marble Mountain Wilderness Area; and the South Fork of the Salmon River from the Salmon River confluence to the Cecilville Bridge.

There are several whitewater boating opportunities that provide excellent scenery and a very good level of solitude for boaters from winter through spring (Cassady and Calhoun, 1995). Runs of 6, 8, 11, and 19 miles require advanced boating skills as Class IV rapids are encountered on all of these runs and Class V rapids exist on two of these runs. Rafts are only recommended on the 19-mile run, while kayaks are recommended on all of the runs (Holbek and Stanley, 1998).

Overall, more than 44 miles of runnable river on the Salmon have been described in whitewater guidebooks and Web-based guides. There are currently a few commercial raft outfitters who provide one- to four-day trips. The river is rarely crowded because of its level of difficulty, even during peak season (Holbek and Stanley, 1998).

Scott River

The Scott River originates on the east side of the Marble Mountain Wilderness Area and the northeastern slopes of the Salmon-Trinity Alps Primitive Area in California. It is a tributary of the Klamath and the confluence of these rivers is near the town of Fort Jones. The Scott River, from its confluence with the Klamath upstream to its confluence with Schackleford Creek, has been designated as part of the Klamath WSR System.

The primary whitewater run on the Scott flows through a deep gorge for 18 miles. The gradient of the run is steep, resulting in almost continuous Class III and IV rapids, and should be navigated by experts only (Holbek and Stanley, 1998). This run has both very good scenery and a very good level of solitude (Holbek and Stanley, 1998). Overall, more than 20 miles of runnable river on the Scott have been described in whitewater guidebooks and Web-based guides. There are a few commercial raft outfitters that provide two-day trips. However, this river is rarely crowded due to the level of expertise required to run it.

Smith River

Located in the northwest corner of California and the southwest corner of Oregon, the Smith and its three forks flow from the western slopes of the Siskiyou Mountains, unencumbered by dams, to the Pacific Ocean. In 1981 and 1990 a total of 325 miles of the Smith were designated as a federal WSR, more than any river in the country. This includes 78 miles designated as a wild resource, 31 miles as a scenic resource, and 216 miles as a recreational resource. Runs on the Smith River have many Class IV and V rapids, thus requiring a fairly high degree of technical boating skills. Once the three forks join to form the mainstem, the land levels out and the last 16 miles to the ocean present less demanding conditions (Class I-II in medium flows). Just past the confluence of the Middle Fork and South Fork, the river flows through the Redwood National and State Parks, with stunning views of giant redwoods and great summer floating in Class I and II waters.

Overall, more than 145 miles of runnable river on the Smith have been described in whitewater guidebooks and Web-based guides. There are currently no commercial raft outfitters on the Smith. Because this system is relatively remote and summer flows become too low for boating, the Smith is lightly used (Cassady and Calhoun, 1995).

Trinity River

The Trinity River, the largest tributary of the Klamath, originates west of Mt. Shasta, flows into Trinity Lake, and eventually joins the Klamath near the town of Weitchpec. In 1981, a total of 203 miles were designated as a federal WSR, including 44 miles as a wild resource, 39 miles as a scenic resource, and 120 miles as a recreational resource. The Trinity changes considerably, from a small river on the eastern slope of the Coast Range, to a much larger river in the lush canyons farther west. The Upper Trinity has been altered considerably in the past, from sluice-mining operations to damming and diversion for irrigation of the Central Valley.

The most popular whitewater recreation reaches on the Trinity River are those on the South Fork and mainstem Trinity from the town of Helena downstream to its confluence with the Klamath. The South Fork run is 48 miles, contains Class V rapids and is only run by boaters with excellent technical skills. Both the scenery and solitude are rated as excellent (Cassady and Calhoun, 1995). There are both easy and more advanced runs on the mainstem of the Trinity. The Burnt Ranch Gorge Run requires expert technical skills due to Class V rapids. Alternatively, Pigeon Point Run is one of the more popular runs, has Class III rapids, and has several access points along the freeway that parallels it for most of its 25-mile length.

Overall, more than 128 miles of runnable river on the Trinity have been described in whitewater guidebooks and Web-based guides. There are several commercial raft outfitters on all of the sections described above that provide one- and two-day trips for all skill levels. Certain runs on the Trinity, particularly the Pigeon Point Run, become crowded during the peak season (Tuthill, pers. comm., 2001) because of good scenery, minimal to moderate skill requirements, and easy access.

Table 4.7-5 summarizes regional whitewater boating opportunities in the region. The table includes the Upper Klamath River, which is in the study area, for comparison.

Table 4.7-5. Summary of whitewater boating opportunities in the region.

| River System | Boatable miles | Year-round | Relative Use | Reasons for Use Levels |
|---|---|---|---|---|
| Clear Creek | 7 | No | Low | Unfamiliar, difficult access |
| Upper Klamath | 31 | Yes | Low | Unfamiliar, class difficulty, remote |
| Lower Klamath | 122 | Yes | Moderate | Unfamiliar but all skill levels |
| McCloud River | 35 | No | Moderate | Proximity to I-5, all skill levels, low flows in summer |
| Pit River | 34 | No | Low | Unfamiliar |
| Rogue River | 114 | Varies | High | Popularity, easy access, all skill levels |
| Upper Sacramento | 36 | No | Moderate | Proximity to I-5, difficult access, average solitude |
| Salmon River | 44 | No | Low | Class difficulty |
| Scott River | 20 | No | Low | Class difficulty |
| Smith River | 145 | No | Very Low | Very remote, class difficulty |
| Trinity River | 128 | No | Moderate | All skill levels |

Sources: Holbek and Stanley, 1998; Cassady and Calhoun, 1995; Willamette Kayak and Canoe Club, 1994; Quinn and Quinn, 1983; www.americanwhitewater.org, 2001; www.creekin.net, 2001; and EDAW, Inc.

### 4.7.1.8 Rivers with Fishing Opportunities within the Region

There are several major river systems in the region that provide a multitude of fishing opportunities, including fly fishing mountain streams for resident trout and trolling from jet boats for salmon returning to the mainstems of major rivers (Figure 4.7-2). Chinook (king) and coho (silver) salmon, steelhead, brown, cutthroat, and native trout, as well as other fish, are found in many of these river systems. Residents of local communities do a majority of the fishing on rivers within the region. Additionally, visitors from the Bay Area; the Portland, Oregon, area; and other parts of the country travel to the region and some pay for a fishing guide or charter service. Of the local anglers, most are from nearby communities within the particular state the river is located in. The quality of nearby fisheries is good enough that residents of Oregon are not typically willing to pay for an additional license or travel to fish in California and vice versa (Trophy Waters Fly Fishing Shop, pers. comm., 2002). In most of the rivers discussed below there are both wild and hatchery runs/populations of fish. Table 4.7-6 lists the fishing opportunities found on regional rivers.

Table 4.7-6. Whitewater fishing opportunities in regional rivers.

| River | Fishing Opportunities |
|---|---|
| Lower Klamath River | Chinook (king) salmon; coho (silver) salmon; steelhead trout; resident trout |
| McCloud River | Shasta native trout |
| Pit River | Native trout; brown trout; smallmouth bass; rough fish |
| Rogue River | Chinook salmon; coho salmon; steelhead trout |
| Salmon River | Chinook salmon; steelhead trout; resident trout |
| Scott River | Chinook salmon; steelhead trout; resident trout |
| Smith River | Chinook salmon; coho salmon; steelhead trout |
| Trinity River | Chinook salmon; steelhead trout; sturgeon; shad; lamprey |
| Upper Sacramento River | Chinook salmon; trout; shad |

Source: EDAW, Inc.

## Lower Klamath River

The Lower Klamath River is considered a high-quality, and thus popular, fishing river. The fish of the Klamath River are the Chinook (king) and coho (silver) salmon, steelhead, and native trout. The Klamath River has been labeled by some as the "Steelhead Capital of the World" because historically more of them were caught on this river than on any other river on the West Coast. Chinook start running in July, with the best action near the mouth coming in August and running through September. The summer/fall steelhead run starts in late summer and runs through October. The winter steelhead run starts in November and goes through February. While the Chinook are average to large in size, the steelhead of the Klamath River tend to run smaller than other rivers (4 to 10 pounds [lb]). However, the number of steelhead makes up for this size difference (Northcoast website, 2001; Kutzkey Fishing website, 2002).

## McCloud River

The McCloud River is one of the more popular trout fishing rivers in the region among fly fishermen (Fish Sniffer website, 2002). The trout population of the McCloud River consists of a strain of native Shasta native trout. Also, wild brown trout that migrate up from Shasta Lake average almost 4 pounds, while some reach more than 10 pounds (Mt. Shasta Fishing Guide website, 2002).

## Pit River

For over 200 miles the Pit River corridor offers remote and pristine fly fishing. The mainstem of the Pit River is composed of long sections of water between PG&E hydroelectric dams that contain native and brown trout, smallmouth bass, and rough fish (Fly Fishing Nor California website, 2002). The Pit River below Lake Britton dam is a popular, 30-mile trout-fishing reach. The fishing season is open from the end of April through mid-July and then again from mid-September to the end of the season on November 15. The average native trout on the Pit River is 12 inches and the typical range is from 9 to 16 inches. The Pit River can be a difficult river to wade due to low water visibility combined with slippery river rocks (Andrew Harris Flyfishing website, 2002).

Rogue River

The Rogue River system, 84 miles of which was designated as a federal WSR, has an extensive salmon and trout fishery. There are only a few times of the year that salmon are not available to anglers. There are winter and summer steelhead runs, a spring and fall Chinook run, and a fall coho run. Fall is the classic fly fishing period on the Rogue River. Winter steelhead can reach trophy size, between 25 and 35 inches. Trout fishing is open year-round with the exception of a closure from the beginning of April until the end of May (Rogue Wilderness Adventures website, 2002).

Upper Sacramento River

Trout fishing near Redding is a year-round fishery, and Chinook salmon fishing usually occurs in the late summer and fall months. Shad fishing, during June and July, has also become popular. These silver-sided fish are known as freshwater tarpon (Steelhead Guides websites, 2002). The Upper Sacramento River is one of the more popular trout fishing rivers in the region among fly anglers (Fish Sniffer website, 2002).

Salmon River

The Salmon River fishery, while considered high in quality, is not as popular as other rivers in the region because it is difficult to access (pers. comm., Ramirez, January 21, 2001). The Salmon River, a tributary of the Klamath, has a summer Chinook run, a summer and winter steelhead run, and a resident native trout population (Quinn and Quinn, 1983).

Scott River

Similar to the Salmon River, the Scott River is considered high in quality, but it is not as popular as other rivers in the region because it is difficult to access (Ramirez, pers. comm., January 21, 2001). Chinook salmon run up the Scott River, a tributary of the Klamath, from September through November. There are also steelhead runs and resident trout that provide additional fishing opportunities (Scott River Lodge website, 2002).

Smith River

The Smith River is the largest free-flowing river in the state, producing the largest steelhead and Chinook salmon. The state record steelhead, over 27 pounds, and the state's second largest Chinook salmon, 86 pounds, were both caught on the Smith. Twenty-pound steelhead are caught on a regular basis, and the Chinook average 20 to 36 pounds. Although somewhat remote, the Smith River is considered high in quality and is thus a popular fishery. However, it is rarely considered crowded. Along with steelhead and Chinook, the Smith River also has runs of coho salmon and sea-run cutthroat trout. The Chinook runs start in late August going through late December, and the steelhead start their runs in early December and go through March. The Smith River is also known as the quickest clearing stream of the coastal rivers. After major storms, the river is fishable in a couple of days, whereas some of the other rivers can take up to 2 weeks to clear (Six Rivers National Forest, 2001).

Trinity River

The Trinity River, a tributary of the Klamath, has a summer/fall Chinook salmon run from June to November and two steelhead runs. One is in the fall, from September to November, and the other is in the winter, from February through March. Sturgeon, shad, and lamprey are also fished in the Trinity. Approximately half of the Klamath Chinook run migrates up the Trinity River tributary to spawn (Quinn and Quinn, 1983).

#### 4.7.1.9 General Public Recreation Areas within the Region

The following subsection describes general recreation opportunities in the regional study area (Figure 4.7-2). Please note that Figure 4.7-2 does not show all the recreation areas discussed. While publicly owned land is the focus of this discussion, one privately owned recreation area (R Ranch) is included because of its large size and proximity to the Project. Table 4.7-7 lists the general public recreation areas within the region.

Table 4.7-7. General public recreation areas within the region.

| Recreation Area | Managing Agency |
|---|---|
| California State Parks | CDPR |
| Cascade-Siskiyou National Monument | BLM |
| Crater Lake National Park | NPS |
| Fremont National Forest | USFS |
| Jackson County Parks | Jackson County, OR |
| Klamath Basin National Wildlife Refuges | USFWS |
| Klamath County Parks | Klamath County, OR |
| Klamath National Forest | USFS |
| Lakeview District- Klamath Falls Resource Area | BLM |
| Lava Beds National Monument | NPS |
| Medford District | BLM |
| Modoc National Forest | USFS |
| Oregon State Parks | OPRD |
| Rogue River National Forest | USFS |
| Siskiyou County Parks | Siskiyou County, CA |
| Shasta-Trinity National Forest | USFS |
| Six Rivers National Forest | USFS |
| Winema National Forest | USFS |

Source: EDAW, Inc.

California State Parks

In the Shasta Cascade and North Coast regions, which encompass all of northern California, there are several state parks. Many of these parks in the Shasta Cascade Region are historical sites that are day use areas. Many of these parks in the North Coast region are located along the

Pacific Coast. A few state parks are located within or near the region defined in this study and provide water-based recreation opportunities similar to those in the Project area. These are discussed below.

- Ahjumawi Lava Springs is a 6,000-acre wilderness area covered with rugged lava rock and containing a myriad of freshwater springs and water bodies such as Big Lake, Horr Pond, Tule River, Fall River, Lava Creek, Ja-She Creek, and Crystal Springs. The park is located south and east of the Modoc National Forest and north of the Lassen National Forest. The park can only be accessed by boat as there are no public roads to it and motor vehicles are prohibited within it. Visitors can launch into Big Lake at a PG&E public boat launch known as "Rat Farm." This boat launch is open year-round and there is a fee assessed for use (CDPR website, 2002).

- Castle Crags State Park is located 6 miles south of Dunsmuir off of I-5 and provides opportunities to swim and fish in the Sacramento River, as well as high-elevation, back-country hiking on 28 miles of trails throughout 4,350 acres. There are 76 developed campsites, six primitive campsites, and a day use area in the park. There is also trail access to Castle Crags Wilderness, which is part of Shasta-Trinity National Forest (CDPR website, 2002).

- McArthur-Burney Falls Memorial State Park is located approximately 25 miles northeast of Redding and contains 910 acres of forest and 5 miles of streamside and lake shoreline, including a portion of Lake Britton. Camping, hiking, fishing, boating, and day use are popular activities at the state park, which has 129 developed campsites and a boat ramp. Lake Britton is a 1,200-acres reservoir created by the Pit River Dam 3 on the Pit River. There are several additional campgrounds near McArthur-Burney Falls Memorial State Park owned by PG&E which are either on and near Lake Britton. It is open year-round and there is a fee assessed for use (CDPR website, 2002).

- Jedediah Smith Redwoods State Park, located 9 miles east of Crescent City, is approximately 10,000 acres of predominantly old-growth coast redwoods through which the Smith River flows. The park has about 20 miles of hiking and nature trails and river access for boating and fishing. There are 109 campsites, a day use area, and a boat ramp at the park. This state park, along with Prairie Creek, Del Norte Coast, and the NPS's Redwoods National Park, is managed cooperatively by the NPS and the CDPR. These parks make up 45 percent of all the old-growth redwood forest remaining in California. It is open year-round and there is a fee assessed for use (CDPR website, 2002).

Cascade-Siskiyou National Monument

The new Cascade-Siskiyou National Monument, in south central Oregon, was established June 9, 2000, to help maintain and protect the ecological diversity of the area and is managed by the Medford District of BLM. The 52,000-acres monument includes Soda Mountain and surrounding lands and resembles a checkerboard around its outer boundary. It is located between Ashland and Klamath Falls and has elevations ranging from 2,300 to 6,000 feet. Camping is permitted within the Cascade-Siskiyou National Monument, as are hiking, nature study, horseback riding, hunting, and fishing. However, cross-country travel by bicycles and motorized vehicles is prohibited to minimize erosion, prevent the spread of weeds, and protect the area's fragile plant communities.

The Pacific Crest National Scenic Trail (PCT), which runs through the Cascade-Siskiyou National Monument, is open to horses and foot traffic. No large, boatable lakes or reservoirs are located within the Cascade-Siskiyou National Monument and only nonmotorized boating is allowed on existing lakes (BLM website, 2002).

Crater Lake National Park

Crater Lake National Park is located in south-central Oregon and is the nation's fifth oldest national park. In 1902, Congress decided that Crater Lake and its surrounding 187,000 acres should be preserved for future generations and be managed by the NPS. Today, an array of recreation opportunities are available to the visitor, including hiking, camping, fishing, bicycling, horseback riding, snowmobiling, staying in a historic hotel, cross-country skiing, and car touring. The lake is the deepest in the United States at 1,932 feet and has a surface elevation of 6,671 feet above sea level. There are no public boat ramps, and private boats or flotation devices are not allowed on the lake. Access to the lake is via a steep trail and boat tours of the lake are offered. Snow typically covers the ground 8 months of the year and often remains until June. There are two developed campgrounds and six day use areas in the park. Mazama Campground has 198 sites and is operated by an NPS concessionaire from mid-June through early October. Lost Creek Campground is operated by the NPS from mid-July through mid-September and has 16 tent camping sites. Due to the short summer season and the world-renowned beauty of the lake and park, campground and interpretive facility use is high, reaching 100 percent capacity on many weekends and holidays. A majority of visitors to Crater Lake National Park are international travelers and the remainder come from different parts of the United States. In 2000, there were over 1 million visitors to the park (King, pers. comm., 2001).

Fremont National Forest

The Fremont National Forest encompasses almost 1.2 million acres east of the Cascade Mountains, in the high-elevation lava tablelands of south-central Oregon. The Fremont National Forest provides less developed and more primitive recreation opportunities than most other forests. A variety of recreation opportunities are available including fishing, hunting, backpacking, cross-country and downhill skiing, camping, and leisure driving. There are 15 developed campgrounds with limited amenities containing approximately 200 sites. There are also 20 primitive campgrounds with approximately 90 sites and four picnic areas in the forest. The Fremont National Forest contains hundreds of miles of trails for hiking, mountain biking, and horseback riding. There is one wilderness area (Gearhart) within the forest and three designated winter recreation sites (USFS website, 2001).

The Chewaucan, Sycan, and Sprague rivers are the major rivers originating in the Fremont National Forest. Many of the forest's small lakes and reservoirs are popular fishing and camping areas. Thompson Reservoir (2,179 acres) is the largest water body in the Fremont National Forest and has two campgrounds and two boat launches. There is a 10-mph speed limit on the reservoir where waterskiing and PWC use are prohibited. There is also camping on Dog Lake (208 acres), Lofton Reservoir (41 acres), Dead Horse Lake (31 acres), and Campbell Lake (21 acres), each of which has one boat launch and a 5-mph boat speed limit on the lake. Day use areas are located on Heart Lake (19 acres), which has a boat launch, and on Withers Lake.

Facilities and lakes/reservoirs in the Fremont National Forest experience levels of use consistent with typical patterns. During weekends and holidays of the peak season, only the most popular campgrounds (East Bay, Lofton Reservoir, Campbell Lake, and Dead Horse Lake) become crowded. Peak season is a little later than most recreation areas in the region and is typically from the end of June until Labor Day. Weather plays a significant role in the level to which facilities are used. Additionally, the hunting season brings users to the Fremont National Forest during the fall months and snow sport activities bring users during the winter. Low use of facilities occurs during weekdays of the peak season and throughout the off season. There is only one fee campground in the Fremont National Forest. All campgrounds remain available for use through the winter, if accessible due to snowfall. A majority of visitors are typically coming from local communities in southern Oregon (Shullanberger, pers. comm., 2002).

Jackson County Parks

There are seven Jackson County (Oregon) parks that provide opportunities for boating in the region near the Project. These parks include Emigrant Lake, Howard Prairie Lake, Dodge Bridge, Rogue Elk, Takelma, Shady Cove, Willow Lake, and Cantrall-Buckley. Each of these parks has a boat launch. Emigrant Lake and Howard Prairie have been addressed in detail in a previous section. Other water-based recreation areas include Dodge Bridge on the Rogue River, which has one-third mile of river frontage, a boat launch, and a fully accessible fishing platform. Rogue Elk has three-quarters of a mile of access to the upper Rogue River and provides opportunities to fish, raft, and swim. Rogue Elk is one of the county's most popular campgrounds and day use areas. Takelma is a more primitive park on the Rogue River that offers 40 acres of day use area, including 0.4 mile of river frontage and a boat launch. Shady Cove is a day use park located on the Rogue River that features a boat ramp, handicap fishing platform, and 0.2 mile of river frontage. Willow Lake provides tent, group, and RV camping as well as a boat launch. Although no boat launch exists at Cantrall-Buckley, day use and group camping are available at this park, which is located on the Applegate River and features 1.8 miles of river frontage. Fishing occurs at all of these parks, while waterskiing typically occurs at Emigrant Lake, Howard Prairie Lake, and Willow Lake only.

Klamath Basin National Wildlife Refuges

There are six separate refuges, in both Oregon and California, that compose the Klamath Basin National Wildlife Refuge complex. These include the Lower Klamath, Clear Lake, Klamath Marsh, Tule Lake, Upper Klamath, and Bear Valley wildlife refuges, all of which are managed by the USFWS. These lands and waters are intensely managed to provide feeding, resting, nesting, and brood rearing habitat for waterfowl and other birds.

- Lower Klamath Refuge (53,600 acres) was established in 1908 as the first waterfowl refuge in the Klamath Basin. It consists of 56 percent marsh, 28 percent cropland, and 16 percent upland habitat (Klamath Basin National Wildlife Refuges Complex website, 2001).

- Clear Lake Refuge (46,460 acres) was established in 1911 and contains approximately 20,000 acres of open water (46 percent), with the remainder being grasslands. Except for limited waterfowl hunting and pronghorn antelope hunting during regular California seasons, the refuge is closed to public access to protect fragile habitats and to reduce disturbance to wildlife. The Clear Lake reservoir is the primary source of water for the agricultural program of the eastern half of the Klamath Basin, with water levels regulated by BLM (Klamath Basin National Wildlife Refuges Complex website, 2001).

- Klamath Marsh Refuge (40,646 acres) was established in 1958 when approximately 16,400 acres were purchased from the Klamath Indians with federal Duck Stamp Funds. In 1990 and 1998, additional acquisitions boosted refuge acreage to its current size. The refuge consists of 95 percent marsh and water and 5 percent upland forest (Klamath Basin National Wildlife Refuges Complex website, 2001).

- Tule Lake Refuge (39,100 acres) was established in 1928 and consists of 44 percent cropland, 27 percent open water, 21 percent upland habitat, and 8 percent marsh. Approximately 17,000 acres are leased by farmers under a program administered by BLM (Klamath Basin National Wildlife Refuges Complex website, 2001).

- Upper Klamath Refuge (15,000 acres) was established in 1928. It is almost entirely composed of freshwater and open marsh. A marked canoe trail has been created because this refuge is best explored by boat. The main hunting area is located near Rocky Point on the west side of UKL (Klamath Basin National Wildlife Refuges Complex website, 2001).

- Bear Valley Refuge (4,200 acres) was established in 1978 to protect roosting areas for wintering bald eagles. All of the land in the refuge is forested and in recent years, as many as 300 bald eagles have used the roosting area in a single night. The refuge is closed to all public entry, except for walk-in deer hunting before November 1, to reduce disturbance to the raptors (Klamath Basin National Wildlife Refuges Complex website, 2001).

Recreational activities in these refuges include hiking, canoeing, photography, scenic tours, hunting, fishing, and wildlife viewing. There is no camping allowed within the refuges, although several private or USFS campgrounds exist near refuge lands. There are several boat launches within the refuges for nonmotorized boat use only. Motorized boating is permitted on certain refuges between October and January for hunting purposes only. A majority of the visitors to the refuges are drive-through visitors. The visitor center in Tulelake, California, receives 12,000 visitors per year, while the Tule Lake and Lower Klamath refuges receive an estimated 180,000 drive-through visitors each per year. The four other refuges receive between 2,000 and 9,000 visitors per year. Combined, the Klamath Basin National Wildlife Refuges receive over 400,000 visitors per year. More than half of the visitors come from local communities while the other half come from places farther away in Oregon and California. The facilities that exist within the refuges are seldom crowded (Menke, pers. comm., 2001).

Klamath County Parks

There are two developed county campgrounds and 13 county day use parks in Klamath County, Oregon. These campgrounds and parks are adjacent to the Upper Klamath and Agency lakes and the Williamson and Lost rivers. A total of 12 improved boat launches are managed by the county; however, no designated swimming areas are provided at any of the county facilities. Peak season is typically from early spring to late fall and users of county parks are predominantly from local communities such as Klamath Falls. The campgrounds and day use areas receive high use during peak-season weekends and holidays and receive medium use during peak-season weekdays (Henry, pers. comm., 2002).

Klamath National Forest

The Klamath National Forest encompasses more than 1.7 million acres in Siskiyou County, California, and Jackson County, Oregon. It is adjacent to Hell's Corner reach in the study area and extends westward to the crest of the Pacific Coast Range in northernmost California. The Klamath National Forest contains 30 campgrounds, 200 miles of boatable river (Klamath, Salmon, and Scott rivers), 152 miles of federally designated WSR river, and five wilderness areas (Marble Mountain, Russian, Trinity Alps, Red Buttes, and Siskiyou) (USFS, 2001). Camping, picnicking, hiking, biking, boating, hunting, and fishing are some of the recreation opportunities available in the Klamath National Forest. Over 300 campsites are available in the 30 campgrounds of the Forest, and six group campsites and more than 20 day use areas also exist.

There are no large lakes or reservoirs in the Klamath National Forest, but many miles of river and several small lakes provide boating opportunities. The wilderness areas contain many lakes. Marble Mountain Wilderness Area, for example, contains 89 lakes, most of which are less than 10 acres in size, although Ukonum (67 acres), Cliff (52 acres), Hancock (44 acres), and Campbell (33 acres) lakes are larger. Lakes in wilderness areas are primarily used for fishing, wildlife viewing, and photography. All lakes in wilderness areas and most in the Klamath National Forest are for nonmotorized use only. However, motorized boats are allowed on the Lower Klamath River and on a few small lakes such as Orr Lake (approximately 50 acres). No waterskiing or PWC use occurs in the Klamath National Forest as there are boater speed restrictions in place on all water bodies and many do not allow motorized use altogether. There are seven improved and many unimproved boat access points on the Lower Klamath River. Whitewater boating opportunities on rivers in this Klamath National Forest (Klamath, Salmon, Scott) were previously discussed in this subsection.

Facilities, lakes, and rivers in the national forest experience levels of use consistent with patterns typical for the region. During weekends and holidays of the peak season, the most popular campgrounds (Sarah Totten, Curley Jack, Juanita Lake, Kangaroo Lake, and Tree of Heaven) become crowded. Peak season is typically from Memorial Day to Labor Day, although snow at higher elevations, such as in several wilderness areas, shortens the use season. Additionally, whitewater boating is popular in the spring months during snowmelt and hunting season occurs during the fall months. The facilities are less frequently used during weekdays and throughout the off season. Most fee campgrounds are open between May and October. If they remain open through the winter, there are typically no services provided. A majority of visitors typically come from local communities within a couple hours' drive or from the Bay Area and communities north of there (Lipke, Linfoot, and Reynolds, pers. comm., 2001).

Lakeview District—Klamath Falls Resource Area

The Klamath Falls Resource Area encompasses over 216,000 acres. The Klamath Falls Resource Area is located both east and west of Klamath Falls and is managed by BLM. Located within the Klamath Falls Resource Area are Gerber reservoir, which is 50 miles east of Klamath Falls, Agency Lake, and sections of land along the Upper Klamath River and J.C. Boyle reservoir, both of which are in the Project area. Portions of the Klamath River have been designated as a federal WSR and contain high-quality whitewater boating managed by BLM.

At Gerber reservoir (3,830 acres), five campgrounds exist on the west side of the reservoir (Stan H. Spring, Potholes, North Gerber, South Gerber, and Miller Creek), two of which are managed by BLM. Two boat launches are on the reservoir (North Gerber and Barner Valley), one day use area (Frog Camp), and two wildlife viewing areas (Potholes and Miller Creek) are also on the west side of the reservoir. Dispersed camping is available at six sites in outlying areas. Camping and fishing are the primary activities here, and a 10-mph boat speed limit restricts waterskiing and PWC use on the lake. Use is low to moderate even during peak-season weekends, which is typically from Memorial Day to Labor Day. A majority of visitors to the reservoir come from the surrounding local communities. During each of the past 10 years, Gerber reservoir facilities received approximately 6,000 to 10,000 visitors per year (Senter, pers. comm., 2001).

Lava Beds National Monument

Lava Beds was designated as a national monument in 1925. Past volcanic eruptions in the area have created a rugged landscape that includes cinder cones, lava flows, spatter cones, lava tube caves, and pit craters. Recreation opportunities include cave exploring (463 caves with over 27 miles of trails), developed camping, wilderness camping, picnicking (two day use areas), hiking, and wildlife viewing. The Lava Beds National Monument is adjacent to the Tule Lake National Wildlife Refuge, making both birdwatching and wildlife viewing popular activities. The Lava Beds National Monument's single campground is open all year, but with limited facilities in winter. Use of the campground is low even during the peak season, which is typically from Memorial Day to Labor Day. A majority of the 100,000 visitors the park receives each year live within a 2-hour drive, while the remainder of visitors are international travelers. There are no lakes or rivers for boating or fishing activities within the monument as it is located in the high desert of northern California (Condon, pers. comm., 2001).

Medford District

The Medford District of BLM is located in southern Oregon. There are a variety of camping opportunities in the Medford District, from developed campgrounds with RV hookups to primitive backcountry trailside sites found in the Cascade Siskiyou National Monument, which was discussed previously in this section. Approximately 600 developed and undeveloped sites are scattered in the Galice-Hellgate Back Country Byway and along Rogue National WSR reaches. Fourteen major trails exist within the forest, including 40 miles of the PCT. Two winter recreation areas provide for snowplay and cross-country skiing. There are four developed campgrounds in the Medford District with 89 sites and four developed day use areas.

Hyatt Reservoir, which was previously discussed in this subsection, is a popular recreation destination and the largest lake in the Medford District, providing camping, day use, and boat ramps. Most water-related recreation activity in the Medford District is near the Rogue River. The Medford District manages 47 miles of the federally designated WSR. There are eight camping areas, 11 picnic day use areas, and ten boat launches associated with the river in the Medford District.

Facilities in the Medford District experience levels of use consistent with patterns typical for the region. During weekends and holidays of the peak season, the Hyatt reservoir campground reaches capacity. Peak season is typically from Memorial Day to Labor Day. Most developed campgrounds open in early May and close in October. Moderate use of these facilities occurs during weekdays of the peak season while low use occurs throughout the off season, as many facilities are closed for winter. A majority of visitors, especially to Hyatt reservoir, come from local communities in Oregon. Other visitors come from nearby California communities as well as from the San Francisco Bay Area (Leffman, pers. comm., 2002).

Modoc National Forest

The Modoc National Forest, located in the northeast corner of the state, encompasses almost 2 million acres and is one of the most remote national forests in California. The Modoc National Forest contains 20 campgrounds and one wilderness area (South Warner). Camping, picnicking, fishing, boating, hiking, and cross-country skiing activities are popular. There are almost 300 campsites available in 20 campgrounds and there are 12 day use areas (USFS website, 2001).

As previously discussed, Medicine Lake (408 acres) is a natural alpine lake at 6,700 feet elevation and attracts the most visitors to the national forest. There are several other lakes in the Modoc National Forest, including Big Sage (over 2,000 acres), Blue (160 acres), Patterson, Reservoir C, and Reservoir F. Waterskiing and PWC uses are allowed on Medicine, Big Sage, and Blue lakes, while there are boating speed restrictions on Reservoirs C and F. Lakes in the South Warner Wilderness Area offer prime fishing but do not allow motorized use.

Facilities and lakes in the Modoc National Forest experience levels of use consistent with typical patterns. During weekends and holidays of the peak season, the most popular campgrounds (Medicine Lake and Blue Lake) receive the most use. However, they are rarely crowded. Peak season is typically from Memorial Day to Labor Day, although snow at higher elevations shortens the use season. Additionally, the hunting season brings users to the Modoc National Forest during the fall months and snow activities bring a few users during the winter months. Facilities are used less frequently during peak season weekdays and throughout the nonpeak season. Most fee campgrounds are open between May and October. If they remain open through the winter there are typically no services provided. A majority of visitors come from local communities within a few hours' drive, while the remainder come from the Bay Area and communities north of there (Pierney, Riley, and Worley, pers. comm., 2001).

Oregon State Parks

Most of the state parks in the southern Oregon region are located adjacent to rivers (such as the Rogue, Illinois, and Wood) or reservoirs (such as Lost Creek) and provide boating, swimming, and fishing opportunities. There are five day use-only parks in the southern Oregon region that are owned and operated by OPRD.

- Casey State Park has day use facilities and a boat ramp. Fishing, boating, and hiking are popular activities at this park located on the Rogue River 29 miles northeast of Medford. Casey State Park is open year-round and there is no fee (OPRD website, 2002).

- Illinois River Forks State Park is located on the confluence of the east and west forks of the Illinois River 1 mile south of Cave Junction. There are opportunities here for picnicking, fishing, hiking, and bird watching year-round and there is no fee (OPRD website, 2002).

- Prospect State Scenic Viewpoint is located 1 mile south of Prospect and has hiking trails leading to Pearson Falls, the Rogue River, and Mill Creek. There is no fee at this day use area (OPRD website, 2002).

- Touvelle State Park is located on the Rogue River 9 miles north of Medford and provides opportunities for picnicking, a boat ramp, boating, swimming, hiking, fishing, and wildlife watching. Touvelle State Park is open year-round and there is a day use fee (OPRD website, 2002).

- Tub Springs State Wayside is located on the historic Applegate Trail 18 miles east of Ashland. This wayside provides opportunities for year-round hiking and picnicking and there is no fee (OPRD website, 2002).

There are also four state parks with campgrounds in the southern Oregon region that are owned and operated by OPRD:

- Collier Memorial State Park has 50 full hookup and 18 tent campsites and is located at the confluence of the Williamson River and Spring Creek, 30 miles north of Klamath Falls. Collier Memorial State Park provides opportunities for picnicking, horse riding, hiking, and fishing. It is open from April through October and there is a fee charged for use (OPRD website, 2002).

- Jackson F. Kimball State Park has ten primitive campsites with no potable water. This State Park is located on a spring-fed lagoon at the headwaters of the Wood River, 3 miles north of Fort Klamath. Camping, fishing, and picnicking are available here from April through October and there is a fee charged for use (OPRD website, 2002).

- Joseph H. Stewart State Park has 151 RV campsites with electrical hookups, 50 tent sites, and two group tent campsites. It is located on Lost Creek reservoir 35 miles northeast of Medford. There is a marina on the lake, a boat ramp, a beach access and swim area, a day use area including large group picnic facilities, and hiking trails at the park. Fishing, boating, and waterskiing are popular activities on the lake. The park is open from March to November and a fee is charged for use (OPRD website, 2002).

- Valley of the Rogue State Park has 97 full-hookup RV campsites, 49 electrical-hookup RV campsites, 21 tent sites, six yurts, and three group tent campsites. This state park is located along 3 miles of the Rogue River 12 miles east of Grants Pass. There is a boat ramp and a day use area at the park, and boating and fishing are popular activities. The facility is open year-round and there is a fee charged for use (OPRD website, 2002).

Rogue River National Forest

The Rogue River National Forest encompasses roughly 630,000 acres of southern Oregon, straddling the Siskiyou and Cascade mountain ranges. A variety of recreation opportunities are available, including camping, picnicking, fishing, swimming, hiking, biking, boating, and skiing. The Rogue River National Forest is probably best known for its world-class whitewater boating opportunities. There are 36 developed campgrounds with approximately 500 campsites and 12 picnic areas in the national forest. The Rogue River National Forest contains approximately 400 miles of trails for hiking, mountain biking, and horseback riding, and the PCT runs the entire length of the national forest. There are also two wilderness areas (Red Buttes and Sky Lakes) within the Rogue River National Forest (USFS website, 2001).

The primary water bodies in the Rogue River National Forest are the Rogue River and Applegate reservoir, both of which were previously discussed in this subsection. Other water bodies include Fish Lake (386 acres) and Willow Lake (acreage unknown). Motorized boat use is allowed on a few water bodies within the national forest, including Fish Lake and Applegate reservoir, although a 10-mph boating speed restriction at each location limits waterskiing and PWC activity. There are five boat launches in the Rogue River National Forest and a marina on Fish Lake, operated as part of a private lodge that is under a Forest Special Use Permit (USFS website, 2001).

Facilities and lakes in the Rogue River National Forest experience levels of use consistent with regional patterns. During peak season, weekends and holidays the most popular campgrounds become crowded. Peak season is typically from Memorial Day to Labor Day. Additionally, hunting season brings visitors to the Rogue River National Forest during the fall months, snow-related activities bring visitors during winter months, and whitewater boating opportunities bring visitors in the spring. Low to moderate use of recreation facilities occurs during weekdays of the peak season. During the off season, use is low. Most fee campgrounds are open between May and November. If facilities remain open through the winter, there are typically no services provided. Depending on the district within the Rogue River National Forest, visitors come from a variety of places. The Prospect District, which contains reaches of the Rogue River used for whitewater boating, receives visitors from all over the country and the world. On the other hand, the Ashland District receives visitors who are passing through on I-5 because of its proximity. Additionally, the Butte Falls and Applegate districts attract visitors from local communities who primarily hunt and fish (Leepik, Proctor, Ellis, and Ricketts, pers. comm., 2001).

Shasta-Trinity National Forest

The Shasta-Trinity National Forest encompasses 2.1 million acres between the Coast Range on the west and the Cascade Range on the east. Mt. Shasta, at 14,612 feet, is the highest point in the national forest. A variety of recreation opportunities are available in the national forest, including camping, picnicking, fishing, swimming, hiking, biking, boating, and skiing. Shasta-Trinity National Forest contains approximately 1,400 miles of trails for hiking, mountain biking, and horseback riding. There are five wilderness areas (Mt. Shasta, Trinity Alps, Castle Crags, Chanchelullah, and Yolla-Bolla-Middle Eel) within the Shasta-Trinity National Forest and most of the Whiskeytown-Shasta-Trinity National Recreation Area as well. The recreation area includes Whiskeytown Lake, Shasta Lake, and Trinity Lake and the surrounding national forest land. Whiskeytown Lake is managed by the NPS, while Shasta Lake and Trinity Lake are managed by the USFS. The USBR operates the storage and delivery of water in these reservoirs.

In addition to Whiskeytown, Shasta, and Trinity lakes, which were previously discussed in this subsection, there are two other water resources of significant size in the Shasta-Trinity National Forest: Iron Canyon reservoir (500 acres) and Lake McCloud (700 acres). Iron Canyon reservoir has 40 developed campsites and one boat launch and receives a low level of use. Lake McCloud has no developed campsites and one boat launch and also receives a low level of use. Fishing is the primary activity at these lakes. There are also numerous alpine lakes for fishing and wildlife viewing. Over 40 alpine lakes are found in the Shasta-Trinity National Forest. They range from

0.75 acre to 47 acres (Castle Lake) and average less than 10 acres. There are three WSR-designated rivers in the Shasta-Trinity National Forest: the Salmon, Trinity, and Scott rivers. Overall, there are 78 developed campgrounds with hundreds of campsites (many with full RV hookups), seven group camps, four major picnic sites, OHV areas, beaches for swimming, and other facilities in the national forest (USFS website, 2001).

Facilities and lakes in the Shasta-Trinity National Forest experience levels of use consistent with regional use patterns. However, because of its proximity to I-5 and popularity of lakes such as Shasta and Trinity, the level of use at recreation facilities in the Shasta-Trinity National Forest is likely higher relative to other facilities in the region. This is especially true for recreation facilities near the I-5 corridor. During weekends and holidays of the peak season, which is typically from Memorial Day to Labor Day, the most popular campgrounds become crowded. Facilities farther away from I-5, such as those along river corridors and lakes like Iron Canyon and McCloud, receive low to medium use. Additionally, fall and winter activities such as hunting, snowmobiling, and cross-country skiing bring visitors to the Shasta-Trinity National Forest in the off season. The same is true for spring activities such as whitewater boating. Half of visitors are from local communities within 100 miles, while the other half come from the Bay Area. Local visitors participate in more day use activities, while those from farther away participate in more overnight activities (Grigsby, pers. comm., 2002).

Siskiyou County Parks, California

There are no recreation resources or facilities managed by Siskiyou County near the Project. However, the county owns land on Siskiyou Lake (435 acres) that it leases to a private concessionaire. This facility, Siskiyou Lake Campground, provides a developed camping experience near I-5 and the city of Mt. Shasta. This campground has 360 campsites, over 90 of which provide full hookups for RV camping. There are two picnic areas, a marina, boat launch, and beach area at the campground as well. Sailing and fishing are popular activities on the lake because motorcraft are restricted to a 10-mph speed limit. The level of use at this facility is high (Lake Siskiyou Camp website, 2002).

Six Rivers National Forest

The Six Rivers National Forest encompasses almost 1 million acres between the Pacific Ocean and the top of the Pacific Coast Mountain Range in northernmost California. The Six Rivers National Forest owes its name to the six rivers (the Smith, Klamath, Eel, Trinity, Van Duzen, and Mad) that flow through the Six Rivers National Forest into the Pacific Ocean. A variety of recreation opportunities are available here, including camping, picnicking, fishing, swimming, hiking, biking, boating, and cross-country skiing. There are 18 developed campgrounds with approximately 300 campsites and five picnic areas in the Six Rivers National Forest. A considerable amount of dispersed camping occurs along these rivers during both fishing and whitewater boating seasons. The Six Rivers National Forest contains many miles of trails for hiking, mountain biking, and horseback riding. There are also three wilderness areas (Siskiyou, Trinity Alps, and North Fork) within the national forest (USFS website, 2001).

The primary water bodies in the Six Rivers National Forest are the rivers that bisect it. The Smith, Klamath, and Trinity rivers were previously discussed in this subsection. There are several river access sites that vehicles can access along the Klamath River (approximately eight) and Salmon River (approximately five) for those launching boats. Within the national forest are approximately 40 miles of the Klamath River, 25 miles of the Salmon River, and 44 miles of the Smith River that are boatable. Motorized boat use is not permitted on rivers within the national forest. The Six Rivers National Forest's 350,000-acre Smith River National Recreation Area contains the last major undammed and undiverted river in California. Other water bodies in the national forest include Ruth Lake (1,100 acres), which allows motorized boat use, and Fish Lake, which does not. There is one boat launch at Ruth Lake, and waterskiing and PWC use are high on peak season weekends (USFS website, 2001).

For the most part, facilities and lakes in the Six Rivers National Forest experience levels of use consistent with regional patterns. During peak season weekends and holidays, a few campgrounds (Dillon, Fish Lake, and Oak Bottom) become crowded in the Mad River Ranger District in the south section of the national forest. Campgrounds in the central and northern districts of the forest only receive moderate use, even on peak-season weekends. The peak season is typically from Memorial Day to Labor Day. Additionally, the hunting season brings users during the fall months, snow-related activities draw users to the area during winter months, and whitewater boating opportunities draw users in the spring. Facilities are less frequently visited during weekdays, as well as during the off season. Most national forest campgrounds are open between May and November. Those that remain open through the winter months typically provide reduced or no services. Because of the national forest's linear shape, which stretches approximately 130 miles north to south, visitors come from a variety of places. The southern half of the forest receives a majority of visitors from local communities along the coast, such as Eureka, with the remainder typically coming from the Bay Area. The northern half of the forest receives a majority of visitors from the Medford, Oregon, area while the remainder come from either the Bay Area or Portland area (Pass, Opliger, and McCray, pers. comm., 2001).

Winema National Forest (USFS)

The Winema National Forest encompasses 1.1 million acres and lies on the eastern slopes of the Cascade Range in south-central Oregon. The Winema National Forest contains 12 campgrounds and three wilderness areas (Mountain Lakes, Sky Lakes, and Mount Thielsen). Camping, picnicking, fishing, boating, and hiking opportunities abound. In the winter, snowmobiling and cross-country skiing are popular activities. Almost 500 campsites are available in the 11 campgrounds, and there are eight day use areas. Trails abound with 151 miles of summer trails, 274 miles of snowmobiling trails, and 60 miles of cross-country ski trails available. There are 41 fish-producing lakes and 175 miles of fishing streams within the national forest (USFS website, 2001).

The largest lakes within or bordering the Winema National Forest are UKL, Lake of the Woods, Fourmile Lake, and Miller Lake. Each of these, with the exception of Miller Lake, was previously discussed in this subsection. Motorized boats are allowed on several lakes in the national forest, but not within the wilderness areas. UKL has a boat speed restriction of 10 mph, while Lake of the Woods, Fourmile Lake, and Miller Lake do not have restrictions. Lake of the Woods receives heavy motorized boat use during peak season while the others do not. Miller Lake (514 acres), which is northeast of Crater Lake National Park, has one boat launch, a developed campground, and four boat-in sites. There are a few boatable river sections in the national forest, including the Sycan River containing 32 miles of Class II rapids, the Sprague River containing 12 miles of flatwater popular with anglers, and the Williamson River containing

1 mile of flatwater. None of these rivers is well known for either whitewater boating or fishing, and they are not crowded during the peak season.

Facilities, lakes, and rivers in the Winema National Forest experience levels of use consistent with patterns typical for the region. During weekends and holidays of the peak season, campgrounds around lakes such as Lake of the Woods and Miller Lake become crowded, as do the day use areas and boat launches associated with them. Peak season is typically from Memorial Day to Labor Day although snow at higher elevations, such as in the wilderness areas, shortens the use season. Hunting season, in October and November, brings users to the national forest during the fall months and the abundance of snow-related opportunities brings users to the forest in the winter months. Low to moderate use of facilities occurs during weekdays, and low use occurs throughout the nonpeak season. Most fee campgrounds are open between May and October. If they remain open through the winter, there are typically no services provided. Almost 500,000 visitors came to the Winema National Forest in 2001. A majority of visitors typically come from local communities (such as Klamath Falls, Medford, Grants Pass), and the remainder come from areas within a couple hours' drive (Johnson, pers. comm., 2001; and Brown, pers. comm., 2001).

R Ranch

R Ranch, while privately owned by its membership, merits acknowledgement as a regional water-based recreation resource because of its size and proximity to the study area. R Ranch is a private recreational ranch, founded in 1971, that sells individual grant deeds to a 1/2500 undivided interest in the entire ranch. This ownership allows owners access to and use of R Ranch's 5,119 acres and recreation facilities. There are two separate campgrounds at R Ranch. Cottonwood Campground is located just off of I-5 farther away from the Project and offers full RV hookup sites and an RV dump station. This RV campground is more family oriented and is centered on an Olympic-size swimming pool. Klamath Campground is located a few miles east of Cottonwood and I-5 and 2 miles downstream of Iron Gate dam along 1.7 miles of the Klamath River. This campground contains a large lodge and is more oriented to adults because it provides opportunities to fish and hunt and has a lounge/adult recreation center. Owners are allowed to stay at R Ranch for up to 210 consecutive days a year. In addition to the amenities listed above, R Ranch has many trails, a horse stable and riding arena, tennis courts, a recreation center, playground, fishing access, restrooms, a bunkhouse with 56 rooms, a private hunting reserve, a shooting range, and a total of 857 RV and tent campsites (Seniors-Site website, 2002; R Ranch website, 2002).

### 4.7.2 Regional Recreation Demand

This discussion focuses on the demand for recreation activities and recreation settings within the study area and the region (as described by statewide recreation demand in California and Oregon). National recreation demand trends are described in the next section, 4.8 Discussion. The following recreation demand factors are described below:

- Existing demand in the study area for recreation activities
- Existing statewide demand for those recreation activities occurring in the study area
- Existing statewide (California) demand for recreation activity settings in the study area

#### 4.7.2.1 Existing Demand for Project Recreation Activities

Information from the Recreation Visitor Surveys (Section 3.0) is used to help describe existing demand for Project recreation activities. During the Recreation Visitor Surveys conducted in 2001 and 2002, those visitors who were surveyed rated the primary, secondary, and tertiary activities they participated in when visiting the study area (Table 4.7-8).

Table 4.7-8. Primary activities indicated by visitors surveyed in the study area.

| Primary Activity | Secondary Activity | Tertiary Activity |
|---|---|---|
| Fishing-boat (14%) | Resting/relaxing (9%) | Resting/relaxing (18%) |
| Waterskiing (11%) | RV camping (9%) | Swimming (9%) |
| Resting/relaxing (10%) | Swimming (7%) | Sightseeing (5%) |
| Fishing-bank (8%) | Sightseeing (6%) | Hiking (5%) |
| RV camping (6%) | Tent camping (6%) | Picnicking (5%) |

Source: EDAW, Inc.

When asked to indicate all activities that they participated in on Project study area lands and waters, more than half (60 percent) of the visitors surveyed indicated resting/relaxing as one of those activities (Table 4.7-9). Ten of the 23 recreation activities listed below are specific water-related activities and several others are associated with those water-related activities.

Table 4.7-9. Most common activities indicated by visitors to the study area.

| Activity* | % Participation |
|---|---|
| Resting/relaxing | 60 |
| Swimming | 46 |
| Picnicking | 39 |
| Sightseeing | 39 |
| Tent camping | 36 |
| Fishing – bank | 34 |
| Sunbathing | 33 |
| Hiking | 31 |
| Fishing – boat | 31 |
| RV camping | 30 |
| Wildlife viewing | 28 |
| Powerboating | 26 |
| Waterskiing | 25 |
| Tubing | 20 |
| Bicycling | 11 |
| Whitewater boating | 10 |
| Riding off-road vehicles | 10 |
| Canoe/kayak | 9 |
| PWC | 9 |
| Target shooting | 8 |
| Hunting | 6 |
| Mountain biking on trails | 5 |
| Horseback riding | 3 |

Source: EDAW, Inc.

* More than one activity could be indicated.

Additional results from the Recreation Visitor Surveys (Section 3.0) conducted in 2001 and 2002 indicate that the water resource most frequently visited within the study area is Iron Gate reservoir (Table 4.7-10).

Table 4.7-10. Most frequently visited areas indicated by visitors to the study area.

| Area* | % Visited |
|---|---|
| Iron Gate Reservoir Area | 50 |
| Upper Klamath River/Hell's Corner Reach Area | 23 |
| Keno Reservoir Area | 21 |
| J.C. Boyle Reservoir Area | 19 |
| Copco Reservoir Area | 19 |
| Link River Area | 15 |
| Lake Ewauna Area | 11 |
| Below Iron Gate Dam to I-5 | 8 |

Source: EDAW, Inc.

* More than one area could be indicated.

When given only one choice, visitors indicated that Iron Gate reservoir was the recreation area they most often visited (Table 4.7-11). Iron Gate reservoir is the closest reservoir in the Project to I-5 and has more developed day use areas than any other reservoir. It also has more campsites than any other reservoir in the study area. There are three boat ramps, six day use areas, and several dispersed use sites popular with visitors.

Table 4.7-11. Most often visited area indicated by visitors to the study area.

| First | Second | Third |
|---|---|---|
| Iron Gate Reservoir (42%) | Keno Reservoir (11%)<br>J.C. Boyle Reservoir (11%) | Copco Reservoir (8%)<br>Upper Klamath River/Hell's Corner Reach (8%) |

Source: EDAW, Inc.

### 4.7.2.2 Existing Statewide Demand for Those Recreation Activities Occurring in the Study Area

Projections of regional demand were based primarily on data obtained by the most recent CDPR and OPRD SCORP data (CDPR, 1998; OPRD, 2003).

The 1998 CDPR study presents the most recent demand data for 43 recreation activities in the state of California, including the following activities that occur in the regional study area:

- Trail hiking
- Bicycling (paved surfaces)
- Mountain biking (unpaved surfaces)
- Driving for pleasure
- Primitive camping
- Developed camping
- Nature study/wildlife viewing
- General use of open space
- Beach activities
- Swimming (nonpool)
- Sailboating and windsurfing
- Kayaking, canoeing, and rafting
- Powerboating
- Waterskiing
- Fishing (freshwater)
- 4-wheel-drive vehicle use
- Hunting
- Motorcycling/ATV use

- Picnicking
- Horseback riding
- Target shooting

Although future participation trends in these activities were not assessed, CDPR's baseline survey (CDPR, 1998) estimated existing demand for each of the common activities in the study area. Participants in the CDPR study were asked to rank those activities for which they would most probably increase their own participation if good opportunities were available. Many of the most common activities available in the study area have high levels of existing demand. The activities listed in Table 4.7-12 are shown in descending order of demand.

Table 4.7-12. Existing demand for selected activities in California.

| Activity | Existing Demand |
|---|---|
| Developed camping | High |
| Trail hiking | High |
| Swimming (nonpool) | High |
| Nature study/wildlife viewing | High |
| Primitive camping | High |
| Beach activities | High |
| General use of open space | High |
| Fishing (freshwater) | High |
| Picnicking | High |
| Bicycling (paved surfaces) | Moderate |
| Driving for pleasure | Low |
| Kayaking, canoeing, and rafting | Low |
| Mountain biking (unpaved surfaces) | Low |
| Hunting | Low |
| Motorcycling/ATV use | Low |
| 4-wheel-drive vehicle use | Low |
| Powerboating | Low |
| Waterskiing | Low |
| Horseback riding | Low |
| Target shooting | Low |
| Sailboating and windsurfing | Low |

Source: CDPR, 1998.

The 2003-2007 Oregon SCORP (OPRD, 2003) estimated existing demand for common outdoor recreation activities. Table 4.7-13 shows the percent of Oregon residents sampled that participated in each activity. Demand for recreation activities in Oregon is similar to demand in California. Nature study is in high demand and bicycling is in moderate demand in both Oregon and California. Both surveys indicated a low demand for kayaking, hunting, motorcycling/ATV use, 4-wheel-drive vehicle use, powerboating, waterskiing, horseback riding, target shooting, and sailboating/windsurfing. The activities listed in Table 4.7-13 are shown in descending order of demand.

#### 4.7.2.3 Existing Statewide Demand for Recreation Activity Settings in the Study Area

In addition to an activity-based approach to assessing recreation demand, it is also important to assess the types of physical, social, and managerial settings that visitors choose for recreation. indicates the types of outdoor recreation areas that California residents visit the most, as well as those areas they would prefer to visit. Due to time, money, availability, or information constraints, California visitors are often prevented from visiting the type of area they would prefer to visit (CDPR, 1998).

Table 4.7-13. Existing demand for selected activities in Oregon.

| **Activity** | **Existing Demand** |
|---|---|
| Sightseeing/driving for pleasure | High |
| Walking for pleasure | High |
| Visiting cultural/historic sites | High |
| Nature study/wildlife viewing | High |
| Bird watching | Moderate |
| Ocean beach activities | Moderate |
| Hiking | Moderate |
| Outdoor photography | Moderate |
| Running/walking for exercise | Moderate |
| Picnicking | Moderate |
| Bicycling | Moderate |
| Fishing from a boat | Moderate |
| Fishing from a bank | Moderate |
| Kayaking, canoeing, and rafting | Low |
| Primitive camping | Low |
| Developed camping | Low |
| Hunting | Low |
| Motorcycling/ATV use | Low |
| 4-wheel-drive vehicle use | Low |
| Powerboating | Low |
| Waterskiing | Low |
| Horseback riding | Low |
| Beach swimming | Low |

Table 4.7-13. Existing demand for selected activities in Oregon.

| Activity | Existing Demand |
|---|---|
| Target shooting | Low |
| Sailboating and windsurfing | Low |

Source: Oregon SCORP, 2003.
Note: For comparison with CDPR data, existing demand data shown as a percentage were divided into three categories. High demand represents 35%-60%, moderate demand represents 20%-34%, and low demand represents 1%-19%.

Table 4.7-14 shows that over two-thirds (69 percent) of California residents prefer to use either undeveloped areas or nature-oriented parks and recreation areas. However, relatively few residents actually use these areas on a consistent basis, primarily due to the constraints mentioned above. Thus, overall demand is high for the type of natural and undeveloped experience available in the study area. Demand is much lower for highly developed parks and recreation areas. Ten percent of residents prefer this type of setting, while over 20 percent actually use this type of setting. This indicates that many residents end up using these areas due to a lack of time, money, or other related reasons.

Table 4.7-14. Types of desired outdoor recreation areas used in California – preferred and actual.

| Type of Area | Preferred Use (%) | Actual Use (%)* |
|---|---|---|
| Natural and undeveloped areas | 39.4 | 11.7 |
| Nature-oriented parks and recreation areas | 30.0 | 9.7 |
| Highly developed parks and recreation areas | 10.2 | 20.5 |
| Historic or cultural buildings, sites, or areas | 9.3 | 2.2 |
| Private, not public, outdoor recreation areas and facilities | 11.1 | 12.9 |

Source: CDPR, 1998.
* Use of an area at least once a week.

The Oregon SCORP measures recreation settings differently from the CDPR survey. As Table 4.7-15 shows, Oregon respondents rated preferred and actual recreation settings in terms of specific recreation activities. In general, the people surveyed prefer less developed settings than those they actually choose, regardless of the recreation activity. Nearly twice as many respondents (40 percent) would prefer to hunt and shoot in a Primitive Recreation setting. The discrepancy between actual and preferred recreation settings was the highest for boating activities. Twenty percent of those surveyed boated in a Nature-dominant within Urban setting, although 0 percent preferred this setting.

Table 4.7-15. Types of desired outdoor recreation areas used in Oregon – preferred and actual.

| Activity | Primitive | | Semiprimitive | | Roaded Natural | | Roaded Modified | | Rural | | Highly Developed | | Nature-Dominant within Urban Areas | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Used=U Preferred=P | U% | P% | U% | P% | U% | P% | U% | P% | U% | P% | U% | P% | U% | P% |
| Picnicking, sightseeing, & touring | 8.47 | 14.29 | 8.47 | 12.70 | 37.29 | 41.27 | 8.47 | 9.52 | 10.17 | 9.52 | 13.56 | 7.94 | 5.08 | 1.59 |
| Fishing, crabbing, & clamming | 19.08 | 20.00 | 13.74 | 25.19 | 34.35 | 34.07 | 12.21 | 11.85 | 12.21 | 2.96 | 5.34 | 5.19 | 0.76 | 0.74 |
| Boating | 12.00 | 21.05 | 12.00 | 26.32 | 20.00 | 26.32 | 8.00 | 10.53 | 20.00 | 10.53 | 8.00 | 5.26 | 20.00 | 0.00 |
| Hunting & shooting | 22.00 | 40.38 | 25.00 | 22.12 | 26.00 | 21.15 | 19.00 | 11.54 | 6.00 | 2.88 | 1.00 | 0.96 | 1.00 | 0.00 |
| Nature study | 8.06 | 16.13 | 16.13 | 29.03 | 35.48 | 33.87 | 9.68 | 8.06 | 16.13 | 9.68 | 3.23 | 0.00 | 6.45 | 3.23 |
| Swimming & beach activities | 4.92 | 13.33 | 13.11 | 18.33 | 36.07 | 36.67 | 6.56 | 11.67 | 16.39 | 10.00 | 13.11 | 3.33 | 1.64 | 1.67 |
| Camping | 4.27 | 6.63 | 9.76 | 11.45 | 35.98 | 37.95 | 15.24 | 17.47 | 9.15 | 6.02 | 22.56 | 18.67 | 0.61 | 0.60 |
| Outdoor sports | 1.47 | 5.08 | 2.94 | 6.78 | 7.35 | 13.56 | 5.88 | 8.47 | 16.18 | 11.86 | 22.06 | 13.56 | 5.88 | 11.86 |
| Nonmotorized snow activities | 7.69 | 20.00 | 7.69 | 16.00 | 7.69 | 12.00 | 19.23 | 8.00 | 0.00 | 4.00 | 42.31 | 32.00 | 3.85 | 4.00 |
| Trail, road & beach activities | 11.23 | 21.84 | 16.74 | 28.37 | 25.64 | 26.33 | 6.36 | 3.88 | 12.71 | 6.12 | 6.78 | 4.08 | 4.66 | 3.67 |

Source: OPRD, 2003.

Note: The two most urban recreation setting categories were excluded because they were not relevant to study area recreation settings.

## 4.8 DISCUSSION

This discussion synthesizes data from Subsection 4.7, above, with respect to the overall general supply and demand for regional recreation facilities, activities, and opportunities.

### 4.8.1 Characterization of Existing Conditions

This synthesis is intended to be general, but it establishes findings that are used to develop the Recreation Needs Analysis (Section 5.0). The results of that study will provide an assessment of the existing and future visitor demand for recreation opportunities and resources within the study area.

#### 4.8.1.1 Role of Project Area Recreation Resources in the Region

Based on an analysis of the similarities and differences between Project and regional recreation resources described above, the following subsection characterizes the role of the Project within the region.

The Project represents an important regional resource in terms of water-based resources and provides a significant amount of recreation facilities and opportunities. One exception, however,

is developed camping opportunities. Tables 4.8-1 and 4.8-2, below, summarize the comparison between Project reservoirs and similar water-based recreation resources in the region.
Table 4.8-1 is an approximate list of facilities at each of the recreation areas. With the exception of the very large UKL to the north and Shasta and Trinity lakes to the south, the lakes and reservoirs in the study area and the regional study area have a similar amount of surface water acreage available for water-based activities. Because they are exceptions to a normal size range, UKL (85,120 acres), Shasta Lake (29,550 acres), and Trinity Lake (16,535) are listed at the bottom of Table 4.8-1, and the number of recreation facilities at each is not included in comparison calculations.

When compared with regional lakes and reservoirs of similar size (surface acres), the study area has a comparable number of boat launches. However, the study area has a significant percentage of developed picnic areas for the region (61 percent of the total) and a much smaller percentage of developed campsites in the region (6 percent). If the number of campsites, boat launches, and picnic areas were factored in for the three larger lakes and reservoirs in the region, the percent of facilities that the Project provides would drop significantly. Thus, they are factored in separately.

Although previously mentioned in the discussion about regional recreation areas, there are lakes and reservoirs of comparable size that are not included in the comparison table. The following water bodies were not included because they are beyond the regional study area boundary; they are not a publicly owned and/or managed resource; or they are so different in character from Project resources that a comparison is not meaningful. Although they are not included in the comparison table, it is important to be aware of them because they are visited by people who also visit the Project reservoirs. These lakes and reservoirs include:

- Big Sage reservoir (~2,000 acres) in the Modoc National Forest
- Clear Lake (~20,000 acres) as part of the Klamath National Wildlife Refuge complex
- Goose Lake
- Iron Canyon reservoir (500 acres) in the Shasta-Trinity National Forest
- Lake Britton (1,200 acres) in the Shasta-Trinity National Forest
- McCloud reservoir (700 acres) in the Shasta-Trinity National Forest
- Miller Lake (514 acres) in the Winema National Forest
- Ruth Lake (1,100 acres) in the Six Rivers National Forest
- Siskiyou Lake (435 acres)
- Thompson reservoir (2,179 acres) in the Fremont National Forest

Table 4.8-1. Recreation facilities comparison of Project study area reservoirs to specific lakes or reservoirs in the region.

| Project Study Area Reservoirs | Surface Water(acres) | Number of Developed Campsites | Number of Developed/ Improved Boat Launches | Number of Developed Picnic Areas | Generalized Use Levels |
|---|---|---|---|---|---|
| Keno/Lake Ewauna | 2,475 | 26 | 3 | 2 | Low |
| J.C. Boyle | 420 | 16 | 2 | 4 | Low |
| Copco No. 1 | 1,000 | 0 | 2 | 2 | Low |
| Copco No. 2 | 40 | 0 | 0 | 0 | Low |
| Iron Gate | 944 | 37 | 3 | 6 | Moderate |
| *Subtotal/% of Total* | | 79 (6%) | 10 (29%) | 14 (61%) | |
| Lakes and Reservoirs of Similar Size | | | | | |
| Agency Lake | ~5,500 | 43 | 3 | 0 | Low |
| Lake of the Woods | 1,113 | 190 | 3 | 1 | High |
| Fourmile Lake | 740 | 25 | 1 | 0 | Low |
| Hyatt Reservoir | 1,250 | 172 | 2 | 1 | Moderate |
| Emigrant Lake | 806 | 110 | 2 | 2 | Moderate |
| Howard Prairie Reservoir | 2,000 | 303 | 4 | 1 | Moderate |
| Applegate Reservoir | 988 | 66 | 3 | 1 | Low |
| Medicine Lake | 408 | 72 | 1 | 1 | Low |
| Gerber Lake | 3,830 | 50 | 2 | 1 | Moderate |
| Whiskeytown Lake | 3,200 | 139 | 3 | 1 | Moderate |
| Subtotal/% of Total | | 1,170 (94%) | 24 (71%) | 9 (39%) | |
| Total/% of Total | | 1,249 (100%) | 34 (100%) | 23 (100%) | |
| Lakes and Reservoirs Much Larger in Size | | | | | |
| Shasta Lake | 29,500 | 320 | 7 | 7 | High |
| Trinity Lake Unit | 16,535 | 500 | 7 | 2 | Moderate |
| Upper Klamath Lake | 85,120 | 269 | 6 | 1 | Moderate |
| Total | | 1,098 | 20 | 10 | |

Source: EDAW, Inc.

Table 4.8-2 compares recreation features such as physical setting, visitor origins, facility utilization, and water-based activities of regional lakes and reservoirs with Project reservoirs.

Table 4.8-2. Comparison of recreation features on regional lakes/reservoirs to those on Project study area reservoirs.

| Lake/Reservoir | Similar Physical Setting | Similar Visitor Origins | Similar Facility Utilization | Similar Water-Based Activities |
|---|---|---|---|---|
| Agency Lake | Y | Y | Y | Y |
| Applegate Reservoir | N | Y | Y | N (primarily fishing, speed restriction) |
| Emigrant Lake | N | Y | N | Y |
| Fourmile Lake | N | Y | Y | N (primarily fishing, high elevation) |
| Gerber Lake | N | Y | Y | N (primarily fishing, speed restriction) |
| Howard Prairie Reservoir | N | Y | N | N (primarily fishing, high elevation) |
| Hyatt Reservoir | N | Y | N | N (speed restriction) |
| Lake of the Woods | N | Y | N | Y |
| Medicine Lake | N | N | Y | N (primarily fishing, high elevation) |
| Whiskeytown Lake | N | N | N | Y |
| Shasta Lake | N | N | N | N (houseboating most popular) |
| Trinity Lake Unit | N | N | N | N (houseboating most popular) |
| Upper Klamath Lake | Y | Y | N | N (primarily fishing) |

Source: EDAW, Inc.

Legend: Y = Yes, it is similar to Project reservoirs, N = No, it is not similar to Project reservoirs.

Reservoir Physical Setting

In terms of the physical setting, the Project reservoirs are similar to only a few other lakes or reservoirs in the region. The Project reservoirs are located among a number of different mountain ranges (Coast Range, Siskiyous, Sierras, and Cascades) and are thus a unique environment within the region. As the river slices through the ancient volcanic rock of this conglomeration of ranges, a variety of arid landscapes is encountered, from steep forested canyons to rolling brush-covered hills. Only nearby Upper Klamath and Agency lakes could be considered as having a similar physical setting to Project reservoirs because of their proximity to the study area, although even they are different. Each is much larger in size and both are adjacent to or near the city of Klamath Falls, agriculture/grazing lands, and a wildlife refuge.

Reservoir Visitor Origins

The majority of visitors to both the Project and regional recreation areas come from surrounding local communities and counties. Recreation areas farther north in the region typically receive a majority of visitors from southern Oregon counties and communities such as Medford, Ashland, and Grants Pass. Recreation areas farther south in the region typically receive a majority of visitors from northern California counties and communities. However, reservoirs or lakes that are close to major highways or have a unique attraction, such as an excellent fishery or houseboating, also tend to have a higher proportion of visitors from farther away, including the San Francisco Bay Area or the Portland, Oregon, area.

Overall Facility Utilization

From a facility utilization perspective, the study area is similar to most other recreation areas in the region. Project facilities have similar visitor use patterns, although facilities are not utilized at the same high level as they are at Lake of the Woods, Emigrant Lake, Trinity Lake, or Shasta Lake. Peak season for the region is typically between Memorial Day and Labor Day, although somewhat fewer numbers of visitors come to the area to go whitewater boating in the spring, to hunt or view wildlife in the fall, and to participate in snow activities in the winter. It is typical for Project facilities to experience moderate to high use during peak season weekends and holidays while the most popular destinations in the region are also reaching capacity or are at full capacity.

Water-based Activities

Water-based activities that are available in the Project area include swimming, fishing, motorized boating, waterskiing, PWC use, nonmotorized boating, and whitewater boating. Houseboating does not occur in the Project area and boat-in camping seldom occurs compared with Shasta Lake and Trinity Lake. There are several lakes in the region that provide a more serene experience, either because they have boating speed restrictions, such as Applegate reservoir and Hyatt Lake, or allow no motorized boating altogether, such as the multitude of alpine lakes located within wilderness areas nearby. There are flatwater and whitewater fishing opportunities of varying quality throughout the region. Many of the alpine lakes have excellent trout fisheries and several lakes, such as Howard Prairie reservoir, are stocked with trout. Chinook and coho salmon; steelhead; and brown, cutthroat, and native trout are found in regional rivers.

The study area provides a unique setting to experience a variety of recreation activities that also occur throughout the region. There are limited camping opportunities in the study area compared with camping opportunities at lakes and reservoirs of similar size in the region. However, a significant percentage of the region's public boat launches that are on lakes and reservoirs similar in size are located in the study area. During peak season, Project facilities are not utilized to the extent that others in the region are, but they do experience the same pattern of use: busy during summer weekends and holidays. Facilities that are close to the I-5 corridor (Shasta Lake and Trinity Lake); near larger towns such as Medford and Ashland (Emigrant reservoir); or at places that are historically popular with local county users (Lake of the Woods) tend to be more popular. One of the Project reservoirs, Iron Gate, is more popular than the others due to its proximity to I-5, which is likely why more facilities are provided there.

Overall, reservoirs in the Project area are an important water-based recreation resource in southern Oregon and northern California. They provide an extensive amount of surface water area and boat launch sites for water-based recreation, although some are more difficult to access from major state highways and I-5. In addition, with only 79 developed campsites, the Project area contains only a small percentage (6 percent) of reservoir-related camping in the region. These factors, principally quick and easy access, have most likely kept Project reservoirs from becoming as popular as some of the other lakes and reservoirs in the region.

Demand for Recreation Activities

The most common recreation activities on Project lands and waters are water-related such as swimming, beach activities (sunbathing), and fishing. Table 4.8-3 indicates that activities having a high demand statewide are activities that are also currently in demand and taking place in the study area. There are also activities that were rated by CDPR (1998) and OPRD (2003) as having a low demand that are popular in the study area. Kayaking, canoeing, rafting, powerboating, waterskiing, and sailing were rated by the CDPR as having a low existing demand. As previously stated, results from visitor surveys (Section 3.0) conducted in 2001 and 2002 indicate that boat fishing is a primary activity of visitors to the study area. Waterskiing is the seventh most common activity in the Project area, and 31 percent of visitors in 2001 and 2002 participated in boat fishing. Also, 26 percent of Project visitors participated in powerboating and 10 percent participated in whitewater boating. One activity that is not considered in either the California or Oregon SCORPs is PWC use. This activity is expected to continue to grow in the region.

Table 4.8-3. Comparison between statewide (CA and OR) demand and percent participation in activities within the Project.

| Recreation Activity | Existing Demand for Selected Activities in California[1] | Existing Demand for Selected Activities in Oregon[2] | Percent Participation in the Most Common Activities Indicated by Visitors to the Project Area in 2001 and 2002[3] |
|---|---|---|---|
| Developed camping | High | Low | 35% (tent), 30% (RV) |
| Trail hiking | High | Moderate | 31% |
| Swimming (nonpool) | High | Moderate | 46% |
| Nature study/wildlife viewing | High | High | 28% |
| Primitive camping | High | Low | 35% (tent) |
| Beach activities | High | Moderate | 46% (swimming) |
| General use of open space | High | Not listed | Not Applicable |
| Fishing (freshwater/bank) | High | Moderate | 34% (bank) 31% (boat) |
| Picnicking | High | Moderate | 39% |
| Bicycling | Moderate | Moderate | 11% |

Source: EDAW, Inc.

1 CDPR, 1998.

2 OPRD, 2003.

3 EDAW, Inc. (see Section 3.0).

Because many of the recreation areas in the Project are relatively remote, many visitors are more likely to use camping facilities as part of their trip. For this reason, analyzing utilization of camping facilities is an efficient manner in which to characterize current use of recreation areas in the region. As previously discussed, 66 percent of visitors to the study area surveyed in 2001 and 2002 participated in tent or RV camping (Table 4.7-9). Anecdotal information regarding most of the campgrounds located in study area reservoirs indicate that although utilization is moderate to high on peak weekends and holidays, the supply of campground facilities is generally meeting demand on a seasonal basis. However, current use levels during peak-season weekends and holidays appear to be approaching capacity. This may be because the number of campsites available in the study area is far fewer than the number available at lakes and reservoirs of comparable size within the region. Utilization data from the recreation capacity analysis, a component of the Recreation Needs Analysis (Section 5.0) confirms this observation.

In the study area, recreation demand will eventually exceed the existing recreation supply, as it will for the region. Growth projections in many of these existing activities indicate that the current supply of recreation facilities in the region will need to be increased to meet demand. Existing facilities that will likely need to be expanded to help meet demand include the following:

- Boat launches
- Boat-trailer parking
- Campgrounds (sites with and without hookups)
- Hiking trails
- Day use facilities (picnic tables, restrooms)
- Interpretive facilities

Both California and Oregon SCORP recreation setting preference data indicate that visitors prefer more primitive camping and boating settings than they currently use. This could indicate that some visitors would prefer additional primitive camping facilities as opposed to more developed campgrounds with full hook-ups. However, with the aging of the U.S. population and the continued high demand for RV campsites, developed campsites in the study area will likely continue to be popular in the future. This popularity should continue as long as the setting provides a natural outdoor character with an adequate buffer between campsites.

Overall, the existing supply of recreation facilities and experiences appears to be generally meeting demand at both the regional and Project level when considering the entire season (May to September). However, as activity participation and population trends continue to rise, demand in the region will likely exceed the existing supply unless current facilities are enlarged or new facilities are constructed. Peak use is now occurring during peak-season weekends and holidays and in recreation areas that are more easily accessible, such as those along I-5.

#### 4.8.2 Characterization of Future Activities and Demand

Recent trends in activity participation can be determined from activity participation rates from 1987, 1993, and 1997 statewide surveys in California conducted by CDPR (CDPR, 1988, 1994, and 1998) and in the Oregon SCORP conducted by OPRD (OPRD, 2003). These data can be used to assess recent trends in participation that may suggest future trends. Although it cannot be assumed that these trends will be consistent throughout the license period, they do provide some general direction. Activities common in the study area for which participation has been increasing in California over this period include the following:

- Bicycling (paved surfaces)
- Nature study/wildlife viewing
- Motorcycling/ATV use

Two activities common in the study area for which participation has been increasing in Oregon over this period include the following:

- Nature study/wildlife viewing
- Motorcycling/ATV use

Regional recreation activities for which participation has not changed significantly over this period, but which represent activities in the study area, include the following:

- Mountain biking (unpaved surfaces)
- Primitive camping
- Kayaking, canoeing, and rafting
- Fishing (freshwater)

In general, participation has not decreased for any of the regional activities common in the study area.

Future trends in recreation activity demand can also be determined from recent national and regional data. Table 4.8-4 indicates the projected change in participation in various activities that are common in the study area by the year 2030 in the Pacific Region, which includes California, Oregon, Washington, Alaska, and Hawaii. These projections are based on estimated regional changes in population as well as changes in basic demographic variables that affect participation such as age, race, and income. In addition, these projections also factor in the changing supply of recreation opportunities in the future. While the regional area used in this analysis (Pacific Region) is much broader than the regional study area or study area in the Project, this information provides further context for estimating the potential growth in activities common in the study area. Participation in many of the activities that are currently popular in the study area is expected to continue to increase in the future. In general, this increase is expected to be larger in the Pacific Region than for the nation as a whole (Cordell, 1999).

One additional component of future demand for recreation activities in the study area is current population data for the surrounding area where visitors originate, as well as forecasts for changes in the population of these areas. Table 4.8-5 details population projections for various counties in southern Oregon, northern California, and the San Francisco Bay Area. These areas were selected because they are the counties where the Project is located, as well as the place of residence for many of the visitors to the study area. The population projections shown in Table 4.8-5 are projected to continue through the year 2020.

Population within Oregon and California counties in the study area is projected to increase over 26 percent by the year 2020. Residents from the San Francisco Bay Area are also an important component of visitors to the study area. The population of the counties in this area is projected to increase by 18 percent by the year 2020.

Table 4.8-4. National and regional trends in outdoor recreation activity participation (2000 to 2030).

| Activity | National Trend (2000-2030) (percent change) | Pacific Region Trend (2000-2030) (percent change) | Pacific vs. National Trend Difference (2000-2030) (percent change) |
|---|---|---|---|
| Sightseeing | +42 | +49 | +7 |
| Rafting/floating | +47 | +47 | +0 |
| Canoeing | +22 | +45 | +23 |
| Motorboating | +28 | +45 | +17 |
| Hiking | +31 | +45 | +14 |
| Nonconsumptive wildlife | +37 | +44 | +7 |
| Walking | +27 | +41 | +14 |
| Developed camping | +28 | +39 | +11 |
| Visiting a beach | +33 | +38 | +5 |
| Nonpool swimming | +30 | +37 | +7 |
| Picnicking | +33 | +37 | +4 |
| Biking | +37 | +35 | -2 |
| Family gathering | +32 | +35 | +3 |
| Primitive camping | +5 | +22 | +17 |
| Fishing | +20 | +18 | -2 |
| Off-road vehicle riding | +6 | +16 | +10 |
| Hunting | -8 | -21 | -13 |

Source: Cordell, 1999.

Table 4.8-5. Population estimates and forecasts for selected areas of California and Oregon where visitors originated.

| Study Area Vicinity Counties | 2000 Population[1] | 1990-2000 Population Change (percent)[1] | Estimated 2020 Population[2] | 2000-2020 Population Change (percent) |
|---|---|---|---|---|
| Douglas County, OR | 100,399 | +6.1% | 120,671 | +20.2% |
| Josephine County, OR | 75,726 | +20.9% | 93,669 | +23.7% |
| Jackson County, OR | 181,269 | +23.8% | 221,665 | +22.3% |
| Klamath County, OR | 63,775 | +10.5% | 78,369 | +22.9% |
| Lake County, OR | 7,442 | +3.3% | 8,530 | +14.6% |
| Siskiyou County, CA | 44,301 | +1.8% | 53,900 | +21.7% |
| Trinity County, CA | 13,022 | -0.3% | 15,400 | +18.3% |
| Shasta County, CA | 163,256 | +11.0% | 231,000 | +41.5% |
| Modoc County, CA | 9,449 | -2.4% | 11,500 | +21.7% |
| Subtotal | 658,639 | +13.2% | 834,704 | +26.7% |
| San Francisco Bay Area, California Counties | | | | |
| San Francisco County | 801,400 | +10.7% | 755,800 | (5.7%) |
| Contra Costa County | 930,000 | +15.7% | 1,152,900 | +24.0% |
| Alameda County | 1,454,300 | +13.9% | 1,811,800 | +24.6% |
| Sonoma County | 459,258 | +18.3% | 628,400 | +36.8% |
| San Mateo County | 730,000 | +12.4% | 834,500 | +14.3% |
| Marin County | 249,700 | +8.5% | 273,800 | +9.7% |
| Subtotal | 4,624,658 | +13.9% | 5,457,200 | +18.0% |
| States | | | | |
| California | 34,480,300 | +15.4% | 45,821,900 | +32.9 |
| Oregon | 3,421,399 | +20.4% | 4,326,000 | +26.4 |

Source: EDAW, Inc.

[1] U.S. Census Bureau Data (http://quickfacts.census.gov).

[2] EPA Technology Transfer Network (www.epa.gov/ttn/rto/areas/pop/pop_proj.htm).

# 5.0 RECREATION NEEDS ANALYSIS

## 5.1 DESCRIPTION AND PURPOSE

This Recreation Needs Analysis consists of four study components. The study components and purpose are briefly described below.

1. Recreation Supply Analysis inventories recreation facilities and use areas in the Klamath Hydroelectric Project study area and their condition.

2. Recreation Demand Analysis identifies existing recreational demand in the study area and projects future demand for various reservoir- and river-based activities of interest.

3. Recreation Capacity Analysis assesses the capacity of the study area to accommodate existing and future recreation use, and includes a nonmotorized trail feasibility study.

4. Recreation Needs Analysis synthesizes the results of all of the studies and identifies existing recreation needs and future needs over the potential term of the new license. The results of this study will be directly used in the development of a follow-on Recreation Resource Management Plan (Section 6.0) for the study area.

## 5.2 OBJECTIVES

The objectives and key questions addressed by this study are as follows:

- Inventory and evaluate recreation facilities, use areas, and site conditions for each of the major recreation facilities and sites in the study area. Determine whether the facilities comply with the Americans with Disabilities Act (ADA) and recent draft proposed accessibility guideline revisions (Access Board, 2002).

- Identify the current and future demands for recreation in the study area.

- Are there any latent (unmet) demands?

- What are the potential effects of the Project and its operations on recreation resources?

- Are current recreation demands being met by Project recreation facilities and sites? What are the opportunities for recreation development? What are the constraints?

- Synthesize results into a comprehensive assessment of recreation facility, use area, and service needs in the study area.

## 5.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The results of this study provide the analysis necessary to understand the recreation facility and service needs in the study area, both current and during the anticipated term of the new license. This study is intended to help focus decisionmaking on recreation needs for possible inclusion as proposed PM&E measures in the license application. This information will satisfy FERC license application requirements related to the assessment of Project-related recreation inventory/supply, demand, capacity, trails, and needs analyses.

## 5.4 METHODS AND GEOGRAPHIC SCOPE

The following subtasks are included in this study:

- Recreation Supply Analysis that inventories recreation resources and Project-related activities.
- Recreation Demand Analysis that assesses the demand for various Project-related activities.
- Recreation Capacity Analysis, including a nonmotorized trail feasibility study, that assesses the capacity of recreation resources to accommodate existing and future use levels.
- Recreation Needs Analysis that synthesizes the results of the previous studies and identifies existing and future recreation needs in the study area.

### 5.4.1 Recreation Supply Analysis

This subtask provides an inventory and evaluation of existing recreation facilities, dispersed undeveloped sites and use areas, and the conditions for each of the facilities and sites in the study area. The study focuses on developing a good inventory of the supply of Project-related developed facilities and primary undeveloped, dispersed use areas and trails in the study area (Figures 1.1-1 and 1.1-2). Specific areas of interest include the physical condition of facilities and use areas and ongoing operations and maintenance issues.

Standard inventory and facility condition forms were developed and used for existing recreation sites and facilities (Appendix 5A). Existing data from PacifiCorp and BLM were incorporated into these forms.

For each developed site, the following field data were collected:

- Site photography
- General measurements and area calculations of major developed sites
- Mapping of developed recreation sites using geographic information system (GIS) software, and locating, mapping, and numbering of dispersed sites in GIS

Methods for the analysis involved review of existing information, consultation with site managers and/or private operators, and site-specific field investigations. Inventory forms were filled out at each recreation site and facility. Existing conditions were identified and documented through field reconnaissance and notes and were revalidated and documented in tabular format. Planned or future recreation facilities or use areas were documented through review of existing plans and through consultation. Facilities that will be expanded or upgraded in the future were noted. Interviews were held with PacifiCorp, BLM, and private recreation providers in the study area.

Facility condition forms also were filled out for each recreation site and facility. To characterize facility conditions, each site was rated using specific criteria. Four qualitative criteria were used:

- (X) Needs replacement (broken or missing components, or nonfunctional)
- (R) Needs repair (structural damage or otherwise in obvious disrepair)
- (M) Needs maintenance (primarily cleaning)
- (G) Is in good condition (functional and well maintained)

Unsafe conditions and signs of overuse were noted at each site. Planned improvements at each site also were noted. In conducting this assessment, existing PacifiCorp and BLM data were used as available.

Dispersed undeveloped recreation sites in the study area were identified. The location and general ecological condition of these sites were assessed.

This subtask also included a detailed assessment of compliance of recreation facilities with the ADA at each developed recreation facility in the study area. The ADA, signed into law in 1990, protects individuals with disabilities by specifying that adequate access to facilities, including recreation facilities, be provided to the physically disabled. Methods for the ADA accessibility assessment component of this analysis involved review of published information and guidelines, consultation with agencies and facility operators, and site-specific field investigations. The methodology involved two primary components: (1) review of existing literature and background considerations, and (2) field assessment of recreation facility accessibility.

#### 5.4.1.1 Review of Existing Literature and Background Considerations

The primary sources of information reviewed for this study include existing and proposed sections of the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) (Access Board, 1991, 1999, and 2002). The Architectural and Transportation Barriers Compliance Board (Access Board) is responsible for developing accessibility guidelines under the ADA to ensure that new construction and alterations of facilities covered by the ADA are readily accessible to and usable by individuals with disabilities. In most cases, the Access Board develops “guidelines,” which serve as the basis for “standards” issued by other agencies. In this sense, Access Board guidelines serve as the minimum baseline for enforceable standards for recreation facility accessibility. The Access Board created ADAAG in 1991. ADAAG consists of general sections that apply to all types of buildings and facilities, and special application sections that contain additional requirements for certain types of buildings and facilities. ADAAG applies only to newly designed or newly constructed buildings and facilities and to existing facilities when they are substantially altered. Routine or periodic maintenance or repair is not considered an alteration.

Accessibility guidelines for recreation facilities in the study area are currently provided in various existing and proposed sections of ADAAG. Table 5.4-1 shows which existing and proposed sections of ADAAG apply to various recreation facilities in the study area. These include: (1) original ADAAG (1991), (2) ADAAG for Recreation Facilities (2003), and (3) ADAAG for Outdoor Developed Areas (under consideration). Newly constructed and altered recreation facilities and outdoor developed areas are required to comply with general sections of the original ADAAG, where the provisions can be applied. For example, parking areas, entrances, and restrooms that are part of newly constructed and altered recreation facilities must comply with ADAAG. As issued in 1991, the original ADAAG did not recognize the unique features and constraints specific to recreation facilities and outdoor environments; therefore, additional provisions and special application sections have been or are still being developed.

Table 5.4-1. Existing and proposed sections of ADAAG relevant to various recreation facilities in the study area.

| Original ADAAG (1991) | Expanded ADAAG for Recreation Facilities (2002) | Additional ADAAG for Outdoor Developed Areas (Currently Under Review) |
|---|---|---|
| • Toilets/restrooms<br>• Telephones<br>• Water faucets<br>• Access routes<br>• Parking areas<br>• Signage<br>• Entrances<br>• Buildings | • Boating facilities<br>• Fishing piers and platforms<br>• Play areas<br>• Shooting ranges | • Trails<br>• Outdoor access routes<br>• Beach access routes<br>• Picnic areas<br>• Cooking surfaces and grills<br>• Trash and recycling containers<br>• Wood stoves and fireplaces<br>• Overlooks and viewing areas<br>• Benches<br>• Utility sinks<br>• Storage facilities<br>• Pit toilets<br>• Utilities<br>• Campsites |

Source: Access Board, 1991, 1999, and 2002.

On September 3, 2002, the Access Board issued final accessibility guidelines for recreation facilities. These guidelines supplement the original ADAAG by adding a new special application section on recreation facilities. These guidelines cover some of the recreation facilities in the study area, such as boating and fishing facilities, among others. Guidelines for other recreation facilities in the study area, such as camping and picnicking, are still under development. In 1997, the Outdoor Developed Areas Regulatory Negotiating Committee was established by the Access Board and charged with developing proposed accessibility guidelines for outdoor developed areas including access to trails, beaches, and picnic and camping areas. Proposed guidelines for outdoor developed areas were published in a report by this committee in 1999 (Access Board, 1999). The Access Board is now preparing proposed guidelines based on this report. Once final guidelines are issued, likely sometime after 2003, they will supplement the original ADAAG by adding a new special application section on outdoor developed areas. Currently, the guidelines in the report by the Outdoor Developed Areas Regulatory Negotiation Committee are used as the “best available guidance” for compliance with the ADA (Beatty, pers. comm., 2000).

#### 5.4.1.2 Field Assessment of Recreation Facility Accessibility

A field assessment of recreation facilities in the study area was conducted as part of the recreation supply analysis. An inventory form was developed to document recreation facility accessibility in the study area (Appendix 5A). For each developed recreation site, the field assessment reviewed accessibility in several key areas, including: access routes, parking areas, toilets and restrooms, boat launches and boarding docks, fishing piers, picnic areas, beach access, recreation trails, campsites, and utilities. Accessibility guidelines in the appropriate section of

ADAAG (Table 5.4-1) were used as the primary guidance for design standards and technical criteria when conducting the field assessment of recreation facility accessibility in the study area.

Additionally, FERC also requires a discussion of National Recreation Trails and federal Wild and Scenic Rivers (existing and candidate). These resources were documented as part of the Recreation Flow Analysis (Section 2.0) and the Regional Recreation Analysis (Section 4.0). These resources are located in the area surrounding the recreation study area.

### 5.4.2 Recreation Demand Analysis

This subtask provides an analysis of recreation demand in the study area and consisted of two steps. The first step considered regional demand using existing SCORP data for Oregon and California and other existing sources of regional data to estimate existing and future demand for various activities in the study area. This first step was completed as part of the Regional Recreation Analysis (Section 4.0).

The second step compared the results of the regional analysis with the results of the Recreation Flow Analysis (Section 2.0) and the Recreation Visitor Surveys (Section 3.0). This second step compared current recreation use and demand in the study area with trends in regional and activity-specific demand. Results were used to help assess latent (unmet) demand, if any, and the demand for Project-related activities over the anticipated term of the new license. Additionally, recreational use of study area facilities were projected through the anticipated term of the new license based on regional and activity-specific demand.

Recreation activities occurring on surrounding non-Project lands that are unrelated to the Project, including OHV use, hunting, and target shooting, are not assessed in this analysis. These activities would be occurring with or without the Project. While the Project provides access roads, attractions, and facilities that may attract these types of uses (OHV, hunting, target shooting, etc.), it is generally the responsibility of surrounding landowners and resource managers to manage these dispersed use activities occurring on their lands.

### 5.4.3 Recreation Capacity Analysis

The Recreation Capacity Analysis has two components:

1. Recreation Carrying Capacity Analysis
2. Nonmotorized Recreation Trail Feasibility Study

#### 5.4.3.1 Recreation Carrying Capacity Analysis

This subtask provides an assessment of recreation capacity based on an analysis of several types of capacity that are used for planning purposes. This analysis focuses on the capacity of developed recreation facilities because they receive the greatest amount of visitation and are subject to increased crowding problems. These resources include developed campgrounds and day use areas, including boat launches. The capacity analysis uses results from the previous subtask analyses. These analyses provide an understanding of area facilities, existing use patterns, responses to questions regarding crowding, facility capacities, and user impacts and conflicts. An analysis of capacity limiting factors was also conducted.

There is a large body of research on crowding and resource deterioration in recreation settings. In this research, it is useful to distinguish among four types of carrying capacity in recreation settings (Shelby and Heberlein, 1986). These four capacity types and examples include:

- Biophysical (Ecological) Capacity—Concerned with impacts on the ecosystem, such as the loss of ground cover, impacts to wetlands and riparian communities, observed soil compaction and soil erosion, and observed trash accumulation and sanitary problems. Also concerned with impacts to cultural resources at developed and dispersed recreation areas in the study area (to be assessed by cultural resource group).

- Spatial Capacity—Concerned with space-related impacts, such as the number of people occupying specific areas or lengths of shorelines, number of parties per site, or the expansion potential of existing sites.

- Facility Capacity—Concerned with facility impacts, such as number of people, groups, or vehicles per boat ramp, parking lot, or campground, percent occupancy for various facilities, time waiting to use facilities such as boat launches, or the number of refusals for campsites.

- Social Capacity—Concerned with social impacts, such as visitors' perceptions of crowding from survey data, the number of encounters with other parties per day, and the number of encounters with PWC.

This subtask assesses each of these four types of capacity for each of the recreation sites and facilities. In addition, it is important to define the overall capacity of each reservoir. For each of the recreation sites and for each reservoir, qualitative and quantitative data were used to identify biophysical, spatial, facility, and social capacity impacts and management parameters. Typically, one or a few types of capacity become the primary limiting factor(s). Information that was collected and assessed for each capacity type included the following:

- Biophysical Capacity Information: For this capacity type, sources of information that were considered include qualitative observations of resource impacts during site inventory, such as excessive bare ground and compaction, litter, sanitation problems, erosion, wetland and riparian vegetation impacts, and proximity to raptor nest sites, if any. Additionally, the cultural resource group provided a description of any recreational impacts to cultural resources.

- Spatial Capacity Information: For this capacity type, sources of information that were considered include qualitative observations of available expansion area at recreation sites and facilities, topographic constraints, and information based on use estimates calculated in the Recreation Visitor Surveys (Section 3.0).

- Facility Capacity Information: For this capacity type, sources of information that were considered include survey data related to facility occupancy levels, facility capacity utilization, waiting times for launching at boat ramps, facility conditions, boat ramp elevations at low pool level, and accessibility opportunities.

- Social Capacity Information: For this capacity type, sources of information that were considered include survey data related to visitor perceived crowding, data on user conflicts, and other visitor perceptions. The Klamath and Siskiyou County Sheriff's offices were contacted to provide input on user conflicts and visitor safety concerns, such as at the Boyle Bluffs dispersed swimming area and boating concerns on Iron Gate reservoir.

It should be noted that while social capacity is frequently studied in outdoor recreation research, a definitive perceived crowding scale (i.e., a standard measurement, methodology, and point at which a site is considered to have exceeded its social capacity) has yet to be commonly accepted. Social capacity is a complex issue that is influenced by multiple factors including recreation setting (developed versus dispersed), ethnicity, and activity-type, among other variables. Additionally, empirical studies have shown that a typical inverse relationship does not always exist between perceived crowding and satisfaction with a recreation experience (i.e., as perceived crowding increases, satisfaction decreases) (Manning 1999). It is nonetheless important to develop a social capacity standard on a site-by-site basis based on specific conditions at each site (i.e., perceived crowding standard may likely be higher for a developed recreation site compared with a wilderness area).

For each site or facility and reservoir, the limiting factor(s) were determined using these four capacity types (biophysical, spatial, facility, and social). In many cases, the limiting factor(s) is obvious, such as if perceived crowding was very high (social capacity). In other less obvious cases, judgments were made regarding the limiting factor, or an area may have more than one limiting factor(s). To summarize this analysis, recreation sites and reservoirs were prioritized from highest to lowest capacity concern.

#### 5.4.3.2 Nonmotorized Recreation Trail Feasibility

In addition, a nonmotorized recreation trail feasibility subtask was performed as part of the Recreation Capacity Analysis. This study subtask was added based on agency comments and consisted of the following steps:

- Existing nonmotorized trails in the vicinity of the study area were identified and analyzed for feasibility to be linked with potential trails within or near the existing FERC Project boundary and Hell's Corner reach between the J.C. Boyle and Copco reservoirs. For this purpose, trail maps were solicited from BLM and the USFS, OPRD and CDPR, Klamath and Siskiyou counties, City of Klamath Falls, and bicycling groups in Klamath Falls.

- Based on the review of potential trail linkages noted above, a desktop analysis of preliminary trail routes was conducted. Known mapped constraints, such as wetlands, riparian vegetation, raptor nest sites, steep slopes, non-PacifiCorp private land, and others, were considered. A potential trail routes map was prepared showing where proposed trails might be constructed and linked with other trails nearby. The pros and cons of each trail route were summarized.

- Potentially viable trail routes were then preliminarily field checked by vehicle and/or boat to better understand the lay of the land and to observe other potential trail constraints and opportunities in the field. Based on this field check, the potential trail routes map was updated.

- The next step involved field reconnaissance to more specifically locate likely trail routes on the ground. Global positioning system (GPS) readings were taken along the routes. Notes were taken about the trail routes that may be used in cost estimating or other future uses.

- The GPS data were then entered into the GIS database as a new data layer. The GPS points were connected, resulting in potential trail corridors. The trail corridors were overlaid with other existing GIS data layers to highlight potential resource or land ownership issues that need further review or mitigation.

- Next, a more detailed preliminary trails plan was prepared to better define estimated costs and trail-related responsibilities. The preliminary trails plan included a general cost estimate, a more detailed trail routes map, and a phasing, construction, and operations and maintenance plan. As part of the preliminary trails plan, the anticipated design footprint of the nonmotorized trail(s) in the study area was defined, including bicycling, hiking, and walking, and possibly equestrian trails. The preliminary trails plan also schematically located a system of likely trailheads and parking, trail linkage access to PacifiCorp- and BLM-managed campgrounds and day use sites, trail rest stops, and ecological restrictions that are anticipated. The preliminary trails plan estimated the anticipated number and type of trail users by trail segment/reservoir. The analysis included investigating the potential of opening the existing Link River Nature Trail to bicycle use and providing safer river rapid scouting/fishing access trails.

### 5.4.4 Recreation Needs Analysis

This subtask provides an analysis of recreation needs in the study area as required by FERC guidelines. In this task, existing recreation needs were identified and future needs were projected for increments of time (e.g., 10-year periods) over the term of the anticipated new license. Needs were assessed for existing and potential future developed recreation facilities in the study area. Recreation needs identified in the study area will be coordinated with other resource specialists to identify potential resource conflicts. Recreation needs identified in this analysis should not be considered to be solely Project-related needs. Rather, these needs should be considered the needs of one resource area that must be balanced with other recreation providers and other resource needs in the study area.

In general, this subtask is a synthesis of the results from the previous recreation studies that analyzed, identified, and projected existing and future recreation needs in the study area. Specific components of this analysis include the following steps:

1. An analysis of recreation needs in the study area over time (i.e., estimate of the number of total campsites needed in the future based on current demand)

2. An identification of developed and dispersed recreation needs on a site-by-site basis, both existing and future (in 10-year increments)

3. An identification of Project-related recreation criteria

Many different types of sites, facilities, and use areas associated with various recreation activities were considered in this analysis. Facilities and sites related to the following activities were considered:

- Camping (at developed and dispersed undeveloped shoreline sites)
- Day use/picnicking (at developed and dispersed undeveloped shoreline sites)

- Boating
- Swimming and sunbathing
- Visiting interpretation and education (I&E) facilities (including programs and signs)
- Nonmotorized trail use (including hiking, walking, and mountain biking)
- Fishing (boat and bank)
- General use of open space (including hunting and wildlife observation/photography)

#### 5.4.4.1 Identify Overall Recreation Needs in the Study Area

In Step 1, overall recreation needs in the study area were assessed using an analysis that compares and contrasts demand, supply, and capacity factors to arrive at conclusions regarding overall recreation needs. Data from demand, supply, and capacity analyses were used in this task. This first step focused on the overall need for various types of facilities, for example, without specifying where that need may be met. This included consideration of both developed and dispersed undeveloped recreation sites or use areas.

With respect to existing facility utilization, several capacity thresholds were identified (in the Recreation Capacity Analysis—see Section 5.4.3, above) to account for peak-season (generally considered to be Memorial Day to Labor Day) and peak-month (generally considered to be July and August) recreation use. Any existing or projected utilization over the identified thresholds represents demand that is in excess of capacity for planning purposes. This method was used to determine the number of facilities (campsites and parking spaces, for example) that would need to be provided in the short and long term in order to meet existing and projected demand.

It should be noted that all facilities related to projected demands may not actually be constructed because of resource constraints or potential impacts of the "desired" experience (i.e., potential overdevelopment of an area considered primitive by visitors).

A number of interrelated factors were considered in this overall needs analysis. Factors to be considered include recreation facility occupancy and condition. Types of data for these factors included:

- Recreation user survey responses
- Visitor perceptions of crowding and crowding criteria
- Projected increases in demand for various activities
- Seasonal and weekday/weekend occupancy rates
- Facility and use area capacity utilization
- Physical and spatial arrangement of existing facilities and use areas
- Existing facility conditions and accessibility guidelines and report recommendations
- Opportunities and constraints analysis depicting potential sites or areas
- Opportunities for infill, redesign, or expansion of existing facilities
- Management goals and objectives of published plans
- Visual observations and observed impacts from existing use
- Professional judgment

Overall existing and future recreation needs were identified and projected for the recreation activities in the study area.

5.4.4.2 Identify Recreation Needs on a Site-by-Site Basis

Step 1 investigated the broader context of recreation needs within the study area by activity type. Step 2 attempts to identify where those needs may be accommodated on a site-by-site basis, in conjunction with the results of the previous subtask (Recreation Capacity Analysis). Site-specific needs were identified through review and analysis of several data types, including:

- Recreation survey responses about specific sites
- Seasonal and weekday/weekend occupancy rates at specific sites
- Spatial arrangement of sites and design problems observed
- Facility conditions
- Accessibility compliance and guideline recommendations at sites
- Opportunities for infill, redesign, or expansion at each site
- Observed impacts of use at each site
- Professional judgment

The identification of future recreation needs was based on the list of identified existing needs. This analysis projected overall recreation needs in 10-year increments. Where new recreation facilities might be considered in a given area to satisfy demand, the anticipated implementation phase was projected. Primary indicators used in defining future needs for developed facilities are projected increases in demand over 30 to 50 years and anticipated capacity. Projected future recreation needs were estimated for each developed facility, use area, and activity type.

5.4.4.3 Identify Project-Related Recreation Criteria

Not all recreation needs identified in the preceding steps should be assumed to be Project-related needs. Associating recreation needs in the study area with the Project entails consideration of various contributing factors or criteria. Three of the likely factors to consider include: (1) proximity to the FERC Project boundary, (2) direct Project cause, and (3) shared role and responsibility of recreation providers in the study area. A list of potential criteria for how responsibility for Project-related recreation needs may be assigned was developed in this step for further consideration in the development of the draft RRMP (Section 6.0).

## 5.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The following relationships have been identified in the Recreation Needs Analysis and are summarized below:

- FERC requires that a licensee develop a recreation plan for the Project area for the term of the new license (18 CFR Section 4.51 F[5]). The information collected in this study was used to help develop the draft Recreation Resource Management Plan (RRMP) (see Section 6.0) and helped place the Project area in proper context within the region.

- FERC and other agencies require the licensee to describe and analyze potential Project effects on National Wild and Scenic Rivers in the vicinity of the Project. The 11-mile segment of the Upper Klamath River was designated on September 22, 1994 as a BLM- and state-administered component of the national system, pursuant to Section 2 (a)(ii) of the National Wild and Scenic Rivers Act (NWSRA). The information collected and analyzed in this study was used in the development of the draft RRMP (see Section 6.0). The management actions and direction in the plan should be consistent with agency plans for the Upper Klamath River reach.

## 5.6 TECHNICAL WORK GROUP COLLABORATION

Following Stage 1 and the FSCD, the Recreation Needs Analysis study plan was expanded to incorporate agency comments. Study expansions include:

- The addition of a Recreation Needs Analysis, a synthesis document that pulls together the results of all of the individual studies
- The addition of a nonmotorized trail feasibility study
- The renaming of the study to better characterize its purpose

Collaboration with the Recreation Work Group (RWG) did not result in significant change to the needs analysis. For more information on RWG collaboration, please see the Comprehensive Consultation Report appended to the Executive Summary (Kearns and West, 2003).

## 5.7 STUDY OBSERVATIONS AND FINDINGS

### 5.7.1 Recreation Supply Analysis

Discussion of recreation resources in the study area is divided into seven sections (the five recreation resource areas—Keno reservoir/Link River, J.C. Boyle reservoir, Upper Klamath River/Hell's Corner reach, Copco reservoir, and Iron Gate reservoir—dispersed recreation use areas, and ADA accessibility). There are a total of 28 public developed recreation sites in the study area. Developed public recreation sites and their associated facilities are briefly summarized in Table 5.7-1. The condition of facilities at these recreation sites is presented in Table 5.7-2. Each developed recreation site was photographed (Appendix 5B) and conceptual site plans were developed (Appendix 5C).

In addition to public developed recreation facilities and sites, approximately 27 undeveloped dispersed recreation sites or areas were identified in the study area. These sites and areas were identified through a systematic inventory of publicly accessible shoreline areas in the study area. General descriptions of each dispersed site or area are provided in Section 5.7.1.6 and in Table 5.7-3 (see Section 5.7.1.6). Each dispersed site or area was also photographed (Appendix 5D). Completed inventory and condition forms for all developed and dispersed recreation sites and use areas are provided in Appendix 5E.

ADA-accessibility was also assessed as part of the Recreation Supply Analysis. The field assessment reviewed accessibility in several key areas, including: access to primary elements, elements in space and the recreation environment, parking areas, boat launches and boarding docks, access to recreation trails, campsites, and group sites. A general description of ADA-accessible recreation facilities is provided and summarized in Table 5.7-4 (see Section 5.7.1.7).

#### 5.7.1.1 Keno Reservoir/Link River

Developed recreation sites at Keno reservoir/Link River include campgrounds, day use areas, boat launches, and trails (Figure 1.1-1). The key elements of these recreation sites are summarized below. In addition to describing the recreation facilities available at these developed sites, this subsection also summarizes the condition of the facilities. Developed public recreation sites discussed in this subsection include the following:

- Link River Nature Trail
- City of Klamath Falls' Veteran's Memorial Park/Boat Launch
- ODFW's Miller Island Boat Launch
- Keno Recreation Area

<u>Link River Nature Trail</u>

The Link River Nature Trail runs approximately 1.5 miles along the west side of the Link River bypass reach, between UKL and Keno reservoir/Lake Ewauna. The trail is affiliated with the USA National Trails System and is part of the Link River Bird Sanctuary and Small Game Refuge. The trail is currently for pedestrian use only and pets are only allowed on a leash. Access at the north and south entries is controlled by a turnstile. At the north entry, there is an undefined asphalt parking area, accessed directly from a city street, with four wheel-stops and room for 15 vehicles. There is no defined parking area at the southern entry, though cars do use the side of the road for parking. There is room for approximately ten cars on the side of the road. The Link River Nature Trail does not have restroom facilities. Other recreational facilities on the Link River Nature Trail include two trash receptacles (one at each trailhead area), a wildlife viewing station along the northern end of the trail (near the log boom across the river), and a bench near the dam. Additionally, there are four ADA-accessible fishing pads at the north end of the trail on UKL. However, only one fishing pad is accessible from the parking area. The remaining three are behind a locked gate and can be accessed only by contacting the Pacific Power Klamath District office. While not developed features of the Link River Nature Trail, several user-made dirt trails (especially on the southern half of the trail) provide access to the river shoreline.

The trail itself and the trash receptacles at the Link River Nature Trail are in good condition. The trail signs are in need of maintenance, while the trailhead parking areas, the paths to the trail, and the main paved access road are in need of repair. The interpretive displays and accessible fishing pads are in need of replacement. Additionally, the trail is in need of shade trees as there currently are none. While not in need of maintenance or repair, the turnstiles at the northern and southern termini of the trail are difficult to use and should be replaced to increase ease of access for all visitors, including visitors with strollers and potentially bicycles.

Table 5.7-1. Inventory of public developed recreation facilities at or near the existing Klamath Hydroelectric Project.

| Recreation Facilities/Areas | Recreation Facilities | | | | | | | | | | | | Service Facilities | | | | | | | | | | | | Access Facilities | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Camping | | | | Picnicking | | | | | Swim/Sunbath. | | | Sanitary | | | Water | | | Disposal | | Services | | | | Vehicular | | | | Trails | | | Angler | | Boating/PWC | | | | | |
| | Pay Stations | Group Reservation Sites (# spaces) | Campsites w/ Table/Fire Ring | Campsites[1] | Playground | Picnic Tables | Picnic Fire Rings/BBQs[2] | Shade Trees | Grass Area | Designated Swim Area w/ Boom | Swimming Beach | Sign/Safety Apparatus | Restrooms-ADA Accessible[3] | Restrooms-non-ADA Accessible[3] | RV Tank Disposal Station | Water/Drinking Faucets | Hot Water Available | Showers | Trash Receptacles/Dumpsters | Grey Water Sumps | Telephone | Camp Hosts | Security Guards | Firewood Distribution Site | Main Paved Access Roads | Secondary Gravel Roads | Parking Area (# veh.) | Boat Trailer Parking | Multi-use Trails | Trail Signs | Trailhead Parking | Shoreline Fishing | Dock Fishing | Unimproved Boat Launches | Improved Boat Launches (# lanes) | w/ Dock | Floating Booms | Navigation/Info. Buoys | Information Signs Onshore |
| Link River Nature Trail | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | 25 | | | | | | | | | | | | |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | | | | | | 5 | | | | | | | 4 | | | | | | 5 | | | | | | | | 75 | 6 | | | | | | | 1(2) | 1 | | | |
| ODFW's Miller Island Boat Launch | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 25 | 4 | | | | | | | 1(2) | 1 | | | |
| Keno Recreation Area | | | 26 | | 1 | 19 | 2 | | | | | | 1 | 2 | 1 | 3 | | 2 | 3/5 | | | | | 2 | | | 82 | 7 | | | | | | | 1(1) | 1 | | | |
| Sportsman's Park | | | | | | 16 | | | | | | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pioneer Park (West) | | | | | | 15 | 14 | | | | | | 1 | 1 | | | | | 3 | | | | | | | | 25 | | | | | | | 1 | | | | | |
| Pioneer Park (East) | | | | | | 2 | | | | | | | | | | | | | 1 | | | | | | | | 40 | 20 | | | | | | | 1(2) | | | | |
| BLM's Topsy Campground | | | 16 | | | 2 | 2 | | | | | | | 4 | 1 | 7 | | | 15 | | | | | | | | | 3 | | | | | | | 1(2) | 1 | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | | | | | | 1 | | | | | | | 2 | | | | | | 1 | | | | | | | | 12 | | | | | | | | | | | | |
| BLM's Klamath River Campground | | | 3 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stateline take-out (PacifiCorp and BLM) | | | | | | | 2 | | | | | | 1 | 3 | | | | | | | | | | | | | 28 | | | | | | | 1 | | | | | |
| Fishing Access Site 6 | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | 6 | | | | | | | 1 | | | | | |
| Fishing Access Site 5 | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | 5 | | | | | | | | | | | | |
| Fishing Access Site 4 | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | 10 | | | | | | | | | | | | |
| Fishing Access Site 3 | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | 6 | | | | | | | | | | | | |

Table 5.7-1. Inventory of public developed recreation facilities at or near the existing Klamath Hydroelectric Project.

| | Recreation Facilities | | | | | | | | | | | | Service Facilities | | | | | | | | | | | | Access Facilities | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Camping | | | | Picnicking | | | | | Swim/Sunbath. | | | Sanitary | | | Water | | | Disposal | | Services | | | | Vehicular | | | | Trails | | | Angler | | Boating/PWC | | | | | |
| Recreation Facilities/Areas | Pay Stations | Group Reservation Sites (# spaces) | Campsites w/ Table/Fire Ring | Campsites[1] | Playground | Picnic Tables | Picnic Fire Rings/BBQs[2] | Shade Trees | Grass Area | Designated Swim Area w/ Boom | Swimming Beach | Sign/Safety Apparatus | Restrooms-ADA Accessible[3] | Restrooms-non-ADA Accessible[3] | RV Tank Disposal Station | Water/Drinking Faucets | Hot Water Available | Showers | Trash Receptacles/Dumpsters | Grey Water Sumps | Telephone | Camp Hosts | Security Guards | Firewood Distribution Site | Main Paved Access Roads | Secondary Gravel Roads | Parking Area (# veh.) | Boat Trailer Parking | Multi-use Trails | Trail Signs | Trailhead Parking | Shoreline Fishing | Dock Fishing | Unimproved Boat Launches | Improved Boat Launches (# lanes) | w/ Dock | Floating Booms | Navigation/Info. Buoys | Information Signs Onshore |
| Fishing Access Site 2 | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | 3 | | | | | | | | | | | | |
| Fishing Access Site 1 | | | | | | | | | | | | | | 2 | | | | | 2 | | | | | | | | 10 | | | | | | | | | | | | |
| Mallard Cove | | | | | | 10 | 14 | | | | | | | 2 | | | | | 2 | | | | | | | | 25 | | | | | | | | 1(1) | 1 | | | |
| Copco Cove | | | | | | 2 | 2 | | | | | | | 1 | | | | | 1 | | | | | | | | 5 | | | | | | | | 1(1) | 1 | | | |
| Fall Creek Trail | | | | | | 2 | 1 | | | | | | 1 | | | 1 | | | | | | | | | | | | | | 1 | | | | | | | | | |
| Fall Creek | | | | | | 3 | 5 | | | | | | | 2 | | | | | 1 | | | | | | | | 8 | | | | | | | | | | | | |
| Jenny Creek | | | 4 | 2 | | 5 | 4 | | | | | | | 1 | | | | | 2 | | | | | | | | 32 | | | | | | | | | | | | |
| Wanaka Springs | | | | 6 | | 6 | 3 | | | | | | | 3 | | | | | 2 | | | | | | | | 18 | | | | | | 1 | | | | | | |
| Camp Creek | | | 13 | 6 | | 6 | 10 | | | | | | | 3 | 1 | 3 | | | 7 | | | | | | | | | | | | | | 3 | | 1(1) | 1 | | | |
| Juniper Point | | | | 9 | | 8 | 9 | | | | | | | 2 | | | | | 2 | | | | | | | | | | | | | | 1 | | | | | | |
| Mirror Cove | | | 8 | 2 | | | 2 | | | | | | | 3 | | | | | 4 | | | | | | | | 20 | | | | | | | | 1(2) | 1 | | | |
| Overlook Point | | | | | | 3 | 5 | | | | | | | 3 | | | | | 2 | | | | | | | | 6 | | | | | | | | | | | | |
| Long Gulch | | | | | | 2 | 4 | | | | | | | 3 | | | | | 2 | | | | | | | | 16 | | | | | | | | 1(1) | | | | |
| Iron Gate Hatchery Public Use Areas | | | | | | 6 | | | | | | | | 2 | | | | | 3 | | | | | | | | 20 | | | | | | | | | | | | |

Source: EDAW, Inc.
Note: Shaded areas denote that facilities or services exist at this location. A number denotes the inventory of that facility type, if applicable or known.
[1] Includes semideveloped (some developed features) and/or user-defined campsites (no developed features).
[2] Fire rings include developed and user-defined fire rings.
[3] Number of toilets.

Table 5.7-2. Condition of developed recreation facilities at or near the Klamath Hydroelectric Project.

| | Recreation Facilities | | | | | | | | | | | Service Facilities | | | | | | | | | | | | Access Facilities | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Camping | | | | Picnicking | | | | | Swim/Sunbath. | | | Sanitary | | | Water | | | Disposal | | Services | | | | Vehicular | | | | Trails | | | Angler | | Boating/PWC | | | | | |
| Recreation Facilities/Areas | Pay Stations | Group Reservation Sites (# spaces) | Campsites w/ Table/Fire Ring | Campsites | Playground | Picnic Tables | Picnic Fire Rings/BBQs | Shade Trees | Grass Area | Designated Swim Area w/ Boom | Swimming Beach | Sign/Safety Apparatus | Restrooms-ADA Accessible | Restrooms-non-ADA Accessible | RV Tank Disposal Station | Water/Drinking Faucets | Hot Water Available | Showers | Trash Receptacles/Dumpsters | Grey Water Sumps | Telephone | Camp Hosts | Security Guards | Firewood Distribution Site | Main Paved Access Roads | Secondary Gravel Roads | Parking Area (# veh.) | Boat Trailer Parking | Multi-use Trails | Trail Signs | Trailhead Parking | Shoreline Fishing | Dock Fishing | Unimproved Boat Launches | Improved Boat Launches (# lanes) | w/ Dock | Floating Booms | Navigation/Info. Buoys | Information Signs Onshore |
| Link River Nature Trail | | | | | | | | R | | | | | | | | | | | G | | | | | | R | G | R | | G | M | R | G | | | | | | | |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | | | | | | G | | G | G | | | | X | | | X | | | G | | | | | | G | | G | R | | | | G | | | M | G | | G | M |
| ODFW's Miller Island Boat Launch | | | | | | | | | | | | | | X | | | | | | | | | | | G | G/X | M | M | | | | G | | | X | X | | | |
| Keno Recreation Area | G | | G | | G | G | G | G | | | | G | G | G | R | R | G | G | G | | | G | | | G | M | M | M | | | | M | | | R | G | | | G |
| Sportsman's Park | | | | | | G | | G | G | | | | | G | | | | | | | | G | | | G | G | G | | | | | | | | | | | | |
| Pioneer Park (West) | | | | | | G | G | G | G | | | | G/X | G/X | | | | | G | | | | | | | M | M | M | | | | G | | X | | | | | |
| Pioneer Park (East) | | | | | | G | | | | | | | | | | | | | G | | | | | | | M | M | M | | | | G | | M | M | | | | |
| BLM's Topsy Campground | G | | G | | | G | G | G | | | | | | G | G | G | | | G | G | | G | | | | G | G | G | | | | G | M | | G | G | | | G |
| BLM's Upper Klamath River (Spring Island) Boater Access | | | | | | G | | | | | | | G | | | | | | G | | | | | | M | M | G | G | | | | G | | G | | | | | G |
| BLM's Klamath River Campground | | | | G | | | | | | | | | | G | | | | | | | | | | | | R | | | | | | G | | | | | | | |
| Stateline take-out (PacifiCorp and BLM) | | | | M | | | | | | | | | G | G | | | | | | | | | | | | M | M | M | | | | M | | M | | | | | |
| Fishing Access Site 6 | | | | | | | | | | | | | | G | | | | | G | | | | | | | G | G | G | G | | | G | | | | | | | |
| Fishing Access Site 5 | | | | | | | | | | | | | | | | | | | G | | | | | | | G | G | | G | | | G | | | | | | | |
| Fishing Access Site 4 | | | | | | | | | | | | | | G | | | | | G | | | | | | | G | G | | G | | | G | | | | | | | |
| Fishing Access Site 3 | | | | | | | | | | | | | | R | | | | | G | | | | | | | G | G | | G | | | G | | | | | | | |

Table 5.7-2. Condition of developed recreation facilities at or near the Klamath Hydroelectric Project.

| Recreation Facilities/Areas | Recreation Facilities | | | | | | | | | | | | Service Facilities | | | | | | | | | | | | Access Facilities | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Camping | | | | Picnicking | | | | | Swim/Sunbath. | | | Sanitary | | | Water | | | Disposal | | Services | | | | Vehicular | | | | Trails | | | Angler | | Boating/PWC | | | | | |
| | Pay Stations | Group Reservation Sites (# spaces) | Campsites w/ Table/Fire Ring | Campsites | Playground | Picnic Tables | Picnic Fire Rings/BBQs | Shade Trees | Grass Area | Designated Swim Area w/ Boom | Swimming Beach | Sign/Safety Apparatus | Restrooms-ADA Accessible | Restrooms-non-ADA Accessible | RV Tank Disposal Station | Water/Drinking Faucets | Hot Water Available | Showers | Trash Receptacles/Dumpsters | Grey Water Sumps | Telephone | Camp Hosts | Security Guards | Firewood Distribution Site | Main Paved Access Roads | Secondary Gravel Roads | Parking Area (# veh.) | Boat Trailer Parking | Multi-use Trails | Trail Signs | Trailhead Parking | Shoreline Fishing | Dock Fishing | Unimproved Boat Launches | Improved Boat Launches (# lanes) | w/ Dock | Floating Booms | Navigation/Info. Buoys | Information Signs Onshore |
| Fishing Access Site 2 | | | | | | | | | | | | | | G | | | | | G | | | | | | | G | G | | G | | | G | | | | | | | |
| Fishing Access Site 1 | | | | | | | | | | | | | | G | | | | | G | | | | | | | M | M | | G | | | G | | | | | | | |
| Mallard Cove | | | | | | G | R | | | | | | | G | | | | | G | | | | | | G | M | G | G | | | | G | | | G | G | | G | M |
| Copco Cove | | | | | | G | | | | | | | | G | | | | | G | | | | | | | M | M | M | | | | G | | | G | G | | | M |
| Fall Creek Trail | | | | | | G | | | | | | | G | | | | | | | | | | | | G | G | G | | R | G | | | | | | | | | |
| Fall Creek | | | | | | G | G | | | | | | | M/X | | | | | G | | | | | | G | M | | | | | | G | | | | | | | |
| Jenny Creek | | | X | | | | | | | | | | | G | | | | | G | | | | | | G | M | M | | R | | | G | | | | | | | |
| Wanaka Springs | | | | G | | G | G | | | | | | | G/X | | | | | G | | | | | | G | R | R | | | | | G | M | | | | | | |
| Camp Creek | | | M | | | | | | | | | | | M | X | G | | | G | | | | | | G | R | G | R | | | | G | X | G | G | | | | M |
| Juniper Point | | | | | | G | M | | | | | | | G | | | | | G | | | | | | G | R | R | | | | | G | X | | | | | | |
| Mirror Cove | | | | | | G | R | | | | | | | G/X | | | | | G | | | | | | G | R | R | M | | | | G | | | R | G | | | M |
| Overlook Point | | | | | | X | G | | | | | | | G/X | | | | | G | | | | | | G | R | R | | | | | G | | | | | | | |
| Long Gulch | | | | | | R | | | | | | | | G/X | | | | | G | | | | | | G | M | M | M | | | | G | | | | | | | M |
| Iron Gate Hatchery Public Use Areas | | | | | | G | | | | | | | | G | | | | | G | | | | | | G | G/R | G | G | G | G | | | | R | | | | | |

Source: EDAW, Inc.
Note: G = good condition, M = needs maintenance, R = needs repair, X = needs replacement.

City of Klamath Falls' Veteran's Memorial Park/Boat Launch

Located in the City of Klamath Falls, Oregon, on the northern shoreline of Keno reservoir/Lake Ewauna, Veteran's Memorial Park/Boat Launch is managed by the City of Klamath Falls, Department of Parks and Recreation. The park has day use facilities and a boat launch. This facility is not part of the Project.

Located to the north of the main access road, the day use area has five picnic tables, two benches, three flagpoles, a restroom facility (two toilets and a sink for both men and women), and a large stage with electricity and lighting. Additionally, there is a historical train display and a small botanical garden associated with the day use area. The main access road through the park and parking area are paved. The parking area has 75 single-vehicle parking spaces, including two ADA-accessible spaces.

Located to the south of the main access road, the boat launch has two paved lanes. The launch is accessed either from Main Street or by the main access road through the park. There is a floating dock, a small observation area with a wooden railing, six benches, and a small parking area with six spaces for vehicles with trailers (none are ADA-accessible) in the boat launch area. Additionally, there are several informational signs and maps located near the boat launch parking area. A small dog area (fenced and signed) is located adjacent to the boat launch area.

Most day use recreation facilities at Veteran's Memorial Park/Boat Launch are in good condition with the exception of the restroom building and the drinking fountain. The restrooms and drinking fountain are in need of replacement.

Most recreational facilities associated with the boat launch at Veteran's Memorial Park/Boat Launch, including shoreline fishing access and the floating dock, are also in good condition. However, the boat ramp is in need of maintenance and the vehicle with trailer parking area is in need of repair.

ODFW's Miller Island Boat Launch

Located on the east shore of Keno reservoir about 6 miles to the south of Klamath Falls, off of SR 97, ODFW's Miller Island Boat Launch is managed by ODFW. The boat launch is accessed via Miller Island Road, which runs 3 miles (approximately 2 miles paved) through the Klamath Wildlife Area Miller Island Unit (managed by ODFW). An entrance station area, including a small cabin, large parking area, wildlife viewing trail, and a portable toilet (ADA-accessible), provides information about recreational opportunities in the Klamath Wildlife Area. Several interpretive signs, associated with the wildlife area, are located along Miller Island Road on the way to the boat launch. The boat launch can also be accessed via a dirt/gravel road to the south of Miller Island Road, across from a rest stop on US 97. However, there is no signage associated with this access road.

The boat launch itself has two concrete lanes and an L-shaped wooden dock. The narrow one-lane access road to the boat launch site and the undefined parking area are gravel. The parking area has approximately ten spaces for vehicles without trailers or four spaces for vehicles with trailers. Additionally, an adjacent grassy area is used for overflow parking and can accommodate approximately 15 vehicles without trailers. There is also a vault toilet at the site. None of the recreational facilities associated with this site are ADA-accessible (does not include facilities associated with the ODFW entrance station area).

Miller Island Road, the gravel access road, and shoreline fishing areas of ODFW's Miller Island Boat Launch are generally in good condition. The southern access road is very rough and should be replaced if used as the primary access road. The gravel parking area is in need of maintenance and access footpaths are in need of repair. The boat ramps, along with the dock, need to be replaced. The vault toilet has been vandalized repeatedly, is surrounded by trash (potentially because this site does not have a trash receptacle), and should be replaced.

Keno Recreation Area

Keno Recreation Area, managed by PacifiCorp as part of the existing Project, is located on the southwestern shore of Keno reservoir. Activities here include camping, fishing, horseshoes, sunbathing, resting/relaxing, and boating. The site is composed of a campground, day use area, and boat launch.

The Keno Recreation Area campground has 26 developed campsites, a restroom facility (two flush toilets and showers), three water faucets, an RV dump station, and five garbage dumpsters at the campground. Each campsite includes a picnic table and a fire pit with a hinged grill. This campground is open from May through October and has a $10.00 per night fee. All other PacifiCorp campgrounds and day use areas are available for use at no cost.

The Keno Recreation Area day use area consists of an upper and lower use area. The upper use area is located adjacent to the campground and the lower use area is located adjacent to the boat launch. The upper and lower use areas have a total of 19 picnic tables. There are two large cooking grills and two drinking fountains at the upper use area. The upper use area also has playground equipment (two swings and a slide), two horseshoe pits, and a historical marker displaying a rack and pinion mechanism used at the old dam site. The lower day use area has a portable toilet that is shared with the boat launch and has two trash receptacles. The interior road providing access to the upper and lower use areas at the Keno Recreation Area is gravel and each area has an undefined gravel parking area. The lower use area has parking for approximately ten vehicles, while the upper parking area provides space for about 35 vehicles, including a small area near the historical display that can accommodate five vehicles.

The Keno Recreation Area boat launch is located on the southwestern shoreline of Keno reservoir, adjacent to the lower day use area and downhill from the campground. The boat ramp is made of concrete ties and has one lane. There is a T-shaped dock next to the ramp. The site has two benches and the shoreline provides access to shoreline fishing opportunities. In addition, a waterski course is located downstream from the boat launch. The boat launch has a trash receptacle and shares a portable toilet with the lower day use area. The undefined gravel parking area provides space for approximately 12 vehicles. A gravel overflow area provides another 20 parking spaces for vehicles without trailers or approximately seven spaces for vehicles with trailers.

Based on this evaluation, all of the camping-related facilities at the Keno Recreation Area campground are generally in good condition. Many of the recreation facilities at the Keno Recreation day use area (upper and lower) are in good condition including the picnic areas (tables and grills), the playground equipment, and restrooms. The dock at the Keno Recreation Area boat launch is also in good condition. The interior gravel road and parking areas at the day use areas and boat launch, as well as the shoreline fishing access areas, are in need of maintenance at the Keno Recreation Area. The historical display located at the upper day use area, the RV dump station, the drinking fountains (particularly the fountain at the historical display that is currently broken), and the boat ramp are in need of repair. The user-defined informal paths that provide access to the various recreation facilities at the Keno Recreation Area should be replaced.

#### 5.7.1.2 J.C. Boyle Reservoir

Developed recreation sites along the J.C. Boyle reservoir include campgrounds, day use areas, and boat launches (Figure 1.1-1). The key elements of these recreation sites are summarized below. In addition to describing the recreation facilities available at these developed sites, this subsection also summarizes the condition of the facilities. Developed public recreation sites discussed in this subsection include the following:

- Sportsman's Park
- Pioneer Park (East and West units)
- BLM's Topsy Campground

<u>Sportsman's Park</u>

Located on the southeastern shoreline of J.C. Boyle reservoir, Sportsman's Park is a 345-acre multi-use facility on land owned by PacifiCorp with a long-term lease to Klamath County. The land is nonhydro land; it is not part of the FERC Project but is simply corporate-owned land. The park contains a rifle and pistol range, sporting clay range, archery ranges, ATV/motocross and dirt drag-strip racetracks, and a model aircraft flying field. Additionally, the site has 16 picnic tables, two restroom facilities with four toilets, and an informational signboard. An individual annual membership pass to the park costs $25 and single day passes are $3. An on-site caretaker lives at Sportsman's Park and is responsible for monitoring use at the site and routine maintenance. As previously mentioned, Sportsman's Park is not associated with the Klamath Hydroelectric Project.

In general, most facilities associated with Sportsman's Park are in good condition.

<u>Pioneer Park (East and West Units)</u>

Managed by PacifiCorp as part of the Project, Pioneer Park consists of two separate day use areas on the western and eastern shoreline of J.C. Boyle reservoir. Both sites have access from SR 66 and are located on each side (west and east) of the Spencer Bridge over a narrow point of the reservoir.

Pioneer Park West has 15 picnic tables and 14 fire rings with grills. There are two portable toilets (one ADA-accessible), one trash receptacle, two trash dumpsters, and informational signs at the site. Additionally, the shoreline is used for fishing and a dirt boat ramp area is used primarily to launch car-top boats. The main access road into Pioneer Park West is paved, but the undefined parking area is gravel and dirt and can accommodate approximately 25 vehicles without trailers.

At Pioneer Park East, there are two picnic tables, one trash receptacle, and three interpretive signs with information regarding the Applegate Trail. The site also has a boat launch with two lanes made of concrete ties. A large stretch of gravel along the shoreline provides car-top boat launching and shoreline fishing opportunities. The access road to Pioneer Park East and parking area are gravel. While undefined, the parking area can accommodate approximately 40 vehicles without trailers or 15 to 20 vehicles with trailers. An alternate gated entrance to Sportsman's Park is also located at Pioneer Park East.

The picnic areas, trash receptacles and dumpsters, interior paths to facilities, and shoreline fishing access at Pioneer Park West are in good condition. The picnic tables and shoreline fishing access at Pioneer Park East are also in good condition. The interior gravel roads and parking areas at both the eastern and western portions of the site are in need of maintenance, as are the boat ramp and car-top launching area at Pioneer Park East. The portable toilets at Pioneer Park West, while in good condition, and the informational signs also at this site should be replaced, as should the interpretive signs at Pioneer Park East. Additionally, the dirt boat launch area at Pioneer Park West should be removed or replaced by a new developed launch.

ODOT is planning to realign the SR 66 bridge that currently spans J.C. Boyle reservoir between Pioneer Park West and Pioneer Park East. Preliminary realignment plans would eliminate Pioneer Park East, though Pioneer Park West could likely be expanded to compensate for this loss. The Recreation Needs Analysis (Section 5.7.4) and the draft RRMP (Section 6.0) provide more information on this potential bridge realignment.

<u>BLM's Topsy Campground</u>

Managed by BLM, Topsy Campground is located on the southeastern shoreline of J.C. Boyle reservoir and can be accessed via the Topsy Grade Road off of SR 66. The site consists of a campground, small day use area, and a boat launch.

BLM's Topsy Campground has 16 campsites, one of which is an ADA-accessible campsite. All but two of the campsites have tent pads. Additionally, there are two vault toilets, an RV dump station, five water faucets, two drinking fountains, 14 trash receptacles, and one trash dumpster associated with the campground. These facilities are also shared by the day use and boat launch areas at this site. All roads within the campground are asphalt.

BLM's Topsy Campground has a small day use area that provides two picnic tables and two grills. One of the picnic tables is an ADA-accessible site. Day use parking is available adjacent to the boat launch.

The boat launch at BLM's Topsy Campground has two concrete lanes and a floating dock. There is also an ADA-accessible fishing pier with two benches. A paved parking area near the boat launch can accommodate three vehicles with trailers.

In general, all recreational facilities at BLM's Topsy Campground, including the campground, day use area, and boat launch, are in good condition. The ADA-fishing pier, however, is in need of maintenance. In addition, BLM's water system needs refurbishment and/or a new potable well source created.

5.7.1.3 Upper Klamath River/Hell's Corner Reach

The section of the Klamath River between the J.C. Boyle powerhouse and the California stateline was designated an Oregon State Scenic Waterway in 1988, and a National WSR in 1994. The designation request was made by the Governor of Oregon under Section 2(a)(ii) of NWSRA; under this designation, BLM manages the river in cooperation with the State of Oregon (NPS, 1994).

This section of the Klamath River can be characterized as a swift river in a natural setting. As such, it receives significant use by commercial rafting companies and private whitewater boating. BLM reports that estimated use for these activities is approximately 5,000 visitor days annually (Weidenbach, pers. comm., 2002). To accommodate the demand, BLM constructed the Upper Klamath River (Spring Island) Boater Access approximately 0.25 mile downstream of the J.C. Boyle powerhouse.

Developed recreation sites along the Upper Klamath River/Hell's Corner reach include primitive campsites, day use/fishing access areas, and whitewater boat put-ins/take-outs (Figure 1.1-1). The key elements of these recreation sites are summarized below. In addition to describing the recreation facilities available at these developed sites, this subsection also summarizes the condition of the facilities. Developed public recreation sites discussed in this subsection include the following:

- BLM's Upper Klamath River (Spring Island) Boater Access
- BLM's Klamath River Campground
- Stateline take-out (PacifiCorp and BLM)
- Fishing Access Site 6
- Fishing Access Site 5
- Fishing Access Site 4
- Fishing Access Site 3
- Fishing Access Site 2
- Fishing Access Site 1

<u>BLM's Upper Klamath River (Spring Island) Boater Access</u>

Managed by BLM, the Upper Klamath River (Spring Island) Boater Access is located on the Klamath River adjacent to (downstream of) the J.C. Boyle powerhouse. This site was recently renamed the Spring Island Boater Access. The site provides car-top boat launching (whitewater boats) and provides access for shoreline fishing. There is a picnic table, an ADA-accessible toilet building with two vault toilets, two changing areas (men and women), and a trash receptacle at the boater access. The main access road to the site is gravel while the interior access road is paved. An undefined gravel parking area provides parking for six vehicles and there is parking for an additional six vehicles along the interior access road.

Most of the recreation facilities associated with BLM's Upper Klamath River (Spring Island) Boater Access are in good condition. Only the main access road to the site is in need of maintenance.

BLM's Klamath River Campground

Managed by BLM, the Klamath River Campground is located on the Klamath River, approximately 3 miles south (downstream) of the J.C. Boyle powerhouse. The campground has three developed campsites, each with a picnic table and fire ring, and the shoreline can be used for fishing and boater access. Additionally, there is a single-vault toilet at the campground. The access road to the campground is gravel.

The recreation facilities, including the developed campsites, toilet, and shoreline fishing and boater access areas, at BLM's Klamath River Campground are in good condition. The gravel access road to the site is in need of repair.

Stateline Take-out (PacifiCorp and BLM)

Located on the Klamath River at the Oregon/California stateline, the Stateline take-out (PacifiCorp and BLM) has upper and lower use areas that are co-managed by BLM and PacifiCorp. The lower use area provides an undeveloped boat put-in/take-out and access to shoreline fishing opportunities. The lower use area also has two seasonal portable toilets (only at site during the summer), one of which is ADA-accessible. These facilities are owned and maintained by PacifiCorp while the access road to the lower use area is owned and maintained by BLM. Camping is not permitted at the lower use area and several signs communicate this regulation to the public. The upper use area is owned and managed by BLM and consists of a large open field area with two older vault toilets. Camping is not encouraged at the upper use area either (not signed), though the area has several user-defined camping sites and at least two user-defined fire rings. There is a gravel access road to the site, a gravel/dirt interior access road connecting the upper and lower use areas, an undefined gravel/dirt parking area at the lower use area with parking for approximately eight vehicles, and a large undefined gravel/grass parking area at the upper use area that could accommodate at least 20 vehicles.

The recreation facilities at the lower use area of Stateline take-out (PacifiCorp and BLM) are generally in need of maintenance including the shoreline fishing access, boat launch area, and access road. The user-defined campsites at the upper use area, the gravel/dirt roads (access and interior), and the parking areas (upper and lower) are in need of maintenance. In 2003, BLM replaced the two older vault toilets at the upper use area with a new single vault toilet building.

Fishing Access Site 6

Fishing Access Site 6 is located downstream from Stateline take-out (PacifiCorp and BLM). The site consists of a small gravel parking area adjacent to Ager-Beswick Road and a gate system to allow public pedestrian/angler access through private ranch lands. The small parking area has space for approximately six to eight vehicles. There is also a single-vault toilet building and a trash receptacle at the parking area. In 2001 and 2002, PacifiCorp allowed commercial river rafting outfitters to use the site as a take-out by special permit. A gated road provides vehicle access to the river shoreline, where there is a large dirt parking/loading area. Additionally, there is a CDFG fishing survey box located near the access gate at this site.

All of the recreation facilities at Fishing Access Site 6 are in good condition including the vault toilet building, trash receptacle, access road, parking area, shoreline fishing access, and car-top boat take-out area.

Fishing Access Site 5

Fishing Access Site 5 is located downstream from Fishing Access Site 6. The site consists of a small gravel parking area, which can accommodate approximately five vehicles, on the river side of Ager-Beswick Road and several user-defined trails through private ranch lands to the river shoreline. The parking area has a trash receptacle and a CDFG fishing survey box. A small bridge located about 0.12 mile downstream from the parking area provides pedestrian access to the opposite shoreline.

All of the recreation facilities at Fishing Access Site 5 are in good condition including the trash receptacle, access road, parking area, and shoreline fishing access.

Fishing Access Site 4

Fishing Access Site 4 is located downstream of Fishing Access Site 5 along Ager-Beswick Road and consists of a small gravel parking area and a pedestrian access trail to the shoreline. The parking area has a single-vault toilet building, a trash receptacle, and space for approximately ten vehicles. The pedestrian trail is located about 100 feet upstream from the parking area and provides access through private ranch lands to shoreline fishing opportunities.

All of the recreation facilities at Fishing Access Site 4 are in good condition including the vault toilet building, trash receptacle, access road, parking area, and shoreline fishing access.

Fishing Access Site 3

Fishing Access Site 3 is located downstream of Fishing Access Site 4 along Ager-Beswick Road. The site has a gravel parking area that can accommodate approximately six vehicles, a single-vault toilet building, and a trash receptacle. A gated trail on the riverside of Ager-Beswick Road across from the parking area provides pedestrian access through private ranch lands to shoreline fishing opportunities.

Most of the recreation facilities at Fishing Access Site 3 are in good condition including the trash receptacle, access road, parking area, and shoreline fishing access. The vault toilet building is in need of repair.

Fishing Access Site 2

Fishing Access Site 2 is located downstream of Fishing Access Site 3. The site has a small gravel parking area directly adjacent to Ager-Beswick Road that can accommodate about three vehicles. There is also a vault toilet building with a privacy screen and a trash receptacle in the parking area. A gated trail across from the parking area provides pedestrian access through private ranch lands to shoreline fishing opportunities. There is also a CDFG fishing survey box located near the gated trailhead.

All of the recreation facilities at Fishing Access Site 2 are in good condition including the vault toilet building, trash receptacle, access road, parking area, and shoreline fishing access.

Fishing Access Site 1

Fishing Access Site 1 is located downstream of Fishing Access Site 2, near the area where the Klamath River enters Copco reservoir. Similar to the other fishing access sites, this site is located adjacent to Ager-Beswick Road and has a gravel parking area with approximately 10 spaces for vehicles. The site has two portable toilets, two trash receptacles, and provides access through private ranch lands for shoreline fishing opportunities. The site is also popular as a boat take-out and has a gravel turn-around for vehicles with trailers. This is the last take-out for boaters on the Hell's Corner reach.

Most of the recreation facilities at Fishing Access Site 1 are in good condition including the portable toilets, trash receptacles, and shoreline fishing access. However, both the access road and parking area are in need of maintenance.

#### 5.7.1.4 Copco Reservoir

Developed recreation sites at Copco reservoir include camping areas, day use areas, and boat launches (Figure 1.1-2). The key elements of these recreation sites are summarized below. In addition to describing the recreation facilities available at these developed sites, this subsection also summarizes the condition of the facilities. Developed public recreation sites discussed in this subsection include the following:

- Mallard Cove
- Copco Cove

Mallard Cove

Located on the south shore of Copco reservoir, off Ager-Beswick Road at Keaton Cove, Mallard Cove is owned and managed by PacifiCorp. The site consists of a day use/picnic area and a boat launch. While not an official campground, this site is also used for camping. The naturally wooded site has 10 picnic tables, 12 cooking grills, and two user-defined fire rings. There is a toilet building with two vault toilets and two trash receptacles at the site. The boat launch has a concrete ramp with one lane. The site also has a metal and wood dock located adjacent to the boat ramp. The access road and parking area are gravel. The parking area, while undefined, has eight wheel-stops and parking for approximately 25 vehicles.

The recreation facilities at Mallard Cove are generally in good condition. However, the gravel access road is in need of maintenance and the cooking grills are in need of repair.

Copco Cove

Managed by PacifiCorp, Copco Cove is located on the western shoreline of Copco reservoir, off of Copco Road. The site has a picnic area and a boat launch. While not an official campground, this site is also used for camping. The picnic area is naturally wooded and has two picnic tables with one fire ring at each. The site has one portable toilet and one trash receptacle. The boat launch has a concrete ramp with one lane. There is also a concrete dock adjacent to the boat ramp. The access road and parking area are gravel. There are approximately five spaces for vehicles in the undefined parking area.

Most recreation facilities at Copco Cove are in good condition. However, the access road and parking area are in need of maintenance. While the boat ramp is in good condition, the approach is steep and maintaining a proper turning radius is difficult when there are other vehicles parked at the site.

5.7.1.5 Iron Gate Reservoir

Developed recreation sites at Iron Gate reservoir include campgrounds, day use areas, and boat launches (Figure 1.1-2). The key elements of these recreation sites are summarized below. In addition to describing the recreation facilities available at these developed sites, this subsection also summarizes the condition of the facilities. Developed public recreation sites discussed in this subsection include the following:

- Fall Creek Trail
- Fall Creek
- Jenny Creek
- Wanaka Springs
- Camp Creek
- Juniper Point
- Mirror Cove
- Overlook Point
- Long Gulch
- Iron Gate Hatchery Public Use Areas

Fall Creek Trail

The Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir, adjacent to a CDFG fish hatchery facility. The gated trail begins on the northern side of Copco Road and continues to Fall Creek Falls. The trail can also be accessed via the road/parking area associated with the Fall Creek powerhouse. There is a gated gravel road providing vehicle access to a small gravel parking area near the beginning of the upper portion of the trail. The lower portion of the trail is gravel, while the upper portion of the trail is dirt and generally not well defined. There is a sign at the beginning of the upper portion of the trail indicating the direction to the falls. There are two picnic tables at the base of the trail and a user-defined fire ring near the falls. The site has a water faucet (associated with the fishery operations) and a trash receptacle. There is also a portable ADA-accessible toilet across the road from the trailhead near the CDFG fishery rearing ponds.

The recreation facilities associated with the Fall Creek Trail are in variable condition. The upper portion of the trail is in need of repair. Most of the recreation facilities at the Fall Creek Trail are in good condition, however, accessing the trail is difficult. In 2002, all gates providing access to the site were locked.

Fall Creek

Fall Creek is located on the far northeast shore of Iron Gate reservoir and is primarily a day use area, though some camping does occur. The site has three picnic tables, two cooking grills, two fire rings, and one user-defined fire ring. There is one trash receptacle, an older single-vault toilet building (closed in 2002), and one portable toilet at this site also. User-defined trails provide access to shoreline fishing opportunities. Parking at this site is undefined and generally occurs along the interior gravel road. Approximately eight vehicles could be accommodated at this site. A newly graveled boat launch is also provided.

The recreation facilities, including the picnic tables, trash receptacles, and shoreline fishing access, at Fall Creek are generally in good condition. However, both the toilet and gravel interior road are in need of maintenance. In 2002, the vault toilet building was closed and a portable toilet was placed at this site.

Jenny Creek

Located between Copco Road and Jenny Creek on the northern shoreline of Iron Gate reservoir, Jenny Creek is managed by PacifiCorp. The site provides primitive day use and camping opportunities. The site has six day use/campsites, four of which are separated by boulders at the southern end of the parking area, while the remaining two are located along the shoreline of Jenny Creek. There are five picnic tables and four user-defined fire rings at the site. Additionally, the site has two trash receptacles and a single-vault toilet building with a privacy screen. Several user-defined trails provide shoreline fishing access to Jenny Creek. The gravel parking area can accommodate approximately 20 vehicles. There is also a large gravel parking area across from this site, on the shoreline of Iron Gate reservoir that is used for shoreline fishing access. This parking area can accommodate about 12 vehicles, but is not considered to be part of the Jenny Creek site.

The vault toilet building, trash receptacles, and shoreline fishing access at Jenny Creek are in good condition. Both the interior gravel road and parking area need maintenance. The user-defined trails need to be repaired and the primitive day use/campsites are in need of replacement.

Wanaka Springs

Located on the north shore of Iron Gate reservoir, Wanaka Springs is managed by PacifiCorp. The naturally wooded site is used for day use and camping and consists of a small upper use area and a larger lower use area. The upper use area can be accessed by vehicle via a gravel road through the lower use area and has two picnic tables, a fire pit, a trash receptacle, and provides parking for about two vehicles. The lower use area has a large gravel parking area that can accommodate approximately 16 vehicles, four picnic tables, two fire pits, a trash receptacle, two single-vault toilet buildings, and a portable toilet. A dirt pedestrian trail connects the upper and lower use areas and provides access to the vault toilets. Additionally, a dirt pedestrian trail provides access to a wooden dock with a concrete walkway on the reservoir shoreline.

Many of the recreation facilities at Wanaka Springs are in good condition including the picnic areas, trash receptacles, and shoreline fishing access. The dock needs maintenance and both the interior road and parking area are in need of repair. Additionally, the vault toilet buildings were unusable in 2002 and should be repaired and/or replaced.

Camp Creek

Camp Creek is located on Copco Road along the northern shoreline of Iron Gate reservoir and is managed by PacifiCorp. The site accommodates camping, day uses, and boat launching and is generally split into three use areas. The first use area is located on the shoreline and consists of 13 developed campsites and a boat launch. The second use area is located across Copco Road from the first use area and is used as a day use area and for overflow camping and parking. The third use area is located on the shoreline to the northwest of the first use area and provides for day use activities, including ADA access to the shoreline, as well as overnight camping.

The first use area at Camp Creek has 13 developed campsites each with a picnic table, fire ring, and a parking space. Boulders separate the campsites. There are two water faucets and six trash receptacles at this use area. There is also a boat launch with a single lane concrete ramp at this use area. There is a wooden walkway leading to a concrete dock next to the boat ramp. The interior access road is used for parking and can accommodate approximately six to eight vehicles. Additionally, there are two wooden float docks located to the north and south (on the existing jetty) of the boat launch. Each of these docks provides shoreline fishing opportunities.

The second use area at Camp Creek is located directly across Copco Road from the first use area. The site has two picnic tables with shelters, three picnic tables without shelters, three grills, one constructed fire ring, and at least five user-defined fire rings. An RV dump station, two composting toilet building, a portable toilet, a trash receptacle, and a water faucet are located in this area and are shared facilities with the other use areas at Camp Creek. Overflow camping occurs at this site when the 13 developed campsites in the first use area are full. Additionally, a large grassy area provides overflow parking for the first use area. There is space for approximately 60 vehicles in the overflow parking area. There is an interpretive display at this use area that provides a brief discussion of the Wilkes Expedition that stopped at this site in 1841.

The third use area at Camp Creek is located to along the reservoir shoreline to the northwest of the first use area. This area is small and has one picnic table and a user-defined fire ring. There is an ADA-accessible concrete fishing pier and boat ramp for launching car-top boats at this use area. This site often receives use as a single campsite and is occasionally used as a group campsite.

Some of the recreation facilities at Camp Creek are in good condition, including the boat launch, concrete docks, picnic tables, interpretive display, water faucets, and trash receptacles. Other facilities, such as campsites and toilets, are in need of maintenance, while the interior gravel roads are in need of repair. The RV dump station and the two wooden docks (to the north and south of the boat launch) need to be replaced.

Juniper Point

Located on the northwestern shoreline of Iron Gate reservoir, Juniper Point is managed by PacifiCorp and provides approximately nine semiprimitive campsites. The camping area has eight picnic tables, nine constructed fire rings, two single-vault toilet buildings (located across Copco Road from this site), and two trash receptacles. There is also a wooden T-shaped dock at this site that provides for shoreline fishing opportunities. The access road into this site is very steep.

The recreation facilities, including the picnic tables, toilets, trash receptacles, and shoreline fishing access areas, at Juniper Point are generally in good condition. Some of the fire rings are in need of maintenance and the interior gravel road should be repaired. Additionally, the wooden dock needs to be replaced.

Mirror Cove

Mirror Cove, managed by PacifiCorp, is located on the western shoreline of Iron Gate reservoir. The site has a camping area and a boat launch. The camping area has ten campsites, all of which have fire rings. However, only eight of the campsites have picnic tables. There are also at least two user-defined fire rings at this site. This site has two single-vault toilet buildings located across Copco Road, a portable toilet in the parking area, and four trash receptacles. The boat launch at Mirror Cove has a concrete ramp with two lanes. There is a wooden gangway leading to a concrete dock adjacent to the boat ramp. The gravel parking area at this site can accommodate approximately 20 vehicles.

The picnic tables, concrete dock, toilets, and trash receptacles at Mirror Cove are in good condition. However, the fire rings, interior gravel road, gravel parking area, and boat ramp are in need of repair. Additionally, the vault toilet buildings were unusable in 2002 and should be repaired and/or replaced.

Overlook Point

The Overlook Point, managed by PacifiCorp, is located on the western shoreline of Iron Gate reservoir. The site has three picnic tables, three fire rings, and two user-defined fire rings. There are also two single-vault toilet buildings (closed in 2002), a portable toilet, and two trash receptacles at this site. A long, steep gravel road provides access to the site. Parking at this site is undefined, but can generally accommodate approximately six vehicles.

Only the fire rings and trash receptacles at Overlook Point are considered in good condition. The steep interior road and undefined parking areas are in need of repair and the picnic tables should be replaced. Additionally, the vault toilet buildings are unusable and should be repaired and/or replaced.

Long Gulch

Long Gulch, managed by PacifiCorp, is located on the southern shoreline of Iron Gate reservoir. The site has a picnic area that is occasionally used for camping and a boat launch. The picnic area has two picnic tables and four user-defined fire rings. The boat launch has a single concrete lane. The site has two single-vault toilet buildings (closed in 2002), one portable toilet, and two trash receptacles. The undefined gravel parking area at this site can accommodate approximately 16 vehicles. This site is not well signed.

The boat ramp and trash receptacles at Long Gulch are in good condition. The gravel access road and parking area are in need of maintenance, while the picnic tables are in need of repair. Additionally, the vault toilet buildings are unusable and should be repaired and/or replaced.

Iron Gate Hatchery Public Use Area

Located below Iron Gate dam, the Iron Gate fish hatchery is operated by CDFG (PacifiCorp funds 80 percent of the fish hatchery's annual operating expenses). There is a public day use area adjacent to the hatchery and an undeveloped boat launch across the river from the hatchery. Fishing is prohibited in this area (to 3,500 feet downstream of the dam). The day use area has a covered picnic shelter, six picnic tables, three trash receptacles, a small visitor center/interpretive kiosk (providing information on dam construction, salmon, and regional wildlife), two flush toilets in restrooms, and an ADA-accessible trail to the river shoreline (near Bogus Creek). A gravel parking area provides spaces for approximately 20 vehicles.

Across the river from the Iron Gate fish hatchery is an undeveloped boat launch. The boat launch is used primarily to launch car-top boats (hand launch); however, the launch does receive some boat trailer use. The gravel shoulder along Copco Road provides undefined parking for the boat launch.

The recreation facilities at the day use area of the Iron Gate Hatchery Public Use Area are generally in good condition. However, the undeveloped boat launch and gravel access road to the launch are in need of repair.

5.7.1.6 Dispersed Recreation Sites in the Study Area

In addition to the developed recreation facilities in the study area, the undeveloped reservoir and river shorelines provide numerous dispersed recreational use opportunities, both for land-based and water-based activities. Many visitors use the reservoir and river shorelines for dispersed activities such as fishing, relaxing, swimming, sunbathing, and camping.

Twenty-seven dispersed recreation sites or use areas on or adjacent to the reservoir or river shorelines were identified during the field inventory (Figure 1.1-2). These sites do not have developed facilities such as picnic tables, grills, or boat launches. The majority (17) of dispersed sites were identified at J.C. Boyle reservoir, while none were found in the Keno reservoir/Lake Ewauna/Link River areas. Many of the identified dispersed sites are located along roads on or near the reservoir or river shoreline. Table 5.7-3 provides brief descriptions by reservoir or river reach of the identified dispersed sites in the study area. Many of the identified dispersed sites appear to have been used for camping and day use activities, though camping is specifically prohibited at a few of the sites. Fires are limited seasonally at most dispersed sites in the study area.

Further discussion of dispersed recreation sites is presented in Section 5.7.3, Recreation Capacity Analysis.

Table 5.7-3. Description of dispersed shoreline recreation areas at or near the Klamath Hydroelectric Project.

| Location and Site Name | General Site Description |
|---|---|
| Keno Reservoir/Lake Ewauna/Link River | |
| No sites identified | |
| J.C. Boyle Reservoir | |
| J.C. Boyle DS 1 | Use area on cliff above Klamath River. Vehicle access via gravel/dirt road north off of SR 66, east of Sportsman's Park. Remnant of two fire pits, nice shade trees, and large area of bare ground. Site has a large amount of trash and some tree damage, likely from target practice. Site likely receives moderate use. |
| J.C. Boyle DS 2 | Smaller site along southern shoreline of Klamath River, east of J.C. Boyle reservoir. Vehicle access via gravel/dirt road off of SR 66, east of Sportsman's Park. One small fire ring and fair amount of bare ground, especially in higher use areas. Site is used as a trash dump. Site likely receives moderate use. |
| J.C. Boyle DS 3 | Large area of bare ground near mouth of Klamath River at eastern end of reservoir. One large user-built fire ring. Some trash at site. Users were fishing and sunbathing at site during field inventory. |
| J.C. Boyle DS 4 | Large grassy site with nice views east and west. One large user-built fire ring about 15 feet from shoreline. Some trash and sanitation problems. |
| J.C. Boyle DS 5 | Site on reservoir, approximately 15 feet from shoreline. Cleared area with some shade trees and one user-defined fire ring built around existing large rock at site. Some trash and moderate sanitation problems. |
| J.C. Boyle DS 6 | Site on eastern side of mouth of Spencer Creek, though not on reservoir shoreline. One user-built fire ring. Some evidence of recent use. |
| J.C. Boyle DS 7 | Large area of bare ground on eastern side of Spencer Creek. Two user-built fire rings. RV parked at site during field inventory. |
| J.C. Boyle DS 8 | Large site with several (six to eight) individual sites on western shoreline of Spencer Creek. On nonreservoir side of road. Many user-built fire pits. Squatter camp located at site during field inventory. |
| J.C. Boyle DS 9 | Large bare area on southwestern side of Spencer Creek, reservoir side of road. Several user-built fire rings (at least five). Site likely receives heavy use due to extent of bare ground, amount of litter, and sanitation problems. Transient squatter camp location. |
| J.C. Boyle DS 10 | Large site near mouth of Spencer Creek. Panoramic view of reservoir. Private timber company property. Some footpaths from road to site and shoreline. Potential sanitation problem. |
| J.C. Boyle DS 11 | Large site on reservoir shoreline. Shade trees. One user-built fire ring. Evidence of recent use. |
| J.C. Boyle DS 12 | Small site on reservoir shoreline. One user-built fire ring, approximately 5 feet from shoreline. Limited evidence of recent use, however, potential sanitation problems. |
| J.C. Boyle DS 13 | Cluster of sites (approximately four) on western shoreline of reservoir, north of SR 66. Four user-built fire rings. Nice shade trees and view of reservoir. Signs indicate no camping in area. Light to moderate use. |
| J.C. Boyle DS 14 | Large area of bare ground on eastern shoreline of reservoir, south of SR 66. Several footpaths to and along shoreline. Vehicle access to shoreline is blocked. Some litter. |
| J.C. Boyle DS 15 (Bluffs) | Large area on bluff above reservoir, across from Pioneer Park (West). Large use area extends from T-lines north of BLM's Topsy Campground to bluffs area. Several (at least two) user-built fire rings. Heavy amount of trash. Site likely receives a heavy amount of use. Visitors jump from bluffs into reservoir. |

Table 5.7-3. Description of dispersed shoreline recreation areas at or near the Klamath Hydroelectric Project.

| Location and Site Name | General Site Description |
|---|---|
| J.C. Boyle DS 16 | Small roadside pullout on reservoir shoreline south of BLM's Topsy Campground. Evidence of fires, though no ring at time of field inventory. Heavy amount of trash. Moderate to heavy use. |
| J.C. Boyle DS 17 | Large site adjacent to road, below J.C. Boyle dam. Several user-defined footpaths to river shoreline. One user-built fire ring. Very little trash. Light to moderate use. |
| <u>Upper Klamath River/Hell's Corner Reach</u> | |
| BLM DS 1 | Small site along the western shoreline of the Klamath River approximately 1 mile south of BLM's Upper Klamath River (Spring Island) Boater Access site. Steep road entering the site. Campsites for one or two vehicles. Receives low to moderate use, little amounts of litter present. |
| Turtle Camp | Small site along the western shoreline of the Klamath River approximately 1 mile south of BLM's Klamath River Campground. Some boat-in use was evident along the shoreline. Site was relatively clean with little amounts of litter present. |
| Frain Ranch | Very large area with multiple dispersed sites (at least six fire pits/use areas) and roads along the eastern shoreline of the river. Several historic buildings are located here. Accessed via the river by boat/raft or by vehicle on Topsy Grade Road (not maintained by Klamath County). Composting toilets on-site, but closed by PacifiCorp due to vandalism. Ecological impacts focused at heavier use areas (along river shoreline, camping areas, etc.). Site is very difficult to access, but use is estimated to be moderate at times. Site is occasionally used by large groups and long-term squatters. Site is also used as a boater take-out/rest stop and viewpoint for upcoming rapids. |
| BLM DS 4 | Moderate-sized site along the western/northern shoreline of the river that is accessed via a dirt road or by boat. Several rafting groups use the site as a rest area/take-out and viewpoint for upcoming rapids. Use is primarily distributed along the shoreline. Site was relatively clean with little amounts of litter present. (No dispersed site #2 exists—replaced by the name Klamath River Campground. No dispersed site #3 exists—replaced by the name Turtle Camp.) |
| <u>Copco Reservoir</u> | |
| Raymond Gulch DS | Roadside pullout on reservoir shoreline. Most of site is bare ground. Several footpaths to and along shoreline. Impacts likely from cattle grazing, not recreation. |
| Beaver Creek Cove DS | Reservoir shoreline site adjacent to road. Most of site is bare ground. Several footpaths to shoreline. Old user-built fire ring, though doesn't appear to have been used recently. Floating dock at site, belongs to nearby resident. |
| <u>Iron Gate Reservoir</u> | |
| Iron Gate DS 1 | Small site on rocky point along reservoir shoreline. Space for approximately two vehicles. Several footpaths to shoreline, highly impacted. Evidence of fires at site, though no fire ring at time of field inventory. Site likely receives heavy use by shoreline anglers. |
| Iron Gate DS 2 | Small roadside pullout along reservoir shoreline. One user-built fire ring. Several footpaths to and along shoreline. Some vegetative trampling, though likely due to cattle grazing, not recreation. Site likely receives moderate use by shoreline anglers. |
| Iron Gate DS 3 | Two gravel access roads provide vehicular access to reservoir shoreline. Both roads cabled at time of field inventory, no vehicle access. Two user-built fire rings. Nice beach area. Site appears to have received heavy use, but currently receives only light use due to lack of vehicle access. |

Table 5.7-3. Description of dispersed shoreline recreation areas at or near the Klamath Hydroelectric Project.

| Location and Site Name | General Site Description |
|---|---|
| Long Gulch DS | Large area with at least five individual sites on hill above reservoir, to the east of Long Gulch. Several (at least five) user-built fire rings. Nice shade trees and views of reservoir. Various dirt roads though area and large extent of bare ground. Site likely receives heavy use. Access road to site was cabled in 2002, though new access road around cable was quickly formed. |

Source: EDAW, Inc.

### 5.7.1.7 ADA Accessibility

This subsection describes accessibility for the physically disabled at recreation features in the study area. In general, there are very few accessible recreation features in the study area that meet modern ADA standards. Furthermore, complete standards for ADA accessibility are still being developed by the Access Board. A few sites, however, do have some accessible features. These ADA-accessible recreation features are summarized in Table 5.7-4.

Table 5.7-4. ADA accessible features at developed recreation sites at or near the existing Klamath Hydroelectric Project.

| Site | Accessible Features |
|---|---|
| Link River Nature Trail | • Four shoreline fishing pads (only one accessible from parking area, others behind locked fence) |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | • Parking (two spaces), none for trailer parking<br>• Access routes from parking area to restrooms and drinking fountain<br>• Restrooms |
| Keno Recreation Area | • Restrooms and showers<br>• Parking (two spaces near restrooms) |
| Pioneer Park (West) | • Portable toilet |
| BLM's Topsy Campground | • Fishing pier<br>• One campsite<br>• One picnic table in day use area<br>• Parking (one space near restrooms) |
| BLM's Upper Klamath River (Spring Island) Boater Access | • Access route from parking area to toilets/changing rooms |
| Fall Creek Trail | • Parking<br>• Portable toilet (but behind locked gate) |
| Camp Creek | • Fishing pier |
| Iron Gate Hatchery Public Use Area | • Parking<br>• Access routes to interpretive kiosk, river shoreline, and three picnic tables |

Source: EDAW, Inc.

Further discussion of ADA-accessible facilities is presented in Section 5.7.4, Recreation Needs Analysis.

### 5.7.2 Recreation Demand Analysis

Information from the Recreation Demand Analysis, a component of the Recreation Needs Analysis, is used to help define existing and future demand for recreation activities in the study area. This analysis synthesizes the results of a regional analysis, recreation surveys, and user counts to present an overall assessment of the topic of recreation demand.

The Recreation Demand Analysis consists of two components. The first component considers regional demand using existing published SCORP data for Oregon and California and other existing published sources of regional data to estimate existing and future demand for various activities in the study area. This first step was completed as part of the Regional Recreation Analysis (Section 4.0).

The second component compares the results of the regional analysis with the results from the Recreation Visitor Surveys (Section 3.0) and other published and anecdotal information. This comparison is of current recreation use and demand in the study area with published trends in regional and activity-specific demand noted above.

Results from this analysis are used to help assess latent (unmet) demand, if any, and the demand for Project-related activities over the anticipated term of the new license. Additionally, future recreational use of study area facilities are projected through the anticipated term of the new license based on regional and activity-specific demand.

Dispersed recreation activities that are unrelated to the Project, including OHV use, hunting, and target shooting, are not assessed in this analysis per the study plan. These activities would be occurring with or without the Project. While the Project provides access roads, attractions, and facilities that may attract these types of uses (OHV, hunting, target shooting, etc.), it is generally the responsibility of surrounding landowners and resource managers to manage these dispersed use activities occurring on their lands.

The following topics are addressed in this section:

- Summary of regional recreation demand
- Summary of existing study area recreation demand
- Summary of projected demand for the study area
- Synthesis of regional and study area recreation demand, as well as a discussion of latent (unmet) demand

#### 5.7.2.1 Regional Recreation Demand Analysis

The regional recreation demand summarizes regional demand for various Project-related recreation activities followed by a discussion of demand for various recreation settings and a discussion on regional demand for whitewater boating and fishing.

Regional Demand for Project-Related Recreation Activities

The analysis of regional demand is based primarily on data from published California and Oregon SCORP documents (CDPR, 1998; OPRD, 2003). The 1998 CDPR SCORP study presents the most recent regional demand data for 43 recreation activities, including the following activities that occur in the regional study area:

- Trail hiking
- Bicycling (paved surfaces)
- Mountain biking (unpaved surfaces)
- Driving for pleasure
- Primitive camping
- Developed camping
- Nature study/wildlife viewing
- General use of open space
- Beach activities
- Picnicking
- Horseback riding
- Swimming (nonpool)
- Sailboating and windsurfing
- Kayaking, canoeing, and rafting
- Powerboating
- Waterskiing
- Fishing (freshwater)
- 4-wheel-drive vehicle use
- Hunting
- Motorcycling/ATV use
- Target shooting

Although future participation trends in these activities were not assessed, CDPR's baseline survey (CDPR, 1998) estimated existing demand for each of the common activities in the study area. Participants in the CDPR study were asked to rank those activities for which they would most probably increase their own participation if good opportunities were available. The results showed that several activities that take place in the study area have existing "high" demand. The activities with high demand would most likely see an increase in participation if there was an increase in opportunities or access. These activities include:

- Developed camping
- Trail hiking/walking
- Swimming (nonpool)
- Nature study/wildlife viewing
- Primitive camping
- General use of open space
- Freshwater fishing
- Picnicking

For California, the CDPR SCORP (1998) divided recreation activities into three demand categories: high existing demand, moderate existing demand, and low existing demand. The activities listed in Table 5.7-5 are shown in descending order of demand.

Table 5.7-5. Existing demand for selected recreational activities in California.

| Activity | Existing Demand |
|---|---|
| Developed camping | High |
| Trail hiking | High |
| Swimming (nonpool) | High |
| Nature study/wildlife viewing | High |
| Primitive camping | High |
| Beach activities | High |
| General use of open space | High |
| Fishing (freshwater) | High |
| Picnicking | High |
| Bicycling (paved surfaces) | Moderate |
| Driving for pleasure | Low |
| Kayaking, canoeing, and rafting | Low |
| Mountain biking (unpaved surfaces) | Low |
| Hunting | Low |
| Motorcycling/ATV use | Low |
| 4-wheel drive vehicle use | Low |
| Powerboating | Low |
| Waterskiing | Low |
| Horseback riding | Low |
| Target shooting | Low |
| Sailboating and windsurfing | Low |

Source: CDPR, 1998.

The 2003-2007 Oregon SCORP (OPRD, 2003) estimated existing demand for common outdoor recreation activities. Demand for recreation activities in Oregon is similar to demand in California. Nature study is in high demand and bicycling is in moderate demand in both Oregon and California. Both surveys indicate a lower demand for kayaking, hunting, motorcycling/ATV use, 4-wheel-drive vehicle use, powerboating, waterskiing, horseback riding, target shooting, and sailboating/windsurfing.

For Oregon, recreation activities listed in Table 5.7-6 are shown in descending order of demand. For purposes of comparison with the California data, high demand was defined as 35 to 60 percent participation, moderate demand was defined as 10 to 34 percent, and low demand was defined as 1 to 19 percent. These Oregon results, unlike the California data, do not take existing supply into account.

Table 5.7-6. Existing demand for selected recreational activities in Oregon.

| Activity | Existing Demand |
|---|---|
| Sightseeing/driving for pleasure | High |
| Walking for pleasure | High |
| Visiting cultural/historical sites | High |
| Nature study/wildlife viewing | High |
| Bird watching | Moderate |
| Ocean beach activities | Moderate |
| Hiking | Moderate |
| Outdoor photography | Moderate |
| Running/walking for exercise | Moderate |
| Picnicking | Moderate |
| Bicycling | Moderate |
| Fishing from a boat | Moderate |
| Fishing from a bank | Moderate |
| Kayaking, canoeing, and rafting | Low |
| Primitive camping | Low |
| Developed camping | Low |
| Motorcycling/ATV use | Low |
| 4-wheel drive vehicle use | Low |
| Powerboating | Low |
| Waterskiing | Low |
| Horseback riding | Low |
| Beach swimming | Low |
| Sailboating and windsurfing | Low |

Source: OPRD, 2003.

The following activities have high existing demand in Oregon:

- Sightseeing/driving for pleasure (note: low in California)
- Walking for pleasure
- Visiting cultural/historic sites
- Nature study/wildlife viewing

Regional Demand for Outdoor Recreation Settings

In addition to an activity-based approach to assessing recreation demand, it is also important to assess the types of physical, social, and managerial settings that visitors choose for outdoor recreation. The CDPR report and Oregon SCORP assess this somewhat differently. But in both cases, the results show that in general respondents prefer settings less developed than those that they actually visit. Various user groups also seek different types of settings based on their facility needs, willingness to pay, and personal preference.

The data in Table 5.7-7 show that over two-thirds (69 percent) of California residents prefer to use either undeveloped areas or nature-oriented parks and recreation areas. However, relatively few residents actually use these areas on a consistent basis, primarily due to travel time or distance, cost, or lack of time. Based on the desire for a less developed recreational setting by many California residents, overall demand can be characterized as generally high for the type of natural setting that is available in the study area. Demand tends to be much lower for highly developed parks and recreation areas. Ten percent of California residents tend to prefer highly developed parks and recreation areas; however, over 20 percent actually use this type of setting.

Table 5.7-7. Types of desired outdoor recreation areas used in California–preferred and actual.

| Type of Area | Preferred Use (Percent) | Actual Use* (Percent) |
|---|---|---|
| Natural and undeveloped areas | 39.4 | 11.7 |
| Nature-oriented parks and recreation areas | 30.0 | 9.7 |
| Highly developed parks and recreation areas | 10.2 | 20.5 |
| Historic or cultural buildings, sites or areas | 9.3 | 2.2 |
| Private, not public, outdoor recreation areas and facilities | 11.1 | 12.9 |

Source: CDPR, 1998.

* Use of an area at least once a week.

The Oregon SCORP measures recreation settings differently from the CDPR survey. As Table 5.7-8 presents, Oregon residents rated preferred and actual recreation settings in terms of specific recreation activities. In general, the people surveyed prefer less developed settings than those they actually choose, regardless of the recreation activity. The discrepancy between actual and preferred recreation settings was the highest for boating activities. Twenty percent of those surveyed boated in an urban setting with natural features, although less than 1 percent actually preferred this setting.

Table 5.7-8. Types of desired outdoor recreation areas used in Oregon–preferred and actual.

| Activity | Outdoor Recreational Setting[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Primitive/Semi-Primitive[2] | | Roaded Natural/Roaded Modified[2] | | Rural | | Highly Developed/Nature Dominant within Urban Area[2] | |
| | U[3] (percent) | P[3] (percent) | U[3] (percent) | P[3] (percent) | U[3] (percent) | P[3] (percent) | U[3] (percent) | P[3] (percent) |
| Picnicking, sightseeing, and touring | 17.0 | 27.0 | 45.8 | 50.8 | 10.2 | 9.5 | 18.7 | 9.5 |
| Boating | 24.0 | 47.3 | 28.0 | 36.8 | 20.0 | 10.5 | 28.0 | 5.3 |
| Hunting & shooting | 47.0 | 42.7 | 45.0 | 32.7 | 6.0 | 2.9 | 2.0 | 1.0 |
| Nature study | 24.2 | 45.1 | 45.2 | 42.0 | 16.1 | 9.7 | 9.7 | 3.2 |
| Swimming & beach activities | 18.0 | 31.6 | 42.7 | 48.4 | 16.4 | 10.0 | 14.7 | 5.0 |
| Camping | 14.1 | 18.1 | 51.2 | 55.5 | 9.2 | 6.0 | 23.1 | 19.3 |
| Outdoor sports | 4.4 | 11.9 | 13.2 | 22.0 | 16.2 | 11.9 | 28.0 | 25.5 |
| Nonmotorized snow activities | 15.4 | 36.0 | 26.9 | 20.0 | 0.0 | 4.0 | 46.2 | 36.0 |
| Trail, road & beach activities | 28.0 | 50.2 | 32.0 | 30.2 | 12.7 | 6.1 | 11.5 | 7.8 |

Source: OPRD, 2003.

1 Two very urban recreational settings were excluded because they were not relevant to the study area.

2 Some categories were combined.

3 U = used, P = preferred.

These results indicate that the more primitive and less developed settings provided in the study area are desired by many residents of Oregon and California. This desire, however, is tempered by issues of access, travel time, and distance.

Regional Demand for Whitewater Boating

According to the Oregon SCORP (2003) and the CDPR report (1998), whitewater boating activities have lower existing statewide demand. Both states have many whitewater boating opportunities, and generally the rivers that are closer to urban centers receive higher use levels (such as the American River in California).

The regional study area includes at least ten rivers that provide a variety of whitewater boating opportunities and demand different levels of experience from whitewater boaters. The Rogue River has the highest existing level of use. All of the other rivers have more moderate levels of use. Several of the rivers have commercial whitewater outfitters, including the Rogue, Upper Sacramento, and Klamath rivers. Whitewater boating rivers in the region, some of which are major tributaries of the Klamath River, are shown in Table 5.7-9.

Table 5.7-9. Rivers with whitewater boating opportunities in the region.

| River | State | Comparative Level of Use | Boating Class Type | Miles of Boatable Whitewater |
|---|---|---|---|---|
| Clear Creek | CA | Low | IV+ | 7 |
| Klamath River* | CA | Low/Moderate | I-IV | 100+ |
| McCloud (tributary of the Sacramento) | CA | Moderate | II-IV | 35 |
| Pit River (tributary of the Sacramento) | CA | Low | IV-V | 34 |
| Rogue River | OR | High | III-V | 100+ |
| Salmon River (tributary of the Klamath) | CA | Moderate | III-V | 44 |
| Scott River (tributary of the Klamath) | CA | Low | III-V | 20 |
| Smith River | OR, CA | Low | III-V | 100+ |
| Upper Sacramento River | CA | Low | III-V | 36 |
| Trinity River (tributary of the Klamath) | CA | Moderate | III-V | 100+ |

Sources: Holbek and Stanley, 1998; Cassady and Calhoun, 1995; Willamette Kayak and Canoe Club, 1994; EDAW, Inc.

* Includes whitewater reaches outside of study area.

As Table 5.7-9 indicates, there are many whitewater boating opportunities in the region. The study area provides whitewater boating enthusiasts with varying skills with a variety of opportunities. The Upper Klamath River's Hell's Corner reach is a WSR reach that provides a challenging Class IV whitewater run. Below Keno dam, a lightly used Class III run exists. There are also less challenging water reaches within the study area, in particular certain reaches below Iron Gate dam. Another unique characteristic of whitewater boating in the study area is the limited access which results in fewer users compared with the Rouge River, for example. This may be appealing to some boaters as it provides an increase in solitude.

<u>Regional Demand for River Fishing</u>

The Oregon SCORP (2003) rates fishing as having moderate demand, while the CDPR report states that fishing has high existing demand. Both states have a variety of fishing opportunities, as each state has many river systems as well as significant shoreline.

The regional study area includes several major rivers that provide a multitude of fishing opportunities including fly fishing mountain streams for resident trout and trolling from jetboats for salmon returning to the main stems of major rivers. Chinook (king) and coho (silver) salmon, steelhead, brown, cutthroat, and native trout, as well as other fish, are found in many of these river systems (Table 5.7-10).

The region provides an array of fishing opportunities that serve the needs of diverse user groups. The study area provides a setting which attracts anglers seeking solitude. This is especially true of the Upper Klamath River's Hell's Corner reach, which has limited access. The forested canyon is also likely an attraction to individuals who seek scenic beauty and solitude while fishing.

Table 5.7-10. Fish species and fishing opportunities in regional rivers.

| River | Fish Species Caught | Common Types of Fishing |
|---|---|---|
| Lower Klamath River | Chinook (king) salmon; coho (silver) salmon; steelhead trout; native trout | Drift boat, powerboat |
| McCloud River | Shasta native trout | Fly fishing, bank fishing |
| Pit River | Native trout; brown trout; smallmouth bass; Rough Fish | Fly fishing, bank fishing |
| Rogue River | Chinook salmon; coho salmon; steelhead trout | Drift boat/ powerboat/fly fishing |
| Salmon River | Chinook salmon; steelhead trout; resident trout | Fly fishing, bank fishing |
| Scott River | Chinook salmon; steelhead trout; resident trout | Fly fishing, bank fishing |
| Smith River | Chinook salmon; coho salmon; steelhead trout | Drift boat/ powerboat/flyfishing |
| Trinity River | Chinook salmon; steelhead trout; sturgeon; shad; lamprey | Drift boat/ powerboat/fly fishing/bank fishing |
| Upper Sacramento River | Chinook salmon; trout; shad | Fly fishing, bank fishing |

Sources: Boat Escape.com. Oregon's Ultimate Boating Resource!, 2002; Fish Sniffer.com, 2002; and EDAW, Inc.

Residents of local communities do a majority of the fishing on rivers within this region. Visitors travel to the region to fish especially from the San Francisco Bay Area and Portland. Some pay for fishing guides or charter services to enhance their experience. Of the local anglers, most are from nearby communities within the particular state the river is located. The quality of nearby fisheries is generally good enough that residents of Oregon are not typically willing to pay for an additional license or travel to fish in California, and vice versa (Trophy Waters Fly Fishing Shop, pers. comm., 2002).

Fishing Licenses Sold in California and Oregon

In order to help assess existing regional fishing demand, fishing license data were acquired from CDFG and ODFW and are presented in Table 5.7-11 and Table 5.7-12. These data indicate that the number of fishing licenses sold in California has decreased considerable over the last 6 years (-12.5 percent), while Oregon has experienced a slight increase in the number of fishing licenses sold (1.6 percent). These data are not presented in Recreation Days.

Oregon has seen the number of resident license holders decline slightly from 1996-2001 (2.9 percent) even though the state's population has increased by 7 percent during the same period. At the same time, the number of nonresident permits sold has increased by over 18 percent. The net effect is an increase of 1.6 percent. These results indicate an increase in the number of tourists fishing in Oregon while the number of in-state anglers decline (Table 5.7-12).

Table 5.7-11. Fishing license purchases in California (1996-2001).

| Type of Fishing License | Number of Fishing Licenses Sold by Year | | | | | | Percent Change 1996-2001 |
|---|---|---|---|---|---|---|---|
| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | |
| Resident | 1,403,126 | 1,385,321 | 1,289,617 | 1,272,055 | 1,265,344 | 1,228,036 | -12.4% |
| Non-resident (1 year) | 16,752 | 12,070 | 11,441 | 11,661 | 11,549 | 10,140 | -18.5% |
| Non-resident (10-day) | 12,448 | 20,430 | 20,951 | 14,624 | 14,418 | 13,827 | -17.4% |
| Total Licenses: | 1,432,326 | 1,417,821 | 1,322,009 | 1,298,340 | 1,291.311 | 1,252,003 | -12.5% |

Source: California Department of Fish and Game website, 2003a.

Table 5.7-12. Fishing license purchases in Oregon (1996-2001).

| Type of Fishing License | Number of Fishing Licenses Sold by Year | | | | | | Percent Change 1996-2001 |
|---|---|---|---|---|---|---|---|
| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | |
| Resident | 533,232 | 532,106 | 516,900 | 514,246 | 499,855 | 517,666 | -2.9% |
| Non-resident | 145,276 | 146,271 | 136,392 | 139,105 | 166,196 | 172,003 | 18.3% |
| Total Licenses: | 678,508 | 678,377 | 653,292 | 653,351 | 666,051 | 689,669 | 1.6% |

Source: Carter, pers. comm., 2002.

#### 5.7.2.2 Existing Recreation Demand in the Study Area

This section summarizes recreation demand specific to the study area. This includes a discussion of what areas visitors are using most while in the study area, and existing recreation use levels. This discussion is followed by an analysis of study area demand for whitewater boating and fishing and concludes with a discussion of demand from information contained in the Recreation Flow Analysis (Section 2.0).

Existing Use by Project-Related Activities

A visitor recreation survey was conducted in 2001 and 2002 to obtain information regarding the views and perceptions of users from throughout the study area. Section 3.0 in this report (Recreation Visitor Surveys) provides a detailed discussion of the survey results. Visitor surveys were also used to assess existing activity use within the study area. Those surveyed identified their primary activities that they participated in when visiting the study area.

The following activities were the most common cited primary activities in the study area:

- Fishing (boat)
- Waterskiing
- Resting/relaxing
- Fishing (bank)
- RV camping

When asked to indicate all activities that they participated in on study area lands and waters, more than half (60 percent) of the visitors surveyed indicated resting/relaxing as one of those activities. Ten of the 23 recreation activities listed below are specific water-related activities and several others are associated with those water-related activities. The following data summarize the results:

- 60 percent of the visitors to the study area stated resting/relaxing as an activity that they participated in while in the study area.
- Resting/relaxing was the most common activity for visitors at Link River/Lake Ewauna/Keno reservoir, J.C. Boyle reservoir, and Iron Gate reservoir.
- Whitewater boating was the most common activity among respondents in the Upper Klamath River/Hell's Corner reach resource area.
- Fishing from a boat was the most common activity among respondents in the Copco reservoir resource area.

<u>Demand for Study Area Sites and Areas</u>

In general, sites within the study area that have additional facilities, and increased access, receive higher use. Iron Gate reservoir is the most popular reservoir area to visit within the study area (half of survey respondents). When given only one choice, survey respondents indicated that Iron Gate reservoir was the recreation area they most often visited. This statement is not surprising since Iron Gate reservoir is the closest reservoir in the study area to I-5 and has more developed day use areas than any other reservoir. It also has more campsites than any other reservoir in the study area. There are three boat ramps, six day use areas, and several dispersed use sites popular with visitors. The other most popular areas included the Upper Klamath River/Hell's Corner reach (quarter of respondents) and Keno Recreation Area (fifth of respondents).

Sites with the highest use measured in RDs in the study area are listed below in descending order:

- City of Klamath Falls' Veteran's Memorial Park/Boat Launch
- Link River Nature Trail
- Pioneer Park (East/West)
- Camp Creek
- Sportsman's Park
- Mirror Cove

The two factors that most affected demand at individual sites within the study area were access and facilities. For example, City of Klamath Falls' Veteran's Memorial Park/Boat Launch and the Link River Nature Trail are easily accessible from the city of Klamath Falls. Camp Creek, Sportsman's Park, and Mirror Cove are more developed sites that attract more visitors compared with less developed sites. It is also important to note that these sites are all in proximity to paved roads.

Recreation Use Levels in the Study Area

As a part of the Recreation Visitor Survey (Section 3.0), annual visitation was estimated for the entire study area and by site. These data are estimated in RDs, the preferred unit of measurement of FERC. An RD is defined as a visit to a recreation area for any reason in a 24-hour period. Seasonal RDs at each site were calculated by multiplying VAOT averages (Table 3.7-32), people per vehicle averages (Table 3.7-34), turnover rates (Table 3.7-35), and the number of RDs per season (VAOT * people per vehicle * turnover rate * days per season = RDs). In total, it is estimated that annual recreational use of the study area is approximately 192,000 RDs. Overall use of the study area can be generally characterized as moderate, though heavier use occurs during the peak season, particularly at Iron Gate reservoir. An overall characterization by season includes:

- Peak season use represents over 60 percent of annual recreational use of the study area.
- Early shoulder season use is approximately 12 percent.
- Late shoulder season use is approximately 17 percent.
- Off-season use is approximately 8 percent.

In each resource area, peak season use accounts for a majority of use. The peak season percentage of annual use was highest at the Upper Klamath River/Hell's Corner reach resource area (83 percent—assuming approximately 70 percent of annual use at BLM sites occurs during the peak season) and lowest at the Link River/Lake Ewauna/Keno reservoir resource area (52 percent). Table 5.7-13 shows use within the study area divided by resource area and season.

Table 5.7-13. Estimated recreation days for the study area.

| | Recreation Days | | | | | |
|---|---|---|---|---|---|---|
| | Early Shoulder Season | Peak Season | | Late Shoulder Season | Off Season | Total |
| **Recreation Site/Resource Area** | | **Weekday** | **Weekend** | | | |
| Link River/Lake Ewauna/Keno Reservoir | 9,243 | 19,578 | 27,788 | 15,082 | 9,437 | 81,128 |
| J.C. Boyle Reservoir | 4,002 | 10,284 | 12,999 | 5,084 | 2,501 | 34,870 |
| Upper Klamath River/Hell's Corner Reach | 1,094 | 3,356 | 7,023 | 1,174 | 0 | 12,647 |
| Copco Reservoir | 1,234 | 1,968 | 4,165 | 1,475 | 0 | 8,842 |
| Iron Gate Reservoir | 5,378 | 14,200 | 19,533 | 9,076 | 3,568 | 51,755 |

Source: EDAW, Inc., 2003.

However, annual RD estimates differed from these percentages. The Link River/Lake Ewauna/Keno reservoir resource area accounted for the highest number of annual RDs of the five resource areas. This is due to the location of two developed recreation sites in the city of

Klamath Falls, resulting in increased shoulder (early and late) and off season use compared with the other resource areas. The Copco reservoir resource area accounted for the lowest number of annual RDs. Recreational use of Copco reservoir is lower because of its location (i.e., the reservoir is less convenient to and harder to access compared with other study area reservoirs) and because there are only two developed recreation sites along its shoreline, among other reasons.

Demand for Whitewater Boating in the Study Area

Whitewater boating is an important activity within the study area and is discussed in further detail in the Recreation Flow Analysis (Section 2.0). The Klamath River draws visitors from a very broad area for whitewater boating recreation, extending from central California to Washington and beyond. A majority of the Klamath River within the study area is not suitable for whitewater recreation because it has been inundated. However, there are five reaches containing just over 30 miles of whitewater within the study area, and a sixth reach containing 122 miles downstream of the Project that also provides whitewater boating opportunities. The most popular whitewater boating is the Hell's Corner reach between J.C. Boyle powerhouse and Copco reservoir.

For this study, BLM provided information on the number of whitewater boaters registering on the river. The results may be considered conservative as nonregistered individual private boaters are not included. The 8-year average for the number of RDs on the river is 5,250. The 8-year high was 6,395 RDs in 1995 (Table 5.7-14). A drop in use was noted in 2001 due to flows affected by drought conditions and the California energy crisis.

Table 5.7-14. Klamath River study area whitewater use in recreation days (RDs).

| Year | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | Average |
|---|---|---|---|---|---|---|---|---|---|
| Recreation Days | 5,206 | 6,365 | 6,207 | 5,826 | 4,395 | 4,897 | 5,369 | 3,699 | 5,250 |

Source: Weidenbach, pers. comm., 2002.

Demand for Bank Fishing in the Study Area

There are several fishable reaches of the river within the study area. A survey conducted as part of the Recreation Visitor Survey Analysis (Section 3.0) indicates that overall 33 percent of visitors to the study area participate in bank fishing (reservoir and river). In addition, an angler survey was also conducted along the Upper Klamath River/Hell's Corner reach to determine more specific details about fishing in this reach.

Bank anglers in the study area tend to remain close to home. Typically, the southern river reaches near Copco reservoir and Iron Gate reservoir in California are not as popular with anglers from Klamath Falls and other Oregon communities and vice versa. The reason for this is likely the travel time required to get to these reaches in the upper or lower study area and the cost of either a second California or Oregon out-of-state fishing license.

In general, fishing for trout on river reaches within the study area is considered very good (Miranda, Ramirez, and Trophy Waters Fly Fishing Shop, pers. comm., 2002). The two most popular fishing reaches are the Keno reach below Keno dam and the J.C. Boyle bypass reach below J.C. Boyle dam. The Keno reach is 5 miles long and provides very good trout fishing opportunities in an undeveloped rural area. The river is accessible by roads below Keno dam and in Sportsman's Park on J.C. Boyle reservoir. Oregon SR 66 provides access to this river reach. Based on anecdotal evidence from a local angler shop, the number of anglers on the Keno reach varies. The J.C. Boyle bypass reach is 5 miles long and also provides good trout fishing opportunities. Based on conversations with local anglers and angler supply shops, this reach often has many more anglers than the Link River bypass reach and is consistently used on a day to day basis (Miranda, pers. comm., 2002; and Trophy Waters Fly Fishing Shop, pers. comm., 2002).

Other river reaches used for fishing in the study area include the Link River bypass reach, Hell's Corner reach, Copco No. 2 bypass reach, and below Iron Gate dam. The Link River bypass reach is approximately 1 mile long and provides a trout fishing area near the city of Klamath Falls. Based on observations made during field research, anglers appear to use the Link River bypass reach at a few sites where there is access through thick riparian vegetation. Hell's Corner reach is approximately 17 miles long and provides trout fishing opportunities throughout the canyon. Based on observations made during field research, angler use in Hell's Corner reach appears comparatively low due to poor access and long travel times. Angler use here is concentrated at six fishing access sites downstream of the Stateline take-out (PacifiCorp and BLM), at Frain Ranch, and a few BLM sites upstream from there. There are no developed trails along the Copco No. 2 bypass reach, but anglers willing to wade the river and bushwhack along the shore can gain access to numerous pools and riffles at base flows (about 10 cfs). The Klamath River below Iron Gate dam extends for more than 120 miles before flowing into the Pacific Ocean. The Middle and Lower Klamath River from approximately 3,500 feet below Iron Gate dam to the river mouth is open to fishing year-round. This reach attracts and supports several fishing outfitter services that focus on fishing for salmon, steelhead, and trout fisheries.

#### 5.7.2.3 Projected Future Recreation Demand in the Study Area

This section presents a summary of the projected recreation demand and use within the study area. Projections are made based on published regional reports and population projections, and on-site conditions documented in relicensing study results. Projected use is addressed in detail as a component of the Recreation Visitor Survey (Section 3.0).

<u>Population Growth</u>

The majority (61.6 percent) of visitors surveyed in the study area are from Oregon. An additional 35 percent of visitors are from California. Two study area counties (Klamath, Oregon, and Siskiyou, California) accounted for nearly 50 percent of all visitors to the study area, indicating that at least half of the recreational use of the study area is from local county residents. Approximately 34 percent of visitors were from Klamath County, Oregon, the most visitors from a single county. Jackson County, Oregon, accounted for the second most visitors from a single county (15.1 percent) and Siskiyou County, California, accounted for the third most visitors from a single county (14.5 percent). The counties of origin of the remaining visitors that were surveyed were distributed over several other counties primarily in Oregon and California.

Both California and Oregon are projected to experience significant population growth over the estimated license period. Oregon is projected to experience a population increase of about

52 percent by 2040 and California is expected to experience a population increase of approximately 51 percent by 2040.

Additionally, rapid growth occurring in many of the counties of visitor origin is projected to continue through 2040. The five counties with the highest existing use in the study area (Klamath, Jackson, Siskiyou, Josephine, and Shasta counties) are all projected to grow by over 40 percent by the year 2040. Projected increases in these counties range from 40 percent in Siskiyou County, California, to 80 percent in Shasta County, California, by 2040. It should be noted that these five counties do not have major urban and metropolitan centers.

Overall, an increase in state and county populations will likely increase the demand for and use of recreation facilities in the study area. In general, population increases in the counties closest to the study area tend to increase demand more for day use facilities and related activities. Population increases in counties farther from the study area tend to increase demand more for overnight recreation opportunities plus day use facilities used by these campers. Oregon and California SCORP document projections assumed that these types of population increases would be occurring.

Trends in Recreation Activities

Consideration of current and projected future recreation activity helps identify recreational needs in the study area. Statewide, regional, and national activity participation trends were compared with activity participation data from the visitor questionnaire survey and field observations. This comparison was used to help understand existing and projected levels of participation in recreational activities commonly pursued in the study area (Table 5.7-15). Activity trend data used in this analysis included the activities listed in the table below.

Table 5.7-15. Projected annual changes in recreation activity participation in the study area.

| Activity | Cordell | CDPR[1] | OR SCORP[1] | Study Area Projection Classification[2] |
|---|---|---|---|---|
| Powerboating/PWC Use | 1.2% | 3.0% | 0.2% | Increase |
| Sightseeing | 1.3% | 3.5% | 1.3% | Increase |
| Whitewater Boating | 1.2% | -4.8% | 6.0% | Slight Increase |
| Wildlife Viewing | 1.2% | 7.3% | 6.8% | Increase |
| RV Camping | 1.1% | -4.2% | 4.6% | Increase |
| Tent Camping | 0.7% | -4.2% | -1.4% | Slight increase |
| Picnicking | 1.1% | -3.3% | -1.5% | Minimal increase |
| Rest/Relaxation | 1.0% | NA[3] | NA | Increase |
| Hiking | 1.2% | 7.0% | No change | Increase |
| Swimming | 1.0% | 1.8% | 0.7% | Slight increase |
| Fishing | 0.6% | -7.0% | 2.5% | Slight increase |
| Hunting | -0.2% | NA | 3.6% | Minimal increase |
| Beach Use/Sunning | 1.0% | 1.0% | 0.7% | Slight increase |
| Waterskiing | NA | -1.73% | 1.6% | Increase |
| Off-Highway Vehicle Use | NA | 1.01% | 1.6% | Slight increase |

Sources: Cordell et al. 1999; CDPR, 1994 and 1998; OPRD, 2003; and EDAW, Inc.

[1] CDPR and OR SCORP annual changes assume past trends in participation will continue.

[2] Study area projection classifications defined as Increase—greater than 1.2 percent annual increase, Slight Increase—annual increase between 0.7 and 1.2 percent, and Minimal Increase—annual increase between 0.0 and 0.6 percent.

[3] NA indicates that the activity was not addressed in the study.

From a regional perspective, Cordell et al. (1999) provides a comprehensive analysis of future trends in outdoor recreation participation within the broader region as well as nationwide. Using statistical models, projected changes in demographics are used to assess likely future trends of various outdoor recreation activities. Based on these activity participation trends from Cordell et al., annual changes in several recreation activities currently occurring in the study area were developed.

In addition to assessing regional recreation activity trends, current study area conditions were also evaluated in terms of their effect on future study area recreation activity participation. Current study area conditions were considered including field observations (PAOT, VAOT, and BAOT), supply of existing recreation sites, and population changes in the counties of origin of visitors to the study area, among others.

Using regional, statewide, and study area data, the following recreation activities are projected to increase more than other activities at an annual rate of greater than 1.2 percent:

- Powerboating/PWC use
- Sightseeing

- Wildlife viewing
- RV camping
- Resting/relaxing
- Hiking
- Waterskiing

In addition, not only are these activities currently popular in the study area, but they will become increasingly popular at a faster rate than many other activities. It is important to note that a decrease is not projected for any activity currently occurring in the study area.

Projected Recreation Use in the Study Area

Future recreation use in the study area was estimated for the anticipated term of the new license (assumed to be through 2040 for planning purposes). Site-level projected use was assessed by applying the projected annual increases in participation in various activities (which incorporate recreation activity participation trends and existing study area conditions) (Table 3.7-40) to existing use estimates at each recreation site (Table 3.7-36). Use of the study area is projected to reach approximately 282,000 RD by 2040. This represents approximately a 45 percent increase from existing use levels in the study area. Projected use is discussed in greater detail as a portion of the Recreation Visitor Survey (Section 3.0).

#### 5.7.2.4 Latent (Unmet) demand

Latent demand is defined as unmet demand. For this analysis, demand was compared with study area recreation resources to identify any potential missing facilities or services offered in the study area. Areas where sufficient resources may be lacking were noted. The study area provides a diverse amount of recreation opportunities, from whitewater boating to hiking to swimming. It is important to note that activities which are not available in the study area may be available in the region. Therefore, the demand for these activities may be met regionally. Both Oregon and northern California have extensive public outdoor recreation resources. This is reflected by the high number of national forests, BLM-managed land, and wilderness areas, among other resources.

Based on data in the Oregon and California SCORPs, as well as results from the relicensing studies conducted in the study area, the following five activities likely have some existing latent (unmet) demand varying from area to area due to the reasons listed:

- Nonmotorized biking—few bike paths, routes, and trails

- Interpretation—few interpretive facilities (other than signboards) such as amphitheaters and campgrounds

- Waterskiing—few courses (club only)

- ADA-accessible activities—few accessible facilities

- Group use—no formal group facilities available

#### 5.7.2.5 Conclusion

The study area provides an array of diverse recreation opportunities for visitors, most without a user fee. This area is surrounded by vast tracts of federally managed land, of which many include reservoirs that provide similar recreation opportunities. As demand increases over time, it is likely that all of the recreation resources within the region and the study area will see an increase in recreational use. It is also likely that as recreation sites closer to major urban areas become increasingly crowded, some visitors may choose to visit more “remote” recreation areas, such as the study area.

It is important to acknowledge that each resource area is different and will absorb future use and demand differently. The following is a brief summary of these differences:

- Iron Gate reservoir—Currently has the highest existing use among the reservoir resource areas and will likely to continue to have the highest use due to its ease of road access, proximity to I-5 and its extent of existing developed facilities.

- Copco reservoir—Currently has the lowest existing use among the reservoir resource areas. This is due to the limited road access (gravel and dusty conditions) to the reservoir and the limited number of developed facilities at the reservoir. This area will likely see some spillover affect from Iron Gate reservoir over time.

- J.C. Boyle reservoir—Currently receives intermediate use, in large part due to Sportsman’s Park. Sportsman’s Park provides recreational opportunities (hunting, target shooting, archery) not available at other sites within the study area. Use levels on the reservoir should continue to increase over time as the Klamath Falls area grows.

- The Link River Nature Trail/Lake Ewauna/Keno reservoir—This resource area is unique in that it is adjacent to the city of Klamath Falls, which has a significant impact on the amount of use within the resource area. This area will continue to see increased use as the city grows over time up to the capacity of facilities.

- The Upper Klamath River/Hell’s Corner reach—This area is unique within the study area in that a large percentage (64 percent) of the visitors are involved in whitewater boating. Use levels are largely dependent on whitewater boating activity changes over time, as long as access remains primitive.

Using regional, statewide, and study area data, the following recreation activities are projected to increase more than other activities at an annual rate of greater than 1.2 percent:

- Powerboating/PWC use
- Sightseeing
- Wildlife viewing
- RV camping
- Resting/relaxing
- Hiking
- Waterskiing

In addition, not only are these activities currently popular in the study area, but they will become increasingly popular at a faster rate than many other activities. It is important to note that a decrease is not projected for any activity currently occurring in the study area.

### 5.7.3 Recreation Capacity Analysis

This section analyzes and describes the recreation capacity of developed recreation sites in the study area. Additionally, this section provides the results of a nonmotorized trail feasibility analysis that was added to this analysis.

The Recreation Capacity Analysis assessed types and levels of recreational use in the study area to determine whether use levels are compatible with the capacity of the study area both currently and during the term of the new license. Maintaining use levels within a recreation site's capacity is important in terms of protecting natural, cultural, and recreation resources, as well as "helping to assure public safety, providing predictability to private sector permittees and local communities, allocating opportunities among public and private sector providers, contributing to planning at a local or regional ecosystem scale, and helping to assess the consequences of management alternatives" (Haas, 2002).

Exploring different levels of capacity are important in determining where capacity concerns may exist and where management priorities and monitoring programs should be directed. Two levels of capacity need to be assessed: site-specific level and resource area-wide level. Once these levels have been assessed, overall capacity can be determined for the study area.

Capacity at outdoor recreation areas is generally associated with determining the level of use a given site or area can accommodate. However, capacity is a complex issue and often requires more than an estimate of how many people can use a given site at any time. Capacity is also dependent on the type and severity of ecological impacts, available space or facilities for recreation, and the social perceptions of visitors to the site, among other variables. In order to account for the complexity of capacity at recreation sites, four types of capacity were investigated at each site and resource area in the study area: biophysical, spatial, facility, and social capacity. An overall estimate of site capacity was determined based on identifying limiting factors to each type of capacity.

Capacity levels expressed in absolute maximum numbers of users or vehicles, for example, are not the focus of this analysis because capacities are estimates and absolute numbers have been proven to be incorrect over time in many recreation settings. Capacities reported in this analysis are generally expressed in qualitative terms, or estimated numbers. Because capacities are expressed in qualitative terms and as estimates, capacity levels should be monitored over time in order to adapt to changing conditions. The draft RRMP further defines future capacity monitoring needs in the study area (Section 6.0).

While the focus of this analysis is on developing qualitative estimates of use related to site and area capacity, FERC Form 80 requires reporting percent occupancy for developed recreation sites in the study area (Appendix 3B). Based on results from the existing and projected recreation use analyses (Sections 3.7.2 and 3.7.3), percent occupancy was calculated for each developed recreation site. As previously noted, percent occupancy (i.e., facility capacity) should not be relied on as the only capacity indicator. Instead, percent occupancy should be considered along with the other three types of capacity (biophysical, spatial, and social) when determining the overall recreation capacity of a developed site.

In summarizing overall recreation capacity at a site and resource-wide level, informed judgments were made as to whether a site or area is below, approaching, at, or exceeding capacity. These judgments were based on guidelines developed for this study. Some of these guidelines were developed from National Recreation and Parks Association (NRPA) guidelines and other standards, as well as experience with other relicensing studies conducted for recreation resources in the Pacific Northwest and northern California.

The purpose of the component trail siting and feasibility analysis was to identify corridors where nonmotorized trails will serve identified demand for trails during the term of the new Project license. This study is intended to investigate the feasibility of various trail segments that may be considered during the relicensing process.

#### 5.7.3.1 Developed Recreation Site Occupancy as a Capacity Indicator

In addition to providing a baseline estimate of current recreational use in the study area (Section 3.7.2), developed recreation site percent occupancy was also investigated to meet current and future FERC Form 80 reporting requirements. Percent occupancy (facility capacity) provides an estimate of the number of RDs a developed recreation site could theoretically accommodate. It is based solely on the maximum number of RDs at a site and does not incorporate biophysical, spatial, or social capacity limiting factors.

Developed site occupancy was determined by calculating a theoretical maximum capacity for each site and comparing it with existing use at the site. Similar to calculating existing use, the theoretical maximum capacity of a site was determined by multiplying the number of parking spaces or campsites available at a developed site by established multipliers including average group size, length of stay, and days per season (Section 3.7.2). The following equation was then used to calculate percent occupancy at each developed recreation site:

$$\frac{\text{Existing RDs}}{\text{Theoretical Maximum RDs}} = \text{Percent Occupancy}$$

Table 5.7-16 presents the peak season weekend and total peak season (weekday and weekend combined) percent occupancy for developed recreation sites and resource areas in the study area. Percent occupancy is only displayed for the peak season (defined as Memorial Day through Labor Day), as this season tends to receive higher levels of recreational use than the other seasons (early shoulder season, late shoulder season, and off season). Facility capacity is more likely a limiting factor during this heavier use period (i.e., facility limitations are more likely to occur as the number of visitors at a given site increases). Additionally, the focus of FERC Form 80 is on monitoring and reporting recreational use during heavier use periods, specifically requiring the reporting of peak season weekend percent occupancy.

Overall, the developed recreation facilities in the study area could theoretically provide a maximum of approximately 320,000 RDs (not including dispersed recreation sites) during the peak season, assuming 100 percent utilization of all developed recreation sites (Table 5.7-16).

The estimate of existing recreation use in the study area during the peak season is 120,894 RDs (not including dispersed recreation sites). This equates to an overall seasonal percent occupancy of 38 percent. Existing site occupancy rose to 47 percent during peak season weekends. While these occupancy rates are generally considered moderate, many sites had much higher percent occupancies, including several that had exceeded peak-season 100 percent occupancy (City of Klamath Falls' Veteran's Memorial Park/Boat Launch, Camp Creek, and Mirror Cove).

Peak-season and peak-season weekend percent occupancy was also determined by resource area. Resource area percent occupancy was calculated to account for the fact that when one recreation site in an area reaches capacity, other recreation sites in the same area may have capacity to absorb the additional use. This redistribution of use can prolong the time it takes for a site to reach capacity, but can also decrease the time for other sites to reach capacity.

The Iron Gate reservoir resource area had the highest peak-season and peak-season weekend percent occupancies (60 percent and 73 percent, respectively). The Copco reservoir resource area had the lowest peak-season percent occupancy (27 percent) and the J.C. Boyle reservoir resource area had the lowest peak-season weekend percent occupancy (33 percent). Individual site percent occupancy is discussed in Section 5.7.3.3 in regards to the facility capacity of each developed recreation site.

Basing developed recreation site utilization on theoretical maximum occupancy of a site (i.e., 100 percent occupancy), while important for considering the maximum possible number of RDs the study area could potentially accommodate during the peak season, is less useful as a day-to-day management indicator. Management actions are typically necessary long before recreation site percent occupancy reaches 100 percent in order to plan potential expansion or take other nonconstruction management actions to avoid impacts related to crowding and facility overuse. For purposes of this analysis and future monitoring, 2 percent occupancy thresholds (i.e., indicators) were considered in terms of categorizing existing and future use of developed recreation sites in the study area. A 60 percent occupancy level was used as an indicator that a developed recreation site was at its peak-season capacity. Additionally, an 80 percent peak-season weekend occupancy level was used as a second indicator of site capacity. Using these percent occupancy levels as indicators, existing percent occupancy at each developed recreation site in the study area was categorized according to the following capacity levels for purposes of this analysis:

| Capacity Level | Peak Season Percent Occupancy | Peak Season Weekend Percent Occupancy |
|---|---|---|
| Below | < 40 percent | < 60 percent |
| Approaching | 40 to 59 percent | 60 to 79 percent |
| At | 60 percent | 80 percent |
| Exceeding | > 60 percent | > 80 percent |

Table 5.7-16. Estimated peak season percent occupancy at developed recreation sites in the study area.

| Resource Area/Recreation Site | Existing Peak Season (Weekend) RDs[1] | Theoretical Maximum Peak Season (Weekend) RDs[2] | Peak Season (Weekend) Percent Occupancy |
|---|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir | | | |
| Link River Nature Trail | 13,552 (5,700) | 59,907 (28,500) | 23% (20%) |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 25,272 (15,675) | 17,573 (8,360) | 144% (188%) |
| ODFW's Miller Island Boat Launch | 3,862 (3,167) | 10,650 (5,067) | 36% (63%) |
| Keno Recreation Area | 4,677 (3,246) | 14,193 (6,752) | 33% (48%) |
| **Resource Area Subtotal** | **47,365 (27,788)** | **102,324 (48,678)** | **46% (57%)** |
| J.C. Boyle Reservoir | | | |
| Sportsman's Park | 7,560 (4,410) | 18,502 (8,802) | 41% (50%) |
| Pioneer Park (East and West) | 10,133 (5,159) | 70,485 (33,532) | 14% (15%) |
| BLM's Topsy Campground | 5,590 (3,340) | 13,184 (6,272) | 42% (55%) |
| **Resource Area Subtotal** | **23,283 (12,999)** | **83,669 (39,804)** | **28% (33%)** |
| Upper Klamath River/Hell's Corner Reach | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | 3,675 (2,363) | 9,245 (4,398) | 40% (54%) |
| BLM's Klamath River Campground | 700 (450) | 2,311 (1,100) | 30% (41%) |
| Stateline take-out (PacifiCorp and BLM) | 2,764 (1,919) | 5,162 (2,456) | 54% (78%) |
| Fishing Access Sites 1 – 6 | 3,237 (2,291) | 19,261 (9,163) | 17% (25%) |
| **Resource Area Subtotal** | **10,377 (7,022)** | **35,980 (17,116)** | **29% (41%)** |
| Copco Reservoir | | | |
| Mallard Cove | 5,381 (3,807) | 20,008 (9,518) | 27% (40%) |
| Copco Cove | 753 (358) | 3,010 (1,432) | 25% (25%) |
| **Resource Area Subtotal** | **6,134 (4,165)** | **23,018 (10,950)** | **27% (38%)** |
| Iron Gate Reservoir | | | |
| Fall Creek Trail[3] | - | - | - |
| Fall Creek | 1,836 (1,058) | 4,746 (2,258) | 39% (47%) |
| Jenny Creek | 1,844 (1,120) | 3,768 (1,793) | 52% (63%) |
| Wanaka Springs | 3,196 (2,431) | 3,504 (1,667) | 91% (146%) |
| Camp Creek | 9,465 (5,145) | 5,768 (2,744) | 164% (188%) |
| Juniper Point | 3,586 (2,067) | 5,214 (2,481) | 69% (83%) |

Table 5.7-16. Estimated peak season percent occupancy at developed recreation sites in the study area.

| Resource Area/Recreation Site | Existing Peak Season (Weekend) RDs[1] | Theoretical Maximum Peak Season (Weekend) RDs[2] | Peak Season (Weekend) Percent Occupancy |
|---|---|---|---|
| Mirror Cove | 8,331 (4,686) | 11,588 (5,513) | 72% (85%) |
| Overlook Point | 1,325 (413) | 4,172 (1,985) | 32% (21%) |
| Long Gulch | 3,283 (2,117) | 9,492 (4,516) | 35% (47%) |
| Iron Gate Hatchery Public Use Areas | 770 (496) | 8,343 (3,969) | 9% (13%) |
| **Resource Area Subtotal** | **33,735 (19,534)** | **56,595 (26,924)** | **60% (73%)** |
| **Study Area Total** | **120,894 (71,508)** | **320,088 (152,275)** | **38% (47%)** |

Source: EDAW, Inc.

[1] Existing RDs developed and reported in Section 3.7.2 (Table 3.7-36).

[2] Theoretical maximum RDs are based on available campsite and/or parking spaces at each site (Section 3.7.1), people per vehicle (Table 3.7-34), turnover rates (Table 3.7-35), and days per season.

[3] Existing use was not determined for the Fall Creek Trail, as the trail was gated (locked) during the 2002 field season.

Table 5.7-17 presents the percent occupancy indicators for each developed recreation site in the study area. Specific capacity levels are discussed in Section 5.7.3.3 under the facility capacity for each developed recreation site and resource area. It should be noted that percent occupancy related management actions should not be based on one year's worth of data that indicates occupancies exceed either peak-season or peak-season weekend capacity. A sustained multiyear trend is needed to account for environmental influences (e.g., poor weather, drought conditions, forest fires, etc.) that may affect recreation use in the study area. A 3- to 5-year trend should be established and identifiable before capacity-related management actions are taken (3 consecutive years in a row).

### 5.7.3.2 Reservoir Surface Water Capacity

In addition to investigating developed recreation site occupancy, the surface water capacity of the study area reservoirs was also explored. Surface water capacity is generally considered in terms of surface water acres per watercraft, though overall surface water capacity is also dependent on the types of watercraft used, the natural topography and setting, safety conditions, and on-water crowding perceptions, among other factors (Aukerman et al. 2002). Several density standards for surface water acres per watercraft have been developed and used by researchers and are presented in Table 5.7-18. These density standards vary from as few as 4 surface water acres needed per watercraft, to as many as 40 ac needed. The larger density standards are generally for speed and space-dependent activities, such as waterskiing and PWC use, and for areas with physical constraints, such as shallow areas, areas with submerged hazards, and very narrow areas.

Table 5.7-17. Developed recreation site percent occupancy indicators.

| Resource Area/Recreation Site | Occupancy Indicator 1 (60 Percent Peak Season Weekday and Weekend Occupancy) | Occupancy Indicator 2 (80 percent Peak Season Weekend Only Occupancy) |
|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir | | |
| Link River Nature Trail | 23 percent—Below capacity | 20 percent—Below capacity |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 144 percent—Exceeding capacity | 188 percent—Exceeding capacity |
| ODFW's Miller Island Boat Launch | 36 percent—Below capacity | 63 percent—Approaching capacity |
| Keno Recreation Area | 33 percent—Below capacity | 48 percent—Below capacity |
| **Resource Area Subtotal** | **46 percent—Approaching capacity** | **57 percent—Below capacity** |
| J.C. Boyle Reservoir | | |
| Sportsman's Park | 41 percent—Approaching capacity | 50 percent—Below capacity |
| Pioneer Park (East and West) | 12 percent—Below capacity | 12 percent—Below capacity |
| BLM's Topsy Campground | 34 percent—Below capacity | 44 percent—Below capacity |
| **Resource Area Subtotal** | **28 percent—Below capacity** | **33 percent—Below capacity** |
| Upper Klamath River/Hell's Corner Reach | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | 40 percent—Approaching capacity | 54 percent—Below capacity |
| BLM's Klamath River Campground | 30 percent—Below capacity | 41 percent—Below capacity |
| Stateline take-out (PacifiCorp and BLM) | 54 percent—Approaching capacity | 78 percent—Approaching capacity |
| Fishing Access Site 1 – 6 | 17 percent—Below capacity | 25 percent—Below capacity |
| **Resource Area Subtotal** | **29 percent—Below capacity** | **41 percent—Below capacity** |
| Copco Reservoir | | |
| Mallard Cove | 27 percent—Below capacity | 40 percent—Below capacity |
| Copco Cove | 25 percent—Below capacity | 25 percent—Below capacity |
| **Resource Area Subtotal** | **27 percent—Below capacity** | **38 percent—Below capacity** |
| Iron Gate Reservoir | | |
| Fall Creek Trail[1] | - | - |
| Fall Creek | 39 percent—Below capacity | 47 percent—Below capacity |
| Jenny Creek | 52 percent—Approaching capacity | 63 percent—Approaching capacity |
| Wanaka Springs | 91 percent—Exceeding capacity | 146 percent—Exceeding capacity |

Table 5.7-17. Developed recreation site percent occupancy indicators.

| Resource Area/Recreation Site | Occupancy Indicator 1 (60 Percent Peak Season Weekday and Weekend Occupancy) | Occupancy Indicator 2 (80 percent Peak Season Weekend Only Occupancy) |
|---|---|---|
| Camp Creek | 164 percent—Exceeding capacity | 188 percent—Exceeding capacity |
| Juniper Point | 69 percent—Exceeding capacity | 83 percent—Exceeding capacity |
| Mirror Cove | 72 percent—Exceeding capacity | 85 percent—Exceeding capacity |
| Overlook Point | 32 percent—Below capacity | 21 percent—Below capacity |
| Long Gulch | 35 percent—Below capacity | 47 percent—Below capacity |
| Iron Gate Hatchery Public Use Areas | 9 percent—Below capacity | 13 percent—Below capacity |
| **Resource Area Subtotal** | **60 percent—At capacity** | **73 percent—Approaching capacity** |
| **Study Area Total** | **38 percent—Below capacity** | **47 percent—Below capacity** |

Source: EDAW, Inc.

[1] The Fall Creek Trail was closed (gated and locked) during the 2002 data collection period. Quantitative estimates of use were not computed for this site.

Table 5.7-18. Selected boating surface water capacity standards.

| Source | Standard (acres/boat) |
|---|---|
| National Recreation and Parks Association (NRPA) | 4 |
| Bureau of Outdoor Recreation | 9 |
| Arizona Outdoor Recreation Coordination Commission | 10-20 |
| Wisconsin Comprehensive Plan | 20-40 |
| Louisiana Parks and Recreation Commission | 20-40 |

Sources: NRPA, 1981; USBR, 1970; and Urban Research Development Corporation (URDC), 1977.

Recently, researchers have adapted the Recreation Opportunity Spectrum (ROS) to apply to surface water boating capacity and management (Aukerman et al. 2002). Using this adapted water ROS system, boating density standards are dependent on the setting classification(s) of a lake or reservoir. Surface water acres per watercraft density standards in the water ROS system range from as few as 1 to 10 surface water acres needed per watercraft in an urban setting to as many as 3,200 surface water acres needed per watercraft in a primitive setting. Table 5.7-19 provides a brief description of the water ROS setting classifications, as well as the associated surface water acres per watercraft densities.

Given the natural settings and range of available recreation opportunities at study area reservoirs, Keno and Iron Gate reservoirs are classified as Rural Developed, and J.C. Boyle and Copco reservoirs are classified as Rural Natural according to the water ROS description above. To help determine the surface water capacity of study area reservoirs, density standards in Table 5.7-19 were applied to the available surface water acres at high pool elevations at each study area reservoir. Table 5.7-20 displays the available surface water acres at full pool elevation at each study area reservoir, as well as the current estimate of peak season BAOT, the theoretical maximum BAOT, and the percent occupancy at each reservoir. Specific occupancy levels at each reservoir are discussed in Section 5.7.3.3 under the facility capacity for each resource area.

#### 5.7.3.3 Recreation Capacity of Developed Recreation Sites in the Study Area Considering the Four Capacity Types

There are numerous developed recreation sites in each resource area. Overall capacity conclusions for each developed recreation site and resource area are summarized below based on a review of four capacity types (biophysical, spatial, facility, and social). For purposes of this analysis, only developed recreation sites were included in this capacity study. It is generally not practical to determine recreation capacity for individual dispersed recreation sites due to their undeveloped (i.e., lake of developed site facilities) nature and small size. Instead, however, the recreation capacity of dispersed recreation sites in the study area is discussed in terms of their relationship to the overall capacity of each resource area.

Table 5.7-21 summarizes resource area and site capacity conclusions from this analysis. Overall, recreation use levels are below capacity at three resource areas (Link River/Lake Ewauna/Keno reservoir, J.C. Boyle reservoir, and Copco reservoir), approaching capacity at one resource area (Upper Klamath River/Hell’s Corner reach), and at or exceeding capacity at the last resource area (Iron Gate reservoir). The majority of developed recreation sites (57 percent) are considered to be below their recreation capacity. Four developed recreation sites in the Iron Gate reservoir area (Wanaka Springs, Camp Creek, Juniper Point, and Mirror Cove) are considered to be at or exceeding their recreation capacity.

Table 5.7-19. Water ROS setting descriptions and surface water densities.

| Setting | Description | Standard (acres/boat) |
|---|---|---|
| Urban | • Limited opportunities to see, hear, or smell the natural resources due to the extensive level of development, human activity, and natural resource modification.<br>• Watching and meeting other visitors is expected and socializing with family and friends is important.<br>• Diverse range of visitors and activities, including large groups and special events.<br>• Convenience is central and dominant. | 1-10 |
| Suburban | • Limited or seldom opportunities to see, hear, or smell the natural resources due to the widespread and prevalent level of development, human activity, and natural resource modification.<br>• Watching and meeting other visitors is expected and socializing with family and friends is important.<br>• Diverse range of visitors and activities.<br>• Convenience is central and dominant. | 10-20 |
| Rural Developed | • Occasional or periodic opportunities to see, hear, or smell the natural resources due to the common and frequent level of development, human activity, and natural resource modification.<br>• Brief periods of solitude are important though the presence of other visitors is expected.<br>• Diverse range of visitors and activities.<br>• A moderate level of comfort and convenience is important. | 20-50 |
| Rural Natural | • Frequent opportunities to see, hear, or smell the natural resources due to the occasional or periodic level of development, human activity, and natural resource modification.<br>• A sense of independence and freedom with a moderate level management presence is important.<br>• Diverse range of visitors and activities though experiences tend to be more resource-dependent.<br>• Comfort and convenience is not important or expected. | 50-110 |
| Semiprimitive | • Widespread and very prevalent opportunities to see, hear, or smell the natural resources due to the seldom or minor level of development, human activity, and natural resource modification.<br>• Solitude and lack of contact with other visitors, managers, and management is important.<br>• Opportunities for more adventure-based enthusiasts and overnight visitors.<br>• A sense of challenge, adventure, risk, and self-reliance is important. | 110-480 |

Table 5.7-19. Water ROS setting descriptions and surface water densities.

| Setting | Description | Standard (acres/boat) |
|---|---|---|
| Primitive | • Extensive opportunities to see, hear, or smell the natural resources due to the rare and very minor level of development, human activity, and natural resource modification.<br>• Solitude and the lack of the sight, sound, and smells of others is very important.<br>• Opportunities for human-powered activities (e.g., canoeing, fly fishing, backpacking, etc).<br>• A sense of solitude, peacefulness, tranquility, challenge, adventure, risk, testing skills, orienteering, and self-reliance is important. | 480-3,200 |

Source: Aukerman et al. 2002.

Table 5.7-20. Peak-season study area reservoir surface water acre capacities.

| Reservoir | High Pool Surface Water Acres | Current Peak Season BAOT[1] | Theoretical Maximum BAOT[2] | Peak Season Percent Occupancy |
|---|---|---|---|---|
| Keno | 2,475 | 1.7 | 123.8 | 2 percent |
| J.C. Boyle | 420 | 3.1 | 8.4 | 37 percent |
| Copco | 1,000 | 2.3 | 20.0 | 12 percent |
| Iron Gate | 944 | 22.1 | 47.2 | 47 percent |

Source: EDAW, Inc.

1 Current peak-season BAOT estimates discussed in Section 3.7.2.3.

2 Determined by applying the low range density standard in Table 5.7-18 to the available high pool surface water acres at each study area reservoir.

Table 5.7-21 also displays the capacity priority or concern by site and resource area. The capacity concern is based on the overall use level at the recreation site or resource area and should be used to help prioritize potential management actions as they relate to resource and study area capacity. Only one resource area (Iron Gate reservoir) and four developed recreation sites (Wanaka Springs, Camp Creek, Juniper Point, and Mirror Cove) are categorized as being high capacity concerns at this time. Potential management options are discussed in Section 5.7.4, and future monitoring and management actions are further detailed in the draft RRMP (Section 6.0).

The following sections provide a qualitative description of each capacity type at the resource areas and developed recreation sites in the study area.

Link River/Lake Ewauna/Keno Reservoir Area

This section discusses recreation capacity at each of the developed recreation facilities at or near the Link River/Lake Ewauna/Keno reservoir resource area. For each facility, four types of recreation capacity are discussed, as well as overall conclusions indicating whether use levels and associated impacts have exceeded the recreation capacity at that site. The limiting factor(s) to recreation capacity at each facility are also identified.

Table 5.7-21. Summary of study area recreation capacity by resource area and site.

| Resource Area/Site | Identified Limiting Factor(s)[1] | Overall Capacity Summary[2] | Capacity Concern Priority[3] |
|---|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir Area | Spatial | Below | Low |
| • Link River Nature Trail | Spatial | Below | Low |
| • City of Klamath Falls' Veteran's Memorial Park/Boat Launch | Biophysical<br>Spatial<br>Facility | Approaching | Moderate |
| • ODFW's Miller Island Boat Launch | Biophysical<br>Spatial | Below | Low |
| • Keno Recreation Area | Facility | Below | Low |
| J.C. Boyle Reservoir Area | Biophysical | Below | Low |
| • Sportsman's Park | Facility | Below | Low |
| • Pioneer Park (West and East) | Spatial | Below | Low |
| • BLM's Topsy Campground | Facility | Below | Low |
| Upper Klamath River/Hell's Corner Reach Area (including Frain Ranch) | Biophysical<br>Spatial | Approaching | Moderate |
| • BLM's Upper Klamath River (Spring Island) Boater Access | Spatial | Below | Low |
| • BLM's Klamath River Campground | Spatial | Approaching | Moderate |
| • Stateline take-out (PacifiCorp and BLM) | Biophysical | Approaching | Moderate |
| • Fishing Access Sites 1 – 6 | Biophysical<br>Spatial | Below | Low |
| Copco Reservoir Area | Facility | Below | Low |
| • Mallard Cove | Spatial | Below | Low |
| • Copco Cove | Spatial | Below | Low |
| Iron Gate Reservoir Area | Biophysical<br>Spatial<br>Facility<br>Social | At/Exceeding | High |
| • Fall Creek Trail | Spatial | Below | Low |
| • Fall Creek | Biophysical<br>Spatial | Approaching | Moderate |
| • Jenny Creek | Biophysical<br>Spatial | Approaching | Moderate |
| • Wanaka Springs | Biophysical<br>Spatial<br>Facility | Exceeding | High |
| • Camp Creek | Biophysical<br>Facility<br>Social | Exceeding | High |

Table 5.7-21. Summary of study area recreation capacity by resource area and site.

| Resource Area/Site | Identified Limiting Factor(s)[1] | Overall Capacity Summary[2] | Capacity Concern Priority[3] |
|---|---|---|---|
| • Juniper Point | Spatial<br>Facility | At | Moderate |
| • Mirror Cove | Spatial<br>Facility<br>Social | Exceeding | High |
| • Overlook Point | Biophysical<br>Spatial | Approaching | Moderate |
| • Long Gulch | Biophysical | Below/Approaching | Low/Moderate |
| • Iron Gate Hatchery Public Use Area | Spatial | Below | Low |

Source: EDAW, Inc.

1 Indicates whether the capacity limiting factor(s) is based on biophysical, spatial, facility, or social constraints.

2 Indicates whether overall recreational use is considered to be below, approaching, at, or exceeding capacity.

3 Indicates whether the overall capacity is of low, moderate, or high priority or concern.

Link River Nature Trail: The Link River Nature Trail is located at the northern end of the study area, between UKL and Lake Ewauna/Keno reservoir, in the city of Klamath Falls, Oregon. The 1.5-mile trail runs along the west side of the Link River bypass reach. The trail is accessed via two small trailheads located at the northern and southern termini of the trail. The trail is for pedestrian use only and pets are only allowed on a leash.

- *Biophysical Capacity*— The ecological concerns at this site are primarily related to soil compaction and erosion around the north parking area and ADA fishing pads. The shoreline access trail is steep, with fairly significant soil erosion occurring at some points. Exposed roots from erosion, bare ground, and soil compaction also occur on the access trail. These ecological concerns were concentrated at the north end of the trail with few user impacts evident along the trail itself. Overall, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—The Link River Nature Trail is bordered on the west by residential development, on the east by the Link River bypass reach, on the north by UKL, and on the south by urban development. Given these constraints, the physical expansion of the trail is not possible; however, the potential exists to connect the Link River Nature Trail into a larger regional trail system. Spatial capacity is considered a limiting factor at this site because of these site constraints.

- *Facility Capacity*—During the peak recreation season, this site accounts for approximately 13,552 RDs, of which 5,700 are attributable to weekend use (Table 5.7-16). This equates to a peak-season percent occupancy of 23 percent and a peak-season weekend percent occupancy of 20 percent (Table 5.7-17). Both of these occupancy rates are considered to be below capacity. Given that neither capacity indicator has been met or exceeded, facility capacity is currently not considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 2.1 (on a nine-point scale) (Shelby and Heberlein, 1986). This score is generally considered low and an indication that visitors to this site do not perceive crowding as a problem. Given the low perceived crowding score, social capacity is not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, recreation use at this site is considered to be below its recreation capacity. Currently, the only limiting factor is spatial capacity due to the lack of physical expansion possibilities at this site. Existing recreational use of this site is relatively low (36 percent peak season occupancy and 32 percent peak season weekend occupancy) and thus facility capacity is not considered a limiting factor at this time. Biophysical and social capacity are also currently not considered limiting factors at the Link River Nature Trail.

<u>City of Klamath Falls' Veteran's Memorial Park/Boat Launch:</u> Located in Klamath Falls, on northern shoreline of Lake Ewauna/Keno reservoir, City of Klamath Falls' Veteran's Memorial Park/Boat Launch provides day use opportunities, as well as a boat launch.

- *Biophysical Capacity*— Most ecological impacts at this site occur at the boat launch and are primarily related to erosion, vegetation damage, and sanitation problems caused by large numbers of Canada geese and other waterfowl. Around the boat ramp and along the shoreline, erosion is significant and much of the existing vegetation has been damaged by trampling or other physical impact. In addition, Canada geese and other waterfowl droppings are scattered throughout the site. There is little evidence of ecological impacts in the adjacent picnic area with the exception of some bare ground and vegetation damage along the access road from Main Street. Overall, biophysical capacity is considered a limiting factor in the boat launch area of this site.

- *Spatial Capacity*—The location of this site, in the city of Klamath Falls, likely limits any physical expansion of the site. The City of Klamath Falls' Veteran's Memorial Park/Boat Launch is bordered by Main Street and Klamath Avenue to the north, by private development to the east, by Lake Ewauna/Keno reservoir to the west, and private property to the south. Due to these constraints, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—During the peak recreation season, recreational use of this site accounts for approximately 17,575 RDs, of which 8,360 RDs are attributable to weekend use (Table 5.7-16). Considering just the boat launch area of this site, this level of use equates to a peak-season percent occupancy of 144 percent and a peak-season weekend percent occupancy of 188 percent (Table 5.7-17). Both of these occupancy rates are considered to be well above capacity. Several factors may help explain these high occupancy rates, including a large percentage of visitors who do not use a vehicle to access the site (e.g., visitors who walk or bike to the sites), a large number of drive-through visitors (i.e., spend less than 10 minutes at the site), and a large number of vehicles who park in the boat launch parking area but do not have a boat trailer (the boat launch parking area is striped for vehicles with trailers).

  These percent occupancy rates consider use at the lakeside boat launch area of the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, which provides only six parking spaces (Section 5.7.1). If the additional street parking spaces at the picnic area of the park are factored into the occupancy estimate, the peak-season and peak-season weekend occupancy rates drop considerably (to approximately 11 and 14 percent respectively). The facility capacity of the boat launch area of the City of Klamath Falls' Veteran's Memorial Park/Boat Launch is currently considered a limiting factor; however, the additional parking available at this site (non-boat launch area parking) currently accommodates most overflow use (use in excess of site capacity) at this time.

- *Social Capacity*—The mean perceived crowding score at this site is 1.7. This score is considered low and indicates that visitors at this site do not feel crowded. Social capacity is not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—The urban location of this park is an important capacity factor to consider and higher use levels should be expected at this site compared with a similar nonurban recreation site. However, this site is considered to be approaching its recreation capacity due to its current level of use, lack of expansion potential, and ecological impacts (cleanliness). Biophysical, spatial, and facility capacity are considered limiting factors at this site. Only social capacity is currently not considered a limiting factor at this site.

<u>ODFW's Miller Island Boat Launch:</u> This site is located on the eastern shoreline of Lake Ewauna/Keno reservoir about 6 miles south of Klamath Falls and is managed by ODFW. The site consists of a boat launch with two concrete lanes and a gravel parking area. A narrow one-lane road is used to access this site.

- *Biophysical Capacity*—The ecological concerns at this site are primarily related to sanitation and accumulated debris. A vault toilet is located directly adjacent to a canal and may be a potential source of water contamination. Algae in the water tends to accumulate here in the slow-moving water. Moderate amounts of debris, such as wood and rock, are scattered throughout the parking lot. Shoreline vegetation shows some evidence of damage near the boat ramp. Soil erosion exists, but primarily near the boat ramp. In addition, there is some evidence of bare ground and compaction near the shoreline and along the nearby levees. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—This site is located on a relatively flat area along the Lake Ewauna/Keno reservoir shoreline. Some potential exists to expand this site considering that ODFW manages the surrounding land; however, expansion of the site is somewhat limited by the adjacent Klamath Wildlife Area with its ditches and ponds that surround the boat launch. In addition, the access road to this site is very winding and narrow and is one lane in some areas. It is doubtful that the road could accommodate increased traffic, as portions of it are on top of a levee surrounding waterfowl ponds. As a result, spatial capacity is currently considered a limiting factor at this.

- *Facility Capacity*—During the peak recreation season, recreational use of this site accounted for approximately 4,000 RDs (Table 5.7-16). Over 80 percent of current peak-season use occurred during weekends (approximately 3,175 RDs). Recreational use of this site during the peak season resulted in 36 percent occupancy for the entire season and 63 percent for peak-season weekends (Table 5.7-17). Both of these occupancy rates are relatively low and indicate that use is currently below capacity during the peak season and approaching capacity during peak-season weekends. Given that neither capacity indicator has been met or exceeded (Table 5.7-17), facility capacity is currently not considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 2.3. This was the highest crowding score of the four developed recreation sites in the Link River/Lake Ewauna/Keno reservoir resource area. While the mean crowding score at this site was higher than other sites in the area, this score is generally considered low and indicates that visitors do not perceive crowding as a problem at this site. Social capacity is not consider a limiting factor at this time given the low mean perceived crowding score at this site.

- *Overall Site Capacity Conclusion*—Overall, this site is considered to be below its recreation capacity. Currently, limiting factors at this site include biophysical capacity due to recreation and public use impacts and spatial capacity due to physical site conditions. Existing recreational use of this site is relatively low (36 percent peak season occupancy and 63 percent peak season weekend occupancy) and thus facility capacity is not considered a limiting factor at this time. Social capacity is also currently not considered a limiting factor at the ODFW's Miller Island Boat Launch, as perceived crowding levels were generally low.

<u>Keno Recreation Area:</u> This site is managed by PacifiCorp and is located on the southwestern shoreline of Keno reservoir. The site consists of a 26-site campground and several day use areas, including a boat launch. This site has a campground fee of $10.00 per night, the only PacifiCorp-operated facility in the study area with a user fee. The day use areas provide a boat launch, picnic sites, a playground, horseshoe pits, and interpretive facilities.

- *Biophysical Capacity*—Some bare ground and soil compaction are evident throughout Keno Recreation Area. Other ecological concerns at this site include moderate amounts of litter and debris and some erosion and vegetation damage. Footpaths between use areas have resulted in some soil compaction as well as vegetation damage. Moderate vegetation damage is evident near the historical exhibit and along several footpaths leading to the shoreline. Erosion is fairly confined to the shoreline area near the boat ramp. Moderate amounts of litter were seen at the lower day use area and the campground. Despite these conditions, however, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located between SR 66 and Keno reservoir. The main constraint to the physical expansion of this site is the steep topography of the surrounding land in some areas. PacifiCorp owns additional lands in the area; therefore, some potential expansion opportunities exist at this site. Additionally, the campground could be expanded by converting day use areas into campsites (or campsites into more day use areas). Some areas planned for other recreation facilities that are adjacent to this site have never been developed. Given these potential expansion options, spatial capacity is currently not considered a limiting factor at this site.

- *Facility Capacity*—During the peak recreation season, recreational use of this site accounted for approximately 4,680 RDs (Table 5.7-16). Nearly 70 percent of current peak-season use occurred during weekends (approximately 3,250 RDs). Recreational use of this site during the peak season resulted in 33 percent occupancy for the entire season and 48 percent for peak-season weekends (Table 5.7-17). Both of these occupancy rates are considered moderate and indicate that use levels are currently below capacity. However, the presence of day use and camping facilities at this site reduces the percent occupancy (i.e., the large number of parking spaces associated with the day use area increase the total capacity of the site). Based on field observations, the majority of use at this site occurs at the campground which is considered to be approaching capacity. Additionally, this is the only site with camping opportunities in this resource area. While use levels have not yet reached or exceeded capacity at this site (Table 5.7-17), facility capacity is currently considered a limiting factor due to the amount of use that the campground component receives.

- *Social Capacity*—The mean perceived crowding score at this site is 2.0. This score is generally low and indicates that visitors do not feel overly crowded at this site. Given the low mean crowding score at this site, social capacity is not considered a limiting factor at this time.

- *Overall Site Capacity Conclusion*—Overall, use levels at this site are considered to be below its recreation capacity. Currently, the only limiting factor at this site is facility capacity due to the amount of use attributable to the campground area. There is some potential to expand either the campground or day use facilities at this site, if necessary, and thus spatial capacity is not a limiting factor. Neither social capacity nor biophysical capacity is currently considered a limiting factor at Keno Recreation Area.

<u>Link River/Lake Ewauna/Keno Reservoir Resource Area Summary:</u> This resource area is located at the northern end of the study area, adjacent to the city of Klamath Falls, Oregon. There are four developed recreation sites in this resource area, two of which are currently managed by PacifiCorp (Link River Nature Trail and Keno Recreation Area). The remaining two developed recreation sites, City of Klamath Falls' Veteran's Memorial Park/Boat Launch and ODFW's Miller Island Boat Launch, are managed by the City of Klamath Falls Department of Parks and Recreation and ODFW, respectively. There are no identified dispersed use areas in this resource area. Popular activities at the developed recreation sites in the Link River/Lake Ewauna/Keno reservoir resource area include resting/relaxing, sightseeing, hiking, powerboat fishing, and wildlife viewing, among others. A summary of the four capacity types is provided below.

- *Biophysical Capacity*—Biophysical capacity is considered a limiting factor at two developed recreation sites in this resource area (City of Klamath Falls' Veteran's Memorial Park/Boat Launch and ODFW's Miller Island Boat Launch). Observed impacts included erosion, vegetation damage, algae accumulation, and sanitation issues related to Canada geese and other waterfowl at City of Klamath Falls' Veteran's Memorial Park/Boat Launch, and sanitation issues and accumulated debris at ODFW's Miller Island Boat Launch. However, most of the observed ecological impacts are localized and do not appear to have a widespread influence on the biophysical capacity of the resource area, except for algae accumulation in the adjacent waters. For this reason, biophysical capacity is currently not considered a limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at three developed recreation sites in this resource area (Link River Nature Trail, City of Klamath Falls' Veteran's Memorial Park/Boat Launch, and ODFW's Miller Island Boat Launch). At each of these sites, the potential for physical expansion is limited by roads, private property, topography, and the river and/or reservoir. In addition to a lack of physical expansion at these sites, there are very few PacifiCorp-managed shoreline areas that are highly suitable for developed recreation sites in this resource area based on property ownership. Due to the spatial constraints at these existing developed recreation sites and the relative lack of additional areas for future recreation development, spatial capacity is considered a limiting factor at this resource area.

At high pool elevations, there are approximately 2,475 surface water acres available for boating on Keno reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Developed—Section 5.7.3.2), it is estimated that approximately 128 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak season boating use on the reservoir (1.7 BAOT) is much lower than the theoretical maximum BAOT estimate. Thus surface water capacity is not a limiting factor at this time. However, the number of available parking spaces at boat launches on Keno reservoir may limit the number of boats the reservoir can accommodate in the future.

- *Facility Capacity*—Facility capacity is considered a limiting factor at two of the developed recreation sites in this resource area, City of Klamath Falls' Veteran's Memorial Park/Boat Launch and Keno Recreation Area. At each of these developed recreation sites, however, only specific facilities have reached their facility capacity (the boat launch parking area at City of Klamath Falls' Veteran's Memorial Park/Boat Launch and the campground at Keno Recreation Area). Due to the additional site capacity at each of these sites and the lower use levels (percent occupancy) at the remaining two developed recreation sites (Link River Nature Trail and ODFW's Miller Island Boat Launch), facility capacity is currently not considered a limiting factor at this resource area, though may be in the future. While facility capacity is currently not a limiting factor, peak-season occupancy at this resource area is approaching capacity and may be a limiting factor in the future (Table 5.7-17).

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at the four developed recreation sites tended to be low (< 2.5) and the mean perceived crowding score for the resource area is 2.0. This crowding score is low and indicates that visitors to the resource area do not perceive high levels of crowding. Social capacity is not considered a limiting factor at this resource area because of this low mean perceived crowding score.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be below capacity. Spatial capacity is currently the only overall limiting factor at this resource area due to the general lack of expansion and/or new recreation site development options. While some recreation and public use impacts were observed, biophysical capacity is currently not a limiting factor. Facility capacity is a limiting factor at three developed recreation sites, but overall facility capacity is currently not considered a limiting factor at the resource area level. Surface water boating capacity is also not a limiting factor at this time. Additionally, perceived crowding scores are generally low in this resource area and social capacity is not considered a limiting factor at this time.

<u>J.C. Boyle Reservoir Area</u>

This section discusses recreation capacity at each of the developed recreation facilities at or near the J.C. Boyle reservoir resource area. For each facility, four types of recreation capacity are discussed, as well as a conclusion indicating whether use levels have exceeded the recreation capacity at that site. The limiting factor(s) to recreation capacity at each facility are also identified.

<u>Sportsman's Park:</u> Located on the southeastern shoreline of J.C. Boyle reservoir, Sportsman's Park is a large multi-use facility on land owned by PacifiCorp and leased to Klamath County. This site is not part of the existing FERC license. The park contains a rifle and pistol range, sporting clay range, archery ranges, ATV/motocross and dirt drag-strip racetracks, a model aircraft flying field, and another day use amenities (picnic tables, restrooms, etc.). Single day passes to the park are $3.00, while an annual membership pass costs $25.00.

- *Biophysical Capacity*—Ecological impacts at Sportsman's Park were not investigated in detail compared with other developed recreation sites in the study area due to the nature of recreation activities at the site. The types of use this site receives generally result in various ecological impacts (e.g., bare ground from ATV use, shell casings from the shooting ranges, etc.), but in general, ecological impacts at this site were generally localized and contained. An on-site manager supervises use and maintains the grounds at this site. Overall, biophysical capacity is currently not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located between SR 66 and J.C. Boyle reservoir. There is extensive expansion potential at this site due to its large size and areas of undeveloped open space. Given these factors, spatial capacity is not considered a limiting factor at this site, though safety concerns (i.e., adequate space for shooting and archery ranges) may limit spatial capacity in the future.

- *Facility Capacity*—Recreational use at Sportsman's Park was provided by the site operator. The site operator estimated that annual use of the site accounted for approximately 12,600 RDs. It is estimated that approximately 60 percent of annual recreation use at this site occurs during the peak season. This equates to approximately 7,560 RDs during the peak season, including 4,410 peak-season weekend RDs (Table 5.7-16). Given these levels of use, peak-season occupancy is considered to be approaching capacity (41 percent), while peak-season weekend occupancy is considered below capacity at this site (50 percent) (Table 5.7-17). Since use may be limited by the number of existing facilities, such as range targets, facility capacity is considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 2.6. This was the lowest crowding score of the three developed recreation sites in the J.C. Boyle reservoir resource area. The perceived crowding score at this site is generally considered low and indicates that perceived crowding is currently not a problem at this time. Social capacity is not considered a limiting factor at this site because of the low perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, use levels at this site are considered to be below its recreation capacity. Currently, facility capacity is the only limiting factor due to limitations on the number of specific facilities, such as range targets. Biophysical, spatial, and social capacity types are not considered limiting factors at this time.

<u>Pioneer Park (East and West units):</u> Managed by PacifiCorp, Pioneer Park consists of two separate day use areas on the western and eastern shoreline of J.C. Boyle reservoir. Pioneer Park

West provides day use opportunities, including picnicking and resting and relaxing, and has an undeveloped boat launch. Pioneer Park East also has day use facilities including picnic tables, shoreline fishing access, and a developed boat launch with two lanes.

- *Biophysical Capacity*—There are few ecological concerns at Pioneer Park (East and West units). Minor ecological impacts are related to shoreline erosion and vegetation damage. Vegetation damage is primarily concentrated around the developed boat ramp at Pioneer Park East and the undeveloped boat launch at Pioneer Park West where some trampling occurs and exposed tree roots are evident. Minor bare ground and compaction occur around picnic tables, the boat launch areas, and the parking areas at Pioneer Park (East and West units). There are no toilet facilities at Pioneer Park East; however, no sanitation problems were apparent when researchers visited the site. Overall, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—Pioneer Park West is located between SR 66 and J.C. Boyle reservoir. Land ownership and topography likely limit any potential physical expansion of this site. Pioneer Park East is bordered by SR 66 to the south, the reservoir to the west, and Sportsman's Park to the east and north. Given these constraints, there are no significant physical expansion possibilities at these sites. Spatial capacity is considered a limiting factor at both Pioneer Park West and East due to these spatial constraints.

- *Facility Capacity*—Overall, recreational use of this site accounts for approximately 10,135 RDs (Table 5.7-16) and a percent occupancy rate of 14 percent (Table 5.7-17) during the peak season. Peak-season weekend use is estimated to be about 5,160 RDs (15 percent occupancy). These use levels are low and indicate that the site is below its peak-season and peak-season weekend capacity levels (Table 5.7-17). Based on field observations, it is estimated that use of Pioneer Park West is generally higher than use at Pioneer Park East. Considering this difference in amount of use, it is estimated that use of Pioneer Park West is likely to be approaching capacity, while use of Pioneer Park East is likely to be below capacity. Despite this difference, facility capacity is currently not considered a limiting factor at this site due to the low level of use the site as a whole receives.

- *Social Capacity*—The mean perceived crowding score at this site is 2.9. This score is relatively low, but indicates that visitors to this site may feel slightly crowded at this time. Social capacity is not considered a limiting factor at this site because of the relatively low mean perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, use levels at this site are considered to be below its recreation capacity. Currently, spatial capacity is the only limiting factor, as limited potential exists to expand these sites. Facility capacity is not considered a limiting factor at this time due to the low level of use the site receives; however, facility capacity is more likely to be a limiting factor at Pioneer Park West in the future due to the higher level of use this part of the site receives compared with Pioneer Park East. While recreation and public use impacts were observed, biophysical capacity is not considered a limiting factor. Perceived crowding scores at this site were low (2.9), and social capacity is not a limiting factor at this time but may be in the future (i.e., the site may be approaching its social capacity).

BLM's Topsy Campground: BLM's Topsy Campground, managed by BLM, is located on the southeastern shoreline of J.C. Boyle reservoir. The site is accessed via the Topsy Grade Road off SR 66. The site consists of a developed fee campground (16 campsites), a small day use area (two picnic tables), and a boat launch (concrete ramp with two lanes).

- *Biophysical Capacity*—Minor ecological impacts at this site focus on shoreline erosion and bare ground and compaction, particularly near the fishing pier. In addition, some trampling of understory vegetation was evident within the campground. In general, the site is very clean with no litter or debris accumulation or observed sanitation problems. Overall, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located on a relatively flat area along the southeastern shoreline of J.C. Boyle reservoir. The site is bordered on the east by the Topsy Grade Road and by the reservoir on the west and south. However, some expansion potential may exist to the north of this site between Topsy Grade Road and the reservoir shoreline. Given this potential expansion option, spatial capacity is currently not considered a limiting factor at this site.

- *Facility Capacity*—During the peak season, recreational use of this site accounted for approximately 5,590 RDs (Table 5.7-16). Peak-season weekend use accounted for 3,340 RDs. These levels of use are relatively low and equate to a 42 percent occupancy rate for the peak season (considered approaching capacity) and a 55 percent occupancy rate for peak-season weekends (considered below capacity) (Table 5.7-17). While use levels are low to moderate at this time, the number of available campsites limits facility capacity in the future, especially since this site provides the only developed camping opportunities in this resource area. Due to this limitation, facility capacity is considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 3.1. This was the highest mean crowding score in the J.C. Boyle reservoir resource area. While this crowding score was higher relative to the other developed sites at J.C. Boyle reservoir, it is still considered low. Based on this mean perceived crowding score, visitors to BLM's Topsy Campground may feel slightly crowded; however, social capacity is currently not a limiting factor.

- *Overall Site Capacity Conclusion*—Overall, use levels at this site are considered to be below its recreation capacity. Currently, the primary limiting factor is facility capacity due to the limited number of available developed campsites in the resource area. Social capacity is not a limiting factor at this time; however, this site had the highest perceived mean crowding score in the resource area and the site is likely approaching its social capacity. This site has many hardened facilities and displays very few recreation and public use impacts; consequently, biophysical capacity is not considered a limiting factor at this time. Spatial capacity is also not considered a limiting factor at this time, as some potential to expand this site exists; however, landownership and topography should be further explored in order to verify the presence of adjacent lands that may be suitable for expansion.

J.C. Boyle Reservoir Resource Area Summary: This resource area is located downstream from Keno reservoir. There are three developed recreation sites in this resource area, one of which is managed by PacifiCorp (Pioneer Park). The other two developed recreation sites are Sportsman's Park, leased by Klamath County from PacifiCorp, and BLM's Topsy Campground, managed by

BLM. Additionally, 17 undeveloped dispersed recreation sites were identified along the shoreline of J.C. Boyle reservoir. Popular activities in this resource area include resting/relaxing, swimming, shoreline fishing, picnicking, RV camping, target shooting, and ATV use, among others.

- *Biophysical Capacity*—Biophysical capacity is not considered a limiting factor at the developed recreation sites in this resource area. However, various ecological impacts were observed at the dispersed recreation sites along the reservoir shoreline. Observed impacts at dispersed recreation sites included vegetation damage and trampling, bare ground and soil compaction, large amounts of litter, and sanitation issues. Some of these impacts may not be related to recreation use though, as several sites, especially those located near Spencer Creek, appear to be used by groups of long-term nonrecreational squatters. While some of the observed ecological impacts at dispersed sites are localized, many appear to be widespread and pose a constraint to the overall biophysical capacity of the resource area. Due to the ecological concerns at dispersed sites, biophysical capacity is currently considered a limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at Pioneer Park, where the potential for physical expansion is limited by roads and the reservoir. While this developed recreation site is physically constrained, there are a few PacifiCorp-managed shoreline areas with existing dispersed recreation sites that could be developed into hardened recreation sites if needed. Given this potential, spatial capacity is currently not a limiting factor at this resource area.

  At high pool elevations, there are approximately 420 surface water acres available for boating on J.C. Boyle reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Natural—Section 5.7.3.2), it is estimated that approximately eight watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak season boating use on the reservoir (3 BAOT) is lower than the theoretical maximum BAOT estimate. Based on this level of use, surface water capacity is not a limiting factor at this time. However, surface water boating capacity is currently exceeded during heavier use periods (the maximum BAOT observed during field investigations was 10) and thus overall surface water capacity is considered to be approaching capacity.

- *Facility Capacity*—Recreational use of this resource area accounted for approximately 23,285 RDs during the peak season, of which about 56 percent are attributable to weekends (approximately 13,000 RDs) (Table 5.7-16). This level of use results in a peak-season percent occupancy of 28 percent and peak-season weekend percent occupancy of 33 percent. This level of use is generally considered to be low. Additionally, facility capacity is currently considered a limiting factor at Sportsman's Park and BLM's Topsy Campground. Given the level of recreation use at this resource area, facility capacity is not considered a limiting factor at this time.

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at the three developed recreation sites tended to be relatively low (< 3.2), though visitors may feel slightly crowded. The mean perceived crowding score for the resource area is 2.9. This crowding score was the second highest in the study area but is considered relatively low and indicates that visitors perceive slight levels of crowding. Social capacity is currently not considered a limiting factor at this resource area based on the mean perceived crowding score, but may be sometime in the future.

- *Overall Resource Area Capacity Conclusion*—Overall, use levels in this resource area are considered to be below capacity. Currently, biophysical capacity is considered a limiting factor due to the extent of observed recreation and public use impacts at shoreline dispersed recreation sites and areas. Additionally, while social capacity is currently not considered a limiting factor, this resource area may be approaching its social capacity and should be monitored. Neither facility capacity nor spatial capacity is considered a limiting factor at this time.

Upper Klamath River/Hell's Corner Reach Area

This section discusses recreation capacity at the developed recreation facilities at or near the Upper Klamath River/Hell's Corner reach resource area. For each facility, four types of recreation capacity are discussed, as well as a conclusion indicating whether use levels have exceeded the recreation capacity at that site. The limiting factor(s) to recreation capacity at each facility are also identified.

BLM's Upper Klamath River (Spring Island) Boater Access: Managed by BLM, the Upper Klamath River (Spring Island) Boater Access is located on the Klamath River downstream from the J.C. Boyle powerhouse. The site provides whitewater boat launching and shoreline fishing opportunities.

- *Biophysical Capacity*—Minor ecological concerns at this site focus on vegetation damage and bare ground and soil compaction. Trampling between access roads as well as footpaths accessing the river contribute to some vegetation damage. Bare ground and soil compaction are concentrated near the shoreline and toilet, as well as on and around footpaths accessing the river. Overall, however, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located along the western bank of the Klamath River, between the river and a gravel access road. This location, limited road access, and adjacent steep topography all limit expansion possibilities at this site. Spatial capacity is considered a limiting factor because of the lack of expansion possibilities at this site.

- *Facility Capacity*—Recreational use at BLM's Upper Klamath River (Spring Island) Boater Access was provided by BLM. BLM estimates that annual use of the site is approximately 5,250 RDs. It is estimated that approximately 70 percent of annual recreation use at this site occurs during the peak season. This equates to approximately 3,675 RDs during the peak season, including 2,363 peak-season weekend RDs (Table 5.7-16). Given these levels of use, peak-season occupancy is considered to be approaching capacity (40 percent), while peak-season weekend occupancy is considered below capacity at this site (54 percent) (Table 5.7-17). This site is generally used for shorter periods of time. Facility capacity at this site is also linked to the number of watercraft that can be accommodated on the river at one time, which is defined by BLM. Currently, however, facility capacity is not considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 2.7. This was the highest crowding score at developed sites in the Upper Klamath River/Hell's Corner reach resource area, though it is still considered relatively low. This crowding score indicates that visitors generally do not feel overly crowded at this site. Social capacity is currently not a limiting factor at this site based on the low perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, use levels at this site are considered to be below its recreation capacity. Currently, the primary limiting factor is spatial capacity due to the lack of expansion potential at this site. However, capacity is also dependent on the number of watercraft that can be accommodated on the river as defined by BLM. Facility capacity is not currently a limiting factor at this site. Perceived crowding scores at this site were relatively low and social capacity is currently not considered a limiting factor at this time. Biophysical capacity is also not considered a limiting factor at this time.

<u>BLM's Klamath River Campground:</u> Managed by BLM, the Klamath River Campground is located on the western bank of the Klamath River, approximately 3 miles south (downstream) of the J.C. Boyle powerhouse. The site has only three developed campsites and provides shoreline fishing and boat access opportunities. It is accessed by a relatively rough dirt road that limits use levels.

- *Biophysical Capacity*—Minor ecological concerns at this site focus on vegetation damage, bare ground, and soil compaction. Trampling at and between campsites, as well as footpaths accessing the river, contribute to some vegetation damage. Bare ground and soil compaction are concentrated near the shoreline, at campsites, along the access road, and around user-defined footpaths to the river. Overall, however, biophysical capacity is currently not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located on the western bank of the Klamath River, between the river and a gravel access road. This location, the access road to this site, and the steep topography of the area all limit the physical expansion potential at this site. Spatial capacity is considered a limiting factor at this site due to these constraints.

- *Facility Capacity*—Recreational use at BLM's Klamath River Campground was provided by BLM. BLM estimated that annual use of the site accounted for approximately 1,000 RDs. It is estimated that approximately 70 percent of annual recreation use at this site occurs during the peak season. This equates to approximately 700 RDs during the peak season, including 450 peak-season weekend RDs (Table 5.7-16). Given these levels of use, peak-season occupancy (30 percent) and peak-season weekend occupancy (41 percent) are considered to be below capacity (Table 5.7-17). However, this site provides the only developed campsites along the river reach and only has three campsites. As a result, facility capacity is considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 1.9. This perceived crowding score is considered low and indicates that visitors to this site do not perceive crowding as a problem. Given the low crowding score at this site, social capacity is not consider a limiting factor at this time.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be approaching its recreation capacity. Both spatial and facility capacity are considered limiting factors at this time. Spatial capacity is a limiting factor because of the lack of expansion options at this site and access road conditions, while facility capacity is a limiting factor because of the limited number (three) of campsites and the lack of other developed camping opportunities along the river reach. Biophysical capacity is currently not a limiting factor, though some recreation and public use impacts were observed. Social capacity is also not a limiting factor, as perceived crowding scores were low at this site.

<u>Stateline Take-out (PacifiCorp and BLM):</u> Located on the eastern bank of the Upper Klamath River at the Oregon/California stateline, the Stateline take-out (PacifiCorp and BLM) has an upper and lower use area that is co-managed by BLM and PacifiCorp. The lower use area provides a primitive boat put-in/take-out and access to shoreline fishing opportunities. The upper use area consists of a parking area, vault toilets, and an area that is occasionally used for dispersed camping.

- *Biophysical Capacity*—There are a number of ecological concerns at both the upper and lower use areas at Stateline take-out (PacifiCorp and BLM). In the upper area, vehicle driving and parking have resulted in a large barren area with tire ruts. Downed wood has been cleared from the area. In the lower area, bare ground and soil compaction exist in the vehicle turn-around area and soil compaction occurs on and along footpaths accessing the river and along the shoreline near the put-in area. Exposed roots, bare ground, and soil compaction also occur on the access trails and at the put-in area. Trampled vegetation was observed throughout the lower use area. In addition, a leaking irrigation ditch contributes to erosion in the lower use area. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—The lower use area of this site is located on a relatively flat area along the river. Steep topography and other constraints, however, limit the expansion of this lower use area. The upper use area is located between Ager-Beswick Road and the lower use area (a steep hillside divides the upper and lower use area). This upper use area is relatively undeveloped and the potential exists to expand the site, if necessary. Spatial capacity is considered a limiting factor at the lower use area of Stateline take-out (PacifiCorp and BLM); however, spatial capacity is not considered a limiting factor at the upper use area, as the potential to expand this area exists.

- *Facility Capacity*—During the peak season, recreational use of this site accounted for approximately 2,765 RDs (Table 5.7-16). Weekend use during the peak season accounted for about 1,920 RDs. Site occupancy was 54 percent during the peak season and 78 percent during peak season weekends (Table 5.7-17). These occupancy levels indicate that this site is approaching its facility capacity, though facility capacity is not currently considered a limiting factor.

- *Social Capacity*—The mean perceived crowding score at this site is 1.9. This score is considered low and an indication that perceived crowding is not a problem at this site. Social capacity is not a limiting factor due to this low perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be approaching its recreational capacity. Currently, biophysical capacity is considered a primary limiting factor, though both spatial and facility capacity are considered to be approaching capacity and may be limiting factors in the future. Biophysical capacity is considered a limiting factor because of the number and severity of observed recreation and public use impacts. Spatial capacity is not considered a limiting factor at this time, though the lower use area of this site is spatially constrained within the currently developed area. Recreation use at this site is moderate and likely approaching the site's facility capacity; however, facility capacity is not currently considered a limiting factor. Social capacity is not a limiting factor at this time due to the low perceived crowding scores at this site.

<u>Fishing Access Sites 1 - 6:</u> There are six fishing access sites located along the eastern bank of the Upper Klamath River between Stateline take-out (PacifiCorp and BLM) and Copco reservoir along Ager-Beswick Road. These sites are managed by PacifiCorp and provide shoreline fishing access and whitewater boating take-out opportunities (Sites 1 and 6). All six sites were considered together for purposes of this analysis.

- *Biophysical Capacity*—Ecological concerns at the six fishing access sites relate primarily to litter, bare ground and compaction, erosion, and vegetation damage. There is moderate to heavy litter and/or debris accumulation at some sites. In general, most sites have user-defined footpaths leading to the shoreline that are bare and heavily compacted. Vegetation damage, largely trampled or beaten down grasses, is primarily concentrated along footpaths and the shoreline. Some sites, however, also have trees with broken limbs and/or much of the down wood cleared from the area. Erosion is also concentrated along footpaths and the shoreline. Biophysical capacity is considered a limiting factor at all six fishing access sites.

- *Spatial Capacity*—Located along the eastern/southern bank of the Klamath River, each of the six fishing access sites consist of a small parking area and a shoreline access trail. In general, topography and land ownership (including long-term leases) limit the expansion potential of the fishing access sites. Due to these constraints, spatial capacity is considered a limiting factor at all six fishing access sites.

- *Facility Capacity*—Currently, recreation use at the six fishing access sites accounts for approximately 3,240 RDs during the peak season and 2,290 during peak-season weekends (Table 5.7-16). Use of these sites has declined in recent years (PacifiCorp, 2000) and current percent occupancy is generally low (17 percent during the peak season and 25 percent during peak season weekends [Table 5.7-17]). Due to the low levels of recreational use these sites receive, facility capacity is not considered a limiting factor at this time.

- *Social Capacity*—Due to a limited number of completed surveys from each of the six fishing access sites, a perceived crowding score for all six fishing access sites combined was calculated. The mean perceived crowding score for the six fishing access sites is 1.9. This crowding score is similar to the mean scores at the other developed sites along the Upper Klamath River/Hell's Corner reach and is considered low. This indicates that visitors to these sites do not perceive crowding as a problem. Given the low crowding score at the fishing access sites, social capacity is currently not considered a limiting factor at this time.

- *Overall Site Capacity Conclusion*—Overall, use of the six fishing access sites is considered to be below capacity. Use of the fishing access sites is relatively low and facility capacity is not a limiting factor. Social capacity is also not considered a limiting factor at this time. Both biophysical and spatial capacity are considered limiting factors, though these limiting factors are partially negated by the low level of recreation use the sites receive. Biophysical capacity is currently considered a limiting factor because of the moderate to heavy litter accumulation at these sites. Spatial capacity is also considered a limiting factor due to the lack of expansion at most of the fishing access sites. However, the need for expansion of the fishing access sites is not necessary at this time due to the low levels of use the sites receive.

<u>Upper Klamath River/Hell's Corner Reach Resource Area Summary:</u> This resource area straddles the Oregon/California border between J.C. Boyle reservoir (upstream) and Copco reservoir (downstream). The section of river between the J.C. Boyle powerhouse and the California-Oregon stateline was designated a State Scenic Waterway in 1988 and a National WSR in 1994. Under these designations, BLM manages the river in cooperation with the State of Oregon (NPS, 1994). BLM manages two developed recreation sites along this segment of the river (BLM's Upper Klamath River (Spring Island) Boater Access and BLM's Klamath River Campground). PacifiCorp and BLM co-manage a third developed recreation site at the Oregon/California border (Stateline take-out [PacifiCorp and BLM]). PacifiCorp also manages six fishing access sites along the lower segment of the river (all in California). Additionally, there are four identified dispersed recreation sites along the Upper Klamath River/Hell's Corner reach, including the large dispersed use area at Frain Ranch. Popular activities along the river reach include whitewater boating, bank fishing, and tent camping, among others.

- *Biophysical Capacity*—Biophysical capacity is considered a limiting factor for some of the developed recreation sites in this resource area (Stateline take-out [PacifiCorp and BLM] and Fishing Access Sites 1–6). Observed ecological impacts at all sites included trampled vegetation, bare ground and soil compaction, erosion, and litter accumulation, among others. At the remaining developed sites and most of the dispersed sites, ecological impacts were minimal except for Frain Ranch. Frain Ranch exhibits several ecological impacts due to recreation and public use including vegetation trampling and damage, bare ground and soil compaction, erosion, litter accumulation, sanitation problems, and vandalism to existing structures. The observed ecological impacts at Frain Ranch were most pronounced at dispersed camping areas, along user-defined river access trails, and at the closed toilet building. It should be noted that some observed ecological impacts at Frain Ranch are caused by long-term nonrecreational squatters who occasionally use this remote site. Except at Frain Ranch, ecological impacts at developed and dispersed sites along the river reach are fairly localized. Biophysical capacity is currently considered a limiting factor at this resource area because of the many localized impacts in this hard-to-access and hard-to-maintain river reach.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at all of the developed recreation sites in this resource area, except Stateline take-out (PacifiCorp and BLM) that has space in the upper use area. Steep topography and limited road access are the primary constraints to physical expansion of the existing developed recreation sites along the river reach. However, several areas may be suitable for certain types of recreational development, including trails and small day use sites. Overall the remote, primitive natural setting and the lack of convenient road access to recreation sites on the river reach constrain the physical expansion potential of existing recreation sites. Whitewater boating use on the river reach is partially controlled by permits issued by BLM. Currently, only commercial whitewater boating operators must be permitted on the river reach; private boaters may voluntarily obtain a permit from BLM. The new BLM river management plan (BLM, 2003) may contain revised permitting guidelines. Given the constraints along the river reach, spatial capacity is considered a limiting factor at this resource area.

- *Facility Capacity*—Facility capacity is only considered a limiting factor at BLM's Klamath River Campground due to its limited number of campsites (three) and the lack of other developed campsites along the river reach. At all sites in this resource area, use levels tend to be lower (below to approaching capacity) due to the remoteness of the resource area, limited road access, and primitive conditions.

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at all of the developed recreation sites, except BLM's Upper Klamath River (Spring Island) Boater Access, tended to be low (< 2). The mean perceived crowding score at BLM's Upper Klamath River (Spring Island) Boater Access is 2.7. This score is also relatively low but indicates that visitors may feel slight levels of crowding at this site. The mean perceived crowding score for the resource area is 2.2. This crowding score was the second lowest in the study area and is considered low. Social capacity is currently not considered a limiting factor at this resource area based on the low mean perceived crowding scores of visitors to this area.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be approaching capacity. While two developed recreation sites in this resource area are considered to be below capacity, the remaining two are considered to be approaching capacity. The primary limiting factors at each of the developed recreation sites and at the resource-area level are biophysical capacity and spatial capacity. Currently, biophysical capacity is considered a limiting factor due to the extent of observed recreation and public use impacts at Frain Ranch and at the other shoreline dispersed recreation sites and areas. Additionally, the more primitive and remote nature of the resource area makes it more susceptible to widespread ecological impacts due to access constraints. Spatial capacity is a limiting factor because of the lack of expansion possibilities at many of the existing developed recreation sites, the general lack of large areas along the river reach for new developed recreation sites, and poor road access due to site conditions. Facility capacity is currently not considered a limiting factor, but may be in the future based on the limited capacity of the existing developed recreation sites. Social capacity is not considered a limiting factor at this resource area at this time.

<u>Copco Reservoir Area</u>

This section discusses recreation capacity at each of the public developed recreation facilities at or near the Copco reservoir resource area. For each facility, four types of recreation capacity are discussed, as well as a conclusion indicating whether use levels have exceeded the recreation capacity at that site. The limiting factor(s) to recreation capacity at each facility are also identified.

Mallard Cove: Located on the southern shoreline of Copco reservoir, Mallard Cove is managed by PacifiCorp and BLM (BLM owns the land that accesses the site). The site consists of a day use/picnic area and a boat launch (concrete ramp with one lane). While not an official campground, this site is used for camping.

- *Biophysical Capacity*—The most significant ecological concern at this site is erosion, primarily concentrated around the shoreline and parking area. There is also moderate erosion on the hillside between the access road and picnic area. In addition, some bare ground and compaction occur near the boat launch, and vegetation damage–trampling and broken limbs–was observed along footpaths to the shoreline. Overall, however, biophysical capacity is not considered a limiting factor at this site, as observed impacts were localized.

- *Spatial Capacity*—This site is located on a flat point of land at the base of a steep hill on the southern shoreline of Copco reservoir. Physical expansion is limited by steep topography to the south, by private land to the east and west, and by the reservoir to the north. Due to these constraints, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—During the peak season, use of this site accounted for approximately 5,380 RDs (Table 5.7-16). Weekends during the peak recreation season accounted for nearly 3,810 RDs. These levels of use result in percent occupancies of 27 percent for the peak season and 40 percent for peak season weekends (Table 5.7-17). This level of use is relatively low; thus, facility capacity is currently not considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 2.5. This perceived crowding score is relatively low and indicates that perceived crowding is not a problem at this site. Social capacity is not a limiting factor at this time due to the low crowding score.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be below its recreation capacity. Only spatial capacity is currently considered a limiting factor due to the lack of expansion potential at this site. Percent occupancy during the peak season and peak season weekends at this site is relatively low, and facility capacity is not considered a limiting factor. Biophysical and social capacities at this site are also not considered limiting factors at this time.

Copco Cove: Located on the western shoreline of Copco reservoir, this site is managed by PacifiCorp. The site provides picnic/day use and boat launching opportunities. While not officially a campground, the site receives some overnight use.

- *Biophysical Capacity*—The main ecological concern at this site is soil erosion, primarily concentrated on the hillside and between use areas. Most of the site is relatively bare with areas of soil compaction. Vegetation damage was observed and downed wood has been cleared from the site. Overall, however, site impacts are localized and biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—This site is located at the base of a steep hill on the western shoreline of Copco reservoir. The steep topography limits potential expansion possibilities at this site. Due to this constraint, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—During the peak recreation season, recreational use of this site accounts for approximately 755 RDs, of which about 360 are attributable to weekend use (Table 5.7-16). This equates to a peak-season percent occupancy of 25 percent and also a peak-season weekend percent occupancy of 25 percent (Table 5.7-17). Both of these occupancy rates are considered to be below capacity. Given that neither capacity indicator has been met or exceeded, facility capacity is currently not considered a limiting factor at this site.

- *Social Capacity*—The mean crowding score at this site is 4.0. This is a comparatively high perceived crowding score and indicates that visitors feel moderately crowded at this site. However, because only a small number of completed surveys were returned by Copco Cove visitors, this crowding score may be biased (too high). The mean crowding score that the Copco reservoir resource area (2.7) received is likely a better indicator of perceived crowding at Copco Cove. Based on the relatively low resource area perceived crowding score, social capacity is currently not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be below its recreation capacity. Only spatial capacity is currently considered a limiting factor due to the lack of expansion potential at this site. Percent occupancy during the peak season and peak-season weekends at this site is low, and facility capacity is not considered a limiting factor. Biophysical and social capacities at this site are also not considered limiting factors at this time.

<u>Copco Reservoir Resource Area Summary:</u> This resource area is located downstream from the Upper Klamath River/Hell's Corner reach. There are two developed recreation sites at the reservoir, Mallard Cove and Copco Cove. Mallard Cove is managed by PacifiCorp and BLM, while Copco Cove is managed by PacifiCorp. Additionally, there are two identified dispersed sites along the reservoir shoreline. Popular activities at Copco reservoir include boat fishing and picnicking, among others. Road access to this reservoir is more limited (good, but dusty gravel road from Iron Gate reservoir), and the reservoir is farther away from I-5 compared with Iron Gate reservoir, located downstream.

- *Biophysical Capacity*—Biophysical capacity is not considered a limiting factor at either of the developed recreation sites in this resource area. Observed ecological impacts at both sites were localized and do not constitute a widespread constraint to the biophysical capacity of the resource area. Additionally, observed impacts at the two dispersed sites on Copco reservoir were also minimal. Observed impacts at the dispersed sites appear to be caused primarily by cattle grazing rather than recreational use. Biophysical capacity is currently not considered a limiting factor at this resource area because of the lack of widespread ecological impacts resulting from recreational use of the area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at both of the developed recreation sites in this resource area. Steep topography and land ownership patterns limit potential expansion of either developed recreation site at Copco reservoir. However, while these two developed recreation sites are physically constrained, there are other undeveloped shoreline areas where future recreation sites could potentially be developed. Land ownership and infrastructure issues would need to be investigated at these sites, and an improved access road along the northern shoreline would likely need to be provided prior to new site development. Given the potential option for future recreation development along the Copco reservoir shoreline, spatial capacity is currently not a limiting factor at this resource area.

At high pool elevations, there are approximately 1,000 surface water acres available for boating on Copco reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Natural—Section 5.7.3.2), it is estimated that approximately 20 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak-season mean boating use on the reservoir (2.3 BAOT) is much lower than the theoretical maximum BAOT estimate. Thus surface water capacity is not a limiting factor at this time.

- *Facility Capacity*—Recreational use of this resource area is estimated to account for over 6,130 RDs during the peak season and approximately 4,165 RDs during peak-season weekends (Table 5.7-16). This level of use equates to an occupancy rate of 27 percent during the peak season and 38 percent during peak-season weekends (Table 5.7-17). Neither of the developed recreation sites in this resource area is considered to have reached its facility capacity. While facility capacity is not currently a limiting factor at the developed recreation sites, and recreational use in the resource area is relatively low, facility capacity is an overall limiting factor at the resource-area level due to the small number of available developed sites and facilities at the reservoir. The small number of developed recreation sites (two) in this resource area may ultimately limit the amount of recreational use the area could receive, particularly as the Iron Gate reservoir resource area fills up.

- *Social Capacity*—Social capacity is not considered a limiting factor at either of the developed recreation sites in this resource area. Perceived crowding scores at both developed recreation sites tended to be relatively low; however, the resource area mean was assumed for Copco Cove due to the limited number of completed surveys at this site. The mean perceived crowding score for the resource area is 2.7. This crowding score is considered relatively low and indicates that visitors perceive slight levels of crowding. Social capacity is currently not considered a limiting factor at this resource area based on the mean perceived crowding score.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be below capacity. The primary limiting factor for this resource area is facility capacity. Facility capacity is a limiting factor because of the small number of developed recreation sites and facilities in this resource area. These limited facilities will ultimately limit the amount of recreational use the area could accommodate. Additionally, this resource area is more difficult to access (e.g., lack of a paved road from Iron Gate reservoir, lack of signs indicating location of reservoir and recreation sites, etc.) compared with other study area reservoirs. Biophysical, spatial, and social capacity are not considered limiting factors at this resource area at this time. Surface water boating capacity is also not considered a limiting factor at this time.

Iron Gate Reservoir Area

This section discusses recreation capacity at each of the developed recreation facilities at or near the Iron Gate reservoir resource area. For each facility, four types of recreation capacity are discussed, as well as a conclusion indicating whether use levels have exceeded the recreation capacity at that site. The limiting factor(s) to recreation capacity at each facility are also identified.

Fall Creek Trail: This nonfee site is located between Iron Gate reservoir and Copco reservoir adjacent to a CDFG fish hatchery facility. The trail begins on the northern side of Copco Road and continues to Fall Creek Falls. In addition to hiking opportunities, the site also provides picnic facilities.

- *Biophysical Capacity*—The Fall Creek Trail exhibits few ecological concerns. Ecological impacts that do occur primarily relate to erosion and vegetation damage along the hillside and trail. Vegetation trampling has occurred in areas where visitors have traveled off the main trail. Overall, biophysical capacity is not considered a limiting factor at this site.

- *Spatial Capacity*—The location of this site between Copco Road and Fall Creek Falls likely limits the expansion potential of this trail. The CDFG hatchery facilities, Copco Road, and very steep topography at the falls severely limit the extension of the Fall Creek Trail. However, the potential does exist to link this trail into a larger regional trail network. Given the expansion limitations at this site, spatial capacity is currently considered a limiting factor at this site.

- *Facility Capacity*—This site was closed (gated and locked) during the 2002 data collection period. Use is estimated to be low at this site, though this condition is partially a result of the site being gated and locked. If the site was open to the public and signed, recreational use would likely be higher. Facility capacity is not considered a limiting factor at this time due to the low level of use the site received before and after the gate was locked.

- *Social Capacity*—A limited number of completed surveys were received from visitors to the Fall Creek Trail (likely due to the site being gated during 2002) to developed an accurate mean perceived crowding score. Given the lack of completed surveys at this site, the Iron Gate reservoir resource area mean perceived crowding score (2.9) at sites without a boat launch was used in lieu of a site-specific score (Section 3.7.1.7—Perceptions of Crowding in the Study Area). The resource area (non-boat launch) crowding score is generally considered low. While the crowding score indicates that visitors may feel slightly crowded, social capacity is not considered a limiting factor at this time.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be below its recreation capacity. Currently, the only limiting factor at this site is spatial capacity, as there are few expansion possibilities on lands adjacent to this site. Biophysical and social capacity are not considered limiting factors at this time. Facility capacity is also not considered a limiting factor at this time, though the site was gated during 2002 and use data were not collected.

Fall Creek: This nonfee site is located along the northeastern shoreline of Iron Gate reservoir. The site is primarily used for day uses (picnicking, shoreline fishing, etc.), though some camping does occur here. A newly graveled boat ramp is also provided at this site.

- *Biophysical Capacity*—This site shows signs of ecological impacts primarily related to bare ground and soil compaction, litter accumulation, erosion, and vegetation damage. Bare ground, soil compaction, and erosion are concentrated at the shoreline as well as around fire rings and picnic tables. Additional erosion was observed along the hillside and footpaths throughout the site. Vegetation throughout the site was generally trampled, and downed wood was cleared from the site. Some of the impacts here are caused by nonrecreational squatters. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—This site, similar to many of the recreation sites at Iron Gate reservoir, is located between Copco Road and the reservoir. This location precludes or limits the expansion potential of this site. Due to this constraint, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 1,060 RDs during peak season weekends and a total of nearly 1,840 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of 47 percent and a peak-season occupancy rate of 39 percent (Table 5.7-17). Both of these occupancy rates are considered to be below capacity; thus, facility capacity is not considered a limiting factor at this time.

- *Social Capacity*—The mean perceived crowding score at this site is 3.1. This crowding score is fairly low, though it indicates that visitors may feel slightly crowded at this site. Social capacity is currently not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be approaching the capacity of this site. Both biophysical and spatial capacity are considered to be limiting factors at this time due to the extent of observed ecological impacts and the lack of potential expansion options, respectively. Furthermore, perceived crowding scores indicate that the site is likely approaching its social capacity, though social capacity is not considered a limiting factor at this time. Facility capacity is currently not considered a limiting factor at this site, as use is relatively low.

Jenny Creek: Located between Copco Road and Jenny Creek on the northern shoreline of Iron Gate reservoir, Jenny Creek is managed by PacifiCorp. The nonfee site provides semideveloped day use and camping opportunities.

- *Biophysical Capacity*—This site shows signs of ecological impacts primarily related to bare ground and soil compaction, litter accumulation, erosion, and vegetation damage. Heavy bare ground, soil compaction, and erosion occur along the shoreline adjacent to the lower picnic tables as well as along shoreline footpaths throughout the site. Vegetation damage and moderate amounts of recreation-related debris were observed throughout the site. In addition, evidence of sanitation problems occurred near the lower picnic area. Some of the impacts here are caused by nonrecreational squatters. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—The location of this site likely limits the expansion potential of the site. This site is bordered by Copco Road to the south and by Jenny Creek to the north and west. A steep hill provides the eastern border of the site. Spatial capacity is considered a limiting factor at this site because of these constraints.

- *Facility Capacity*—During the peak season, recreational use of this site accounted for approximately 1,850 RDs (Table 5.7-16). Peak-season weekend use accounted for 1,120 RDs. These levels of use are moderate and equate to a 52 percent occupancy rate for the peak season and a 63 percent occupancy rate for peak-season weekends (Table 5.7-17). Peak-season and peak-season weekend use is considered to be approaching capacity. Facility capacity is currently not considered a limiting factor at this site because use levels are below both the peak-season and peak-season weekend capacity thresholds.

- *Social Capacity*—The mean perceived crowding score is 3.1 at this site. This crowding score is below the mean crowding score for the Iron Gate reservoir resource area (3.7), but it indicates that visitors may feel slightly crowded at this site. However, the mean crowding score is still considered relatively low for a developed site, and social capacity is not a limiting factor at this time.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be approaching the capacity of this site. Both biophysical and spatial capacity are considered to be limiting factors at this time due to the extent of observed ecological impacts and the lack of potential expansion options, respectively. Furthermore, perceived crowding scores indicate that the site is likely approaching its social capacity, though social capacity is not considered a limiting factor at this time. Facility capacity is currently not considered a limiting factor at this site.

<u>Wanaka Springs:</u> Managed by PacifiCorp, this nonfee site is located on the northern shoreline of Iron Gate reservoir. The naturally wooded site is used for day use and camping and consists of a small upper use area and a larger lower use area. The site also has a wooden dock located at the bottom of a steep slope.

- *Biophysical Capacity*— This site shows signs of ecological impacts primarily related to bare ground and soil compaction, erosion, and vegetation damage. Bare ground and soil compaction occur at the day use area near the shoreline as well as throughout the upper use area. Erosion is evident along the hillside between the shoreline and picnic area; however, it is largely confined to footpaths. Vegetation near the picnic area exhibits exposed roots, and downed wood was cleared from the site. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—This site is located between Copco Road and the reservoir, limiting the physical expansion potential to the west and east. Steep topography further limits any potential physical expansion in all directions, particularly to the north and south. Given these constraints, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 2,435 RDs during peak-season weekends and a total of nearly 3,200 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of

146 percent and a peak-season occupancy rate of 91 percent (Table 5.7-17). Both of these occupancy rates are considered high and have exceeded the peak-season weekend and overall peak-season capacity thresholds. Facility capacity is considered a limiting factor at this site because of these high levels of use.

- *Social Capacity*—Similar to other developed recreation sites (Fall Creek and Jenny Creek) on the eastern shoreline of Iron Gate reservoir, the mean perceived crowding score at this site is 3.1. This perceived crowding score is relatively low, though it indicates that visitors may feel slightly crowded at this site. Due to the relatively low crowding score, social capacity is currently not a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be exceeding the capacity of this site. Biophysical capacity is currently considered a limiting factor because of the extent of observed recreation and public use impacts at this site. The lack of potential expansion options at this site makes spatial capacity a limiting factor. Additionally, facility capacity is also considered a limiting factor due to the high levels of overall peak-season and peak-season weekend use at this site. Furthermore, perceived crowding scores indicate that the site is likely approaching its social capacity, though social capacity is not considered a limiting factor at this time.

<u>Camp Creek:</u> This nonfee site is located on Copco Road along the northern shoreline of Iron Gate reservoir and is managed by PacifiCorp. The site provides camping, day use, and boat launching facilities and is split into three use areas. The first use area is located on the shoreline and consists of 13 developed campsites and a boat launch. The second use area is located across Copco Road and is used as a day use area and overflow camping and parking area. The third use area is located on the shoreline to the northwest and provides for day use activities, including partial ADA access to the shoreline, as well as some overnight camping.

- *Biophysical Capacity*—Ecological concerns at this site focus primarily on bare ground, soil compaction, and erosion. Most of the site is bare, while erosion is concentrated along the shoreline and in the overflow area. Minor amounts of recreation-related debris were observed. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—The shoreline locations of the first and third use areas limit the physical expansion potential of this site. Copco Road further limits any potential expansion of either of these areas. Some expansion may be possible at the second (overflow) use area, though Dutch Creek, Copco Road, and private property minimize potential expansion. A redevelopment of the second use area could provide more developed camping/day use sites. Due to the potential redevelopment of the second use area, spatial capacity is currently not considered a limiting factor at this site. However, similar to other recreation sites that are bisected by Copco Road, visitor safety must be carefully considered when expanding to the nonreservoir side of the road.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 5,145 RDs during peak-season weekends and a total of 9,465 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of 188 percent and a peak-season occupancy rate of 164 percent (Table 5.7-17). Both of these occupancy rates are considered very high and have exceeded the peak-season weekend and overall peak season capacity thresholds. It should be noted that the overflow area of Camp Creek (second use area) was not included in the occupancy calculation. However, these high levels of use indicate that the overflow area is used on a regular basis when the shoreline sites (first and third use areas) are at capacity (i.e., the overflow area absorbs the additional use that cannot be accommodated at the shoreline use areas). Considering the constant use of the overflow area to absorb additional recreation use, facility capacity is considered a limiting factor at this site.

- *Social Capacity*—The mean perceived crowding score at this site is 3.8. This was the second highest crowding score in the study area and indicates the visitors to this site feel somewhat crowded. Additionally, approximately 20 percent of survey respondents at this site felt the site was more crowded than they expected and 25 percent of respondents indicated that the number of people present detracted (either a little or a lot) from their enjoyment. Given this information and the higher crowding score, social capacity is currently considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be exceeding the capacity of this site. Biophysical capacity is currently considered a limiting factor because of the observed recreation and public use impacts at this site. Facility capacity is considered a limiting factor due to the high levels of overall peak season and peak season weekend use at this site and continuous use of the overflow area. Furthermore, perceived crowding scores indicate that the site is approaching its social capacity. Spatial capacity is not considered a limiting factor at this time since some redevelopment/expansion potential exists at this site.

<u>Juniper Point:</u> Located on the northwestern shoreline of Iron Gate reservoir, this nonfee site is managed by PacifiCorp. The site provides approximately nine semideveloped picnic/camping sites. There is also a wooden T-shaped dock at this site that provides shoreline fishing opportunities.

- *Biophysical Capacity*—Some localized ecological concerns were observed at this site and are related to bare ground, soil compaction, and vegetation damage. Vegetation damage includes some trees being vandalized and downed wood and understory vegetation cleared from the site. Bare ground and soil compaction occur throughout the entire site. Overall, however, biophysical capacity is not considered a limiting factor at this site because the impacts are localized and moderate compared with other sites.

- *Spatial Capacity*—The location of this site limits its physical expansion potential. The site is sandwiched between Copco Road and Iron Gate reservoir. A portion of the site (toilet buildings) is located on the nonreservoir side of Copco Road. Steep topography limits expansion of this site on the nonreservoir side of the road. Additionally, visitor safety (i.e., visitors must cross road to access portions of the site) must be considered if expansion of this site potentially occurs on the nonreservoir side of the road. Due to these constraints, the spatial capacity of this site is currently considered a limiting factor.

- *Facility Capacity*—During the peak season, recreational use of this site accounted for approximately 3,590 RDs (Table 5.7-16). Peak-season weekend use accounted for nearly 2,070 RDs. These levels of use are high and equate to a 69 percent occupancy rate for the overall peak season and a 83 percent occupancy rate for peak-season weekends (Table 5.7-17). Each of these use levels is considered to be at or exceeding the facility capacity of this site. Facility capacity is currently considered a limiting factor at this site because of these higher use levels.

- *Social Capacity*—The mean perceived crowding score at this site is 2.9. This score is relatively low and similar to the score at other developed recreation sites without a boat launch on Iron Gate reservoir. This crowding score indicates that most visitors do not perceive crowding to be a particular problem at this site. Social capacity is currently not considered a limiting factor at this site due to the relatively low perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be at the capacity of this site. Both spatial and facility capacity are considered to be limiting factors at this time due to the lack of potential expansion options and higher use levels, respectively. Social capacity is not considered a limiting factor at this time. Biophysical capacity is currently not considered a limiting factor at this site, though some impacts are occurring at this site.

Mirror Cove: This nonfee site, managed by PacifiCorp, is located on the western shoreline of Iron Gate reservoir. The site has a camping area with ten developed campsites and a boat launch. The boat ramp has two concrete lanes and a concrete dock.

- *Biophysical Capacity*—Some localized ecological concerns were observed at this site and are related to bare ground, soil compaction, and vegetation damage. Vegetation damage occurs in and around the campsites, with some trees vandalized and downed wood and understory vegetation cleared from the site. Bare ground and soil compaction occur throughout the entire site but are concentrated along the interior road and at the campsites. Some shoreline vegetation trampling and soil erosion were also evident at this site. Overall, however, biophysical capacity is not considered a limiting factor at this site because the impacts are localized and moderate compared with other sites.

- *Spatial Capacity*—Similar to Juniper Point, the location of this site between Copco Road and Iron Gate reservoir severely limits the expansion potential of this site. A portion of the site (toilets) is located on the nonreservoir side of Copco Road. Steep topography and non-PacifiCorp-owned land limit expansion of this site on the nonreservoir side of the road. Additionally, visitor safety (i.e., visitors must cross road to access portions of the site) must be considered if expansion on the nonreservoir side of the road is explored. Due to these constraints, the spatial capacity of this site is considered a limiting factor.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 4,690 RDs during peak-season weekends and a total of nearly 8,335 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of 85 percent and an overall peak-season occupancy rate of 72 percent (Table 5.7-17). Both of these occupancy rates are considered high and are considered to be exceeding the peak-season capacity thresholds. Facility capacity is considered a limiting factor at this site because of these higher use levels.

- *Social Capacity*—The mean perceived crowding score at this site is 4.6. This was the highest crowding score in the study area and indicates that visitors likely feel moderately crowded at this site. Additionally, 13 percent of survey respondents felt this site was more crowded than they expected and nearly 45 percent of survey respondents felt the number of people present detracted (either a little or a lot) from their enjoyment. Given this information, social capacity is currently considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be exceeding the capacity of this site. Spatial capacity is currently considered a limiting factor because of the lack of expansion potential at this site. Facility capacity is considered a limiting factor due to the higher levels of peak-season and peak-season weekend use at this site. Furthermore, perceived crowding scores at this site were the highest in the study area, indicating that the site may have exceeded its social capacity. Biophysical capacity is not considered a limiting factor at this time, however, some site impacts are recognized.

<u>Overlook Point:</u> This nonfee site is located on the western shoreline of Iron Gate reservoir and is managed by PacifiCorp. This site provides day use facilities, including opportunities for shoreline fishing, but is occasionally used for camping.

- *Biophysical Capacity*—Ecological concerns at this site focus primarily on bare ground, soil compaction, litter accumulation, erosion, and vegetation damage. Bare ground, soil compaction, and vegetation damage are concentrated around the picnic tables and along the shoreline. In general, the shoreline exhibits ecological impacts including: sloughing and exposed roots, tire ruts, and severe erosion due to bare ground and a slight slope. Large amounts of litter were observed throughout the site. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—This small site is located along a steep slope between Copco Road and the reservoir shoreline. The steep topography of the site likely limits any potential physical expansion of the site. Due to the topography and lack of expansion potential, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—During the peak recreation season, recreational use of this site accounts for approximately 1,325 RDs, of which about 415 are attributable to weekend use (Table 5.7-16). This equates to an overall peak-season percent occupancy of 32 percent and a peak-season weekend percent occupancy of 21 percent (Table 5.7-17). Both of these occupancy rates are considered to be below capacity. Given that neither capacity indicator has been met or exceeded, facility capacity is currently not considered a limiting factor at this site, but it could be in the future.

- *Social Capacity*—The mean perceived crowding score is 2.4 at this site. This crowding score is considered low and indicates that visitors do not feel crowding is a particular problem at this site. Given the low crowding score, social capacity is currently not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, current recreational use is considered to be approaching the capacity of this site. Both biophysical and spatial capacity are considered to be limiting factors at this time due to the extent of observed ecological impacts and the lack of potential expansion options, respectively. Facility and social capacity are currently not considered limiting factors at this site.

Long Gulch: This nonfee site, managed by PacifiCorp, is located on the southern shoreline of Iron Gate reservoir. The site consists of a picnic area that is occasionally used for camping, and a boat launch. The boat launch has one concrete lane. The site also provides opportunities for shoreline fishing.

- *Biophysical Capacity*—Observed ecological concerns at this site are a concern, focusing primarily on bare ground, soil compaction, litter and debris accumulation, erosion, and vegetation damage. The site is generally bare with moderate soil compaction. Accumulated debris includes piles of gravel, ash, and broken glass. Shoreline erosion occurs at the site, with bank sloughing observed near the boat ramp. Vegetation is damaged and downed wood has been cleared throughout the site. Overall, biophysical capacity is considered a limiting factor at this site.

- *Spatial Capacity*—Unlike many of the developed recreation sites on Iron Gate reservoir, this site's physical expansion is not limited by roads or the reservoir shoreline. Steep topography in some areas at the site and adjacent areas limits the expansion potential of the site, but does not completely limit potential expansion. Additionally, the adjacent Long Gulch Bluff dispersed site could be improved and incorporated into this site. Due to the expansion potential at this site, spatial capacity is not considered a limiting factor.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 2,120 RDs during peak season weekends and a total of nearly 3,290 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of 47 percent and a peak-season occupancy rate of 35 percent (Table 5.7-17). Both of these occupancy rates are relatively low and are considered to be below the peak-season weekend and peak-season capacity thresholds. Facility capacity is not considered a limiting factor at this site because of these low use levels.

- *Social Capacity*—The mean perceived crowding score at this site is 2.7. This crowding score is relatively low, especially given the fact that the mean score at other developed recreation sites with boat launches at Iron Gate reservoir was 4.0. Social capacity is not a limiting factor at this site due to this low perceived crowding score.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be below to approaching its recreation capacity. Only biophysical capacity is currently considered a limiting factor due to observed recreation and public use impacts at this site. The potential exists to expand this site, if needed, and thus spatial capacity is not considered a limiting factor. Percent occupancy during the peak season and peak-season weekends at this site is below threshold levels and facility capacity is not considered a limiting factor. Social capacity at this site is also not considered a limiting factor at this time.

Iron Gate Hatchery Public Use Area: Located below Iron Gate dam, this site is operated by CDFG, though PacifiCorp funds 80 percent of the fish hatchery's annual operating expenses. The site has a developed day use/interpretive/trail area adjacent to the hatchery facilities and an undeveloped boat launch directly across the river from the hatchery.

- *Biophysical Capacity*—No ecological impacts were observed at this site (most of the site is hardened). Additionally, only minor erosion and soil compaction were observed at the undeveloped boat launch at this site. Due to the relative lack of ecological impacts at this site, biophysical capacity is currently not considered a limiting factor.

- *Spatial Capacity*—The physical expansion potential at this site is likely limited by several factors. At the day use area, the primary limitation to expansion is the existing fish hatchery facilities located adjacent to the site. At the undeveloped boat launch, physical expansion is limited due to the site's location between Copco Road and the river, and the steep topography of the river bank. Given these latter constraints, spatial capacity is considered a limiting factor at this site.

- *Facility Capacity*—Recreational use of this site is estimated to account for approximately 500 RDs during peak-season weekends and a total of 770 RDs during the peak season (Table 5.7-16). This level of use results in a peak-season weekend occupancy rate of 9 percent and a peak-season occupancy rate of 13 percent (Table 5.7-17). Both of these occupancy rates are very low and are considered to be below the peak-season weekend and peak-season capacity thresholds. Facility capacity is not considered a limiting factor at this site because of these very low use levels.

- *Social Capacity*—The mean perceived crowding score at this site is 2.3. This score is low and indicates that most visitors to this site generally do not feel crowded. Due to this low crowding score, social capacity is currently not considered a limiting factor at this site.

- *Overall Site Capacity Conclusion*—Overall, use of this site is considered to be below its recreation capacity. Only spatial capacity is currently considered a limiting factor due to the lack of expansion potential at the boat launch area. Biophysical, facility, and social capacity are not limiting factors at this site.

<u>Iron Gate Reservoir Resource Area Summary:</u> This resource area is located downstream from Copco reservoir at the southern end of the study area. There are ten developed recreation sites in this resource area, nine of which are managed by PacifiCorp. The Iron Gate Hatchery is operated by CDFG, though PacifiCorp funds 80 percent of the hatchery operations. Additionally, there are four identified dispersed recreation sites located along the Iron Gate reservoir shoreline, including the Long Gulch Bluff dispersed site. Popular activities in this resource area include powerboat fishing, waterskiing, resting/relaxing, and sightseeing, among others.

- *Biophysical Capacity*—Biophysical capacity is considered a limiting factor at six of the ten developed recreation sites in this resource area: Fall Creek, Jenny Creek, Wanaka Springs, Camp Creek, Overlook Point, and Long Gulch. Observed ecological impacts included vegetation trampling and damage, bare ground and soil compaction, erosion, downed wood being removed, and litter accumulation. While many of these impacts were localized, several constitute a constraint to the overall biophysical capacity of the resource area.

  Vegetation trampling, bare ground, erosion, and litter accumulation were also observed at several of the dispersed sites along the reservoir shoreline. However, some of the observed impacts (vegetation trampling, bare ground, and erosion) at the dispersed sites appear to be caused primarily by cattle grazing rather than recreational use. Due to the observed impacts at developed and dispersed recreation sites, biophysical capacity is considered an overall limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at eight of the ten developed recreation sites in this resource area, excluding Camp Creek and Long Gulch. One of the primary constraints to the physical expansion of existing recreation sites and the potential construction of future sites is the proximity of Copco Road to the northern shoreline of the reservoir. In many areas, the road runs directly adjacent to the shoreline and bisects several of the existing developed recreation sites on the northern shoreline. While areas to expand developed recreation sites may exist on the nonreservoir side of Copco Road, visitor safety (i.e., visitors must cross road to access portions of the site) must be considered if expansion on the nonreservoir side of the road is explored. Steep topography and land ownership also pose constraints to the expansion of existing sites and the development of future recreation sites. In general, while several areas for potential expansion of existing recreation sites or the development of new recreation sites exist, spatial capacity is considered an overall limiting factor due to the physical constraints of this resource area.

  At high pool elevations, there are approximately 944 surface water acres available for boating on Iron Gate reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Developed—Section 5.7.3.2), it is estimated that approximately 47 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current average boat use on the reservoir (22 BAOT) is lower than the theoretical maximum peak-season BAOT estimate. Based on this level of use, surface water capacity is not a limiting factor at this time. However, surface water boating capacity is currently exceeded during heavier use periods (the maximum BAOT observed during field investigations was 76); thus, overall surface water capacity is considered to be approaching capacity at a minimum.

- *Facility Capacity*—Recreational use of this resource area is estimated to account for nearly 33,750 RDs during the peak season and approximately 19,550 RDs during peak-season weekends (Table 5.7-16). This level of use equates to an occupancy rate of 60 percent during the peak season and 73 percent during peak-season weekends (Table 5.7-17). Peak-season occupancy is considered to be at capacity, while peak-season weekend occupancy is considered to be approaching capacity. Facility capacity is a limiting factor at this resource area based on these levels of use. Additionally, facility capacity is a limiting factor at four of the ten developed recreation sites in this resource area and will likely be a limiting factor at several of the remaining sites in the future.

- *Social Capacity*—Social capacity is considered a limiting factor at two of the ten developed recreation sites in this resource area, Camp Creek and Mirror Cove. While social capacity is not considered a limiting factor at the other developed recreation sites, the perceived crowding scores at several sites indicate that visitors perceive at least slight levels of crowding. Additionally, the mean perceived crowding score for this resource area was the highest in the study area (3.7). This crowding score is generally considered fairly high and indicates that the social capacity of the resource area may be an overall concern and is a factor to monitor over time. Due to the resource area's mean perceived crowding score, social capacity is currently considered a limiting factor at this resource area.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be at or exceeding capacity. Four developed recreation sites are considered to be at or exceeding capacity individually, while an additional three developed recreation sites are approaching capacity in this resource area. All four capacity types are considered to be limiting factors in this resource area. Biophysical capacity is considered a limiting factor because of observed recreation and public use impacts at developed and dispersed recreation sites in this resource area. Spatial capacity is a limiting factor in this resource area due to the general lack of land for new and/or expanded recreation development. Surface water spatial boating capacity is currently not considered a limiting factor, but boating use exceeds capacity during heavier use periods and will likely be a limiting factor in the future. Facility capacity is a limiting factor because of the levels of use the resource area receives and because of the higher levels of use several of the developed recreation sites receive. Additionally, the perceived crowding scores in this resource area were the highest in the study area, indicating that use is approaching the resource area's social capacity.

#### 5.7.3.4 Nonmotorized Recreation Trail Feasibility

This section presents the results of the Nonmotorized Recreation Trail Feasibility Study. This study was added to the Recreation Needs Analysis based on stakeholder comments. Specifically, this section provides a summary and discussion of the following:

- Existing trails in the study area
- Potential trail routes in five recreation resource areas

This study includes a schematic plan for a proposed trail system, including trailhead locations, trail classifications, and design guidelines. Cost estimates for proposed trail development and implementation phasing are provided in the draft RRMP (Appendix E7-A of the final license application).

<u>Existing Nonmotorized Trail Routes in the Study Area</u>

Existing nonmotorized trails in the study area were identified by reviewing relicensing recreation studies and existing trail-related plans and maps and conducting a site reconnaissance. There are only a few designated and/or developed trails in the study area:

- Link River Nature Trail
- Klamath Wildlife Area Wildlife Viewing Trail
- Fall Creek Trail

In addition, there are well-established user-defined trails at Jenny Creek and the six Fishing Access Sites on the Upper Klamath River/Hell's Corner reach. A brief description of each of these existing trail routes is provided below. The location of each of these existing trails is shown in Figure 1.1-2.

<u>Link River Nature Trail:</u> The Link River Nature Trail (Figure 1.1-2, Sheet 14) runs approximately 1.5 miles along the west side of the Link River bypass reach, between UKL and Lake Ewauna/Keno reservoir. The trail is affiliated with the USA National Trails System and is part of the Link River Bird Sanctuary and Small Game Refuge. The trail is currently for

pedestrian use only, and pets are only allowed on a leash. Access at the north and south entries is controlled by a turnstile. At the north entry, there is a nonstriped asphalt parking area, accessed directly from a city street, with four wheel-stops and room for approximately 15 vehicles. There is no defined parking area at the southern entry, although cars use the side of the road for parking. There is room for approximately ten cars on the side of the road. Other recreational facilities associated with the Link River Nature Trail include two trash receptacles, a bench near the dam, and four ADA-accessible fishing pads at the northern end of the trail (three are located behind a locked gate). While not developed features of the Link River Nature Trail, several user-made dirt trails (especially on the southern half of the trail), provide access to the river shoreline. Given this site's location in the city of Klamath Falls, it receives a considerable amount of use from visitors who have walked to the site, as opposed to having driven, as with most other sites in the study area.

<u>Klamath Wildlife Area Wildlife Viewing Trail:</u> Located on the east shore of Lake Ewauna/Keno reservoir about 6 miles to the south of Klamath Falls off of SR 97, the Klamath Wildlife Area Miller Island Unit is managed by ODFW. As shown in Figure 1.1-2 (Sheet 12), an approximately 1-mile-long wildlife viewing trail follows a levy near the entrance station along Miller Island Road. Sufficient parking, a portable toilet (ADA-accessible), and a kiosk with information about recreational opportunities in the Klamath Wildlife Area are provided at the entrance station. In addition, several interpretive signs associated with the wildlife area are located along Miller Island Road.

<u>Fall Creek Trail:</u> The Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir, adjacent to a CDFG fish hatchery facility. As shown in Figure 1.1-2 (Sheet 2), the gated trail begins on the northern side of Copco Road and continues to Fall Creek Falls. The trail can also be accessed via the road/parking area associated with the Fall Creek powerhouse. There is a gated gravel road providing vehicle access to a small gravel parking area near the beginning of the upper portion of the trail. The lower portion of the trail is gravel, while the upper portion of the trail is dirt and generally not well defined. There is a sign at the beginning of the upper portion of the trail indicating the direction to the falls. There are two picnic tables at the base of the trail and a user-defined fire ring near the falls. The site has a water spigot (associated with the fishery operations) and a trash receptacle. There is also a portable ADA-accessible toilet across the road from the trailhead near the CDFG fish rearing ponds.

<u>Jenny Creek Area:</u> Several user-defined trails provide shoreline fishing access to Jenny Creek (Figure 1.1-2, Sheet 2). A well-established user-defined trail runs upstream along the creek beginning at the parking area. The trail becomes less obvious after a few hundred yards and eventually dissipates into an open grass area beyond which is a fenced field used for ranching.

<u>Fishing Access Sites 1 to 6:</u> Six fishing access sites are located along Ager-Beswick Road, each consisting of a small gravel parking area and a pedestrian access trail to the shoreline (Figure 1.1-2, Sheets 4 and 5). These user-defined trails are gated and provide access through private ranch lands to traditional shoreline fishing areas.

<u>Potential Nonmotorized Trail Routes in the Study Area</u>

Potential trail routes in the study area were identified by reviewing relicensing recreation studies, existing trail-related plans and maps, and conducting a site reconnaissance. Potential trail routes were identified in each of the five recreation resource areas during field research from June 10 through 14, 2002, and again from July 28 through August 1, 2003.

Descriptions of the potential trail routes identified during initial field research in each of the five recreation resource areas are provided below. The location within the Project area of each of these potential trail routes is shown in Figure 5.7-1. More specific trail locations are shown in Figure 1.1-2.

An overview of the location and length of each trail segment is provided in Table 5.7-22. Comments received from stakeholders helped guide the assessment of the advantages, disadvantages, and overall feasibility of each potential trail route. Throughout this process, some potential trail routes were considered but eliminated from further investigation; however, a discussion of these trail routes is also included in this section.

Table 5.7-22. Overview of location and length of potential trail routes.

| Trail Segment | Reservoir/Project Area | Total Length (miles) |
|---|---|---|
| Link River Nature Trail | Keno reservoir/Link River | 1.4 |
| J.C. Boyle Reservoir Loop Trail | J.C. Boyle reservoir | 5.0 |
| Fishing Access Site Trail Enhancements | Upper Klamath River/Hell's Corner reach | Varies |
| Klamath River Edge Trail (Upper Klamath River [Spring Island] Boater Access to Frain Ranch on river right) | Upper Klamath River/Hell's Corner reach | 8.5 |
| J.C. Boyle Bypass Reach/Powerhouse Area Fishing Access Trails | Upper Klamath River/Hell's Corner reach | Varies |
| J.C. Boyle Powerhouse Old Foundations Area to Upper Klamath River (Spring Island) Boater Access Trail | Upper Klamath River/Hell's Corner reach | 0.3 |
| Frain Ranch Trails | Upper Klamath River/Hell's Corner reach | Varies |
| Fall Creek Trail | Copco reservoir | 1.0 |
| Long Gulch to Iron Gate Hatchery Trail | Iron Gate reservoir | 1.0 |
| Bogus Creek Trail | Iron Gate reservoir | 0.5 |
| Total[1] | | 17.7 |

Source: EDAW, Inc.

[1] Total length of all trail segments will depend on the exact siting of trails at Frain Ranch, the fishing access sites, and J.C. Boyle bypass reach/powerhouse area.

Figure 5.7-1. Potential trail routes within Project area.

8.5 x 11” color

Sheet 1 of 3

Sheet 1 of 3

Back

Figure 5.7-1

8.5 x 11” color

Sheet 2 of 3

Sheet 2 of 3

Back

Figure 5.7-1

8.5 x 11" color

Sheet 3 of 3

Sheet 3 of 3

Back

Keno Reservoir/Link River: The following trail opportunities exist in this area.

*Link River Nature Trail*—As stated earlier, the Link River Nature Trail is currently for pedestrian use only and access at the north and south entries is controlled by a turnstile. Enhancements to the 1.4-mile-long trail could include allowing bicycle use, removing or replacing the turnstiles with less obtrusive gates or bollards, and providing connections to local and/or regional multi-use trails within the city of Klamath Falls (such as the A Canal Trail and the OC&E Woods Line State Trail). In addition, at least two short stretches of the trail are probably too steep to meet ADAAG guidelines. Reduced grades in these areas and/or more slip-resistant surface material would improve universal accessibility of the trail.

*Klamath Wildlife Area*—The existing wildlife viewing trail could be extended into a loop trail approximately 6 miles long. From the terminus of the existing wildlife viewing trail, the loop trail could follow the Copco dike for approximately 3 miles along the Upper Klamath River to ODFW's Miller Island Boat Launch. From the boat launch, the trail could follow Miller Island Road back to the entrance station. This potential trail route would offer enhanced nonconsumptive, wildlife-related recreation opportunities at the Klamath Wildlife Area; however, access may be seasonally restricted to protect waterfowl. In addition, expanded "safety zones" may need to be established to minimize conflict between trail users and hunters.

*Keno Reach*—A potential trail route was identified along the south side (river left) of the Upper Klamath River from Keno Recreation Area to Sportsman's Park. This stretch, approximately 5 miles long, offers outstanding views of the river as well as rock formations along the canyon wall. Most of this potential trail route could take advantage of existing dirt roads, user-defined trails, and game trails. Much of this corridor is PacifiCorp-owned property; however, there are some large parcels of private land, including a number of residences just downstream of Keno dam. Other potential constraints to trail development include steep topography just upstream from Sportsman's Park, at least two stream crossings, and the trail's proximity to hydroelectric operations (e.g., Keno dam and a gauging station).

*Keno Recreation Area Trails*—In addition to the potential trail route along the Keno reach, an internal trail system could be developed within Keno Recreation Area. There are currently a number of footpaths among the various use areas within the site. These footpaths could be formalized and improved to provide better nonmotorized circulation and to minimize ecological impacts, such as erosion and vegetation damage, throughout the site. In addition, short loop trails could be developed near the interpretive kiosk using existing user-defined fishing access trails. This loop trail could provide access between the interpretive kiosk and the day use area, provide improved shoreline access, and provide improved views of the river. Additional interpretive material could be developed building on the existing historical content and providing information about PacifiCorp hydroelectric operations.

J.C. Boyle Reservoir: The following trail opportunities exist in this area.

*J.C. Boyle Reservoir Loop Trail*—This trail would start at Pioneer Park West, travel west towards the J.C. Boyle dam, then head east to BLM's Topsy Campground, north to the Boyle Bluffs (proposed new facility), and then continue on to Pioneer Park West. This approximately 5-mile-long loop could take advantage of a network of existing utility roads and user-defined shoreline access trails. The trail would cross SR 66 using the new SR 66 bridge alignment. With

the exception of the bridge crossing, this trail would be almost entirely on PacifiCorp-owned property. From Pioneer Park West, an existing user-defined footpath follows the shoreline, providing a fairly flat, shaded shoreline trail opportunity. After approximately 1,000 feet, the footpath ends and the terrain becomes somewhat steep and rocky. While potentially challenging, this route could provide a trail with access to a panoramic overlook of the reservoir and dam.
Upper Klamath River/Hell's Corner Reach: Potential trail routes in this area will be developed in parallel with BLM's Draft Upper Klamath River Management Plan (BLM, 2003). This plan specifies various trail routes and other recreation facilities throughout the Upper Klamath River/Hell's Corner reach ; however, this study found only a portion of the trail routes to be feasible. The following trail opportunities exist in this area.

*Fishing Access Site Trail Enhancements*—Six Upper Klamath River fishing access sites are located along Ager-Beswick Road, each consisting of a small gravel parking area and a pedestrian access trail to the shoreline. These user-defined trails are gated and provide access through private ranch lands to shoreline fishing opportunities. Formalized fishing access trails could be provided at one or more of these sites. Fishing Access Site 1 is most feasible for an ADA-accessible fishing trail because of its location, relatively flat terrain, and adjacent parking. Formalized hardened fishing access trails could be provided at Fishing Access Sites 2, 3, 4, and 5. Fishing Access Site 6 is not as feasible for formalized trail use because of its sensitive natural resources and its use as a boater take-out.

*Klamath River Edge Trail (Upper Klamath River [Spring Island] Boater Access to Frain Ranch)*—The 8.5-mile trail segment from Frain Ranch to Upper Klamath River (Spring Island) Boater Access would require a river crossing. A 100- to 150-foot-long suspension bridge to accommodate pedestrians, bicycles, horses, and maintenance vehicles at the old bridge crossing is probably feasible and should be considered within the context of other potential recreation facility enhancements in the river corridor at Frain Ranch, Turtle Camp, Klamath River Campground, and Upper Klamath River (Spring Island) Boater Access.

*Rapids Scouting Trails*—In general, formalizing scouting trails to improve safety and accessibility are appropriate and feasible (e.g. Caldera Rapids). On-site field investigation should be completed to determine the exact length of such trails.

*Panther Canyon Overlook Trail and Shovel Creek Trail*—These trails are not recommended for inclusion in relicensing trail planning efforts. While these trails may be desirable for whitewater rafters/boaters seeking additional recreational opportunities, existing land use and natural resources in these tributaries/canyons appear to minimize the recreation potential for trails. Again, short spur trails—unless specifically intended as fishing access trails and/or scouting trails—are less desirable than longer, corridor-long trail opportunities. Given the study area's remote nature and challenging access, visitors seeking hiking and/or bicycling opportunities probably will prefer longer trail segments.

*J.C. Boyle Bypass Reach/Powerhouse Area Fishing Access Trails*—There are a number of opportunities to formalize user-defined trails and/or create new hardened fishing access trails in the J.C. Boyle bypass reach/powerhouse area. Formalized fishing access trails could be developed below J.C. Boyle dam and near the J.C. Boyle powerhouse. One or more pull-offs along the Canal Access Road could be used for parking. A second location for a formalized trail would start at the gravel parking area adjacent to the J.C. Boyle Powerhouse "shed" and follow the river upstream. This short fishing access trail probably would require some new trail construction.

*J.C. Boyle Powerhouse (Old Foundations Area) to Upper Klamath River (Spring Island) Boater Access Trail*—This short (0.3-mile) trail would start at the old foundations area and follow the river downstream to Upper Klamath River (Spring Island) Boater Access to provide nonmotorized access between these two recreation use areas.

*Frain Ranch Trails*—There are a number of opportunities for trail development at Frain Ranch. Many of the potential trail routes at Frain Ranch would use existing unneeded roads that are closed and rehabilitated. Implementation of any road management/access plan will require additional management and/or monitoring. Road closures and vehicle restrictions will be challenging, especially in meadow areas. Trail improvements should be consistent with recreation facility enhancements and road access in the river corridor.

The following potential trail routes and road management strategies exist in the Frain Ranch area:

- The Frain Ranch access road (from Topsy Grade Road) should be closed seasonally.
- The shoreline road should be converted to a trail with motorized access provided to designated campsites only.
- Vehicular access should be considered for three to five designated campsites, including sites at existing informal gravel take-out areas.
- Natural vehicular barriers should be installed to protect sensitive natural and/or cultural resources.
- Public vehicular access north of the “three-way” should be restricted.
- The Caldera Rapid Scouting Trail should be formalized for a length necessary to gain visual access of the rapids. River access points should be formalized at designated take-out areas.

<u>Copco Reservoir</u>: The following trail opportunities exist in this area.

*Fall Creek Trail (enhancements, potential loop extension)*—As discussed above, the Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir, adjacent to a CDFG fish hatchery. The gated trail begins on the northern side of Copco Road and climbs up the east side of Fall Creek to Fall Creek Falls. This semideveloped trail is approximately 1,000 feet in distance and has a moderate elevation gain. There are no directional signs indicating the trail route. The falls are accessible from an old roadbed and network of user-defined footpaths on the west side of Fall Creek. Above the falls, the creek becomes narrow enough to be traversed easily, presenting an opportunity for a loop trail. Potential improvements to the Fall Creek Trail include developing a loop trail, formalizing the existing semideveloped trail (including repairing and/or replacing the lower creek crossing, increasing the surface tread width, and providing selective vegetation clearing), and providing adequate trail information and consistent public access.

*Fall Creek to Copco No. 2 Bypass Reach*—A potential trail route was identified to connect the existing Fall Creek Trail and Day Use Area to the Copco No. 2 bypass reach. This potential trail route would begin on the east side of Copco Road behind the CDFG fish rearing ponds. Access east that is directly behind the rearing ponds is steep and difficult and requires some rock climbing and/or hopping. Access just to the north is somewhat less steep; however, it requires crossing a small creek. After this initial climb, the potential trail route heads east over a lava flow. The route would be extremely hot during summer months because there is little or no vegetation and the terrain is uneven and therefore difficult. The route is approximately 2,000 feet from the rearing ponds to the edge of the Copco No. 2 bypass reach canyon wall. The edge of the canyon wall provides a spectacular view of the canyon and river below, as well as panoramic views of the hillside and Fall Creek on the west side of Copco Road. This route is entirely on PacifiCorp-owned land and offers scenic value and a unique trail experience; however, it may be infeasible because of construction costs and potential safety hazards.

Iron Gate Reservoir: The following trail opportunities exist in this area.

*Reservoir shoreline (river right; scouted but not feasible)*—The potential for trail development along the north and west side (river right) of Iron Gate reservoir was investigated during initial field research. A trail through this corridor would provide connections among several existing recreation areas and could use these areas for trail support facilities. On- and off-road alignments were considered; however, an on-road alignment was quickly dismissed because of the narrow and potentially hazardous character of Copco Road (as a trail/road combination). An off-road alignment probably also would be infeasible because of the area between Copco Road and the reservoir shoreline often is narrow.

*Camp Creek/Horseshoe Ranch Wildlife Area*—A potential trail route following the west bank of Camp Creek was investigated during initial field research. Beginning just west of where Copco Road crosses Camp Creek, this potential trail route is flat and fairly scenic, following existing roads and user-defined trails. However, PacifiCorp ownership upstream of Copco Road is limited. After less than 1,000 feet, the creek corridor is in private ownership; therefore, researchers did not investigate farther upstream.

There may be potential for trail development at the Horseshoe Ranch Wildlife Area, a CDFG-managed tract of land adjacent to Camp Creek. Management objectives of the area include nonconsumptive recreation activities. Future trail development could use existing dirt roads; however, coordination with CDFG may reveal that new trail development is possible.

*Jenny Creek*—There is potential to improve the user-defined trails at Jenny Creek. The main trail, a well-established user-defined trail running upstream, could provide shoreline fishing access as well as nonmotorized trail use opportunities. In the creek corridor, PacifiCorp's ownership extends approximately 1 mile northeast of the parking area; however, some of this land is leased for ranching activities, and this may limit trail development potential. Furthermore, it is unknown whether the fishing opportunities at Jenny Creek warrant trail development to improve shoreline fishing access.

*Long Gulch to Iron Gate Hatchery Trail*—There is a new trail opportunity stretching from Long Gulch to the Iron Gate Hatchery running along the western side of Iron Gate reservoir. If proposed recreation measures (formalized boat launch/day use/camping) are implemented at

Long Gulch, such a trail would provide a nonmotorized connection between one or more developed recreation sites. New trail construction would be required at Long Gulch as well as approximately 0.25 mile to the south. At this point, the trail could use an old road bed that follows the reservoir and passes by Iron Gate dam. Additional fencing would likely be required to improve security near the dam. This trail could use existing and any potential future facilities at Iron Gate Hatchery Public Use Area as trailhead facilities (e.g., parking, restrooms, etc.).

*Bogus Creek Trail*—There is also an opportunity to provide a short (0.5-mile) spur trail starting at the fish hatchery and heading upstream along Bogus Creek. Old road beds exist on both sides of the creek; however, they end quickly. Some game trails exist beyond this point, but the creek banks are often rocky and steep. New trail construction would be required to continue the trail for any significant distance. A short interpretive trail could be considered, connecting the existing hatchery operations and the Bogus Creek viewing area with upstream areas.

<u>Trail Development Standards</u>

<u>Design Guidelines</u>: Besides the trail itself, there are other facilities and design features that will increase the quality and user enjoyment of the trail. General design guidelines and trail facilities considered for the trail system include the following:

- Clear Zones—An appropriate vertical and horizontal clearance above and on each side of the trail should be maintained so that it is free from protruding objects, such as trees and overgrown vegetation,

- Slope—In flat areas, the trail should be cross-sloped or crowned at approximately 2 percent.

- Drainage and Erosion Control—Techniques appropriate to the site should be used to move and keep water off the trail.

- Fencing/Handrailings—Fencing and/or handrailings should be installed on bridges to increase public safety. Fencing or other screening may be appropriate in areas where a trail is routed near private property.

- Signage—Signs should be placed to increase the visibility, ease of navigation, and safety of trails. Directional, regulatory, cautionary, and interpretive signage may be installed along trails, at trailheads, and along nearby roadways.

An overview of recommended trail width and surface and anticipated trail users for each potential trail route is provided in Table 5.7-23.

Table 5.7-23. Overview of recommended trail development standards.

| Trail Segment | Trail Width | Trail Surface | Primary Users |
|---|---|---|---|
| Link River Nature Trail | 10 feet | Asphalt | Bicyclists, walkers |
| J.C. Boyle Reservoir Loop Trail | 5 feet | Native materials[1] | Walkers, hikers |
| Fishing Access Site Trail Enhancements | 5 feet | Native materials | Anglers, hikers |
| Klamath River Edge Trail (Upper Klamath River [Spring Island] Boater Access to Frain Ranch on river right) | 8 feet | Native materials | Hikers, bicyclists, equestrians |
| J.C. Boyle Bypass Reach/Powerhouse Area Fishing Access Trails | 5 feet | Native materials | Anglers |
| J.C. Boyle Powerhouse (Old Foundations Area) to Upper Klamath River (Spring Island) Boater Access Trail | 5 feet | Native materials/asphalt[2] | Boaters, hikers |
| Frain Ranch Trails | Varies | Native materials | Campers, hikers, boaters |
| Fall Creek Trail | 5 feet | Native materials | Hikers |
| Long Gulch to Iron Gate Hatchery Trail | 5 feet | Native materials | Campers, hikers |
| Bogus Creek Trail | 5 feet | Native materials | Hikers |

Source: EDAW, Inc.

[1] No trail-related improvements are anticipated; that is, the existing surface of native materials is sufficient for trail use.

[2] Asphalt or another slip-resistant surface will be required for the ADA-accessible trail at FAS 1.

ADAAG Compliance: ADA, signed into law in 1990, protects individuals with disabilities by specifying that adequate access to facilities—including recreation facilities—be provided to the physically disabled. In 1991, ADAAG was published. ADAAG specified guidelines, not standards, to consider when designing facilities, including recreation facilities. The Access Board is responsible for developing accessibility guidelines under the ADA to ensure that new construction and alterations of facilities are readily accessible to and usable by individuals with disabilities. In 1997, the Outdoor Developed Areas Regulatory Negotiating Committee was established by the Access Board and charged with developing proposed accessibility guidelines for trails, picnic and camping areas, and beaches. Draft proposed guidelines for trails, picnic and camping areas, and beaches were published in a report by the Outdoor Developed Areas Regulatory Negotiation Committee (Access Board, 1999). The Access Board is now preparing a proposed rule based on this report. These guidelines will supplement the existing ADAAG by adding a new chapter on outdoor developed areas. When the guidelines are adopted, probably sometime after 2003, they will provide design standards and technical criteria regarding the mandate to provide ADA-accessible recreation facilities in the United States. The draft proposed ADAAG guidelines for outdoor developed areas have not been adopted as regulations by law but are used as the “best available guidance” for compliance with ADA (Beatty, pers. comm., 2000).

The draft proposed ADAAG guidelines for trails apply to those that are designed and constructed for pedestrian use. These guidelines are not applicable to trails designed and constructed primarily for recreational use by equestrians, mountain bicyclists, snowmobile users, or OHV users, even if pedestrians may occasionally use these trails. The draft proposed ADAAG guidelines apply to all newly constructed and altered trails connected to accessible trails or designated accessible trailheads. The draft proposed ADAAG guidelines outline several technical provisions for trails, including specifications for trail surface, tread width, passing space, and slope. Where new trails connect to an existing trail that is not accessible, the technical provisions do not apply. In addition, departures from the technical provisions are permitted where specified in the provisions, or if one or more of four specific conditions that permit departures exist. These four conditions recognize that several factors, such as soil, surrounding vegetation, hydrology, terrain, and cultural and historical features, influence the ability to provide fully accessible facilities and that without the opportunity to depart from the technical provisions, compliance with ADAAG guidelines may significantly alter the nature of the outdoor experience (Access Board, 1999).

The draft proposed ADAAG guidelines do not require a percentage of the miles of trails or the total number of trails provided to be accessible. Rather, the guidelines encourage trail designers and managers to "provide access to the greatest extent possible" and address specific circumstances where trail designers and managers may not be able to achieve accessibility (Access Board, 1999).

<u>Trailheads</u>: Trailheads refer to specific areas designed as the primary means of accessing a trail segment. Trailheads should be located at each terminus of the seven trail segments. The exact size and specific facilities of each trailhead would vary depending on its location; however, it is anticipated that each trailhead would have a vault toilet building, gravel parking area, trash receptacles, benches, and informational signage. The following sites were identified as potential locations for trailheads:

- Link River Nature Trail—improvements at existing northern and southern trailheads
- J.C. Boyle Reservoir Loop Trail—Pioneer Park West, Boyle Bluffs, and BLM's Topsy Campground (1 or all 3)
- Fall Creek Trail—new graveled trailhead and sign along Copco Road outside gate and hatchery area or near existing parking lot
- Upper Klamath River (Spring Island) Boater Access to Frain Ranch Trail—river left terminus at Frain Ranch
- J.C. Boyle bypass reach/Powerhouse Area Fishing Access Trails—two trailheads, one below J.C. Boyle dam and one near the J.C. Boyle powerhouse
- J.C. Boyle Powerhouse (Old Foundations Area) to Upper Klamath River (Spring Island) Boater Access Trail—trailhead at the old foundations area

Additional trail access points (minor connections between the trail and nearby recreation facilities) may be identified in the future.

<u>Trail Cost Estimate and Phasing Options</u>

Cost estimates for proposed trail development and implementation phasing options are provided in the draft RRMP (Appendix E7-A of the final license application).

### 5.7.4 Recreation Needs Analysis

The Recreation Needs Analysis, as required by FERC, provides a synthesis of results from the recreation studies associated with the relicensing of the Project. Results associated with the following recreation studies were used to formulate the overall and site-specific recreation needs in the study area:

- Recreation Flow Analysis (Section 2.0)
- Recreation Visitor Survey Analysis (Section 3.0)
- Regional Recreation Analysis (Section 4.0)
- Recreation Supply Analysis (Section 5.7.1)
- Recreation Demand Analysis (Section 5.7.2)
- Recreation Capacity Analysis (Section 5.7.3)

In addition to the results of these studies, other published reports and stakeholder comments were considered in the Recreation Needs Analysis.

Results and conclusions from this study are organized in three sections. Section 5.7.4.1, Overall Recreation Needs in the Study Area, presents existing and future public recreation needs by activity. Section 5.7.4.2, Recreation Facility and Use Area Needs by Site, specifically identifies needs at individual public recreation sites, including developed facilities and dispersed undeveloped sites. Section 5.7.4.3, Project-Related Recreation Needs Criteria, presents the criteria used to assess whether specific needs identified throughout this document might be considered by PacifiCorp for potential enhancements.

It should be noted that the identification of recreational needs in the study area in this analysis does not commit PacifiCorp to act as the sole entity responsible for satisfying them. Rather, the needs identified in this analysis represent potential recreation capital development and operations and management options that will be further considered in the development of a draft Recreation Resource Management Plan (Section 6.0).

#### 5.7.4.1 Overall Recreation Needs in the Study Area

Overall public recreation needs were first assessed by comparing and contrasting a number of demand, supply, and capacity factors to arrive at conclusions. Existing data for the study area from the Recreation Flow Analysis (Section 2.0), Recreation Visitor Surveys (Section 3.0), Regional Recreation Analysis (Section 4.0), Recreation Supply Analysis (Section 5.7.1), Recreation Demand Analysis (Section 5.7.2), and the Recreation Capacity Analysis (Section 5.7.3) were used for this purpose. Additionally, input from agencies, other stakeholders, and published studies were also considered.

This study component focused on the "big picture" need for various types of facilities or opportunities, without specifying where or how such needs might be met. The assessment considered both developed and dispersed recreation sites and use areas, as well as popular activities in each resource area (e.g., camping, day use/picnicking, boating, swimming, interpretation and education, nonmotorized trail use, fishing, general open space activities, whitewater boating and fishing, etc.).

A number of interrelated factors were considered in this overall needs analysis. One of the factors considered in this analysis was projected facility occupancy. Facility occupancy at study area developed recreation sites was projected through the anticipated term of the new license. Projected developed site occupancy was determined by calculating the existing theoretical maximum capacity for each site and comparing it with existing and projected use at each site. Existing maximum capacity and projected use were developed as a component of the Recreation Visitor Surveys (Section 3.0) and the Recreation Capacity Analysis (Section 5.7.3). Table 5.7-24 displays the projected percent occupancy at each developed recreation site in the study area in 10-year increments through 2040.

For purposes of this analysis and potential future monitoring, two occupancy thresholds (i.e., indicators) were considered in terms of categorizing existing and future use of developed recreation sites in the study area. A 60 percent occupancy level was used as an indicator that a developed recreation site was at its peak-season capacity. Additionally, an 80 percent peak-season weekend occupancy level was used as a second indicator of site capacity. Using these percent occupancy levels as indicators, existing percent occupancy at each developed recreation site in the study area was categorized as below, approaching, at, or exceeding capacity (Section 5.7.3).

Several developed recreation sites in the study area are projected to reach and/or exceed the facility capacity thresholds during the new license. The City of Klamath Falls' Veteran's Memorial Park/Boat Launch, Wanaka Springs, Camp Creek, Juniper Point, and Mirror Cove currently exceed both the peak-season and peak-season weekend capacity thresholds (Table 5.7-24). BLM's Topsy Campground, Stateline take-out (PacifiCorp and BLM), Fall Creek, and Jenny Creek are projected to reach the peak-season capacity threshold in the future (Table 5.7-24). Additionally, ODFW's Miller Island Boat Launch, BLM's Topsy Campground, Stateline take-out (PacifiCorp and BLM), and Jenny Creek are also projected to reach the peak season capacity threshold during the new license (Table 5.7-24).

For sites that are projected to potentially exceed their peak-season or peak-season weekend facility capacity threshold during the anticipated term of the new license, an estimate is provided of the number of new sites that would be needed to keep the site below both of the capacity thresholds by 2040 (Table 5.7-25). It should be noted that the estimated number of sites needed is based solely on facility capacity factors and does not consider the potential effect increasing facility capacity may have on biophysical, spatial, and social capacity of a developed site. These other capacity factors will be further investigated prior to decisionmaking regarding the development of potential new recreation sites and facilities. Additionally, while the estimated number of additional facilities was determined by site (i.e., the number of additional facilities necessary to reduce occupancy below the facility capacity thresholds), new recreation development is presented by resource area in Table 5.7-25, as several existing sites are spatially constrained and cannot be expanded to accommodate more day use or campsites.

Table 5.7-24. Projected occupancy at developed recreation sites in the study area (2002–2040).

| Site/Resource Area | Projected Peak-Season Percent Occupancy[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | | 2010 | | 2020 | | 2030 | | 2040 | |
| | Weekend | Total | Weekend | Total | Weekend | Total | Weekend | Total | Weekend | Total |
| Link River/Lake Ewauna/Keno Reservoir | | | | | | | | | | |
| Link River Nature Trail | 20% | 23% | 22% | 25% | 25% | 28% | 28% | 32% | 31% | 36% |
| City of Klamath Falls' Veteran's Memorial Park/Boat Launch | 188% | 144% | 206% | 158% | 232% | 178% | 262% | 201% | 295% | 226% |
| ODFW's Miller Island Boat Launch | 63% | 36% | 66% | 38% | 71% | 41% | 76% | 44% | 81% | 47% |
| Keno Recreation Area | 48% | 33% | 53% | 36% | 60% | 41% | 67% | 46% | 76% | 52% |
| **Subtotal** | **57%** | **46%** | **63%** | **51%** | **70%** | **57%** | **79%** | **64%** | **88%** | **72%** |
| J.C. Boyle Reservoir | | | | | | | | | | |
| Sportsman's Park | 50% | 41% | 51% | 42% | 53% | 43% | 54% | 44% | 56% | 46% |
| Pioneer Park | 15% | 14% | 17% | 16% | 19% | 18% | 21% | 20% | 24% | 23% |
| BLM's Topsy Campground | 55% | 42% | 60% | 47% | 68% | 53% | 76% | 59% | 86% | 67% |
| **Subtotal** | **27%** | **23%** | **29%** | **25%** | **31%** | **27%** | **35%** | **30%** | **38%** | **33%** |
| Upper Klamath River/Hell's Corner Reach | | | | | | | | | | |
| BLM's Upper Klamath River (Spring Island) Boater Access | 54% | 40% | 57% | 42% | 61% | 45% | 65% | 48% | 70% | 52% |
| BLM's Klamath River Campground | 41% | 30% | 43% | 32% | 46% | 34% | 50% | 37% | 53% | 39% |
| Stateline take-out (PacifiCorp and BLM) | 78% | 54% | 83% | 57% | 89% | 61% | 95% | 65% | 102% | 70% |
| Fishing Access Sites 1 – 6 | 25% | 17% | 26% | 18% | 28% | 19% | 30% | 20% | 33% | 22% |
| **Subtotal** | **41%** | **29%** | **43%** | **30%** | **47%** | **33%** | **50%** | **35%** | **53%** | **38%** |
| Copco Reservoir | | | | | | | | | | |
| Mallard Cove | 40% | 27% | 42% | 28% | 45% | 30% | 49% | 33% | 52% | 35% |
| Copco Cove | 25% | 25% | 26% | 26% | 28% | 28% | 30% | 30% | 33% | 33% |
| **Subtotal** | **38%** | **27%** | **40%** | **28%** | **43%** | **30%** | **46%** | **32%** | **50%** | **35%** |

Table 5.7-24. Projected occupancy at developed recreation sites in the study area (2002–2040).

| Site/Resource Area | Projected Peak-Season Percent Occupancy[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | | 2010 | | 2020 | | 2030 | | 2040 | |
| | Weekend | Total | Weekend | Total | Weekend | Total | Weekend | Total | Weekend | Total |
| Iron Gate Reservoir | | | | | | | | | | |
| Fall Creek Trail[2] | - | - | - | - | - | - | - | - | - | - |
| Fall Creek | 47% | 39% | 52% | 43% | 58% | 48% | 65% | 54% | 74% | 61% |
| Jenny Creek | 63% | 52% | 69% | 57% | 77% | 64% | 87% | 72% | 98% | 81% |
| Wanaka Springs | 146% | 91% | 160% | 100% | 181% | 113% | 204% | 127% | 229% | 144% |
| Camp Creek | 188% | 164% | 198% | 174% | 213% | 186% | 228% | 199% | 244% | 214% |
| Juniper Point | 83% | 69% | 92% | 76% | 103% | 85% | 116% | 96% | 131% | 108% |
| Mirror Cove | 85% | 72% | 94% | 79% | 105% | 89% | 119% | 100% | 134% | 113% |
| Overlook Point | 21% | 32% | 23% | 35% | 26% | 39% | 29% | 44% | 33% | 50% |
| Long Gulch | 47% | 35% | 50% | 37% | 53% | 39% | 57% | 42% | 61% | 45% |
| Iron Gate Hatchery Public Use Area | 13% | 9% | 14% | 10% | 15% | 11% | 17% | 13% | 20% | 15% |
| **Subtotal** | **73%** | **60%** | **79%** | **65%** | **87%** | **72%** | **96%** | **79%** | **107%** | **88%** |
| **TOTAL** | **44%** | **36%** | **48%** | **39%** | **53%** | **43%** | **59%** | **47%** | **65%** | **52%** |

Source: EDAW, Inc.

[1] Projected percent occupancy is based on capacity at each developed site (see Recreation Capacity Analysis for more detail) and projected use at each developed site (see Projection of Future Recreation Use section of the Recreation Visitor Surveys [Section 3.0].) Projected percent occupancy is provided for the peak season and peak-season weekends only due to selected threshold capacity factors (see Recreation Capacity Analysis) and FERC Form 80 reporting requirements.

[2] Existing use of the Fall Creek Trail is estimated to be low. The site was gated and locked in 2002 and thus quantitative estimates of use were not possible.

Table 5.7-25. Estimated year developed recreation sites will reach facility capacity thresholds and anticipated new facilities that will be needed to accommodate additional recreation use.

| Resource Area | Site—Estimated Year Peak-Season (Peak-Season Weekend) Capacity Threshold Reached[1] | Resource Area Facility Needs[2] |
|---|---|---|
| Link River/Lake Ewauna/Keno Reservoir | City of Klamath Falls' Veteran's Memorial Park/Boat Launch—2002 (2002)<br>ODFW's Miller Island Boat Launch—N/A[3] (2037) | • None anticipated—adequate overflow to accommodate use in excess of capacity |
| J.C. Boyle Reservoir | BLM's Topsy Campground—2031 (2034) | • Need three to five additional campsites to meet future demand |
| Upper Klamath River/Hell's Corner Reach | Stateline take-out (PacifiCorp and BLM)—2019 (2005) | • None anticipated—adequate overflow to accommodate use in excess of capacity |
| Copco Reservoir | N/A | • None at this time |
| Iron Gate Reservoir | Fall Creek—2039 (N/A)<br>Jenny Creek—2014 (2023)<br>Wanaka Springs—2002 (2002)<br>Camp Creek—2002 (2002)<br>Juniper Point—2002 (2002)<br>Mirror Cove—2002 (2002) | • Need 80 additional campsites to meet current and future demand<br>• Need 20 to 25 additional day use sites to meet current and future demand |

Source: EDAW, Inc.

[1] Peak-season capacity threshold is 60 percent and peak-season weekend capacity threshold is 80 percent. Only sites that will reach and/or exceed the facility capacity thresholds are presented.

[2] Facility needs presented by resource area as existing developed recreation sites may not have space for potential expansion.

[3] N/A indicates site will not reach facility capacity thresholds by 2040.

In general, the Iron Gate reservoir resource area has the greatest need for new developed recreation facilities in the study area during the term of the new license (approximately 80 campsites and 20 to 25 day use sites needed). Many of the facilities needed at Iron Gate reservoir are current needs (i.e., needed in the next 5 to 10 years), while some of the new day use and campsites are needed in the future. The J.C. Boyle reservoir resource area is the only other resource area with facility needs in the study area. Approximately three to five new campsites are anticipated in this resource area in the future (i.e., 2030 to 2040). No additional facility needs are currently anticipated at the remaining three resource areas. Facility capacity and day use and camping facilities potentially needed in the study area are discussed in more detail in Sections 5.7.4.1 and 5.7.4.2.

In addition to facility capacity, several other factors were considered in this analysis including regional recreation areas, visitor survey responses, facility conditions, and agency and user consultation, among others. Site-specific needs are further addressed in Section 5.7.4.2, Recreation Facility and Use Area Needs by Site.

Overall Camping Needs in the Study Area

Overall camping supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. Camping needs analyzed in the study area include both developed campgrounds (RV and tent) and dispersed campsites.

Camping Supply Factors: Important camping supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area).

- There are a total of approximately 70 developed campsites in the study area operated by PacifiCorp and BLM. PacifiCorp provides about 51 developed campsites (73 percent) at four campgrounds in the study area. BLM provides 19 developed campsites (27 percent) at two campgrounds in the study area. Additionally, approximately 50 picnic/day use facilities at eight developed recreation sites are occasionally used for camping. Including these picnic/camping sites, the study area provides a total of 120 potential campsites.
- There are developed camping opportunities in all five recreation resource areas.
- There are three RV dump stations in the study area, one each at Keno reservoir, J.C. Boyle reservoir, and Iron Gate reservoir. There are only two developed campsites that provide full RV hookups in the study area, both at J.C. Boyle reservoir.
- Campsites at two developed campgrounds in the study area are available on a fee-only basis. PacifiCorp charges a $10 fee per day for campsites at Keno Recreation Area. BLM charges a $7 fee per day for campsites at BLM's Topsy Campground. All other campsites are available on a first-come/first-serve basis for no fee.
- There are no designated group campsites in the study area.
- There are at least 27 dispersed shoreline sites in the study area, some of which are used for camping. Dispersed sites were identified in all recreation resource areas, except Link River/Lake Ewauna/Keno reservoir. J.C. Boyle reservoir had the largest number of identified dispersed sites (17) in the study area, mainly along the northern shoreline in the vicinity of Spencer Creek.
- There are two ADA-accessible campsites in the study area. Both ADA-accessible campsites are located at BLM's Topsy Campground.
- Overall, most of the recreation facilities at campgrounds in the study area are in good condition. However, some minor maintenance and repair are needed at several developed campgrounds, especially those located along the Iron Gate reservoir shoreline.
- The study area represents an important regional resource in terms of water-based resources and provides a significant amount of recreation facilities and opportunities. However, the study area has a much smaller percentage of camping opportunities than other regional recreation areas.

- At regional reservoirs and lakes of similar size to the study area reservoirs, the number of developed campsites ranges from as few as 25 sites at Fourmile Lake to as many as 303 sites at Howard Prairie reservoir. At regional reservoirs and lakes that are much larger in size than the study area reservoirs, the number of developed campsites range from 269 at UKL to 500 at Trinity Lake.

Camping Demand Factors: Important camping demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail).

- Camping is one of the most popular activities in the study area. Nearly seven out of every 10 visitors (66 percent) participated in some form of camping while visiting the study area. Tent camping was slightly more common among visitors to the study area than RV camping. The percentage of visitors tent camping was highest in the Upper Klamath River/Hell's Corner reach (62 percent) and lowest at J.C. Boyle reservoir (23 percent). The percentage of visitors RV camping was highest at Iron Gate reservoir (45 percent) and lowest at the Upper Klamath River/Hell's Corner reach (2 percent). Overall, camping is an important activity to consider when analyzing recreational needs in the study area and likely contributes to other needs as well.

- Approximately 60 percent of survey respondents indicated that they stayed overnight in the study area on their current trip. About 77 percent of overnight visitors reported staying at study area campgrounds. On average, visitors spent 3.6 nights in the study area per trip.

- Utilization of campgrounds in the study area is highest during the peak season, especially on weekends. Most campgrounds in the study area are considered to be below and/or approaching either a peak-season (60 percent) or peak-season weekend (80 percent) threshold, except campgrounds at Iron Gate reservoir. Nearly all of the developed campgrounds at Iron Gate reservoir have reached and/or exceeded the peak-season and peak-season weekend capacity thresholds.

- Demand for camping is increasing in the study area as the population of areas of visitor origin continues to increase. Annual increases in demand are based on data from regional (CDPR, 1994; CDPR, 1998; and OPRD, 2003), as well as national (Cordell, 1999) studies and publications. Participation in RV camping is projected to increase by at least 1.2 percent per year through the anticipated term of the new license. Participation in tent camping is projected to increase by between 0.7 and 1.2 percent per year over this same period of time. Existing and potential new campgrounds and recreation sites located in proximity to the water will be in the highest demand, particularly given the increasing demand for water-based recreation activities in general and high temperatures in the study area (Kakoyannis and Stankey, 2002).

- California and Oregon SCORP reports indicate that the more primitive and less developed settings provided in the study area are desired by many residents of these states. Potential new camping facilities in the study area should take this preference into consideration.

- Expanding existing campgrounds or building new facilities can both satisfy existing demand (relieves crowding at existing campgrounds) and generate new demand (i.e., new facilities create new opportunities and may stimulate use). Key considerations include maintaining or improving the visitor experience while not degrading the ecological and social conditions in the area.

<u>Camping Capacity Factors</u>: Important camping capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- *Biophysical Capacity*—Issues related to ecological conditions are a concern at seven (approximately 50 percent) of the developed recreation sites that can potentially accommodate camping in the study area. Commonly observed ecological impacts at developed campgrounds include vegetation trampling and loss, bare ground and soil compaction, and erosion, among others.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at many (64 percent) of the developed recreation sites in the study area that could potentially accommodate camping, particularly those along the Iron Gate reservoir shoreline. The primary limitation to the physical expansion of these campgrounds is the lack of available expansion potential in adjacent areas. Limits to the physical expansion of sites include land ownership, topography, existing roads, and bodies of water, among other factors.

- *Facility Capacity*—Facility capacity is a primary limiting factor at six (43 percent) of the developed recreation sites that potentially accommodate camping in the study area. Most of the campgrounds in the study area are considered to be approaching their facility capacity, while several (Wanaka Springs, Camp Creek, Juniper Point, and Mirror Cove) are considered to be at or exceeding their facility capacity. At several other campgrounds, facility capacity will likely become a limiting factor in the future based on the number of campsites currently available.

- *Social Capacity*—The primary indicator of social capacity is visitor perceptions of crowding. Measured on a nine-point scale from 1 (Not Crowded) to 9 (Extremely Crowded), perceived crowding is relatively low (< 3.0) at the 14 developed recreation sites that potentially accommodate camping in the study area except Camp Creek and Mirror Cove (Shelby and Heberlein, 1986). Mirror Cove had the highest mean perceived crowding score (4.6) of all the developed campgrounds in the study area.

<u>Overall Camping Needs:</u> Based on a review of the factors and indicators above, overall camping needs and potential actions to address these needs have been identified in the study area. These are potential actions and should not be assumed to be PM&E measures. As such, the word “consider” is used throughout this section. Site-specific camping needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall camping needs and potential actions to satisfy them include:

- *Consider maintenance and improvements to existing camping facilities*—The condition of recreation facilities at many of the existing developed recreation sites that potentially accommodate camping is variable. Several developed facilities and amenities are in need of maintenance, repair, or replacement. This includes restroom facilities, individual site facilities, and other site amenities provided at specific campgrounds.

- *Consider increasing the supply of camping facilities to meet current and future demand*—Projected demand at campgrounds in the study area indicates that additional campsites are needed in the study area to help accommodate current and future demand for camping. These sites would likely be phased in over the term of the anticipated new license. Additional campground amenities should also be considered including partial RV hookups, tent pads, shade trees, water spigots, RV dump stations, and other campground facilities. Because campground utilization currently exceeds capacity at some sites and is anticipated to exceed capacity in the future at other sites, use should be monitored to determine when existing sites should be improved/enhanced or when new sites should be constructed. A monitoring program (a component program of the draft RRMP) should be developed that identifies threshold criteria or triggering mechanisms. Preliminary threshold criteria may include the following: (1) a 60 percent peak-season (weekday and weekend combined) capacity threshold, and (2) an 80 percent peak-season weekend capacity threshold. These capacity levels should be exceeded for multiple years (3 out of 5 consecutive years) before actions are taken to ensure that the need is actual. It is anticipated that new developed campsites will be needed in the study area during the new license. The location of a potential new campground(s) will need to be coordinated with other resource needs considered in the relicensing process, including but not limited to terrestrial resources, cultural resources, and fishery resources. These combined needs should be addressed based upon further coordination and negotiations.

By the end of the new license (estimated to be 2040 for planning purposes), it is estimated that approximately 80 new RV and tent campsites will be needed in the study area to meet current and future demand for camping based on projected occupancy (Tables 5.7-22 and 5.7-23). Given the type of recreation use developed campsites in the study area currently receive (i.e., day use sites are also used for camping), it is anticipated that the majority of these sites will be needed on the southern end of the study area. The multiple use nature of existing day use/campsites in the study area is generally not recommended and the future distribution, enforcement, and management of sites should be separated by camping and/or day use facilities to avoid potential user conflicts. Prior to potential construction, campground development scenarios should be developed and evaluated to better understand the feasibility of increasing camping capacity in the study area. Additionally, infill at existing developed recreation sites should be considered for improvements/enhancements prior to all new campground development.

In addition, other camping-related facility needs in the study area may be considered including improved RV dump stations and group sites. Consideration should also be given to increasing the management presence and improving signage.

- *Consider charging overnight camping fees once sites are improved*—After a campground is improved, consider charging a reasonable user fee to help defray the cost of operations and maintenance as allowed by FERC. More primitive campsites with minimal amenities may have a lower fee, or no fee, compared with campgrounds with more amenities.

- *Consider providing a range of camping experiences*—Continue to provide visitors with a range of camping experiences from dispersed undeveloped tent campsites to campsites with full RV hookups. Consider the ROS-type classifications for each resource area when planning future campsites. Maintain a broad spectrum of experience levels, to be further defined in the draft RRMP (Section 6.0).

- *Consider ADA compliance at all existing and new camping facilities*—As improvements are made to existing campgrounds and new sites are potentially developed, ADA-accessibility should be provided based on ADAAG. Guidelines regarding how many campsites should be accessible in a campground based on the total number of sites should be reviewed and incorporated into camping facility development plans. In addition, all facilities (including parking spurs, tent pads, picnic tables, fire rings, drinking fountains and water faucets, trash receptacles, and paths to other accessible facilities) at campsites designated as accessible must adhere with new and forthcoming ADAAG.

- *Consider hardening some undeveloped sites and monitoring visitor use at sensitive shoreline dispersed sites and use areas commonly used for camping*—Visitor use at some dispersed campsites appears to be moderate to heavy due to impacts observed, such as vegetation damage, sanitation problems, litter accumulation, erosion, fire hazards, and personal safety issues. However, some of these impacts are from nonrecreational squatters and cattle grazing. At other dispersed recreation sites, few impacts were observed and the sites appear to naturally recover by themselves given an adequate rest period. At sites that are or may be heavily impacted by visitors, hardening should be considered to better accommodate increased visitor use at these sites without negatively impacting the desired visitor experience.

<u>Overall Day Use/Picnicking Needs in the Study Area</u>

Overall day use/picnicking supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. Day use/picnicking needs analyzed in the study area include both developed facilities and dispersed sites.

<u>Day Use/Picnicking Supply Factors:</u> Important day use/picnicking supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area).

- All developed recreation sites in the study area have day use/picnic facilities including picnic tables, fire rings, vault toilet buildings, water faucets, and other facilities. In total, there are approximately 595 day use parking spaces and 125 picnic tables in the study area. One group picnic site exists at Keno Recreation Area.

- There at least 27 dispersed shoreline sites in the study area, some of which are used for day use/picnicking activities. Dispersed sites were identified in all recreation resource areas, except Link River/Lake Ewauna/Keno reservoir. J.C. Boyle reservoir had the largest number of identified dispersed sites (17) in the study area.

- There are four ADA-accessible picnic tables in the study area (one at BLM's Topsy Campground and three at the Iron Gate Hatchery Public Use Area). Several other day use/picnicking sites have ADA-accessible facilities including restrooms, parking spaces, and access routes.

- The day use/picnicking facilities at developed recreation sites in the study area are in variable condition. Many of the day use/picnicking facilities are in good condition, though several are in need of maintenance, repair, or replacement.

- The study area has a significant percentage of developed day use/picnic areas in the region (61 percent of the total).

- In general, the study area reservoirs provide more developed day use/picnic sites than other reservoirs and lakes of similar size in the region. Shasta Lake is the only regional water body that has more developed day use/picnic sites than any of the regional study area lakes or reservoirs.

Day Use/Picnicking Demand Factors: Important day use/picnicking demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail).

- Approximately 40 percent of survey respondents indicated that they were in the study area for day use purposes only (i.e., they were not spending the night in the study area). On average, these day users reported spending approximately 4.9 hours per visit in the study area.

- Common day use activities in the study area include resting/relaxing, swimming, sightseeing, picnicking, fishing (both bank and boat), sunbathing, hiking, wildlife viewing, and waterskiing, among others.

- Resting/relaxing was one of the more popular activities in the study area. It was consistently one of the top three activities reported by visitors to all five resource areas in the study area.

- Picnicking is a common activity among visitors to the study area. Approximately 39 percent of survey respondents indicated that they picnicked during their visit to the study area. Picnicking was the second most participated in activity at J.C. Boyle reservoir and lower at other resource areas.

- Demand for day use activities is highly variable. Resting/relaxing is projected to increase by at least 1.2 percent per year, while picnicking is projected to increase by less than 0.6 percent per year during the new license. Despite varying rates of increase, day use activities in total are anticipated to increase significantly over the anticipated term of the new license. Improved and/or new day use/picnicking facilities will be needed in the future to accommodate this increase in use. Existing and potential new developed recreation sites located in proximity to the water will be in the highest demand, particularly given the increasing demand for water-based recreation activities in general (Kakoyannis and Stankey, 2002).

- California and Oregon SCORP reports indicate that the more primitive and less developed settings provided in the study area are desired by many residents of these states. Potential new day use/picnic facilities in the study area should take this preference into consideration.

- A component of demand is the additional use that could potentially be induced by the construction of new facilities. While new facilities would help meet existing demand, they may also generate new demand. Key considerations include maintaining or improving the visitor experience and building new facilities only up to sustainable levels.

Day Use/Picnicking Capacity Factors: Important day use/picnicking capacity factors to consider are summarized below (see Section 5.7.3 for more detail).

- All of the developed recreation sites (28) in the study area have day use/picnicking facilities. As such, all developed sites were considered in determining day use/picnicking capacity factors. These factors should be considered in conjunction with other activity capacity factors (e.g., boating capacity factors, fishing capacity factors, swimming/sunbathing capacity factors, etc.) described in the sections below.

- *Biophysical Capacity*—Issues related to ecological conditions are a concern at approximately half (15) of the developed recreation sites with day use/picnicking facilities in the study area. Commonly observed ecological impacts at developed recreation sites included vegetation trampling and loss, bare ground and soil compaction, and erosion, among others.

- *Spatial Capacity—*Spatial capacity is considered a limiting factor at 22 (79 percent) of the developed recreation sites in the study area. The primary limitation to the physical expansion of these developed recreation sites is the lack of available expansion potential in adjacent areas. Limits to the physical expansion of sites include land ownership, topography, existing roads, and bodies of water, among other factors.

- *Facility Capacity*—Facility capacity is a primary limiting factor at seven (25 percent) of the developed recreation sites in the study area. Nearly all (86 percent) of the sites where facility capacity is a limiting factor are campgrounds that also accommodate day use/picnicking activities. Campground facility capacity is discussed in the Camping Capacity Factors section above. The only day use site where facility capacity is currently a limiting factor is the City of Klamath Falls' Veteran's Memorial Park/Boat Launch. However, facility capacity is currently only a limiting factor at the boat launch area of this site, and the additional street parking available at the picnic area of the site is adequate to accommodate most overflow use at this time. At several other developed recreation sites, facility capacity will likely become a limiting factor in the future based on the number of parking spaces and picnic tables currently available.

- *Social Capacity*—The primary indicator of social capacity is visitor perceptions of crowding. Measured on a nine-point scale from 1 (Not Crowded) to 9 (Extremely Crowded), perceived crowding is relatively low at all of the developed recreation sites in the study area (Shelby and Heberlein, 1986). Social capacity is only a limiting factor at 2 (7 percent) developed recreation sites in the study area (Camp Creek and Mirror Cove), both of which accommodate camping. Social capacity at Camp Creek and Mirror Cove is discussed in more detail in the Camping Capacity Factors section above.

<u>Overall Day Use/Picnicking Needs:</u> Based on a review of the factors and indicators above, potential actions to address overall day use/picnicking-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific day use/picnicking needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall day use/picnicking needs and potential actions to satisfy them include:

- *Consider maintenance and improvements to existing day use/picnicking facilities*—Facilities at many of the existing developed day use/picnicking sites in the study area are in variable conditions. These facilities (vault toilet buildings, picnic tables, trash receptacles, fire rings/grills, and other day use facilities) are generally in need of maintenance, repair, or replacement. Older day use/picnicking sites will need to be replaced or modernized over time. Existing day use/picnicking sites should be improved prior to the development of new day use/picnic site, if feasible.

- *Consider increasing the supply of day use/picnicking facilities to meet future demand*—Since parking spaces and picnic tables are primary facility limiting factors at day use/picnicking sites, it is important to consider the need for these facilities. It is anticipated that new parking spaces and picnic tables will be needed at developed day use/picnic sites during the new license (estimated to be 2040). These sites would likely be phased in over the term of the anticipated new license. Additional day use/picnicking amenities should also be considered including vault toilet buildings, trash receptacles, grills, and other facilities. Because day use/picnic site utilization currently exceeds capacity at some sites and is anticipated to exceed capacity in the future at other sites, use should be monitored to determine when existing sites should be improved/enhanced or when new sites should be constructed. A monitoring program (a component of the draft RRMP [Section 6.0]) should be developed that identifies threshold criteria or triggering mechanisms. Preliminary threshold criteria include the following: (1) a 60 percent peak-season (weekday and weekend combined) capacity threshold, and (2) an 80 percent peak-season weekend capacity threshold. These capacity levels should be exceeded for multiple years (3 out of 5 consecutive years) before actions are taken to ensure that the need is actual.

  Compared with overall camping needs, day use/picnicking needs are minor. By the end of the new license (estimated to be 2040), it is estimated that only 20 to 25 new parking spaces (excludes boat launch parking) and picnic tables will be needed in the study area to meet future demand for day use/picnicking. This number will need to be reassessed as joint day use/overnight camping sites are re-evaluated to potentially segregate these uses, which are currently unsegregated. Due to the relatively small number of anticipated new parking spaces/picnic tables needed in the study area, improvements/enhancements to existing developed recreation sites will likely suffice to meet the demand for these types of facilities.

  Additionally, new day use/picnicking facilities should also be considered for group use where appropriate, such as group shelters. No such facilities currently exist, except at Keno Recreation Area. Group sites would likely be fee sites if the amenities provided warrant a fee, such as reserving a group shelter.

  If day use sites are substantially improved with additional amenities, user fees may be considered, such as a parking fee. More primitive day use sites would possibly not require a fee. A mix of day use opportunities and experience levels to be provided in the study area will need to be defined during the development of the draft RRMP (Section 6.0).

- *Consider monitoring visitor use of undeveloped dispersed recreation sites*—Use of undeveloped dispersed recreation sites should be monitored over time. Many dispersed recreation sites are used for day use/picnicking activities, and additional management actions should be considered to minimize impacts. While most dispersed recreation sites are estimated to received low to moderate use, some sites appear to be heavily used based on observed impacts including vegetation damage, soil compaction, sanitation issues, litter accumulation, erosion, fire hazards, and personal safety. Demand for dispersed recreation sites is projected to increase by the anticipated term of the new license, especially as developed recreation sites reach their capacity. At dispersed sites that are or may be heavily impacted by visitors, increased management presence and hardening should be considered to better accommodate visitor use at these sites without negatively impacting the desired visitor experience. At several dispersed sites, various observed ecological impacts are likely from nonrecreational squatters and cattle grazing. Increased management presence could help alleviate impacts and safety concerns resulting from nonrecreational squatters.

- *Consider ADA compliance at all existing and new day use/picnicking facilities*—As improvements are made to existing day use/picnicking sites in the study area, ADA-accessibility should be provided based on ADAAG. All facilities (including parking areas, picnic tables, fire rings/grills, water faucets, trash receptacles, vault toilet buildings, and paths to accessible facilities) at day use/picnicking sites should adhere to ADAAG. New day use/picnic facilities should also adhere to these guidelines. Specific improvements needed at existing day use/picnic sites are identified in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below.

Overall Boating Needs in the Study Area

Overall flatwater and whitewater boating-related supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. Boating facility needs that were analyzed in the study area include boat launches, ramps, docks, and parking for vehicles with trailers, among other boating needs.

Boating Supply Factors: Important boating supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area):

- There are ten sites in the study area with developed flatwater boat launches, including the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, ODFW's Miller Island Boat Launch, Keno Recreation Area, Pioneer Park (East), BLM's Topsy Campground, Mallard Cove, Copco Cove, Camp Creek, Mirror Cove, and Long Gulch. There are a total of 15 ramp lanes at these locations. All ramps are concrete or concrete ties. All boat launches in the study area have a dock except Pioneer Park and Long Gulch. Several sites also have dirt launches, and hand launching of car-top boats is possible at most of the developed recreation sites in the study area.

- There are no marinas or temporary mooring facilities in the study area.

- On the Upper Klamath River/Hell's Corner reach, there is one hand launch site (BLM's Upper Klamath River [Spring Island] Boater Access) that provides access for whitewater boating. Additionally, three downstream sites act as whitewater boat take-outs (Stateline take-out (PacifiCorp and BLM), Fishing Access Site 6, and Fishing Access Site 1).

- There are no fully ADA-accessible boat launch facilities in the study area.

- At high pool elevations, there are approximately 2,475 surface water acres available for boating on Lake Ewauna/Keno reservoir, 420 surface water acres available for boating on J.C. Boyle reservoir, 1,000 surface water acres available for boating on Copco reservoir, and 944 surface water acres available for boating on Iron Gate reservoir.

- There is one waterski course in the study area, located on Iron Gate reservoir.

- Most facilities associated with boat launches in the study area are in good condition. Some facilities at several boat launches, however, are in need of maintenance, repair, or replacement.

- When compared with regional lakes and reservoirs of similar size (surface water acres), the study area has a comparable number of boat launches. Regional lakes and reservoirs that are much larger than the study area reservoirs tend to have two to three times as many developed boat launches as the study area reservoirs, commensurate with their size.

- There are at least ten identified rivers in the regional study area that provide whitewater boating opportunities. The Rogue River has the highest existing level of whitewater boating use, while most of the other regional rivers have more moderate levels of use.

- Whitewater boating opportunities in the study area are primarily located in the Upper Klamath River/Hell's Corner reach, though smaller whitewater runs exist throughout the study area. The Hell's Corner reach provides challenging Class IV and V whitewater rapids during the summer when many other West Coast rivers do not.

<u>Boating Demand Factors:</u> Important boating demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail).

- Over half (53 percent) of survey respondents indicated that they had used a boat launch in the study area. Of those survey respondents who had used a study area boat launch, 91 percent did not have to wait to use their primary boat launch. Only 9 percent of study area boat launch users had to wait to use their primary launch. However, the average wait time for those respondents was only 7.6 minutes.

- Current participation in boating-related activities in the study area is variable. According to survey respondents, approximately 31 percent of visitors fish from a boat, 26 percent participate in powerboating, 25 percent waterski, 20 percent participate in tubing, 10 percent participate in whitewater boating, and 9 percent use a PWC or a canoe/kayak, respectively (percentages do not sum to 100 as multiple activities were chosen by survey respondents).

- Whitewater boating was the primary activity reported by survey respondents in the Upper Klamath River/Hell's Corner reach. Fishing from a boat was the primary activity of visitors at Copco and Iron Gate reservoirs, according to survey respondents.

- Whitewater boating is estimated to account for approximately 5,250 RDs annually in the Upper Klamath River/Hell's Corner reach (based on an 8-year average provided by BLM [Weidenbach, pers. comm., 2002]). The 8-year high in registered whitewater boating use on the Hell's Corner reach occurred in 1998 with roughly 6,400 RDs. A recent decline in whitewater boating was noted in 2001, likely due to the flow regime that was affected by drought conditions and the California energy crisis.

- Powerboats accounted for approximately 95 percent of observed boats on Project reservoirs during the peak season in the study area. Observed powerboat activities in the study area included fishing, waterskiing/tubing, boating for pleasure, and PWC use. Powerboat fishing was the most observed boating activity on three of the four study area reservoirs (Keno, Copco, and Iron Gate reservoirs). Waterskiing/tubing was the most observed boating activity on J.C. Boyle reservoir and was also highly observed on Iron Gate reservoir.

- Current average BAOT averages at study area reservoirs are 1.7 at Lake Ewauna/Keno reservoir, 3.1 at J.C. Boyle reservoir, 2.3 at Copco reservoir, and 22.1 at Iron Gate reservoir. Iron Gate reservoir had the most boats observed at one time (76) of the study area reservoirs.

- Water-based recreation opportunities are and will continue to be in high demand in the future. Annual increases in boating-related activities in the study area include: powerboating (at least 1.2 percent), whitewater boating (0.7 to 1.2 percent), PWC use (at least 1.2 percent), and waterskiing (at least 1.2 percent).

- In general, the number of watercraft does not seem to affect visitor enjoyment of recreation activities at this time. Only 5 percent of visitors in the study area perceived the number of watercraft to be unacceptable or totally unacceptable in terms of their enjoyment of recreation activities.

- Water level on Project reservoirs does not seem to affect visitor enjoyment or safety at this time. Approximately 8 percent of study area respondents felt that the water level was either unacceptable or totally unacceptable in terms of their enjoyment of recreation activities, while only 4 percent of study area respondents perceived water level as unacceptable or totally unacceptable in terms of safety. Visitors who thought water level was unacceptable for their enjoyment cited water level (too low) and water quality (too much algae and dirty/smelly) as reasons. Similar responses were provided regarding visitor safety and water level.

<u>Boating Capacity Factors:</u> Important boating capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- Overall, boating capacity in the study area is a factor of developed boat launch site capacity and surface water boating capacity.

- Facility capacity at developed recreation sites with boat launches in the study area is variable. Many boat launches are currently approaching their facility capacity, while several others have already exceeded their facility capacity. Facility capacity has been exceeded at the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, Camp Creek, and Mirror Cove. During periods of heavy use, parking areas at these sites are filled to capacity and overflow parking areas must be used. Overall capacity (considering all four capacity types) has been exceeded at both Camp Creek and Mirror Cove.

- In addition to approaching or exceeding facility capacity, use at developed boat launches in the study area appears to be approaching social capacity. The mean perceived crowding score of visitors to developed boat launches was 4.0. This crowding score is considered moderate and indicates that visitors perceive higher levels of crowding than visitors at sites without boat launches. This can be explained by the additional traffic, congestion, noise, and activity associated with a boat launch compared with sites without a boat launch.

- Using water ROS setting categories as a guideline, Lake Ewauna, Keno reservoir, and Iron Gate reservoir are classified as Rural Developed and J.C. Boyle and Copco reservoirs are classified as Rural Natural based on the natural settings and range of available recreation opportunities at each study area reservoir.

- At Lake Ewauna/Keno reservoir, based on a Rural Developed water ROS classification and available surface water acres for boating, it is estimated that approximately 128 watercraft could potentially be accommodated at one time. Current peak season boating use at this reservoir is much lower than the maximum BAOT estimate. Surface water boating capacity is not a limiting factor at this reservoir because of this low level of use.

- At J.C. Boyle reservoir, based on a Rural Natural water ROS classification and available surface water acres for boating, it is estimated that approximately eight watercraft could potentially be accommodated at one time on this reservoir. Current surface water percent occupancy at this reservoir is estimated to be 37 percent. However, surface water boating capacity exceeds 100 percent during heavier use periods. Overall, surface water utilization is considered to be approaching capacity. Additionally, the amount of boat trailer parking at J.C. Boyle reservoir exceeds the maximum number of boats that could potentially be accommodated at one time on the reservoir. If these parking areas are used to capacity by boating-related vehicles (i.e., vehicles with boat trailers), surface water capacity may be exceeded.

- Surface water capacity on the Upper Klamath River/Hell's Corner reach is partially controlled by BLM. Currently, only commercial whitewater boating operators must be permitted on the river reach (BLM currently provides a maximum of 23 commercial permits); private boaters may voluntarily register their trip with BLM. A new BLM river management plan (BLM, 2003), once adopted, may contain revised permitting/registration guidelines.

- Current boating use at Copco reservoir is much lower than the maximum number of boats that could potentially be accommodated at one time on the reservoir. Based on a Rural Natural water ROS classification, it is estimated that approximately 20 watercraft could potentially be accommodated at one time on this reservoir. Surface water percent occupancy is estimated to be 12 percent at this time and thus surface water capacity is not a limiting factor.

- Current average boating use on Iron Gate reservoir is lower than the theoretical maximum peak-season BAOT estimate. Based on a Rural Developed water ROS classification, it is estimated that about 47 watercraft could potentially be accommodated at one time on this reservoir. Surface water capacity is currently approximately 47 percent; however, surface water boating capacity is currently exceeded during heavier use periods. Surface water capacity at Iron Gate reservoir is considered to be approaching capacity. Additionally, including overflow parking at Camp Creek, there are an adequate number of existing parking spaces at developed sites on Iron Gate reservoir to fully utilize all available surface water capacity on the reservoir.

<u>Overall Boating Needs:</u> Based on a review of the factors and indicators above, potential actions to address overall boating-related needs have been identified in the study area. It should not be

assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific boating needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall boating needs and potential actions to satisfy them include:

- *Consider maintenance and improvements to existing boating-related facilities*—Facilities at several of the existing boat launch facilities are in need of maintenance, repair, or replacement. Although the primary boating-related maintenance and improvement need is associated with boat ramp lanes, other considerations should include vault toilet buildings, docks, parking, and other boating-related facilities.

- *Consider increasing the supply of boating-related facilities to meet current and future demand*—Utilization of the existing boat launch facilities is variable, with several sites currently exceeding capacity and others projected to exceed capacity by the anticipated term of the new license. There are four aspects of boating-related facility demand to consider prior to increasing supply: (1) surface water capacity, (2) boat ramp lanes, (3) loading docks and moorage facilities, and (4) boat trailer parking. Other factors that influence where boating-related facilities could be provided include use levels, water depth, access, wind (and the resulting waves), and geographic distribution. Currently, new boat launches are not anticipated during the new license, though some existing ramps need to be improved/enhanced. Additional boat launch parking is also not anticipated, though a restructuring of developed sites (i.e., separation between day use and camping facilities) could result in a need for additional boat launch parking as the design of each site is reassessed in greater detail as part of the draft RRMP (Section 6.0).

  An additional waterski course may be considered, based on survey results, and could be accommodated on either Iron Gate or Copco reservoir.

  Whitewater boating needs on the Upper Klamath River/Hell's Corner reach are being evaluated by BLM and State of Oregon as part of the planning process for the Draft Upper Klamath River Management Plan (BLM, 2003). A plan has not yet been adopted.

- *Consider increasing reservoir Marine Patrol and management presence*—With a projected increase in the number of visitors participating in boating-related activities, additional management presence may be needed. Increased law enforcement of boating regulations (e.g., speed limits, no wake zones, etc.) to be performed by Marine Patrols may be needed in the future. Additional Marine Patrols may be needed during the peak season when existing boating use levels are higher. Existing regular Marine Patrols are provided by the Siskiyou County Sheriff's Office on Iron Gate reservoir and occasionally on Copco reservoir.

- *Consider ADA compliance at some existing and new boating-related facilities*—New AGAAG pertaining to boating-related facilities (e.g., docks, gangways, boat entry, etc.) should be implemented when existing sites are improved/enhanced. In addition, at least one fully accessible boat launch should be provided on each reservoir. All facilities (including boarding floats, docks, parking spaces, vault toilet buildings, water faucets, trash receptacles, and paths to accessible facilities) at boat launches designated as accessible should adhere to ADAAG. New boating-related facilities should also adhere to these guidelines.

Overall Swimming and Sunbathing Needs in the Study Area

Overall swimming and sunbathing supply, demand, and capacity factors are presented below, followed by a discussion of overall needs.

Swimming and Sunbathing Supply Factors: Important swimming and sunbathing supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area).

- There are no designated swim areas (i.e., delineated swimming areas with floating booms, sandy beaches, signs, and/or safety apparatus) in the study area, though swimming occurs at many of the developed recreation sites. There are also no developed ADA-accessible swimming facilities in the study area.

- In addition to the developed shoreline sites, there are many dispersed sites in the study area where swimming occurs. One of the more popular dispersed swimming sites is the Boyle Bluffs area at J.C. Boyle reservoir. The shoreline bluffs make this site an attractive "bluff-jumping" (i.e., jumping from the bluffs into the reservoir) and swimming site.

Swimming and Sunbathing Demand Factors: Important swimming and sunbathing demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail):

- Swimming is a popular activity in the study area. Approximately 46 percent of survey respondents indicated that they swam while in the study area. An additional 33 percent of survey respondents reported sunbathing while in the study area.

- Demand for swimming and sunbathing is increasing in the region. Both swimming and sunbathing are projected to increase by between 0.7 and 1.2 percent per year in the study area through the anticipated term of the new license.

- Similar to other outdoor activities, swimming and sunbathing participation levels are dependent on good weather conditions and good water quality (little or no algae), among other factors. As a result, the peak season months of June, July, and August are the primary use months for swimming and sunbathing. However, towards the end of summer, algae blooms limit swimming at Project reservoirs.

Swimming and Sunbathing Capacity Factors: Important swimming and sunbathing capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- The overall utilization of day use/picnicking facilities is closely tied to capacity as it relates to swimming and sunbathing. Refer to the Overall Day Use/Picnicking Needs section for a complete discussion of capacity factors as they relate to swimming and sunbathing.

Overall Swimming and Sunbathing Needs: Based on a review of the factors and indicators above, potential actions to address overall swimming- and sunbathing-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific swimming and sunbathing needs are discussed in Recreation Facility and Use Area Needs by Site

(Section 5.7.4.2), below. Overall swimming and sunbathing needs and potential actions to satisfy them include:

- *Consider increasing the supply of swimming-related facilities to meet current and future demand*—Swimming is currently a popular activity in the study area and is projected to increase by between 0.7 and 1.2 percent annually through the anticipated term of the new license. New designated swimming areas may be considered to meet this demand. If reservoir water quality and algae blooms improve, consider providing a designated swim area at each significant recreation facility where suitable conditions exist, including sandy beaches. It is estimated that one to two designated swim areas could be provided on each reservoir at existing or potential new developed recreation sites. Swimming-related facilities to consider at each site include area delineators/floating booms, safety apparatuses, safety signs, and other facilities.

- *Consider providing fully accessible swimming areas*—If reservoir water quality and algae blooms improve, consider providing one to two fully accessible developed swimming areas in the study area, possibly one each at Iron Gate reservoir and J.C. Boyle reservoir. Facilities (including parking spaces, toilets, water faucets, trash receptacles, and paths to accessible facilities) at swimming areas designated as accessible should adhere to current and forthcoming ADAAG, if developed. This should include an accessible path to the edge of the water, but not necessarily below the surface of the water.

<u>Overall Interpretation and Education Needs in the Study Area</u>

Overall I&E-related supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. I&E program and facility needs that were analyzed in the study area include signs, kiosks, viewpoints, and nature trails, among others.

<u>Interpretation and Education Supply Factors:</u> Important I&E supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area):

- Several I&E facilities (interpretive signs, kiosks, and nature trails) currently exist in the study area. Most developed recreation sites in the study area have signboards and other informational signs. Six developed sites currently have specific I&E facilities.

- Existing developed recreation sites with I&E facilities include the City of Klamath Falls' Veteran's Memorial Park/Boat Launch (historical train display and botanical garden), ODFW's Miller Island Boat Launch (interpretive signs), Keno Recreation Area (historical marker displaying a rack and pinion mechanism used at the old dam site), Pioneer Park (Applegate Trail interpretive signs), Camp Creek (Wilkes Expedition historical marker), and Iron Gate Hatchery Public Use Area (visitor center/interpretive kiosk).

- Many of the existing I&E facilities are in need of some repair or replacement.

<u>Interpretation and Education Demand Factors:</u> Important I&E demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail):

- Existing participation in I&E-related activities in the study area is moderate. Approximately 39 percent of survey respondents indicated they participate in sightseeing, 31 percent participate in hiking, and 28 percent participate in wildlife viewing in the study area.

- Visiting interpretive displays is in high demand in the region. Projected increases in activities related to I&E demand include at least a 1.2 percent annual increase in sightseeing, wildlife viewing, and hiking through the anticipated term of the new license.

- The study area and surrounding region offer multiple sightseeing and educational opportunities, some of which currently offer I&E facilities.

<u>Interpretation and Education Capacity Factors:</u> Important I&E capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- Currently, there are no limiting factors to the capacity of existing I&E facilities in the study area. However, due to the projected demand for these types of programs and facilities and the poor conditions of some facilities, it is likely that facility capacity may be a limiting factor in the future.

<u>Overall Interpretation and Education Needs:</u> Based on a review of the factors and indicators above, potential actions to address overall I&E-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific I&E needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall I&E needs and potential actions to satisfy them include:

- *Consider developing an I&E Program in the draft RRMP*—The study area is currently lacking a comprehensive I&E program for the Project. These needs should be addressed in the draft RRMP (Section 6.0).

- *Consider new improved I&E facilities in the study area*—Consider the addition of I&E facilities in the study area to meet current and future demand. Most of the existing developed sites in the study area are suitable for I&E facilities such as signboards and kiosks. New facilities and programs could interpret the hydroelectric project, cultural resources, geology, natural resources, and the history of the area. These facilities could also be used to educate the public about resource protection and stewardship, as well as dangers such as rattlesnakes. A recreation site sign program should also be considered to help visitors better identify recreation sites in the area and their options.

- *Consider ADAAG compliance at all existing and new facilities*—ADAAG should be followed for all existing and new and existing I&E facilities. This may include exhibits, parking areas, paths to facilities, toilets/restrooms, and any other facilities provided in conjunction with I&E facilities.

- *Consider providing new and/or enhanced nature trail opportunities*—Where appropriate, consider self-guided nature trails at or near existing developed recreation sites. Areas of opportunity to consider may include the Link River Nature Trail, Miller Island Wildlife Area, Fall Creek Trail, Jenny Creek, and possibly other areas identified in the Overall Trail Needs section below.

Overall Trail Needs in the Study Area

Overall trail-related supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. Only nonmotorized recreational trail facility needs were analyzed in the study area.

Trail Supply Factors: Important trail supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area):

- There are three designated trails in the study area (Link River Nature Trail, Klamath Wildlife Area Viewing Trail, and Fall Creek Trail). In addition, there are well-established user-defined trails at Jenny Creek and the six fishing access sites on the Upper Klamath River/Hell's Corner reach, as well as several internal and shoreline access trails at developed recreation facilities and dispersed recreation sites.

- The Link River Nature Trail runs approximately 1.5 miles along the west side of the Link River bypass reach, between UKL and Lake Ewauna/Keno reservoir. The trail is affiliated with the USA National Trails System and is part of the Link River Bird Sanctuary and Small Game Refuge. The trail is for pedestrian use only and pets are only allowed on a leash. Access at the north and south entries is controlled by a turnstile. Recreational facilities associated with the Link River Nature Trail include two trash receptacles, a bench near the dam, and four ADA-accessible fishing pads at the northern end of the trail (three are located behind a locked gate). While not developed features of the Link River Nature Trail, several user-made dirt trails (especially on the southern half of the trail) provide access to the river shoreline. Due to the location of this site (in the city of Klamath Falls), this site receives a considerable amount of use from visitors who walk to the site, as opposed to driving like most other sites in the study area.

- Located on the east shore of Lake Ewauna/Keno reservoir about 6 miles to the south of Klamath Falls off of SR 97, the Klamath Wildlife Area Miller Island Unit is managed by ODFW. An approximately 1-mile-long wildlife viewing trail follows a levee near the entrance station to the wildlife area along Miller Island Road. Parking, a portable toilet (ADA-accessible), and a kiosk with information about recreational opportunities in the Klamath Wildlife Area are provided at the entrance station.

- The Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir, adjacent to a CDFG fish hatchery facility. The gated trail begins on the northern side of Copco Road and continues to Fall Creek Falls. The trail can also be accessed via the road/parking area associated with the Fall Creek powerhouse. There is a gated gravel road providing vehicle access to a small gravel parking area near the beginning of the upper portion of the trail. The lower portion of the trail is gravel, while the upper portion of the trail is dirt and generally not well defined. There is a sign at the beginning of the upper portion of the trail indicating the direction to the falls. There are two picnic tables at the base of the trail and a user-defined fire ring near the falls. The site has a water faucet (associated with the fishery operations) and a trash receptacle. There is also a portable ADA-accessible toilet across the road from the trailhead near the CDFG fish rearing ponds (behind a locked gate).

- Several user-defined trails provide shoreline fishing access to Jenny Creek. A well-established user-defined trail runs upstream along the creek beginning at the parking area. The trail becomes less obvious after a few hundred yards and eventually dissipates into an open grass area beyond which is a fenced field used for ranching.

- Six fishing access sites are located along Ager-Beswick Road, each consisting of a small gravel parking area and a pedestrian access trail to the shoreline. These user-defined trails are gated and provide access through private ranch lands to traditional shoreline fishing areas.

<u>Trail Demand Factors:</u> Important trail demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail):

- Approximately 31 percent of survey respondents indicated that they participated in hiking while in the study area. Other trail-related activities that were reported by survey respondents include bicycling (11 percent), riding off-highway vehicles (10 percent), mountain biking on trails (5 percent), and horseback riding (3 percent).

- Hiking was the third most participated in activity in the study areas as reported by survey respondents. Hiking was also the third most participated in activity in the Link River/Lake Ewauna/Keno reservoir resource area as reported by survey respondents from this resource area.

- Demand for hiking is projected to increase by at least 1.2 percent annually through the anticipated term of the new license.

- Current use of existing developed recreational trails is estimated to be low in the study area. Use of the Link River Nature Trail accounts for over 25,000 RDs per year. Use of the Fall Creek Trail was not quantified as the site was gated and locked during 2002; however, recreational use of this trail is estimated to be low.

<u>Trail Capacity Factors:</u> Important trail capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- Due to the relative lack of developed trails in the study area, trail capacity was investigated only at the Link River Nature Trail. The only other developed trail that was investigated during field observations was the Fall Creek Trail. Use is estimated to be low at this trail, though this condition is partially a result of the trail being gated and locked during 2002.

- Overall, recreation use at the Link River Nature Trail is considered to be below its recreation capacity. The primary limiting factor at this site is spatial capacity due to the lack of expansion possibilities. Biophysical, facility, and social capacity are not considered limiting factors at the Link River Nature Trail.

<u>Overall Trail Needs:</u> Based on a review of the factors and indicators above, potential actions to address overall trail-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word “consider” is used throughout this section. Site-specific trail needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall trail needs and potential actions to consider to help satisfy those needs may include:

- *Consider new and/or enhanced trail opportunities in the study area*—Consider new nonmotorized trail development and trailheads at suitable locations in the study area. Potential new trail routes to consider may include a J.C. Boyle reservoir loop trail, an Upper Klamath River (Spring Island) Boater Access to Frain Ranch trail (Klamath River Edge Trail), J.C. Boyle bypass reach/powerhouse area fishing access trails, a J.C. Boyle powerhouse Old Foundations Area to Upper Klamath River (Spring Island) Boater Access trail, Frain Ranch trails, a Long Gulch to Iron Gate Hatchery trail, and a Bogus Creek trail. Any trail routes in the Upper Klamath River/Hell's Corner reach should be coordinated with BLM and consistent with the Draft Upper Klamath River Management Plan (BLM, 2003). Potential existing trails to be considered for possible enhancement/improvement may include the Link River Nature Trail, the Fishing Access Sites (1-6), and Fall Creek Trail.

- *Consider the construction of ADA-accessible trails in the study area*—There are very few existing accessible paths in the study area. Accessible paths or trails should be considered as part of improvements to existing developed recreation sites as well as to potential new developed recreation facilities.

- *Consider implementing a trail sign program*—Consider providing signs for formalized trail routes in the study area to communicate trail opportunities to visitors. Integrate potential trail signs with the proposed I&E program.

<u>Overall Fishing Needs in the Study Area</u>

Overall fishing-related supply, demand, and capacity factors are presented below, followed by a discussion of overall needs.

<u>Fishing Supply Factors:</u> Important fishing supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area).

- All but three developed recreation sites (Sportsman's Park, Fall Creek Trail, and Iron Gate Hatchery Public Use Area) in the study area provide shoreline fishing opportunities. Additionally, ten developed recreation sites (the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, ODFW's Miller Island Boat Launch, Keno Recreation Area, Pioneer Park (East), BLM's Topsy Campground, Mallard Cove, Copco Cove, Camp Creek, Mirror Cove, and Long Gulch) in the study area have boat launches that are used by powerboat anglers.

- Six sites in the study area (BLM's Topsy Campground, Mallard Cove, Copco Cove, Wanaka Springs, Camp Creek, and Juniper Point) have piers and docks that are used for shoreline fishing. BLM's Topsy Campground and Camp Creek (partially accessible) have the only ADA-accessible fishing piers in the study area. There are four ADA-accessible fishing platforms at the northern end of the Link River Nature Trail; however, three are behind a locked gate.

- There are six developed fishing access sites along the Upper Klamath River/Hell's Corner reach.

- Undeveloped portions of the study area reservoirs' shorelines are fairly accessible to bank anglers except where steep topography prohibits access. Several small user-defined fishing access trails were identified at each reservoir in the study area.

- In general, fishing for trout on river reaches within the study area is considered very good (Miranda, Ramirez, and Trophy Waters Fly Fishing Shop, pers. comm., 2002). The three most popular fishing reaches are the Keno reach below Keno dam, the J.C. Boyle bypass reach below J.C. Boyle dam, and the Upper Klamath River/Hell's Corner reach. Other river reaches used for fishing in the study area include the Link River bypass reach, Copco No. 2 bypass reach, and the Middle Klamath River below Iron Gate dam.

- The regional study area includes several major rivers (McCloud River, Pit River, Rogue River, Salmon River, Scott River, Smith River, Trinity River, and the Upper Sacramento River) that provide a multitude of fishing opportunities, including fly fishing, bank fishing, and trolling, among others. Chinook (king) and coho (silver) salmon; steelhead; and brown, cutthroat, and native trout, as well as other fish, are found in many of these river systems.

Fishing Demand Factors: Important fishing demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail):

- Fishing is a popular activity in the study area. A total of 65 percent of survey respondents reported participating in fishing (34 percent in bank fishing and 31 percent in boat fishing).

- Boat fishing was the primary activity of survey respondents in two of the five resource areas (Copco reservoir and Iron Gate reservoir) in the study area.

- Based on fishing license sales, participation in fishing in Oregon has increased slightly (approximately 1.6 percent) recently, while participation in fishing in California has decreased by as much as 12.5 percent in recent years.

Fishing Capacity Factors: Important fishing capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- Boat anglers use the entire reservoir area but tend to concentrate in areas where the fishing is good. Surface water capacity for boat fishing is currently not considered a limiting factor in the study area because the average amount of boat use on the study area reservoirs tends to be low to moderate.

- Bank anglers may use much of the publicly accessible shoreline for fishing but tend to concentrate in areas with good road access, near existing developed sites, and at existing dispersed use sites in the study area.

Overall Fishing Needs: Based on a review of the factors and indicators above, potential actions to address overall fishing-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific fishing needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall fishing needs and potential actions to satisfy them include:

- *Consider providing additional ADA-accessible fishing piers in the study area*—There are two existing ADA-accessible fishing piers (BLM's Topsy Campground and Camp Creek [partially accessible]) and four accessible shoreline fishing platforms (three behind a locked gate) (Link River Nature Trail) in the study area. One additional ADA-accessible fishing pier (at Iron Gate reservoir) should be considered to meet current and future demand for bank/shoreline fishing. If new fishing piers are installed, they should be constructed to adhere to current and forthcoming ADAAG for fully accessible piers, and be located in areas of known fishing success.

- *Consider continued fishery management programs*—In general, good recreational fishing opportunities exist in the study area. To meet future demand, continued, expanded, or new fishery management programs will be needed to maintain and enhance the sport fishery. Consider cooperating with ODFW and CDFG to allow for continued fishery management programs. Additionally, consider providing information (signs, brochures) to the public detailing the location of shoreline fishing access opportunities.

- *Consider needs identified under boating*—As most anglers are boat anglers, consider the needs identified in the Overall Boating Needs in the Study Area section above.

<u>Overall Open Space Needs in the Study Area</u>

Overall recreation open-space-related supply, demand, and capacity factors are presented below, followed by a discussion of overall needs. General open space activities considered in this analysis include hunting, wildlife/nature observation, photography, and sightseeing, among others.

<u>Open Space Supply Factors:</u> Important open space supply factors to consider are summarized below (see Section 5.7.1 for more detail and Figure 1.1-2 for the location of developed and dispersed recreation sites in the study area):

- Much of the land in the Project's recreational study area, as well as in several adjacent areas, is natural open space used for recreation, wildlife habitat, timber production, and hydropower production.

- The Hell's Corner reach, located between the J.C. Boyle powerhouse and the California/Oregon stateline, was designated an Oregon State Scenic Waterway in 1988 and a National WSR in 1994. These designations provide for the continued preservation of natural open space along the reach. A new BLM Upper Klamath River Management Plan (BLM, 2003), once adopted, will provide updated management direction for this reach.

- At least 27 undeveloped dispersed recreation sites were identified in the study area. Many of these sites are likely used for open space-dependent activities including wildlife viewing, hunting, photography, and sightseeing, as well as other activities.

- Frain Ranch is a very large dispersed use area along the Upper Klamath River/Hell's Corner reach that provides a primitive setting for open space-dependent activities. Topsy Grade Road provides vehicular access to Frain Ranch, though this Klamath County road is primitive (4x4 only), unmaintained, and unusable at certain times of the year due to muddy conditions.

- There is an abundance of state and federal land in the regional study area, much of which is managed as natural open space. The Forest Service (Klamath National Forest) and BLM (Redding, Lakeview, and Medford districts) are the adjacent federal land management agencies in the region and have lands within or directly adjacent to the study area. Both Forest Service- and BLM-managed lands are managed in accordance with specific resource management plans developed for each unit.

<u>Open Space Demand Factors:</u> Important open space demand factors to consider are summarized below (see Sections 3.0 and 5.7.2 for more detail):

- Participation in open space-dependent activities in the study area was variable. Sightseeing (39 percent) and wildlife viewing (28 percent) were more popular activities according to survey respondents, while hunting (6 percent) was a less commonly reported activity. Reported participation in hunting is likely lower than actual participation rates as the majority of visitor surveys were administered during the peak season, which is generally a nonhunting season.

- Demand for open space-dependent recreational activities is projected to increase throughout the term of the anticipated new license. Demand for sightseeing and wildlife viewing is projected to increase by at least 1.2 percent per year, while demand for hunting is projected to increase by between 0.0 and 0.6 percent per year.

- Open space surrounding the study area reservoirs receives relatively low levels of recreational use based on observed use at dispersed recreation sites.

<u>Open Space Capacity Factors:</u> Important open space capacity factors to consider are summarized below (see Section 5.7.3 for more detail):

- Several sites exhibit some ecological impacts. Various dispersed sites in the study area are used by long-term nonrecreational squatters. This type of use decreases the overall capacity of dispersed sites for outdoor recreation activities.

- Hunting-related capacity is limited to specific game species, specific seasons, specific areas, and within certain harvest limits as established by ODFW and CDFG.

- Sensitive ecological areas, land ownership configurations, and access road conditions may restrict some uses of natural open space in the study area.

<u>Overall Open Space Needs:</u> Based on a review of the factors and indicators above, potential actions to address overall open space-related needs have been identified in the study area. It should not be assumed that these are proposed PM&E measures. As such, the word "consider" is used throughout this section. Site-specific open space needs are discussed in Recreation Facility and Use Area Needs by Site (Section 5.7.4.2), below. Overall open space needs and potential actions to satisfy them include:

- *Consider maintaining adequate open space lands on PacifiCorp-owned property*—An adequate supply of land for open space-related recreation activities appears to currently exist in most areas of the study area. As surrounding private lands develop over time, however, the quantity and quality of the remaining open space may be reduced in some areas. Consider retaining the existing study area open space lands to serve as a buffer to future private development and to retain the natural open space quality for visitors to the study area. Consider focusing recreation development only in highly suitable areas while retaining the remaining areas as open space. This will help retain a semiprimitive natural setting for outdoor recreation activities including hunting, wildlife viewing, photography, and other activities that are dependent on open space.

- *Consider providing designated wildlife viewing areas*—Currently, wildlife viewing opportunities are available at some sites in the study area (Link River Nature Trail and ODFW's Miller Island Boat Launch). Due to the increasing demand in wildlife viewing and photography through the anticipated term of the new license, additional wildlife viewing opportunities should be provided. Consider providing two ADA-accessible Watchable Wildlife sites, possibly one at each end of the study area.

#### 5.7.4.2 Recreation Facility and Use Area Needs by Site

The previous section addressed overall "big picture" needs in the study area. This section addresses existing and future recreation needs on a site-by-site basis by resource area. It should be noted that these are not proposed PM&Es; therefore, the word "consider" is used in this section. Unless specified otherwise, it is assumed that the character and level of development at each site are consistent with the existing type of recreation experience.

<u>Link River/Lake Ewauna/Keno Reservoir Resource Area</u>

The Link River/Lake Ewauna/Keno reservoir resource area is located at the northern end of the study area, adjacent to the city of Klamath Falls, Oregon (see Figure 1.1-1). Link River dam, currently operated by PacifiCorp under the direction of USBR, provides regulation of UKL and diverts water to the East Side and West Side powerhouses, as well as to the Link River bypass reach. The Keno dam, which creates Keno reservoir, is located approximately 21 miles downstream of the Link River dam. Keno reservoir has a surface water area of 2,475 acres and a total storage capacity of 18,500 acre-feet (PacifiCorp, 2000).

Recreation opportunities and facilities in the Link River/Lake Ewauna/Keno reservoir resource area include trails, boat launches, day use areas, and a campground. Existing PacifiCorp-operated recreation facilities include the Link River Nature Trail and the Keno Recreation Area. Other recreation facilities in the resource area include the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, managed by the City of Klamath Falls Department of Parks and Recreation, and ODFW's Miller Island Boat Launch, managed by ODFW.

<u>Link River Nature Trail:</u> The Link River Nature Trail runs approximately 1.5 miles along the west side of the Link River bypass reach. The trail is affiliated with the USA National Trails System and is part of the Link River Bird Sanctuary and Small Game Refuge. The trail is currently for pedestrian use only. A small parking area at the northern terminus of the trail provides approximately 15 parking spaces. There is no parking at the southern terminus of the trail. Other recreational facilities associated with the Link River Nature Trail include two trash receptacles, a bench near the dam, and four ADA-accessible fishing platforms at the northern end of the trail (three are located behind a locked gate).

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include hiking, wildlife viewing, and bank fishing.
- Due to the location of this site (in the city of Klamath Falls), this site receives a considerable amount of use from visitors who walk to the site. As a result, parking capacity is less of a consideration at this site.
- The northern trailhead is located adjacent to Putnam's Point, a park operated by the City of Klamath Falls.
- On an annual basis, recreational use of this site is estimated to account for approximately 25,300 RDs. Slightly more than half (54 percent) of annual use occurs during the peak season (weekday and weekend combined).
- Peak-season percent occupancy of this site is estimated to be 23 percent, while peak-season weekend percent occupancy is estimated to be 20 percent. Both of these occupancy rates are considered to be below capacity.
- Based on existing use levels and projected trends in recreation activities, this site will not reach the peak-season or peak-season weekend capacity thresholds by 2040 (Table 5.7-24).
- The mean perceived crowding score at this site is 2.1. This score is generally considered low and an indication that visitors to this site do not perceive crowding to be a problem at this time.
- Overall, recreation use at this site is considered to be below its recreation capacity. The primary limiting factor at this site is spatial capacity due to the lack of expansion possibilities.

*Existing Facility and Use Area Needs:*

- Consider repairing the trailhead parking areas and main paved access road.
- Consider replacing the interpretive displays and the fishing platforms (one to be fully accessible).
- Consider improved signage to and at this site.
- Consider planting a few areas with shade trees along the trail.
- Consider replacing the turnstiles at the northern and southern trailheads to increase ease of access for all visitors, including those with strollers.
- Consider making the trail ADA-accessible. This would require improving the trailheads and the trail, regrading steeper slopes in two areas, and making the fishing platforms fully accessible.
- Consider managing the trail as a multiple-use trail, allowing for other recreational activities such as bicycling.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

City of Klamath Falls' Veteran's Memorial Park/Boat Launch: Located in the city of Klamath Falls, Oregon, on the northern shoreline of Lake Ewauna/Keno reservoir, the City of Klamath Falls' Veteran's Memorial Park/Boat Launch is managed by the City of Klamath Falls Department of Parks and Recreation. The park has day use facilities and a boat launch. The day use area has five picnic tables, two benches, restroom facility (two flush toilets and a sink for both men and women), large stage with lighting, historical train display, small botanical garden, and approximately 75 parking spaces (two ADA-accessible). The boat launch has one ramp with two paved lanes, floating dock, boathouse, small observation area, six benches, informational signs, and parking for six vehicles with trailers.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include sightseeing, resting/relaxing, and picnicking.

- Due to the location of this site (in the city of Klamath Falls), it receives a considerable amount of use from visitors who walk to the site. Parking capacity may thus be less of a consideration at this site, except at the boat launch.

- Annual recreation use at this site is estimated to be approximately 42,500 RDs. Nearly 60 percent of use at this site occurs during the peak season (weekday and weekend combined).

- Percent occupancy at the boat launch area of this site is estimated to be approximately 144 percent during the peak season and 188 percent during peak-season weekends (Table 5.7-24). Both of these occupancy rates are considered to be well above capacity. However, the additional parking available at the day use area of this site currently accommodates most overflow use at this time.

- The mean perceived crowding score at this site is 1.7. This score is considered low and indicates that visitors at this site do not feel crowded.

- This site is considered to be approaching its recreation capacity due to its current level of use, lack of expansion potential, and observed ecological impacts. Biophysical, spatial, and facility capacity are considered limiting factors at this site.

*Existing Facility and Use Area Needs:*

- Consider increased signage and site management to prohibit passenger cars from using the limited parking stalls reserved for vehicles with trailers at the boat launch.

- Consider providing improved maintenance for the boat ramp.

- Consider replacing the nearby restrooms and drinking fountains at the park with ADA-accessible facilities.

- Consider repairing the parking area at the boat launch.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

ODFW's Miller Island Boat Launch: Located on the east shore of Keno reservoir about 6 miles south of Klamath Falls, ODFW's Miller Island Boat Launch is managed by ODFW. The boat launch is accessed through the Klamath Wildlife Area, Miller Island Unit, via Miller Island Road. The boat launch area has a concrete ramp with two lanes, an L-shaped wooden dock, a gravel parking area (ten parking spaces), an overflow parking area (15 vehicles), and a vault toilet. The road to the boat launch is very narrow and is one lane wide on top of a dike in some locations.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include powerboat fishing, wildlife viewing, and resting/relaxing.
- During the peak season (weekday and weekend combined), recreational use of this site is estimated to account for approximately 4,000 RDs. Annual recreational use accounts for about 7,350 RDs.
- This site receives heavier use during the fall waterfowl hunting season.
- Recreational use of this site during the peak season resulted in 36 percent occupancy for the entire season and 63 percent for peak-season weekends. Both of these occupancy rates are low to moderate and indicate that use is currently below capacity during the peak season and approaching capacity during peak-season weekends. Assuming current site capacity (supply of parking spaces), peak-season weekend occupancy is not projected to exceed 80 percent until 2037 (Table 5.7-24).
- The mean perceived crowding score at this site is 2.3. This is the highest crowding score of the four developed recreation sites in the Link River/Lake Ewauna/Keno reservoir resource area. However, this score is generally considered low and indicates that visitors do not perceive crowding as a particular problem at this site.
- Overall, this site is considered to be below its recreation capacity. Currently, limiting factors at this site include biophysical and spatial capacity.

*Existing Facility and Use Area Needs:*

- Consider improving the one-lane access road to the boat launch area by rerouting the road, providing additional signs, providing vehicle pull-outs, and/or defining a one-way loop roadway.
- Consider providing maintenance to the existing gravel parking area.
- Consider replacing or upgrading the boat ramp, dock, and older vault toilet (with a new vault toilet).
- Consider improving signage to and at the site, including I&E facilities (signs, kiosks, etc).

- Consider providing a trash receptacle at this site, or post it as pack it in/pack it out.
- Consider modifying the narrow access route and possibly discontinuing access to the site via the southern entrance road.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Keno Recreation Area:</u> Managed by PacifiCorp, Keno Recreation Area is located on the southwestern shore of Keno reservoir. The site is composed of a campground, day use area, and boat launch. The campground area has 26 developed campsites (each with a picnic table and fire pit), a restroom facility (two flush toilets and showers), an RV dump station, and five garbage dumpsters. There is a $10.00 per night fee to use the campground. The day use area is split between an upper and lower area. Combined, the two day use areas provide 19 picnic tables, two large cooking grills, two drinking fountains, playground equipment, two horseshoe pits, a historical display, and parking for approximately 50 vehicles. The boat launch has a one-lane concrete ramp, a T-shaped dock, a trash receptacle, portable toilet, and parking for about 12 vehicles.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include RV camping, resting/relaxing, and tent camping.
- During the peak season (weekday and weekend combined), recreational use of this site accounted for approximately 4,680 RDs. Annual recreation (all seasons combined) use is estimated to be approximately 6,050 RDs.
- Recreational use of this site during the peak season resulted in 33 percent occupancy for the entire season and 48 percent for peak season weekends. Both of these occupancy rates are considered moderate and indicate that use levels are currently below capacity. Peak-season and peak-season weekend occupancy at this site is not projected to reach or exceed the facility capacity thresholds by 2040 (Table 5.7-24).
- The mean perceived crowding score at this site is 2.0. This score is generally low and indicates that visitors do not feel overly crowded at this site.
- Overall, use levels at this site are considered to be below its recreation capacity. Currently, the primary limiting factor at this site is facility capacity due to the amount of use attributable to the campground area.

*Existing Facility and Use Area Needs:*

- Consider providing maintenance to the existing gravel parking areas and interior roads.
- Consider repairing the historical display, RV dump station, drinking fountains, and boat ramp.

- Consider hardening and/or closing and rehabilitating several user-defined trails that provide informal access to the various recreation facilities at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Dispersed Undeveloped Sites and Use Areas: No significant dispersed sites were identified in the Link River/Lake Ewauna/Keno reservoir resource area above Keno dam.

J.C. Boyle Reservoir Resource Area

The J.C. Boyle reservoir resource area is located roughly 5 miles downstream of Keno dam. J.C. Boyle reservoir, formed by the J.C. Boyle dam, has a surface water area of 420 acres and a total storage capacity of 3,495 acre-feet (1,724 acre-feet of active storage) (PacifiCorp, 2000).

Recreation opportunities and facilities at the J.C. Boyle reservoir resource area include a campground, day use areas, an outdoor sports park, and boat launches. PacifiCorp-operated recreation facilities include Pioneer Park (East and West units). Other recreation facilities in the J.C. Boyle reservoir resource area include Sportsman's Park, managed by Klamath County under a lease from PacifiCorp, and BLM's Topsy Campground, managed by BLM.

Sportsman's Park: Located on the southeastern shoreline of J.C. Boyle reservoir, Sportsman's Park is a 345-acre, multi-use outdoor sports park facility leased by Klamath County from PacifiCorp. It is operated by the Klamath Sportsman's Park Association. The park contains a rifle and pistol range, sporting clay range, archery ranges, ATV/motocross and dirt drag-strip racetracks, a model aircraft flying range, 16 picnic tables, two restroom facilities, and an informational signboard. An annual membership pass to the park costs $25.00 and single-day passes are $3.00.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include target shooting, archery, and ATV/motorbike use.

- The Klamath Sportsman's Park Association operates the site.

- The site operator at this site estimated that annual use of the site was approximately 12,600 RDs. Approximately 60 percent of annual recreation use at this site occurs during the peak season.

- Percent occupancy at this site is estimated to be 41 percent during the entire peak season and 50 percent during peak-season weekends. These use levels are generally low and peak-season occupancy is considered to be approaching capacity, while peak-season weekend capacity is considered below capacity (Table 5.7-24).

- The mean perceived crowding score at this site is 2.6. This was the lowest crowding score of the three developed recreation sites in the J.C. Boyle reservoir resource area. This score is considered low and indicates that perceived crowding is currently not a problem at this time.

- Overall, use levels at this site are considered to be below its recreation capacity. Facility capacity is the primary limiting factor at this time due to limitations on the number of specific facilities, such as range targets.

*Existing Facility and Use Area Needs:*
- None have been identified at this time.

*Future Facility and Use Area Needs:*
- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Pioneer Park (East and West Units):</u> Managed by PacifiCorp, Pioneer Park consists of two day use areas on the western and eastern shoreline of J.C. Boyle reservoir. Both areas can be accessed via SR 66 and are located on each side (west and east) of Spencer Bridge. Pioneer Park (West) has 15 picnic tables, 14 fire rings with grills, two portable toilets (one ADA-accessible), one trash receptacle, two trash dumpsters, informational signs, an informal dirt boat ramp, shoreline fishing area, and parking for approximately 25 vehicles. Pioneer Park (East) provides two picnic tables, one trash receptacle, three interpretive signs, a boat launch with two lanes (concrete ties), an informal car-top boat launch, shoreline fishing area, and parking for about 40 vehicles.

*Relevant Site Information:*
- Based on visitor survey results (questionnaire and observations), the primary activities at this site include resting/relaxing, picnicking, and swimming. Motor boating and waterskiing are also popular activities, particularly at Pioneer Park (West).

- Annual recreational use of this site accounts for nearly 16,700 RDs. During the entire peak season, recreational use is estimated to account for approximately 10,135 RDs, of which 5,160 RDs are attributable to peak-season weekends.

- Percent occupancy at this site is estimated to be 14 percent during the entire peak season and 15 percent during peak-season weekends. These use levels are low and indicate that the site is below the peak-season capacity thresholds. Use of this site is not projected to exceed the peak-season and peak-season weekend capacity thresholds by 2040 (Table 5.7-24). While use levels are generally low when investigated seasonally, Pioneer Park does receive large influxes of visitors for short periods of time on several occasions during the peak season (e.g., weekdays during the late afternoon, weekends, holidays, etc.).

- The mean perceived crowding score at this site is 2.9. This score is relatively low but indicates that visitors to this site may feel slightly crowded at this time.

- Overall, use levels at this site are considered to be below its recreation capacity. Currently, spatial capacity is the primary limiting factor as limited potential exists to expand this site. Biophysical, facility, and social capacity are not considered limiting factors at Pioneer Park (East and West).

- ODOT is planning to realign the SR 66 bridge that currently spans J.C. Boyle reservoir between Pioneer Park (West) and Pioneer Park (East). Preliminary realignment plans would eliminate Pioneer Park (East), though Pioneer Park (West) could likely be expanded to compensate for this loss. Additionally, the higher bridge will permit visitors to pass underneath it, thereby providing use of the entire reservoir for boating from any boat launch (the existing bridge does not allow boats to pass underneath it).

*Existing Facility and Use Area Needs:*

- Consider coordinating all improvements at Pioneer Park (West) with the realignment of the SR 66 bridge by ODOT (Pioneer Park [East] would be eliminated). Improvements should include redesigning the site to absorb the lost visitor capacity from Pioneer Park (East).

- Consider providing maintenance or improving the existing gravel parking areas and interior roads at Pioneer Park.

- Consider replacing the portable toilets (with new vault toilet buildings) and the informational signs at Pioneer Park (West).

- Consider providing a hardened boat launch at Pioneer Park (West) (to replace the existing informal dirt ramp).

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>BLM's Topsy Campground:</u> Managed by BLM, BLM's Topsy Campground is located on the southeastern shoreline of J.C. Boyle reservoir. The site consists of a campground, small day use area, and a boat launch. The campground area has 16 campsites (one ADA-accessible), two vault toilets, a RV dump station, five water faucets, two drinking fountains, 14 trash receptacles, and one trash dumpster. The small day use area provides two picnic tables (one ADA-accessible) and two grills. The small boat launch area has a two-lane concrete boat ramp, floating dock, ADA-accessible fishing pier with two benches, and parking for approximately three vehicles with trailers. These existing facilities, as well as future facilities, may be modified by actions in the Draft Upper Klamath River Management Plan (BLM, 2003), once adopted.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include RV camping, resting/relaxing, and picnicking.

- Annual recreational use of this site is estimated to account for nearly 6,000 RDs. All of this use occurs during the peak season (Memorial Day through Labor Day), as this site is closed during the early shoulder, late shoulder, and off seasons.

- Percent occupancy at this site is estimated to be 42 percent during the entire peak season and 55 percent during peak-season weekends. These use levels are generally low to moderate and peak-season occupancy is considered to be approaching capacity, while peak-season weekend capacity is considered below capacity. Assuming the current supply of campsites and parking spaces at BLM's Topsy Campground does not change, peak-season occupancy is estimated to exceed 60 percent capacity by 2031 and peak-season weekend occupancy is estimated to exceed 80 percent capacity by 2034 (Table 5.7-24).

- This site has the highest mean perceived crowding score in the J.C. Boyle reservoir resource area at 3.1. This score, however, is considered moderately low and indicates that visitors perceive crowding to be only a slight problem at this time.

- Overall, use levels at this site are considered to be below its recreation capacity. Currently, the primary limiting factor is facility capacity due to the limited number of available developed campsites in the resource area.

*Existing Facility and Use Area Needs:*

- Consider providing an ADA-accessible swimming area with a floating delineator and safety apparatus.

- Consider providing needed maintenance to the ADA-accessible fishing pier.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

- Consider adding a few new campsites (up to five) by 2031 to meet future demand, if adjacent land for development is suitable in consultation with BLM and consistent with the Draft Upper Klamath River Management Plan (BLM, 2003).

<u>Dispersed Undeveloped Sites and Use Areas:</u> Seventeen dispersed sites were identified along the J.C. Boyle reservoir shoreline and immediately below the dam along the river reach (Figure 1.1-2). Approximately 82 percent of these sites demonstrated impacts associated with overnight use (presence of a user-defined fire pit and other typical impacts), while the remaining sites show typical signs of day use impacts only.

*Relevant Site Information:*

- The condition of identified dispersed sites along the J.C. Boyle reservoir shoreline is variable. Several sites appear to be lightly used and exhibit only minor impacts. Other sites appear to be more heavily used and exhibit ecological impacts such as erosion, trash accumulation, sanitation problems, and vegetation removal.

- Some of the dispersed sites in this resource area, especially those identified in the vicinity of Spencer Creek (directly adjacent to the reservoir shoreline), are used by nonrecreational squatters.

- Participation in open space-dependent activities that typically occur at dispersed recreation sites was variable in the study area. Sightseeing (39 percent) and wildlife viewing (28 percent) were more commonly participated in activities according to survey respondents, while hunting (6 percent) was a less commonly reported activity. Reported participation in hunting is likely lower than actual participation rates as the majority of visitor surveys were administered during the peak season, which is generally a nonhunting season.

- Demand for open space-dependent recreational activities is projected to increase throughout the term of the anticipated new license. Demand for sightseeing and wildlife viewing is projected to increase by at least 1.2 percent per year, while demand for hunting is projected to increase by between 0.0 and 0.6 percent per year.

*Existing Facility and Use Area Needs:*

- Consider removing accumulated trash and other debris, as necessary, at several dispersed recreation sites (Dispersed Sites 1, 2, 3, 4, 5, 9, 14, 15, and 16) (Figure 1.1-2).
- Consider scheduling periodic cleanup of dispersed recreation sites.
- Consider closing and/or rehabilitating dispersed recreation sites with potentially severe ecological and/or cultural resource impacts (Dispersed Sites 2, 3, 7, 8, 9, 10, 11, 14, and 15) (Figure 1.1-2).
- Consider formalizing and hardening the Boyle Bluffs dispersed site, barricading vehicles to designated routes, rehabilitating disturbed areas, providing a graveled road and parking area, providing informational and warning signs, and pack it in/pack it out signs.
- Consider increased management presence at dispersed sites, especially the Boyle Bluffs site and sites used by nonrecreational squatters on Project lands.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels and resource impacts to determine whether capacity thresholds have been reached.
- Consider developing a developed day use area, 10-unit RV/tent campground, and/or group reservation camp at the Boyle Bluffs site once BLM’s Topsy Campground reaches capacity.

<u>Upper Klamath River/Hell’s Corner Reach Resource Area</u>

The Upper Klamath River/Hell’s Corner reach resource area is located immediately downstream of the J.C. Boyle powerhouse (Figure 1.1-1). The reach of river from the powerhouse downstream to the California stateline is designated a National WSR and an OSSW. BLM manages this reach of the river in cooperation with the State of Oregon. The reach below the California/Oregon stateline is not designated a WSR, but it is eligible for designation and is also managed by BLM. Both river reaches are not located within the FERC Project boundary; however, PacifiCorp voluntarily provides some recreational facilities along the reach in cooperation with BLM, OPRD, and CDFG.

Recreation opportunities and facilities at the Upper Klamath River/Hell’s Corner reach resource area include a campground, fishing access sites, and boat put-ins and take-outs. PacifiCorp-managed recreation facilities include six fishing access sites along the southern half of the reach. Other recreation facilities along the reach are managed by BLM and include the Upper Klamath River (Spring Island) Boater Access and BLM’s Klamath River Campground. Additionally, the Stateline take-out (PacifiCorp and BLM) is jointly managed by PacifiCorp and BLM. There are several dispersed sites along the river, including a large use area called Frain Ranch. Road access on both sides of the river is fairly primitive, with improved gravel road access to BLM boater access sites.

BLM and State of Oregon have recently developed a Draft Upper Klamath River Management Plan (2003) that defines management prescriptions and addresses recreation needs in the Upper Klamath River/Hell's Corner reach (BLM, 2003). Identified actions in the River Plan, once adopted, should be coordinated with the draft RRMP (Section 6.0).

<u>BLM's Upper Klamath River (Spring Island) Boater Access:</u> Managed by BLM, the Upper Klamath River (Spring Island) Boater Access site is located downstream from the J.C. Boyle powerhouse. The site provides launching for whitewater watercraft (rafts and kayaks) and shoreline fishing access. The site has one picnic table, ADA-accessible toilet building (two vault toilets), two changing areas, trash receptacle, and parking for approximately 12 vehicles. These facilities, as well as future facilities and boater activity, may be modified by actions in the Upper Klamath River Management Plan (BLM, 2003), once adopted.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include whitewater boating and bank fishing.

- BLM estimates that annual use of this site is approximately 5,250 RDs. Nearly 70 percent of use is estimated to occur during the peak season (weekday and weekend combined).

- Percent occupancy at this site is estimated to be 40 percent during the entire peak season and 54 percent during peak-season weekends. These use levels are generally low to moderate and peak-season occupancy is considered to be approaching capacity, while peak-season weekend capacity is considered below capacity. Additional parking spaces are not anticipated by 2040 (Table 5.7-24).

- Capacity at this site is linked to the number of watercraft and other users that can reasonably be accommodated on the river at one time. Capacity is defined through a permit process by BLM. Currently, only commercial whitewater boating operators must be permitted on the river reach (BLM currently provides a maximum of 23 commercial permits); private boaters may voluntarily obtain a permit from BLM. A new BLM river management plan (BLM, 2003) may contain revised permitting guidelines, once adopted.

- The mean perceived crowding score at this site is 2.7. This is the highest crowding score at developed sites in the Upper Klamath River/Hell's Corner reach resource area, though it is still considered relatively low. This crowding score indicates that visitors generally do not feel overly crowded at this site.

- Overall, use levels at this site are considered to be below its recreation capacity. Currently, the primary limiting factor is spatial capacity due to the lack of expansion potential at this site.

*Existing Facility and Use Area Needs:*

- Consider providing additional maintenance and possible rebuilding of some portions of the main access road to this site over time.

- Consider providing additional information signs to and at this site, including I&E facilities.

- Through the relicensing process and resource balancing, consider identifying appropriate river flows below the J.C. Boyle powerhouse that will accommodate continued whitewater boating, and wading-based fishing consistent with the Draft Upper Klamath River Management Plan (BLM, 2003), once adopted, and PacifiCorp's new FERC license.

- Consider other facility actions in the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003). In general, these may include site improvements, trail construction, and/or whitewater boating limits, among others.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>BLM's Klamath River Campground:</u> Managed by BLM, the Klamath River Campground is located approximately 3 miles downstream of the J.C. Boyle powerhouse. The primitive campground has three campsites (each with a picnic table and fire ring), a single-vault toilet building, and shoreline fishing and boating access. These facilities, as well as future facilities, may be modified by actions in the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include whitewater boating, tent camping, and resting/relaxing.

- BLM estimates that annual use of this site is approximately 1,000 RDs. It is estimated that nearly 70 percent of annual use at this site occurs during the peak season (weekday and weekend combined).

- Peak-season occupancy (30 percent) and peak-season weekend occupancy (41 percent) are considered to be below capacity. Use at this site is not anticipated to exceed the peak-season and peak-season weekend facility capacity thresholds by 2040 (Table 5.7-24).

- The mean perceived crowding score at this site is 1.9. This perceived crowding score is considered low and indicates that visitors to this site do not perceive crowding as a particular problem.

- Overall, use of this site is considered to be below, but approaching its recreation capacity. Both spatial and facility capacity are considered limiting factors at this time. Spatial capacity is a limiting factor because of limited expansion options at this site and access road conditions, while facility capacity is a limiting factor because of the limited number of campsites (three).

*Existing Facility and Use Area Needs:*

- Consider some improvement to the primitive access road to this site, while not attracting large crowds to this site.

- Consider actions in the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003). In general, these may include site improvements and/or site relocation.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Stateline Take-out (PacifiCorp and BLM): Located at the Oregon/California stateline, the Stateline take-out (PacifiCorp and BLM) has an upper and lower use area. The lower use area is managed by BLM and PacifiCorp and provides an undeveloped boat put-in/take-out, access to shoreline fishing, two portable toilets (one ADA-accessible), and parking for approximately eight vehicles. The upper use area is managed by BLM and has a large open field with several user-defined campsites (camping is not encouraged at this site), a new CXT vault toilet building (installed in 2003), and parking for up to about 20 vehicles. These facilities, as well as future ones, may be modified by actions in the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include bank fishing, whitewater boating, and tent camping.

- Annual recreational use of this site is estimated to be less than 3,000 RDs. The majority of use of this site occurs during the peak season (weekday and weekend combined).

- Site occupancy was 54 percent during the entire peak season and 78 percent during peak-season weekends. These occupancy levels indicate that this site is approaching its facility capacity. Peak-season weekend occupancy is projected to exceed 80 percent by 2005, while peak-season (weekday and weekend combined) occupancy is projected to exceed 60 percent by 2019. It is anticipated that the upper use area of this site could absorb this additional use (Table 5.7-24).

- The mean perceived crowding score at this site is 1.9. This score is considered low and an indication that perceived crowding is not a problem at this site.

- Overall, use of this site is considered to be approaching its recreation capacity. However, biophysical capacity (resource protection problems) is considered a limiting factor because of the number and severity of observed recreation and public use impacts. Spatial, facility, and social capacity are not considered limiting factors at this time at Stateline take-out (PacifiCorp and BLM).

*Existing Facility and Use Area Needs:*

- Consider resolving irrigation canal water runoff problems in the lower use area.

- Consider I&E facilities at this site.

- Consider resolving resource protection impacts in the lower use area, including possible closure to vehicular access per the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

- Consider formalizing and graveling parking areas in the upper use area.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Fishing Access Site 6: Fishing Access Site 6 is located downstream from Stateline take-out (PacifiCorp and BLM). The site consists of a graveled parking area (six to eight vehicles), single-vault toilet, and trash receptacle. Recently, PacifiCorp redeveloped this site as a whitewater boating take-out and has allowed commercial river rafting outfitters to use the take-out by permit only.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activity at this site is bank fishing.

- Recreational use of all six fishing access sites was considered in total, as use at individual sites was low. In total, annual use of these six sites accounts for approximately 3,630 RDs. Nearly all of this use is estimated to occur during the peak season.

- Percent occupancy at the fishing access sites is generally low (17 percent during the entire peak season and 25 percent during peak-season weekends) and considered to be below capacity (Table 5.7-24).

- Use of the fishing access sites has reportedly declined in recent years (PacifiCorp, 2000).

- The mean perceived crowding score at the six fishing access sites is 1.9. This score is low and indicates that visitors to these sites do not perceive crowding as a particular problem.

- Overall, use of the six fishing access sites is considered to be below capacity. Both ecological and spatial capacity are considered primary limiting factors, though these limiting factors are partially negated by the low level of use the six fishing access sites currently receive.

*Existing Facility and Use Area Needs:*

- Consider improving signage to and at this site.

- Consider redevelopment (but not enlargement) of this site if the lower portion of the Stateline take-out (PacifiCorp and BLM) is closed to vehicular access, an alternative considered in the Draft Upper Klamath River Management Plan (BLM, 2003).

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

- Consider replacing the vault toilet building and regraveling the parking area.

Fishing Access Site 5: This site is located downstream from Fishing Access Site 6. The site consists of a small gravel parking area (five vehicles) and several user-defined trails to the river bank.

*Relevant Site Information:*

- See description under Fishing Access Site 6, above.

*Existing Facility and Use Area Needs:*

- Consider improving signs at this site.
- Consider providing a formalized (hardened) fishing access trail at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.
- Consider regraveling the parking area.

<u>Fishing Access Site 4:</u> This site is located downstream from Fishing Access Site 5. The site consists of a graveled parking area (ten vehicles), single-vault toilet building, trash receptacle, and pedestrian trail to the river bank.

*Relevant Site Information:*

- See description under Fishing Access Site 6, above.

*Existing Facility and Use Area Needs:*

- Consider improving signs at this site.
- Consider providing a formalized (hardened) fishing access trail at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.
- Consider replacing the vault toilet building and regraveling the parking area.

<u>Fishing Access Site 3:</u> This site is located downstream from Fishing Access Site 4. The site consists of a graveled parking area (six vehicles), single-vault toilet building, trash receptacle, and pedestrian trail to the riverbank.

*Relevant Site Information:*

- See description under Fishing Access Site 6, above.

*Existing Facility and Use Area Needs:*

- Consider repairing or replacing the vault toilet building at this site.
- Consider improving signs at this site.
- Consider providing a formalized (hardened) fishing access trail at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

- Consider regraveling the parking area.

<u>Fishing Access Site 2:</u> This site is located downstream from Fishing Access Site 3. The site consists of a small graveled parking area (three vehicles), single-vault toilet building, trash receptacle, and pedestrian trail to the river bank.

*Relevant Site Information:*

- See description under Fishing Access Site 6, above.

*Existing Facility and Use Area Needs:*

- Consider improved signage at this site.
- Consider providing a formalized (hardened) fishing access trail at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.
- Consider replacing the vault toilet building and regraveling the parking area.

<u>Fishing Access Site 1:</u> This site is located downstream from Fishing Access Site 2, at the upper end of Copco reservoir where the river turns to flatwater. The site consists of a graveled parking area (ten vehicles), two portable toilets, two trash receptacles, and pedestrian trail to the river bank. This site is also the last take-out for whitewater boaters on the Hell's Corner reach.

*Relevant Site Information:*

- See description under Fishing Access Site 6, above.

*Existing Facility and Use Area Needs:*

- Consider providing additional maintenance (regraveling) to the access road and parking area at this site.
- Consider providing improved signs at this site.
- Consider replacing the portable toilets with ADA-accessible vault toilet buildings.
- Consider providing an ADA-accessible fishing platform and trail at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Dispersed Undeveloped Sites and Use Areas:</u> Four dispersed undeveloped sites were identified along the banks of the Upper Klamath River/Hell's Corner reach (Figure 1.1-2). Approximately half of these sites had observed impacts associated with overnight use (presence of a user-defined fire pit), while the other half showed typical signs of day use impacts only.

For purposes of this analysis, Frain Ranch is being considered as a dispersed use area. Frain Ranch is a very large use area with multiple dispersed sites, user-defined trails, and a spider web of dirt roads. The area is primarily used by whitewater boaters as a boater take-out/rest stop and viewpoint for upcoming Class V rapids. However, Frain Ranch is also used by shoreline anglers, dispersed tent campers, long-term nonrecreational squatters, and occasionally by larger groups, including tribal gatherings. A composting toilet building located at Frain Ranch has been closed due to severe vandalism. These facilities, and future ones, may be modified by actions in the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

*Relevant Site Information:*

- The condition of identified dispersed sites along the Upper Klamath River/Hell's Corner reach is generally good; however, some sites may be too close to the river. Most sites appear to be lightly used and exhibit only minor impacts. Frain Ranch, however, does receive increased use and is occasionally used by larger groups and long-term nonrecreational squatters. Vehicular access at Frain Ranch is uncontrolled, resulting in a spider web of dirt roads and vegetation and soil impacts.

- The dispersed recreation sites in this resource area are generally more difficult to access than other dispersed sites in the study area due to primitive road access along the river reach.

- Participation in open space-dependent activities that typically occur at dispersed recreation sites was variable in the study area. Sightseeing (39 percent) and wildlife viewing (28 percent) were more commonly participated in activities, according to survey respondents.

- Demand for open space-dependent recreational activities is projected to increase throughout the term of the anticipated new license. Demand for sightseeing and wildlife viewing is projected to increase by at least 1.2 percent per year, while demand for hunting is projected to increase by between 0.0 and 0.6 percent per year.

- Whitewater boating is estimated to account for approximately 5,250 RDs annually in the Upper Klamath River/Hell's Corner reach (based on an 8-year average provided by BLM). Most of these boaters stop at Frain Ranch or nearby. The 8-year high in registered whitewater boating use on the Hell's Corner reach occurred in 1998 with roughly 6,400 RDs. A recent decline in whitewater boating was noted in 2001 and 2002, likely due to flows that were affected by drought conditions, the California energy crisis, and Lower Klamath Basin wildfires of 2002.

*Existing Facility and Use Area Needs:*

- Consider actions at dispersed undeveloped sites in the river corridor per the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003). In general, these may include limiting or increasing the supply of dispersed recreation sites.

- In general, existing primitive recreational opportunities currently found at Frain Ranch should likely be preserved, but better managed. Consider providing some hardened recreational facilities in suitable areas. Such recreational facilities may potentially include new vault toilet buildings, remove or repair the closed composting toilet building, and provide hardened dispersed sites with picnic tables and fire rings. Potential new/improved recreation facilities at Frain Ranch should be consistent with BLM's Upper Klamath River Management Plan, once adopted (BLM, 2003).

- Consider increased seasonal management presence at Frain Ranch, such as a caretaker, to improve visitor safety, reduce resource impacts, and manage nonrecreational squatters.

- Consider I&E facilities at Frain Ranch.

- Consider an increased emphasis on resource protection at Frain Ranch.

- Consider providing vehicular access barriers to limit travel to designated routes and parking areas. Close and rehabilitate unnecessary roads. Nonmotorized trails should be developed in place of many of the roads in the Frain Ranch area.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels and resource impacts to determine whether capacity thresholds have been reached. In general, these may include limiting or increasing the supply of dispersed recreation sites.

<u>Copco Reservoir Resource Area</u>

The Copco reservoir resource area is located immediately downstream of the Upper Klamath River/Hell's Corner reach resource area (Figure 1.1-1). Copco reservoir, formed by the Copco No. 1 dam, has a surface water area of approximately 1,000 acres and a total storage capacity of 46,867 acre-feet (6,235 acre-feet of active storage) (see Exhibit A of the license application).

Recreation opportunities and facilities at the Copco reservoir resource area include day use areas and boat launches. PacifiCorp-operated recreation facilities include Copco Cove. Additionally, Mallard Cove is jointly managed by PacifiCorp and BLM. Much of the land adjacent to the study area around Copco reservoir is privately owned, and there are many existing hillside and shoreline homes located around the reservoir.

<u>Mallard Cove:</u> Located on the southern shoreline of Copco reservoir, Mallard Cove is jointly managed by PacifiCorp and BLM. The nonfee site consists of a day use/picnic area and a boat launch. While not an official campground, this site is also used for camping. The day use/picnic area has ten picnic tables, 12 cooking grills, a vault toilet building with two toilets, two trash receptacles, and a gravel parking area (25 vehicles). The boat launch has a concrete ramp with one lane. Additional ADA-accessible facilities have been proposed at this site but have not been constructed to date.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include powerboat fishing, RV camping, and resting/relaxing.

- Annually, recreational use of this site is estimated to be nearly 7,600 RDs. Approximately 71 percent of annual recreation use is estimated to occur during the peak season (weekday and weekend combined).

- Percent occupancy is 27 percent during the entire peak season and 40 percent during peak season weekends. This level of use is considered low. Peak-season and peak-season weekend use are not projected to reach or exceed the established facility capacity thresholds by 2040 (Table 5.7-24).

- The mean perceived crowding score at this site is 2.5. This score is relatively low and indicates that perceived crowding is not a problem at this site.

- Overall, use of this site is considered to be below its recreation capacity. Spatial capacity is the primary limiting factor at this time due to the lack of expansion potential at this site.

*Existing Facility and Use Area Needs:*

- Consider providing improved maintenance to the access road and regraveling of the parking area at this site.

- Consider providing improved signs at this site, including I&E facilities.

- Consider repairing the cooking grills.

- Consider formalizing and separating day use and/or overnight sites at this site, or prohibiting overnight camping at this site next to private residences.

- Consider improving ADA-accessibility at this site by potentially providing an accessible boarding float and paths to other accessible facilities, and an ADA-accessible fishing pier.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Copco Cove:</u> Located on the western shoreline of Copco reservoir, Copco Cove is managed by PacifiCorp. The site has a picnic area and a boat launch. While not officially a campground, the site does receive some overnight use. The picnic area has two picnic tables, two fire rings, a portable toilet, a trash receptacle, and a small gravel parking area (five vehicles). The boat launch has a concrete ramp with one lane and a concrete dock.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include powerboat fishing, picnicking, and resting/relaxing.

- Recreational use of this site is estimated to account for nearly 1,250 RDs annually. Sixty percent (755 RDs) of annual use is attributable to the peak season.

- Percent occupancy is 25 percent during both the entire peak season and peak-season weekends. This level of use is considered low. Recreational use at this site is not projected to exceed the peak-season or peak-season weekend facility capacity thresholds by 2040 (Table 5.7-24).

- The mean crowding score at this site is 2.7. This score is relatively low and indicates that visitors do not perceive crowding as a particular problem at this site.

- Overall, use of this site is considered to be below its recreation capacity. Spatial capacity is considered the primary limiting factor due to the lack of expansion potential at this site.

*Existing Facility and Use Area Needs:*

- Consider providing improved maintenance to the access road and regraveling the parking area at this site.
- Consider providing an improved vault toilet building.
- Consider regrading and expanding the access to the boat ramp (steep approach and limited turning radius).
- Consider formalizing and separating day use and/or overnight sites at this site, or prohibiting overnight camping at this small site.
- Consider providing signs at this site.
- Consider improving ADA-accessibility at this site by providing an accessible boarding float and paths to other accessible facilities.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Dispersed Undeveloped Sites and Use Areas:</u> Two dispersed sites were identified along the shoreline of Copco reservoir (Figure 1.1-2). One of these sites exhibits impacts associated with overnight use (presence of a user-defined fire pit), while the other one showed typical signs of day use impacts only.

*Relevant Site Information:*

- The identified dispersed sites along the Copco reservoir display moderate amounts of ecological impacts. The observed impacts, however, are likely caused primarily by cattle grazing, as opposed to recreation and public use.
- Participation in open space-dependent activities that typically occur at dispersed recreation sites was variable in the study area. Sightseeing (39 percent) and wildlife viewing (28 percent) were more commonly participated in activities according to survey respondents.
- Demand for open space-dependent recreational activities is projected to increase throughout the term of the anticipated new license. Demand for sightseeing and wildlife viewing is projected to increase by at least 1.2 percent per year, while demand for hunting is projected to increase by between 0.0 and 0.6 percent per year.

*Existing Facility and Use Area Needs:*

- Consider rehabilitating both dispersed recreation sites with ecological resource impacts (extensive bare ground). It should be noted that the extent of bare ground at both dispersed recreation sites on Copco reservoir is likely a result of cattle grazing, not recreation. Consider changes to cattle grazing along the Copco reservoir shoreline by working with local landowners.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels and resource impacts to determine whether capacity thresholds have been reached.

Iron Gate Reservoir Resource Area

The Iron Gate reservoir resource area is located at the southern end of the study area, approximately 20 miles northeast of Yreka, California (see Figure 1.1-1). Iron Gate reservoir, formed by Iron Gate dam, has a surface water area of 944 acres and a total storage capacity of 58,794 acre-feet (3,790 acre-feet of active storage) (see Exhibit A of the license application).

Recreation opportunities and facilities at the Iron Gate reservoir resource area include several campgrounds, day use areas, trails, and boat launches (Figure 1.1-2). All the recreation facilities at the Iron Gate reservoir resource area are managed by PacifiCorp and include Fall Creek Trail, Fall Creek, Jenny Creek, Wanaka Springs, Camp Creek, Juniper Point, Mirror Cove, Overlook Point, Long Gulch, and Iron Gate Hatchery Public Use Area. Four dispersed recreation sites and use areas were also identified along the Iron Gate reservoir shoreline.

Fall Creek Trail: Managed by CDFG, Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir, adjacent to a CDFG fish hatchery facility. The trail begins on the northern side of Copco Road and continues to the nearby Fall Creek Falls. There is a small picnic area with two picnic tables, water faucet, and trash receptacle near the start of the trail. There is also an ADA-accessible portable toilet at this site, though it is located behind a locked gate.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activity at this site is hiking.
- This site was closed (gated and locked) during the 2002 data collection period. Use is estimated to be low at this site, though this condition is partially a result of the site being gated and locked. If the site were open to the public and signed, recreational use would likely be higher.
- The mean perceived crowding score at this site was 2.9. This score is generally considered low, but it may indicate that visitors feel slightly crowded. The mean perceived crowding score for the Iron Gate reservoir resource area was assumed for this site.
- Overall, use of this site is considered to be below its recreation capacity. The primary limiting factor at this site is spatial capacity as there are few expansion possibilities.

*Existing Facility and Use Area Needs:*

- In consultation with CDFG, consider unlocking the gates to the Fall Creek Falls trail and the adjacent portable toilet for easier use by the public.
- Consider developing a loop trail and formalizing the existing semideveloped trail (including repairing the degraded upper portion of the trail, repairing or placing the lower creek crossing, increasing the surface tread width, and providing selective vegetation clearing).

- Consider providing additional signs indicating the location and name of this trail and trailhead.

- Consider providing I&E facilities at this site.

- Consider providing ADA-accessibility at this site, including an accessible trail to the base of Fall Creek Falls.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Fall Creek: Managed by PacifiCorp, Fall Creek recreation area is located on the far northeast shore of Iron Gate reservoir. The site is primarily a day use site, though some overnight use does occur. The site has three picnic tables, two cooking grills, two fire rings, a trash receptacle, a single vault toilet building (closed in 2002), a portable toilet, and parking for approximately eight vehicles. A boat launch was recently graveled at this site.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include sightseeing, powerboat fishing, and resting/relaxing.

- Current recreational use of this site is estimated to account for nearly 3,500 RDs annually. Slightly over half (53 percent) of the annual use of this site occurs during the peak season.

- Percent occupancy at this site is 39 percent during the entire peak season and 47 percent during peak-season weekends. Both of these occupancy rates are considered to be below capacity. Projected use at this site is estimated to reach a 60 percent peak-season capacity threshold by 2039 (Table 5.7-24).

- The mean perceived crowding score at this site is 3.1. This score is fairly low, though it indicates that visitors feel slightly crowded at this site.

- Overall, current recreational use is considered to be approaching capacity at this site. Both biophysical and spatial capacity are considered primary limiting factors due to observed impacts and the lack of expansion potential at this site.

*Existing Facility and Use Area Needs:*

- Consider providing improved maintenance to the gravel road and parking area at this site.

- Consider replacing the vault toilet building at this site with an ADA-accessible vault toilet building.

- Consider providing I&E facilities at this site with a potential focus on bird and other wildlife viewing opportunities (possible Watchable Wildlife station).

- Consider increased management presence at this site.

- Consider improved signs at this site.

- Consider redesigning, formalizing, and separating day use and/or overnight facilities at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Jenny Creek: Managed by PacifiCorp, Jenny Creek is located between Copco Road and Jenny Creek, near the northern shoreline of Iron Gate reservoir. The site is used for day use and overnight activities. The site has six day use/campsites, five picnic tables, two trash receptacles, a single-vault toilet building, and a gravel parking area for approximately 20 vehicles.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include resting/relaxing, bank fishing, and RV camping.

- Annually, recreational use of this site is estimated to account for nearly 3,700 RDs. During the entire peak season, recreational use accounted for approximately 1,850 RDs, while peak season weekends accounted for 1,120 RDs.

- Percent occupancy at this site is 52 percent during the entire peak season and 63 percent during peak-season weekends. These occupancy rates are considered to be approaching capacity. Peak-season occupancy is projected to exceed 60 percent by 2014, and peak-season weekend occupancy is projected to exceed 80 percent by 2023 (Table 5.7-24).

- The mean perceived crowding score at this site is 3.1. This crowding score is below the mean crowding score for the Iron Gate reservoir resource area (3.7) but indicates that visitors feel slightly crowded at this site.

- Overall, recreational use of this site is considered to be approaching its recreation capacity. The site is adjacent to a riparian zone. Biophysical and spatial capacity are considered primary limiting factors at this time due to observed riparian impacts and the lack of potential expansion options, respectively. Facility and social capacity are not considered limiting factors at Jenny Creek.

*Existing Facility and Use Area Needs:*

- Consider closure of this site due to its location adjacent to a riparian zone. If the site is retained, consider redesigning, formalizing, and separating day use and/or overnight facilities at this site or creating a group reservation site; and redesigning the site to protect adjacent riparian areas along Jenny Creek.

- Consider providing improved maintenance to the gravel road and parking area at this site.

- Consider hardening the user-defined trails at this site.

- Consider renovating the six existing campsites, including providing one ADA-accessible campsite.

- Consider increased management presence at this site.

- Consider improving signs at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Wanaka Springs: Located on the northern shoreline of Iron Gate reservoir, Wanaka Springs is managed by PacifiCorp. The site is primarily used for day use activities, though some camping does occur. The site has six picnic tables, three fire pits, two trash receptacles, two single-vault toilets, one portable toilet building, one wooden dock, and parking for approximately 18 vehicles.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include waterskiing, resting/relaxing, and tent camping.

- Annual recreational use of this site is estimated to account for nearly 4,150 RDs. Approximately 77 percent of annual recreational use occurs during the peak season (weekday and weekend combined).

- Percent occupancy at this site is 91 percent during the entire peak season and 146 percent during peak-season weekends. Both of the occupancy rates are high and are considered to have exceeded capacity thresholds (Table 5.7-24).

- The mean perceived crowding score at this site is 3.1. This score is fairly low, though it indicates that visitors perceive slight levels of crowding.

- Overall, current recreational use of this site is considered to be exceeding the capacity of this site. Biophysical, spatial, and facility capacity are all considered limiting factors at this site.

*Existing Facility and Use Area Needs:*

- Consider redesigning, formalizing, and separating day use and/or overnight facilities at this site.

- Consider providing improved signs at this site.

- Consider providing maintenance at the wooden dock, including erosion control on the slope to the dock.

- Consider repairing the gravel road and parking area at this site.

- Consider replacing the vault toilet buildings and portable toilet.

- Consider increased management presence at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Camp Creek: Managed by PacifiCorp, Camp Creek is located on Copco Road along the northern shoreline of Iron Gate reservoir. The site consists of three use areas. The first Camp Creek use area is located on the Iron Gate reservoir shoreline and has a campground and boat launch. Recreation facilities at the first use area include 13 campsites (each with a picnic table, fire ring, and parking space), a concrete boat ramp with one lane, a concrete dock, two wooden float docks, and parking for approximately eight vehicles. The second Camp Creek use area is located across Copco Road from the first use area and is generally used as an overflow parking and RV camping area when the first use area is full. The second use area consists of five picnic tables (two with shelters), three grills, an RV dump station, a composting toilet building with two toilets, portable toilet, trash receptacle, water faucet, and large grassy field with parking for approximately 60 vehicles. The third Camp Creek use area is located on the reservoir shoreline to the northwest of the first use area. Recreation facilities at the third use area include a picnic table, a partially ADA-accessible concrete fishing pier, and a small car-top boat launching area.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include powerboat fishing, RV camping, and resting/relaxing.

- On an annual basis, recreational use of this site currently accounts for approximately 15,260 RDs. A majority of annual recreation use (62 percent) occurs during the peak season (weekday and weekend combined).

- Percent occupancy at this site (excluding the overflow area) is 164 percent during the entire peak season and 188 percent during peak-season weekends (Table 5.7-24). Both of these occupancy rates are considered excessive and have exceeded the established facility capacity thresholds with overflow use. These high levels of use indicate that the overflow area of this site is used on a regular basis when the shoreline facilities are at capacity.

- The mean perceived crowding score at this site is 3.8. This was the second highest crowding score in the study area and indicates the visitors to this site feel somewhat crowded.

- Overall, current recreational use of this site is considered to be exceeding its recreation capacity. Biophysical, facility, and social capacity are considered primary limiting factors at this site.

*Existing Facility and Use Area Needs:*

- During the draft RRMP planning process, consider providing an additional 20 to 30 day use and/or overnight campsites to help meet current demand in the resource area. The overflow area of the site should be considered for potential improvement prior to developing a new recreation site to accommodate additional use. The overflow site may also be considered for a group reservation camp as an alternative.

- Consider providing ADA-accessible campsites per ADAAG, as amended, at this site. Other ADA-accessible facilities (toilets, water, parking, and access routes) should also be considered.

- Consider redesigning this site, including formalizing and separating day use and/or overnight facilities.

- Consider providing improved signs at this site, including I&E facilities (signboards, kiosks, etc.).

- Consider providing increased maintenance to the campsites and composting toilet building.

- Consider repairing the gravel roads at this site.

- Consider replacing the RV dump station.

- Consider replacing the two wooden docks.

- Consider providing an ADA-accessible boarding float at the boat launch.

- Consider providing an ADA-accessible swimming area with floating delineator and sandy beach.

- Consider providing an ADA-accessible fishing access platform, possibly at the current site.

- Consider providing mooring balls at this site to provide for temporary boat moorage.

- Consider increased management presence at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Juniper Point:</u> Located on the northwestern shoreline of Iron Gate reservoir, Juniper Point is managed by PacifiCorp. The site is used for both day use and overnight activities. The site provides nine semiprimitive campsites, which are also used as day use/picnic sites. Recreation facilities at the site include eight picnic tables, nine fire rings, two single-vault toilet buildings, two trash receptacles, and a wooden dock.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include waterskiing, resting/relaxing, and picnicking.

- Recreational use at this site is estimated to be 4,720 RDs annually. During the entire peak season, recreational use at this site accounted for approximately 3,590 RDs, while peak-season weekend use accounted for nearly 2,070 RDs.

- Percent occupancy at this site is estimated to be 69 percent during the entire peak season and 83 percent during peak-season weekends. This level of use is considered to be exceeding facility capacity thresholds (Table 5.7-24).

- The mean perceived crowding score at this site is 2.9. This score is relatively low and indicates that many visitors are slightly crowded but do not perceive crowding to be a significant problem at this site.

- Overall, current recreational use of this site is considered to be at its recreation capacity. Spatial and facility capacity are considered limiting factors at this time due to the lack of potential expansion options and higher use levels, respectively.

*Existing Facility and Use Area Needs:*

- Consider redesigning this site and formalizing and separating day use and/or overnight facilities.

- Consider providing increased maintenance to the fire rings.

- Consider repairing the gravel road at this site.

- Consider implementing erosion control measures at this site.

- Consider replacing the wooden dock.

- Consider providing improved signage at this site.

- Consider increased management presence at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Mirror Cove: Located on the western shoreline of Iron Gate reservoir, Mirror Cove is managed by PacifiCorp and provides day use, camping, and boat launching recreational facilities. The site consists of ten campsites, two single-vault toilet buildings, one portable toilet, four trash receptacles, concrete boat ramp with two lanes, concrete dock, and parking for approximately 20 vehicles. This site receives heavy use from waterski clubs and functions as a group site on occasion.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include waterskiing, RV camping, and resting/relaxing.

- Annually, recreational use of this site accounts for nearly 11,140 RDs. Approximately 75 percent of annual use is estimated to occur during the entire peak season (weekday and weekend combined).

- Percent occupancy at this site is 72 percent during the entire peak season and 85 percent during peak-season weekends. Both of these occupancy rates are high and are considered to be exceeding peak-season and peak-season weekend facility capacities (Table 5.7-24).

- The mean perceived crowding score at this site is 4.6. This is the highest crowding score in the entire study area and indicates that visitors feel moderately crowded at this site.

- Overall, current recreational use of this site is considered to be exceeding its recreation capacity. Spatial, facility, and social capacity are considered primary limiting factors at this site.

*Existing Facility and Use Area Needs:*

- Consider redesigning this site, including formalizing and separating day use and/or overnight facilities.

- Consider repairing or replacing the fire rings.

- Consider repairing the gravel road and parking area.

- Consider repairing the boat ramp, including improving ADA-accessible boat launching facilities (e.g., accessible boarding float, accessible parking, accessible access paths, etc.).

- Consider providing temporary mooring balls to help reduce shoreline erosion at this site.

- Consider replacing missing picnic tables at this site.

- Consider providing at least one ADA-accessible picnic facility at this site.

- Consider improving signs at this site.

- Consider replacing the vault toilet buildings.

- Consider increased management presence at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Overlook Point:</u> Managed by PacifiCorp, Overlook Point is a small day use area located on the western shoreline of Iron Gate reservoir. The site consists of three picnic tables, three fire rings, two vault toilet buildings (closed in 2002), one portable toilet, two trash receptacles, and parking for approximately six vehicles.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include waterskiing, picnicking, and resting/relaxing.

- Recreation use at this site accounts for nearly 1,900 RDs annually. During the peak season, recreational use accounts for approximately 1,325 RDs, of which 415 RDs are attributable to weekend use.

- Percent occupancy at this site is 32 percent for the entire peak season and 21 percent during peak-season weekends. This level of use is considered to be low. Percent occupancy is not projected to exceed the peak-season and peak-season weekend capacity thresholds by 2040 (Table 5.7-24).

- The mean perceived crowding score at this site is 2.4. This score is generally considered low and indicates that visitors do not feel crowding is a particular problem at this site.

- Overall, current recreation use is considered to be approaching capacity at this site. Biophysical and spatial capacity are primary limiting factors at this site due to the extent of observed impacts and the lack of potential expansion options, respectively.

*Existing Facility and Use Area Needs:*

- Consider closing this site due to the steep slope and observed resource damage.

- If this site is retained, consider redesigning this site with the following potential improvements:

  - Consider limiting use at this site to day use recreation activities only, possibly boat-in use only.
  - Consider providing improved signs to and at this site.
  - Consider implementing erosion control measures due to the steep topography at this site.
  - Consider repairing the steep gravel road at this site.
  - Consider repairing the undefined parking area.
  - Consider erecting barriers to confine vehicle use to the designated access road and parking area only.
  - Consider replacing the picnic tables.
  - Consider replacing the old vault toilet buildings (closed in 2002), with new vault toilet buildings.
  - Consider increasing management presence at this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

<u>Long Gulch:</u> Located on the southern shoreline of Iron Gate reservoir, Long Gulch is managed by PacifiCorp and provides day use, camping, and boat launching opportunities. The site consists of two picnic tables, two vault toilet buildings (closed in 2002), one portable toilet, two trash receptacles, one concrete boat ramp with one lane, and gravel parking (16 vehicles).

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include powerboat fishing, PWC use, and resting/relaxing.

- Annual recreational use of this site is estimated to account for nearly 5,225 RDs. Approximately 63 percent of annual use is attributable to the entire peak season.

- Percent occupancy at this site is 35 percent during the entire peak season and 47 percent during peak-season weekends. This level of use is considered low. Percent occupancy at this site is not projected to exceed the peak-season and peak-season weekend capacity thresholds by 2040 (Table 5.7-24).

- The mean perceived crowding score at this site is 2.7. This score is relatively low and indicates that visitors do not perceive crowding to be a particular problem at this site.

- Overall, recreational use of this site is considered to be below to approaching its recreation capacity. Biophysical capacity is currently the primary limiting factor at this site due to observed recreation and public use impacts.

*Existing Facility and Use Area Needs:*

- Consider redesigning this site, including formalizing it for day use only, with the upper graded area a possible group reservation site.

- Consider defining traffic patterns by erecting barriers to limit vehicle use to the designated access road and parking area only.

- Consider providing ADA-accessible boat launching facilities at this site. Potentially accessible facilities may include a boarding float, parking spaces, access routes, and other site amenities.

- Consider providing maintenance to the gravel road and parking area at this site.

- Consider implementing erosion control measures at this site.

- Consider repairing the picnic tables.

- Consider replacing the old vault toilet buildings with ADA-accessible vault toilet buildings.

- Consider new signage from Copco Road to this site, as there are currently no signs indicating the location of Long Gulch.

- Consider an increased management presence at this site.

- Consider acquiring a recreation access easement along the main access road to this site.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Iron Gate Hatchery Public Use Area: Located below Iron Gate dam, the Iron Gate fish hatchery is operated by CDFG with 80 percent funding from PacifiCorp. The public use area of the site consists of a day use area and a primitive boat launch across from the hatchery. The day use area is located adjacent to the fish hatchery and has a covered picnic shelter, six picnic tables, three trash receptacles, interpretive kiosk, two flush toilets in a hatchery building, ADA-accessible trail to the river/fish return area, and a gravel parking area for approximately 20 vehicles.

The primitive boat launch is located across the river from the hatchery and is used to launch car-top boats, rafts, and small trailered boats. A gravel road leads down to the shoreline where the launching area is river rock.

*Relevant Site Information:*

- Based on visitor survey results (questionnaire and observations), the primary activities at this site include picnicking and sightseeing.
- Recreational use of this site is estimated to account for approximately 2,200 RDs annually. During the entire peak season, recreational use is estimated to be 770 RDs, with nearly 500 RDs attributable to peak-season weekends.
- Percent occupancy at this site is 13 percent during the entire peak season and only 9 percent during peak-season weekends. Both of these occupancy rates are low and are considered to be below peak-season facility capacity thresholds. Percent occupancy is not projected to exceed the peak-season or peak-season weekend capacity threshold by 2040 (Table 5.7-24).
- The mean perceived crowding score at this site is 2.3. This crowding score is low and indicates that most visitors to this site generally do not feel crowded.
- Overall, recreational use of this site is considered to be below its recreation capacity. Spatial capacity is the primary limiting factor at this site due to the lack of expansion potential at the boat launch area.

*Existing Facility and Use Area Needs:*

- Consider providing a visitor contact orientation kiosk, including informational signs and maps, at this general location.
- Consider additional hardening and improved access to the primitive boat launch.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Dispersed Undeveloped Sites and Use Areas: Four dispersed sites were identified along the shoreline of Iron Gate reservoir (Figure 1.1-2). Three of these sites exhibit impacts associated with overnight use (presence of a user-defined fire pit), while the other one showed typical signs of day use only.

*Relevant Site Information:*

- The condition of identified dispersed sites along the Iron Gate reservoir is variable. Several sites appear to be lightly used and exhibit only minor impacts. Other sites appear to be heavily used and exhibit many severe ecological impacts. Some observed impacts at dispersed sites are likely from cattle grazing, not recreation and public use of the sites. Vehicular access to two of the dispersed sites is limited by cables.

- The dispersed sites in this resource area appear to be used primarily by shoreline anglers.

- The Long Gulch dispersed site adjacent to the developed Long Gulch site shows evidence of being used as a campground, with at least five identified fire rings.

- Participation in open space-dependent activities that typically occur at dispersed recreation sites was variable in the study area. Sightseeing (39 percent) and wildlife viewing (28 percent) were more commonly participated in activities, according to survey respondents.

- Demand for open space-dependent recreational activities is projected to increase throughout the term of the anticipated new license. Demand for sightseeing and wildlife viewing is projected to increase by at least 1.2 percent per year, while demand for hunting is projected to increase by between 0.0 and 0.6 percent per year.

*Existing Facility and Use Area Needs:*

- Consider closing and/or rehabilitating dispersed recreation sites with areas of large ecological impacts (Dispersed Site 1 and Long Gulch dispersed site). It should also be noted that some observed shoreline ecological resource impacts (bare ground and erosion) are likely caused by cattle grazing at Dispersed Site 1, not recreational use. As a result, cattle grazing activities along the shoreline should be reviewed.

*Future Facility and Use Area Needs:*

- Consider periodically monitoring use levels and resource impacts to determine whether capacity thresholds have been reached.

<u>Potential New Developed Recreation Sites in the Study Area</u>

Based on this assessment, not all anticipated recreation needs in the study area can be met at existing developed recreation sites through infill or redesign. This is especially the case at Iron Gate and Copco reservoirs, where most of the existing developed sites are physically constrained. At least one new developed recreation site will likely be needed during the term of the new license to accommodate future recreation use in the study area. A few potential sites for new recreation development or infill are described below. These sites and others will be further investigated and discussed in more detail during the planning process for the draft RRMP (Section 6.0). In a phased approach, redesigning and improving existing developed recreation sites should take priority over the construction of new sites.

- Iron Gate reservoir—A potential new campground and day use area may be considered at this reservoir to meet existing and future demand. The Long Gulch Bluff dispersed site, a large plateau site located adjacent to Long Gulch (Figure 1.1-2), may be explored as a potential option for new recreation development. This site would be in addition to a redesign and expansion of the campground at Camp Creek.

Several new trails should also be considered in the Iron Gate reservoir area. These trails include a Long Gulch to Iron Gate Hatchery Public Use Area trail and a Bogus Creek trail.

- Copco reservoir—Some limited new recreation development may be considered at Mallard Cove.
- J.C. Boyle reservoir—Recreation development may be considered at the Boyle Bluffs dispersed site. A new loop trail around the reservoir shoreline connecting BLM's Topsy Campground, Pioneer Park (West), and the potential new site at Boyle Bluffs should also be considered.
- Link River/Lake Ewauna/Keno reservoir—No new recreation facilities are currently anticipated on this reservoir.
- Upper Klamath River/Hell's Corner reach—Several new trails should be considered in this area. Potential trails may include a trail connecting the old foundations area adjacent to the J.C. Boyle powerhouse with Upper Klamath River (Spring Island) Boater Access, a trail connecting Upper Klamath River (Spring Island) Boater Access and Frain Ranch (Klamath River Edge Trail), multiple rapids scouting trails, and a few fishing access trails in the J.C. Boyle bypass reach.

#### 5.7.4.3 Project-Related Recreation Needs Criteria

The Recreation Needs Analysis has identified several proposed existing and future recreation needs in the study area. In determining which needs are Project-related and which ones are not, this section recommends three criteria for consideration during the relicensing process: direct Project cause, proximity to Project features, and shared recreation provider responsibility. These three criteria are discussed below and are intended to be viewed as a set of considerations that may be helpful in identifying proposed Project enhancements. All three of these criteria listed below should be considered together rather than separately.

<u>Direct Project Cause</u>

One factor is the cause or type of facility, activity, or use area creating the need. To address this factor, the cause of the need should be identified. Causes of Project-related needs may include recreation use or its impacts, either induced by the attraction of the reservoir (water-based activities and related shoreline use) or by increased access into areas that would not ordinarily have access as a result of Project roads. Activities that are not considered Project-related are assumed to include snow-related activities, hunting, caving, rock climbing, hang gliding, general sightseeing, and visitation at adjacent federal and state recreation areas; OHV use along the shorelines; and attractions where those areas are the primary destination. Because of the interrelated recreation use among BLM, Forest Service, other federal and state recreation providers, and PacifiCorp recreation facilities, future needs in the study area should be coordinated with these other recreation providers.

Potential needs (listed previously) that are not considered Project-related include needs specifically related to snow-related activities, hunting, caving, rock climbing, hang gliding, sightseeing, OHV use, and visitation to non-Project regional recreation attractions.

Proximity to Project Features

A second factor is the geographic proximity of the recreation need to Project features, such as the dams, reservoirs, Project recreation facilities, or within the FERC Project boundary. Needs associated with the Project may be based on proximity to Project features, such as along the Project shoreline or inside the FERC Project boundary.

Shared Recreation Provider Responsibility

The study area includes public, semiprivate, and PacifiCorp recreation providers. All of these recreation providers play an important role in providing for the recreational needs of both visitors and residents in the region and the study area. As such, each recreation provider meets only a portion of the overall needs in the region and the study area and has a shared responsibility, either geographically or by facility/activity type. No one recreation provider can do it all.

## 5.8 DISCUSSION

This discussion is intended to provide a general summary of results from the Recreation Needs Analysis pertinent to the existing and future condition of recreation resources and use in the study area. These results will be used in conjunction with other relicensing recreation study results to develop the draft RRMP (Section 6.0).

### 5.8.1 Characterization of Existing Conditions

The Recreation Needs Analysis examined the condition of existing recreation resources and use by exploring the supply of exiting recreation facilities, determining the demand for recreation facilities and activities, analyzing the recreation capacity of existing recreation sites, and developing a list of existing recreation needs in the study area. This section provides a summary of the results from these investigations.

#### 5.8.1.1 Recreation Supply Analysis Summary

The Recreation Supply Analysis component provides an inventory and evaluation of existing developed recreation sites and dispersed undeveloped sites and use areas in the study area. This analysis also describes the conditions of each of the facilities and sites in the study area. In total, there are 28 public developed recreation sites in the study area. Additionally, 27 dispersed undeveloped recreation sites and areas were identified in the study area. Brief descriptions of the recreation sites in each resource area are provided below.

Link River/Lake Ewauna/Keno Reservoir Resource Area

- There are a total of four developed recreation sites in the Link River/Lake Ewauna/Keno reservoir resource area (see Figure 1.1-2). There are no documented dispersed recreation sites or use areas in this resource area.

- There is one developed campground in this resource area: the Keno Recreation Area.
- There are three developed boat launches in this resource area: the City of Klamath Falls' Veteran's Memorial Park/Boat Launch, ODFW's Miller Island Boat Launch, and Keno Recreation Area boat launch.
- There are two developed day use facilities in this resource area: City of Klamath Falls' Veteran's Memorial Park/Boat Launch and Keno Recreation Area.
- There is one developed recreation trail in this resource area: the Link River Nature Trail.
- There are several ADA-accessible recreation features at the developed recreation sites in this resource area. ADA-accessible features include four shoreline fishing stations along the Link River Nature Trail, four parking spaces (two at City of Klamath Falls' Veteran's Memorial Park/Boat Launch and two at Keno Recreation Area), routes from parking area to restrooms at City of Klamath Falls' Veteran's Memorial Park/Boat Launch, and restrooms (City of Klamath Falls' Veteran's Memorial Park/Boat Launch and Keno Recreation Area).
- In general, the condition of recreation facilities at developed sites in this resource area is good, though specific amenities at each site need maintenance, repair, or replacement.

<u>J.C. Boyle Reservoir Resource Area</u>

- There are a total of three developed recreation sites in this resource area. There are also 17 documented dispersed recreation sites or use areas in this resource area (see Figure 1.1-2).
- There is one developed campground in this resource area: BLM's Topsy Campground.
- There are currently three developed day use facilities in this resource area: Sportsman's Park, Pioneer Park (East and West), and BLM's Topsy Campground.
- There are two developed boat launches in this resource area: Pioneer Park (East) and BLM's Topsy Campground.
- There are several ADA-accessible recreation features at the developed recreation sites in this resource area. ADA-accessible features include a portable toilet at Pioneer Park (West), a fishing pier, campsite, picnic table, and parking space all at BLM's Topsy Campground.
- In general, the condition of recreation facilities at developed sites in this resource area is good. However, specific amenities, including toilets and parking areas, at some of the developed recreation sites are in need of repair or replacement.

<u>Upper Klamath River/Hell's Corner Reach Resource Area</u>

- There are a total of nine (semi-) developed recreation sites in this resource area. There are also four documented dispersed recreation sites or use areas in this resource area, including Frain Ranch (see Figure 1.1-2).

- There is one developed campground in this resource area: BLM's Klamath River Campground.
- There are six developed fishing access sites along the river reach: Fishing Access Sites 1 through 6.
- There are four developed sites that accommodate car-top/hand launching and take-out of whitewater boats: BLM's Upper Klamath River (Spring Island) Boater Access (primary access for whitewater boating trips), Stateline take-out (PacifiCorp and BLM), Fishing Access Site 6 (by PacifiCorp permit only), and Fishing Access Site 1.
- Frain Ranch, located along the southern bank of the river reach, is a unique dispersed use area with multiple dispersed sites, as well as several historic buildings. The site is a popular stopping place for whitewater boaters and is occasionally used by large groups and long-term nonrecreational squatters.
- The only ADA-accessible feature in this resource area is the path from the parking area to the toilets/changing rooms at BLM's Upper Klamath River (Spring Island) Boater Access.
- In general, the condition of facilities at developed recreation sites in this resource area is considered variable. Many sites have facilities that are in good condition, though all of the sites have elements that are in need of maintenance, repair, or replacement.

<u>Copco Reservoir Resource Area</u>

- There are only two developed recreation sites in this resource area. There are also two documented dispersed recreation sites or use areas in this resource area (see Figure 1.1-2).
- There are two developed day use areas in this resource area: Mallard Cove and Copco Cove. Both of these sites are occasionally used for camping.
- Both Mallard Cove and Copco Cove have developed boat launches.
- There are no ADA-accessible features in the Copco reservoir resource area.
- Both developed recreation sites in this resource area are generally in good condition. Each site has specific amenities, however, that are in need of maintenance and repair.

<u>Iron Gate Reservoir Resource Area</u>

- There are ten developed recreation sites in this resource area. There are also four documented dispersed recreation sites or use areas in this resource area (see Figure 1.1-2).
- There are three designated developed campgrounds in this resource area: Camp Creek, Juniper Point, and Mirror Cove.

- There are six developed day use areas in this resource area: Fall Creek, Jenny Creek, Wanaka Springs, Overlook Point, Long Gulch, and Iron Gate Hatchery Public Use Area. Many of these day use sites are also used for camping.

- There are three developed boat launches in this resource area: Camp Creek, Mirror Cove, and Long Gulch. In addition, there are two unimproved boat launches in this resource area: Fall Creek and Iron Gate Hatchery Public Use Area.

- There is one developed trail in this resource area: Fall Creek Trail.

- There are several ADA-accessible recreation features at the developed recreation sites in this resource area. ADA-accessible features include a portable toilet at the Fall Creek Trail (behind a locked gate), parking at the Fall Creek Trail and Iron Gate Hatchery Public Use Area, a fishing pier at Camp Creek, and paths at the Iron Gate Hatchery Public Use Area.

- The condition of recreation facilities at the developed recreation sites in this resource area is variable. All of the developed sites have elements that are in good condition; however, all of the sites also have other facilities that are in need of maintenance, repair, and replacement.

#### 5.8.1.2 Recreation Demand Analysis Summary

The Recreation Demand Analysis component is used to help define existing and future demand for recreation activities in the study area. The analysis consists of two components. The first component considers regional demand using existing published SCORP data for Oregon and California and other existing published sources of regional data to estimate existing and future demand for various recreational activities in the study area. The second component compares the results of the Regional Recreation Analysis with the results from the Recreation Visitor Surveys and other published and anecdotal information. Key results of these two components are summarized below.

- CDPR (CDPR, 1998) cited the following eight activities as having high existing demand in California: (1) developed camping, (2) trail hiking/walking, (3) swimming (nonpool), (4) nature study/wildlife viewing, (5) primitive camping, (6) general use of open space, (7) freshwater fishing, and (8) picnicking.

- The 2003-2007 Oregon SCORP (OPRD, 2003) estimated existing demand for common outdoor recreation activities. The following activities were found to have high existing demand in Oregon: (1) sightseeing/driving for pleasure, (2) walking for pleasure, (3) visiting cultural/historic sites, and (4) nature study/wildlife viewing.

- According to the Oregon SCORP (2003) and the CDPR report (1998), whitewater boating activities have relatively low existing statewide demand. The most popular whitewater boating in the study area is the Upper Klamath River/Hell’s Corner reach between J.C. Boyle powerhouse and Copco reservoir. The 8-year average for the number of RDs on this reach of river is 5,250. The 8-year high was 6,395 RDs in 1995.

- The Oregon SCORP (2003) rates fishing as having moderate demand, while the CDPR report states that fishing has high existing demand. A survey conducted as part of the Recreation Visitor Surveys (Section 3.0) indicates that overall 34 percent of visitors to the study area participate in bank fishing (reservoir and river). Angler use here is concentrated at six fishing access sites downstream of the Stateline take-out (PacifiCorp and BLM), at Frain Ranch, and a few BLM sites upstream from there.

- In general, residents of both California and Oregon prefer more primitive or undeveloped settings than they are currently visiting (CDPR, 1998; OPRD, 2003). These results indicate that the more primitive and less developed settings provided in the study area are desired by many residents of Oregon and California.

- The number of fishing licenses sold in California has decreased considerably over the last 6 years (-12.5 percent), while Oregon has experienced a slight increase in the number of fishing licenses sold (1.6 percent).

- According to the Recreation Visitor Surveys (Section 3.0), the following activities were the most commonly cited primary activities among visitors to the study area: (1) fishing (boat), (2) waterskiing, (3) resting/relaxing, (4) fishing (bank), and (5) RV camping.

- The following recreation sites have the highest existing use measured in RDs in the study area: (1) City of Klamath Falls' Veteran's Memorial Park/Boat Launch, (2) Link River Nature Trail, (3) Pioneer Park (East and West), (4) Camp Creek, (5) Sportsman's Park, and (6) Mirror Cove.

- Peak-season use represents over 60 percent of annual recreational use of the study area; early shoulder season use is approximately 12 percent; late shoulder season use is approximately 17 percent; and off-season use is approximately 8 percent.

- The Link River/Lake Ewauna/Keno reservoir has the highest existing recreation use in the study area. This is due to its proximity to the city of Klamath Falls, Oregon.

- The majority (61.6 percent) of visitors surveyed in the study area are from Oregon. An additional 35 percent of visitors are from California. Two study area counties (Klamath, Oregon, and Siskiyou, California) accounted for nearly 50 percent of all visitors to the study area.

- Oregon is projected to experience a population increase of about 52 percent by 2040, and California is expected to experience a population increase of approximately 51 percent by 2040. Additionally, rapid growth occurring in many of the counties of visitor origin is projected to continue through 2040. The five counties with the highest existing use in the study area (Klamath, Jackson, Siskiyou, Josephine, and Shasta counties) are all projected to grow by over 40 percent by the year 2040.

- Using regional, statewide, and study area data, the following recreation activities are projected to increase in the study area at an annual rate of greater than 1.2 percent: (1) powerboating/PWC use, (2) sightseeing, (3) wildlife viewing, (4) RV camping, (5) resting/relaxing, (6) hiking, and (7) waterskiing.

- Future recreation use in the study area was estimated for the anticipated term of the new license (assumed to be through 2040 for planning purposes). Use of the study area is projected to reach approximately 282,000 RD by 2040. This represents approximately a 45 percent increase from existing use levels in the study area.

- Iron Gate reservoir currently has the second highest existing use among the reservoir resource areas and will likely to continue to have higher levels of use due to its ease of road access, proximity to I-5, and its extent of existing developed facilities.

- Copco reservoir currently has the lowest existing use among the reservoir resource areas. This is due to the limited road access (gravel and dusty conditions) to the reservoir and the limited number of developed facilities at the reservoir.

- J.C. Boyle reservoir currently receives moderate use, in large part due to Sportsman's Park. Sportsman's Park provides recreational opportunities (hunting, target shooting, archery) not available at other sites within the study area.

- The Link River/Lake Ewauna/Keno reservoir resource area is unique in that it is adjacent to the city of Klamath Falls, which has a significant impact on the amount of use within the resource area.

- The Upper Klamath River/Hell's Corner reach is unique within the study area in that a large percentage (64 percent) of the visitors are involved in whitewater boating. Use levels are largely dependent on whitewater boating activity changes over time, as long as access remains primitive.

#### 5.8.1.3 Recreation Capacity Analysis Summary

The Recreation Capacity Analysis consists of two components: (1) Recreation Capacity Analysis, and (2) Nonmotorized Recreation Trail Feasibility Study. The capacity analysis component provides an assessment of recreation capacity at each developed recreation site in the study area based on an evaluation of four types of capacity (biophysical, spatial, facility, and social) that are commonly used for planning purposes. The trail feasibility study component provides an inventory of existing recreational trails in the study area and proposes new trails for potential development. Summary results from these two components are provided below.

<u>Recreation Capacity Analysis</u>

Overall capacity conclusions for each resource area are summarized below based on a review of the four capacity types (biophysical, spatial, facility, and social).

<u>Link River/Lake Ewauna/Keno Reservoir Resource Area:</u>

- *Biophysical Capacity*—Biophysical capacity is considered a limiting factor at two developed recreation sites in this resource area (City of Klamath Falls' Veteran's Memorial Park/Boat Launch and ODFW's Miller Island Boat Launch). Observed impacts included erosion, vegetation damage, algae accumulation, and sanitation issues related to Canada geese and other waterfowl at City of Klamath Falls' Veteran's Memorial Park/Boat Launch, and sanitation issues and accumulated debris at ODFW's Miller Island Boat Launch. However, most of the observed ecological impacts are localized and do not appear to have a widespread influence on the biophysical capacity of the resource area, except for algae accumulation in the adjacent waters. For this reason, biophysical capacity is currently not considered a limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at three developed recreation sites in this resource area (Link River Nature Trail, City of Klamath Falls' Veteran's Memorial Park/Boat Launch, and ODFW's Miller Island Boat Launch). At each of these sites, the potential for physical expansion is limited by roads, private property, topography, and the river and/or reservoir. In addition to a lack of physical expansion at these sites, there are very few PacifiCorp-managed shoreline areas that are highly suitable for developed recreation sites in this resource area based on property ownership maps. Due to the spatial constraints at these existing developed recreation sites and the relative lack of additional areas for future recreation development, spatial capacity is considered a limiting factor at this resource area.

- At high pool elevations, there are approximately 2,475 surface water acres available for boating on Keno reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Developed—Section 5.7.3.2), it is estimated that approximately 128 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak-season boating use on the reservoir (1.7 BAOT) is much lower than the theoretical maximum BAOT estimate. Thus, surface water capacity is not a limiting factor at this time. However, the number of available parking spaces at boat launches on Keno reservoir may limit the number of boats the reservoir can accommodate in the future.

- *Facility Capacity*—Facility capacity is considered a limiting factor at two of the developed recreation sites in this resource area, City of Klamath Falls' Veteran's Memorial Park/Boat Launch and Keno Recreation Area. At each of these developed recreation sites, however, only specific facilities have reached their facility capacity (the boat launch parking area at City of Klamath Falls' Veteran's Memorial Park/Boat Launch and the campground at Keno Recreation Area). Due to the additional site capacity at each of these sites and the lower use levels (percent occupancy) at the remaining two developed recreation sites (Link River Nature Trail and ODFW's Miller Island Boat Launch), facility capacity is currently not considered a limiting factor at this resource area, though it may be in the future. While facility capacity is currently not a limiting factor, peak-season occupancy at this resource area is approaching capacity and may be a limiting factor in the future (Table 5.7-20).

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at the four developed recreation sites tended to be low (< 2.5) and the mean perceived crowding score for the resource area was 2.0. This crowding score is low and indicates that visitors to the resource area do not perceive high levels of crowding. Social capacity is not considered a limiting factor at this resource area because of this low mean perceived crowding score.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be below capacity. Spatial capacity is currently the only overall limiting factor at this resource area due to the general lack of expansion and/or new recreation site development options. While some recreation and public use impacts were observed, biophysical capacity is currently not a limiting factor. Facility capacity is a limiting factor at three developed recreation sites, but overall facility capacity is currently not considered a limiting factor at the resource area level. Surface water boating capacity is also not a limiting factor at this time. Additionally, perceived crowding scores are generally low in this resource area and social capacity is not considered a limiting factor at this time.

<u>J.C. Boyle Reservoir Resource Area:</u>

- *Biophysical Capacity*—Biophysical capacity is not considered a limiting factor at the developed recreation sites in this resource area. However, various ecological impacts were observed at the dispersed recreation sites along the reservoir shoreline. Observed impacts at dispersed recreation sites included vegetation damage and trampling, bare ground and soil compaction, large amounts of litter, and sanitation issues. Some of these impacts may not be related to recreation use, though, as several sites, especially those located near Spencer Creek, appear to be used by groups of long-term nonrecreational squatters. While some of the observed ecological impacts at dispersed sites are localized, many appear to be widespread and pose a constraint to the overall biophysical capacity of the resource area. Due to the ecological concerns at dispersed sites, biophysical capacity is currently considered a limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at Pioneer Park, where the potential for physical expansion is limited by roads and the reservoir. While this developed recreation site is physically constrained, there are a few PacifiCorp-managed shoreline areas with existing dispersed recreation sites that could be developed into hardened recreation sites if needed. Given this potential, spatial capacity is currently not a limiting factor at this resource area.

- At high pool elevations, there are approximately 420 surface water acres available for boating on J.C. Boyle reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Natural—Section 5.7.3.2), it is estimated that approximately eight watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak-season boating use on the reservoir (3 BAOT) is lower than the theoretical maximum BAOT estimate. Based on this level of use, surface water capacity is not a limiting factor at this time. However, surface water boating capacity is currently exceeded during heavier use periods (the maximum BAOT observed during field investigations was 10); thus, overall surface water capacity is considered to be approaching capacity.

- *Facility Capacity*—Recreational use of this resource area accounted for approximately 23,285 RDs during the peak season, of which about 56 percent are attributable to weekends (approximately 13,000 RDs) (Table 5.7-24). This level of use results in a peak-season percent occupancy of 28 percent and peak-season weekend percent occupancy of 33 percent. This level of use is generally considered to be low. Additionally, facility capacity is currently considered a limiting factor at Sportsman's Park and BLM's Topsy Campground. Given the level of recreation use at this resource area, facility capacity is not considered a limiting factor at this time.

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at the three developed recreation sites tended to be relatively low (< 3.2), though visitors may feel slightly crowded. The mean perceived crowding score for the resource area was 2.9. This crowding score was the second highest in the study area but is considered relatively low and indicates that visitors perceive slight levels of crowding. Social capacity is currently not considered a limiting factor at this resource area based on the mean perceived crowding score, but may be sometime in the future.

- *Overall Resource Area Capacity Conclusion*—Overall, use levels in this resource area are considered to be below capacity. Currently, biophysical capacity is considered a limiting factor due to the extent of observed recreation and public use impacts at shoreline dispersed recreation sites and areas. Additionally, while social capacity is currently not considered a limiting factor, this resource area may be approaching its social capacity and should be monitored. Neither facility capacity nor spatial capacity are considered limiting factors at this time.

Upper Klamath River/Hell's Corner Reach Resource Area:

- *Biophysical Capacity*—Biophysical capacity and resource damage are considered a limiting factor at Stateline take-out (PacifiCorp and BLM) and some of the Fishing Access Sites. Observed ecological impacts at all sites included resource damage, trampled vegetation, bare ground and soil compaction, erosion, and litter accumulation, among others. At the remaining developed sites and most of the dispersed sites, ecological impacts were minimal except for Frain Ranch. Frain Ranch exhibits several ecological impacts due to recreation and public use, including vegetation trampling and damage, bare ground and soil compaction, erosion, litter accumulation, sanitation problems, and vandalism to existing structures. The observed ecological impacts and resource damage at Frain Ranch were most pronounced at dispersed camping areas, along the braided network of dirt roads, along user-defined river access trails, and at the closed composting toilet building. It should be noted that some observed ecological impacts at Frain Ranch are caused by long-term nonrecreational squatters who regularly use this remote site. Except at Frain Ranch, ecological impacts and resource damage at developed and dispersed sites along the river reach are fairly localized. Biophysical capacity is currently considered a limiting factor at this resource area because of the many localized impacts in this hard-to-access and hard-to-maintain river reach.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at all of the developed recreation sites in this resource area, except Stateline take-out (PacifiCorp and BLM) that has space in the upper use area. Steep topography and limited road access are the primary constraints to physical expansion of the existing developed recreation sites along the river reach. However, several areas may be suitable for certain types of recreational development, including trails and small day use sites. Overall the remote, primitive natural setting and the lack of convenient road access to recreation sites on the river reach constrain the physical expansion potential of existing recreation sites. Whitewater boating use on the river reach is partially controlled by permits issued by BLM. Currently, only commercial whitewater boating operators must be permitted on the river reach; private boaters may voluntarily obtain a permit from BLM. A new BLM river management plan may contain revised permitting guidelines, once adopted (BLM, 2003). Given the constraints along the river reach, spatial capacity is considered a limiting factor at this resource area.

- *Facility Capacity*—Facility capacity is only considered a limiting factor at BLM's Klamath River Campground due to its limited number of campsites (three) and the lack of other developed campsites along the river reach. At all sites in this resource area, use levels tend to be lower (below to approaching capacity) due to the remoteness of the resource area, limited road access, and primitive conditions.

- *Social Capacity*—Social capacity is not considered a limiting factor at any of the developed recreation sites in this resource area. Perceived crowding scores at all of the developed recreation sites, except BLM's Upper Klamath River (Spring Island) Boater Access, tended to be low (< 2). The mean perceived crowding score at BLM's Upper Klamath River (Spring Island) Boater Access is 2.7. This score is also relatively low but indicates that visitors may feel slight levels of crowding at this site. The mean perceived crowding score for the resource area is 2.2. This crowding score was the second lowest in the study area and is considered low. Social capacity is currently not considered a limiting factor at this resource area based on the low mean perceived crowding scores of visitors to this area.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be approaching capacity. While two developed recreation sites in this resource area are considered to be below capacity, the remaining two are considered to be approaching capacity. The primary limiting factors at each of the developed recreation sites and at the resource-area level are biophysical capacity and spatial capacity. Currently, biophysical capacity is considered a limiting factor due to the extent of observed recreation and public use impacts at Frain Ranch and at the other shoreline dispersed recreation sites and areas. Additionally, the more primitive and remote nature of the resource area makes it more susceptible to widespread ecological impacts due to access constraints. Spatial capacity is a limiting factor because of the lack of expansion possibilities at many of the existing developed recreation sites, the general lack of large areas along the river reach for new developed recreation sites, and poor road access due to site conditions. Facility capacity is currently not considered a limiting factor, but it may be in the future based on the limited capacity of the existing developed recreation sites. Social capacity is not considered a limiting factor at this resource area at this time.

<u>Copco Reservoir Resource Area:</u>

- *Biophysical Capacity*—Biophysical capacity is not considered a limiting factor at either of the developed recreation sites in this resource area. Observed ecological impacts at both sites were localized and do not constitute a widespread constraint to the biophysical capacity of the resource area. Additionally, observed impacts at the two dispersed sites on Copco reservoir were also minimal. Observed impacts at the dispersed sites appear to be caused primarily by cattle grazing rather than recreational use. Biophysical capacity is currently not considered a limiting factor at this resource area because of the lack of widespread ecological impacts resulting from recreational use of the area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at both of the developed recreation sites in this resource area. Steep topography and land ownership patterns limit potential expansion of either developed recreation site at Copco reservoir. However, while these two developed recreation sites are physically constrained, there are other undeveloped shoreline areas where future recreation sites could potentially be developed. Land ownership and infrastructure issues would need to be investigated at these sites, and an improved access road along the northern shoreline would likely need to be provided prior to new site development. Given the potential option for future recreation development along the Copco reservoir shoreline, spatial capacity is currently not a limiting factor at this resource area.

- At high pool elevations, there are approximately 1,000 surface water acres available for boating on Copco reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Natural—Section 5.7.3.2), it is estimated that approximately 20 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current peak season mean boating use on the reservoir (2.3 BAOT) is much lower than the theoretical maximum BAOT estimate. Thus surface water capacity is not a limiting factor at this time.

- *Facility Capacity*—Recreational use of this resource area is estimated to account for over 6,130 RDs during the peak season and approximately 4,165 RDs during peak-season weekends (Table 5.7-24). This level of use equates to an occupancy rate of 27 percent during the peak season and 38 percent during peak-season weekends (Table 5.7-24). Neither of the developed recreation sites in this resource area is considered to have reached its facility capacity. While facility capacity is not currently a limiting factor at the developed recreation sites, and recreational use in the resource area is relatively low, facility capacity is an overall limiting factor at the resource-area level due to the small number of available developed sites and facilities at the reservoir. The small number of developed recreation sites (two) in this resource area may ultimately limit the amount of recreational use the area could receive, particularly as the Iron Gate reservoir resource area fills up.

- *Social Capacity*—Social capacity is not considered a limiting factor at either of the developed recreation sites in this resource area. Perceived crowding scores at both developed recreation sites tended to be relatively low; however, the resource area mean was assumed for Copco Cove due to the limited number of completed surveys at this site. The mean perceived crowding score for the resource area was 2.7. This crowding score is considered relatively low and indicates that visitors perceive slight levels of crowding. Social capacity is currently not considered a limiting factor at this resource area based on the mean perceived crowding score and its low level of use.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be below capacity. The primary limiting factor for this resource area is facility capacity. Facility capacity is a limiting factor because of the small number of developed recreation sites and facilities in this resource area. These limited facilities will ultimately limit the amount of recreational use the area could accommodate. Additionally, this resource area is more difficult to access (e.g., lack of a paved road from Iron Gate reservoir, lack of signs indicating location of reservoir and recreation sites, etc.) compared with other study area reservoirs. Biophysical, spatial, and social capacity are not considered limiting factors at this resource area at this time. Surface water boating capacity is also not considered a limiting factor at this time.

<u>Iron Gate Reservoir Resource Area:</u>

- *Biophysical Capacity*—Biophysical capacity is considered a limiting factor at six of the ten developed recreation sites in this resource area: Fall Creek, Jenny Creek, Wanaka Springs, Camp Creek, Overlook Point, and Long Gulch. Observed ecological impacts included vegetation trampling and damage, bare ground and soil compaction, erosion, downed wood being removed, and litter accumulation. While many of these impacts were localized, several constitute a constraint to the overall biophysical capacity of the resource area.

- Vegetation trampling, bare ground, erosion, and litter accumulation were also observed at several of the dispersed sites along the reservoir shoreline. However, some of the observed impacts (vegetation trampling, bare ground, and erosion) at the dispersed sites appear to be caused primarily by cattle grazing rather than recreational use. Due to the observed impacts at developed and dispersed recreation sites, biophysical capacity is considered an overall limiting factor at this resource area.

- *Spatial Capacity*—Spatial capacity is considered a limiting factor at eight of the ten developed recreation sites in this resource area, excluding Camp Creek and Long Gulch. One of the primary constraints to the physical expansion of existing recreation sites and the potential construction of future sites is the proximity of Copco Road to the northern shoreline of the reservoir. In many areas, the road runs directly adjacent to the shoreline and bisects several of the existing developed recreation sites on the northern shoreline. While areas to expand developed recreation sites may exist on the nonreservoir side of Copco Road, visitor safety (i.e., visitors must cross road to access portions of the site) must be considered if expansion on the nonreservoir side of the road is explored. Steep topography and land ownership also pose constraints to the expansion of existing sites and the development of future recreation sites. In general, while several areas for potential expansion of existing recreation sites or the development of new recreation sites exist, spatial capacity is considered an overall limiting factor due to the physical constraints of this resource area.

  At high pool elevations, there are approximately 944 surface water acres available for boating on Iron Gate reservoir (Table 5.7-20) (PacifiCorp, 2000). Given this number of available surface water acres and the water ROS classification of this reservoir (Rural Developed—Section 5.7.3.2), it is estimated that approximately 47 watercraft could potentially be accommodated at one time on this reservoir (Table 5.7-20). Current average boat use on the reservoir (22 BAOT) is lower than the theoretical maximum peak season BAOT estimate. Based on this level of use, surface water capacity is not a limiting factor at this time. However, surface water boating capacity is currently exceeded during heavier use periods (the maximum BAOT observed during field investigations was 76); thus, overall surface water capacity is considered to be approaching capacity.

- *Facility Capacity*—Recreational use of this resource area is estimated to account for nearly 33,750 RDs during the peak season and approximately 19,550 RDs during peak-season weekends (Table 5.7-24). This level of use equates to an occupancy rate of 60 percent during the peak season and 73 percent during peak-season weekends (Table 5.7-24). Peak-season occupancy is considered to be at capacity, while peak-season weekend occupancy is considered to be approaching capacity. Facility capacity is a limiting factor at this resource area based on these levels of use. Additionally, facility capacity is a limiting factor at four of the ten developed recreation sites in this resource area and will likely be a limiting factor at several of the remaining sites in the future.

- *Social Capacity*—Social capacity is considered a limiting factor at two of the ten developed recreation sites in this resource area, Camp Creek and Mirror Cove. While social capacity is not considered a limiting factor at the other developed recreation sites, the perceived crowding scores at several sites indicate that visitors perceive at least slight levels of crowding. Additionally, the mean perceived crowding score for this resource area was the highest in the study area (3.7). This crowding score is generally considered fairly high and indicates that the social capacity of the resource area may be an overall concern and is a factor to monitor over time. Due to the resource area's mean perceived crowding score, social capacity is currently considered a limiting factor at this resource area.

- *Overall Resource Area Capacity Conclusion*—Overall, recreational use of this resource area is considered to be at or exceeding capacity. Four developed recreation sites are considered to be at or exceeding capacity individually, while an additional three developed recreation sites are approaching capacity in this resource area. All four capacity types are considered to be limiting factors in this resource area. Biophysical capacity is considered a limiting factor because of observed recreation and public use impacts at developed and dispersed recreation sites in this resource area. Spatial capacity is a limiting factor in this resource area due to the general lack of land for new and/or expanded recreation development. Surface water spatial boating capacity is currently not considered a limiting factor, but boating use exceeds capacity during heavier use periods and will likely be a limiting factor in the future. Facility capacity is a limiting factor because of the levels of use the resource area receives and because of the higher levels of use several of the developed recreation sites receive. Additionally, the perceived crowding scores in this resource area were the highest in the study area, indicating that use is approaching the resource area's social capacity.

<u>Nonmotorized Recreation Trail Feasibility Study</u>

This section presents the summary results of the trail feasibility study.

<u>Existing Nonmotorized Trails in the Study Area:</u> Existing developed nonmotorized trails in the study area were identified by reviewing relicensing recreation studies and existing trail-related plans and maps, and conducting a site reconnaissance. Identified developed nonmotorized trails in and adjacent to the study area include:

- *Link River Nature Trail*—The Link River Nature Trail runs approximately 1.5 miles along the west side of the Link River bypass reach.

- *Klamath Wildlife Area Wildlife Viewing Trail*—The Klamath Wildlife Area is located on the east shore of Lake Ewauna/Keno reservoir about 6 miles south of Klamath Falls. The Wildlife Viewing Trail is approximately 1 mile long and follows a levee near the entrance station to the wildlife area.

- *Fall Creek Trail*—The Fall Creek Trail is located between Iron Gate reservoir and Copco reservoir. The short trail begins on the northern side of Copco Road and continues to Fall Creek Falls.

<u>Potential Nonmotorized Recreation Trail Routes in the Study Area:</u> Potential trail routes identified during field research in each of the five resource areas are provided below. Throughout the relicensing process, including the development of the draft RRMP, some potential trail routes may be dropped from further consideration, while other potential new trail routes may be added.

- *Link River/Lake Ewauna/Keno Reservoir Resource Area*—Link River Nature Trail (improvements and potential connections), Klamath Wildlife Area (improvement and extension), and Keno reach (potential new trail route along the south side of the Klamath River).

- *J.C. Boyle Reservoir Resource Area*—Reservoir Loop Trail (potential new trail route around the reservoir's shoreline and connecting BLM's Topsy Campground, Boyle Bluffs, and Pioneer Park West).

- *Upper Klamath River/Hell's Corner Reach Resource Area*—Potential new and/or improved trail routes in this resource area include improved fishing access site trails, Klamath River Edge Trail (from Upper Klamath River [Spring Island] Boater Access to Frain Ranch), several rapids scouting trails, fishing access trails in the J.C. Boyle bypass reach, J.C. Boyle Powerhouse Old Foundations Area to Upper Klamath River (Spring Island) Boater Access Trail, and formalized trails at Frain Ranch.

- *Copco Reservoir Resource Area*—Fall Creek Trail (improvements and extension).

- *Iron Gate Reservoir Resource Area*—Camp Creek/Horseshoe Ranch Wildlife Area trail route (potential new trail route), Jenny Creek (potential new trail route), Long Gulch to Iron Gate Hatchery Public Use Area Trail (potential new trail route), and Bogus Creek Trail (potential new trail route).

#### 5.8.1.4 Recreation Needs Analysis Summary

The Recreation Needs Analysis is a synthesis of the results of several previous recreation studies conducted as part of the relicensing process. Results associated with the following recreation studies were used to formulate the overall and site-specific recreation needs in the study area:

- Recreation Flow Analysis (Section 2.0)
- Recreation Visitor Survey Analysis (Section 3.0)
- Regional Recreation Analysis (Section 4.0)
- Recreation Supply Analysis (Section 5.7.1)
- Recreation Demand Analysis (Section 5.7.2)
- Recreation Capacity Analysis (Section 5.7.3)

In addition to the results of these studies, other published reports and stakeholder comments were considered in the Recreation Needs Analysis.

The Recreation Needs Analysis consists of three components:

- An analysis of overall "big picture" recreation needs in the study area over time

- An identification of recreation needs on a site-by-site basis
- The development of Project-related recreation needs criteria to be considered during the relicensing process

Summary of Overall Recreation Needs in the Study Area

Overall public recreation needs were assessed by comparing and contrasting a number of supply, demand, and capacity factors to arrive at conclusions. This study component focused on the "big picture" need for various types of facilities or opportunities, without specifying where or how such needs might be met. Potential actions to meet general needs are summarized by activity below. These needs should be coordinated with the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

Overall Camping Needs in the Study Area: Overall camping needs and potential actions to satisfy them include considering:

- Redesign of some existing campground facilities.
- Additional maintenance and site improvements to existing camping facilities for resource protection, health and safety, ADA compliance, relieve crowding, and visitor experience enhancement.
- Increasing the supply of camping facilities to help meet current and future demand where suitable, principally at Iron Gate reservoir. Consider infill and redesign of a few existing facilities and likely one new campground.
- Providing a range of camping experiences, from developed to semiprimitive.
- Charging overnight camping fees at some locations after these sites are improved in the future.
- ADA compliance at all existing and new camping facilities per ADAAG, as amended.
- Hardening undeveloped sites and monitoring visitor use at dispersed sites and use areas commonly used for camping.

Overall Day Use/Picnicking Needs in the Study Area: Overall day use/picnicking needs and potential actions to satisfy them include considering:

- Redesign of some existing day use facilities.
- Additional maintenance and site improvements to existing day use/picnicking facilities for resource protection, health and safety, ADA compliance, relieve crowding, and visitor experience enhancement.
- Increasing the supply of day use/picnicking facilities to help meet future demand where suitable, principally at Iron Gate reservoir. Consider infill and redesign of existing facilities.
- Monitoring visitor use of dispersed undeveloped recreation sites.

- ADA compliance at all existing and new day use/picnicking facilities per ADAAG, as amended.

Overall Boating Needs in the Study Area: Overall boating needs and potential actions to satisfy them include considering:

- Additional maintenance and site improvements to existing boating-related facilities for resource protection, health and safety, ADA compliance, relieve crowding, and visitor experience enhancement.
- Increasing reservoir law enforcement and management presence over time as needed.
- ADA compliance at some existing and new boating-related facilities per ADAAG, as amended.

Overall Swimming/Sunbathing Needs in the Study Area: Overall swimming/sunbathing needs and potential actions to satisfy them include considering:

- If water quality improves, increasing the supply of swimming-related facilities to help meet current and future demand, as well as providing some fully accessible swimming areas.

Overall Interpretation and Education Needs in the Study Area: Overall interpretation and education needs and potential actions to satisfy them include considering:

- Developing an I&E Program as a program in the draft RRMP.
- New I&E facilities in the study area, such as signs, kiosks, etc.
- ADA compliance at all existing and new interpretation and education facilities per ADAAG, as amended.
- Providing new and/or enhanced nature trail opportunities.

Overall Trail Needs in the Study Area: Overall trail needs and potential actions to satisfy them include considering:

- New and/or enhanced trail opportunities in the study area.
- Construction of some ADA-accessible trail segments in the study area.
- Implementing a trail sign program.

Overall Fishing Needs in the Study Area: Overall fishing needs and potential actions to satisfy them include considering:

- Providing an additional ADA-accessible fishing piers in the southern study area.
- Needs identified under boating (discussed previously).

Overall Open Space Needs in the Study Area: Overall open space needs and potential actions to satisfy them include considering:

- Maintaining current undeveloped open space lands on PacifiCorp-owned property for activities such as wildlife viewing, sightseeing, nature appreciation, photography, and other recreational activities that rely on adequate natural open space.

- Providing designated wildlife viewing areas and Watchable Wildlife stations.

Summary of Needs on a Site-by-Site Basis

The second Recreation Needs Analysis component focused on site-specific needs for various types of facilities and opportunities. Potential actions to meet these site-specific needs are summarized below.

Link River/Lake Ewauna/Keno Reservoir Resource Area: Existing recreation facility needs in this resource area include considering:

- *Link River Nature Trail*—Increased maintenance and repair of trail amenities (signs, trailhead parking, etc.), replacing certain trail facilities (interpretive displays, turnstiles, etc.), making the trail ADA-accessible, and managing the trail as a multiple-use trail by considering bicyclists.

- *City of Klamath Falls' Veteran's Memorial Park/Boat Launch*—Increased signage and management, improved maintenance and repair (boat ramp, parking area, etc.), and replacing facilities at the nearby park (ADA-accessible restrooms and drinking fountains).

- *ODFW's Miller Island Boat Launch*—Improving certain facilities (access road and circulation, parking area, signs), replacing other site facilities (boat ramp, dock, vault toilet), and providing a trash receptacle.

- *Keno Recreation Area*—Providing improved maintenance (gravel parking areas and interior roads), repairing some site facilities (historical display, RV dump station, boat ramp), and hardening interior user-defined access trails.

J.C. Boyle Reservoir Resource Area: Existing recreation facility needs in this resource area include considering:

- *Sportsman's Park*—No existing needs identified at this time.

- *Pioneer Park (East and West)*—Providing improved maintenance (gravel parking areas, interior roads, boat ramp, car-top boat launching area), replacing specific site facilities (portable toilets and informational signs), and replacing the informal dirt boat launch with a new one where the current bridge exists. Coordinate these modifications with the proposed SR 66 bridge replacement by the Oregon Department of Transportation (ODOT).

- *BLM's Topsy Campground*—Providing maintenance to the ADA-accessible fishing pier, possible campground expansion (up to five sites), and replacing the water well and system.

- *Dispersed Undeveloped Sites and Use Areas*—Trash removal, closing and/or rehabilitating certain sites, and increased management presence at dispersed sites.

Upper Klamath River/Hell's Corner Reach Resource Area: Existing recreation facility needs in this resource area include:

- *BLM's Upper Klamath River (Spring Island) Boater Access*—Continued maintenance to the access road over time, providing improved directional signs, and identifying appropriate river flows that will accommodate whitewater boating consistent with the Draft Upper Klamath River Management Plan (BLM, 2003), once adopted, and PacifiCorp's new FERC license conditions.

- *BLM's Klamath River Campground*—Continued maintenance to the access road.

- *Stateline take-out (PacifiCorp and BLM)*—Improved maintenance (interior roads, gravel parking areas), providing interpretation and education facilities, replacing portable toilets, and formalizing upper use area (parking area and tent camping). Possible closure of the lower use area to vehicular traffic (walk-in only) per the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

- *Fishing Access Sites 1-6*—Improved signage (all sites), replacing vault toilet buildings (at some sites, with ADA-accessible vault toilet buildings), and consider additional maintenance to access road and parking area (regraveling). Possible relocation of the Stateline take-out (PacifiCorp and BLM) boater access site to Fishing Access Site 6 per the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003). Consider an ADA-accessible fishing access platform at Fishing Access Site 1.

- *Dispersed Undeveloped Sites and Use Areas*—Seasonal management presence at Frain Ranch (caretaker) and patrols, I&E facilities at Frain Ranch, increased emphasis on resource protection at Frain Ranch, barricading some dirt roads, providing new vault toilet buildings, and providing some hardened recreational facilities in suitable areas at Frain Ranch. Remove the old composting toilet building (currently closed).

Copco Reservoir Resource Area: Existing recreation facility needs in this resource area include considering:

- *Mallard Cove*—Improved maintenance and repair to site facilities (access road, parking area, cooking grills), providing improved signs, improving ADA access, and formalizing and separating day use and/or overnight facilities. Consider an ADA-accessible fishing pier at this site.

- *Copco Cove*—Improved maintenance and repair to site facilities (access road, parking area), regarding and expanding access to the boat ramp, providing improved signs, improving ADA access, and formalizing and separating day use and/or overnight facilities. Consider day use only at this site.

- *Dispersed Undeveloped Sites and Use Areas*—Rehabilitating sites with ecological resource impacts (some impacts are from cattle grazing).

Iron Gate Reservoir Resource Area: Existing recreation facility needs in this resource area include considering:

- *Fall Creek Trail*—In consultation with CDFG, repairing upper portion of trail, providing signs and I&E facilities, improving ADA accessibility, and unlocking access gates to the trail.

- *Fall Creek*—Providing improved maintenance (gravel road and parking area), providing signs and I&E facilities, increased management presence, improving ADA accessibility, formalizing and separating day use and/or overnight facilities, and possibly providing a Watchable Wildlife site at this location.

- *Jenny Creek*—Consider a possible site closure due to existing riparian impacts. As an alternative, providing improved maintenance (gravel road and parking area), increased management presence, improved signs, improved ADA accessibility, and renovating the site including separating day use and/or overnight facilities and protecting riparian areas.

- *Wanaka Springs*—Providing additional day use or camping sites, maintenance and repair to site facilities (wooden dock, vault toilet buildings, gravel road, parking area), providing improved signs, improved ADA accessibility, increased management presence, and separating and formalizing day use and/or overnight facilities. Also, consider a group campsite at this location.

- *Camp Creek*—Providing additional day use and camping sites, redesigning site including formalizing and separating day use and/or overnight facilities, improving maintenance and repair (campsites, toilets, gravel road), replacing specific site facilities (RV dump station, wooden docks), improving ADA accessibility, providing mooring balls, increased management presence, providing a possible group reservation, and providing an ADA-accessible fishing access platform.

- *Juniper Point*—Redesigning this site including formalizing and separating day use and/or overnight facilities, improving maintenance and repair (fire rings, gravel road), replacing the wooden dock, improved signs, improving ADA accessibility, and increased management presence.

- *Mirror Cove*—Redesigning this site including formalizing and separating day use and/or overnight facilities, improving maintenance and repair (fire rings, gravel road, boat ramp), replacing specific site facilities (picnic tables, toilets), providing ten mooring balls, improved ADA accessibility, improved signs, and increased management presence.

- *Overlook Point*—Potentially closing this site due to resource impacts and steep slope; or possibly implementing a series of actions to improve this site (limit use to day use only, or possible boat-in use only, implement erosion control measures, repair existing facilities, and increase management presence, among others).

- *Long Gulch*—Redesigning this site including formalizing and separating day use and/or overnight facilities, defining traffic patterns, improving maintenance and repair (picnic tables, gravel road, boat ramp), replacing specific site facilities (toilets), improving ADA accessibility, improving signs, and increased management presence. Also consider the upper graded area as a small group reservation site.

- *Iron Gate Hatchery Public Use Area*—Providing improved visitor contact orientation kiosk in this area and hardening and improving access to the primitive boat launch.

- *Dispersed Undeveloped Sites and Use Areas*—Closing and/or rehabilitating dispersed sites with area of large ecological impacts.

### 5.8.2 Characterization of Future Conditions

The Recreation Needs Analysis also examined the condition of future recreation resources and use by exploring potential recreation supply, demand, capacity, and needs in the study area through the anticipated term of the new license (assumed to be approximately 2040 for planning purposes). This section provides a summary of results pertinent to the future condition of recreation resources and use in the study area.

Future conditions that will likely have an effect on study area recreation demand and use levels are summarized below.

- Oregon is projected to experience a population increase of about 52 percent by 2040, and California is expected to experience a population increase of approximately 51 percent by 2040. Additionally, rapid growth occurring in many of the counties of visitor origin is projected to continue through 2040. The five counties with the highest existing use in the study area (Klamath, Jackson, Siskiyou, Josephine, and Shasta counties) are all projected to grow by over 40 percent by the year 2040.

- Using regional, statewide, and study area data, the following recreation activities are projected to increase in the study area at an annual rate of greater than 1.2 percent: (1) powerboating/PWC use, (2) sightseeing, (3) wildlife viewing, (4) RV camping, (5) resting/relaxing, (6) hiking, and (7) waterskiing.

- Future recreation use in the study area was estimated for the anticipated term of the new license (assumed to be through 2040 for planning purposes). Use of the study area is projected to reach approximately 282,000 RD by 2040 (currently 192,000 RDs). This represents approximately a 45 percent increase from existing use levels in the study area.

- Facility capacity at several developed recreation sites in the study area is projected to exceed the 60 percent peak-season and 80 percent peak-season weekend facility capacity threshold during the term of the new license. The following developed sites will likely exceed one or both facility capacity thresholds by 2040:

  - City of Klamath Falls' Veteran's Memorial Park/Boat Launch
  - ODFW's Miller Island Boat Launch
  - BLM's Topsy Campground
  - Stateline take-out (PacifiCorp and BLM)
  - Fall Creek
  - Jenny Creek
  - Wanaka Springs
  - Camp Creek
  - Juniper Point
  - Mirror Cove

- In general, the Iron Gate reservoir resource area has the greatest need for new developed recreation facilities in the study area during the term of the new license (approximately 80 campsites and up to 25 day use sites needed). Many of the facilities needed at Iron Gate reservoir are current needs (i.e., needed in the next 5 to 10 years), while some of the new day use sites and campsites are needed in the future as use at recreation facilities reaches and exceeds capacity.

- The J.C. Boyle reservoir resource area is the only other resource area with facility needs in the study area. Approximately ten new campsites are anticipated in this resource area in the future.

- The City of Klamath Falls' Veteran's Memorial Park/Boat Launch and ODFW's Miller Island Boat Launch are expected to have parking capacity problems in the future. However, assuming adjacent overflow areas can be formalized, this need may be resolved with minor improvements.

- No additional new significant recreation facility needs are currently anticipated at the remaining three resource areas.

Given the anticipated increase in demand for study area activities and facilities, future site-specific recreation site needs are summarized below.

<u>Link River/Lake Ewauna/Keno Reservoir Resource Area</u>: At all developed sites in this resource area, consideration should be given to periodically monitoring use levels to determine whether site capacity thresholds have been reached. Other future recreation facility needs in this resource area include:

- Aside from continued operations, maintenance, and management presence, no new sites are currently anticipated in this resource area.

<u>J.C. Boyle Reservoir Resource Area</u>: At all developed and dispersed sites in this resource area, consideration should be given to periodically monitoring use levels to determine whether site capacity thresholds have been reached. Other future recreation facility needs in this resource area include:

- Expansion through infill is not feasible at BLM's Topsy Campground. As a result, consider adding ten campsites to the potential new site located at Boyle Bluffs.

<u>Upper Klamath River/Hell's Corner Reach Resource Area</u>: At all developed and dispersed sites in this resource area, consideration should be given to periodically monitoring use levels to determine whether site capacity thresholds have been reached. Other future recreation facility needs in this resource area include:

- No new sites are currently anticipated in this resource area. Potential new/improved recreation sites in this resource area should be consistent with the Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

- Consider replacing the vault toilet building and regraveling the parking area at Fishing Access Sites 2, 4, and 6.

- Consider regraveling the parking area at Fishing Access Sites 3 and 5.
- Consider replacing the portable toilets at Fishing Access Site 1 (or sooner if an ADA-accessible fishing platform is constructed earlier).

Copco Reservoir Resource Area: At all developed and dispersed sites in this resource area, consideration should be given to periodically monitoring use levels to determine whether site capacity thresholds have been reached.

Iron Gate Reservoir Resource Area: At all developed and dispersed sites in this resource area, consideration should be given to periodically monitoring use levels to determine whether site capacity thresholds have been reached. Other future recreation facility needs in this resource area include:

- A potential new campground and day use area may be considered at this reservoir. The Long Gulch dispersed site, a large plateau area located adjacent to Long Gulch, is a potential site for new recreation development. Other potential sites may also be considered. This new site would be considered for potential development after infill potential and redesign projects have been completed at existing recreation sites, namely Camp Creek.

# 6.0 RECREATION RESOURCE MANAGEMENT PLAN

## 6.1 DESCRIPTION AND PURPOSE

The purpose of this study is to develop a detailed annotated outline for the draft Recreation Resource Management Plan (RRMP). The complete annotated outline of the draft RRMP is provided in Appendix 6A. When completed, the draft RRMP will identify the long-term roles and responsibilities of PacifiCorp for providing recreation opportunities and facilities in the Project area over the anticipated term of the new license. The draft RRMP will describe PacifiCorp's recreation goals and objectives, identify recreation development and maintenance programs to be implemented, provide a list of proposed PM&E measures, and provide details on implementation including a schedule, estimated costs, operations and maintenance activities, conceptual site plans, and periodic monitoring activities. The draft RRMP will satisfy FERC requirements for developing a recreation plan for the study area in compliance with 18 CFR 4.5.1 F (5). Once completed, the draft RRMP will be filed with FERC as a draft plan. After a new license is issued by FERC, the draft RRMP will be finalized.

## 6.2 OBJECTIVES

The draft RRMP will help answer the following key questions. How will PacifiCorp:

- Address existing and future Project-related recreation needs in the study area for the term of the new license?
- Develop, maintain, and monitor Project-related developed recreation facilities in the study area for the term of the new license?
- Monitor and maintain Project-related dispersed/undeveloped recreation sites and use areas in the study area for the term of the new license?
- Help coordinate recreation management opportunities and funding for partnerships with other entities, such as BLM?
- Help provide for the health and safety of recreation visitors at Project facilities and reservoirs?
- Help manage and monitor recreation resources in the study area to be compatible with other resource values for the term of the new license?

## 6.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The draft RRMP will satisfy FERC requirements to prepare a recreation plan and to define the responsibilities of parties when public recreation facilities are to be provided. The draft RRMP will use results from the previous recreation studies, as well as agency, tribal, and other stakeholder consultation, to develop a plan to effectively guide the management of existing and future recreation resources associated with the Project. The draft RRMP will establish goals for managing recreation resources in the Project vicinity, identify measures for existing and proposed recreation resources, and describe programs designed to implement those measures.

More specifically, the draft RRMP is an implementation tool to be used to guide, design, construct, renovate, monitor, fund, operate, and maintain existing and future public recreation facilities and programs in the Project vicinity for the term of the new license. Conclusions and recommendations will be formulated that address only Project-related recreation facilities and related activities. This will be done with the understanding that the draft RRMP will not represent a comprehensive planning effort for the entire Upper Klamath basin, but will focus only on the Project lands and waters and resources affected by the Project.

The draft RRMP will identify a series of site-specific and programmatic recreation PM&E measures. The draft RRMP also will detail how these measures will be implemented over the anticipated term of the new license, including estimated costs for development and operation, conceptual site plan designs, and an implementation schedule over the term of the new license. As a result, the draft RRMP will address agency comments on the FSCD and draft study plans relative to the roles and responsibilities of PacifiCorp during the term of the new license.

## 6.4 METHODS AND GEOGRAPHIC SCOPE

The annotated outline of the draft RRMP is provided in Appendix 6A. Specific tasks that were conducted between the draft license application in 2003 and the final license application in 2004 include the following:

- In consultation with stakeholders, develop several implementation programs that are a key part of the draft RRMP, including recreation facility capital improvements, recreation facility operations and maintenance (O&M), recreation monitoring, I&E, multi-resource integration, whitewater river recreation (including boating and fishing), aesthetics/visual resource enhancement measures, and draft RRMP plan updates over time.
- In consultation with stakeholders, compile these programs into the draft RRMP document.

The completed draft RRMP will be provided in Appendix E7-A of the final license application.

### 6.4.1 Develop Draft RRMP Programs

The draft RRMP will define the necessary programmatic details associated with implementing new facility development, performing facility and use area O&M, providing whitewater boating and fishing flows if appropriate (to be coordinated with all resource needs), conducting periodic monitoring, and coordinating resource needs and integration over the anticipated term of the new license.

Like other resource-specific plans, the development of the draft RRMP programs will involve a process that brings together major recreation providers in the study area (such as BLM), resulting in coordinated and planned actions benefiting the recreating public and other resource values. Like PacifiCorp, BLM and other agencies have a shared responsibility in the management of recreation resources in the study area. The draft RRMP will be specific to PacifiCorp's recreation resource responsibilities as Licensee and will not make commitments for other entities, such as BLM or private interests.

Several programs will be developed in the draft RRMP. These programs will be based on study results and agency, tribal, and other stakeholder input and consultation. Actions developed in the draft RRMP may be adjusted in the future through an adaptive management strategy that will involve periodic monitoring of public recreation resources and visitation over time in the study area, yet provides certainty to PacifiCorp.

The draft annotated outline of the draft RRMP (Appendix 6A) will be refined and reviewed by the agencies, tribes, and other stakeholders. Comments received will be addressed prior to the full development of the draft RRMP.

Eight programs are anticipated in the draft RRMP to define PacifiCorp's roles and responsibilities during the anticipated term of the new license. These programs are as follows:

- Recreation Facility Development/Capital Improvement Program. This program will define PacifiCorp's construction-related responsibilities, identify proposed recreation development projects, provide estimated costs for recreation measures, identify locations and conceptual layouts of the development measures, and discuss general facility development standards and criteria to be used. Partnerships with BLM and others for developing new facilities will be identified, if any.

- Recreation Operations and Maintenance Program. This program will define PacifiCorp's O&M responsibilities, provide estimated costs for O&M, and discuss general facility and use area maintenance standards to be followed. Partnerships with BLM and others for maintaining facilities and use areas will be identified. Land and on-water law enforcement needs and issues, such as Marine Patrols, will be discussed in this program.

- Whitewater Boating and Fishing Program. This program will define PacifiCorp's potential whitewater flow volumes and schedules and discuss general whitewater recreation needs and issues. Coordination with BLM, USBR, other agencies, and stakeholders concerning whitewater releases and schedules will be discussed in this program. Because recreation flows below the J.C. Boyle powerhouse are linked to many other resource flow needs, this program likely will not be finalized until a new license is issued and flow levels and ramping rates are determined.

- Recreation Monitoring Program. This program will define PacifiCorp responsibilities related to periodic recreation resource monitoring in the study area. Features will likely include a Limits of Acceptable Change (LAC)-type format consisting of a recreation capacity and suitability methodology used to identify standards for monitoring. Other features include definitions of basic annual monitoring needs including use and resource conditions, additional periodic monitoring and reporting responsibilities, and a decisionmaking framework related to when new facility construction (if any) would be triggered.

- Resource Integration and Coordination Program. This program will define how recreation resource issues and needs identified in the draft RRMP will be coordinated and integrated with other resource areas (such as wildlife, cultural, and aquatic resources) over the term of the new license. Periodic coordination meetings are anticipated over the term of the new license to address these multi-resource coordination needs.

- Interpretation and Education Program. This program will identify I&E needs in the study area and will describe how such a program will be cooperatively developed with other recreation providers in the study area. A more detailed I&E Program likely will be developed after the new license is issued by FERC. The I&E Program will be developed in cooperation with BLM and other agencies in the study area. PacifiCorp will have a shared responsibility, but not the sole responsibility, for implementing actions in the I&E Program. The I&E Program will specify the details of this program to be implemented over the anticipated term of the new license.

- Aesthetics/Visual Resource Enhancement Program. This program will be used to enhance visual resources associated with the Klamath Hydroelectric Project. The program will identify specific actions to be taken by PacifiCorp, such as the visual screening of industrial Project facilities and the painting of penstocks within the viewshed of nearby, sensitive viewpoints.

- Plan Review and Revision Program. This program will define how and when the draft RRMP programs will be updated or revised over the term of the new license.

### 6.4.2 Prepare the Draft RRMP Document

As the details of the draft RRMP programs are developed, the programs will be compiled into a draft RRMP document. The outline for the draft RRMP (see Appendix 6A) includes the following major topics or sections:

- Overview of the plan (purpose and intent, plan vision, methodologies used, adaptive management strategy, use of LAC concept, issues and assumptions, and explanation of terms).

- Goals and objectives.

- RRMP roles and coordination, including a Rolling 5-Year Recreation Action Plan.

- Recreation management programs (eight programs are listed above).

- References and literature cited.

- Exhibits and/or appendices likely will include a list of proposed recreation PM&E measures, estimated costs and schedules for recreation measures, locations of recreation projects and conceptual site plans, monitoring indicators and standards, monitoring sites, and the Rolling 5-Year Recreation Action Plan framework. Study results, to be used as baseline information, may be included as an appendix.

## 6.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The following relationships have been identified in the draft RRMP and are summarized below:

- FERC requires that a licensee develop a recreation plan for the study area for the term of the new license (18 CFR 4.51 F[5]). The plans and programs included in the draft RRMP accomplish this requirement.

- The 11-mile segment of the Upper Klamath River was designated as a BLM- and state-administered component of the National W&SR system on September 22, 1994, pursuant to Section 2 (a)(ii) of the National Wild and Scenic Rivers Act. The plans in the draft RRMP should be consistent with the identified ORVs identified for the Klamath W&SR reach. Recreation programs developed in the draft RRMP also should be coordinated with the policies and recommendations in BLM's Draft Upper Klamath River Management Plan, once adopted (BLM, 2003).

- Recreation programs developed in the draft RRMP should be consistent with the adopted policies and recommendations in the: (1) Klamath Falls Resource Area Resource Management Plan (KFRA RMP) and Record of Decision (KFRA ROD); (2) Redding Resource Area Resource Management Plan (RRA RMP) and Record of Decision (RRA ROD); (3) Klamath County and Siskiyou County Comprehensive Plans and Zoning; (4) City of Klamath Falls Comprehensive Plan and Zoning; and (5) Klamath National Wildlife Refuge Comprehensive Conservation Plans. Other policies and recommendations in federal and state plans, such as Oregon and California SCORP documents, also were reviewed for consistency.

## 6.6 TECHNICAL WORK GROUP COLLABORATION

Following Stage 1 and release of the FSCD, the draft RRMP was added as a relicensing product to clearly define PacifiCorp's roles and responsibilities for recreation resources in the Project area for the term of the new license. Agencies, tribes, and other stakeholders were involved in the development of the draft RRMP between the draft license application in 2003 and the final license application in 2004. The draft RRMP will be where recreation PM&Es for the Project are proposed. The completed draft RRMP will be provided in Appendix E7-A of the final license application.

Several technical work group meetings were held during 2003 to discuss and develop the draft RRMP.

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