FINAL TECHNICAL REPORT

Klamath Hydroelectric Project
(FERC Project No. 2082)

Socioeconomic Resources

PacifiCorp
Portland, Oregon

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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.

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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

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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

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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

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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

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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

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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

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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

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

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

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WQRRS	Water Quality for River-Reservoir Systems (a model)
WQS	Water Quality Standards
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

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GLOSSARY

Abandonment	The loss of water rights through nonuse.
Abutment	Part of a valley or canyon wall against which a dam is constructed. Right and left abutments are those on respective sides of an observer looking downstream.
Acre-foot	The amount of water required to cover 1 acre to a depth of 1 foot. An acre-foot equals 326,851 gallons or 43,560 cubic feet. This volume measurement is used to describe a quantity of storage in a reservoir.
Affecting	Means "will or may have an effect on," as defined by 40 Code of Federal Regulations (CFR) 1508.3.
Afterbay	A channel for conducting water away from a power plant after it has passed through it.
Aggradation	The raising of a riverbed because of sediment deposited.
Allocation	The amount of water guaranteed to a jurisdiction under an agreement.
Alluvium	Sediments deposited by erosional processes, usually by streams.
Alternatives	A given agency's duty is to consider "alternatives as they exist and are likely to exist" (CEQ No. 8, 1981). <u>Range of alternatives</u> 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) <u>Reasonable alternatives</u> 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) <u>No Action Alternative</u> 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	Doctrine of Prior With respect to water, refers to the system western states use to assign and distribute quantifiable amounts of water, in the form of water rights; system operates on a first-in-time, first-in-right basis. Process Water Refers to the system a state has established to issue and keep track of water rights. Applies only to states that have adopted the doctrine of prior appropriation of water rights.
Appropriative rights	Those rights to the use of water that result from the doctrine of prior appropriation of water rights.
Appurtenant	Existing as part of a broader property right. For instance, a surface water right may exist as part of the rights associated with ownership of land bordering a body of water.
Aquatic microphyte	A plant living in water, large enough to be seen with the naked eye.
Aquatic plants	Plants that grow in water either floating on the surface, growing up from the bottom of the body of water, or growing under the surface of the water.
Aquifer	A porous layer of rock that can hold water within it.
Arch dam	A dam construction method used in sites where the ratio of width to height between abutments is not great and where the foundation at the abutment is solid rock capable of resisting great forces. The arch provides resistance to movement. When combined with the weight of concrete (arch-gravity dam), both the weight and shape of the structure provide great resistance to the pressure of water.
Armored riverbed	A riverbed from which easily removed sediment has been eroded, leaving a surface of cobbles or boulders.

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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).

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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

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

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	humans or animals.
Coordinated operation	The operation of two or more interconnected electrical systems to achieve greater reliability and economy. As applied to hydropower resources, the operation of a group of hydropower plants to obtain optimal power benefits with due consideration to all other uses.
Coordination	The practice by which two or more interconnected electric power systems augment the reliability of bulk electric power supply by establishing planning and operating standards; by exchanging pertinent information regarding additions, retirements, and modifications to the bulk electric power supply system; and by joint review of these changes to assure that they meet the predetermined standards.
Creek	A small stream of water which serves as the natural drainage course for a drainage basin of nominal or small size. The term is relative to size. Some creeks in a humid region might be called rivers if they occur in an arid region.
Crest	(1) The highest stage or level of a flood wave as it passes a point; (2) The top of a dam, dike, spillway, or weir, to which water must rise before passing over the structure.
Critical areas	Areas of ecological significance. This term is frequently used as a modifier to describe government programs that concentrate on the conservation and protection of natural resources that are fragile or sensitive to development, and that are of great importance in overall state efforts to conserve and protect the natural resource environment.
Cryptogam	Plant that reproduces by spores, not by flowers or seeds. For example, ferns.
Cubic feet per second (cfs)	A measurement of water flow representing 1 cubic foot of water (7.48 gallons) moving past a given point in 1 second. One cfs equals about 2 acre-feet per day.
Cumulative impact	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)
Cupules	Small (1 to 3 inches in diameter), round depressions that have been pecked into the surface of a rock with a hammerstone. They are typically ½ inch to 1 inch deep.

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Cycling	Power plant operation to meet the intermediate portion of the load (9 to 14 hours per day).
Dam	A concrete or earthen barrier constructed across a river and designed to control water flow or create a reservoir.
Dam failure	Event characterized by the sudden, rapid, and uncontrolled release of impounded water because of a breach in the dam.
Dead storage	That part of a reservoir that lies beneath the elevation of the bottom of the dam's lowest outlet.
Decommissioning	The act of retiring or dismantling a dam.
Deflector screens/ diversion screens	Wire mesh screens placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.
Degradation	The lowering of a riverbed because of erosion.
Delta	An alluvial deposit, often in the shape of the Greek letter "delta," which is formed where a stream drops its debris load on entering a body of water (lake or ocean).
Demand	The rate at which electric energy is delivered to or by a system, part of a system, or a piece of equipment. It is expressed in kilowatts, kilovoltamperes, or other suitable units at a given instant or averaged over any designated period of time. The primary source of "demand" is the power-consuming equipment of the customers.
Descaling	A condition in which a fish has lost a certain percentage of scales.
Design head	The head at which the full gate of the turbine equals the manufacturer-rated generator capacity.
Designated	Given formal statutory recognition, as in a federal or state river system.
Dewatering	Elimination of water from a lake, river, stream, reservoir, or containment.
Dike	(1) (Engineering) An embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee; (2) A low wall that can act as a barrier to prevent a spill from spreading; (3) (Geology) A tabular body of igneous (formed by volcanic action) rock that cuts across the structure of adjacent rocks or cuts massive rocks.
Direct effects	Caused by the action and occurring at the same time and place.

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Discharge	Volume of water released from a dam or powerhouse at a given time, usually expressed in cubic feet per second. Discharge is often used interchangeably with streamflow.
Discount rate	The rate at which future economic values are reduced to make them economically equivalent to today's value; a rate used to convert a future value to present value.
Dissolved gas concentrations	The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).
Dissolved oxygen (DO)	The amount of oxygen in the water available to aquatic organisms measured in mg/L or percent 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.

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Easement	Limited right of ownership of one's land conveyed by deed to another for a special purpose.
Ecological impact	The total effect of an environmental change, either natural or human-made, on the ecology of the area.
Ecology	The interrelationships of living things to one another and to their environment or the study of such interrelationships.
Ecosystem	The interacting system of a biological community and its nonliving environment.
Ecotone	Border between two biomes, where the plants and animals of those biomes mingle.
Ecotourism	Tourism that focuses on the enjoyment of wildlife and other ecological resources.
Effects	Effects and impacts as used in the Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations are synonymous. Effects are ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. (CEQ regulations, 40 CFR 1508.9)
Efficiency	The ratio of useful energy output to total energy input, usually expressed as a percent.
Effluent	Treated wastewater discharged from sewage treatment plants.
Electric Consumers Protection Act of 1986	The Electric Consumers Protection Act of 1986 (ECPA) brought about significant changes and imposed new requirements to both procedural and substantive aspects of project licensing and relicensing under the Federal Power Act (FPA). The FPA was amended to require FERC to give equal consideration to energy conservation, fish and wildlife protection, enhancement and preservation of recreational opportunities, and other aspects of environmental quality. These requirements are described in the discussion of the Federal Power Act below.
Electric magnetic field (EMF)	An electric or magnetic field, or a combination of the two, as in an electromagnetic wave.
Electric power system	Physically connected electric generating, transmission, and distribution facilities operated as a unit under one control.

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

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Assessment	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))
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

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	marshes, and lagoons).
Estuarine zone	The area near the coastline that consists of estuaries and coastal saltwater wetlands.
Estuary	The thin zone along a coastline where freshwater systems and rivers meet and mix with a salty ocean (such as a bay, mouth of a river, salt marsh, or lagoon).
Eutrophication	The process by which a body of water is enriched by nutrients.
Evaporation	The physical process by which a liquid (or a solid) is transformed to the gaseous state. In hydrology, evaporation is vaporization that takes place at a temperature below the boiling point.
Evapotranspiration	Water transmitted to the atmosphere by a combination of evaporation from the soil and transpiration from plants.
Face	The external surface of a structure, such as the surface of a dam.
Facilitator	An independent third party whose role is to help participants reach lasting agreement (among as many of participants as possible on as many issues as possible.) The facilitator can help participants to identify goals, identify issues, develop and maintain critical paths, accomplish creative problem solving, and resolve issues (facilitate and mediate as necessary).
Federal Emergency Management Agency (FEMA)	An agency of the federal government responsible for hazard mitigation. FEMA also administers the National Flood Insurance Program.
Federal Energy Regulatory Commission (FERC)	A quasi-judicial independent regulatory commission established in 1977 (replacing the Federal Power Commission) within the U.S. Department of Energy. FERC issues and regulates licenses for construction and operation of nonfederal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects. FERC is composed of five commissioners appointed by the President. No more than three can be from any one political party.
Federal Power Act	Enacted in 1920, the FPA, as amended in 1935, consists of three parts. The first part incorporated the Federal Water Power Act administered by the former Federal Power Commission. It confined FPC activities almost entirely to licensing nonfederal hydroelectric projects. With passage of the Public Utility Act, which added parts II and III, the Commission's jurisdiction was extended to include regulating the interstate transmission of electric energy and rates for its sale at wholesale in interstate commerce.

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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

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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.

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	Section 18 Under Section 18, FERC must provide for the construction, operation, and maintenance of any mandatory "fishway" prescribed by the Secretary of the Interior (through the U.S. Fish and Wildlife Service) or the Secretary of Commerce (through the National Marine Fisheries Service) for the safe and timely upstream and downstream passage of fish (16 U.S.C. 811). As with Section 4(e), the fishway conditions submitted by the relevant resource agency must be supported on the record before FERC with substantial evidence. FERC must include the Secretary's prescription for fishway as conditions in a license, if a license is issued. This section applies to any project that may impact the life stages or passage of any fish species present in a project area and where a project may affect passage of a species planned for introduction in the area. Also applicable to fishway prescriptions in both upstream and downstream passage; not limited to anadromous or other migratory species. (P.L. 102-486, 1701(b)(1992))
Federal project operators and regulators	Federal agencies that operate or regulate hydroelectric projects in the Columbia River basin. They include the Bonneville Power Administration, the Bureau of Indian Affairs, the Bureau of Reclamation, the U.S. Army Corps of Engineers, and FERC.
Fill dam	Any dam constructed of excavated natural materials or industrial wastes.
Final Order	A final ruling by FERC which terminates an action, decides some matter litigated by the parties, operates to divest some right, or completely disposes of the subject matter.
Finding of No Significant Impact (FONSI)	A document by a federal agency briefly presenting the reasons why an action, not otherwise excluded (Sec. 1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared. It shall include the environmental assessment or a summary of it and shall note any other environmental documents related to it (Sec 1501.7(a)(5)). If the assessment is included, the finding need not repeat any of the discussion in the assessment but may incorporate it by reference. (CEQ regulations, 40 CFR 1508.13)
Firm energy	The amount of energy that can be generated given the region's worst historical water conditions. It is energy produced on a guaranteed basis.
Firm energy load carrying capability (FELCC)	Firm energy load carrying capability is the amount of energy the region's generating system, or an individual utility or project, can be called on to produce on a firm basis during actual operations. FELCC is made up of both hydro and nonhydro resources, including power purchases.

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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. 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.

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Key observation point (KOP)	An important location from which project facilities or operations are visible to the public, based on frequency of use and other factors.
Kilowatt (kW)	A unit of power equal to 1,000 watts or 1.3414 horsepower. It is a measure of electrical power or heat flow rate and equals 3,413 Btu per hour. An electric motor rated at 1 horsepower uses electric energy at a rate of about 3/4 kilowatt.
Kilowatt-hour (kWh)	1,000 watts of electrical energy, operating for 1 hour. Electrical energy is commonly sold by the kilowatt-hour.
Kjeldahl nitrogen	Organic nitrogen as determined by the Kjeldahl method, which entails quantitative analysis of organic compounds to determine nitrogen content by interaction with concentrated sulfuric acid; ammonia is distilled from the NH_4SO_4 formed.
KSFD	A volume of water equal to 1,000 cubic feet of water flowing past a point for an entire day. Same as 1.98 FAF.
Levee	A long, narrow, earthen embankment usually built to protect land from flooding. If built of concrete or masonry, the structure is referred to as a floodwall. Levees and floodwalls confine streamflow within a specified area to prevent flooding.
License	Authorization by FERC to construct, operate, and maintain nonfederal hydro projects for a period of up to 50 years.
Licensee	Any person, state, or municipality licensed under the provisions of section 4 of the Federal Power Act, and any assignee or successor in interest thereof. (Federal Power Act, Sec. 3 (5))
Littoral zone	The area on or near the shore of a body of water.
Live storage	That part of a reservoir that lies above the elevation of the bottom of the dam's lowest outlet.
Load	The amount of electric power or gas delivered or required at any point on a system. Load originates primarily at the energy consuming equipment of the customers.
Load factor	The ratio of average load to peak load for a specified period, usually expressed as a percentage.
Load factoring operation	A hydropower project operation that uses the generating equipment and reservoir impoundment capacity to store water and then provide power during daily, weekly, or seasonal periods of peak power demand.

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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. 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.

3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

5. Compensating for the impact by replacing or providing substitute resources or environments. (CEQ regulations, 40 CFR 1508.20)

Mitigation measures	A. Mitigation measures discussed in a NEPA document must cover the range of impacts of the proposal. Mitigation measures must be considered even for impacts that by themselves would not be considered "significant." Once the proposal itself is considered as a whole to have significant effects, all of its specific effects on the environment (whether or not "significant") must be considered, and mitigation measures must be developed where it is feasible to do so. (40 CFR 1502.14(f), 1502.16(h), 1508.14) B. All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the Records of Decision (RODs) of these agencies (40 CFR 1502.16(h), 1502.2(c)). This will serve to alert agencies or officials who can implement these extra measures, and will encourage them to do so (46 FR 18032).
Monitor	To systematically and repeatedly measure conditions in order to track changes.
Mortality	The number of fish lost or the rate of loss.
Multipurpose dam	A barrier constructed for two or more purposes such as storage, flood control, navigation, power generation, or recreation.
Multipurpose reservoir	A reservoir that can be used for more than one purpose, such as flood control, hydroelectric power development, and recreation.
Navigability	The ability of a body of water to be traveled by water craft.
Navigable Waters	Those parts of streams or other bodies of water over which Congress has jurisdiction to regulate commerce with foreign nations and among the several states, and which either in their natural or improved condition notwithstanding interruptions between the navigable parts of such streams or waters by falls, shallows, or rapids compelling land carriage, are used or suitable for use for the transportation of persons or property in

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	interstate or foreign commerce, including therein all such interrupting falls, shallows, or rapids, together with such other parts of streams as shall have been authorized by Congress for improvement by the United States or shall have been recommended to Congress for such improvement after investigation under its authority. (Federal Power Act, Sec. 3(8))
NEPA	National Environmental Policy Act, as amended (42 U.S.C. 4321, et. seq.).
Net environmental benefit analysis	An assessment of the impact of an economic decision on flow of ecological services provided by natural resources.
New license	Any license, except an annual license issued under section 15 of the Federal Power Act, for a water power project that is issued after the initial license for that project. (FERC regulations – 18 CFR 4.30(b)(19))
Nitrogen supersaturation	A condition of water in which the concentration of dissolved nitrogen exceeds the saturation level of water. Excess nitrogen can harm the circulatory system of fish.
Nondegradation	A term in the Clean Water Act that indicates a standard of water quality for which certain water bodies are to be managed so as to prevent any degradation.
Nonpoint Source Pollution	A term in the Clean Water Act also called "polluted runoff," water pollution produced by diffuse land-use activities. Occurs when runoff carries fertilizer, animal wastes, and other pollution into rivers, streams, lakes, reservoirs, and other bodies of water.
Northwest Power Act	The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power Planning Council and directed it to develop this program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries.
Northwest Power Pool Coordinating Group	An operating group made up of Bonneville Power Administration, the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and public and private generating utilities in the northwest. One of the group's functions is administering the Pacific Northwest Coordination Agreement.
Nutrient cycling	Circulation or exchange of elements such as nitrogen and carbon between nonliving and living portions of the environment.
Nutrients	Animal, vegetable, or mineral substance that sustains individual organisms and ecosystems.

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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. • Forced outage—the shutdown of a generating unit, transmission line, or other facility, for emergency reasons • Scheduled outage—the shutdown of a generating unit, transmission line, or other facility, for inspection or maintenance, in accordance with an advance schedule
Outflow	The water that is released from a project during the specified period.
Overdraft	Pumping of groundwater for consumptive use in excess of safe yield.
Oviposition	Egg laying; egg deposition; egg dropping. Typically used in reference to a specific behavioral trait or adaptation that a species employs when depositing its eggs.
Pacific Northwest Utilities Conference Committee (PNUCC)	A group formed by Pacific Northwest utilities officials in order to coordinate policy on Pacific Northwest power supply issues and activities. PNUCC lacks contractual authority, but it plays a major role in regional power planning through its Policy; Steering; Fish and Wildlife; and Lawyers committees, and the Technical Coordination Group. PNUCC publishes the Northwest Regional Forecast, containing information on regional loads and resources.
Paedomorphic	Characteristic of certain amphibians: becoming sexually mature and active in the aquatic (larval) form before metamorphosing into the terrestrial (adult) form.

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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. 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

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	economy, and accounting for the interrelationships among the sectors.
Regulated river	A river whose natural flow pattern is altered by a dam or dams.
Regulations	FERC carries out its regulatory functions, including procedures and practice, through rulemaking and adjudication. Under rulemaking, the Commission may propose a general rule or regulation change. By law, it must issue a notice of the proposed rule and a request for comments in the Federal Register, and publish any final decision. Alternatively, the Commission considers, on a case-by-case basis, applications submitted by regulated companies. If there is an objection to a particular proposal and a settlement cannot be reached, the proposal must, by law, be presented at a hearing presided over by an agency administrative law judge. A decision by a judge may be adopted, modified, or reversed by the Commission. An aggrieved party may petition for a rehearing, and may appeal a decision to the United States Court of Appeals and ultimately, to the United States Supreme Court.
Reliability	The probability that a device will function without failure during a specified time period or amount of usage.
Relicensing	The administrative proceeding in which FERC, in consultation with other federal and state agencies, decides whether and on what terms to issue a new license for an existing hydroelectric project at the expiration of the original license.
Reregulating facility	A dam and reservoir, located downstream from a hydroelectric peaking plant, with sufficient storage capacity to store the widely fluctuating discharges from the peaking plant and to release them in a relatively uniform manner downstream.
Reregulation	Storing erratic discharges of water from an upstream hydroelectric plant and releasing them uniformly from a downstream plant.
Reservation	National forest, tribal lands within Indian reservations, military reservations, and other lands and interests in lands owned by the United States, and withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws; also lands and interests in lands acquired and held for any public purposes; but shall not include national monuments or national parks. (Federal Power Act, Sec. 3.(2) 16 U.S.C. 796.2)
Reservation of water right	At the state level, the reservation of a water right means that the state declares its authority to stop certain water diversions in the event that a river runs dangerously low.
Reservoir	A body of water collected in an artificial lake behind a dam and used for

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	the storage, regulation, and control of water.
Resident fish	Fish species that reside in freshwater throughout their lives.
Resource agency	A federal, state, or interstate agency exercising administration over the areas of flood control, navigation, irrigation, recreation, fish and wildlife, water resource management (including water rights), or cultural or other relevant resources of the state or states in which a project is or will be located. (FERC regulations, 18 CFR 4.30(b)(27))
Riffles	Shallow, turbulent portions of a stream or river.
Riparian	Pertaining to a river (for example, the riparian zone).
Riparian habitat	The habitat found on streambanks and riverbanks, where semiaquatic and terrestrial organisms mingle.
Riparian zone	The habitat found on stream banks and river banks, where semiaquatic and terrestrial organisms mingle.
Riparian-use doctrine	Legal rights belonging to the owner of land bordering on a given stream. The riparian owner is entitled to the reasonable use of the water in the bordered stream provided that use does not unreasonably diminish the rights of downstream users.
River	A natural stream of water emptying into an ocean, lake, or another river.
River basin	The total area drained by a river and its tributaries.
River left	Left bank when facing downstream.
River mouth	The place where a river ends by flowing into another body of water such as a lake, ocean, or another river.
River right	Right bank when facing downstream.
Riverine ecosystem	The zone of biological and environmental influence of a river and its floodplain.
Rockfill dam	An embankment dam in which more than 50 percent of the total volume consists of compacted or dumped pervious natural or crushed rock.
Rolled-fill dam	An embankment dam of earth or rock in which the material is placed in layers and compacted by using rollers or rolling equipment.
Rule curves	Water levels, represented graphically as curves, that guide reservoir operations.

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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. • Ampere—the unit of measurement of electrical current produced in a circuit by 1 volt acting through a resistance of 1 ohm • Ohm—the unit of measurement of electrical resistance. The resistance of a circuit in which a potential difference of 1 volt produces a current of 1 ampere. • Volt—the unit of measurement of voltage, electrical force, or pressure. The electrical force that, if steadily applied to a circuit with a resistance of 1 ohm, will produce a current of 1 ampere.
Weir	(1) A low dam built across a stream to raise the upstream water level. Called a fixed-crest weir when uncontrolled. Other types of weirs include broad-crested, sharp-crested, drowned, and submerged; (2) A structure built across a stream or channel for the purpose of measuring flow (measuring or gauging weir).
Wetland	An area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances supports, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (U.S. Army Corps of Engineers and EPA definition). Wetlands must have the following three attributes: (1) at least

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	periodically, the land supports predominately hydrophytes; (2) the substrate is predominately undrained hydric soil; and (3) the substrate is on soil and is saturated with water or covered by shallow water at some time during the growing season of each year.
Wild and Scenic Rivers Act	1968 federal law (Public Law 90-542) establishing and setting forth the procedure for including outstanding river segments in a national system of free-flowing, protected rivers.
Wild River	Defined in the National Wild and Scenic Rivers Act as "those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, within watersheds or shorelines essentially primitive and water unpolluted. These represent vestiges of primitive America."
Winter's Doctrine	A legal document arising from the case "Winters v. U.S., U.S. Supreme Court, 1908, 207 US 564," that holds that, upon the creation of a federal reservation on the public domain, the reservation has appurtenant to it the right to divert as much water from streams within or bordering it as is necessary to serve the purposes for which the reservation was created.

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1.0 INTRODUCTION

1.1 SCOPE OF WORK

This Final Technical Report (FTR) documents the methods, observations, and findings of the socioeconomic study to provide technical support for the relicense application for the Klamath Hydroelectric Project (Project). The Project is located on the Upper Klamath River in southern Oregon and northern California.

- Drafts of the study plan were submitted for public review in winter 2002 and spring 2002 and revised to address stakeholder comments. In summer 2002, the socioeconomic work group recommended separating the study into two phases. The Phase 1 study plan, which is to describe the existing socioeconomic condition, was accepted by the plenary group in summer 2002. The proposed purpose of the Phase 2 study plan was to assess potential, incremental Project effects on the socioeconomic condition. In winter 2003, the socioeconomic work group proposed breaking the Phase 2 study into two parts. Accordingly, the socioeconomic study now consists of three phases:

- Phase 1 describes the existing socioeconomic condition of the Project study area under current Project operations, and it describes environmental and social measures as they relate to socioeconomic factors.

- Phase 2 involves a high-level socioeconomic analysis of the landscape options defined by the plenary group.

- Phase 3 assesses the changes in the socioeconomic condition in the study area resulting from the differences in the proposed Project and the current Project, including protection, mitigation, and enhancement (PM&E) measures (e.g., new environmental and social measures).

Phase 2 was delegated by the plenary to a subgroup of the socioeconomic work group and their deliberations are not included in this report. Phase 3 involves examining only the incremental effects resulting from any changes in the current Project and PM&E measures.

The Project consists of seven mainstem hydroelectric facilities on the Upper Klamath River and one tributary facility on Fall Creek. The Project is owned and operated by PacifiCorp under a single license (No. 2082) issued in 1956 by the Federal Energy Regulatory Commission (FERC). The existing FERC license expires March 1, 2006.

This report documents the results of the socioeconomic studies conducted through January 2004. Any changes in the final study plans are noted in the methods sections. The information in this report provides the foundation for the development of Exhibit E (Environmental Report) of the FERC license application. This FTR is not intended to assess the impacts of the current Project or recommend PM&E measures. Its purpose is to serve as a reference to help agencies, tribes, and interested parties understand changes from the current Project operations as they relate to socioeconomic issues.

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1.2 OVERVIEW OF SOCIOECONOMICS

The following studies have been conducted to describe the existing socioeconomic setting and to identify the relationship between the potential, incremental Project and PM&E measures and socioeconomic factors.

The first phase of this socioeconomic study is limited to a description of the existing condition of the following socioeconomic factors:

- Population
- Housing
- Economic development (employment, earnings, and output), including descriptions of the current commercial salmon fishery, Klamath River-based recreation industries, and the construction industry in the study area
- Local and tribal government fiscal conditions
- Public services (police, fire, emergency personnel, schools)
- Recreation resources
- Infrastructure (transportation [roads, bridges], utilities [water supply, water treatment, electricity rates, natural gas])
- Descriptions of socioeconomic conditions of the tribes

Descriptions of the above resources establish the current socioeconomic condition and describe how the current Project relates to these socioeconomic factors. Phase 3 addresses the following key questions related to estimating changes in the socioeconomic condition resulting from the proposed Project:

- Which major economic sectors will be affected and what would be the effects on those sectors?
- How would the effects on economic sectors translate into changes in employment and earnings in the economies of the study region?
- What would be the effects on population growth and community services in the study area?
- What would be the changes in market and nonmarket economic benefits and costs (i.e., described in monetary, nonmonetary, and/or qualitative terms)?
- How would the potential benefits and costs be distributed within and across regions in the study area (i.e., which societal groups would bear the burdens and who would reap the benefits)?

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To address these questions, as part of the Phase 3 scoping process, the following additional studies related to the potential changes in the current Project and PM&E measures were proposed and discussed with socioeconomic work group members:

- Regional economic impact analysis (i.e., Input-Output analysis using IMPLAN) to capture changes in local employment, output, and earnings in the study area resulting from the potential changes in the current Project and PM&E measures. This includes sector analyses for the major economic sectors that would be affected by the potential changes in the Project to both describe the specific impacts to those sectors and to provide inputs into the regional models.

- Descriptions of the changes in socioeconomic factors in the study area resulting from the potential changes in the current Project and PM&E measures.

- National level economic benefit-cost analysis to capture the changes in net benefits to the public resulting from the potential changes in the current Project and PM&E measures.

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2.0 ANALYSIS OF PROJECT EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT—PHASE 1

2.1 DESCRIPTION AND PURPOSE

The socioeconomic study consists of three phases. This section addresses the first phase, which describes the existing socioeconomic condition in the study area and the current Project and environmental and social measures as they relate to socioeconomic factors.

This study will provide information to satisfy FERC license application requirements specific to Project-related effects on the socioeconomic environment as specified in the applicable sections of 18 Code of Federal Regulations (CFR) Parts 4 and 16.

Consistent with FERC procedures, the analysis uses the current operation of the Project under its existing license and the current waterway environment as the baseline. This study describes that baseline. Phases 2 and 3 of the studies address the incremental effects of the potential Project and PM&E measures in terms of the changes relative to this baseline condition.

2.2 OBJECTIVES

This section describes the study objectives as defined in the study plan approved by the plenary group and updated through collaboration with the socioeconomic stakeholder work group. The objectives and key questions addressed by the first phase of the socioeconomic study are as follows:

- Describe the existing socioeconomic environment in the study area, including population, housing, economic development, public services, fiscal conditions, and infrastructure.
- Describe socioeconomic resource trends under the existing condition.
- Summarize the existing condition of the recreation resources in the study area, referring to the recreation resource report.
- Describe the current Project and social and environmental measures as they relate to the socioeconomic factors (e.g., number of PacifiCorp employees working in the study area, local PacifiCorp payroll, number of calls to local authorities for emergency services on Project lands).
- Describe the current socioeconomic condition of the tribes.
- Identify socioeconomic issues and concerns.

2.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The results of this study will provide information to satisfy FERC license application requirements specific to Project-related effects on the socioeconomic environment as specified in the applicable sections of 18 CFR Parts 4 and 16.

PacifiCorp will use the three-phased study results to describe the current socioeconomic condition and the relationships between potential Project activities and socioeconomic endpoints such as population, housing, economic development, local and tribal government revenues and expenditures, public services, and infrastructure. The analysis is limited to socioeconomic factors potentially influenced by incremental Project effects and is not intended to provide a comprehensive model of the local, regional, or national economies. Information from this study will be integrated as appropriate with other recreation, cultural, and biological resource information about the study area to help determine potential Project PM&E measures.

2.4 METHODS AND GEOGRAPHIC SCOPE

This section documents the methods used to collect the data, the data sources that were used, problems that precluded collecting data as planned, and shortcomings in the proposed data collection methods. Data analysis methods are described, including any revisions in planned methods. The geographic extent of the data collection efforts and analyses is also described.

2.4.1 Review Existing Information

A variety of resources were used to obtain data and other relevant information and the procedures that were followed. The list of general resources includes the following:

- Published literature
- Public reports
- Internet sources
- Personal observations from site visit
- Dialogues with members of communities, organizations, and agencies
- Information from the tribes
- Information from socioeconomic work group members

These information resources were accessed through a literature review, internet searches, a site visit, and dialogues with representatives from local communities, nongovernmental organizations, governmental organizations and agencies, tribal members and work group members. These efforts resulted in identifying several published articles, public reports, and other data sources that were reviewed in the course of preparing the Phase 1 study.

A complete list of published literature, public reports, and Internet sources is provided in Section 5.0, Information Sources.

2.4.1.1 Site Visit

In August of 2002, PacifiCorp researchers toured the Project area and communities located along the Klamath River downstream of the Link River dam. The purpose of this tour was to observe the condition of the resource and to meet with community members familiar with the interrelationships between the Klamath River and the socioeconomic condition of the communities. A PacifiCorp employee provided a tour of the Project area communities and facilities, including the following:

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- Link River dam and trail
- Keno dam
- J.C. Boyle dam
- Topsy Recreation Area
- Frain Ranch
- Stateline Takeout
- Copco Lake
- Copco
- Iron Gate dam

The communities along the Klamath River were accessed via an auto tour that followed the Klamath River on State Route (SR) 96 from Yreka, to Happy Camp and on to Wieitchpec. The auto tour continued on SR 96 to Willow Creek where it turned on to SR 299 and traveled west to Arcata. During the auto tour consultants stopped for meetings with community members in Yreka (Marcia Armstrong and local area retirees and farmers), Happy Camp (Dave Payne, Karen Derry, John Grunbaum and others) and Arcata (Paula Yoon). The consultants also stopped along the way at select businesses (Copco Store, Yreka Chamber of Commerce, Quigley Store, New 49ers, Somes Bar Store) to discuss with representatives the relationships between their businesses and river-related activities.

2.4.1.2 Personal Contacts

PacifiCorp and its consultants engaged in dialogues with resource agencies, local and tribal government officials, and various members of the public. The list of personal contacts includes:

- Socioeconomic work group members
- Members of the other Klamath Hydroelectric Project Licensing work groups
- Aaron Douglas, USGS
- Bob Hemus, USFS
- Dave McCracken, The New 49ers Mining Association
- Dave Payne, USFS
- Jim Seger, Pacific Fishery Management Council (October 17, 2002)
- Dan Viele, NOAA Fisheries Service (October 17, 2002)
- Tom Waddell (September 3, 2002)
- Grant Weidenback, Bureau of Land Management (BLM)
- Marcy Charlen, New 49ers
- Sharina Davis, Lost Dutchman's Mining Association

2.4.1.3 Geographic Extent of the Data Collection Effort

The data gathered from these information sources cover the geographic region of the study area. The data describe the current condition of the socioeconomic environment. The study area is large and includes a number of subregions and groups of individuals. It is likely that the potential Project would affect such entities differently. Therefore, the data-gathering effort attempted to

target the information requirements by the appropriate regions, industries, and other groups (e.g., tribal nations, recreationists).

One area where potential data deficiencies were recognized relatively early in the study relates to the socioeconomic condition of the tribal nations. Tribal members noted that U.S. Census statistics were inadequate for characterizing their socioeconomic status because their members were geographically dispersed. In addition, tribal representatives commented that wherever the study plan mentioned reporting information on local governments, the same information should be reported for tribal governments. To address these deficiencies, PacifiCorp developed a socioeconomic survey for the tribes to self-administer. This questionnaire included the same information collected for the general population and local governments in the study area, with the addition of questions specific to the tribes related to historical and current reliance by tribal members on Klamath River fisheries for their subsistence. (The list of questions is included as Appendix 2A.) The tribes did not respond to the survey. Tribal representatives indicated that they did not believe that the questionnaire was adequate for addressing their concerns. Therefore, the socioeconomic study includes information available from published sources. In addition, PacifiCorp and the tribes are investigating other means of addressing tribal concerns.

2.4.2 Existing Socioeconomic Environment

This section describes the methodology that was followed to characterize the current socioeconomic condition, including population, housing, economic development, local and tribal government budgets, public services, recreation resources, and transportation and utility infrastructure.

2.4.2.1 Scoping

The first phase of study describes the existing socioeconomic condition of the study area (as defined in Section 2.4.2) and environmental and social measures of the study area as they relate to socioeconomic factors.

To understand incremental Project effects on socioeconomic resources, it is important first to characterize the existing population demographics, local human resources and public services, the local and tribal economy, as well as pertinent trends in such factors. To accomplish this objective, it was necessary to identify the study area in terms of the geographic extent of the potential incremental Project's sphere of influence on the socioeconomic condition as well as to identify likely differences across regions in the types of socioeconomic factor effects. Otherwise, a great deal of effort would be expended gathering data that would not be useful. The existing information is used to identify current socioeconomic conditions and expected trends in the study area.

The first phase of study identifies socioeconomic issues and concerns to focus on those socioeconomic factors that are likely to be influenced by changes in the Project, including potential Project PM&E measures.

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Population

This study was conducted to summarize the socio-demographic characteristics of the populations in the study area and to document recent and projected future trends. If updated local socioeconomic data were not readily available, 2000 U.S. Census data were used to approximate existing conditions. Other data sources included the various reports and Internet sites that use the U.S. Census data and information collected by the American Indian tribes. Population statistics are reported at the county level, by city and unincorporated areas, and by American Indian tribes, where available. Within each county, it is reasonable to assume that potential changes in Project operations and PM&E measures could have disproportionate impacts on the communities located most proximate to the Klamath River. To provide perspective on this issue, PacifiCorp also reports the population statistics for the area within 5 miles of the river and within 50 miles of the river as well as for the entire county.

Housing

Housing stock and vacancy information for the study area was derived from the 2000 Census data. As necessary, local and tribal government officials and real estate professionals familiar with the study area were contacted to gain further insight into local housing conditions.

Economic Development

An economic development study was conducted to describe the current condition of the economies of the American Indian tribes (to the extent that such information was available) and counties in the study area (Klamath, Jackson, and Curry counties, Oregon, and Siskiyou, Del Norte, and Humboldt counties, California), including such factors as seasonal and annual labor force participation, employment, output, and earnings. Such information is reported separately by sector, where it contributes to the objectives of the analysis and where readily available.

This study also included identifying the local and tribal industries (such as construction, recreation/tourism, subsistence fishing, and commercial fishing) that changes in the Project are likely to influence directly. Data on local whitewater rafting industry revenues and employment were collected by PacifiCorp as part of the recreation resource study, as well as from local sources, or estimated using the available literature to establish baseline conditions. Data related to recreation expenditures in the study area also were collected by PacifiCorp.

For industries downstream of Iron Gate dam (i.e., recreation, subsistence fishing, and commercial fishing), data were gathered from published economic data sources, from personal interviews with local and tribal government officials and area businesses, and from the other resource studies to support the description of the existing condition.

Local and Tribal Government Fiscal Conditions

Budgets and tax information were obtained from affected local jurisdictions for use in the description of the existing fiscal condition. PacifiCorp's existing tax payments or in-lieu fees that accrue to the counties, local communities, or local service providers were also collected. This information has been used to establish the baseline condition for evaluating Project effects on local and tribal government revenues and expenditures.

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Public Services

The public services section of the study describes existing conditions of the following services:

- Fire
- Police
- Schools
- Emergency personnel and medical services

The description of public services is restricted to the Project area and is based on readily available information from local planning agencies, the tribes, and service providers. Information related to PacifiCorp's use of public services is provided.

Recreation Resources

The local recreation resources are considered a socioeconomic resource. Information collected as part of the Recreation Resources FTR, including an assessment of the existing and anticipated future opportunities and uses of Project facilities and operations for recreational boating, shoreline day-uses, camping, and angling, has been used in this Phase 1 study.

Infrastructure

Utilities. The utilities section of the study describes existing conditions of the following:

- Water and stormwater
- Wastewater treatment
- Solid waste disposal
- Electricity
- Natural gas

The inventory of utilities is restricted to the Project area and is based on readily available information from local planning agencies, the tribes, and service providers, including PacifiCorp. Information related to PacifiCorp's utilization of local utilities is provided. The description of the existing electricity rate setting involves a discussion of current rates and planned changes to them, including how the agricultural rate may change.

Transportation. This resource has been assessed in the land use study; results are summarized in the socioeconomic study. If additional information is needed in the way of a traffic analysis for socioeconomic purposes, the study will rely on available information on existing traffic and roadway conditions as well as expected future conditions. Because the evaluation requires projections for future use, the Oregon Department of Transportation (ODOT), California Department of Transportation (CALTRANS), and county planners will be contacted to identify programmed improvements to the roadways in question. If needed, this information would be included in the Phase 3 study.

Environmental Justice. On February 11, 1994, President Clinton issued Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income

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Populations." The purpose of the EO is to avoid the disproportionate placement of any adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations. The President directed the U.S. Environmental Protection Agency (EPA) to ensure that agencies analyze the environmental effects (including human, health, social, and economic effects) on minority and low-income communities.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than the general population of the larger surrounding area. The term "minority population" includes persons who identify themselves as African American, Asian or Pacific Islander, American Indian or Alaskan Native, or Hispanic. Race refers to Census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, or Central or South American.

The U.S. Census Bureau does not provide a specific definition for "low-income." Rather, the term is used interchangeably with "poverty" (EPA, 2000). For this study, low-income populations were identified using the Census Bureau's ratio of income in 1999 to poverty level. Individuals whose income to poverty ratios are below one are considered low income.

The Census Bureau defines a "poverty area" as a Census tract where 20 percent or more of the residents have incomes below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level (Bureau of Census, 1999). The Census poverty level refers to income levels, based on family size, age of householder, and number of children under 18 years of age, that are considered too low to meet essential living requirements. The criteria for determining poverty level are applied nationally (except for Alaska and Hawaii), without regard to the local cost of living. At the 2000 Census, the poverty threshold for a family of four was $17,761.

This section identifies the low-income and/or minority populations living in the Census tracts and block groups within the study area. If provided by the tribes, information obtained from the American Indian tribes will be used to augment the Census data related to low-income tribal populations.

2.4.3 Geographic Scope

The geographic scope of the socioeconomic analysis is determined by the Project's sphere of influence on the socioeconomic environment. Thus, the Phase 1 study:

- Identifies a relevant study area for assessment of impacts
- Identifies potentially affected communities and potentially relevant ordinances

The preliminary study area for the socioeconomic analysis includes Klamath, Jackson, and Curry counties in Oregon and Siskiyou, Humboldt, and Del Norte counties in California. These are the counties that contain the Project boundaries or whose economies, local services, and human resources are potentially affected by the incremental changes to the Project and PM&E measures. Even within these counties, the nature and extent of the Project effects that can be included in the socioeconomic study may be limited by the study areas of the other resource studies that provide inputs into the socioeconomic analysis.

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Readily accessible socioeconomic data were collected and presented for two additional regions within the above-mentioned state and county boundaries. The regions consist of two corridors extending from the Link River dam down the Klamath River to the Pacific Ocean, at which point they spread along the coast, terminating at the boundaries of the Klamath Management Zone (KMZ) (Humbug Mountain, Oregon, and Horse Mountain/Shelter Cove, California). One corridor was extended 5 miles on each side of the river and 5 miles inland at the coast. The 5-mile corridor was expanded slightly to include the communities of Yreka and Dorris, California, which are considered to have a strong connection to the river, but are just outside the 5-mile corridor. The other region was extended up to 50 miles on each side of the river and up to 50 miles inland along the coast. Where possible, interrelationships between changes in Project operations and PM&E measures and the socioeconomic factors pertinent to these regions have been described. The study attempts to report information for the regions and geographic scales that are most pertinent to study objectives, given the limitations of the data.

2.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The socioeconomic study provides the information necessary to satisfy FERC license application requirements specific to Project-related effects on the socioeconomic environment as specified in the applicable sections of 18 CFR Part 4 and 16.

2.6 TECHNICAL WORK GROUP COLLABORATION

As part of the collaborative process, a number of changes were made to the scope of the study plans that guide the analysis presented in this FTR. The geographic range of the study area was expanded from the three upstream counties covered to the six counties in California and Oregon that are listed in Section 2.4.3 Geographic Scope. In addition, to address stakeholder concerns related to using county data to describe local impacts, two additional geographic regions were defined to capture local populations living within 5 miles and 50 miles of the river and coast. Where appropriate, explicit mention of the tribes was included, and refinements were made to the scope of material to be collected and analyzed in a three-phase process. The Phase 1 study was approved by the plenary group in August 2002.

There have been many areas of agreement in developing the study plan and these are reflected in each phase of the study plan. However, work group members have expressed differences about the extent to which the socioeconomic analysis will include an analysis of a full range of alternatives. The proposed phased study plan does not include an evaluation of a full range of alternatives, which has been requested by some work group members.

A turning point for the socioeconomic work group came when the members agreed to coordinate with the plenary group on defining options for reconnaissance-level analysis and defining the proposed Project and PM&E measures. This collaboration was construed as an iterative process primarily driven by fish passage options, especially in so far as they are likely to differ in their potential consequences for the socioeconomic environment.

This agreement among work group members was based on the understanding that some work group members take issue with the FERC baseline. However, in the interest of moving forward, the socioeconomic work group acknowledged that this was a policy issue, which would not be resolved in the context of the relicensing Project.

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For a more comprehensive description of the collaborative process, please refer to Appendix E-1A of Exhibit E of the final license application.

2.7 STUDY OBSERVATIONS AND FINDINGS

Study observations and findings identified to date are described in the following sections.

The following section discusses the socioeconomic conditions in the Project area, the 5-mile buffer area, the 50-mile buffer area and the region of influence encompassing the six-county region. The Project is in a largely rural area of Klamath County, Oregon, and Siskiyou County, California. According to the 2000 Census, Klamath County had a population of 63,775, 35 percent of whom lived in rural areas (non-census designated places [CDPs]). Siskiyou County, on the other hand, had a population of 44,301, 47 percent of whom lived in rural areas (non-CDPs). There are several communities within the Project area but data that adequately describe these communities are scarce. For this study, data used to describe the communities came from the U.S. Census, the Oregon Employment Department, and the Center for Economic Development at Chico State University, Chico, California.

2.7.1 Population

2.7.1.1 Population Size

Within the six-county study area, the total population is 464,507. The three counties (Klamath, Jackson, and Siskiyou) that compose the upstream region have a combined population of 289,345. Table 2.7-1 shows the contribution of each of the three counties in the upstream region to the upstream region total and the six-county study area total. The combined population of the downstream region is 175,162. Table 2.7-2 shows the contribution of the individual counties (Curry, Del Norte, and Humboldt) to the downstream region and the combined six-county region.

Table 2.7-1. Year 2000 upstream region population by county.

	Population	Percent of Upstream Total	Percent of Six-County Total
Jackson	181,269	63	39
Klamath	63,775	22	14
Siskiyou	44,301	15	10
Upstream Region Total	289,345	100	62
Six-County Total	464,507		100

Source: U.S. Census, 2000.

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Table 2.7-2. Year 2000 downstream region population by county.

	Population	Percent of Downstream Total	Percent of Six-County Total
Curry	21,137	12	5
Del Norte	27,507	16	6
Humboldt	126,518	72	27
Downstream Region Total	175,162	100	38
Six-County Total	464,507		100

Source: U.S. Census, 2000.

The upstream region contains more than 60 percent of the study area population, with Jackson County, Oregon, composing almost 40 percent of the total study area population. The physical structures of the Project are all within the counties of Klamath in Oregon and Siskiyou in California. These two counties combine for 37 percent of the upstream region's population and just under 25 percent of the six-county study area population.

Table 2.7-3 shows the population of each CDP for each of the six counties in the study area. Within Jackson County, Ashland and Medford are the major population centers with a combined population of almost 83,000, or 45 percent of the county population. Within Klamath County, Klamath Falls and Altamont are the two biggest population centers, each with about 30 percent of the county population. In Siskiyou County, Yreka, Mt. Shasta, and Weed have the greatest populations, accounting for a total of about 30 percent of the county population.

Table 2.7-3. Year 2000 population by census designated place.

	Year 2000 Population	Percent of County Total
Curry County		
Brookings	5,447	25.8
Gold Beach	1,897	9.0
Harbor	2,622	12.4
Port Orford	1,153	5.5
Non-CDPs	10,018	47.4
Total	21,137	100.0
Del Norte County		
Bertsch-Oceanview	2,238	8.1
Crescent City	4,006	14.6
Crescent City North	4,028	14.6
Klamath	651	2.4
Non-CDPs	16,584	60.3
Total	27,507	100.0
Humboldt County		
Arcata	16,651	13.2
Bayview	2,359	1.9
Blue Lake	1,135	0.9

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Table 2.7-3. Year 2000 population by census designated place.

	Year 2000 Population	Percent of County Total
Curry County		
Cutten	2,933	2.3
Eureka	26,128	20.7
Ferndale	1,382	1.1
Fortuna	10,497	8.3
Humboldt Hill	3,246	2.6
Hydesville	1,209	1.0
McKinleyville	13,599	10.7
Myrtletown	4,459	3.5
Pine Hills	3,108	2.5
Redway	1,188	0.9
Rio Dell	3,174	2.5
Trinidad	311	0.2
Westhaven-Moonstone	1,044	0.8
Willow Creek	1,743	1.4
Non-CDPs	32,352	25.6
Total	126,518	100.0
Jackson County		
Ashland	19,522	10.8
Butte Falls	439	0.2
Central Point	12,493	6.9
Eagle Point	4,797	2.6
Gold Hill	1,073	0.6
Jacksonville	2,235	1.2
Medford	63,154	34.8
Phoenix	4,060	2.2
Rogue River	1,847	1.0
Shady Cove	2,307	1.3
Talent	5,589	3.1
White City	5,466	3.0
Non-CDPs	58,287	32.2
Total	181,269	100.0
Klamath County		
Altamont	19,603	30.7
Bonanza	415	0.7
Chiloquin	716	1.1
Klamath Falls	19,462	30.5
Malin	638	1.0
Merrill	897	1.4
Non-CDPs	22,044	34.6
Total	63,775	100.0
Siskiyou County		
Carrick	156	0.4
Dorris	886	2.0

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Table 2.7-3. Year 2000 population by census designated place.

	Year 2000 Population	Percent of County Total
Curry County		
Dunsmuir	1,923	4.3
Edgewood	67	0.2
Etna	781	1.8
Fort Jones	660	1.5
Gazelle	136	0.3
Greenview	200	0.5
Grenada	351	0.8
Hornbrook	286	0.6
McCloud	1,343	3.0
Macdoel	140	0.3
Montague	1,456	3.3
Mount Hebron	92	0.2
Mount Shasta	3,621	8.2
Tennant	63	0.1
Tulelake	1,020	2.3
Weed	2,978	6.7
Yreka	7,290	16.5
Non-CDPs	20,852	47.1
Total	44,301	100.0

Source: U.S. Census, 2000.

Throughout the study region, significant populations occur in non-CDPs, as shown in Table 2.7-3. For example, in Klamath, Siskiyou, and Humboldt counties, which account for the majority of the Klamath River miles, individuals in non-CDPs account for 35, 47, and 25 percent, respectively, of the county populations. Many of the smaller communities along the Klamath River are not CDPs or incorporated cities; therefore, they do not show up individually in the Census data. Table 2.7-4 shows the communities within a 5-mile buffer area by county as identified by the 2000 Census, as well as road and recreation maps.

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Table 2.7-4. Listing of communities within the 5-mile buffer area.

County	Communities
Klamath County, Oregon	Klamath Falls, Midland, and Keno
Curry County, Oregon	Brookings and Gold Beach
Siskiyou County, California	Copco, Klamathon, Henley, Hornbrook, Yreka, Gottville, Klamath River, Horse Creek, Hamburg, Seiad Valley, Fort Goff, Nolton, Happy Camp, Clear Creek, Dorris, Montague, and Somes Bar
Humboldt County, California	Arcata, Bayview, Cutten, Eureka, Ferndale, Humboldt Hill, McKinleyville, Myrtletown, Pine Hills, Trinidad, Westhaven-Moonstone, Orleans, Weitchpec, Martins Ferry, Waseck, Kanick, Surgone, Pecwan, and Johnsons
Del Norte County, California	Bertsch-Oceanview, Crescent City, Crescent City North, Klamath Glen, Klamath, and Requa

Table 2.7-5 shows the year 2000 populations for the two geographic regions that compose the area of 5- and 50-mile buffers along the Klamath River and the coast, along with the county populations.

Table 2.7-5. Census 2000 population by individual county, and within the 50-mile and the 5-mile buffer areas.

	Population in		
	County	50-Mile Buffer	5-Mile Buffer
Del Norte County, California	27,507	27,505	26,019
Humboldt County, California	126,518	126,516	93,175
Siskiyou County, California	44,301	44,268	16,504
Curry County, Oregon	21,137	18,186	17,977
Jackson County, Oregon	181,269	179,709	785
Klamath County, Oregon	63,775	61,005	48,968
Upstream	289,345	284,982	65,509
Downstream	175,162	172,207	137,171
Six-County	464,507	457,189	202,680
California Total	198,326	198,289	135,698
Oregon Total	266,181	258,900	66,982
Two-State Total	464,507	457,189	202,680

Source: U.S. Census, 2000.

The populations of the 50-mile buffer areas are almost equal to the county populations. Thus the 50-mile buffer does not appear to add any new information or perspective. The 5-mile buffer for the upstream counties represents about 20 percent of the upstream county population total. This suggests that it can be important to separate the 5-mile buffer from the county population to

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better characterize local effects in the Project area. In contrast, the coastal population of the downstream counties captures about 80 percent of the downstream county population total. Thus the county aggregates are likely to adequately reflect effects felt within the 5-mile coastal corridors.

Over time, the county populations in the study area have exhibited relatively low annual growth rates. The upstream region had an annual average growth of 1.6 percent between 1970 and 2000, and this growth is predicted to slow to 0.6 percent between 2000 and 2040. The downstream region shows a similar pattern, with a 1.1 percent average annual growth rate from 1970 to 2000 and a predicted rate of 0.7 percent for 2000 to 2040. Table 2.7-6 shows the population estimates and predictions for the years 1970 to 2040 on a county-by-county basis and for the study regions. The population changes have been more severe at the subcounty level, with some of the smaller communities experiencing population reductions over this time period. See the discussion following topic area, e.g., race/ethnicity, age distribution, housing, in Sections 2.7.1.2 through 2.7.2.

Table 2.7-6. Estimated population (in thousands) and predicted long-term population trends, 1970 to 2040.

									Percent Average Annual Growth Rate	
	1970	**1980**	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**	**1970 to 2000**	**2000 to 2040**
Upstream Region	177.8	231.3	248.9	287.3	320.3	353.7	387.0	418.5	1.6	0.9
Downstream Region	127.3	143.7	162.2	178.7	201.4	215.5	227.4	236.4	1.1	0.7
Six-County Region	305.1	375.0	411.1	466.0	521.8	569.2	614.3	654.9	1.4	0.9
Curry	13.0	17.0	19.6	24.7	28.6	32.5	35.9	38.6	2.2	1.1
Del Norte	14.6	18.2	23.5	27.5	37.3	41.9	46.4	50.9	2.1	1.5
Humboldt	99.7	108.5	119.1	126.5	135.6	141.1	145.1	146.9	0.8	0.4
Jackson	94.5	132.5	147.4	178.0	199.4	221.7	244.1	264.9	2.1	1.0
Klamath	50.0	59.1	57.9	65.0	71.4	78.4	85.2	91.5	0.9	0.9
Siskiyou	33.2	39.7	43.5	44.3	49.5	53.7	57.6	62.0	1.0	0.8

Source: U.S. Decennial Census.

Source: Office of Economic Analysis, 2002.

Data exist for a number of cities and other incorporated communities in proximity to the Project. The existing data are limited to those available through the U.S. Census.

Most of the communities within the 5-mile buffer area experienced population growth between 1980 and 1990. The only exceptions were the communities of Cutten (-3.5 percent), Ferndale (-0.3 percent), and Trinidad (-1.0 percent). Between 1990 and 2000, annual population growth rate was less than what it was the preceding decade in most communities, with some communities (e.g., Crescent City, Dorris, Eureka, Klamath, Trinidad and Westhaven-Moonstone) losing population. The three Oregon communities (Brookings, Gold Beach, and Klamath Falls) within the 5-mile buffer have a different population growth pattern. These communities have

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seen a steady growth in population in the last two decades. Table 2.7-7 summarizes the population estimates from the last three U.S. censuses.

Table 2.7-7. Population by community within the 5-mile buffer area, 2000 census.

Community	1980 Population	1990 Population	2000 Population	Average Annual Growth Rate		
				1980 to 1990 (percent)	1990 to 2000 (percent)	1980 to 2000 (percent)
Arcata City, CA	12,340	15,197	16,714	2.1	1.0	3.1
Bayview CDP, CA		1,355	2,355		5.7	
Bertsch-Oceanview CDP, CA			2,097			
Clear Creek/Fort Goff/Hamburg, CA*			525			
Copco, CA*			1,648			
Crescent City, CA	3,075	4,380	3,888	3.6	-1.2	2.4
Crescent City North CDP, CA	2,846	3,853	4,069	3.1	0.5	3.6
Cutten CDP, CA	2,375	1,656	3,096	-3.5	6.5	2.7
Dorris City, CA	836	925	902	1.0	-0.3	0.8
Eureka City, CA	24,153	26,848	25,929	1.1	-0.3	0.7
Ferndale City, CA	1,367	1,331	1,421	-0.3	0.7	0.4
Gottsville/Henley/ Klamathon, CA*			743			
Happy Camp, CA*			667			
Hornbrook CDP, CA			314			
Horse Creek, CA*			1,749			
Humboldt Hill CDP, CA		2,907	3,252		1.1	
Johnsons/Pecwan/Kanick/ Martin's Ferry/Surgone/Waseck/ Weitchpec, CA*			465			
Klamath CDP, CA		841	653		-2.5	
Klamath Glen/Requa, CA*			1,126			
Klamath River/Nolton/Seiad Valley, CA*			990			
McKinleyville CDP, CA	7,772	10,749	13,601	3.3	2.4	5.8
Montague City, CA	1,285	1,415	1,525	1.0	0.8	1.7
Myrtletown CDP, CA	3,959	4,413	4,375	1.1	-0.1	1.0
Orleans, CA*			601			

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Table 2.7-7. Population by community within the 5-mile buffer area, 2000 census.

Community	1980 Population	1990 Population	2000 Population	Average Annual Growth Rate		
				1980 to 1990 (percent)	1990 to 2000 (percent)	1980 to 2000 (percent)
Pine Hills CDP, CA	2,686	2,905	3,096	0.8	0.6	1.4
Somes Bar, CA*			891			
Trinidad City, CA	379	343	331	-1.0	-0.4	-1.3
Westhaven-Moonstone CDP, CA		1,082	1,046		-0.3	
Yreka City, CA	5,916	6,948	7,442	1.6	0.7	2.3
Brookings City, OR	3,384	4,469	5,363	2.8	1.8	4.7
Gold Beach City, OR	1,515	1,546	1,864	0.2	1.9	2.1
Midland, OR*			1,301			
Keno, OR*			1,011			
Klamath Falls City, OR	16,661	17,737	19,335	0.6	0.9	1.5

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

2.7.1.2 Race Distribution

More than three-fourths of the population in the study area is white. The American Indian population constitutes the second largest racial group in all but Jackson County, where the second largest racial group consists of individuals who characterize themselves as being from "Two or More Races." Table 2.7-8 shows the race and ethnic distributions by individual county.

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Table 2.7-8. Race/ethnic distributions by individual county, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaskan Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic*
Curry County	21,137	19,661	25	509	166	7	216	553	707
Del Norte County	27,507	21,686	1,176	1,571	610	49	1,056	1,359	3,708
Humboldt County	126,518	107,307	979	7,087	1,859	138	2,981	6,167	7,750
Jackson County	181,269	166,034	760	1,975	1,398	337	5,173	5,592	12,066
Klamath County	63,775	55,625	288	2,636	474	116	2,303	2,333	4,967
Siskiyou County	44,301	38,551	558	1,623	598	102	1,231	1,638	3,203

Source: U.S. Census, 2000.

* Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

Table 2.7-9 shows the race/ethnic distributions by region in the study area. Although both the upstream and the downstream regions have populations that are predominantly white, the downstream region has a slightly more diverse racial makeup.

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Table 2.7-9. Race/ethnic distributions by region, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaskan Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic*
Upstream Region	289,345	260,393	1,708	6,378	2,669	458	8,642	9,097	20,236
Downstream Region	175,162	148,506	2,327	9,463	2,875	288	4,412	7,291	12,165
Six-County Region	464,507	408,899	4,035	15,841	5,544	746	13,054	16,388	32,401
California Total	198,326	167,445	2,875	10,737	3,254	321	5,402	8,292	14,661
Oregon Total	266,181	241,454	1,160	5,104	2,290	425	7,652	8,096	17,740
Two-State Region	464,507	408,899	4,035	15,841	5,544	746	13,054	16,388	32,401

Source: U.S. Census, 2000.

* Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

Tables 2.7-10 and 2.7-11 show the race/ethnic distribution within the 50-mile and 5-mile buffer area, respectively. The racial/ethnic distributions within both buffer areas resemble those at the individual county level, with more than 75 percent or more of the population in both buffer areas being white. American Indians constitute the second largest racial group in all counties but Jackson.

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Table 2.7-10. Race/ethnic distributions within the 50-mile buffer area, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaskan Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic*
Curry County	19,082	17,742	22	479	157	7	195	480	641
Del Norte County	27,507	21,686	1,176	1,571	610	49	1,056	1,359	3,708
Humboldt County	126,518	107,307	979	7,087	1,859	138	2,981	6,167	7,750
Jackson County	181,269	166,034	760	1,975	1,398	337	5,173	5,592	12,066
Klamath County	61,305	53,327	278	2,568	467	116	2,293	2,256	4,915
Siskiyou County	44,301	38,551	558	1,623	598	102	1,231	1,638	3,203

Source: U.S. Census, 2000.

* Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

Table 2.7-11. Race/ethnic distributions within the 5-mile buffer area, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaskan Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic*
Curry County	18,082	16,871	22	437	157	7	189	399	616
Del Norte County	26,583	20,953	1,154	1,559	604	49	1,032	1,232	3,650
Humboldt County	101,152	84,987	868	6,212	1,700	128	2,169	5,088	5,761
Jackson County	785	727	0	27	0	0	0	31	4
Klamath County	50,970	44,945	220	1,836	406	95	1,669	1,799	3,669
Siskiyou County	21,725	18,725	103	1,195	358	53	488	803	1,344

Source: U.S. Census, 2000.

* Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

Within the 5-mile buffer area, the community of Klamath CDP had the highest concentration of minority (nonwhite) population in 2000. About 46 percent of the population of Klamath CDP is nonwhite. Almost three-fourths of the minority population in Klamath CDP, California, is American Indian. Excepting Klamath CDP, the percentage of minority population ranges from 6.5 percent in Ferndale, California, to 22.6 percent in Crescent City, California. Tables 2.7-12a

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and 2.7-12b show the race/ethnic distribution of the population in the four cities within the Project area.

Table 2.7-12a. Race/ethnic distributions (population) by community within the 5-mile buffer area, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic[1]
Arcata City, CA	16,714	14,013	211	502	301	0	699	988	1,182
Bayview CDP, CA	2,355	1,940	9	118	62	0	112	108	218
Bertsch-Oceanview CDP, CA	2,097	1,735	0	155	69	0	56	82	152
Clear Creek/Fort Goff/Hamburg, CA[2]	525	411	2	81	7	0	3	21	11
Copco, CA[2]	1,648	1,471	9	83	0	2	19	64	69
Crescent City, CA	3,888	3,011	26	241	191	0	203	216	418
Crescent City North CDP, CA	4,069	3,230	19	139	123	0	167	391	368
Cutten CDP, CA	3,096	2,743	0	199	6	0	31	117	201
Dorris City, CA	902	701	0	73	7	0	88	33	176
Eureka City, CA	25,929	21,483	306	1,086	745	43	589	1,677	1,867
Ferndale City, CA	1,421	1,328	2	14	0	0	21	56	59
Gottsville/Henley/ Klamathon, CA[2]	743	642	3	49	0	1	13	35	32
Happy Camp, CA[2]	667	459	4	166	0	0	0	38	26
Hornbrook CDP, CA	314	278	0	20	0	0	5	11	21
Horse Creek, CA[2]	1,749	1,602	0	36	3	0	30	78	123
Humboldt Hill CDP, CA	3,252	2,763	65	71	81	0	109	163	253
Johnsons/Pecwan/ Kanick/Martin's Ferry/Surgone/ Waseck/Weitchpec, CA[2]	465	91	0	322	0	0	11	41	11
Klamath CDP, CA	653	354	0	257	0	2	8	32	32
Klamath Glen/Requa, CA[2]	1,126	672	21	323	10	2	25	73	96
Klamath River/Nolton/Seiad Valley, CA[2]	990	744	3	153	8	9	3	70	38
McKinleyville CDP, CA	13,601	12,036	22	481	170	4	180	708	601

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Table 2.7-12a. Race/ethnic distributions (population) by community within the 5-mile buffer area, 2000 census.

	Total Population	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic[1]
Montague City, CA	1,525	1,393	2	57	0	0	24	49	60
Myrtletown CDP, CA	4,375	3,834	118	69	190	0	57	107	171
Orleans, CA[2]	601	385	0	142	21	0	8	45	21
Pine Hills CDP, CA	3,096	2,886	24	70	11	0	0	105	87
Somes Bar, CA[2]	891	736	0	97	0	0	4	54	22
Trinidad City, CA	331	294	8	4	5	0	4	16	16
Westhaven-Moonstone CDP, CA	1,046	941	0	31	22	0	3	49	47
Yreka City, CA	7,442	6,405	20	304	315	37	133	228	400
Brookings City, OR	5,363	4,885	8	125	120	0	80	145	244
Gold Beach City, OR	1,864	1,788	5	31	0	7	4	29	41
Midland, OR[2]	1,301	1,236	0	9	6	9	0	41	110
Keno, OR[2]	1,011	948	0	7	7	0	0	49	24
Klamath Falls City, OR	19,335	16,445	127	958	206	60	882	657	1,697

Source: U.S. Census, 2000.

[1] Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

[2] These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

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Table 2.7-12b. Race/ethnic distributions (percent) by community within the 5-mile buffer area, 2000 census.

	Total Population	White (%)	Black or African American (%)	American Indian and Alaska Native (%)	Asian (%)	Native Hawaiian and Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic[1] (%)
Arcata City, CA	16,714	83.8	1.3	3.0	1.8	0.0	4.2	5.9	7.1
Bayview CDP, CA	2,355	82.4	0.4	5.0	2.6	0.0	4.8	4.6	9.3
Bertsch-Oceanview CDP, CA	2,097	82.7	0.0	7.4	3.3	0.0	2.7	3.9	7.2
Clear Creek/Fort Goff/Hamburg, CA[2]	525	78.3	0.4	15.4	1.3	0.0	0.6	4.0	2.1
Copco, CA[2]	1,648	89.3	0.5	5.0	0.0	0.1	1.2	3.9	4.2
Crescent City, CA	3,888	77.4	0.7	6.2	4.9	0.0	5.2	5.6	10.8
Crescent City North CDP, CA	4,069	79.4	0.5	3.4	3.0	0.0	4.1	9.6	9.0
Cutten CDP, CA	3,096	88.6	0.0	6.4	0.2	0.0	1.0	3.8	6.5
Dorris City, CA	902	77.7	0.0	8.1	0.8	0.0	9.8	3.7	19.5
Eureka City, CA	25,929	82.9	1.2	4.2	2.9	0.2	2.3	6.5	7.2
Ferndale City, CA	1,421	93.5	0.1	1.0	0.0	0.0	1.5	3.9	4.2
Gottsville/Henley/ Klamathon, CA[2]	743	86.4	0.4	6.6	0.0	0.1	1.7	4.7	4.3
Happy Camp, CA[2]	667	68.8	0.6	24.9	0.0	0.0	0.0	5.7	3.9
Hornbrook CDP, CA	314	88.5	0.0	6.4	0.0	0.0	1.6	3.5	6.7
Horse Creek, CA[2]	1,749	91.6	0.0	2.1	0.2	0.0	1.7	4.5	7.0
Humboldt Hill CDP, CA	3,252	85.0	2.0	2.2	2.5	0.0	3.4	5.0	7.8
Johnsons/Pecwan/ Kanick/Martin's Ferry/Surgone/ Waseck/Weitchpec, CA[2]	465	19.6	0.0	69.2	0.0	0.0	2.4	8.8	2.4
Klamath CDP, CA	653	54.2	0.0	39.4	0.0	0.3	1.2	4.9	4.9
Klamath Glen/Requa, CA[2]	1,126	59.7	1.9	28.7	0.9	0.2	2.2	6.5	8.5
Klamath River/Nolton/Seiad Valley, CA[2]	990	75.2	0.3	15.5	0.8	0.9	0.3	7.1	3.8
McKinleyville CDP, CA	13,601	88.5	0.2	3.5	1.2	0.0	1.3	5.2	4.4
Montague City, CA	1,525	91.3	0.1	3.7	0.0	0.0	1.6	3.2	3.9
Myrtletown CDP, CA	4,375	87.6	2.7	1.6	4.3	0.0	1.3	2.4	3.9
Orleans, CA[2]	601	64.1	0.0	23.6	3.5	0.0	1.3	7.5	3.5
Pine Hills CDP, CA	3,096	93.2	0.8	2.3	0.4	0.0	0.0	3.4	2.8

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Table 2.7-12b. Race/ethnic distributions (percent) by community within the 5-mile buffer area, 2000 census.

	Total Population	White (%)	Black or African American (%)	American Indian and Alaska Native (%)	Asian (%)	Native Hawaiian and Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic[1] (%)
Somes Bar, CA[2]	891	82.6	0.0	10.9	0.0	0.0	0.4	6.1	2.5
Trinidad City, CA	331	88.8	2.4	1.2	1.5	0.0	1.2	4.8	4.8
Westhaven-Moonstone CDP, CA	1,046	90.0	0.0	3.0	2.1	0.0	0.3	4.7	4.5
Yreka City, CA	7,442	86.1	0.3	4.1	4.2	0.5	1.8	3.1	5.4
Brookings City, OR	5,363	91.1	0.1	2.3	2.2	0.0	1.5	2.7	4.5
Gold Beach City, OR	1,864	95.9	0.3	1.7	0.0	0.4	0.2	1.6	2.2
Midland, OR[2]	1,301	95.0	0.0	0.7	0.5	0.7	0.0	3.2	8.5
Keno, OR[2]	1,011	93.8	0.0	0.7	0.7	0.0	0.0	4.8	2.4
Klamath Falls City, OR	19,335	85.1	0.7	5.0	1.1	0.3	4.6	3.4	8.8

Source: U.S. Census, 2000.

[1] Hispanics or Latinos are those people who classified themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the Census 2000 questionnaire—"Mexican, Mexican Am., Chicano," "Puerto Rican," or "Cuban"—as well as those who indicate that they are "other Spanish/Hispanic/Latino." People who identify their origin as "other Spanish/Hispanic/Latino" may be of any race. Thus, the percent Hispanic should not be added to percentages for racial (i.e., minority) categories.

[2] These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

Table 2.7-13 shows the age distributions for each of the six counties. The age distributions are similar across counties, with about one-fourth of the population under 18 years and one-third over 50 years. Curry County is the only exception, with about 20 percent of its population below 17 years and about half of its population above 50 years.

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Table 2.7-13. Age distribution by individual county, 2000 census.

Geography	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Del Norte County	27,507	1,481	5,420	1,249	2,933	4,660	4,379	3,915	3,470
Humboldt County	126,518	7,095	22,116	8,923	15,503	15,990	20,486	20,501	15,904
Siskiyou County	44,301	2,273	8,299	2,005	2,712	4,720	7,494	8,719	8,079
Curry County	21,137	868	3,150	602	1,135	2,048	3,099	4,546	5,689
Jackson County	181,269	10,945	33,179	9,513	16,162	22,604	28,481	31,386	28,999
Klamath County	63,775	4,070	12,427	3,124	6,038	7,914	9,714	11,014	9,474

Source: U.S. Census, 2000.

Aggregating the county level data by region and by state shows the age distribution to be similar across regions and state. The differences observed in Table 2.7-13 with regard to Curry County are somewhat obscured once the counties are aggregated into regions and states. Table 2.7-14 summarizes the age distributions by region.

Table 2.7-14. Age distribution by region, 2000 census.

Geography	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Upstream Region	289,345	17,288	53,905	14,642	24,912	35,238	45,689	51,119	46,552
Downstream Region	175,162	9,444	30,686	10,774	19,571	22,698	27,964	28,962	25,063
Six-County Region	464,507	26,732	84,591	25,416	44,483	57,936	73,653	80,081	71,615
California Total	198,326	10,849	35,835	12,177	21,148	25,370	32,359	33,135	27,453
Oregon Total	266,181	15,883	48,756	13,239	23,335	32,566	41,294	46,946	44,162
Two-State Total	464,507	26,732	84,591	25,416	44,483	57,936	73,653	80,081	71,615

Source: U.S. Census, 2000.

Age distributions within the 50-mile and 5-mile buffer areas are similar to those observed at the county levels. Tables 2.7-15 and 2.7-16 show the age distribution within the 50-mile and 5-mile buffer areas.

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Table 2.7-15. Age distribution within the 50-mile buffer area, 2000 census.

Geography	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Curry County	19,082	793	2,873	541	1,050	1,875	2,723	4,058	5,169
Del Norte County	27,507	1,481	5,420	1,249	2,933	4,660	4,379	3,915	3,470
Humboldt County	126,518	7,095	22,116	8,923	15,503	15,990	20,486	20,501	15,904
Jackson County	181,269	10,945	33,179	9,513	16,162	22,604	28,481	31,386	28,999
Klamath County	61,305	3,939	11,989	3,074	5,884	7,625	9,276	10,420	9,098
Siskiyou County	44,301	2,273	8,299	2,005	2,712	4,720	7,494	8,719	8,079

Source: U.S. Census, 2000.

Table 2.7-16. Age distribution within the 5-mile buffer area, 2000 census.

Geography	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Del Norte County	26,583	1,414	5,181	1,227	2,881	4,514	4,271	3,722	3,373
Humboldt County	101,152	5,560	17,092	7,659	13,336	12,706	16,221	16,185	12,393
Siskiyou County	21,725	1,093	4,150	887	1,286	2,399	3,618	4,280	4,012
Curry County	18,082	769	2,665	513	1,030	1,810	2,553	3,835	4,907
Jackson County	785	53	144	4	92	81	161	185	65
Klamath County	50,970	3,350	9,884	2,701	5,238	6,502	7,648	8,235	7,412

Source: U.S. Census, 2000.

Table 2.7-17 shows the age distributions for each of the communities within the 5-mile buffer area. The age distributions are similar across communities, with about one-fourth of the population under 18 years and one-third above 50 years. The city of Trinidad is the only exception, with about 14 percent of its population below 17 years and about half of its population above 50 years. The presence of an older population within Trinidad is also evidenced by the fact that the median age in the city in 2000 was 50.2 years, whereas all other communities had median ages that were less than or equal to those at the county level.

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Table 2.7-17. Age distribution by community within the 5-mile buffer area, 2000 census.

Community	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Arcata City, CA	16,714	656	1,849	2,866	4,450	1,882	1,787	1,791	1,433
Bayview CDP, CA	2,355	128	452	150	187	325	367	401	345
Bertsch-Oceanview CDP, CA	2,097	136	431	96	161	285	338	342	308
Clear Creek/Fort Goff/Hamburg, CA*	525	9	106	14	21	57	115	128	75
Copco, CA*	1,648	65	320	74	54	170	282	388	295
Crescent City, CA	3,888	370	833	209	433	541	542	438	522
Crescent City North CDP, CA	4,069	305	924	181	367	550	634	620	488
Cutten CDP, CA	3,096	190	572	167	246	377	534	568	442
Dorris City, CA	902	54	201	48	72	86	134	134	173
Eureka City, CA	25,929	1,508	4,246	1,672	3,442	3,379	4,010	4,043	3,629
Ferndale City, CA	1,421	85	227	67	123	136	215	316	252
Gottsville/Henley/Klamathon, CA*	743	36	94	24	36	76	104	171	202
Happy Camp, CA*	667	40	115	12	51	85	113	130	121
Hornbrook CDP, CA	314	5	61	16	13	38	36	68	77
Horse Creek, CA*	1,749	97	307	50	116	167	297	365	350
Humboldt Hill CDP, CA	3,252	212	580	283	317	365	558	495	442
Johnsons/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec, CA*	465	32	131	17	28	66	94	46	51
Klamath CDP, CA*	653	36	138	71	33	79	111	96	89
Klamath Glen/Requa, CA*	1,126	47	193	124	64	176	208	154	160
Klamath River/Nolton/Seiad Valley, CA*	990	46	202	15	43	92	191	243	158
McKinleyville CDP, CA	13,601	942	2,625	721	1,486	2,066	2,354	1,942	1,465
Montague City, CA	1,525	101	343	67	116	213	220	280	185
Myrtletown CDP, CA	4,375	184	719	191	485	579	688	708	821
Orleans, CA*	601	49	131	19	37	92	68	129	76
Pine Hills CDP, CA	3,096	190	520	116	237	471	470	627	465
Somes Bar, CA*	891	14	182	42	25	101	173	212	142
Trinidad City, CA	331	19	26	11	29	40	44	100	62

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Table 2.7-17. Age distribution by community within the 5-mile buffer area, 2000 census.

Community	Total	Under 5 years	5-17 years	18-21 years	22-29 years	30-39 years	40-49 years	50-64 years	65 years and up
Westhaven-Moonstone CDP, CA	1,046	42	159	37	80	133	245	245	105
Yreka City, CA	7,442	419	1,514	337	509	940	1,124	1,164	1,435
Brookings City, OR	5,363	271	1,011	184	331	650	779	831	1,306
Gold Beach City, OR	1,864	73	336	51	112	225	344	418	305
Midland, OR*	1,301	91	254	18	117	185	196	189	251
Keno, OR*	1,011	47	146	12	53	118	227	237	171
Klamath Falls City, OR	19,335	1,493	3,254	1,507	2,483	2,611	2,722	2,759	2,506

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

2.7.2 Housing

Housing stock, vacancy, and substandard housing information for the study area were derived from the 2000 Census data. Although the U.S. Census does not have a category of housing called "substandard" in its data, certain housing features are considered to be important for a housing unit to be considered standard for habitation. The Bureau of Census collects housing information for the Department of Housing and Urban Development and provides these data as the American Housing Survey. According to the American Housing Survey, a housing unit may be categorized as "substandard" if the unit lacks either adequate plumbing or kitchen facilities. For the current study, a housing unit is considered to be "substandard" if it lacks adequate plumbing and kitchen facilities.

The study area has adequate housing as indicated by the high vacancy rates. Vacancy rates above 5 percent are generally thought to indicate surplus of housing units available for rent. This measure can be important if, for example, the proposed Project would require a sudden in-migration to the area.

Overall, there are about twice as many owner-occupied housing units as there are renter-occupied housing units. The ratio of owner-occupied housing units is sometimes used as an indicator of community well-being because it is reflective of the relative wealth and commitment of residents to the area (Doak and Kusel, 1997). Jackson County has the highest percentage of owner-occupied housing and Humboldt County has the lowest percentage. Table 2.7-18 summarizes housing information in the study area by individual county and CDPs.

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Table 2.7-18. Housing stock, vacancy and substandard housing information by census designated place.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing*
Curry County, OR							
Brookings	2,614	305	12	1,313	996	50.2	1.2
Gold Beach	987	158	16	550	279	55.7	2.2
Harbor	1,691	358	21	1,072	261	63.4	2.7
Port Orford	662	91	14	403	168	60.9	0.9
Non-CDPs	5,452	951	17	3,624	877	66.5	4.5
Total	11,406	1,863	16	6,962	2,581	61.0	3.1
Del Norte County, CA							
Bertsch-Oceanview	924	110	12	556	258	60.2	0.0
Crescent City	1,754	176	10	518	1,060	29.5	0.0
Crescent City North	1,761	194	11	780	787	44.3	1.0
Klamath	365	101	28	200	64	54.8	6.4
Non-CDPs	5,630	683	12	3,798	1,149	67.5	1.7
Total	10,434	1,264	12	5,852	3,318	56.1	1.3
Humboldt County, CA							
Arcata	7,272	221	3	2,646	4,405	36.4	0.5
Bayview	981	45	5	604	332	61.6	1.0
Blue Lake	556	52	9	310	194	55.8	2.7
Cutten	1,249	52	4	717	480	57.4	1.6
Eureka	11,637	680	6	5,092	5,865	43.8	1.7
Ferndale	663	52	8	385	226	58.1	2.0
Fortuna	4,414	229	5	2,606	1,579	59.0	0.2
Humboldt Hill	1,269	60	5	921	288	72.6	1.7
Hydesville	489	32	7	385	72	78.7	0.0
McKinleyville	5,494	217	4	3,444	1,833	62.7	0.8
Myrtletown	1,827	89	5	1,060	678	58.0	0.2
Pine Hills	1,253	54	4	903	296	72.1	1.7
Redway	641	98	15	332	211	51.8	1.5
Rio Dell	1,434	213	15	708	513	49.4	1.6
Trinidad	228	60	26	105	63	46.1	4.4
Westhaven-Moonstone	498	45	9	323	130	64.9	0.8
Willow Creek	1,099	327	30	514	258	46.8	6.5
Non-CDPs	14,908	2,148	14	8,479	4,281	56.9	8.6

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Table 2.7-18. Housing stock, vacancy and substandard housing information by census designated place.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing*
Total	55,912	4,674	8	29,534	21,704	52.8	3.2
Jackson County, OR							
Ashland	9,050	513	6	4,456	4,081	49.2	2.4
Butte Falls	170	10	6	97	63	57.1	0.0
Central Point	4,760	147	3	3,249	1,364	68.3	1.5
Eagle Point	1,823	120	7	1,201	502	65.9	0.0
Gold Hill	446	27	6	296	123	66.4	0.4
Jacksonville	1,102	68	6	796	238	72.2	0.4
Medford	26,297	1,204	5	14,372	10,721	54.7	1.5
Phoenix	1,850	104	6	1,134	612	61.3	0.5
Rogue River	949	47	5	478	424	50.4	1.1
Shady Cove	1,107	118	11	715	274	64.6	2.2
Talent	2,420	96	4	1,327	997	54.8	1.2
White City	1,841	80	4	1,432	329	77.8	1.5
Non-CDPs	23,922	1,671	7	18,011	4,240	75.3	2.6
Total	75,737	4,205	6	47,564	23,968	62.8	1.9
Klamath County, OR							
Altamont	8,315	538	6	5,594	2,183	67.3	1.7
Bonanza	152	13	9	98	41	64.5	0.0
Chiloquin	290	33	11	160	97	55.2	2.1
Klamath Falls	8,722	806	9	3,906	4,010	44.8	2.6
Malin	217	17	8	122	78	56.2	6.9
Merrill	380	36	9	228	116	60.0	1.9
Non-CDPs	10,807	2,235	21	7,030	1,542	65.1	6.0
Total	28,883	3,678	13	17,138	8,067	59.3	3.6
Siskiyou County, CA							
Carrick	67	11	16	33	23	49.3	0.0
Dorris	396	54	14	237	105	59.8	2.4
Dunsmuir	1,170	303	26	483	384	41.3	15.5
Edgewood	25	0	0	19	6	76.0	0.0
Etna	362	33	9	232	97	64.1	1.6
Fort Jones	328	30	9	175	123	53.4	3.8
Gazelle	67	10	15	37	20	55.2	2.9

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Table 2.7-18. Housing stock, vacancy and substandard housing information by census designated place.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing*
Greenview	99	11	11	69	19	69.7	1.4
Grenada	146	7	5	93	46	63.7	0.0
Hornbrook	148	28	19	84	36	56.8	9.5
McCloud	702	121	17	380	201	54.1	4.0
Macdoel	44	7	16	15	22	34.1	0.0
Montague	609	49	8	377	183	61.9	0.2
Mount Hebron	43	8	19	22	13	51.2	5.4
Mount Shasta	1,798	129	7	839	830	46.7	0.9
Tennant	96	62	65	25	9	26.0	0.0
Tulelake	459	101	22	201	157	43.8	2.6
Weed	1,293	109	8	650	534	50.3	3.3
Yreka	3,303	189	6	1,797	1,317	54.4	0.5
Non-CDPs	10,792	2,129	20	6,704	1,959	62.1	6.5
Total	21,947	3,391	15	12,472	6,084	56.8	4.6

Source: U.S. Census, 2000.

* Substandard housing consists of housing units that lack adequate plumbing and kitchen facilities.

Table 2.7-19 presents housing information for the study area by region. More housing units exist in the upstream region compared to the downstream. This ties back to the presence of a larger population in the upstream region. The percentage of "substandard" housing units is about the same in the upstream and the downstream regions.

Table 2.7-19. Housing stock, vacancy, and substandard housing information by region, 2000 census.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing*
Upstream Region	126,567	11,274	9	77,174	38,119	61.0	2.7
Downstream Region	77,752	7,801	10	42,348	27,603	54.5	2.9
Six-County Region	204,319	19,075	9	119,522	65,722	58.5	2.8
California Total	88,293	9,329	11	47,858	31,106	54.2	3.3
Oregon Total	116,026	9,746	8	71,664	34,616	61.8	2.4
Two-State Total	204,319	19,075	9	119,522	65,722	58.5	2.8

Source: U.S. Census, 2000.

* Substandard housing consists of housing units that lack adequate plumbing and kitchen facilities.

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Tables 2.7-20 and 2.7-21 show housing stock, vacancy, and substandard housing information within the 50-mile and 5-mile buffer areas. In general, the 5-mile buffer area has slightly lower vacancy rates at the county level, indicating that housing, though still above the 5 percent that is thought to indicate housing shortage, is becoming limited. The only exception is Jackson County, which has a vacancy rate at the 5-mile buffer area that is about five times as high as it is at the 50-mile buffer area.

The ratio of owner-occupied housing units within the 5-mile buffer area is slightly less than that within the 50-mile buffer area. Thus, the closer to the Project area, the tighter the housing market and the poorer the community (or the lower the community well-being as measured by the ratio of owner-occupied housing units).

Substandard housing ratios in each county are similar for the 50-mile and 5-mile buffer areas. The only exception is Jackson County, which has about two percent of its housing units within the 50-mile buffer area falling under the "substandard housing" category, compared to 18 percent for the 5-mile buffer area..

Table 2.7-20. Housing stock, vacancy, and substandard information within the 50-mile buffer area, 2000 census.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing*
Curry County	10,237	1,700	16.6	6,213	2,324	60.7	3.0
Del Norte County	10,434	1,264	12.1	5,851	3,319	56.1	1.3
Humboldt County	55,912	4,674	8.4	29,524	21,714	52.8	3.2
Jackson County	75,737	4,205	5.6	47,574	23,958	62.8	1.9
Klamath County	27,563	3,366	12.2	16,380	7,817	59.4	3.5
Siskiyou County	21,947	3,391	15.5	12,475	6,081	56.8	4.6

Source: U.S. Census, 2000.

* Substandard housing consists of housing units that lack adequate plumbing and kitchen facilities.

In addition to summarizing housing information at the 5-mile buffer area within each of the six counties, Table 2.7-21 also summarizes information for communities (both CDPs and non-CDPs) within the 5-mile buffer area. With the exception of Arcata, Clear Creek/Fort Goff/Hamburg, Crescent City, Crescent City North, Eureka, Happy Camp, Klamath River/Nolton/Seiad Valley, Orleans, Somes Bar, Trinidad, and Klamath Falls, the communities within the 5-mile buffer area have a higher ratio of owner-occupied housing units than their respective county averages. The community of Keno has the highest percentage of owner-occupied housing units at 80.8 percent, followed by Humboldt Hill at 72.6 percent, Pine Hills at 72.4 percent, and Westhaven-Moonstone at 64.9 percent.

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The communities within the 5-mile buffer area have, in general, relatively higher percentages of substandard housing. The community with the highest percentage of substandard housing units (at 50.2 percent) is the community of Johnson/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec. The community of Orleans has the second highest percentage of substandard housing units (43 percent), followed by the communities of Somes Bar (24.8 percent) and Clear Creek/Fort Goff/Hamburg (24.6 percent). In addition to the above communities, a number of other communities have proportions of substandard housing units that are higher than the proportion observed for the county. These communities, all of which are in Siskiyou County, are: Gottsville/Henley/Klamathon (9.1 percent), Happy Camp (9 percent), Hornbrook (9.5 percent), and Klamath River/Nolton/Seiad Valley (9.4 percent). Thus, the communities within the Project area are characterized by higher proportions of substandard housing.

Table 2.7-21. Housing stock, vacancy, and substandard housing information within the 5-mile buffer area, 2000 census.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing[1]
Curry County	9,666	1,566	16.2	5,877	2,223	72.6	3.1
Del Norte County	9,980	1,164	11.7	5,623	3,193	63.8	1.2
Humboldt County	44,340	3,271	7.4	23,142	17,927	56.3	2.9
Jackson County	432	113	26.2	249	70	78.1	18.1
Klamath County	22,473	2,238	10.0	13,293	6,942	65.7	3.0
Siskiyou County	10,704	1,639	15.3	6,176	2,889	68.1	5.4
Arcata City, CA	7,272	221	3.0	2,646	4,405	36.4	0.5
Bayview CDP, CA	981	45	5.0	604	332	61.6	1.0
Bertsch-Oceanview CDP, CA	924	110	12.0	556	258	60.2	0.0
Clear Creek/Fort Goff/Hamburg, CA[2]	366	143	39.1	165	58	45.1	24.6
Copco, CA[2]	800	167	20.9	522	111	65.3	5.3
Crescent City, CA	1,754	176	10.0	518	1,060	29.5	0.0
Crescent City North CDP, CA	1,761	194	11.0	780	787	44.3	1.0

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Table 2.7-21. Housing stock, vacancy, and substandard housing information within the 5-mile buffer area, 2000 census.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing[1]
Cutten CDP, CA	1,249	52	4.0	717	480	57.4	1.6
Dorris City, CA	396	54	14.0	237	105	59.8	2.4
Eureka City, CA	11,637	680	6.0	5,092	5,865	43.8	1.7
Ferndale City, CA	663	52	8.0	385	226	58.1	2.0
Gottsville/ Henley/ Klamathon, CA[2]	427	91	21.3	245	91	57.4	9.1
Happy Camp, CA[2]	398	80	20.1	173	145	43.5	9.0
Hornbrook CDP, CA	148	28	19.0	84	36	56.8	9.5
Horse Creek, CA[2]	883	125	14.2	528	230	59.8	4.8
Humboldt Hill CDP, CA	1,269	60	5.0	921	288	72.6	1.7
Johnsons/ Pecwan/Kanick/ Martin's Ferry/Surgone/ Waseck/ Weitchpec, CA[2]	243	68	28.0	122	53	50.2	50.2
Klamath CDP, CA[2]	365	101	28.0	200	64	54.8	6.4
Klamath Glen/Requa, CA[2]	600	169	28.2	315	116	52.5	5.5
Klamath River/Nolton/ Seiad Valley, CA[2]	598	183	30.6	277	138	46.3	9.4
McKinleyville CDP, CA	5,494	217	4.0	3,444	1,833	62.7	0.8
Montague City, CA	609	49	8.0	377	183	61.9	0.2
Myrtletown CDP, CA	1,827	89	5.0	1,060	678	58.0	0.2
Orleans, CA[2]	321	90	28.0	158	73	49.2	43.0

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Table 2.7-21. Housing stock, vacancy, and substandard housing information within the 5-mile buffer area, 2000 census.

	Housing Units	Vacant	Percent Vacancy Rate	Owner Occupied	Renter Occupied	Percent Owner Occupied	Percent Substandard Housing[1]
Pine Hills CDP, CA	1,253	54	4.0	903	296	72.1	1.7
Somes Bar, CA[2]	601	207	34.4	300	94	49.9	24.8
Trinidad City, CA	228	60	26.0	105	63	46.1	4.4
Westhaven-Moonstone CDP, CA	498	45	9.0	323	130	64.9	0.8
Yreka City, CA	3,303	189	6.0	1,797	1,317	54.4	0.5
Brookings City, OR	2,614	305	12.0	1,313	996	50.2	1.2
Gold Beach City, OR	987	158	16.0	550	279	55.7	2.2
Midland, OR[2]	606	100	16.5	452	54	74.6	0.0
Keno, OR[2]	442	41	9.3	357	44	80.8	4.8
Klamath Falls City, OR	8,722	806	9.0	3,906	4,010	44.8	2.6

Source: U.S. Census, 2000.

[1] Substandard housing consists of housing units that lack adequate plumbing and kitchen facilities.

[2] These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

2.7.3 Economic Development

2.7.3.1 General Economic Development

Each of the counties in the study area has experienced a net job growth during the period of 1980 to 1999, as shown in Table 2.7-22. In general, however, the average annual growth rates for the study area counties have been lower than their respective state growth rates, and the study area counties showed negative job growth for the period of 1980 to 1985. The exception to this is Jackson County, Oregon, which has experienced continuous job growth at average annual rates greater than the Oregon average.

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Table 2.7-22. Historical total employment, 1980 to 1999, with average growth rates.

						Percent Average Annual Growth Rate	
	1980	1985	1990	1995	1999	1980 to 1990	1990 to 1999
Upstream Region	103,822	105,680	125,391	141,521	156,736	1.9	2.5
Downstream Region	67,007	66,333	79,090	84,591	89,413	1.7	1.4
Six-County Region	170,829	172,013	204,481	226,112	246,149	1.8	2.1
California Total	12,776,835	14,359,725	16,970,340	17,092,816	19,020,930	2.9	1.3
Oregon Total	1,353,338	1,378,693	1,639,255	1,861,197	2,080,821	1.9	2.7
Two-State Total	14,130,173	15,738,418	18,609,595	18,954,013	21,101,751	2.8	1.4
Individual Counties							
Curry County, OR	7,062	6,767	8,633	9,318	10,187	2.0	1.9
Del Norte County, CA	8,338	7,052	9,080	10,067	10,680	0.9	1.8
Humboldt County, CA	51,607	52,514	61,377	65,206	68,546	1.7	1.2
Jackson County, OR	58,792	61,934	76,513	89,057	101,323	2.7	3.2
Klamath County, OR	27,135	26,129	28,667	30,995	33,182	0.6	1.6
Siskiyou County, CA	17,895	17,617	20,211	21,469	22,231	1.2	1.1

Source: USDOC, 2003a.

Note: Employment trends include seasonal employment.

Table 2.7-23 shows the distribution of jobs among different industries for the individual counties in the year 1999. Throughout the study region, Services, Retail Trade, and Government are the three industries with the greatest percentage of total county employment. Agriculture varies in importance in terms of employment, with total employment in agriculture (farm employment as well as employment in agricultural services) accounting for 8 percent of all jobs in Siskiyou and 7.2 percent of all jobs in Klamath counties, compared with 4.9 percent in Del Norte, 3.8 percent in Curry, 3.4 percent in Humboldt, and 3.2 percent in Jackson counties. Employment in the Fishing, Hunting, and Trapping sector accounts for 1.1 percent of all jobs in Del Norte, 0.9 percent in Curry and 0.1 percent in Humboldt counties. Employment data in the Fishing, Hunting, and Trapping sector are not available for the other three counties for reasons of confidentiality.

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Table 2.7-23. 1999 employment by industry for individual counties (thousands of jobs).[1]

	Curry		Del Norte		Humboldt		Jackson		Klamath		Siskiyou	
	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total
Total Full- and Part-Time Employment[2]	10.3		10.7		68.8				32.4		22.2	
Farm Employment[3]	0.4	3	0.5	5	1.7	2	2.7	3	2.2	7	1.6	7
Nonfarm Employment	9.9	97	10.2	95	67.2	98	97.9	97	30.3	93	20.7	93
Agricultural Services, Forestry, Fishing, and Other[4]	0.7	7	0.6	5	2.2	3	2.0	2	(D)		0.9	4
Agricultural Services	0.0	0	0.0	0	0.7	1	0.5	1	0.2	1	0.2	1
Forestry	0.0	0	(D)		0.2	0	0.6	1	0.1	0	0.4	2
Fishing, Hunting, and Trapping	0.1	1	0.1	1	0.1	0	NA		NA		0.0	0
Mining	(D)		(L)		(D)		0.2	0	(D)		(D)	
Construction	0.8	8	0.4	4	3.8	5	6.4	6	1.7	5	(D)	
Manufacturing	0.9	9	0.5	4	7.3	11	10.2	10	4.0	12	1.7	7
Transportation and Public Utilities	0.3	3	0.3	3	2.5	4	4.4	4	1.2	4	1.1	5
Wholesale Trade	(D)		0.2	2	(D)		3.2	3	1.2	4	(D)	
Retail Trade	2.2	22	1.8	17	12.8	19	22.0	22	5.5	17	3.9	18
Finance, Insurance, and Real Estate	0.7	7	0.4	4	4.3	6	6.8	7	1.9	6	1.2	6
Services	2.7	26	3.0	28	21.2	31	31.5	31	9.1	28	6.0	27
Government and Government Enterprises	1.3	13	3.0	28	11.3	16	11.3	11	4.9	15	4.3	19

Source: USDOC, 2003a.

(D) Estimate not shown to avoid disclosure of confidential information; estimate included in totals. No information about 'D' designated cells can be given, including what triggers the use of 'D' level (Albetski, 2003).

(L) Estimate less than $50,000 or less than 10 jobs; estimate included in totals.

[1] Employment trends include seasonal employment.

[2] Employment numbers are first broken down into farm and nonfarm employment. The nonfarm category is further subdivided into the major sectoral categories (e.g., mining, construction, manufacturing).

[3] Farm employment refers to the number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer. Farm employment numbers do not include employment in farm service sectors.

[4] Agricultural services, forestry, fishing, and other sectors consist of establishments primarily engaged in agricultural services, forestry, commercial fishing, hunting, trapping, and related services. Agricultural services includes establishments primarily engaged in supplying soil preparation services, crop services, veterinary services, other animal services, farm labor and management services, and landscape and horticultural services, for others on a contract or fee basis. Forestry covers establishments primarily engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as the gathering of gums, barks, balsam needles, maple sap, Spanish moss, and other forest products. Logging is considered a manufacturing activity and hence is not included in this sector.

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Table 2.7-23. 1999 employment by industry for individual counties (thousands of jobs).[1]

	Curry		Del Norte		Humboldt		Jackson		Klamath		Siskiyou	
	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total

Fishing, hunting, and trapping covers establishments primarily engaged in commercial fishing (including crabbing, lobstering, clamming, oystering, and the gathering of sponges and seaweed), and the operation of fish hatcheries and fish and game preserves, in commercial hunting and trapping, and in game propagation.

NA = Not available.

Table 2.7-24 shows the industry employment aggregated to the level of upstream and downstream regions. For the region as a whole, farm employment represents 4 percent for the upstream region and 3 percent for the downstream region. As with the individual counties, the industries with the greatest percentage of jobs are Services, Retail Trade, and Government.

Conversations with local community members have indicated that recreation and tourism have become important industries for many of the smaller communities along the river. Recreation and tourism jobs are included in the Services and Retail Trade industries in the databases that track employment at the county level.

Historically, communities along the coast were dependent on ocean commercial and recreational sportfishing. Employment in commercial fishery is included in the estimates for the Agricultural services, Forestry, Fishing and Other sector. Along with the commercial fishing, the coastal communities were also dependent on the packing and processing plants that prepared the fish for market. But with the ongoing restriction on fishing of the Klamath salmon, most of the packing and processing plants have closed. Employment in the packing and processing plants are included in the estimates for the Food Processing sector that is aggregated into the Manufacturing sector (shown in Table 2.7-24 below).

Table 2.7-24. 1999 employment by industry for regions (thousands of jobs).[1]

	Upstream Region Total		Downstream Region		Six-County Region		California Total		Oregon Total	
	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total
Total Full- and Part-Time Employment[2]	155.2		89.8		244.9		101.7		143.2	
Farm Employment[3]	6.4	4.1	2.5	2.8	8.9	3.6	3.7	3.6	5.2	3.6
Nonfarm Employment	148.8	95.9	87.3	97.2	236.1	96.4	98.0	96.4	138.1	96.4
Agricultural Services, Forestry, Fishing, and Other[4]	(D)		3.5	3.9	(D)		3.7	3.7	(D)	
Agricultural Services	0.9	0.6	0.8	0.9	1.7	0.7	0.9	0.9	0.8	0.5
Forestry	1.1	0.7	(D)		(D)		(D)		0.7	0.5
Fishing, Hunting, and Trapping	NA		0.3	0.3	NA		0.2	0.2	NA	
Mining	(D)		(D), (L)		(D), (L)		(D), (L)		(D)	

Table 2.7-24. 1999 employment by industry for regions (thousands of jobs).[1]

	Upstream Region Total		Downstream Region		Six-County Region		California Total		Oregon Total	
	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total
Construction	(D)		5.0	5.6	(D)		(D)		8.9	6.2
Manufacturing	15.9	10.2	8.7	9.7	24.6	10.1	9.5	9.3	15.2	10.6
Transportation and public utilities	6.7	4.3	3.1	3.5	9.8	4.0	3.9	3.9	5.9	4.1
Wholesale trade	(D)		(D)		(D)		(D)		(D)	
Retail trade	31.4	20.2	16.9	18.8	48.3	19.7	18.6	18.2	29.7	20.8
Finance, Insurance, and Real Estate	9.9	6.4	5.4	6.1	15.4	6.3	5.9	5.8	9.4	6.6
Services	46.6	30.0	26.8	29.9	73.4	30.0	30.1	29.6	43.3	30.2
Government and government enterprises	20.4	13.2	15.6		36.0	14.7	18.6	18.3	17.4	12.2

Source: USDOC, 2003a.

(D) – Estimate not shown to avoid disclosure of confidential information; estimate included in totals. No information about 'D' designated cells can be given including what triggers the use of 'D' level (Albetski, 2003).

(L) – Estimate less than $50,000 or less than 10 jobs; estimate included in totals.

[1] Employment trends include seasonal employment.

[2] Employment numbers are first broken down into farm and nonfarm employment. The nonfarm category is further subdivided into the major sectoral categories, e.g., mining, construction, manufacturing.

[3] Farm employment refers to the number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer. Farm employment numbers do not include employment in farm service sectors.

[4] Agricultural services, forestry, fishing, etc sector is comprised of establishments primarily engaged in agricultural services, forestry, commercial fishing, hunting, trapping, and related services. Agricultural services includes establishments primarily engaged in supplying soil preparation services, crop services, veterinary services, other animal services, farm labor and management services, and landscape and horticultural services, for others on a contract or fee basis. Forestry covers establishments primarily engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as the gathering of gums, barks, balsam needles, maple sap, Spanish moss, and other forest products. Logging is considered a manufacturing activity and hence is not included in this sector. Fishing, hunting, and trapping covers establishments primarily engaged in commercial fishing (including crabbing, lobstering, clamming, oystering, and the gathering of sponges and seaweed), and the operation of fish hatcheries and fish and game preserves, in commercial hunting and trapping, and in game propagation.

NA = Not available.

At the county level, the distribution of jobs among industry categories has remained fairly constant over time. Table 2.7-25 shows the aggregated industry employment during the period of 1980 to 1999 for the downstream regions. During this period, the Manufacturing industry experienced a decrease in importance, from 15 percent of all county jobs in 1980 to 10 percent in 1999. In contrast, the Services industry saw consistent increase in importance, growing from 23 percent of all jobs in 1980 to 30 percent in 1999. The upstream region shows a similar pattern, with Manufacturing dropping from 15 percent of jobs in 1980 to 10 percent in 1999, while the Services industry increased from 23 percent of all jobs in the upstream region in 1980 to 30 percent in 1999. The upstream region data are shown in Table 2.7-26.

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Table 2.7-25. Downstream region employment by industry over time.[1]

	1980		1985		1990		1995		1999	
	Jobs	**% Total**	**Jobs**	**% Total**	**Jobs**	**% Total**	**Jobs**	**% Total**	**Jobs**	**% Total**
Total Full- and Part-Time Employment[2]	67,007		66,333		79,090		84,591		89,413	
Farm Employment[3]	2,049	3	1,961	3	2,101	3	2,137	3	2,509	3
Agricultural Services, Forestry, Fishing, and Other[4]	3,168	5	3,058	5	2,654	3	3,115	4	3,315	4
Mining	*112 (L)*		*137 (L)*		*89 (L)*		*78 (L)(D)*		*0 (L)(D)*	
Construction	2,467	4	2,879	4	4,588	6	4,627	5	5,173	6
Manufacturing	10,247	15	8,465	13	8,900	11	9,432	11	8,521	10
Transportation and Public Utilities	3,339	5	3,224	5	3,542	4	3,035	4	3,156	4
Wholesale Trade	2,139	3	1,855	3	2,252	3	*1,767 (D)*		*166 (D)*	
Retail Trade	11,536	17	12,209	18	15,695	20	17,427	21	17,158	19
Finance, Insurance, and Real Estate	3,889	6	3,642	5	4,193	5	4,799	6	5,552	6
Services	15,430	23	17,170	26	20,598	26	23,697	28	26,439	30
Government and Government Enterprises	12,623	19	11,725	18	14,466	18	14,332	17	15,493	17

Source: USDOC, 2003a.

(D) – Estimate not shown to avoid disclosure of confidential information; estimate included in totals. No information about 'D' designated cells can be given including what triggers the use of 'D' level (Albetski, 2003).

(L) – Estimate less than $50,000 or less than 10 jobs; estimate included in totals.

[1] Employment trends include seasonal employment.

[2] Employment numbers are first broken down into farm and nonfarm employment. The nonfarm category is further subdivided into the major sectoral categories, e.g., mining, construction, manufacturing.

[3] Farm employment refers to the number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer. Farm employment numbers do not include employment in farm service sectors.

[4] Agricultural services, forestry, fishing, etc sector is comprised of establishments primarily engaged in agricultural services, forestry, commercial fishing, hunting, trapping, and related services. Agricultural services includes establishments primarily engaged in supplying soil preparation services, crop services, veterinary services, other animal services, farm labor and management services, and landscape and horticultural services, for others on a contract or fee basis. Forestry covers establishments primarily engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as the gathering of gums, barks, balsam needles, maple sap, Spanish moss, and other forest products. Logging is considered a manufacturing activity and hence is not included in this sector. Fishing, hunting, and trapping covers establishments primarily engaged in commercial fishing (including crabbing, lobstering, clamming, oystering, and the gathering of sponges and seaweed), and the operation of fish hatcheries and fish and game preserves, in commercial hunting and trapping, and in game propagation.

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Table 2.7-26. Upstream region employment by industry over time.

Upstream	1980		1985		1990		1995		1999	
	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total	Jobs	% Total
Total Full- and Part-time Employment[1]	103,822		105,680		125,391		141,521		156,736	
Farm Employment[2]	6,090	6	6,254	6	6,455	5	6,105	4	6,388	4
Agricultural Services, Forestry, Fishing, and Other[3]	1,605	2	1,958	2	2,078	2	*2,520 (D)*		*2,884 (D)*	
Mining	186	0	308	0	260	0	*283 (D)*		*241 (D)*	
Construction	5,177	5	4,405	4	6,134	5	7,694	5	*7,943 (D)*	
Manufacturing	15,308	15	15,373	15	16,727	13	16,256	11	15,871	10
Transportation and public utilities	5,443	5	5,693	5	6,214	5	6,100	4	6,801	4
Wholesale trade	4,303	4	3,982	4	4,571	4	5,308	4	*4,488 (D)*	
Retail trade	19,645	19	19,980	19	24,852	20	29,351	21	31,929	20
Finance, Insurance, and Real Estate	7,628	7	6,907	7	7,200	6	8,177	6	10,488	7
Services	20,333	20	23,839	23	31,598	25	39,262	28	46,856	30
Government and Government Enterprises	18,104	17	16,981	16	19,302	15	19,771	14	20,497	13

Source: USDOC, 2003a.

(D) – Estimate not shown to avoid disclosure of confidential information; estimate included in totals. No information about 'D' designated cells can be given including what triggers the use of 'D' level (Albetski, 2003).

[1] Employment trends include seasonal employment.

[2] Employment numbers are first broken down into farm and nonfarm employment. The nonfarm category is further subdivided into the major sectoral categories, e.g., mining, construction, manufacturing.

[3] Farm employment refers to the number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer. Farm employment numbers do not include employment in farm service sectors.

[4] Agricultural services, forestry, fishing, etc sector is comprised of establishments primarily engaged in agricultural services, forestry, commercial fishing, hunting, trapping, and related services. Agricultural services includes establishments primarily engaged in supplying soil preparation services, crop services, veterinary services, other animal services, farm labor and management services, and landscape and horticultural services, for others on a contract or fee basis. Forestry covers establishments primarily engaged in the operation of timber tracts, tree farms, forest nurseries, and related activities such as the gathering of gums, barks, balsam needles, maple sap, Spanish moss, and other forest products. Logging is considered a manufacturing activity and hence is not included in this sector. Fishing, hunting, and trapping covers establishments primarily engaged in commercial fishing (including crabbing, lobstering, clamming, oystering, and the gathering of sponges and seaweed), and the operation of fish hatcheries and fish and game preserves, in commercial hunting and trapping, and in game propagation.

The county-level employment data presented do not always tell the complete story of recent changes in employment. Smaller communities with less diverse economies can experience significant changes as a result of employment shifts that appear minor when aggregated to the county or regional level. For example, many of the smaller communities along the Klamath

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River were once relatively dependent on forest products jobs, which fall under the Manufacturing industry category that has shown job losses over time at the county level. As logging restriction on public lands have increased, most of these manufacturing jobs in the smaller communities were lost, and may not have been replaced with jobs in other industries. Tourism is one industry that many of the smaller communities have come to rely on as a replacement for manufacturing; however, this can change the social character of the community.

The preceding characterization of the employment by industry in the study area is based on data from the U.S. Bureau of Labor Statistics (BLS). The BLS data are based on state monthly estimates of employment by industry. The state monthly estimates are developed through surveys of business establishments. Because the BLS data are not available for all the communities within the 5-mile buffer area, the U.S. Census data were used to characterize employment by industry for the population 16 years and older. Tables 2.7-27 and 2.7-28 show the 1990 and 2000 employment by industry for the communities within the 5-mile buffer area, respectively.

According to the 2000 Census data, industry employment in the Services and Retail trade sectors ranged between about a third (e.g., 31.2 percent in Midland, Oregon) to three-fourths (e.g., 74.8 percent in Westhaven-Moonstone CDP, Oregon). Manufacturing accounted for an average of 13 percent of employment. The following communities had less than 5 percent of their industry employment in the manufacturing sector: Clear Creek/Fort Goff/Hamburg, Crescent city, Happy Camp, Johnsons/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec, Myrtletown, Somes Bar, and Westhaven-Moonstone CDP. On average, employment in the agriculture, forestry, fishing and hunting sector accounted for about 8 percent of the employment by industry in the 5-mile buffer area. The agriculture, forestry, fishing and hunting sector is an important employment sector in the communities of Clear Creek/Fort Goff/Hamburg (25 percent), Somes Bar (19.4 percent), Klamath River/Nolton/Seiad Valley (18.5 percent), Orleans (18.4 percent), Johnsons/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec (16.3 percent), and Horse Creek (15.3 percent).

A comparison of the 2000 Census data (Table 2.7-27) with the 1990 Census data (Table 2.7-28) shows a decline in employment in the agriculture, forestry, fishing, and hunting category for several communities, including Dorris, California, from 20.6 percent to 14.3 percent; Gottsville/Henley/Klamathon, California, from 19.2 percent to 11.5 percent; Happy Camp, California, from 14.8 percent to 8.7 percent; Keno, Oregon, from 11.6 percent to 6 percent; Westhaven-Moonstone CDP, California, from 15.3 percent to 0.7 percent; and Gold Beach, Oregon, from 10.1 percent to 4.7 percent. The community of Clear Creek/Fort Goff/Hamburg saw a sharp increase in the share of employment in this category, from 10 percent in 1990 to 25 percent in 2000. A few communities experienced modest growth in the share of employment in the agriculture, forestry, fishing, and hunting category, most notably Klamath CDP up to 8.9 percent from 5.5 percent.

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Table 2.7-27. Employment by industry by community within the 5-mile buffer area, 2000 census.

Community	Total Employed Civilian Population	Percent Agriculture, Forestry, Fishing, and Hunting	Percent Mining	Percent Construc-tion	Percent Manu-facturing	Percent Wholesale Trade	Percent Retail Trade	Percent Transpor-tation and utilities	Percent Information	Percent F.I.R.E.	Percent Services	Percent Public Adminis-tration
Arcata City, CA	8,409	3.3	0.0	2.9	6.6	2.4	11.8	2.2	3.2	3.7	58.8	5.2
Bayview CDP, CA	981	4.9	0.0	2.3	6.3	5.4	13.4	2.8	1.4	8.9	49.9	4.7
Bertsch-Oceanview CDP, CA	761	8.1	0.0	3.9	9.9	2.6	11.0	1.8	1.2	1.1	45.2	15.1
Clear Creek/Fort Goff/Hamburg, CA *	168	25.0	1.2	1.2	1.8	1.8	20.2	9.5	3.0	0.0	31.0	5.4
Copco, CA *	608	11.2	0.0	7.7	8.9	1.8	10.4	5.6	1.3	4.6	42.1	6.4
Crescent City, CA	1,214	4.0	0.0	3.0	3.2	1.1	11.4	1.8	3.5	1.2	51.8	18.9
Crescent City North CDP, CA	1,522	4.9	0.0	5.0	4.6	2.4	12.9	1.7	1.1	1.3	46.1	20.0
Cutten CDP, CA	1,415	1.7	0.0	6.3	6.9	6.4	17.0	3.3	2.3	6.8	41.2	8.2
Dorris City, CA	314	14.3	0.0	9.2	9.9	1.9	14.0	3.8	1.6	4.1	33.8	7.3
Eureka City, CA	10,694	3.6	0.1	6.5	5.6	3.4	14.1	3.9	2.1	6.4	48.5	5.7
Ferndale City, CA	659	5.9	0.0	5.6	8.8	2.4	13.2	5.0	3.6	4.1	43.4	7.9
Gottsville/Henley/Klamathon, CA *	243	11.5	0.0	4.1	7.0	1.2	12.3	4.9	0.8	1.6	44.9	11.5
Happy Camp, CA *	184	8.7	3.3	2.2	1.1	4.3	13.6	2.2	1.6	2.2	51.1	9.8
Hornbrook CDP, CA	90	6.7	0.0	8.9	8.9	3.3	18.9	7.8	2.2	0.0	36.7	6.7
Horse Creek, CA *	626	15.3	0.0	9.3	4.5	1.8	10.7	2.7	2.9	8.3	39.5	5.1
Humboldt Hill CDP, CA	1,350	3.9	0.0	5.1	4.3	3.4	14.4	1.3	1.9	5.3	51.7	8.7
Johnsons/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec, CA *	86	16.3	0.0	2.3	1.2	2.3	2.3	0.0	2.3	4.7	66.3	2.3

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Table 2.7-27. Employment by industry by community within the 5-mile buffer area, 2000 census.

Community	Total Employed Civilian Population	Percent Agriculture, Forestry, Fishing, and Hunting	Percent Mining	Percent Construc-tion	Percent Manu-facturing	Percent Wholesale Trade	Percent Retail Trade	Percent Transpor-tation and utilities	Percent Information	Percent F.I.R.E.	Percent Services	Percent Public Adminis-tration
Klamath CDP, CA	237	8.9	0.0	2.5	6.8	1.3	1.3	0.8	0.0	3.8	51.5	23.2
Klamath Glen/Requa, CA *	436	7.3	0.0	1.4	7.6	3.4	3.0	0.5	0.0	2.1	52.8	22.0
Klamath River/Nolton/Seiad Valley, CA*	281	18.5	0.0	7.8	6.0	1.8	9.6	5.0	2.1	3.6	36.7	8.9
McKinleyville CDP, CA	5,820	4.7	0.0	5.4	10.1	3.1	13.8	4.1	1.5	4.7	47.4	5.4
Montague City, CA	580	4.7	0.3	8.4	12.4	1.4	14.0	3.4	1.4	3.3	44.5	6.2
Myrtletown CDP, CA	2,016	1.2	0.0	5.5	3.7	4.1	11.8	7.4	2.3	7.8	45.1	11.0
Orleans, CA*	234	18.4	0.0	10.3	0.0	0.0	21.8	7.3	0.0	2.6	32.5	7.3
Pine Hills CDP, CA	1,473	2.9	0.0	4.7	5.8	2.6	17.2	4.3	1.4	6.4	44.5	10.0
Somes Bar, CA *	387	19.4	0.0	6.2	1.8	3.6	13.7	8.3	0.3	1.6	38.5	6.7
Trinidad City, CA	167	0.0	0.0	4.2	8.4	2.4	7.8	1.2	4.8	5.4	61.7	4.2
Westhaven-Moonstone CDP, CA	573	0.7	0.0	7.7	4.9	1.6	11.3	3.5	1.2	2.1	63.5	3.5
Yreka City, CA	2,950	2.3	0.0	4.7	5.1	1.1	14.8	3.6	0.8	4.2	52.8	10.4
Brookings City, OR	2,169	5.0	0.0	7.1	9.8	1.8	17.3	2.4	3.4	4.3	37.7	11.2
Gold Beach City, OR	843	4.7	0.0	7.6	5.9	0.7	14.2	4.0	2.4	5.0	45.0	10.4
Midland, OR *	551	12.3	0.0	11.6	11.3	2.0	8.5	15.2	1.1	3.4	22.7	11.8
Keno, OR *	483	6.0	0.0	11.8	11.8	1.7	12.8	9.1	2.3	8.9	34.2	1.4
Klamath Falls City, OR	8,346	3.1	0.1	6.4	12.1	2.9	13.7	3.7	3.8	4.4	46.2	3.6

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Table 2.7-27. Employment by industry by community within the 5-mile buffer area, 2000 census.

Community	Total Employed Civilian Population	Percent Agriculture, Forestry, Fishing, and Hunting	Percent Mining	Percent Construc-tion	Percent Manu-facturing	Percent Wholesale Trade	Percent Retail Trade	Percent Transpor-tation and utilities	Percent Information	Percent F.I.R.E.	Percent Services	Percent Public Adminis-tration

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

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Table 2.7-28. Employment by industry by community within the 5-mile buffer area, 1990 census.

Community	Total Employed civilian population	Percent Agriculture, Forestry, Fishing, and Hunting	Percent Mining	Percent Construc-tion	Percent Manu-facturing	Percent Wholesale Trade	Percent Retail Trade	Percent Transpor-tation and Utilities	Percent F.I.R.E.	Percent Services	Percent Public Adminis-tration
Arcata City, CA	6,881	3.4	0.2	3.4	11.5	3.9	24.0	4.7	3.5	41.9	3.5
Bayview CDP, CA	662	4.2	0.0	4.7	13.9	1.1	32.6	6.3	1.8	31.1	4.2
Bertsch-Oceanview CDP, CA	NA										
Clear Creek/Fort Goff/Hamburg, CA[1]	220	10.0	9.1	0.0	21.4	0.0	21.8	0.0	4.5	27.3	5.9
Copco, CA[1]	617	15.6	0.8	3.1	20.1	1.5	13.9	7.8	5.5	25.6	6.2
Crescent City, CA	1,565	2.9	0.0	4.5	10.4	1.8	27.4	5.9	4.9	31.1	11.1
Crescent City North CDP, CA	1,394	5.2	0.0	6.1	7.0	2.5	21.7	3.4	2.7	35.9	15.6
Cutten CDP, CA	767	2.0	0.0	6.4	10.6	5.5	18.1	11.5	8.6	29.1	8.3
Dorris City, CA	233	20.6	0.0	8.2	24.0	3.0	14.2	3.9	0.9	17.6	7.7
Eureka City, CA	11,220	3.1	0.0	5.9	12.3	4.6	21.2	5.6	5.5	37.6	4.3
Ferndale City, CA	543	8.3	0.0	7.9	7.2	2.8	23.0	5.3	4.2	37.6	3.7
Gottsville/Henley/Klamathon, CA[1]	317	19.2	0.0	12.3	16.4	4.1	19.2	0.0	7.3	21.5	0.0
Happy Camp, CA[1]	359	14.8	0.0	3.1	30.1	0.0	17.0	7.5	1.7	22.6	3.3
Hornbrook CDP, CA	NA										
Horse Creek, CA[1]	582	15.1	3.1	9.1	11.7	2.4	19.6	6.9	3.8	24.1	4.3
Humboldt Hill CDP, CA	1,289	2.5	0.0	6.3	13.3	7.0	24.7	3.2	3.3	34.7	5.0
Johnsons/Pecwan/Kanick/ Martin's Ferry/ Surgone/Waseck/Weitchpec, CA[1]	NA										
Klamath CDP, CA	200	5.5	0.0	7.0	17.0	1.0	26.5	4.0	3.5	21.5	14.0
Klamath Glen/Requa, CA[1]	NA										
Klamath River/Nolton/Seiad Valley, CA[1]	330	13.9	0.0	8.2	30.9	3.0	13.0	3.6	0.0	27.3	0.0
McKinleyville CDP, CA	4,636	4.9	0.3	6.0	17.0	2.2	19.3	5.6	5.2	37.3	2.2

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Table 2.7-28. Employment by industry by community within the 5-mile buffer area, 1990 census.

Community	Total Employed civilian population	Percent Agriculture, Forestry, Fishing, and Hunting	Percent Mining	Percent Construc-tion	Percent Manu-facturing	Percent Wholesale Trade	Percent Retail Trade	Percent Transpor-tation and Utilities	Percent F.I.R.E.	Percent Services	Percent Public Adminis-tration
Montague city, CA	480	7.3	1.3	4.8	20.0	2.7	24.6	8.3	1.5	24.8	4.8
Myrtletown CDP, CA	2,003	4.8	0.0	6.0	10.7	4.8	18.0	6.8	4.1	38.9	5.7
Orleans, CA[1]	NA										
Pine Hills CDP, CA	1,435	3.1	0.0	7.0	7.5	2.5	22.9	6.6	3.9	39.8	6.7
Somes Bar, CA[1]	346	23.4	1.4	5.5	22.8	0.9	7.5	7.8	4.3	21.4	4.9
Trinidad city, CA	141	2.1	0.0	5.0	12.8	0.0	13.5	16.3	1.4	47.5	1.4
Westhaven-Moonstone CDP, CA	444	15.3	0.0	5.9	9.7	4.5	12.6	0.7	2.0	43.0	6.3
Yreka City, CA	2,814	4.9	0.0	2.8	12.5	1.2	21.0	5.9	6.9	34.2	10.5
Brookings City, OR	1,684	4.6	0.0	4.9	9.2	1.8	24.5	2.7	7.8	35.0	9.4
Gold Beach City, OR	661	10.1	0.0	2.9	15.4	1.5	17.1	4.4	4.1	37.4	7.1
Midland, OR [1]	255	14.1	0.0	0.0	16.9	0.0	30.6	3.5	6.3	21.2	7.5
Keno, OR[1]	242	11.6	0.0	3.3	22.3	7.0	16.5	7.0	2.5	16.9	12.8
Klamath Falls City, OR	7,255	3.3	0.0	3.5	19.7	3.5	23.1	6.2	4.3	32.4	4.0

Source: U.S. Census, 1990.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as shown in this table.

NA = Not available.

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Most of the communities in the 5-mile buffer area experienced a decline in employment in the manufacturing sectors from what they were in 1990. While most communities experienced a modest decline in the share of employment in manufacturing, the following communities saw a significant decline: Clear Creek/Fort Goff/Hamburg, California, from 21.4 percent to 1.8 percent; Happy Camp, California, from 30.1 percent to 1.1 percent; and Somes Bar, California, from 22.8 percent to 1.8 percent.

The period 1990 to 2000 was characterized by the general loss of manufacturing jobs in almost all the communities in the 5-mile buffer area. For some communities, the loss in manufacturing jobs was offset by gains in the agriculture, forestry, fishing, and hunting sector jobs, as well as gains in service sector jobs. The communities of Clear Creek/Fort Goff/Hamburg, Klamath CDP, and Klamath River/Nolton/Seiad Valley, saw an increase in the share of employment in the agriculture, forestry, fishing, and hunting sector when the share of employment in the manufacturing sector declined. The communities of Klamath CDP, Happy Camp, and Gottsville/Henley/Klamathon, all in California, experienced significant increases in share of employment in the service sector.

Total 1999 personal income for the combined downstream counties was $3,726 million, with Humboldt County earning $2,776 million, Del Norte County earning $469 million, and Curry County earning $481 million. The upstream county total was nearly twice as high at $6,464 million, with Jackson County earning $4,220 million, Klamath County earning $1,325 million, and Siskiyou County earning $918 million. County-level per capita personal income for each study area county is less than the state averages for California and Oregon, as shown in Table 2.7-29. According to the 2000 Census, Jackson County had the highest per capita income of all counties in the study area, while Del Norte County had the lowest.

The upstream region as a whole shows a per capita income of approximately $23,000; however, this is dominated by the relatively high level for Jackson County, which has the majority of the population in the upstream region. The other upstream region counties, Klamath and Siskiyou, both have per capita incomes of approximately $21,000. The downstream region has an aggregate per capita personal income level of $22,000. In the downstream region, Curry County and Humboldt County, the most populous of the downstream counties, both have per capita personal income levels of about $23,000, while Del Norte County has a substantially lower per capita income of $18,000.

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Table 2.7-29. 1999 Personal income measures.

	Personal Income (thousands of dollars)	Population (number of persons)	Per Capita Personal Income
Curry County, OR	481,118	21,170	22,726
Del Norte County, CA	469,221	26,477	17,722
Humboldt County, CA	2,775,569	121,358	22,871
Jackson County, OR	4,220,369	175,822	24,004
Klamath County, OR	1,324,894	63,435	20,886
Siskiyou County, CA	918,982	43,570	21,092
Upstream Region	6,464,245	282,827	22,856
Downstream Region	3,725,908	169,005	22,046
Six-County Region	10,190,153	451,832	22,553
California Total	989,590,237	33,145,121	29,856
Oregon Total	89,397,520	3,316,154	26,958
Two-State Total	1,078,987,757	36,461,275	29,593

Source: USDOC, 2003b.

Figures 2.7-1 and 2.7-2 show the trend in per capita incomes for the individual counties during the period 1992 to 2001. The figures show that Jackson County has historically had the highest per capita income while Del Norte County has historically had the lowest per capita income. The figures also show that while the county per capita incomes increased over this time period, the counties within the study region generally had lower per capita incomes than their respective states.

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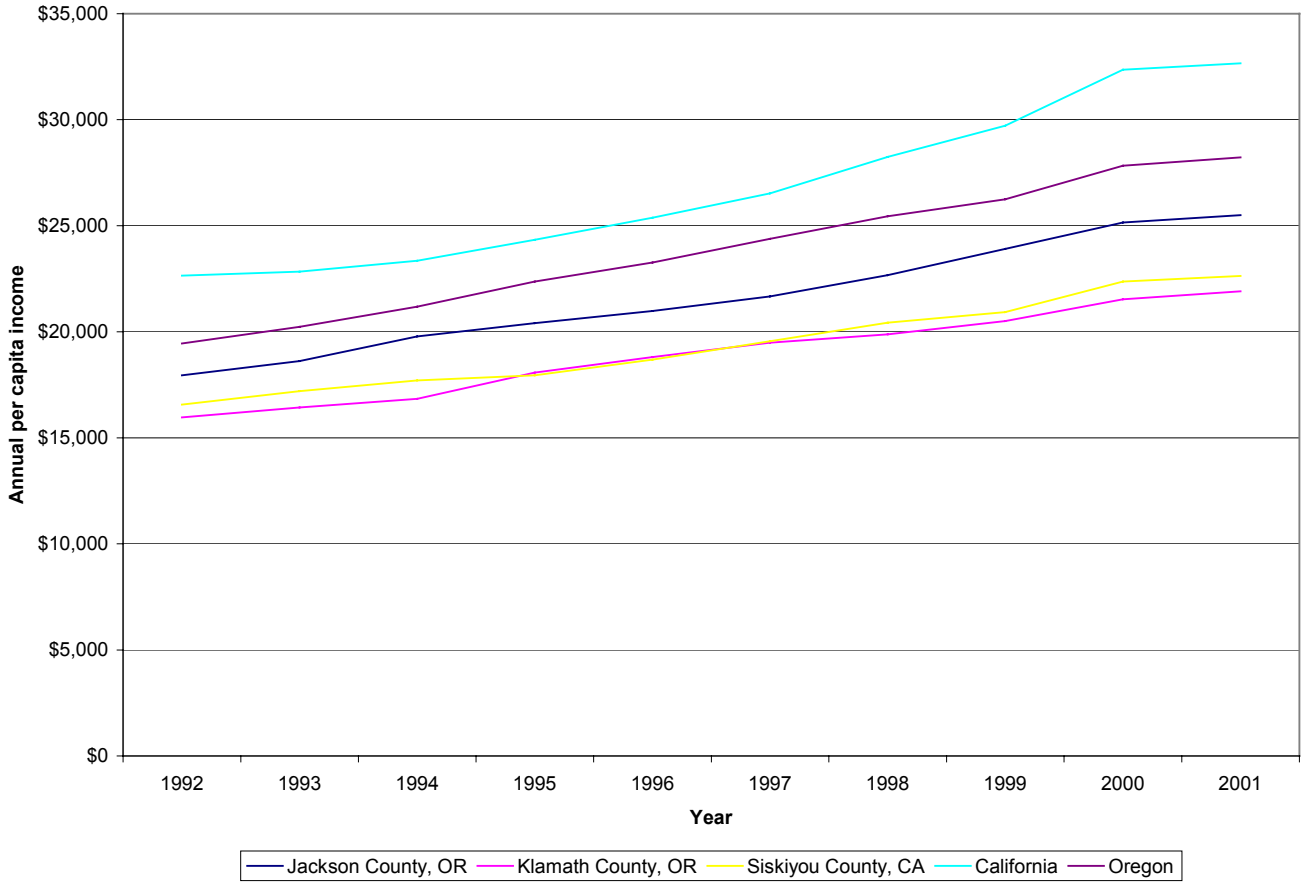

Figure 2.7-1. Historical per capita incomes for Upper Klamath counties, California and Oregon, 1992–2001.

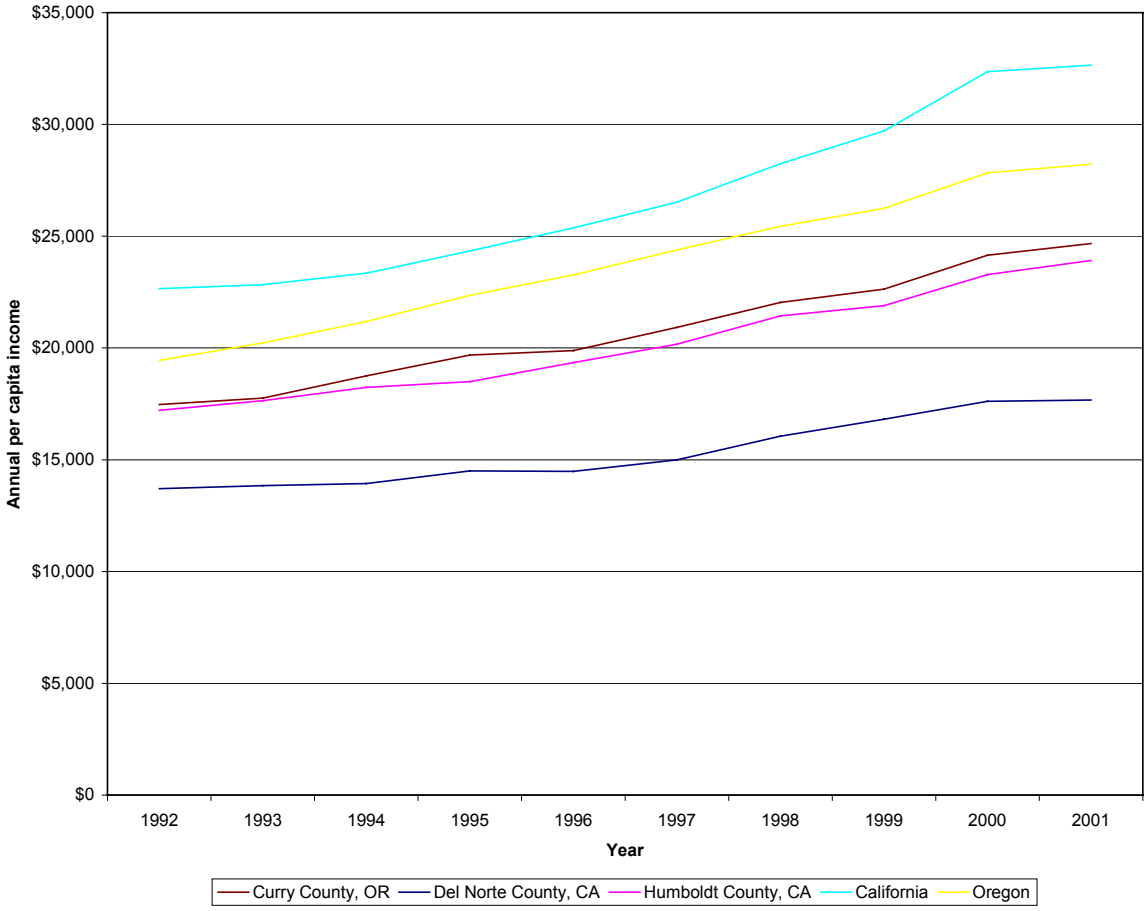

Figure 2.7-2. Historical per capita incomes for Lower Klamath counties, California and Oregon, 1992–2001.

Table 2.7-30 shows the median household incomes, per capita incomes, and percent of the population that is low income for the communities within the 5-mile buffer area. In general, the communities are characterized by lower median household and per capita incomes than those observed at the county or state levels. The only exception is the city of Trinidad, which has a higher per capita and median household income.

Despite the lower incomes, there are a number of communities with lower levels of poverty than levels observed at the county or state level. For example, the communities of Cutten, Ferndale, Humboldt Hill, Klamath, McKinleyville, Myrtletown, Pine Hills, Trinidad, and Brookings, have lower levels of poverty despite having lower median household and per capita income. The lower levels of income are probably due to the lower-paying jobs in the service sector that have replaced the timber and wood products industry as the primary employment sector in the area.

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Table 2.7-30. Income measures by community within the 5-mile buffer area, 2000 census.

Geography	Median Household Income in 1999	Per Capita Income in 1999	Percent Low Income
Arcata City, CA	$22,315	$15,531	32.2
Bayview CDP, CA	$26,023	$14,119	23.1
Bertsch-Oceanview CDP, CA	$26,300	$12,661	18.1
Clear Creek/Fort Goff/Hamburg, CA*	$23,015	$16,675	21.3
Copco, CA*	$30,464	$15,684	12.2
Crescent City, CA	$20,133	$12,833	34.6
Crescent City North CDP, CA	$29,478	$14,649	17.1
Cutten CDP, CA	$35,786	$19,317	13.5
Dorris City, CA	$21,801	$11,447	19.1
Eureka City, CA	$25,849	$16,174	23.7
Ferndale City, CA	$37,955	$21,727	7.1
Gottsville/Henley/Klamathon, CA*	$26,818	$17,775	16.5
Happy Camp, CA*	$20,500	$13,939	25.2
Hornbrook CDP, CA	$26,094	$14,907	21.3
Horse Creek, CA*	$30,076	$17,702	17.0
Humboldt Hill CDP, CA	$37,121	$16,222	11.5
Johnsons/Pecwan/Kanick/Martin's Ferry/Surgone/Waseck/Weitchpec, CA*	$10,000	$6,894	58.0
Klamath CDP, CA*	$29,231	$13,660	15.2
Klamath River/Nolton/Seiad Valley, CA*	$23,375	$14,235	24.0
McKinleyville CDP, CA	$38,047	$17,870	14.9
Montague City, CA	$22,991	$12,661	24.2
Myrtletown CDP, CA	$37,417	$19,057	13.3
Orleans, CA*	$26,023	$12,448	20.5
Pine Hills CDP, CA	$43,527	$20,786	9.6
Somes Bar, CA*	$33,125	$22,653	13.7
Trinidad City, CA	$40,000	$28,050	8.8
Westhaven-Moonstone CDP, CA	$36,000	$21,493	14.1
Yreka city, CA	$27,398	$16,664	21.2
Brookings city, OR	$31,656	$17,010	11.5
Gold Beach City, OR	$30,243	$16,717	12.4
Midland, OR*	$47,981	$18,838	4.1

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Table 2.7-30. Income measures by community within the 5-mile buffer area, 2000 census.

Geography	Median Household Income in 1999	Per Capita Income in 1999	Percent Low Income
Keno, OR*	$32,813	$22,169	9.6
Klamath Falls City, OR	$28,498	$16,710	21.9
Klamath Glen/Requa, OR*	$31,953	$17,739	14.5

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

Table 2.7-31 shows the county level income and poverty status of the American Indian population in the study area. The per capita income of the American Indian population in each of the six counties is significantly lower (about 50 percent lower) than that observed for the entire population in each of the six counties. In addition to per capita income, poverty status is another income measure that is typically included in a socioeconomic discussion. With the exception of Curry County, the counties in the study area have a significantly higher percentage of low-income population among the American Indian population compared to the overall population in the county.

Table 2.7-31. Census 2000 income measures for American Indian population by county and region.

	Total American Indian Population	Per Capita Income ($) American Indian Population	Low-Income* American Indian Population	Percent Low-Income American Indian Population	Percent Low-Income Overall Population
Del Norte County, CA	1,451	9,638	374	25.8	20.2
Humboldt County, CA	6,931	11,532	2,147	31.0	19.5
Siskiyou County, CA	1,595	8,305	505	31.7	18.6
Curry County, OR	501	11,835	73	14.6	12.2
Jackson County, OR	1,859	13,112	368	19.8	12.5
Klamath County, OR	2,617	10,457	1,044	39.9	16.8
Upstream Region	6,071	NA	1,917	31.6	14.4
Downstream Region	8,883	NA	2,594	29.2	18.7
Six-County Region	14,954	NA	4,511	30.2	16.0
California Total	9,977	NA	3,026	30.3	19.4

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Table 2.7-31. Census 2000 income measures for American Indian population by county and region.

	Total American Indian Population	Per Capita Income ($) American Indian Population	Low-Income* American Indian Population	Percent Low-Income American Indian Population	Percent Low-Income Overall Population
Oregon Total	4,977	NA	1,485	29.8	13.5
Two-State Total	14,954	NA	4,511	30.2	16.0

Source: U.S. Census, 2000.

* Low-income population consists of all those individuals whose 1999 income-to-poverty ratio was less than 1.

NA = Not available.

Although American Indians constitute less than 10 percent of the general population in the Project area, the incidence of poverty in this population group is higher than that of the general population. Table 2.7-32 shows the distribution of low-income American Indian population by community within the 5-mile buffer area. According to the 2000 Census, the distribution of low-income population among American Indians in the communities within the 5-mile buffer area was significantly higher than that of the general population in those communities or at the county level. More than two-thirds of the American Indian population in Ferndale and Myrtletown and more than half of the American Indian population in Klamath Falls and Yreka were low income. The percentage of low-income population among the general population in Ferndale and Myrtletown in 1999 was 7 percent and 13 percent, respectively, while that in Klamath Falls and Yreka was 21 percent and 22 percent, respectively. Thus, the communities within the 5-mile buffer area are characterized by pockets of low-income American Indians.

Table 2.7-32. Distribution of low-income American Indian population within Project area, 2000 census.

Geography	Percent Low-Income Population	Percent American Indian in Overall Population	Percent Low-Income American Indian Population
Oregon	11.6	1.3	22.2
California	14.2	0.9	21.9
Curry County, Oregon	12.2	2.4	14.6
Del Norte County, California	20.2	6.1	25.8
Humboldt County, California	19.5	5.6	31.0
Jackson County, Oregon	12.5	1.0	19.8
Klamath County, Oregon	16.8	4.1	39.9
Siskiyou County, California	18.6	3.7	31.7
Arcata City, CA	32.2	3.0	38.9
Bayview CDP, CA	23.1	5.0	42.4
Bertsch-Oceanview CDP, CA	18.1	7.4	36.6

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Table 2.7-32. Distribution of low-income American Indian population within Project area, 2000 census.

Geography	Percent Low-Income Population	Percent American Indian in Overall Population	Percent Low-Income American Indian Population
Clear Creek/Fort Goff/Hamburg, CA*	21.3	15.4	44.4
Copco, CA*	12.2	5.0	61.8
Crescent City, CA	34.6	6.2	39.9
Crescent City North CDP, CA	17.1	3.4	16.5
Cutten CDP, CA	13.5	6.4	7.0
Dorris City, CA	19.1	8.1	20.5
Eureka City, CA	23.7	4.2	37.9
Ferndale City, CA	7.1	1.0	70.0
Gottsville/Henley/Klamathon, CA*	16.5	6.6	43.9
Happy Camp, CA*	25.2	24.9	43.9
Hornbrook CDP, CA	21.3	6.4	25.0
Horse Creek, CA*	17.0	2.1	16.7
Humboldt Hill CDP, CA	11.5	2.2	20.6
Johnsons/Pecwan/Kanick/ Martin's Ferry/Surgone/Waseck/ Weitchpec, CA*	58.0	69.2	121.6
Klamath CDP, CA*	15.2	39.4	14.0
Klamath River/Nolton/Seiad Valley, CA*	24.0	15.5	68. 5
McKinleyville CDP, CA	14.9	3.5	11.8
Montague City, CA	24.2	3.7	17.5
Myrtletown CDP, CA	13.3	1.6	66.7
Orleans, CA*	20.5	23.6	60.6
Pine Hills CDP, CA	9.6	2.3	10.0
Somes Bar, CA*	13.7	10.9	37.1
Trinidad City, CA	8.8	1.2	0.0
Westhaven-Moonstone CDP, CA	14.1	3.0	48.4
Yreka City, CA	21.2	4.1	52.2
Brookings City, OR	11.5	2.3	12.0
Gold Beach City, OR	12.4	1.7	0.0
Midland, OR*	4.1	0.7	0.0
Keno, OR*	9.6	0.7	0.0
Klamath Falls City, OR	21.9	5.0	52.2

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Table 2.7-32. Distribution of low-income American Indian population within Project area, 2000 census.

Geography	Percent Low-Income Population	Percent American Indian in Overall Population	Percent Low-Income American Indian Population
Klamath Glen/Requa, OR*	14.5	28.7	23.2

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

The county unemployment rates for the year 2000 show some variability within the study region, ranging from a low of 5.3 percent in Jackson County to a high of 9.5 percent in Siskiyou County, as shown in Table 2.7-33. These unemployment rates are all higher than the state averages for California and Oregon, both of which had statewide unemployment rates of 4.9 percent in 2000. While the study area subregions collectively had similar unemployment rates (6.4 percent for the upstream region and 6.6 percent for the downstream region), this result masks the higher unemployment rates of Klamath, Siskiyou, and Del Norte counties, all of which were more than 8 percent.

Table 2.7-33. Year 2000 labor force, employment, unemployment, and unemployment rate by region.

	Labor Force	Employment	Unemployment	Percent Unemployment Rate
Upstream Region	138,660	129,760	8,900	6.4
Downstream Region	78,369	73,172	5,197	6.6
Six-County Region	217,029	202,932	14,097	6.5
California Total	17,090,815	16,245,623	845,192	4.9
Oregon Total	1,802,889	1,715,403	87,486	4.9
Two-State Total	18,893,704	17,961,026	932,678	4.9
Individual Counties				
Curry County, OR	8,397	7,868	529	6.3
Del Norte County, CA	9,906	9,048	858	8.7
Humboldt County, CA	60,066	56,256	3,810	6.3
Jackson County, OR	91,920	87,041	4,879	5.3
Klamath County, OR	28,911	26,575	2,336	8.1
Siskiyou County, CA	17,829	16,144	1,685	9.5

Source: USDOL, 2001.

Figures 2.7-3 and 2.7-4 show the trend in unemployment rates for the individual counties during the period of 1992 to 2001. The figures show that while the county unemployment decreased

during this time period, the counties within the study region generally had higher unemployment rates than their respective states.

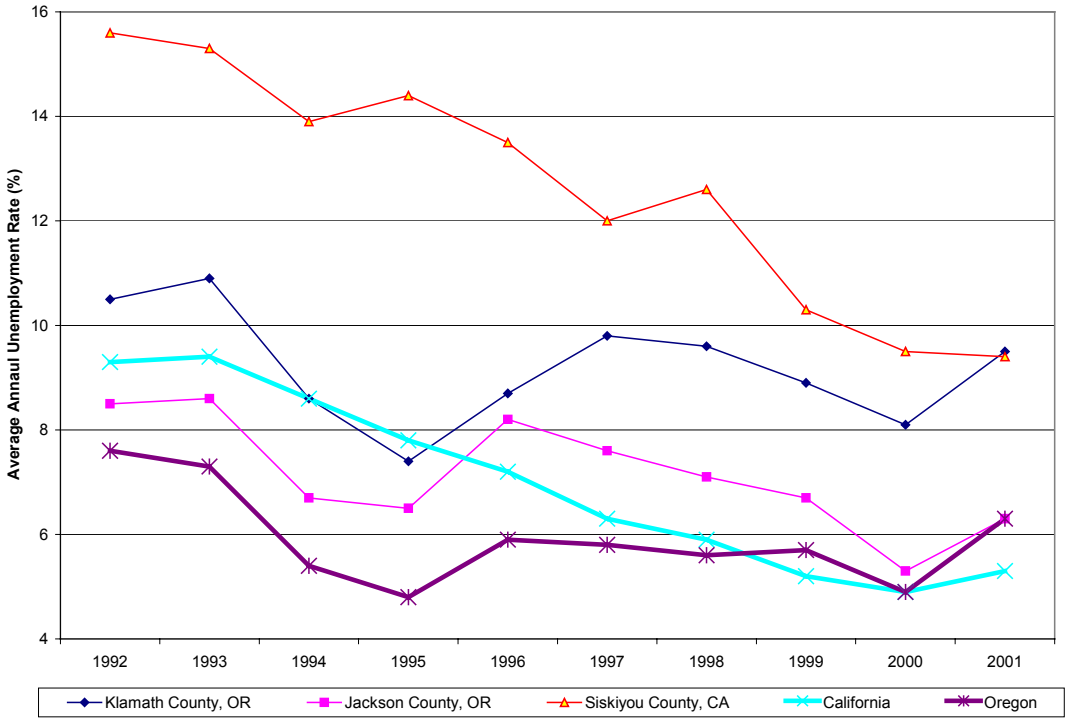

Figure 2.7-3. Historical unemployment rates for upstream counties, California and Oregon, 1992–2001.

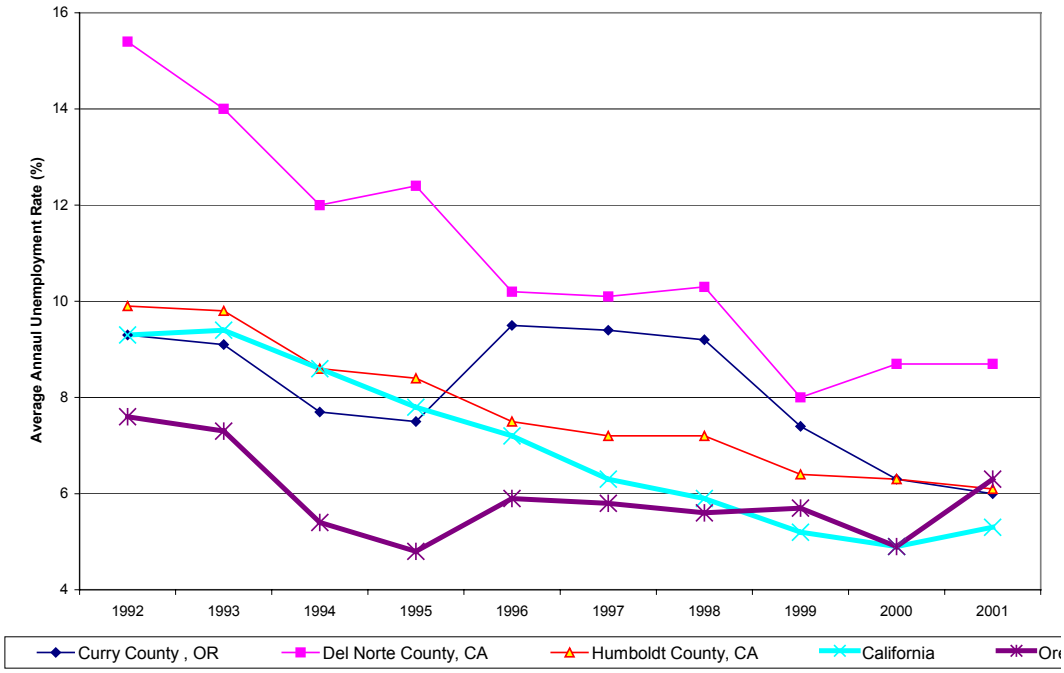

Figure 2.7-4. Historical unemployment rates for downstream counties, California and Oregon, 1992–2001.

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Generally, unemployment data are only reported at the county and Metropolitan Statistical Area (MSA) levels by the BLS. Thus, unemployment data similar to data in Table 2.7-33 are unavailable at the community level. However, it is generally known that at the local community level, the unemployment rate is even higher than the county averages reported by the Bureau of Labor Statistics. For example, it is estimated that the unemployment rate in the Happy Camp area of Siskiyou County is in the range of 30 percent for the general population as a whole and as high as 40 percent within the tribal community (Waddell, 2002).

Because state labor and employment agencies do not typically report employment data at the individual community level, the U.S. Census data on labor force, employment, and unemployment for the population 16 years and over were used to characterize the labor force in the communities within the 5-mile buffer area. Table 2.7-34 presents these data. The Census data are different from the BLS data used to characterize labor force characteristics at the county level (see Table 2.7-33). Thus, any comparison between the data presented in Table 2.7-34 and the data presented in Table 2.7-33 needs to be made with caution.

With the exception of Ferndale, Myrtletown, and Pine Hills, most of the communities in the 5-mile buffer area had unemployment rates that were higher than those reported at the county or state level. According to the Census 2000, one in five civilians were unemployed in Hornbrook, a rate almost twice that for Siskiyou County.

Table 2.7-34. Labor force, employment, and unemployment by community within the 5-mile buffer area for the population 16 years and over, 2000 census.

Community	Total Population	Civilian Labor Force	Employed	Unemployed	Percent Unemployment Rate
Arcata City, CA	14,520	9,235	8,409	826	8.9
Bayview CDP, CA	1,854	1,058	981	77	7.3
Bertsch-Oceanview CDP, CA	1,617	851	761	90	10.6
Clear Creek/Fort Goff/Hamburg, CA*	427	201	168	33	16.4
Copco, CA*	1,312	681	608	73	10.7
Crescent City, CA	2,811	1,398	1,214	184	13.2
Crescent City North CDP, CA	3,009	1,659	1,522	137	8.3
Cutten CDP, CA	2,446	1,573	1,415	158	10.0
Dorris City, CA	674	341	314	27	7.9
Eureka City, CA	20,671	11,838	10,694	1,144	9.7
Ferndale City, CA	1,145	672	659	13	1.9
Gottsville/Henley/Klamathon, CA*	618	290	243	47	16.2
Happy Camp, CA*	525	228	184	44	19.3
Hornbrook CDP, CA	251	112	90	22	19.6
Horse Creek, CA*	1,410	699	626	73	10.4

Table 2.7-34. Labor force, employment, and unemployment by community within the 5-mile buffer area for the population 16 years and over, 2000 census.

Community	Total Population	Civilian Labor Force	Employed	Unemployed	Percent Unemployment Rate
Humboldt Hill CDP, CA	2,559	1,479	1,350	129	8.7
Johnsons/Pecwan/ Kanick/Martin's Ferry/Surgone/Waseck/ Weitchpec, CA*	320	148	86	62	41.9
Klamath CDP, CA*	513	283	237	46	16.3
Klamath River/Nolton/Seiad Valley, CA*	781	351	281	70	19.9
McKinleyville CDP, CA	10,396	6,409	5,820	589	9.2
Montague City, CA	1,128	629	580	49	7.8
Myrtletown CDP, CA	3,571	2,115	2,016	99	4.7
Orleans, CA*	436				
Pine Hills CDP, CA	2,462	1,543	1,473	70	4.5
Somes Bar, CA*	725	439	387	52	11.8
Trinidad City, CA	286	179	167	12	6.7
Westhaven-Moonstone CDP, CA	895	605	573	32	5.3
Yreka City, CA	5,779	3,205	2,950	255	8.0
Brookings City, OR	4,222	2,306	2,169	137	5.9
Gold Beach city, OR	1,502	875	843	32	3.7
Midland, OR*	978	618	551	67	10.8
Keno, OR*	818	523	483	40	7.6
Klamath Falls City, OR	15,071	9,347	8,346	1,001	10.7
Klamath Glen/Requa, OR*	923	506	436	70	13.8

Source: U.S. Census, 2000.

* These are non-census designated place (CDP) communities. Data for these communities were collected at the census block group level. Although some communities may be distinct on the ground, they may be combined in the same census block group, as reflected by the combinations of communities shown in the table.

2.7.3.2 Community

A study of the communities around the Klamath River (Doak and Kusel, 1997) used socioeconomic and community characteristics to evaluate the well-being of the communities along the river. The socioeconomics data (e.g., population distribution, employment, educational attainment, income) used in the study were from the 1990 U.S. Census. The community characteristics were based on information from local experts that evaluated the "collective ability of residents in a community to respond to external and internal stresses, to create and take advantage of opportunities, and to meet the needs of residents, diversely defined." With the

information developed by the local experts, a community capacity ranking system was developed. Communities were ranked on a scale of 1 to 5, with 1 representing the lowest community score and 5 representing the highest.

Table 2.7-35 presents the community capacity scores for the communities within the 5-mile buffer area. The communities of Dorris, Hornbrook, Klamath CDP, and Montague all received low community capacity scores. The communities of Arcata, Ferndale, Yreka, and Klamath Falls all received the highest community capacity scores. The Doak and Kusel study found that the community of Dorris (actually Butte Valley and Dorris were aggregated into one community in the study) lacked the financial capital, services, and community coordination to support economic development. Hornbrook received a low community capacity score because its residents lacked community cohesiveness. The community in Klamath CDP was found to be limited by its lack of social cohesiveness and sense of community, and by recurring disputes among the residents. Montague residents were found to have political divisions that hindered their ability to work together, and this, coupled with a lack of community identity, resulted in the community receiving a low community capacity score.

The communities that received high community capacity scores were generally characterized by residents working together to help improve conditions in their communities. For example, the community of Arcata worked together to help those in poverty. The community of Ferndale was found to have local leaders whose focus was the well-being of the entire community. Yreka had little divisiveness and the groups within the community worked well together. The community of Klamath Falls (which also includes the communities of Keno and Altamont) had a number of citizen groups working to address various problems facing the community. Klamath Falls also had good leadership.

Table 2.7-35. Community capacity scores for the communities within the 5-mile buffer area.

Community	Community Score
Arcata City, CA	5
Bayview CDP, CA	NA
Bertsch-Oceanview CDP, CA	NA
Crescent City, CA	3
Crescent City North CDP, CA	NA
Cutten CDP, CA	NA
Dorris City, CA	1
Eureka City, CA	4
Ferndale City, CA	5
Hornbrook CDP, CA	1
Humboldt Hill CDP, CA	NA
Klamath CDP, CA	1

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Table 2.7-35. Community capacity scores for the communities within the 5-mile buffer area.

Community	Community Score
McKinleyville CDP, CA	4
Montague City, CA	2
Myrtletown CDP, CA	NA
Pine Hills CDP, CA	NA
Trinidad City, CA	4
Westhaven-Moonstone CDP, CA	3
Yreka City, CA	5
Brookings City, OR	NA
Gold Beach City, OR	NA
Klamath Falls City, OR	5

Source: Doak and Kusel, 1997.
NA = Not available.

2.7.3.3 Specific Economic Development

Under current conditions, the Project is related to the economy in the Project area and perhaps to the economies of the broader study area. The general economic development descriptions above can be augmented by specific information on the sectors of the regional economies with potential ties to the incremental Project. This provides perspective on how incremental changes in the Project and PM&E measures might change how the Project impacts these sectors. This section describes PacifiCorp local employment and provides background information on the marine commercial and American Indian commercial fishery, recreation activity along the Klamath, and irrigated agriculture.

PacifiCorp Local Employment

PacifiCorp contributes to local employment in the Project area. The operation and maintenance of the Project facilities results in the employment of 19 individuals for a total annual payroll of about $820,000. Of the 19 jobs, eleven are for full-time year-round jobs while the remaining eight are seasonal jobs.

Recreation Industries

The purpose of this section is to estimate recreation expenditures for activities that are dependent on the Klamath River and its reservoirs in the study area. This information supplements the general economic development information above for the retail and service industries, of which recreation related businesses are a part. The contributions of recreation services to the economies in the study area are described separately for the Upper Klamath River area (i.e., from Link

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River dam to Iron Gate dam) and Lower Klamath River area (i.e., below Iron Gate dam). The type and quality of recreation activities vary by these two broad regions as do the potential influences of changes in the Project and PM&E measures. In addition, the regions fall into different jurisdictions so that the available information related to recreation activities comes from different sources. First, the Upper Klamath River area is described, followed by the Lower Klamath River area.

Upper Klamath River Area. The recreation resource opportunities in the Upper Klamath River area, as well as substitute opportunities, are the subject of a separate study. (Please see the Recreation Resources FTR.) The purpose of the Phase 1 socioeconomic study is to assess the contribution of the Klamath River recreation resources to the existing socioeconomic condition. The recreation visitor survey conducted as part of the recreation study was designed to estimate recreational use for the Project area. (Please see the Recreation Resources FTR, Section 3.0, for more details.) These data as summarized by EDAW, 2003, describe the estimated baseline for recreation activity in the Project area, organized by primary purpose trip. It was found that boat fishing, waterskiing, resting/relaxing, shoreline fishing, RV camping, and whitewater boating account for most visitor days. This information is provided in the socioeconomic study to help with interpreting how recreation activity levels may change in response to incremental changes in the Project and PM&E measures and to estimate the effect of such changes on the socioeconomic condition.

At the request of the socioeconomic specialists, EDAW also collected information on expenditures, which have been used in combination with the recreation activity levels to estimate local expenditures on recreation-related businesses in the Upper Klamath River area. The following tables summarize the results of the socioeconomic-related results of the visitor survey and associated computations. This section also includes a discussion related to the whitewater outfitting businesses, as most of the whitewater expenditures accrue to them and they would be most affected by impacts to this recreation activity. The summary of all recreation expenditures is included at the end of this recreation section after separately discussing the Upper Klamath River area and the Lower Klamath River area.

Visitor Survey (Socioeconomic) Results and Computations. Visitor surveys were distributed to visitors at Project area recreation sites on preselected dates during 2001 and 2002. 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 Sportsman'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 (Table 2.7-36).

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Table 2.7-36. Visitor questionnaire response rates.

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

Source: EDAW, Inc.

A sufficient number of completed surveys were returned to achieve a 95 percent confidence level and a sampling error of 5 percent for the Project area (see Table 2.7-37). 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).

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, except at Copco reservoir and the Upper Klamath River/Hell's Corner reach. If a more homogeneous population is assumed (e.g., low variance in responses) then the sampling error for the Upper Klamath River/Hell's Corner reach also falls within the acceptable 10 percent (see Table 2.7-37).

Table 2.7-37. Completed surveys by resource area and corresponding sampling error.

Resource Area	Returned Surveys	Percent of Total	Sampling Error (High Variance)[1]	Sampling Error (Low Variance)[2]
Link River/Lake Ewauna/Keno Reservoir	98	14	± 9.88	± 7.90
J.C. Boyle Reservoir	141	20	± 8.23	± 6.58
Upper Klamath River/Hell's Corner Reach	63	9	± 12.33	± 9.87
Copco Reservoir	30	4	± 17.88	± 14.31
Iron Gate Reservoir	318	46	± 5.46	± 4.37
Other[3]	44	6	NA	NA
Project Area (Total)	**694**	**100**	**± 3.67**	**± 2.93**

[1] High variance in responses (e.g., 50 percent true and 50 percent false in response to True/False questions) is characteristic of nonhomogeneous populations.

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

[3] Other corresponds to surveys in which a primary location could not be identified for a variety of reasons (e.g., location notation was torn off, location line was not filled in).

NA = Not available.

Source: EDAW, Inc.

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All survey results are presented in tabular format and are grouped by the primary activity (self-reported) of visitors to the Project area. Participants in the visitor survey chose their primary activity from a list of 23 common recreation activities. In this report, only those activities that were chosen as a primary activity by at least 5 percent of survey respondents are included in the analysis. These activities are boat fishing (16 percent), waterskiing (12 percent), resting/relaxing (11 percent), shoreline fishing (8 percent), RV camping (6 percent), and whitewater boating (6 percent). A sufficient number of activity participants for boat fishing, waterskiing, and resting/relaxing were available to achieve a 95 percent confidence level with a sampling error of 10 percent (assuming low variance). However, the number of shoreline fishing, RV camping, and whitewater boating participants was not high enough to achieve a 10 percent sampling error. The sampling error for these activities is approximately 15 percent.

Activities that were indicated by less than 5 percent of survey respondents were combined in an "Other" category. The "Other" activity category represents approximately 37 percent of all survey respondents (4 percent of respondents did not indicate a primary activity) (see Table 2.7-38).

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Table 2.7-38. Group size.

SURVEY QUESTION: How many people in your group today, including yourself, are visiting this area?

Activity (n)		Mean	Median	Sd	Minimum	Maximum
Boat Fishing (96)	**Total**	**6.0**	**3.0**	**7.8**	**1**	**40**
	2001	5.7	4.0	4.8	1	20
	2002	6.1	3.0	9.1	1	40
Waterskiing (77)	**Total**	**7.6**	**6.0**	**5.7**	**2**	**32**
	2001	5.8	5.0	3.2	2	17
	2002	9.8	8.0	7.1	2	32
Resting/Relaxing (71)	**Total**	**6.0**	**4.0**	**5.0**	**1**	**20**
	2001	6.7	5.0	5.3	2	20
	2002	5.1	3.0	4.4	3	20
Shoreline Fishing (51)	**Total**	**3.1**	**3.0**	**2.0**	**1**	**10**
	2001	3.8	3.0	2.3	1	10
	2002	2.3	2.0	1.4	1	7
RV Camping (38)	**Total**	**4.6**	**2.5**	**4.0**	**1**	**15**
	2001	4.2	3.0	3.1	1	14
	2002	5.4	2.0	5.6	1	15
Whitewater Boating (38)	**Total**	**20.4**	**24.0**	**8.2**	**2**	**34**
	2001	21.5	25.0	7.6	2	34
	2002	8.0	9.0	4.6	3	12
Other (258)	**Total**	**6.1**	**4.0**	**5.8**	**1**	**50**
	2001	5.9	4.0	5.5	1	34
	2002	6.9	4.0	7.1	1	50

Source: EDAW, Inc.

Recreation days were estimated by EDAW and details on their Recreation Visitor Survey methods are found in Section 3.0 of the Recreation Resources FTR. The summary table of recreation days is reproduced in Table 2.7-39. EDAW estimates a total of about 192,000 annual recreation days in the Project area.

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Table 2.7-39. 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			
Link River/Lake Ewauna/Keno Reservoir						
Link River Trail[3]	3,110	7,852	5,700	5,881	2,740	25,283
Veteran's Memorial Park/Boat Launch[3]	4,751	9,597	15,675	5,750	6,697	42,470
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
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						
Upper Klamath River Boater Access[4]	788	1,313	2,363	788	0	5,252
Klamath River Campground[4]	150	250	450	150	0	1,000
Stateline Takeout	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

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Table 2.7-39. 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			
Wanaka Springs	379	765	2,431	574	Closed	4,149
Camp Creek	2,443	4,320	5,145	2,874	479	15,261
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 Fish Hatchery	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 vehicles-at-one-time (VAOT) (Recreation Resources FTR, Table 3.7-32), people per vehicle (Recreation Resources FTR, Table 3.7-34), turnover rates (Recreation Resources FTR, 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. 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 Trail and 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, Upper Klamath River Boater Access, and Klamath River Campground. The site operator provided an annual estimate of use at Sportsman's Park and the U.S. Bureau of Land Management (BLM) provided an annual estimate of use at the Upper Klamath River Boater Access and the 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.

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For all types of recreation, an estimate of recreation days by primary purpose trips is found by multiplying the primary purpose share by the total number of recreation days (192,000). The estimate of recreation days is our proxy for visitor days. The aggregate expenditure information is summarized in Table 2.7-40 for all primary purpose visitor days, except for whitewater boating, and the Tables 2.7-41 through 2.7-46 provide the intermediary calculations. Whitewater boating expenditure data from EDAW were too thin to include. Therefore, expenditures on whitewater boating were estimated by other methods described in the Summary of Recreation section below. It is also worth noting that there are alternative estimates of whitewater boating visitor days based on records kept by BLM.

Table 2.7-40. Primary purpose recreation days, average expenditures per person day and total expenditures.

Primary Purpose Activity	Percent Share Of Primary Purpose Recreation Days	Primary Purpose Recreation Days	Average Expenditures per person/day[1]	Nonlocal Visitor Expenditures Project Area[2] (5-mile buffer)	Nonlocal Visitor Expenditures Outside Project Area[3] (50-mile buffer)	Total Expenditures[4] (local and nonlocal)
Boat fishing	16	30,270	$5.12	$119,340	$136,390	$154,980
Waterskiing	12	23,040	$7.81	$136,760	$167,350	$179,940
Resting/Relaxing	11	21,120	$4.06	$60,020	$69,450	$85,750
Shoreline Fishing	8	15,360	$17.02	$130,713.60	$209,143	$261,430
RV Camping	6	11,520	$7.05	$70,660	$70,660	$81,220
Whitewater Boating	6	11,520				
Other	37	71,040	$5.54	$188,910	$310,914	$393,560
No Primary	4	7,680	$4.25	$23,450	$28,350	$32,640
Total	100	192,000	$4.25	$729,854	$992,257	$1,189,520

[1] The expenditure information was obtained from the visitor survey except for the whitewater boating, where the data were too thin to estimate expenditures. Whitewater boating expenditures were estimated by other means described in the Summary of Recreation below. The EDAW survey asked for expenditures by group and by trip. These were converted to average expenditures per person/day.

[2] These expenditures were calculated by taking the share of visitors staying over night in the Project area times the average expenditures per day and multiplying by the number of primary purpose recreation days.

[3] These expenditures were calculated by taking the share of visitors staying over night either inside or outside the Project area times the average expenditures per day and multiplying by the number of primary purpose recreation days. It includes expenditures within the 5-mile buffer.

[4] Total expenditures include expenditures by all visitors, including those visitors who live in the Project area or nearby.

Whitewater boating visitor days (i.e., user days) are estimated annually by BLM for a portion of the Upper Klamath River area. Their estimates are reported in Table 2.7-41. Even using their high year (1996), their estimate of about 6,200 user days is quite a bit less than the 11,520 recreation days from the EDAW study. According to EDAW, the difference results from a number of factors, including the incomplete coverage by BLM, which would keep their number

on the low side and the adjustment factor (i.e., to account for unusually low Project area visitation rates for the survey year) for visitor days in the EDAW study. For the present purpose, EDAW numbers are used to be consistent with all of the other recreation activities in the Upper Klamath River area and to provide an upper-bound estimate for whitewater boating use. In the recreation summary section below, the BLM estimate of average annual whitewater boating use (5,090) is used to provide a lower bound.

Table 2.7-41. Upper Klamath River area* whitewater boating use statistics 1994-2002.

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Commercial Use Levels									
Number of 1-day trips	283	330	372	374	295	307	359	287	285
Number of overnight trips	69	80	70	51	30	41	33	23	21
Total number of trips	352	410	442	425	325	348	392	310	306
Number of Outfitters with commercial use	14	14	22	24	20	19	18	16	17
Total number of permitted outfitters	20	25	27	26	26	23	22	22	22
Total number of passengers (user days)	4,471	5,763	5,963	5,509	4,081	4,614	5,100	3,575	3,580
Average number of passengers per trip	10.6	14.0	13.4	13.0	12.6	13.4	12.8	11.5	11.7
Private/Self-Outfitted Boating Use Levels									
Total number of trips	86	55	40	27	24	34	34	22	31
Total number of boaters(user days)	735	602	244	317	314	283	269	124	269
Average number of boaters per trip	6.8	9.6	6.1	11.1	7.2	6.7	7.3	5.6	8.7

Source: Weidenbach, 2003.

* Upper Klamath River area is the area from Link River dam to Iron Gate dam.

EDAW collected data on visitor expenditures in 2002 only. These data are reported by expenditure category in Table 2.7-42. The expenditure data were converted to average expenditures per person/day for each primary purpose activity using the average group size and average length of trip reported by respondents to the EDAW visitor survey. (See summary tables from the EDAW Survey, Tables 2.7-43 through 2.7-49.) With the exception of whitewater boating, total expenditures by nonlocal visitors are calculated in Table 2.7-40 for the 5-mile buffer in column 5 and the 50-mile buffer (which includes the 5-mile buffer) in column 6. In addition, total expenditures by all visitors, local and nonlocal, are estimated in column 7. These total annual expenditures are $262,000, $992,000, and $1,189,000, respectively.

Table 2.7-42. Expenditures ($0/blank responses included).

SURVEY QUESTION: During this trip, approximately how much did you spend as a group on the following items?*

Activity	Accommodations	Meals/food	Gas/fuel	Supplies	Guide Fee	Other
Boat Fishing	$10.94	$52.58	$48.05	$25.78	$9.38	$0.08
Waterskiing	$1.57	$89.37	$64.29	$25.86	-	-
Resting/Relaxing	$3.39	$36.52	$24.27	$16.51	-	$2.73
Shoreline Fishing	$21.35	$49.82	$41.61	$19.14	-	$0.19
RV Camping	$4.17	$70.83	$52.92	$25.83	-	$19.17
Whitewater Boating	-	$3.33	$6.67	-	-	-
Other	$10.99	$39.08	$22.31	$17.10	$2.77	$8.32

Source: EDAW, Inc.

* This question only appeared on the 2002 visitor survey. All respondents who answered at least one of the expenditures questions were included in the averages for all expenditure categories.

Table 2.7-43. Day use versus overnight use.

SURVEY QUESTION: On this trip, are you staying overnight in the Klamath River area?

Activity		Percent No	Percent Yes	Percent Live Near Here
Boat Fishing	**Total**	**11**	**77**	**12**
	2001	17	74	9
	2002	8	78	14
Waterskiing	**Total**	**17**	**76**	**7**
	2001	27	71	2
	2002	6	83	11
Resting/Relaxing	**Total**	**11**	**70**	**19**
	2001	8	87	5
	2002	16	50	34
Shoreline Fishing	**Total**	**30**	**50**	**20**
	2001	33	67	-
	2002	27	35	38
RV Camping	**Total**	**-**	**87**	**13**
	2001	-	93	7
	2002	-	75	25
Whitewater Boating	**Total**	**5**	**95**	**-**
	2001	3	97	-
	2002	33	67	-

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Table 2.7-43. Day use versus overnight use.

SURVEY QUESTION: On this trip, are you staying overnight in the Klamath River area?

Activity		Percent No	Percent Yes	Percent Live Near Here
Other	**Total**	**31**	**48**	**21**
	2001	33	57	10
	2002	27	35	38

Source: EDAW, Inc.

Table 2.7-44. Nights spent in the Project area.

SURVEY QUESTION: How many nights will you stay on this trip?

Activity (n)		Mean	Median	Sd	Minimum	Maximum
Boat Fishing (75)	**Total**	**4.9**	**3.0**	**3.8**	**1**	**14**
	2001	4.7	4.0	3.5	1	14
	2002	4.9	3.0	4.9	1	14
Waterskiing (56)	**Total**	**2.7**	**2.0**	**1.3**	**1**	**7**
	2001	2.3	2.0	1.0	1	4
	2002	3.1	3.0	1.4	1	7
Resting/Relaxing (52)	**Total**	**3.3**	**2.0**	**2.4**	**1**	**12**
	2001	2.8	2.0	1.7	1	7
	2002	4.1	3.0	1.4	2	4
Shoreline Fishing (22)	**Total**	**3.0**	**2.0**	**2.8**	**1**	**14**
	2001	2.3	2.0	1.7	1	7
	2002	3.9	3.0	3.8	2	14
RV Camping (35)	**Total**	**4.3**	**3.0**	**3.2**	**1**	**14**
	2001	3.8	2.5	3.1	1	14
	2002	5.4	3.0	3.4	1	10
Whitewater Boating (33)	**Total**	**2.4**	**2.0**	**0.7**	**1**	**4**
	2001	2.3	2.0	0.7	1	3
	2002	3.0	3.0	1.4	2	4
Other (116)	**Total**	**3.6**	**2.0**	**4.3**	**1**	**40**
	2001	3.2	2.0	2.8	1	14
	2002	4.2	3.0	6.1	1	40

Source: EDAW, Inc.

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Table 2.7-45. Average expenditures per person/day.

Activity	$/Trip/Group[1]	#Days/Trip[2]	Group Size	$/Person/Day[3]
Boat Fishing	$147	4.77	6	$5.12
Waterskiing	$181	3.05	7.6	$7.81
Resting/Relaxing	$81	3.31	6	$4.06
Shoreline Fishing	$132	2.50	3.1	$17.02
RV Camping	$154	4.74	4.6	$7.05
Whitewater Boating	$10	3.28	20.4	$0.15
Other	$92	2.73	6.1	$5.54
No Primary	114	3.48	7.7	$4.25

[1] This is the sum across all expenditure categories.

[2] This is found by multiplying the share of persons staying overnight times the number of days on site (i.e., 1 plus the number of nights on site) and adding the share of persons not spending the night (i.e., the share of 1-day trips).

[3] The total trip expenditures for the group are divided by the number of days per trip and the number of persons in the group to give the average expenditures per person per day.

Table 2.7-46. Where visitors spend nights in the Project area.

SURVEY QUESTION: During this trip, where are you spending the night?*

Activity (n)	Percent Residence	Percent Campground/Camping	Percent Hotel/Motel	Percent Other
Boat Fishing (54)	7	91	2	-
Waterskiing (31)	7	90	-	3
Resting/Relaxing (18)	6	94	-	-
Shoreline Fishing (13)	46	38	8	8
RV Camping (10)	-	100	-	-
Whitewater Boating (3)	33	67	-	-
Other (58)	38	57	-	5

Source: EDAW, Inc.

* This question only appeared on the 2002 visitor survey.

Besides information related to estimating expenditures, the EDAW visitor survey included questions that could be useful for interpreting how recreation patterns may change with incremental changes in the Project and PM&E measures. For this reason, summary responses to questions related to areas frequented, and visitors' perceptions are reported by primary purpose trip in Tables 2.7-47 through 2.7-49.

Table 2.7-47. Areas visitors generally visit in the Project area.

SURVEY QUESTION: When you make a trip to the Klamath River area, which of the following areas do you generally visit?

Activity	Link River Area	Lake Ewauna	Keno Reservoir	J.C. Boyle Reservoir	Copco Reservoir	Iron Gate Reservoir	Below Iron Gate Dam to I-5	Upper Klamath River/Hell's Corner Reach
	Percent*							
Boat Fishing	5	4	4	12	32	88	16	11
Waterskiing	3	5	10	7	12	84	-	8
Resting/Relaxing	17	14	38	32	13	44	4	22
Shoreline Fishing	14	8	21	15	27	35	10	44
RV Camping	10	5	18	13	10	59	13	8
Whitewater Boating	-	-	-	3	34	5	8	92
Other	25	18	29	25	16	39	8	18

Source: EDAW, Inc.

* Percentages do not sum to 100 as this was a multiple response question.

Table 2.7-48. Primary destination in the Project area.

SURVEY QUESTION: What is your primary destination during this trip while in the Klamath Hydroelectric Project area?

Activity	Primary Destination (Percent)
Boat Fishing	Iron Gate Reservoir (72)
Waterskiing	Iron Gate Reservoir (84)
Resting/Relaxing	Iron Gate Reservoir (42)
Shoreline Fishing	Iron Gate Reservoir (29)
RV Camping	Iron Gate Reservoir (58)
Whitewater Boating	Upper Klamath River/Hell's Corner Reach (71)
Other	Iron Gate Reservoir (37)

Source: EDAW, Inc.

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Table 2.7-49. Primary destination in the region.

SURVEY QUESTION: What is your primary destination in the region on this trip?

Activity	Primary Destination (Percent)
Boat Fishing	Iron Gate Reservoir (55)
Waterskiing	Iron Gate Reservoir (71)
Resting/Relaxing	Iron Gate Reservoir (25)
Shoreline Fishing	Iron Gate Reservoir (18)
RV Camping	Iron Gate Reservoir (4)
Whitewater Boating	Klamath National Forest (26)
Other	Iron Gate Reservoir (34)

Source: EDAW, Inc.

Whitewater Boating Outfitters on the Upper Klamath. Information on whitewater boating is collected separately for the Upper Klamath River area and the Lower Klamath River area. BLM and the most active outfitters in the Upper Klamath River area are the primary data sources for whitewater boating activity on this stretch of the river. Table 2.7-50 shows the variation in number of commercial user days in the Upper Klamath River area by the region of origin of the outfitters over the last 5 years. A commercial user day represents one client on the water for one day; therefore, a boat with five clients on a 2-day trip represents 10 user days. Oregon-based outfitters were responsible for about three-fourths of the commercial user days in the Upper Klamath River area. The majority (80 percent) of the commercial user days by Oregon-based outfitters was by Ashland-Medford area-based outfitters. California-based outfitters were responsible for about 20 percent of the commercial user days in the Upper Klamath River area. About half of the commercial rafting use among California-based outfitters was out of the Mt. Shasta area.

Table 2.7-50. Upper Klamath River area* commercial rafting use by geographical region, 1998-2002.

	1998	1999	2000	2001	2002
Region of Origin					
Ashland-Medford	2,562	3,106	3,276	2,478	2,491
Mt. Shasta, CA	514	504	676	819	601
Rest of CA	500	364	598	216	242
Rest of Oregon	627	562	539	76	225
Total	4,203	4,536	5,089	3,589	3,559

Source: Weidenbach, 2003.

* Upper Klamath River area is the area from Link River dam to Iron Gate dam.

Numbers are "guest visitor use days," guides are not included in this figure. A visitor use day is equal to 1 person for all or part of a day.

Figures are approximate, probably within a 5 percent margin of error.

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A number of outfitters operating in the Upper Klamath River area were contacted to determine the contribution of whitewater recreation to local economies. The information was gathered through telephone interviews using a set of predetermined questions (see Appendix 2A). Whitewater recreation on the Klamath is a seasonal activity (from May through October). A wide variation exists among outfitters when it comes to how dependent they are on whitewater recreation on the Klamath River—from a 1 percent dependence to a 100 percent dependence.

Because the Upper Klamath River area has more rapids and thus requires more expertise, the commercial user days relative to private user days are higher—between 60 and 100 percent. Outfitters contacted were based in the Mt. Shasta and Coloma areas in California and in the Ashland and Medford areas in Oregon, accounting for most of the commercial trips on the Upper Klamath. The outfitters employ between 5 and 44 people during the season. Most of the employees come from the local area where the businesses operate. One of the outfitters reported hiring guides from other countries such as Costa Rica, New Zealand, Nepal, and Germany. Most of the customers are from the Bay Area, southern California, Oregon, and other parts of the western U.S. as well as other parts of the U.S. The rafting trip was the primary reason for most of the customers' trips to the region, although there are customers who come primarily for the Shakespeare Festival in Ashland, and once in the area, take a rafting trip. The majority (more than two-thirds) of the customers stay in hotels/motels in nearby towns of Ashland, Medford, and Mt. Shasta before and after the whitewater trip.

The outfitters offer 1-day, 2-day, and 3-day trips. Rates charged vary from $135 per person for the 1-day trip to $545 per person for the 3-day trip. Rates also vary depending on age. Trip supplies are typically purchased locally at the start of the trip. There are some stores along the way in Weed, but for the most part the only shopping available is at the Copco Lake Store that is at the take-out. Customers can purchase items such as beer, candy, ice cream, snacks, drinks, and souvenirs, and can pick up any photographs of the trip they may want. Between 60 and 100 percent of the customers purchase items at the Copco Lake Store. Copco Lake Store is entirely dependent on the whitewater activities. This information along with expenditure data from the literature are used below in the Summary of Recreation section to estimate whitewater boating expenditures.

Table 2.7-51 summarizes the results of the Upper Klamath River area outfitter surveys.

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Table 2.7-51. Upper Klamath River area[1] whitewater recreation survey results.

Company	Contact	Address	Phone Number	Number of Employees	Origin of Employees	Percent of Business on Upper Klamath	Origin of Customers	Accommo-dation Place	Accommodation Type and Percent
Whitewater Connection	Leanne Ybright	Coloma, CA	530-622-6446	5	Local; other countries, e.g., Costa Rica, New Zealand, Nepal, Germany	1	Southern CA	Weed	hotel- 1st night and campground- 2nd night
Living Waters Recreation	Tom Harris	Mt. Shasta, CA	560-926-5446	6	depends on availability	60-65	San Diego to Seattle, Chicago, Detroit, NY, other East Coast	Mt. Shasta, Dunsville, Weed	hotel - 67 percent; campground - 33 percent
Rogue Klamath River Adventures	Wayne Zallen	Medford, OR	541-779-3708	12		60-65	Predominantly from CA, WA, FL and other parts	Medford or Ashland	campground - 10-15 percent; hotels - 85-90 percent
Noah's River Adventures	Hugh Hague	Ashland, OR	541-488-2811	44	Ashland/Medford (Rogue Valley)	35-40	70 percent West Coast; 30 percent rest of the world	Medford or Ashland	hotel - 95 percent; campground - 5 percent
Turtle River Rafting Company	Rick Demarest	Mt. Shasta, CA	530-926-3223	17	Mt Shasta	10	CA, Bay Area	Mt. Shasta	motels
The Adventure Center	Zac Kauffman	Ashland, OR	541-488-2819	17	Ashland/Medford area	33	Bay Area, CA to Seattle, WA	Ashland or Medford; Grants Pass	hotels - 80-85 percent; campgrounds - 15-20 percent

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Table 2.7-51. Upper Klamath River area* whitewater recreation survey results, continued.

Company	Rafting Trip Primary Reason (Y/N)	Percent of Customers in Area for Other Activities	Total Number of Customers Taken Down the Upper Klamath River	Duration of Trip	Rate	Adult/ Youth	Type of Supply	Where Supplies are Purchased	Any Stores Along the Way (Y/N)	Name of Store	Percent of Customers That Buy Stuff	Items Purchased	Estimate of Commercial User Days to Private Use	Any Photo-graphers (Y/N)
Whitewater Connection	Y	0	25-30	2-day weekdays; 2-day weekends	$289; $319	person	food, gas, and equipment	Coloma, and various vendors	Y	Stores in Weed; Copco Lake Store at take out	100	Food	No way of knowing	Y
Living Waters Recreation	Y	15	350-360	1-day; 3-day	$156; $460-$545	person		Mt. Shasta or Redding/Medford	Y, Weed, McDoel, Dorris	Copco Lake Store at take out	80-90	soda, beer, chips, ice-cream, t-shirt	95 percent commercial; 5 percent private	Y
Rogue Klamath River Adventures	Y	60	700	1-day; 2-day	$139; $379	person	Equip-ment, gas, and food	All over, locally, and Medford	Y	Copco Lake Store at take out	60-75	beer, ice cream, snacks, souvenirs (hats, t-shirts)	99 percent commercial; 1 percent private	Y
Noah's River Adventures	Y	80-90	2,500	1-day; 2-day	$135; $379	person	gas; food	Ashland; Medford	Y	Copco Lake Store at take out	75	soda, ice-cream, t-shirts, beer, snacks, hats	90 percent commercial: 10 percent private	Y
Turtle River Rafting Company	Y	30-40	200	1-day; 2-day	$130; $310	person		Mt Shasta	Y	Copco Lake Store at take out	100	drinks, photographs, snacks	75 percent commercial, 25 percent private	Y
The Adventure Center	N – Shakespeare Festival is the primary reason	75	700-800	1-day; 2-day	$135;$ 339	person		Ashland, Medford	Y	Copco Lake Store	50	drinks, photographs, snacks, souvenirs	90-95 percent commercial; 5-10 percent private	Y

* Upper Klamath River area is the area from Link River dam to Iron Gate dam.

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Lower Klamath River Area. The information related to recreation opportunities and activity levels for the Lower Klamath River area pertains primarily to the stretch of river from Iron Gate dam to the town of Orleans, which is the most accessible and frequented stretch of the Lower River. Marine sportfishing is also included. The recreation activities in the Lower Klamath River area primarily include sportfishing (guided and private river fishing, marine recreational fishing), whitewater boating (guided and private boat), and mining. Camping along the river is popular, but most campers are engaging in one of the other activities while on their camping trip. Therefore, to avoid double counting of visitor days, the assumption is made that all campers are included in the figures for the other activities.

Fishing. American Indian, commercial, and recreational fishing are all dependent on the amount of fish available for harvest. The Pacific Fishery Management Council (PFMC) uses the Klamath Ocean Harvest model to estimate ocean abundance of fish. The Klamath Ocean Harvest model is a systemwide model that models fish populations on the Klamath and includes everything below Iron Gate dam. It also includes the Trinity River. The model is a simple regression model based on the return to the river of 2-year-old and 3-year-old fish each year. Returning fish are sampled every year and these numbers are used to update the model. That is, the model predicts ocean abundance on the basis of the returning 2-year-old and 3-year-old fish. Once ocean abundance is determined, the PFMC sets an escapement goal. The escapement goal requires that a third, or 35,000, of natural spawners return to the river (Viele, 2002). Based on abundance predictions and the escapement goal, fish available for harvest are determined. The PFMC develops annual management recommendations that support the harvest levels determined from the abundance predictions and the escapement goal. These recommendations are made to the U.S. Department of Commerce.

Of the fish resources available in the basin, 50 percent must, by law, go to the Yurok and Hoopa Valley tribes. The Yurok Tribe receives 80 percent of the tribal allocation and the Hoopa Tribe receives the remaining 20 percent. The Karuk Tribe fishing is regulated to a spot at the Ishi-Pishi Falls (Tripp, 2003) and is not limited to a specific allocation. However, they do report their catch to the California Department of Fish and Game (CDFG), as these data are needed to update the Klamath Ocean Harvest model.

Annual allocation recommendations for the remaining fish are made by the Klamath Fishery Management Council and the Pacific Fishery Management Council. The guidelines for allocating the remaining 50 percent are as follows: 15 percent of the nontribal share is allocated to the river recreational fishery, 17 percent of the nontribal share is allocated to the ocean recreation within the KMZ, and 68 percent of the nontribal share is allocated to commercial and non-KMZ recreational ocean fisheries. The preceding guidelines may be constrained by escapement goals or ESA harvest constraints for other stock. For example, if ocean fisheries are unable to take their allotment of Klamath fall Chinook because of coho constraints, they become available to the river recreational harvest. Very few Klamath fall Chinook are taken by non-KMZ recreational fisheries (Viele, 2002).

Commercial (Guided) Sportfishing. The U.S. Forest Service has collected commercial sportfishing use data for the stretch of river from the Seiad area downstream to Orleans. Figure 2.7-5 shows the record of commercial sportfishing trip days for the period of 1995-96 to 2000-2001. A trip day represents a fishing boat on the river for 1 day. Specific estimates of commercial user days are not available. However, boats average one to two people per trip.

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Assuming an average of 1.5 people per boat yields about 200 people on commercial fishing trips in 2000-2001 compared to the high of about 275 in 1998-1999 and a low of about 40 in 1996-1997.

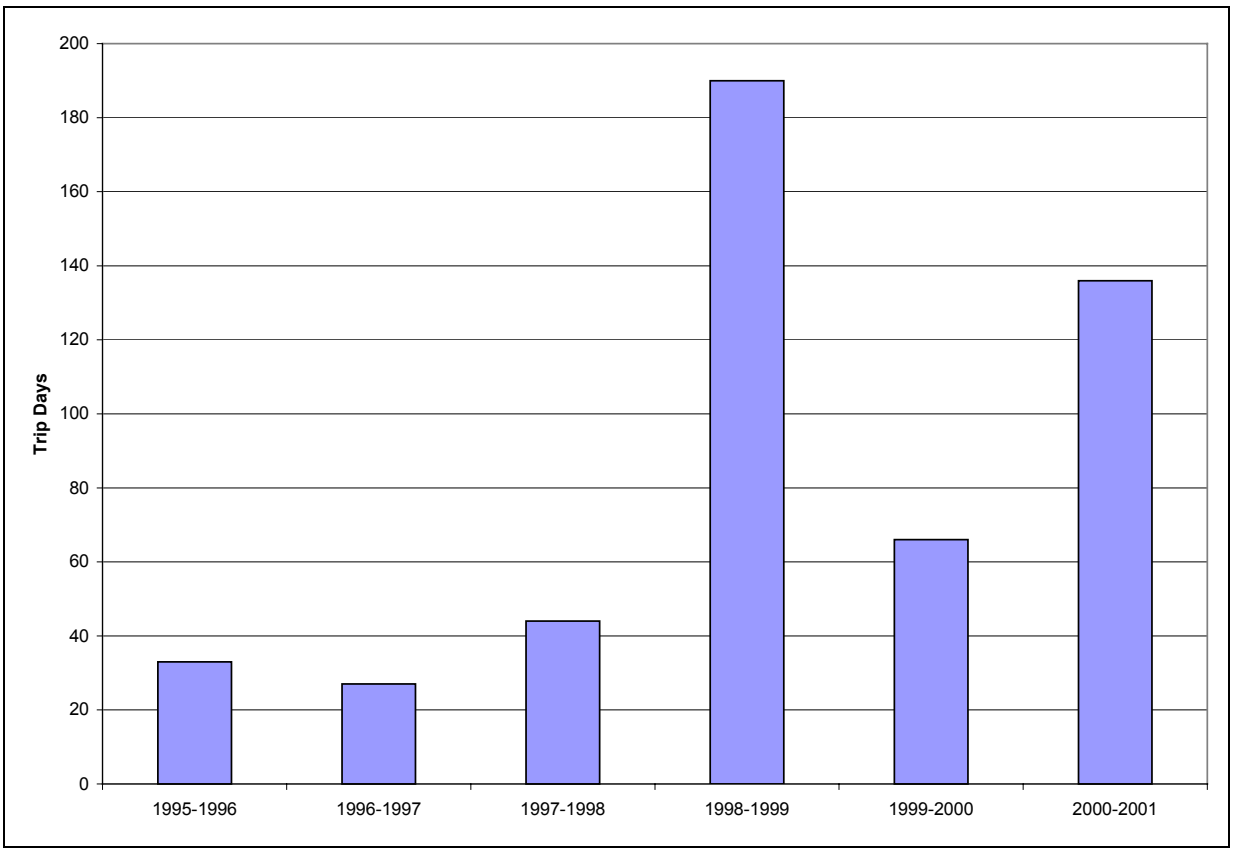

Figure 2.7-5. Historical Lower Klamath commercial sportfishing trip days. (Source: U.S. Forest Service)

Private Sportfishing on the Lower Klamath. Chinook salmon and steelhead trout support popular sportfisheries throughout the Klamath River system, one of the state's primary producers of these two species. Most of the concentrated effort and catch occur in the lower 30 miles of the mainstem Klamath River (Borok, 2003). The Klamath River Project (KRP) divides the Klamath River into three areas to determine angling effort and catch for the entire river. CDFG uses this information to determine when sport anglers have reached the in-river sport harvest quota of fall-run adult Chinook salmon for the entire river (excluding the Trinity River). The Klamath River Chinook quota works in the following manner: one half of the total in-river quota is dedicated to the lower river (Area 1 and Area 2). The other half is dedicated to the upper river (Area 3) and Trinity River. Area 1 is the part of the river from the mouth of the Klamath to the Highway 101 bridge and is referred to as the estuary. Area 2 extends from the Highway 101 bridge upstream to Coon Creek Falls near the community of Johnsons (Pecwan Creek). Area 3 consists of the area above Coon Creek Falls to the Iron Gate Hatchery. Thus, although Area 3 is described as the upper river by CDFG, it is not the same as the Upper Klamath River area that is discussed in this report. The CDFG monitors each areas' Chinook harvest and determines when the quota of each portion has been met.

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Table 2.7-52 presents the annual angling effort and catch for the Lower Klamath River Chinook salmon. Angler effort (as measured by angler trips or angler hours), and catch increased from 1979 to 1982. Effort as well as catch declined in 1983 and 1984. The period 1985 to 1988 saw an increase of 60 percent in angling effort and catch. Both angling effort and catch peaked in 1988. The late 1980s and early 1990s were characterized by declining effort and catch. Although the sportfishing industry on the Lower Klamath River seems to have recovered from the declines in the early 1990s, angler effort and catch have never come close to the numbers seen in the mid 1980s. Each day of fishing is counted as an angler "trip." The creel survey method estimates total days fished, but does not allow for determining whether the days fished are the result of single day trips to the area or some combination of day trips and overnight trips involving multiple days on each trip away from home. The angler effort per fishing day ranges from 3 to 5 hours (CDFG, 2002).

Table 2.7-52. Creel sample data in the Lower Klamath River area.*

Year	Sample Location	Angler		Chinook		
		Trips	Hours	Grilse	Adults	Total
1978		NA	NA	NA	1,694	NA
1979		4,242	13,929	NA	2,141	NA
1980	Area 1	12,479	50,848	835	727	1,562
	Area 2	16,911	53,449	1,648	793	2,441
	Total	29,390	104,297	2,483	1,520	4,003
1981	Area 1	NA	NA	536	1,714	2,250
	Area 2	NA	NA	1,783	661	2,444
	Total	43,220	157,813	2,319	2,375	4,694
1982	Area 1	22,064	97,339	1,252	3,539	4,791
	Area 2	29,899	104,925	2,712	1,016	3,728
	Total	51,963	202,264	3,964	4,555	8,519
1983	Area 1	NA	NA	60	750	810
	Area 2	NA	NA	113	555	668
	Total	0	0	173	1,305	1,478
1984	Area 1	22,844	60,614	175	548	723
	Area 2	14,938	49,884	256	257	513
	Total	37,782	110,498	431	805	1,236
1985	Area 1	21,399	68,070	1,479	2,427	3,906
	Area 2	18,761	70,171	2,331	438	2,769
	Total	40,160	138,241	3,810	2,865	6,675

Table 2.7-52. Creel sample data in the Lower Klamath River area.*

Year	Sample Location	Angler		Chinook		
		Trips	Hours	Grilse	Adults	Total
1986	Area 1	28,274	89,092	704	2,456	3,160
	Area 2	18,156	71,564	2,257	2,661	4,918
	Total	46,430	160,656	2,961	5,117	8,078
1987	Area 1	26,292	79,534	146	2,455	2,601
	Area 2	24,972	99,047	2,980	5,648	8,628
	Total	51,264	178,581	3,126	8,103	11,229
1988	Area 1	34,126	109,022	124	3,367	3,491
	Area 2	29,945	116,993	2,042	5,317	7,359
	Total	64,071	226,015	2,166	8,684	10,850
1989	Area 1	31,157	96,814	137	1,328	1,465
	Area 2	24,775	102,276	1,921	3,254	5,175
	Total	55,932	199,090	2,058	4,582	6,640
1990	Area 1	14,952	46,778	58	291	349
	Area 2	22,187	92,177	1,376	1,934	3,310
	Total	37,139	138,955	1,434	2,225	3,659
1991	Area 1	8,119	24,359	19	314	333
	Area 2	11,841	54,298	336	1,010	1,346
	Total	19,960	78,657	355	1,324	1,679
1992	Area 1	2,349	6,277	13	20	33
	Area 2	8,841	26,803	2,364	393	2,757
	Total	11,190	33,080	2,377	413	2,790
1993	Area 1	6,261	19,613	23	669	692
	Area 2	9,820	32,276	1,064	908	1,972
	Total	16,081	51,889	1,087	1,577	2,664
1994	Area 1	7,534	23,892	231	662	893
	Area 2	7,566	30,856	1,161	181	1,342
	Total	15,100	54,748	1,392	843	2,235
1995	Area 1	10,906	25,790	323	956	1,279
	Area 2	8,975	37,579	2,074	626	2,700

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Table 2.7-52. Creel sample data in the Lower Klamath River area.*

Year	Sample Location	Angler		Chinook		
		Trips	Hours	Grilse	Adults	Total
	Total	19,881	63,369	2,397	1,582	3,979
1996	Area 1	16,535	46,220	100	3,110	3,210
	Area 2	11,394	44,799	1,128	4,052	5,180
	Total	27,929	91,019	1,228	7,162	8,390
1997	Area 1	10,223	32,920	80	1,777	1,857
	Area 2	8,179	34,235	2,203	221	2,424
	Total	18,402	67,155	2,283	1,998	4,281
1998	Area 1	9,122	29,316	124	1,603	1,727
	Area 2	8,484	22,829	406	1,270	1,676
	Total	17,606	52,145	530	2,873	3,403
1999	Area 1	3,254	8,748	25	114	139
	Area 2	7,051	33,688	869	1,112	1,981
	Area 3	4,264	14,842	124	567	691
	Total	14,569	52,278	1,018	1,793	2,811
2000	Area 1	6,264	20,016	102	1,199	1,301
	Area 2	7,911	37,168	951	1,030	1,981
	Area 3	7,153	23,593	192	1,484	1,676
	Total	21,328	80,777	1,245	3,713	4,958
2001	Area 1	11,089	42,489	323	5,298	5,621
	Area 2	9,026	45,563	855	1,987	2,842
	Area 3	7,952	30,551	243	3,041	3,284
	Total	28,067	118,603	1,421	10,326	11,747
2002	Area 1	9,629	39,232	170	4,106	4,276
	Area 2	8,747	46,693	353	3,286	3,639
	Area 3	6,617	27,962	134	3,244	3,378
	Total	24,993	113,887	657	10,636	11,293

Source: California Department of Fish and Game (CDFG), 2003.

NA = Not available.

* Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

Figure 2.7-6 is a graphical representation of the annual angler effort (as measured by angler trips) in the Lower Klamath River area presented in Table 2.7-52.

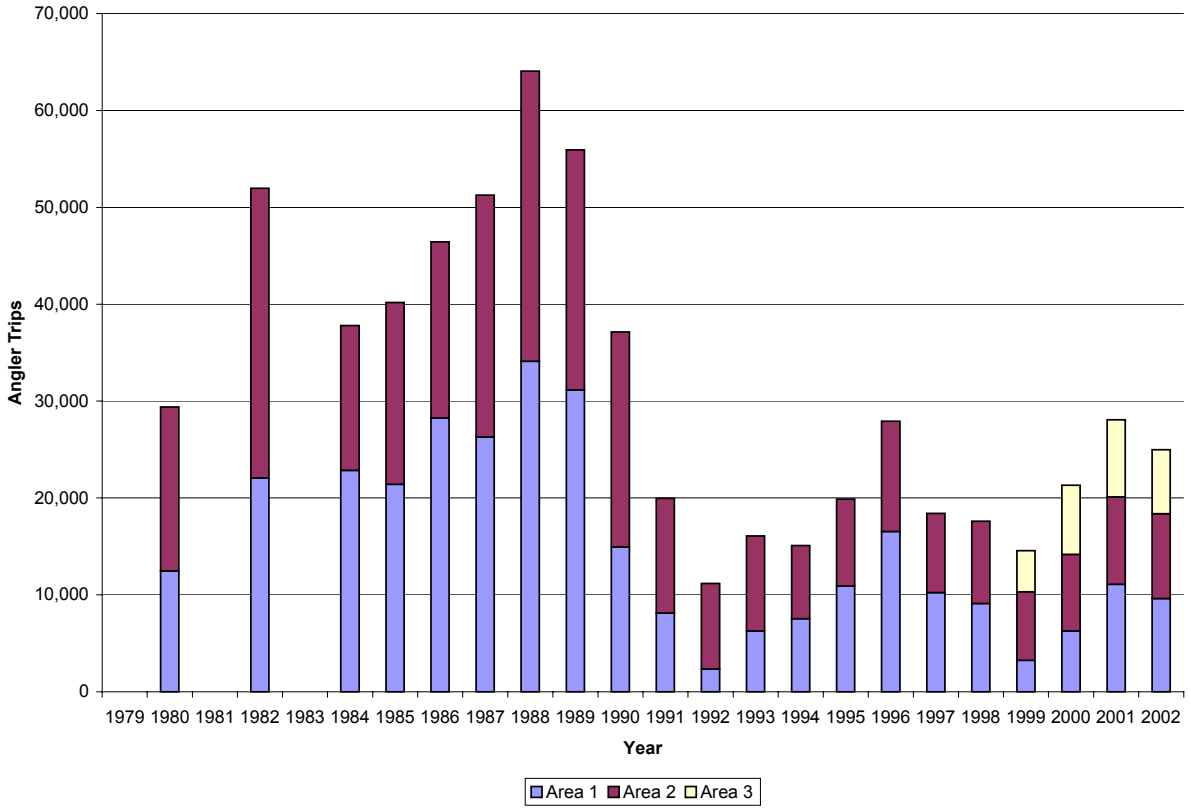

Figure 2.7-6. Fishing effort by sport angler in the Lower Klamath River area. (Source: CDFG, 2003)

In addition to collecting data on harvest to help determine when the quota has been met, the CDFG also conducts a survey to determine the area of origin of anglers by recording the zip codes of the anglers. According to the data for 2002, 72 percent of the anglers that were surveyed were from outside the study area, i.e., outside the six-county region. Of the 28 percent that were from within the six-county area, a majority of them (over 80 percent) were from Del Norte and Humboldt counties.

Although the CDFG do not collect data on angler expenditures, the Research Group (1991) conducted a detailed survey of anglers who fished Oregon waters. They separately estimated expenditures associated with different targeted species, including salmon and steelhead, as well as types of waters (i.e., river/stream, ocean). Average angler expenditures per day for salmon fishing in Oregon rivers was estimated at $38.03 (1990 dollars) or $52.30 in 2002 dollars. About $20.30 is spent near home, about $7.70 is spent en route, and about $24.30 is spent at the destination. If these same expenditure estimates are used for nonresidents fishing the Klamath, then the 72 percent nonlocal visitors spend about $24.30 per angler day in the 5-mile buffer study area and up to $32 in the 50-mile buffer or six-county study area. The residents of the study area are assumed to spend all $52.30 dollars in the six-county study area and $24.30 within the 5-mile buffer. However, only the $24.30 is counted as an expenditure that would lead to an economic impact, and only for the 5-mile buffer. That is, the local expenditures are included

because it is assumed that these dollars would leave the 5-mile buffer if the county residents could not fish the Klamath for their targeted species. However, none of the local expenditures are counted at the 50-mile buffer area or at the county level because it is assumed that these anglers would seek fishing alternatives elsewhere in the county. Thus, they would still inject the expenditures into the larger six-county study area and the Klamath fishing opportunity does not lead to an injection of new dollars at the county level for county residents.

The California Fish and Game Commission (Commission) establishes all angling regulations and quotas for the Klamath River. These regulations are enforced by the CDFG. The Commission adopts the quota recommendations made by the PFMC. Figure 2.7-7 shows the trend in run size estimates for the fall-run Chinook salmon in the Klamath River basin for the years 1978 to 2002. A portion of these run estimates is what becomes available for in-river sportfishing.

Ocean Sportfishing. Historical records on ocean sportfishing effort and landings are maintained by the PFMC. Recreational landings and effort from 1976 to 2001 are shown in Figure 2.7-8. From the 1975 until 1986, total landings fell from just under 80,000 per year to close to 60,000 fish per year. In the late 1980s landings shot up reaching their high at close to 150,000 fish in 1989 before falling back down to about 80,000 in 1991 and then suddenly dropping to about 10,000 in 1992. They reached their low in 1998 at 3,000 but in recent years, have increased and are back up to around 20,000 fish. Angler visitor days follow a similar pattern, reaching their peak of more than 180,000 angler days in 1987, their low point in 1998 of 32,400, and back up to 80,000 angler days in 2001.

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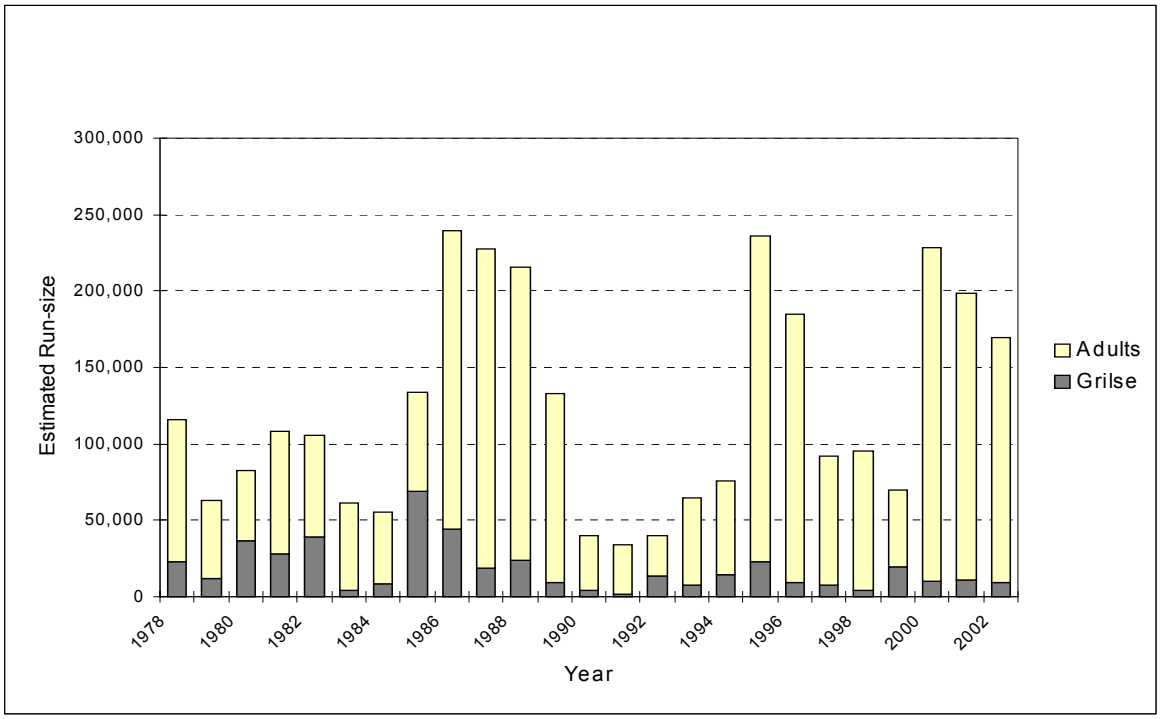

Figure 2.7-7. Klamath River Basin fall-run Chinook salmon run-size estimates, 1978-2002. (Source: CDFG, 2003).

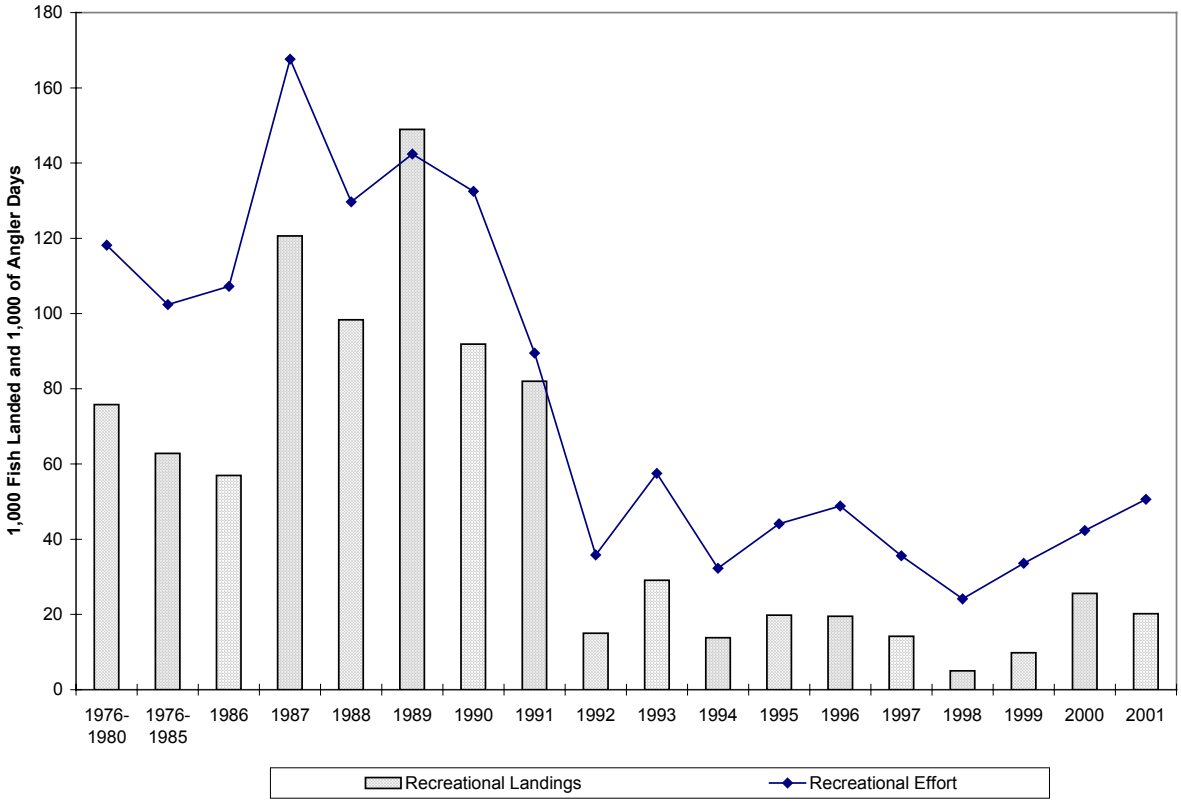

Figure 2.7-8. Historical ocean recreational salmon fishing effort and landings. (Source: NFMS, 2002)

Most of the effort is by private boaters, but on average over the period about 8 percent of the fishing days are on charter boats (PFMC, 1999). Approximately 12 charter vessels in northern California and seven charter vessels in Oregon target salmon in these waters. Annual trips by KMZ ports during the period 1976 to 2001 are reported in Table IV-11 and IV-12 from PFMC 2002 for charter, private, and combined trips for the four KMZ ports, Brookings, Crescent City, Eureka, and Fort Bragg. The estimates of KMZ recreational salmon angler trips by port area and boat type shown in Table 2.7-53 are those from Tables IV-11 and IV-12 in the PFMC 2002 study. Figure 2.7-9 shows the historical recreational ocean salmon angler trips by port area for the KMZ. Figure 2.7-9 is based on the total (private plus charter trips) recreational ocean salmon angler trips by port area shown in Table 2.7-53.

Table 2.7-53. Estimates of KMZ recreational ocean salmon angler trips by port area and boat type.

Year	Crescent City	Eureka	Fort Bragg	Brookings	Total
CHARTER TRIPS (THOUSANDS)					
1976	0.8	2.2	4.1		7.1
1977	1.0	1.2	1.7		3.9
1978	2.4	1.3	9.0		12.7
1979	2.2	0.7	3.3	3.0	9.2
1980	1.4	0.6	2.0	2.8	6.8
1981	0.6	0.5	1.3	3.2	5.6
1982	0.5	0.4	2.4	3.4	6.7
1983	0.5	1.4	1.6	3.6	7.1
1984	0.5	0.9	1.4	2.1	4.9
1985	1.6	3.5	2.3	4.2	11.6
1986	1.1	2.8	2.8	3.4	10.1
1987	1.5	3.8	4.6	4.6	14.5
1988	0.9	2.5	5.6	3.0	12.0
1989	0.6	5.4	4.5	4.4	14.9
1990	0.8	3.2	2.7	2.5	9.2
1991	1.0	2.1	5.4	2.1	10.6
1992	0.1	0.2	1.5	0.5	2.3
1993	0.4	1.0	2.0	0.6	4.0
1994	0.2	0.2	1.3	0.2	1.9
1995	0.1	0.7	3.8	0.3	4.9
1996	[1]	0.6	5.0	0.6	6.2
1997	-	0.8	2.2	0.5	3.5
1998	-	0.3	2.7	0.3	3.3
1999	-	0.4	2.3	0.7	3.4
2000	0.1	1.6	8.6	0.8	11.1
2001[2]	[1]	1.2	8.5	0.7	10.4

Table 2.7-53. Estimates of KMZ recreational ocean salmon angler trips by port area and boat type.

Year	Crescent City	Eureka	Fort Bragg	Brookings	Total
PRIVATE TRIPS (THOUSANDS)					
1976	27.9	26.2	13.0		67.1
1977	21.8	25.5	14.0		61.3
1978	15.0	19.8	8.5		43.3
1979	9.6	17.3	6.5	48.8	82.2
1980	17.8	22.5	4.4	47.7	92.4
1981	13.4	15.8	6.8	64.0	100.0
1982	24.6	22.3	8.0	58.0	112.9
1983	21.2	21.5	6.8	52.1	101.6
1984	23.3	17.9	4.6	35.9	81.7
1985	29.5	31.4	12.6	54.8	128.3
1986	24.5	26.1	10.4	49.3	110.3
1987	50.6	42.4	9.4	64.8	167.2
1988	43.0	30.3	12.2	50.0	135.5
1989	33.0	37.7	13.0	61.3	145.0
1990	41.9	35.4	11.9	48.6	137.8
1991	24.5	25.3	17.2	34.4	101.4
1992	9.0	8.9	9.7	17.2	44.8
1993	15.0	17.3	17.4	23.2	72.9
1994	9.4	6.3	18.1	16.0	49.8
1995	11.8	12.0	25.4	19.1	68.3
1996	11.3	13.6	26.2	22.7	73.8
1997	6.6	11.6	18.0	16.1	52.3
1998	3.3	6.4	5.7	13.8	29.2
1999	5.8	11.6	7.9	15.1	40.4
2000	7.2	11.5	17.0	21.2	56.9
2001 [2]	8.6	14.7	21.1	25.4	69.8
TOTAL TRIPS (thousands)					
1976	28.7	30.5	17.0		76.2
1977	22.8	26.7	15.7		65.2
1978	17.4	21.2	9.5		48.1
1979	11.7	18.0	9.8	60.0	99.5
1980	19.2	23.1	6.4	56.0	104.7
1981	14.1	16.3	8.1	67.1	105.6
1982	25.1	22.8	10.4	61.4	119.7
1983	21.7	22.8	8.4	55.7	108.6

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Table 2.7-53. Estimates of KMZ recreational ocean salmon angler trips by port area and boat type.

Year	Crescent City	Eureka	Fort Bragg	Brookings	Total
1984	23.8	18.8	6.0	38.0	86.6
1985	31.0	34.9	15.0	59.0	139.9
1986	25.6	28.9	13.2	52.7	120.4
1987	52.1	46.1	14.0	69.4	181.6
1988	43.9	32.8	17.8	53.1	147.6
1989	33.6	43.0	17.5	65.8	159.9
1990	42.7	38.7	14.6	51.1	147.1
1991	25.6	27.4	22.6	36.4	112.0
1992	9.1	9.1	11.2	17.7	47.1
1993	15.4	18.3	19.3	23.8	76.8
1994	9.7	6.4	19.4	16.2	51.7
1995	11.9	12.8	29.3	19.4	73.4
1996	11.3	14.2	31.3	23.3	80.1
1997	6.6	12.4	20.2	16.6	55.8
1998	3.3	6.7	8.3	14.1	32.4
1999	5.8	12.0	10.2	15.8	43.8
2000	7.2	13.1	25.6	22.0	67.9
2001 [2]	8.6	15.9	29.6	26.1	80.2

Source: PFMC, 2002.

[1] Fewer than 50 trips.

[2] Preliminary.

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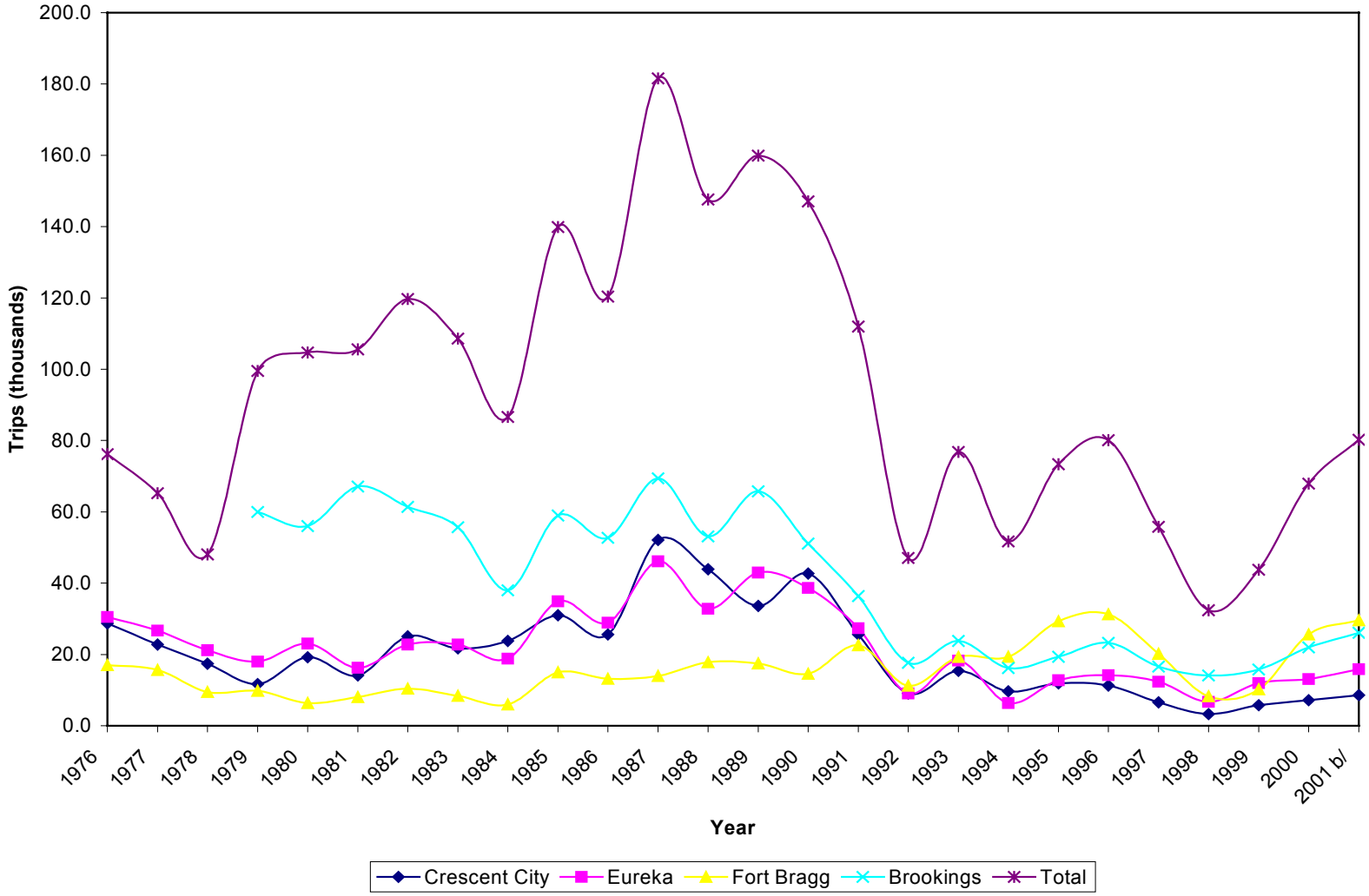

Figure 2.7-9. KMZ Recreational ocean salmon angler trips by port. (Source: PFMC, 2002).

Expenditure information from a survey of anglers fishing in Oregon waters is available from the Research Group (1991). For nonresidents of the local area, this report included an estimate for average local expenditures per day of ocean fishing for salmon in southern Oregon of about $43 in 2001 dollars. Residents spent about $70 in the local area, but about $20 would likely be spent in the area if the resident was forced to seek other salmon fishing opportunities outside the region. These estimates provide a likely ballpark for the study region, which includes part of the southern Oregon coastal region from the angler survey. However, the Project study area includes the northern California coast, which was not represented in the survey.

An even more useful measurement of the contribution of fishing opportunities to the local economy than expenditures is the amount of local personal income that is directly and indirectly generated from the increased sales to fishers. These dollars clearly benefit the local community. The other component of expenditures go to purchase goods and services from industries, which also pay wages and salaries and earn profits for the local community. Although personal income impacts associated with the expenditures in the other recreation activities were not estimated, they are reported for ocean fishing because they were already available from the literature and because they provide the more meaningful measure. In addition, given the way that the data were reported, it would not be straightforward to disentangle the underlying expenditure information that led to the estimates of person income impacts for the study area.

Annual coastal community impacts were estimated over the period 1976 to 2001 using estimates of personal income impacts per day of fishing from the Fishery Economic Assessment Model (FEAM) (PFMC, 2002). Reference information for this model is available from the PFMC. The model utilizes the angler expenditure information collected using surveys of recreational fishers expenditure patterns and charter operator budgets combined with income coefficients from the U.S. Forest Service IMPLAN model. Thus the model captures both the direct effect of the initial expenditures and the indirect effects resulting from spending in the local communities. The estimates for each community are likely overestimates because it is assumed that all trips result in new expenditures in the area and that these expenditures would not occur in other sectors in the coastal communities if salmon fishing were not available. For the KMZ coastal communities the total annual personal income impacts are reported in Tables IV-16 and IV-17 of the PFMC 2002 study. Table 2.7-54 shows the estimates of the coastal community and state personal income impacts of the recreational ocean salmon fishery by port area for the KMZ. The numbers in Table 2.7-54 were compiled from Tables IV-16 and IV-17 of the PFMC 2002 study. The pattern is similar across the four communities with relatively high income impacts from 1976 to about 1990 and then falling precipitously after that before beginning to show signs of recovering some of the lost ground in 2001. For example, in Brookings the average personal income impacts were about $3.7 million from 1976 to 1980 but were down to $566,000 in 1998 and back up to $1.1 million in 2001. The same comparison for Crescent City is a fall from $1 million over the period 1976-1980 to $159,000 in 1998 and then up to $417,000 in 2001; for Eureka a fall from $1.2 million to $353,000 and then up to $838,000; and for Fort Bragg there is a decrease from $715,000 to $ 575,000 and then an increase to $2 million. Summing across all regions the 1976-1980 average income impact was about $6.7 million. It peaked at $8.97 million in 1987, fell to $1.3 million in 1998 and bounced back to $4.3 million in 2001. All estimates are expressed in 2001 dollars.

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Table 2.7-54. Estimates of KMZ coastal community and state personal income impacts of the recreational ocean salmon fishery by port area. [1]

Year	Crescent City	Eureka	Fort Bragg	Brookings[2]	Total
RECREATIONAL (THOUSANDS OF DOLLARS)					
1976-1980	1,059	1,228	715	3,689	6,691
1981-1985	1,160	1,196	573	2,367	5,296
1986	1,300	1,571	818	2,233	5,922
1987	2,601	2,461	963	2,948	8,973
1988	2,167	1,738	1,206	2,224	7,335
1989	1,655	2,410	1,130	2,793	7,988
1990	2,106	2,065	879	2,124	7,174
1991	1,298	1,455	1,431	1,534	5,718
1992	441	452	636	717	2,246
1993	767	945	1,061	960	3,733
1994	475	326	1,016	643	2,460
1995	584	661	1,651	773	3,669
1996	545	718	1,826	941	4,030
1997	317	646	1,111	674	2,748
1998	159	353	575	566	1,653
1999	279	603	636	653	2,171
2000	351	699	1,742	900	3,692
2001 [3]	417	838	1,962	1,055	4,272

Source: PFMC, 2002.

[1] Expressed in 2001 dollars. Per pound and per day estimates of income impacts provided by the Fishery Economic Assessment model. These are the income impacts associated with expenditures in the troll or recreational sectors. There is no differentiation between money new to the area and money which would otherwise have been expended in other sectors. It is assumed that all fish landed at a port is processed in the port area.

[2] On average, between 1976-191 more than 50 percent of the troll fishery community income impacts for the Brookings port area originated from landings in Brookings and Gold Beach. For 1986-1990, an average of about 40 percent of the impacts for the Brookings port area originated in landing made through Brookings and Gold Beach. In 1992 and 1993, impacts originating through these two ports averaged less than 18 percent and 11 percent, respectively, of the total for the Brookings port area.

[3] Preliminary.

It is worth noting that using the available data, it is possible to estimate personal income impacts for changes in fishing days in the future if catch per unit effort stays relatively stable. According to the Research Group (2000), the average personal income impacts over the period 1976 to 1997 are approximately $44 per day fished on a private boat and $102 per day of charter fishing (1996 dollars). Based on a 92 percent/8 percent split between private and charter boat fishing this gives a weighted impact of about $49 in 1996 dollars and $55 in 2001 dollars. From the FEAM model, the personal income impacts are proportional to days fished. Assuming that this relationship also holds for the near future, one can estimate personal income impacts using the estimates of days

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fished for the KMZ, combined with the $personal income impact/per day estimate. As mentioned above, the personal income impacts tended to overestimate impacts. This may be partially offset by the aggregation across communities, which does not include impacts of one coastal community on another. For additional information related to historical anadromous fish populations and their importance to regional and local communities along the Pacific Coast, see the Commercial Fishing sector discussion below.

Gold Mining. The Klamath River is used year-round as a resource for recreational and small-scale commercial gold mining. Many of the recreational miners belong to either the New 49'ers Prospecting Club or the Lost Dutchman's Mining Association. Some of the members of these organizations actually live in the area, while others live elsewhere and travel to the study area for recreational mining. The length of stay for nonlocals varies from a weekend to the full dredging season; while on the average, members will stay in the area to mine for three to four weeks. It is estimated that the New 49'ers organization accounts for approximately 10,000 miner days in the Happy Camp area. The New 49'ers has 500 members from all over the U.S. and parts of Europe.

Within the area, approximately half of the organization's mining claims are on the mainstem Klamath River. The remaining claims are on tributaries to the Klamath. The Lost Dutchman's Mining Association has 26 acres of mining claims on the Klamath River and an additional 28 acres of lands at the junction of the Klamath and Scott rivers. The Lost Dutchman's Mining Association has between 8,000 and 10,000 members, all of whom are from the U.S. or Canada (Davis, 2003). It is estimated that members of the Lost Dutchman's Mining Association account for approximately 5,000 miner days in the area (McCracken, 2002, and LDMA, 2002).

Although the miners use various methods to mine for gold (for example, high banking, panning, dredging, and metal detection), much of the mining activity is dredge mining that occurs in the watered area of the streambed. Therefore, as flows change, different portions of the streambed become accessible to the dredge miners. Low flows allow the dredge miners to reach portions of the streambed that are inaccessible during higher flow periods.

The Lost Dutchman's Mining Association members either camp on the property, bring their RVs onto the property, or find accommodation elsewhere. Members typically pan, dredge, or metal detect for gold. Dredging is the only one of the mining methods that requires a permit. Members typically stay a day or longer (up to 8 months in a 12-month period). Only 100 members can be on the property at any one point in time. Most members are retiree travelers who move about in their RVs. There are also vacationing families (Davis, 2003).

Lost Dutchman's Mining Association members purchase propane, drinking water, gas, and groceries from the local area. They purchase larger items in Yreka. Members purchase their mining equipment from a local mining equipment store or through mail order.

The New 49ers members come to the Happy Camp area to mine between May and October. Most members stay a week with some staying for the entire 5-month season (May through October). Although most miners are visitors to the area, there have been instances of families relocating to the area.

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Gold mining is responsible for increased employment during the summer months (Charlen, 2003). The increased employment is seen in most of the retail stores as well as the post office. Most of the employees are local people or people who have relocated to the area.

Gold mining adds 50 to 100 people to the Happy Camp population during a special weekend in July called the "Gold Rush Days." During this weekend, RV camps are all fully booked.

Most New 49'ers and Lost Dutchman's Mining Association members purchase groceries, gas, and groceries from local retailers. They also purchase parts, gloves, mask, gold pans, and other such items locally from the Napa store or the mining store. Specialized equipment not available locally are purchased from retailers outside the area. Gold miners can either stay in motels (e.g., Forest Lodge motel, Klamath motel), or in campgrounds (e.g., Elk Creek campground) or RV parks (Klamath RV park). A limited number of rental units are available.

Whitewater Boating in the Lower Klamath River Area. Information on whitewater boating is collected separately for the Upper Klamath River area and the Lower Klamath River area. Much of the Lower Klamath River area is surrounded by Forest Service Lands and they, along with the most active outfitters, are the primary information sources for that stretch of River.

The U.S. Forest Service has collected commercial use data for the stretch of river from the Tree of Heaven Campground down to Orleans. Figure 2.7-10 shows the historical variation in service days for the period of 1980 to 2001. A service day represents one client on the water for one day. Therefore, a boat with 5 clients on a two-day trip represents 10 service days. During the period that records have been kept, there has been a general increase in the annual usage of this portion of the river. By 2001, this stretch of the river provided about 15,000 commercial whitewater boating service days. On average, commercial outfitters estimate that commercial recreation accounts for 70 percent of the total whitewater boating. This means that approximately 6,400 additional whitewater boating service days were generated by private boaters in 2001.

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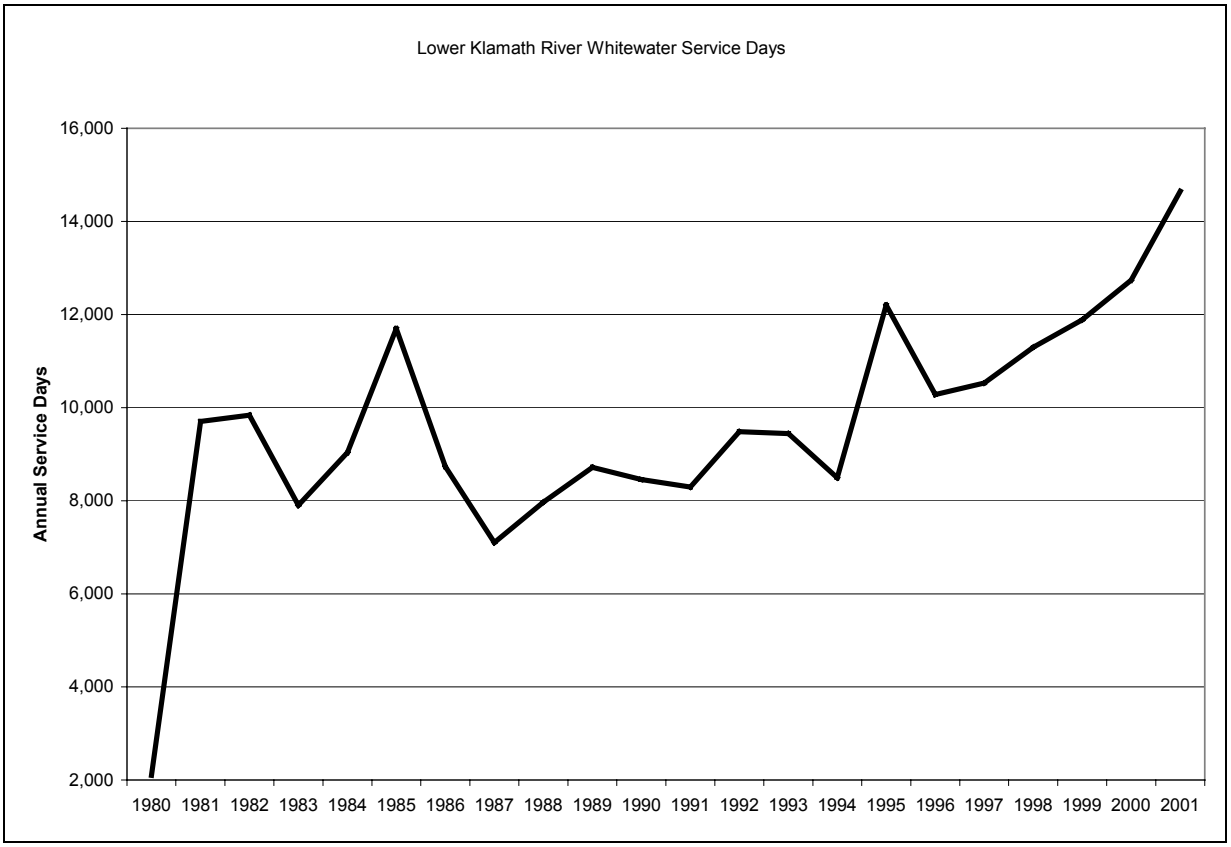

Figure 2.7-10. Annual Lower Klamath River area commercial whitewater boating service days, 1980 to 2001.

Source: U.S. Forest Service.

A number of outfitters operating in the Lower Klamath River area were contacted to determine the contribution of whitewater recreation to local economies. The information was gathered through telephone interviews using a set of predetermined questions. Whitewater recreation on the Klamath is a seasonal activity (from May through October). There is a wide variation among outfitters when it comes to how dependent they are on whitewater recreation on the Klamath River—from a 1 percent dependence to a 100 percent dependence.

The outfitters contacted for information in the Lower Klamath River area were based in the Mt. Shasta, Etna, Greenview, Forks of Salmon, and Angels Camp areas in California and in the Eugene, Grants Pass, and Medford areas in Oregon. The number of employees varies between 4 and 20 people, with most of the employees coming from the local area where the businesses operate. Most of the customers are from the Bay Area, southern California, Oregon, and other parts of the western U.S. One of the outfitters reported customers that came from outside the country – Europe, Australia, Africa, and the Middle East. The outfitters cited rafting as the primary reason why most of their customers were visiting the region. This means that most of the commercial whitewater boating recreation is by nonlocal visitors to the region. To the extent that these visitors pay fees and buy goods and services in the study area, this represents a boost to the local economies. More than half of the customers stay in hotels or motels in nearby towns before and after the whitewater trip. The outfitters offer one-day as well as multiple-day trips. Trip supplies are typically purchased locally at the start of the trip since there are very few places

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along the river where all necessary supplies can easily be purchased. There are a number of small stores where customers can purchase items such as beer, candy, snacks, drinks, souvenirs, etc. These stores are either in Happy Camp or Somes Bar. Between 50 and 100 percent of the customers purchase items at the stores.

Put-in as well as take-out places vary by outfitter as well as by length of trip. Put-in places include Happy Camp, Indian Creek, Ferry Point/Independence Bridge, Paradise Point, Dillon Creek, Presidio Bar, Sandy Bar, Oak Bottom, and Sluice Box. Take-out places include Coon Creek, Downing, Gottville, and Roger's Crossing. A number of the put-in places also serve as take-out places.

Table 2.7-55 summarizes the results of the Lower Klamath River area outfitter surveys.

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Table 2.7-55. Lower Klamath River area* whitewater recreation survey results.

Company	Contact	Address	Phone Number	No. of Employees Supporting Lower Klamath River Whitewater Trips	Origin of Employees	Percent of Business on Lower Klamath River	Origin of Customers	Accommodation Place	Accommodation Type and Percent
Adventure Whitewater	Kyle Ullred	Eugene, OR	541-621-0815	10	Ashland, Siskiyou, Etna, Fort Jones, and S. CA	95	S.CA, Bay Area, Portland, and Seattle	on property in Paradise-20 miles downriver from Happy Camp	campground - 100 percent
JH Ranch	Bruce Johnston	Etna, CA	205-879-5601	10 to 20	all over U.S., mainly S.E. Colleges	100	47 states and Israel, Spain, England, S. Africa, Australia, and Italy	Etna	J.H Ranch
Kidder Creek Orchard Camp Inc	Gayle Ely	Greenview, CA	530-467-3265	8 to 15	S. CA, OR, WY, TX, IS, Redding, Ft Jones, and Etna	33	AZ, S.CA, Bay Area, Redding, and OR	Greenview township, Etna, and Fort Johns	campground - 100 percent
Turtle River Rafting Co	Rick Demarest	Mt. Shasta, CA	530-926-3223	17	Mt. Shasta	80	All over but mostly Bay Area	Happy Camp	hotels - 80 percent; campground - 20 percent
River Dancers	John McDermott	Mt. Shasta, CA	530-926-3517	12 to 18	Mt. Shasta	50	30 percent local; 30 percent Bay area; 40 percent rest of country	Mt. Shasta, Dunsmuir, McCloud, Yreka, Doris	hotels - 50 percent; campground - 50 percent
River Country Rafting	Joe Giera	Happy Camp, CA	530-493-2207 or 707-822-6315 (Arcata)	3	Local - Happy Camp	100	2/3 from CA, rest of U.S. and all over the world; 1/3 local from the Yreka area (with 80 percent of these from Happy Camp)	Happy Camp	motels (Forest Lodge, Klamath Inn) - 50 percent; campground (Elk Creek Campground, FS campground)- 50 percent

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Table 2.7-55. Lower Klamath River area* whitewater recreation survey results.

Company	Contact	Address	Phone Number	No. of Employees Supporting Lower Klamath River Whitewater Trips	Origin of Employees	Percent of Business on Lower Klamath River	Origin of Customers	Accommodation Place	Accommodation Type and Percent
Otter Bar Lodge	Christie Sturges	Forks of Salmon, CA	530-462-4772	Program employ - 4 pple/week; lodge employs 15 pple/week	Local or other parts of the U.S.	50	All over USA	on property	Lodging and campground (1 day out of the week)
Orange Torpedo Trips	Eric Smith	Grants Pass, OR	541-479-5061	4 per week	all local	10	CA accounts for 40-50 percent; rest from other parts of country	Yreka and Happy Camp	lodging - 80 percent; campground - 20 percent
O.A.R.S. Inc	Lannie Yeager	Angels Camp (HQ)	800-346-6277	4-5 max 6	different places	3-4	CA and OR	Happy Camp	hotel (Forest Lodge) - 90 percent; campground - 10 percent
Living Water Reservation	Tom Harris	Mt. Shasta, CA	530-926-5446	6 plus additional if needed	all local	25-30	Mostly Bay Area and S. CA	Mt Shasta	hotel - 67 percent; campground - 33 percent
Rogue Klamath River Adventures	Wayne Zallen	Medford, OR	541-779-3708	12		17	Predominantly from CA, WA, and other parts of USA	Medford-Ashland area	hotels - 90 percent; campground - 10 percent

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Table 2.7-55. Lower Klamath River area* whitewater recreation survey results, continued.

Company	Rafting Trip Primary Reason (Y/N)	Percent of Customers in Area for Other Activities	Duration of Trip	Rate	Adult/ Youth	Type of Supply	Where Supplies are Purchased	Any Stores Along the Way (Y/N)	Percent of Customers that Buy Stuff	Name of Store	Items Purchased	Estimate of Commercial User Days to Private Use	Put-In Place	Take-Out Place	Any Photo-graphers (Y/N)
Adventure Whitewater	Y	less than 5 percent	1-day (typically 3-day trips)	$56 includes meals and equipment	Person	Food, gas, and equipment	Larry's Mkt in Happy Camp; Connor Cardlock gas station in Happy Camp; and S. Oregon	Y	90	Pizza House, and small market next to Pizza House	food, supplies, snacks, souvenirs, sunscreen and sunglasses	80 percent commercial	Happy Camp @ Indian Creek; Ferry Pt/Independence Bridge, and Paradise Pt	Ferry Pt/Windgate Bar, Paradise Pt, and Presidio Bar	N
JH Ranch	Y	0 percent	rate is part of ranch visit, visitors spend a week at the ranch with one day on the river				locally	Y	100	Happy Camp	food, snacks, and t-shirts	No way of knowing	all sections of the river depending on size of group and ages	varies	N
Kidder Creek Orchard Camp Inc	Y	0 percent	2-day; 6-day(not all on the river)	$200; $300	Person		Locally in Greenview and Happy Camp	Generally No stopping	Very small amount	store in Happy Camp	candy, snacks	guessing 75 percent commercial; 25 percent private	Happy Camp	Ferry Pt	N
Turtle River Rafting Co	Y	0 percent	1-day; 2-3-4-day	120 per day	Person	Food, gas, and equipment	Mt. Shasta; Siskiyou, Yreka, Happy Camp; elsewhere	N (nothing from Yreka to Happy Camp)	None			50 percent commercial; 50 percent private	5 different locations in Indian Creek	Downing, Gottville, Coon Creek, & Roger's Crossing	N
River Dancers	Not really	50 percent	1-day; 2-day; 3-day; 4-day; 5-day	$90/$70; $230/$190; $340/$290; $450/$390; $560/$490	Adult/Youth		Mt. Shasta, Redding, Medford	Y, Happy Camp, Seiad Valley, Yreka	100		snacks, gas, souvenirs, groceries	67 percent commercial; 33 percent private	Happy Camp	T-Bar	N

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Table 2.7-55. Lower Klamath River area* whitewater recreation survey results, continued.

Company	Rafting Trip Primary Reason (Y/N)	Percent of Customers in Area for Other Activities	Duration of Trip	Rate	Adult/ Youth	Type of Supply	Where Supplies are Purchased	Any Stores Along the Way (Y/N)	Percent of Customers that Buy Stuff	Name of Store	Items Purchased	Estimate of Commercial User Days to Private Use	Put-In Place	Take-Out Place	Any Photo-graphers (Y/N)
River Country Rafting	Y	20 percent-30 percent (mainly for goldmining, fishing, Oregon caves, etc)	1-day; overnight; 2-day; 3-day; 4-day; 5-day	$60; $85; $170; $255; $340; $425	Person	Food, gas, and equipment	Food and gas from Happy Camp; equipment from either Petaluma, CA or Moscow, ID	Y, Klamath River, Somes Bar	60	Quiqly in Klamath River; Salmon River Outpost in Somes Bar	sunscreen, beer, water sodas, candy, snacks, disposable camera, hats	60-70 percent commercial; 30-40 percent private	Indian Creek, Sluice Box	Ferry Point; Ti Bar, Roger's Crossing	Y
Otter Bar Lodge	Y	0 percent	1 week	$1,890	Person		Eureka, Arcata	Y	100	Somes Bar General Store in Somes Bar	beer, snacks, drinks	Don't know	Dillon Creek, Presidio Bar, Sandy Bar	same as put in	N
Orange Torpedo Trips	Y	0 percent	1-day, 2-day, 3-day	$115, $335, $550	Person		Grants Pass	N	None			70 percent commercial; 30 percent private	Fork Goff stretch, Indian Creek, Oak Bottom	Seattle Creek, Ferry Pt, Dolan Bar	N
O.A.R.S. Inc	Y	5 percent	3-day	$410/$390	adult/youth	Food, gas, and equipment	Happy Camp; elsewhere	N				commercial usually go on a different section	Happy Camp-Lower section; Sluice Box-Upper section	Coon Creek and Presidio-Lower section; Happy Camp-Upper section	N
Living Water Reservation	Y	25 percent	1-day; 3-day; 4-day	$100/$90; $430/$380; $565/$515	adult/youth		Mt. Shasta or Redding/Medford or Happy Camp	Y in Happy Camp, Seiad Valley, Yreka	50		pizza, food, gas, and soda	80 percent commercial; 20 percent private	2-day-Happy Camp 3-4 day up river from Happy Camp	Coon Creek	N
Rogue Klamath River Adventures	Y	10 percent	2-day; 3-day or 4-day	$379 for 2-day; negotiable for 3-day or 4-day	Person		Medford	Generally Don't stopping				70 percent-80 percent commercial; 20 percent-30 percent private	variable - depends on size of group, experience of group, and length of trip	Variable - depends on size of group, experience of group, and length of trip	None

* Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

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Summary of Recreation

This section summarizes the recreation use levels and expenditures for areas within the 5-mile buffer, the 50-mile buffer, and outside the Project area. The information for each of the three areas is presented separately for the Lower Klamath and the Upper Klamath River areas.

Upper Klamath River Area. Table 2.7-56 shows a summary of recreation use and the associated expenditures of nonlocal visitors in the Upper Klamath River area. This table is similar to Table 2.7-40, which summarizes the primary purpose recreation days, average expenditures per person per day and total expenditures from the EDAW survey results, but includes estimates for whitewater boating user days and expenditures. Instead of the whitewater boating estimate based on the EDAW survey (Table 2.7-40), the average of the annual visitor day counts by BLM from 1994 to 2002 (shown in Table 2.7-41) was used. To ensure consistency in the total number of visitors as indicated by the EDAW survey, the number of visitor user days in the activity category 'Other' was adjusted. Thus, Table 2.7-56 differs from Table 2.7-40 in the whitewater boating and other activity category.

Table 2.7-56. Annual recreation use and the associated expenditures of visitors in the Upper Klamath River area[1].

Activity	Primary Purpose Recreation Days (User Days)	$/Person/ Day	Total Expenditure[2]	Total Expenditures by Local Visitors, Project Area[3]	Total Expenditures by Nonlocal Visitors, Project Area[3] (5-mile buffer)	Total Expenditures by All Nonlocal Visitors[4] (50-mile buffer[5])
Boat Fishing	30,270	$5.12	$154,982	$119,340	$119,340	$136,390
Waterskiing	23,040	$7.81	$179,942	$136,760	$136,760	$167,350
Resting/Relaxing	21,120	$4.06	$85,747	$60,020	$60,020	$69,450
Shoreline Fishing	15,360	$17.02	$261,427	$130,714	$130,714	$209,143
RV Camping	11,520	$7.05	$81,216	$70,660	$70,660	$70,660
Whitewater Boating	5,090		$683,333 - $760,191	$55,736 - $63,880	$93,911 - $162,626	$627,597 - $696,311
Other	77,470	$5.54	$429,184	$206,008	$206,008	$339,055
No Primary	7,680	$4.25	$32,640	$23,450	$23,450	$28,350
Total	**192,000**		**$1,908,471 - $1,985,329**	**$802,688 - $810,832**	**$840,863 - $909,578**	**$1,647,995 - $1,716,709**

Sources: Edaw Inc. for the estimates of user days and expenditures with the exception of whitewater boating.

Weidenbach, 2003 for the whitewater boating days.

[1] Upper Klamath River area is the area from Link River dam to Iron Gate dam.

[2] Total expenditures consist of expenditures by all visitors, including those visitors who live in the Project area or nearby.

[3] Total expenditures include expenditures by all visitors who stay overnight in the Project area.

[4] Total expenditures include expenditures by all visitors who stay overnight outside the Project.

[5] The 50-mile buffer area is inclusive of the 5-mile buffer area.

The EDAW visitor survey discussed above included a question on visitor expenditures. Table 2.7-56 summarizes these visitor trip expenditures on a per person per day basis for all

recreation activities. Since the results for whitewater boating were based on too few a sample, it was necessary to supplement the data with additional information. The additional information was derived by using the expenditure information estimated for the various other activities in the Upper Klamath River area combined with the results of the outfitter survey, as well as information from the literature (Neely, DeYoung, and Johnson, 1997; Shelby, Johnson, and Brunson, 1990).

Upper Klamath River Area—5-mile buffer area expenditures for whitewater boating. According to the Upper Klamath River area outfitter survey results presented in Table 2.7-51, only a small number of the visitors that come to the area for whitewater boating are from the immediate Project area (within the 5-mile buffer area). Thus, it is safe to assume that 90 percent of the whitewater boating visitors are from outside the 5-mile buffer area. The remaining 10 percent of whitewater boaters are assumed to be local.

Since the majority of the outfitters are from the Ashland/Medford and other population centers that are beyond the 5-mile buffer area (and these are the areas where they pick-up and drop-off their customers), it is also safe to assume that only a small percentage of the visitors stay overnight in the 5-mile area. For purposes of this study, about 20 percent of the visitors are assumed to stay overnight in the 5-mile buffer area. Thus, accommodation expenditures are only estimated for 20 percent of the nonlocal visitors. Of those visitors that stay overnight, the split between hotels/motels and campgrounds is assumed to be 50:50. In addition to the visitors who come to the area to participate in guided trips, there are a number of private individuals who also come to the area for whitewater boating. Conversation with the Upper Klamath River area outfitters indicate that commercially-guided whitewater boating represents about 70 percent of the whitewater boating activities on the Upper Klamath. The remaining 30 percent are private whitewater boaters.

The expenditures for the 10 percent of whitewater boater that are assumed to be local are estimated using similar assumptions. That is, it is assumed that 70 percent use the services of a commercial guide and 30 percent are private boaters. It is also assumed that there are no costs associated with overnight accommodations as these boaters are local. Modest expenditures on gasoline ($5), food ($5), and supplies ($5) are allowed. The total for this group of boaters is estimated to be between 55,740 and $63,370.

Table 2.7-57 summarizes the expenditures per person for whitewater boating for the 5-mile buffer area. The total nonlocal expenditures in the 5-mile buffer for whitewater boating is estimated to be between $93,910 and $162,630. This is what is assumed to stay within the 5-mile buffer area.

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Table 2.7-57. Expenditures per person per day for whitewater boating within the 5-mile buffer area, Upper Klamath River area[1].

Expenditure Type	Expenditure Per Person Per Day	Nonlocal Visitor Days[2]	Local Visitor Days[2]	Total Local Visitor Expenditures	Total Nonlocal Visitor Expenditures
Accommodations[3]	$5 or $50	916	102	$0	$25,196
Meals/food	$5 -$10	4,581	509	$2,545 - $5,090 -	$22,905 - 45,810
Gas/fuel	$5 - $10	4,581	509	$2,545 - $5,090	$22,905 - 45,810
Supplies	$5 - $10	4,581	509	$2,545 - $5,090	$22,905 - 45,810
Guide Fees[4]	$135	4,581	509	$48,101	$0
Total	$155 - $215			$55,736 - $63,370	$93,911 - $162,626

[1] Upper Klamath River area is the area from Link River dam to Iron Gate dam.

[2] Nonlocal visitor days for the 5-mile buffer area are 90 percent of the average whitewater recreation days (see Table 2.7-56).

[3] For purposes of evaluating accommodation expenditures, only 20 percent of the nonlocal visitor days are assumed to stay overnight in the 5-mile buffer area. Half of these visitors stay in hotels/motels (rates $50 per person per night) and half stay in campgrounds (rates $5 per person per night).

[4] Because almost all of the outfitters are from outside the 5-mile area, none of the guide fees are assumed to stay in the 5-mile Project area.

Upper Klamath River Area—50-mile buffer area expenditures for whitewater boating. Throughout this report, data for the 50-mile buffer area has included the 5-mile buffer area, except where otherwise noted. Thus, for the 50-mile buffer area, the expenditures per person per day are expected to include the estimates shown in Table 2.7-57. In addition to these estimates, consistent with the outfitter survey results, all of the nonlocal visitors are assumed to stay within the region for a minimum of two nights. However, only one of the nights is attributed to whitewater boating as it is assumed that most visitors staying two nights also spend time visiting other area attractions. Guide fees are also assumed to stay in the area since most of the commercial outfitters are located within the 50-mile buffer area. Commercial whitewater outfitters are assumed to account for 70[1] percent of the total whitewater boating activities on the Upper Klamath. Thus, only 70 percent of the visitors pay guide fees. Guide fees are assumed to be $135 per person per day for a one-day trip. All expenditures are per person per day.

Table 2.7-58 summarizes the expenditures per person per day for whitewater boating for the 50-mile buffer area. The total nonlocal expenditures in the 50-mile buffer area for whitewater boating is estimated to be between $627,600 and $696,300. This is what is assumed to stay within the 50-mile buffer area.

[1] The 70 percent estimate is an average derived from the outfitter survey results shown in Table 2.7-51.

Table 2.7-58. Expenditures per person per day for whitewater boating within the 50-mile buffer area, Upper Klamath River area[1].

Expenditure Type	Expenditure Per Person Per Day	Nonlocal Visitor Days[2]	Total Nonlocal Visitor Expenditures[3]
Accommodations[4]	$5 or $50	4,581	$125,977
Meals/food	$5 -$10	4,581	$22,905 - 45,810
Gas/fuel	$5 - $10	4,581	$22,905 - 45,810
Supplies	$5 - $10	4,581	$22,905 - 45,810
Guide Fees[5]	$135	4,581	$432,904 - $979,776[6]
Total	$155- $215		$627,597 - $696,311

[1] Upper Klamath River area is the area from Link River dam to Iron Gate dam.

[2] Nonlocal visitor days for the 50-mile buffer area are 90 percent of the average whitewater recreation days (see Table 2.7-56).

[3] Assume that visitors stay two days and two nights in the 50-mile buffer area, but only one night is due to whitewater boating and the second night is to enjoy other area attractions. Total expenditure reflects this assumption.

[4] For purposes of evaluating accommodation expenditures, all of the nonlocal visitors are assumed to stay a minimum of two nights in the 50-mile buffer area. Half of these visitors stay in hotels/motels (rates $50 per person per night) and half stay in campgrounds (rates $5 per person per night).

[5] Because almost all of the outfitters originate from within the 50-mile area, all of the guide fees are assumed to stay in the 50-mile buffer area.

[6] Because commercially-guided whitewater boating is 70 percent of the total whitewater boating, the total expenditures were adjusted to reflect this, i.e., only 70 percent of the nonlocal visitors pay the guide fees.

Average expenditures for whitewater boating in the communities within the 50-mile buffer area in the Upper Klamath are between $155 and $215 per person per day. These estimates compare favorably with the estimates developed by Johnson and Moore (1993) in their study of the economic impact of whitewater recreation on the Klamath River in Oregon from a user group of 90 percent commercial rafters and 10 percent noncommercial users (this study assumes 70 percent commercial and 30 percent noncommercial). The Johnson and Moore study estimated average total trip expenditures in 1988 dollars for nonlocal users at $350.28. About $200.92 of the total trip expenditures occurred in the two-county area of Klamath and Jackson counties, two counties that are included in the upstream region of the current study's region of influence.

Upper Klamath River Area—County Level. Expenditures per person per day for whitewater boating at the county level are assumed to be similar to those estimates developed for the 50-mile buffer area.

Lower Klamath River Area. Unlike the Upper Klamath River area that has a recreation survey study whose results could be used to evaluate recreation expenditures, no such survey was done for the Lower Klamath River area. Instead, major whitewater outfitters and local businesses were contacted to help construct a reasonable estimate of visitor expenditures for whitewater boating. These estimates formed the basis for visitor expenditures associated with gold mining. Estimates of visitor expenditures for recreational ocean and river sportfishing are described below and elsewhere in this section. Separate expenditure estimates were developed for the 5-mile and 50-mile buffer areas.

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Table 2.7-59 shows a summary of recreation use and the associated expenditures of nonlocal visitors and all visitors in the Lower Klamath River area. The following assumptions were made with respect to the proportion of nonlocal visitors for each of the recreational activities listed in Table 2.7-59: whitewater boating—all visitors in the 5-mile and 50-mile buffer areas are nonlocal; gold mining—nonlocal visitors are 90 percent of all visitors within the 5-mile and 50-mile buffer areas; camping—nonlocal visitors are 65 percent of all visitors within the 5-mile and 50-mile buffer areas; river sportfishing—100 percent of angler days in the 5-mile buffer and 72 percent of angler days in 50-mile buffers are nonlocal (CDFG) or their expenditures would leave the respective region if the anglers could no longer fish the Klamath for salmon; ocean sportfishing—100 percent of angler days in the 5-mile buffer and 50-mile buffers are nonlocal or the expenditures would leave the region if anglers could no longer fish these waters for salmon.

Table 2.7-59. Average annual Recreation use and the associated expenditures of nonlocal visitors in the Lower Klamath River area[1] by buffer area, and total expenditures by all visitors combined.

Activity	Total User Days	Commercial User Days	Private User Days	Total Expenditures[2]	Total Expenditures by Nonlocal Visitors, Project Area[3] (5-mile buffer)	Total Expenditures by All Nonlocal Visitors[4] (50-mile buffer)
Whitewater Boating	13,673	9,571	4,102	1,566,226 - $1,771,319	$371,656 - $576,748	$1,566,226 - $1,771,319
Gold Mining	10,000		10,000	$451,350 - $586,350	$451,350 - $586,350	$451,350 - $586,350
Camping[5]	10,526		10,526	$543,462	$363,835	$363,835
River Sportfishing[6]	28,432	204	28,228	$1,486,990	$690,900	$655,070
Ocean Sportfishing[7]	93,235	7,612	85,623	$4,300,000	$4,300,000	$4,300,000
Total	**155,866**	**17,387**	**138,479**	**$8,348,028 - $8,688,121**	**$6,177,741 - $6,517,833**	**$7,336,481 - $7,676,574**

[1] Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

[2] Total expenditures consist of expenditures by all visitors, including those visitors who live in the Project area or nearby. For whitewater boating and mining, it is assumed that all visitors are nonlocal. For in-river fishing, the expenditures per angler day (i.e., $52.30) include dollars spent outside of the six-county region as well as dollars spent by county residents, neither of which represent new expenditures for the county (i.e., 50-mile buffer) (Source: Research Group, 1991). For ocean fishing, personal income impacts are reported instead of expenditures. These estimates of personal income impacts are from PFMC, 2002, and are based on the per day estimates associated with recreational angler expenditures from the Fishery Economic Assessment Model. There is no differentiation between money new to the area and money which would otherwise have been expended in other sectors in the area. For this reason, total personal income impacts will be identical to impacts in the 5-mile buffer and the 50-mile buffer or county.

[3] Total expenditures for whitewater boaters and miners include expenditures by all nonlocal visitors who stay overnight in the 5-mile buffer area. For river sportfishing, it is assumed that all the estimated destination expenditures (i.e., $24.30 from the Research Group, 1991) by all anglers represent an injection of new dollars into the 5-mile buffer. For ocean fishers, this estimate represents the personal income impact rather than simply expenditures. These estimates of personal income impacts were provided in PFMC, 2002, and are reported here because they were developed specifically for the communities in the study area. They are derived from the ocean angler expenditures and provide a better measure of the local community impact of the ocean angling activity.

[4] Total expenditures in the 50-mile buffer include expenditures by all nonlocal visitors. It is assumed that all nonlocal whitewater and mining visitors stay overnight at some location within the 50-mile buffer. For the river sportfishing, the CDFG data indicate that 72 percent are from outside the six-county study area so that their

Table 2.7-59. Average annual Recreation use and the associated expenditures of nonlocal visitors in the Lower Klamath River area[1] by buffer area, and total expenditures by all visitors combined.

Activity	Total User Days	Commercial User Days	Private User Days	Total Expenditures[2]	Total Expenditures by Nonlocal Visitors, Project Area[3] (5-mile buffer)	Total Expenditures by All Nonlocal Visitors[4] (50-mile buffer)

destination expenditures and a portion of their en route expenditures represent an injection of about $32.0 in new dollars to the County and 50-mile buffer. All residents of the counties are assumed to find other expenditure alternative within the region, if they cannot fish the Klamath for Salmon. For ocean sportfishing, personal income impacts are reported instead of expenditures. It is assumed that the expenditures and personal income impacts for the 50-mile buffer and the County are the same as for the 5-mile buffer.

5 Average user days for camping are assumed to be about a quarter of the total for the all recreation activities with the exception of gold mining ocean sportfishing ((0.25 * (145,340 – 103,235)) or 0.25 * 42,105 = 10,526).

6 Average user days for river sportfishing are based on estimates shown in Table 2.7-52, and are for the period 1978-2002.

7 Average user days for ocean sportfishing are based on estimates given in Table 2.7-53, and are for the period 1976-2001.

Lower Klamath River Area—5-mile buffer area. There are a number of recreation activities in the Lower Klamath region. These activities and their respective user days are summarized in Table 2.7-60.

Table 2.7-60. Summary of user days for the 2001 recreation season in the Lower Klamath River area.[1]

	Fishing						
		Recreational Sportfishing[2]					
Mining	Ocean Sportfishing	Commercial Sportfishing	Area 1	Area 2	Area 3	White-water Boating[3]	Camping[4]
10,000[5]	93,235	204	14,994	14,685	6,497	13,673	10,526

1 Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

2 Total recreational sportfishing user days consist of 36,176 private use days (14,994 in Area 1 + 14,685 in Area 2 + 6,497 in Area 3) and 204 commercial user days.

3 Total whitewater user days consist of 9,571 commercial user days (representing 70 percent of whitewater boaters) and 4,102 private user days.

4 Total camping user days are assumed to be about a quarter of the total for the all recreation activities with exception of gold mining and ocean sportfishing ((0.25 * (145,340 – 103,235)) or 0.25 * 42,105 = 10,526).

5 For the New 49ers, only half of the 10,000 miner days in the Happy Camp area are assumed to be on the Klamath. This assumption is based on the fact that half of the New 49ers claims are on the Klamath.

According to the Lower Klamath River area outfitter survey responses summarized in Table 2.7-55, only a small number of the visitors that come to the area for whitewater boating are from the 5-mile buffer area. Thus, it is safe to assume that all of the whitewater boating visitors are from outside the 5-mile buffer area. The number of visitors staying overnight in the 5-mile buffer area is assumed to be 20 percent. Thus, accommodation expenditures are only estimated for 20 percent of the nonlocal visitors. Of those visitors that stay overnight, the split between those that stay in hotels/motels and those that stay in campgrounds is assumed to be 67:33, based on the average split derived from the outfitter survey results. Expenditures per person per day on

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meals, gas, and supplies are assumed to be the same as those in the Upper Klamath. Since one of the outfitters surveyed is from the Happy Camp area and is responsible for about 8 percent of the guided commercial whitewater boating, it was assumed that 8 percent of the guide fees stay in the area.

In addition to the visitors who come to the area to participate in guided trips, there are a number of private individuals who also come to the area for whitewater boating. Conversations with the Lower Klamath River area outfitters indicated that commercially guided whitewater boating represents about 70 percent of the whitewater boating on the Lower Klamath. The remaining 30 percent are private whitewater boaters. These private whitewater boaters are assumed to share characteristics with the commercially guided boaters in so far as the percent that are nonlocal (all are assumed to be nonlocal), the percent that stay overnight in the 5-mile buffer area (20 percent), and the split in accommodation type (67 percent in hotels/motels versus 33 percent in campground).

Table 2.7-61 summarizes the expenditures per person for whitewater boating for the 5-mile buffer area. The total expenditure per person per day is estimated to be between $112 and $172. The total nonlocal expenditure in the 5-mile buffer area for whitewater boating is estimated to be between $370,000 and $570,000. This is what is assumed to stay within the 5-mile buffer area.

Table 2.7-61. Annual expenditures per person per day for whitewater boating within the 5-mile buffer area, Lower Klamath River area.[1]

Expenditure Type	Expenditure Per Person Per Day	Nonlocal Visitor Days[2]	Total Nonlocal Visitor Expenditures
Accommodations[3]	$5 - $50	13,673	$96,120
Meals/food	$5 -$10	13,673	$68,364 - $136,729
Gas/fuel	$5 - $10	13,673	$68,364 - $136,729
Supplies	$5 - $10	13,673	$68,364 - $136,729
Guide Fees[4]	$92	9,571	$70,443
Total	$112 - $172		$371,656 – $576,748

[1] Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

[2] Nonlocal visitor days consist of the commercial visitor days (14,651) and the private visitor days (6,279) for all expenditure types except the guide fees. For the guide fees, only commercial visitor days are used.

[3] For purposes of evaluating accommodation expenditures, only 20 percent of the nonlocal visitors are assumed to stay overnight in the 5-mile buffer area. Sixty-seven percent (67 percent) of these visitors stay in hotels/motels (rates $50 per person per night) and 33 percent stay in campgrounds (rates $5 per person per night).

[4] Since only one of the outfitters is from the local area, some of the guide fees are assumed to stay in the 5-mile Project area. 8 percent of the guide fees are assumed to stay in the area.

Annual expenditures per person per day for gold mining are shown in Table 2.7-62. The expenditure estimates shown are based on the estimates developed for whitewater boating. The difference between these estimates and those for whitewater is due to the absence of guide fees and the assumptions regarding the percent of visitors that stay overnight in the local area and the length of their stay. Gold mining is a private activity that does not require commercial guides, thus there are no guide fees. Although, the length of stay in the area varies, miners are assumed to stay in the area for an average of 3 days and 3 nights. Thus, accommodation expenditures are

higher for miners than for whitewater boaters. Gold mining contributes between $450,000 and $590,000 to the 5-mile buffer area.

Table 2.7-62. Annual expenditures per person per day for gold mining within the 5-mile buffer area, Lower Klamath River area.[1]

Expenditure Type	Expenditure Per Person Per Day	Nonlocal Visitor Days[2]	Total Nonlocal Visitor Expenditures
Accommodations[3]	$5 - $50	9,000	$316,350
Meals/Food	$5 - $10	9,000	$45,000 - $90,000
Gas/Fuel	$5 - $10	9,000	$45,000 - $90,000
Supplies	$5 - $10	9,000	$45,000 - $90,000
Guide Fees[4]	$0	9,000	$0
Total	$20 - $80		$451,350 - $586,350

[1] Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

[2] Nonlocal visitor days for the 5-mile buffer area are 90 percent of the total recreation user days (see Table 2.7-59).

[3] For purposes of evaluating accommodation expenditures, 100 percent of the nonlocal visitors (miners) are assumed to stay overnight in the 5-mile buffer area. Sixty-seven percent (67 percent) of these visitors stay in hotels/motels (rates $50 per person per night) and 33 percent stay in campgrounds (rates $5 per person per night).

[4] Because no guides are associated with gold mining, visiting miners do not pay guide fees.

Annual expenditures per person per day for camping are shown in Table 2.7-63. The annual expenditure estimates shown are based on estimates developed by the USDA Forest Service (USDA Forest Service, 1998). The USDA Forest Service estimates are, in turn, based on expenditure surveys mailed to visitors to the USDA Forest Service Southern Region forest sites. The particular estimates used in this study are the per person per day expenditures profiles developed for nonlocal visitors whose primary activity included camping (the "Developed Sites" category). Since the estimates were in 1990 dollars, the expenditure data were adjusted to 2002 dollars using the Gross Domestic Product (GDP) Implicit Price Deflator. Although, the length of stay in the area varies, campers are assumed to stay in the area for an average of 3 days and 3 nights. Camping contributes about $363,840 to the 5-mile buffer area.

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Table 2.7-63. Annual expenditures per person per day for camping within the 5-mile buffer area, Lower Klamath River area.[1]

Expenditure Type	Expenditure Per Person Per Day[2]	Nonlocal Visitor Days[3]	Total Nonlocal Visitor Expenditures
Accommodations[3]	$22.10	1,368	$30,243
Meals/Food	$25.53	6,842	$174,673
Gas/Fuel	$13.70	6,842	$93,742
Supplies	$7.01	6,842	$47,953
Guide Fees[4]	$2.52	6,842	$17,225
Total	$70.86		$363,835

[1] Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

[2] Expenditure estimates are based on the USDA Forest Service GTR Draft report of 1998 adjusted to 2002 dollars.

[3] Nonlocal visitor days for the 5-mile buffer area are 65 percent of the total recreation user days (see Table 2.7-59).

[4] For purposes of evaluating accommodation expenditures, 100 percent of the nonlocal visitors (campers) are assumed to stay overnight in the 5-mile buffer area.

Expenditures for in-river fishing were estimated using a survey of anglers in Oregon waters conducted by the Research Group (1991). An estimate of expenditures by river/stream anglers targeting salmon was used. Trip expenditures per angler day were categorized by costs incurred at home ($20.40), en route ($7.70), and at the destination ($24.30), in 2002 dollars. From the CDFG data on angler's zip codes, it was ascertained that 28 percent of the anglers reside within the six-county study area (18 percent in the 5-mile buffer), and 72 percent are nonlocal. The assumption is that all18 percent who reside within the 5-mile buffer would take their dollars to another region outside the buffer if they could no longer fish for salmon in the Klamath River. Thus, the destination expenditures of $24.30 by all angler trips would represent an injection of new dollars into the 5-mile buffer area.

In lieu of expenditures for ocean anglers, the preferred measure of economic importance was used, which is the personal income impacts that are due to recreational ocean fishing in the study area. These impact estimates were reported in PFMC (2002) categorized by major ports and were based on the FEAM developed by the Research Group. The personal income impacts are estimated from the angler expenditures and personal income coefficients, which measure the local income generated by expenditures. Of this first round of new spending, only a fraction goes to income and the remaining is for purchasing supplies and services from other industries. However, these purchases also generate increased wages, salaries and profits. As these sales work through the economy, each round of spending contributes to personal income. In all, the total increase in personal income per dollar of new spending will be less than one dollar, but the size of the personal income coefficient is largely dependent on the share of the first round of spending that went to paying for labor. It was assumed that all of the personal income impacts would accrue to the coastal communities, which largely coincides with our 5-mile buffer.

Lower Klamath River Area—50-mile buffer area. Table 2.7-5 shows that the population within the 5-mile and the 50-mile buffer areas in the downstream counties are similar. For whitewater boating and mining, the expenditure data for the 50-mile buffer area includes that for the 5-mile buffer area. The estimates developed for expenditures in the 5-mile buffer area can be used for

the 50-mile buffer area. In addition to these destination expenditures in the 5-mile buffer, additional expenditures in the 50-mile buffer are due to the assumed percent of guide fees that stay in the area (100 percent since most of the commercial outfitters are located within the 50-mile buffer area), and the number of overnight stays in the 50-mile area. Thus, for the 50-mile buffer area the total nonlocal expenditures for whitewater boating is between $1.6 million and $1.8 million. Table 2.7-64 summarizes the expenditures associated with whitewater boating within the 50-mile buffer area.

Table 2.7-64. Expenditures per person per day for whitewater boating within the 50-mile buffer area, Lower Klamath River area.[1]

Expenditure Type	Expenditure Per Person Per Day	Nonlocal Visitor Days[2]	Total Nonlocal Visitor Expenditures
Accommodations[3]	$5 - $50	13,673	$480,601
Meals/food	$5 -$10	13,673	$68,364 - $136,729
Gas/fuel	$5 - $10	13,673	$68,364 - $136,729
Supplies	$5 - $10	13,673	$68,364 - $136,729
Guide Fees[4]	$92	9,571	$880,531
Total	$112 - $172		$1,566,266 – $1,771,319

[1] Lower Klamath River area refers to the area from Iron Gate dam to the town of Orleans.

[2] Nonlocal visitor days for the 50-mile buffer area are 100 percent of the total recreation user days (see Table 2.7-59).

[3] For purposes of evaluating accommodation expenditures, 100 percent of the nonlocal visitor are assumed to stay 3 days and 3 nights in the 50-mile buffer area. Sixty-seven percent (67 percent) of these visitors stay in hotels/motels (rates $50 per person per night) and 33 percent stay in campgrounds (rates $5 per person per night).

[4] Because almost all of the outfitters originate from within the 50-mile area, all of the guide fees are assumed to stay in the 50-mile buffer area.

For gold mining and camping, the total nonlocal expenditures in the 50-mile buffer area is the same as that estimated for the 5-mile buffer area. For the river sportfishing, the CDFG data indicate that 72 percent are from outside the six-county study area so that their destination expenditures and a portion of their en route expenditures represent an injection of about $32.0 in new dollars to the county and 50-mile buffer. All residents of the counties are assumed to find other alternatives within the region, if they cannot fish the Klamath for Salmon. For ocean sportfishing, personal income impacts are reported instead of expenditures. It is assumed that the expenditures for the 50-mile buffer and the county are the same as for the 5-mile buffer.

Lower Klamath River Area—County Level. Expenditures per person per day for whitewater boating, gold mining, camping, commercial sportfishing, and river and ocean recreational fishing at the county level are assumed to be similar to those estimates developed for the 50-mile buffer area.

Recreation resources below Iron Gate are listed in Appendix 2B.

Commercial Fishing

Pacific coast salmon compete in the global market, where the competition includes coho and Chinook as well as other salmon species (i.e., sockeye, chum, pink, and Atlantic), nonsalmon

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species (e.g., sablefish), other protein sources, and farm-raised salmon and trout. West coast Chinook production is comparable to Canadian and Alaskan production, but coho production on the west coast is minor relative to Alaskan production. Currently, salmon products contribute less than 1 percent to the economies of west coast states. However, this was not always the case and the contributions of commercial fishing to coastal communities can still be significant.

The history of anadromous fish populations and the roles they have played in the economies and cultures of Pacific Coast communities and tribes has been documented by a number of sources, including Lichatowich (1999); NPPC (1986); PFMC (1999); Radtke and Davis (1994); The Research Group (2000); Spranger and Anderson (1988); and, Taylor (1996);(1998). In contrast to the current condition, the predevelopment fishery was a significant component of the west coast economies, especially with the introduction and expansion of canning operations. The more recent history (i.e., 1976 to present) is characterized by downward trends in market prices, poor ocean condition cycles, and adverse habitat alterations for all regions along the West Coast of North America. These trends have caused substantial decreases in the amount of income and jobs in economies where salmon and steelhead fishing has historically been important and coastal communities and tribes have suffered the most.

The commercial fishing fleet within the study region (the KMZ) boundaries of Humbug Mountain to Horse Mountain) is comprised of ships that generally fish in waters relatively close to their home ports and land their catch at ports close to the waters where the fish are caught. The KMZ falls under the jurisdiction of the states of California and Oregon, and the PFMC. Fish landings and fishing effort are tracked by port and data are generally published for major port areas. The major port areas that are included in the KMZ include Brookings in Oregon and Crescent City, Eureka and Fort Brag in California. The Fort Bragg area includes the ports of Fort Bragg, Noyo Harbor, Mendocino, Pt. Arena, and Shelter Cove. Of these ports only Shelter Cove is included in the KMZ.

Historically there had been significant Chinook and coho fisheries that utilized the waters now designated as the KMZ. Figures 2.7-11 and 2.7-12 show the historical salmon landings measured in thousands of fish and thousands of pounds landed for the KMZ ports combined. The adult salmon that can be found in this area include Chinook and coho salmon that could have spawned in freshwater streams ranging from the Central Valley of California to Washington. Commercial salmon fishing in the KMZ is currently managed to protect the Klamath River Chinook and the Klamath River coho, which are listed as threatened under the federal ESA. As a result of the ESA listing the landing of coho is prohibited. To protect the Klamath River Chinook and coho stocks the KMZ salmon fishery and much of the West Coast salmon fishery is restricted to some extent. These management actions together with declining populations explain the dramatic reduction in coho landed from an average of 209 thousand fish during the period of 1976 to 1980 to no landings after the year 1991 and the major reductions in the landings of Chinook.

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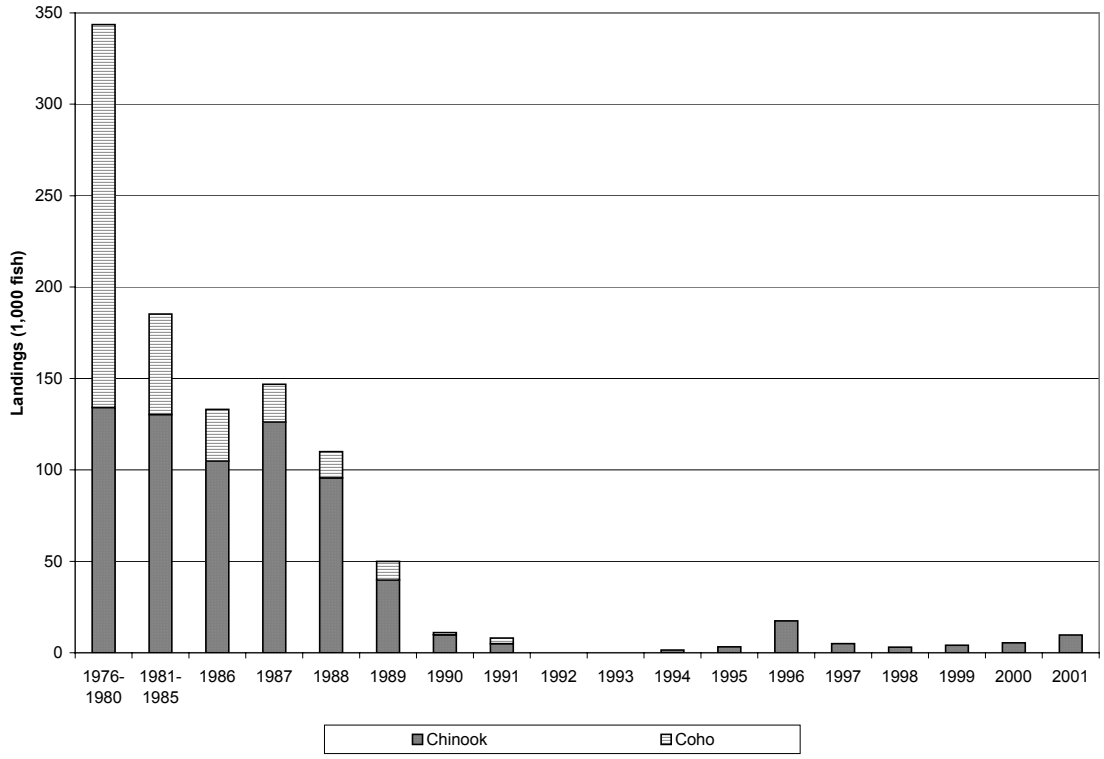

Figure 2.7-11. Historical salmon landing for KMZ port areas in thousands of fish. (Source: PFMC, 2002).

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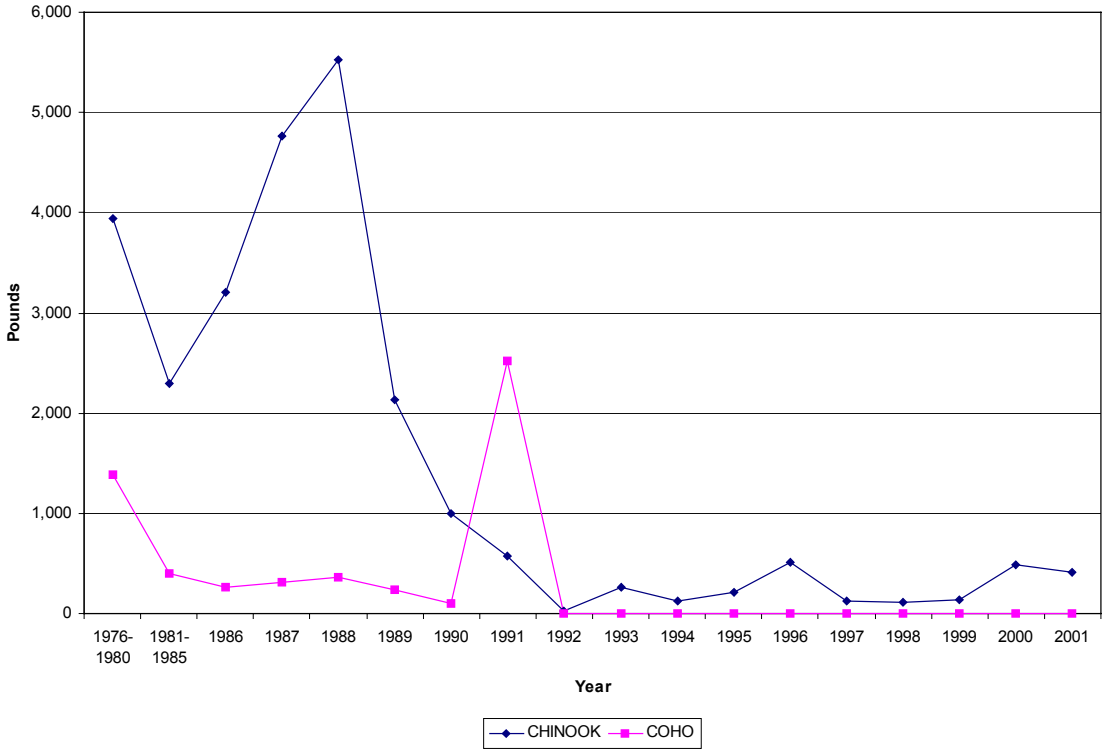

Figure 2.7-12. Historical salmon landing for KMZ port areas in thousands of pounds. (Source: PFMC, 2002).

There are still significant numbers of Chinook (from California's Central Valley in particular) in the waters of the KMZ, however individual species or stocks can not be targeted by the commercial fishing fleet. Therefore, to protect the threatened Klamath River coho, all salmon fishing in the KMZ has been restricted. Recovery of coho stocks would likely result in modifications to salmon fishery management recommendations for the KMZ and other parts of Northern California and Southern Oregon coastal fisheries.

In the area of coastline from Cape Blanco to Horse Mountain, which includes the KMZ, the number of commercial salmon vessels has declined from 1,916 in 1981 to 75 in 1997. This decline is consistent with all other fishery areas along the Pacific coast (PFMC, 1999).

The real market price of salmon has experienced a general decline in recent history, from a high of about $4.80 per pound over the 1976- 1980 period to a low of $1.61 in 2001. This coupled with declining harvests has contributed to the shift of resources out of salmon harvests and into other species (PFMC, 2002). Figure 2.7-13 (Figure IV-3 in the PFMC 2002 study) shows the West Coast non-Indian ocean commercial salmon annual ex-vessel price trends in 2001 dollars.

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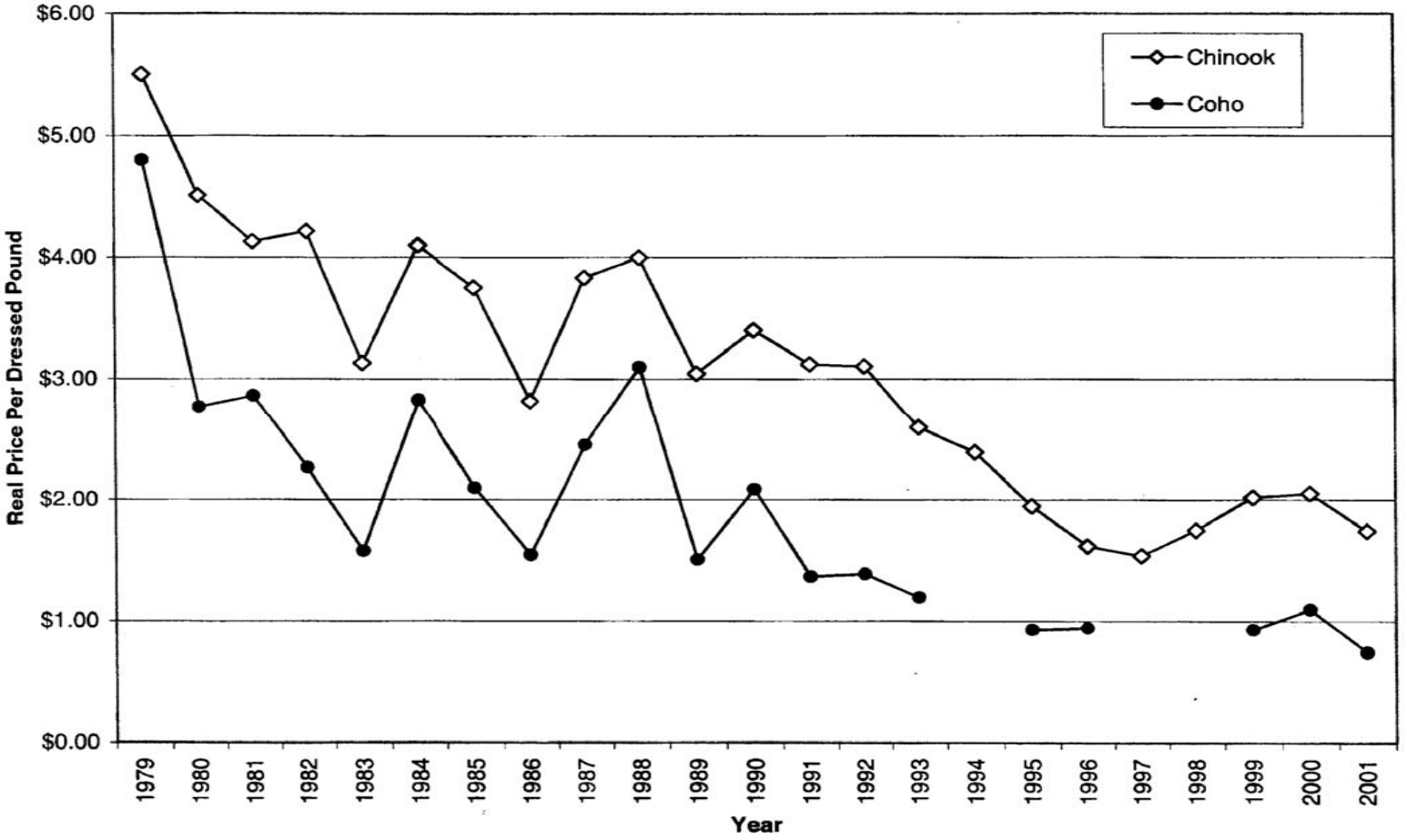

Figure 2.7-13. West coast non-Indian ocean commercial salmon annual exvessel price trends (2001 dollars).
Source: PFMC, 2002.

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Just as with the recreational ocean salmon fishery, the PFMC (2002) have also estimated personal income impacts associated with the troll salmon fishery for the major ports in the KMZ. These income impacts were estimated on a per pound basis provided from output of the FEAM. The personal income impact is a better measure of the importance of the troll fishery to the coastal communities than ex-vessel revenue or troll fishery expenditures, because it provides a direct measure of how those expenditures affect the economic well-being of the local community. No attempt was made to determine whether or not any of the expenditures would accrue to other sectors in the local community, absent the troll fishery. The personal income impacts largely track the landings data, but also reflect the steep decline in the ex-vessel price of salmon over the period.

Across all four ports, personal income impacts were at their highest point (i.e., almost $40 million) over the 1976-1980 period (2001 dollars). They almost approached this high point again in 1988 when they reached about $35 million. Personal income impacts reached their bottom at $139,000 in 1992. In 2001, they were back up to $2 million, which is only 5 percent of the 1976-1980 average. Had the price held firm over the period, the personal income impacts would have been three times as great, but would still fall have fallen far short of the high mark. These personal income impacts are reported by year and port in Tables IV-16 and IV-17 of the 2002 PFMC study. Table 2.7-64 shows the estimates of the coastal community and state personal income impacts of troll ocean salmon fishery for the ports in the KMZ. The numbers in Table 2.7-65 were compiled from Tables IV-16 and IV-17 of the PFMC 2002 study.

Table 2.7-65. Estimates of KMZ coastal community personal state income impacts of the troll ocean salmon fishery by port area.[1]

Year	Crescent City	Eureka	Fort Bragg	Brookings[2]	Total
OCEAN TROLL (THOUSANDS OF DOLLARS)[3]					
1976-1980	5,445	13,831	13,584	6,755	39,615
1981-1985	2,768	3,340	7,813	2,625	16,546
1986	800	2,227	10,199	1,890	15,116
1987	2,379	4,672	19,556	3,950	30,557
1988	89	3,953	27,203	3,676	34,921
1989	651	1,201	7,232	2,024	11,108
1990	2	62	4,303	890	5,257
1991	18	444	2,498	94	3,054
1992	0	4	106	29	139
1993	7	45	911	103	1,066
1994	0	27	337	192	556
1995	14	91	451	160	716
1996	10	303	834	400	1,547
1997	1	46	118	213	378
1998	4	83	136	169	392
1999	13	114	130	296	553

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Table 2.7-65. Estimates of KMZ coastal community personal state income impacts of the troll ocean salmon fishery by port area.[1]

Year	Crescent City	Eureka	Fort Bragg	Brookings[2]	Total
2000	8	71	1,370	368	1,817
2001[4]	15	230	673	417	1,335

Source: PFMC, 2002.

[1] Expressed in 2001 dollars. Per pound and per day estimates of income impacts provided by the Fishery Economic Assessment model. These are the income impacts associated with expenditures in the troll or recreational sectors. There is no differentiation between money new to the area and money which would otherwise have been expended in other sectors. It is assumed that all fish landed at a port is processed in the port area.

[2] On average, between 1976 and 1991 more than 50 percent of the troll fishery community income impacts for the Brookings port area originated from landings in Brookings and Gold Beach. For 1986-1990 an average of about 40% of the impacts for the Brookings port area originated in landing made through Brookings and Gold Beach. In 1992 and 1993, impacts originating through these two ports averaged less than 18% and 11%, respectively, of the total for the Brookings port area.

[3] Excludes pink salmon.

[4] Preliminary.

While salmon landings in KMZ ports have dropped significantly, total landings for the commercial fishery have not been affected to the same extent. Figure 2.7-14 shows the historical landings (all species) for the port areas included in the KMZ for the period of 1981 to 2001. While each of the port areas has experienced variability in landings over this period, they have all experienced general reductions in the total pounds of fish landed, though not to the same degree as salmon landings have been reduced. It is likely that some of the commercial fleet that used to fish for salmon have re-geared and switched their effort to other species as a result of the salmon restrictions. This shift in fishing effort could be responsible for over-fishing of some of the targeted species.

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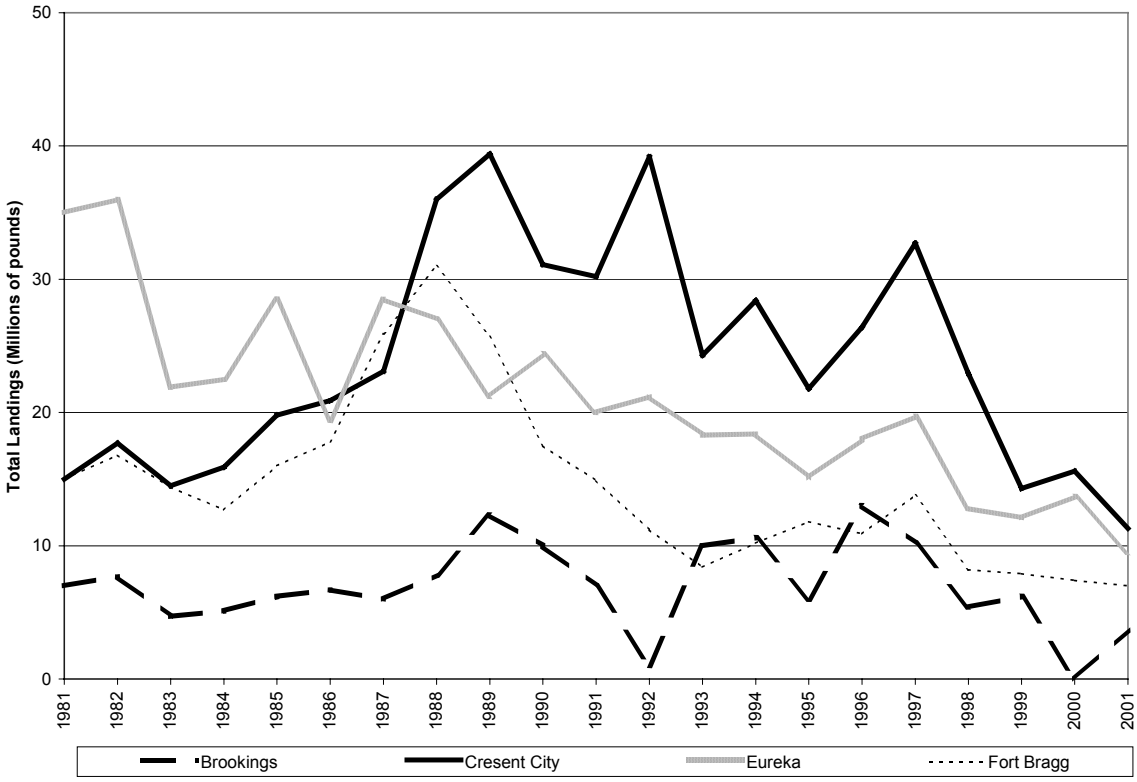

Figure 2.7-14. Total historical commercial fisheries landings for KMZ port areas.

Source: National Marine Fisheries Service Total Commercial Fishery Landings At An Individual U. S. Port For All Years After 1980 http://www.st.nmfs.gov/st1/commercial/landings/lport_hist.html.

American Indian Fishing

In providing this economic summary of commercial and subsistence salmon fishing, it is important to observe that this characterization does not provide the tribal perspective on the role that salmon plays in their culture. One tribal perspective is conveyed in the following excerpt from PFMC, 1999 (p. B-23):

> The Native People of the Klamath River Basin have depended on the Salmon since time immemorial. The awesome cyclical nature of the salmon's yearly migrations over the centuries influenced almost every aspect of their lives. Religion, lore, law and technology all evolved from the Indian's relationship with the salmon and other fish of the Basin. The Supreme Court recognized the importance of salmon to Northwest tribes such as these, when it concluded that access to the fisheries was "not much less necessary to the existence of the Indians than the air they breathed".

See the discussion under Recreation, Lower Klamath River Area, Fishing for details on salmon harvest allocations. Individual tribal members are assigned shares of the tribal allocation under the regulatory authority of the tribes. According to PFMC (2002), recent data on the value of harvests by the Yurok and Hoopa Valley reservation commercial Indian gillnet fisheries in the Klamath River are not available. This is because of the practice by each Indian fisher of independently marketing his or her own catch since 1999. Data from earlier years can be used to

provide insight into the market value of recent harvests. From 1987 through 1989, commercial tribal harvests of Chinook averaged about 27,500 a year. In 1989, the harvest, at an average weight of 15.4 pounds, sold for $852,000 ($1.1 million in 2001 dollars). The 1996 harvest was 43,276 fall and spring Chinook (average weight of 13.5 pounds), which sold for $525,000 ($575,000 in 2001 dollars). The decrease in total revenue can only partially be explained by the decrease in weight and number of fish. As a result of increased supplies from other sources, the market price for salmon had fallen over the period. The 1999 harvest was 2,077 fall Chinook, increasing to 4,922 fall Chinook in 2000 and then increasing again to 9,345 fall Chinook in 2001. Assuming that the fishers received the market price for their catch, and assuming an average weight of 13 pounds, suggests that 2001 revenues may have been around $195,590.

In addition to commercial harvest, these tribes also fish salmon for subsistence and for ceremonial reasons. Historical catch for all three purposes is summarized in Table 2.7-66 below. In many years, the subsistence fishery has dominated the commercial fishery, especially in years when the commercial fishery was absent such as 1990-1995 and 1997-1998. Excluding the Trinity River, in recent years (1999-2001), the subsistence fishery has exceeded the commercial harvest by about 4 to 5 times. For example, the 2001 subsistence catch was 32,591 fish.

Table 2.7-66. Estimates of Yurok and Hoopa Valley reservation Indian gillnet harvest.[1]

Year	Area	Chinook Salmon (numbers of fish)					
		Spring Run			Fall run		
		Jack	Adult	Total	Jack	Adult	Total
1990	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	386	386	13	3,536	3,549
	Middle Klamath	0	521	521	36	1,116	1,152
	Upper Klamath	0	504	504	102	2,331	2,433
	Trinity	24	865	889	36	811	847
	Total	24	2,276	2,302	187	7,794	7,981
1991	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	70	70	7	3,902	3,909
	Middle Klamath	0	46	46	9	1,765	1,774
	Upper Klamath	3	167	170	16	3,251	3,267
	Trinity	0	263	263	30	1,310	1,342
	Total	3	546	549	62	10,228	10,290
1992	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	15	15	124	1,152	1,275
	Middle Klamath	0	97	97	62	1,107	1,159
	Upper Klamath	0	284	284	148	2,580	2,726
	Trinity	0	346	346	42	946	988
	Total	0	742	742	366	5,785	6,151

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Table 2.7-66. Estimates of Yurok and Hoopa Valley reservation Indian gillnet harvest.[1]

Year	Area	Chinook Salmon (numbers of fish)					
		Spring Run			Fall run		
		Jack	Adult	Total	Jack	Adult	Total
1993	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	19	19	62	3,017	3,079
	Middle Klamath	0	320	320	33	1,632	1,865
	Upper Klamath	0	211	211	47	3,495	3,542
	Trinity	0	228	226	33	1,492	1,525
	Total	0	778	778	175	9,636	9,811
1994	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	9	152	161	80	4,341	4,421
	Middle Klamath	14	110	124	4	1,448	1,452
	Upper Klamath	3	239	242	71	3,658	3,729
	Trinity	0	255	255	94	2,266	2,360
	Total	26	756	782	249	11,713	11,962
1995	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	656	656	117	5,200	5,317
	Middle Klamath	0	1,312	1,312	44	2,415	2,459
	Upper Klamath	0	824	624	47	4,610	4,657
	Trinity	93	1,175	1,268	268	3,383	3,651
	Total	93	3,767	3,860	476	15,608	16,084
1996	Commercial Estuary	16	3,113	3,129	127	40,020	40,147
	Subsistence Estuary	1	1,851	1,852	36	9,093	9,129
	Middle Klamath	9	673	682	7	1,570	1,577
	Upper Klamath	3	268	271	12	3,023	3,035
	Trinity	6	1,162	1,186	8	2,770	2,776
	Total	35	7,086	7,122	190	56,476	56,668
1997	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	0	2,919	2,919	21	5,574	5,596
	Middle Klamath	0	1,102	1,102	3	1,479	1,482
	Upper Klamath	0	1,416	1,419	5	3,796	3,801
	Trinity	1	1,250	1,251	6	1,238	1,244
	Total	1	8,690	6,691	35	12,087	12,122

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Table 2.7-66. Estimates of Yurok and Hoopa Valley reservation Indian gillnet harvest.[1]

Year	Area	Chinook Salmon (numbers of fish)					
		Spring Run			Fall run		
		Jack	Adult	Total	Jack	Adult	Total
1998	Commercial Estuary	-	-	-	-	-	-
	Subsistence Estuary	2	621	623	16	3,454	3,470
	Middle Klamath	0	937	937	9	1,324	1,333
	Upper Klamath	0	780	780	23	3,874	3,897
	Trinity	45	426	471	5	1,535	1,540
	Total	47	2,764	2,811	53	10,187	10,240
1999	Commercial Estuary	-	-	-	-	2,077	2,077
	Subsistence Estuary	2	456	456	127	2,315	2,442
	Middle Klamath	0	1,343	1,343	49	2,261	2,310
	Upper Klamath	0	593	593	237	4,784	5,021
	Trinity	13	776	769	96	2,978	3,074
	Total	15	3,188	3,183	509	14,415	14,924
2000	Commercial Estuary	-	-	-	-	3,933	3,933
	Middle Klamath	-	-	-	-	175	175
	Upper Klamath	-	-	-	-	814	814
	Subsistence Estuary	0	1,778	1,778	51	13,380	13,431
	Middle Klamath	0	511	511	25	1,089	1,114
	Upper Klamath	0	918	918	79	4,237	4,316
	Trinity	29	1,325	1,354	303	5,962	6,090
	Total	29	4,532	4,561	458	29,590	30,048
2001[2]	Commercial Estuary	-	-	-	-	8,958	8,956
	Upper Klamath	-	-	-	-	389	389
	Subsistence Estuary	1	12,915	13,094	422	27,394	27,616
	Middle Klamath	178	92	83	26	1,701	1,727
	Upper Klamath	14	1,163	1,177	47	3,011	3,058
	Trinity	47	4,290	4,337	35	4,979	5,014
	Total	240	18,481	18,701	530	46,430	46,760

Source: Table B-5, PFMC, 2002.

[1] U.S. Fish and Wildlife Service (USFWS) estimates for Klamath River portion in 1983-1993. The Fisheries Department of the Hoope Valley business Council has monitored the Trinity River fishery since 1982. The Yurok Tribe Fisheries Program monitored the Klamath River portion in 1994 and 1995.

[2] Preliminary.

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Construction

Klamath County employed about 1,700 persons in the construction industry in 1999 and nearby Jackson County employed 6,200 persons. (See Table 2.7-23, 1999 Employment by Industry for Individual Counties [thousands of jobs].) Construction employment was not reported for Siskiyou County due to confidentiality requirements. As of 2002, the city of Klamath Falls has two or three local construction contracting businesses (www.workconnection.org). Construction accounts for about 6.4 percent of total employment or 534 jobs in Klamath Falls. Yreka has about 139 construction jobs, Hornbrook under 10, and Dorris about 29. (See Table 2.7-27, Employment by Industry by Community within the 5-mile Buffer Area, 2000 Census.) The current Project does not involve construction activities on an on-going basis. Any major Project-related construction in the future would likely lead to a temporary influx of labor to the Project area in Klamath County and Siskiyou County as well as an increase in commuters from neighboring counties, especially Jackson County.

Irrigated Agriculture

The USBR Klamath Irrigation Project (Klamath Project) provides irrigation water for both agricultural and wildlife refuge lands in the Klamath basin. In addition, the Klamath Project provides flood control along the Klamath River in and downstream of PacifiCorp's Klamath Hydroelectric Project area. The Klamath Project provides irrigation water to approximately 240,000 acres of agricultural land, most of which is in Klamath County, Oregon and Siskiyou and Modoc counties, California. According to the 1997 U.S. Census of Agriculture, 1,744 farms and ranches used irrigation water supplied by the Klamath Project. Approximately 50 percent of these farms and ranches are in Klamath County, 30 percent are in Siskiyou County, and the remaining 20 percent are in Modoc County. Of the total farms and ranches using irrigation water, 80 percent are in Siskiyou and Klamath counties, the two counties that are in the Project area.

The Klamath Project and the Klamath Hydroelectric Project are connected through the Keno reservoir. Although the total project water supply delivered from Keno reservoir ranges between 250,000 acre-feet and 450,000 acre-feet, on an average, the Klamath Project diverts only 150,000 acre-feet of water per year. The USBR has the following diversion points out of Keno reservoir: North Canal, Ady Canal, and the Lost River diversion channel to the Klamath Project.

The water diverted through Keno supports about 490 farmers (or 41 percent of the total number of farmers supported by the Klamath Project) and irrigates about 95,600 acres of project farmland and 4,000 acres of non-Project land. Thus, water diverted through Keno irrigates about 45 percent of the total irrigated acres in the Klamath Project (Green, 2003).

Local and Tribal Government Fiscal Conditions

Klamath and Siskiyou counties are the Project area local governments with taxing power. In addition, the cities of Klamath Falls and Yreka may also have taxing power, especially with respect to property taxes (for both cities) and sales taxes (for Yreka only). Although the state of California levies sales tax on goods and services purchased within the state, it does not levy sales taxes on electricity that is transmitted through power lines (BOE, 2003). Because the state does not levy sales tax on electricity sales, it follows that the city of Yreka does not levy sales tax on electricity sales within its jurisdiction. The city does, however, levy a franchise tax (1 percent)

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on gross revenues. In 2002, the city of Yreka received $64,767.03 (1 percent of 647,670.30 in gross revenues) in franchise taxes from PacifiCorp (Ramirez, 2003). There are no sales taxes levied in the state of Oregon and thus in the city of Klamath Falls.

Siskiyou County's General Fund expenditures and revenues are presented in Table 2.7-67. The county's General Fund has shown fluctuating growth from year to year. From fiscal year (FY) 2001 to FY 2002, General Fund revenues grew 13 percent. In FY 2003, the revenues are projected to grow by less than 1 percent. The only revenue source that has shown continued growth is the Intergovernmental Revenues from other governmental agencies.

Table 2.7-67. Siskiyou County revenues and expenditures ($ million).

	FY 2000-2001	FY 2001-2002	FY 2002-2003 (p)
Expenditures			
General	$12.79	$7.57	$8.90
Public Protection	$23.32	$28.50	$35.90
Public Ways and Facilities	$12.24	$13.97	$11.48
Health and Sanitation	$10.39	$11.95	$12.57
Public Assistance	$18.21	$19.42	$19.32
Education	$1.31	$1.18	$1.09
Recreational	$0.09	$0.10	$0.27
Debt Service	$0	$0	$0
Total Expenditures	**$78.35**	**$82.69**	**$89.21**
Revenues			
Taxes	$13.01	$12.59	$12.53
Property Taxes	$6.04	$6.04	$6.54
Other Property Taxes	$0.65	$0.70	$0.66
Sales Taxes	$5.01	$4.70	$4.15
Other Taxes	$1.31	$1.15	$1.18
Licenses, Permits, and Franchises	$1.01	$1.16	$1.09
Fines, Forfeitures, Penalties	$1.65	$2.43	$1.79
Revenue from Use of Money and Property	$1.84	$1.31	$1.09
Intergovernmental Revenues—State	24.38	29.65	29.9
Intergovernmental Revenues—Federal	22.41	22.75	19.7
Intergovernmental Revenues—Other	0.45	0.56	0.74
Charges for Current Services	$5.68	$7.19	$6.45
Other Revenues	1.35	4.72	1.82
Residual Equity Transfers	$4.69	$3.79	$11.65
Total Revenue	**$76.47**	**$86.14**	**$86.75**

Source: Siskiyou County, 2003.

Numbers may not add up because of independent rounding.

(p) Projected

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Table 2.7-68 presents the General Fund expenditures and revenues for the city of Klamath Falls, Oregon. The city's General Fund has been fluctuating from year to year. From FY 2000 to FY 2001, General Fund revenues grew by about 40 percent and by about 10 percent from FY 2001 to FY 2002. The revenue categories that have shown continued growth over the last 3 years are the Licenses, Fees and Permits, and the Fines and Forfeitures.

Table 2.7-68. City of Klamath Falls revenues and expenditures ($ million).

	FY 1999-2000	FY 2000-2001	FY 2001-2002
Expenditures			
General Government	$1.03	$0.99	$0.95
Public Safety	$3.63	$3.78	$4.05
Highways and Streets	$1.21	$1.30	$1.49
Culture and Recreation	$0.47	$0.43	$0.52
Airport	$0.70	$0.75	$0.81
Capital Outlay	$2.33	$5.51	$6.48
Debt Service	$0.69	$0.80	$1.30
Total Expenditures	**$10.07**	**$13.56**	**$15.60**
Revenues			
Taxes	$3.85	$3.98	$3.98
Special Assessments	$0.13	$0.06	$0.04
Intergovernmental	$2.67	$6.12	$7.29
Licenses, Fees and Permits	$0.03	$0.03	$0.04
Franchise Fees	$1.00	$1.18	$1.16
Charges for Services	$0.92	$1.18	$1.26
Fines and Forfeitures	$0.37	$0.42	$0.47
Investment Income	$0.37	$0.49	$0.27
Miscellaneous Revenues	$0.21	$0.07	$0.46
Total Revenue	**$9.55**	**$13.54**	**$14.97**

Source: City of Klamath Falls, 2003.

Numbers may not add up because of independent rounding. A projected budget for fiscal year 2002-03 was not available at the time this subsection was prepared.

Table 2.7-69 presents the General Fund expenditures and revenues for the city of Yreka, California. The city's General Fund has been declining from year to year. From FY 2000 to FY 2001, General Fund revenues decreased by about 16 percent and by about 3 percent from FY 2001 to FY 2002. With the exception of Licenses, Fees and Permits, and Charges for Services, all revenue categories have been declining in the past 3 fiscal years.

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Table 2.7-69. City of Yreka revenues and expenditures ($ million).

	FY 1999-2000	FY 2000-2001	FY 2001-2002
Expenditures			
City Council	$0.02	$0.02	$0.02
City Administration	$0.21	$0.20	$0.20
Public Safety	$1.34	$1.49	$1.71
Animal Regulation	$0.04	$0.05	$0.05
Planning	$0.05	$0.15	$0.16
Public Works	$1.50	$1.02	$1.35
Parks and Recreation	$0.21	$0.29	$0.25
General Government	$1.57	$1.28	$1.32
Community Promotion	$0.30	$0.32	$0.21
Community Development	$0.00	$0.02	$0.11
Senior Nutrition	$0.22	$0.23	$0.24
Drug Awareness Education	$0.01	$0.01	$0.01
Total Expenditures	**$5.47**	**$5.08**	**$5.63**
Revenues			
Taxes	$2.76	$3.18	$3.18
Special Assessments	$0.05	$0.07	$0.07
Intergovernmental	$1.08	$1.34	$1.31
Licenses, Fees, and Permits	$0.49	$0.57	$0.62
Franchise Fees	$0.07	$0.07	$0.07
Charges for Services	$0.31	$0.26	$0.27
Fines and Forfeitures	$0.06	$0.06	$0.05
Investment Income	$2.37	$0.49	$0.29
Total Revenue	**$7.18**	**$6.05**	**$5.86**

Source: City of Yreka, 2003.

Note: Numbers may not add up because of independent rounding. A projected budget for fiscal year 2002-03 was not available at the time this subsection was prepared.

Because the PacifiCorp facilities are located in Klamath and Siskiyou counties, the company pays property taxes in both counties. Table 2.7-70 shows the estimated allowable share of property taxes paid by PacifiCorp in the counties with assets during FY 2002 to 2003. It should be noted that PacifiCorp's property tax bill is for property in a tax code, not just for a given power development. As such, there is no property tax bill for an individual power development.

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Table 2.7-70. Estimated allowable share of PacifiCorp's property taxes, FY 2002-2003.

Development	State	County	Property Tax Total
East Side/West Side	OR	Klamath	$6,799
Keno	OR	Klamath	$32,644
J.C. Boyle	OR	Klamath	$70,050
Oregon Total			$109,494
Copco No. 1	CA	Siskiyou	$51,290
Copco No. 2	CA	Siskiyou	$56,968
Fall Creek	CA	Siskiyou	$4,864
Iron Gate	CA	Siskiyou	$88,481
California Total			$201,603
Total Both States			$311,097

Source: PacifiCorp, 2003.

The above numbers represent allocated property taxes remitted to the respective county.

The amounts relate only to the development in question, and are allocation, each bill PacifiCorp receives for all PacifiCorp property in a given tax code.

During FY 2002 to 2003, Klamath County received a total of $35 million in property taxes. PacifiCorp's contribution was about $ 1.7 million ($105,160 to the city of Klamath Falls and $1.58 million to Klamath County) in FY 2002 to 2003, or about 4.5 percent of the total (Long, 2003). Thus, PacifiCorp is an important contributor to the Klamath County economy.

Siskiyou County received a total of $7.2 million in property taxes in FY 2002-03. PacifiCorp's contribution was about $1.1 million, or about 16.4 percent of the total county property tax receipts (Hammer, 2003). Property tax receipts in Siskiyou County are disbursed in the following manner: 34.8 percent goes to the general fund, 54.6 percent goes to the education fund, 6.4 percent goes to the cities, while the remaining 3.9 percent goes towards fire prevention (1.5 percent) and miscellaneous other services (2.7 percent). Of the 6.4 percent that goes to the cities, Yreka received 2.1 percent ($24,388.5) while the other cities split the remainder in the following manner: Dorris (0.5 percent or $5,651), Dunsmuir (0.7 percent or $8,724), Etna (0.2 percent or $3,158), Ft. Jones (0.5 percent or $6,164), Montague (0.5 percent or 5,355), Mt. Shasta (0.8 percent or $9,811), Tulelake (0.3 percent or $3,962), and Weed (0.7 percent or $8,078). Thus, PacifiCorp is an important contributor to the overall Siskiyou County economy and to the communities along the river.

In addition to the property taxes levied at the county level, the city of Klamath Falls also levies property taxes on the East Side and West Side facilities. Table 2.7-71 shows the city of Klamath Falls' allocation of the property taxes levied on the East Side and West Side facilities. About 40 percent of the property taxes levied by the city of Klamath Falls goes into the city's general fund. Of the remaining 60 percent, about 30 percent goes to the Klamath Falls School District, while 23 percent goes to the Klamath Fire District.

No information on tribal fiscal conditions was provided by the tribes.

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Table 2.7-71. City of Klamath Falls' allocation of property taxes received from PacifiCorp's East Side/West Side powerhouses, FY 2002-2003.

District	Amount ($)
Klamath Falls Urban Renewal District	176
Klamath City Emer Comm	62
Klamath Falls City	2,179
Klamath Fire District	1,155
Klamath Falls School District	1,460
Total	5,032

Source: PacifiCorp, 2003.

Only the East Side/West Side facilities are in a tax code for the city of Klamath Falls.

Public Services

Project area public service providers, including fire, police, schools, and medical services, along with Project-related use of these services, are described below.

Fire. Although the Project facilities in Klamath County, Oregon, are outside the area of service of the Keno Fire Protection District (Keno FPD), and PacifiCorp does not have a formal service agreement with Keno FPD, the Keno FPD has come to the aid of PacifiCorp in the past (Ketchum, 2003). The station at 14800 Puckett Road serves as the headquarters for the KFPD and is the nearest station to the Project facilities. The Keno FPD is staffed by one paid full-time firefighter, six to eight part-time firefighters, and 25 volunteer firefighters. There are two fire engines, two wild land engines, one water tender, and two ambulances. Thus, Keno FPD also provides emergency medical service. Keno FPD has mutual assistance agreements with all other fire districts in the county.

The Project facilities in California are all in Siskiyou County, within the jurisdiction of the Hornbrook Fire District. Hornbrook Fire District is a volunteer fire department dispatched through the California Department of Forestry. Efforts to reach the fire districts in order to document the district's resources and response times have not been successful. The phone number listed for the district is an emergency number with no options to reach anyone.

No fire protection calls were made to the Project facilities in 2002.

Police. The Klamath County Sheriff's Office (KCSO) provides law enforcement services to the Project facilities in Klamath County, Oregon. The KCSO is staffed by 27 patrol deputies and one cooperative deputy (contractual staff from the U.S. Forest Service and BLM). The Sheriff's Department has a dispatch center out of the city of Klamath Falls. The response time to an emergency call into any one of the Project facilities in Klamath County is 10 to 15 minutes (Dailey, 2003).

Siskiyou County Sheriff's Department provides law enforcement services to the Project facilities in Siskiyou County, California. The Siskiyou Sheriff's Department has a number of deputies and

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sergeants. The area within the Project facilities,(i.e., the Yreka area), is served by station located at 311 Lane Street. The Yreka station has eight deputies and two sergeants, all of whom have access to patrol cars equipped with radios (Egeline, 2003). The response time to an emergency call from one of the Project facilities in Siskiyou County is 30 to 45 minutes.

In 2002, 26 police calls were made to the existing Project facilities.

Schools. The schools in Klamath County, Oregon, are within the Jackson Education Service District. Within this service district, the Klamath County School District has a total of 20 schools and the Klamath Falls City Schools consist of nine additional schools. In California, the Project facilities are all in Siskiyou County, which has 28 school districts. Children living in the vicinity of Iron Gate reservoir and Copco Lake are likely to attend an elementary school in the Hornbrook, Willow Creek, Bogus, or Montague school district, all of which feed into Yreka High School.

Emergency Personnel and Medical Services. Emergency and medical services are provided by the Keno FPD in Klamath County and by the Northern Siskiyou Ambulance in Siskiyou County. Although Keno FPD and PacifiCorp do not have a formal service agreement, Keno FPD indicated that it would take approximately 4 minutes to respond to an emergency call from the Project facilities at Keno. The average response time to an emergency call from the J.C. Boyle dam is 15 minutes while that from the J.C. Boyle powerhouse is 20 to 25 minutes (Ketchum, 2003).

The Northern Siskiyou Ambulance is the emergency medical provider for the Project facilities in California (Copcos, Iron Gate, and Fall Creek). Northern Siskiyou Ambulance is a privately-owned provider with four ambulances. Two of the ambulances are staffed by two paramedics 24 hours a day, 7 days a week. The ambulances have advance life support systems. In the event that one ambulance is on call, a third is staffed so as to remain ready to respond. Average response times to the Project facilities is 20 to 25 minutes. The breakdown is approximately 15 minutes to the dam and another 10 minutes to the powerhouse. The ambulances also work with the California Department of Forestry and the Hornbrook Volunteer Fire Department, who are the first responders and normally have about a 10-minute head start. The ambulances provide transport to helicopter landing zones when necessary (Frost, 2003).

No emergency and medical service calls were made to the existing Project facilities in 2002.

Table 2.7-72 shows the public service providers and average annual historical utilization of these services for the Project facilities.

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Table 2.7-72. Public service providers and average annual historical utilization.

	East Side and West Side	Keno	J.C. Boyle	Copco Nos. 1 and 2	Iron Gate	Fall Creek
Nearest:						
Fire	Klamath Falls	Keno	Keno	Hornbrook	Hornbrook	Hornbrook
Police	Klamath Falls	Klamath Falls	Klamath Falls	Yreka	Yreka	Yreka
Ambulance	Klamath Falls	Keno	Keno	Yreka	Yreka	Yreka
Annual visits:						
Fire	0	0	0	0	0	0
Police	4	2	5	5	8	2
Ambulance	0	0	0	0	0	0

Source: PacifiCorp, 2003.

Property Value

The development of the Project facilities at Keno in Klamath County, Oregon, and Copco in Siskiyou County, California, has contributed to the value of the land adjacent to these two facilities. There are 157 parcels (or 805 acres) of land adjacent to Keno reservoir, of which 135 (or 637 acres) are privately owned. According to the Klamath County Assessor's office, the total assessed value of all private property adjacent to Keno reservoir for the FY 2003-2004 was $25,731,910. The total property tax due on these properties for the FY 2003-2004 was $222,728 (Shaw, 2003). In the case of Copco reservoir, there are 226 parcels (or 2,402 acres), of which 204 (or 811 acres) are privately owned. Private property adjacent to the Copco facilities had a total assessed value, in FY 2003-2004, of $8,111,212, with $84,818 due in property taxes (Hammar, 2003).

Several of these properties include docks, which can be affected by changes in reservoir levels. For example, lower reservoir levels can require extending the docks in order for them to continue to be in deep enough water to be accessible to the boats. Copco reservoir has about 47 docks and Keno reservoir has about 22 docks. These figures include private and publicly owned docks. Additional docks within the Project area include two each at Iron Gate, J.C. Boyle, and Link River bypass.

Recreation Resources

Please see the Recreation Resources FTR for a detailed description of recreation opportunities in and around the Project area.

Infrastructure

The following discussion relates to the current Project's use of the existing infrastructure.

Table 2.7-73 shows the water, stormwater, wastewater, and solid waste disposal service providers for the Project facilities.

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Table 2.7-73. Public service providers, Project facilities, 2002.

Providers of	East Side and West Side	Keno	J.C. Boyle	Copco No. 1 and No. 2	Iron Gate	Fall Creek
Potable Water Sources	City	Well	Well	Springs, wells, city water	Well	
Nonpotable Water Sources	Penstock	NA	Penstock	Penstock	Penstock	Penstock
Stormwater Facilities	NA	NA	NA	NA	NA	NA
Wastewater Facilities	Sewer	Septic	Septic	C-2 Septic	Septic	Septic
Solid Waste (Garbage Disposal	Contractor	Contractor	Contractor	Contractor	Contractor	Contractor

Source: PacifiCorp, 2003.
NA = Not applicable.

Utilities

Water and Stormwater. The Project facilities use potable water from the cities, well, or springs. Nonpotable water is provided through penstocks. The Project facilities do not have a stormwater disposal service.

Wastewater. The Project facilities discharge wastewater into city sewer systems or septic tanks. The East Side and West Side facility is the only Project facility with access to a city sewer system, the Klamath Falls sewer system.

Solid Waste Disposal. Contractors provide solid waste disposal service to the Project facilities.

Electricity. This section includes a discussion regarding electricity distribution to areas in the vicinity of existing Project components; a general discussion for the remainder of the study area counties; names of organizations that distribute electricity in each county; and rates.

PacifiCorp conducts its retail electric utility operations via two subsidiaries: Pacific Power and Light Company (PPL) and Utah Power and Light Company (UPL). PPL provides electric utility service to communities in Oregon, Washington, California, Wyoming, and Idaho. The Project area of Klamath County, Oregon, and Siskiyou County, California, is served by PPL. Generation capacity is derived from hydroelectric, natural gas, and coal-fired plants. The Project represents approximately 14 percent of PacifiCorp's total hydroelectric generation capacity and 2 percent of the Company's total capacity. PacifiCorp also purchases power to meet its regulatory supply obligations to its customers.

PacifiCorp serves approximately 1.5 million retail customers in the following six states: Oregon, California, Idaho, Utah, Washington, and Wyoming. The service territory consists of diverse regional economies ranging from agriculture to mining, manufacturing, and government

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services. The service area is also geographically diverse, which provides PacifiCorp with complementary seasonal load patterns. Figure 2.7-15 presents the retail sales (in kilowatt-hours [kWh]) by each state. The states of Utah, Oregon, and Wyoming represent approximately 83 percent of the total sales of 47 billion kWh. California represents the smallest percentage of overall retail sales at 2 percent.

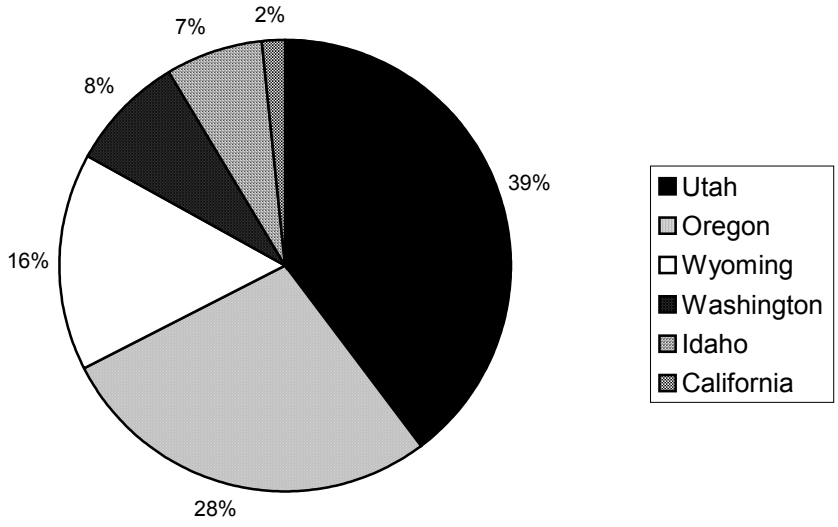

Figure 2.7-15. Percent of overall retail sales (kWh) by state.

Source: PacifiCorp

Figure 2.7-16 presents the average revenue per kWh in each state. Excluded from this figure are public street and highway lighting sales. The figure shows that the average rate ranges from approximately $0.03 in Idaho to slightly above $0.07 in California.

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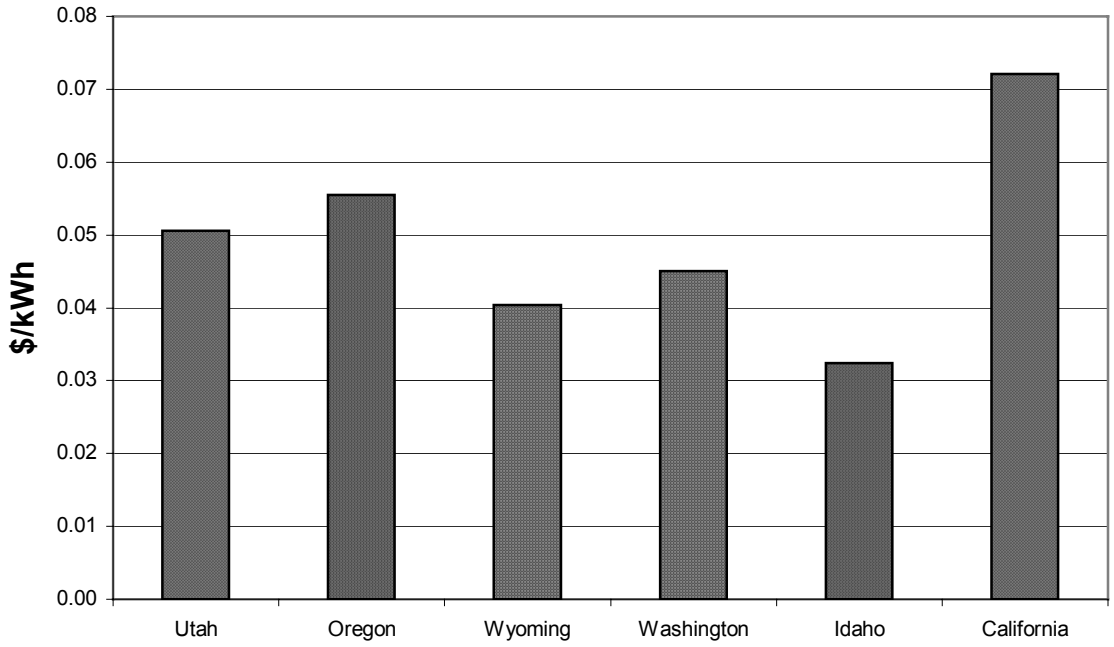

Figure 2.7-16. Average revenue/kWh by state.

As Figure 2.7-17 shows, rates among customer classes vary significantly according to state jurisdictions. For example, residential rates in California are nearly two times those in Idaho. Further, residential rates are higher than all other customer classes in the states where most PacifiCorp sales occur: Utah, Oregon, and Wyoming. In the remaining states, commercial rates are highest.

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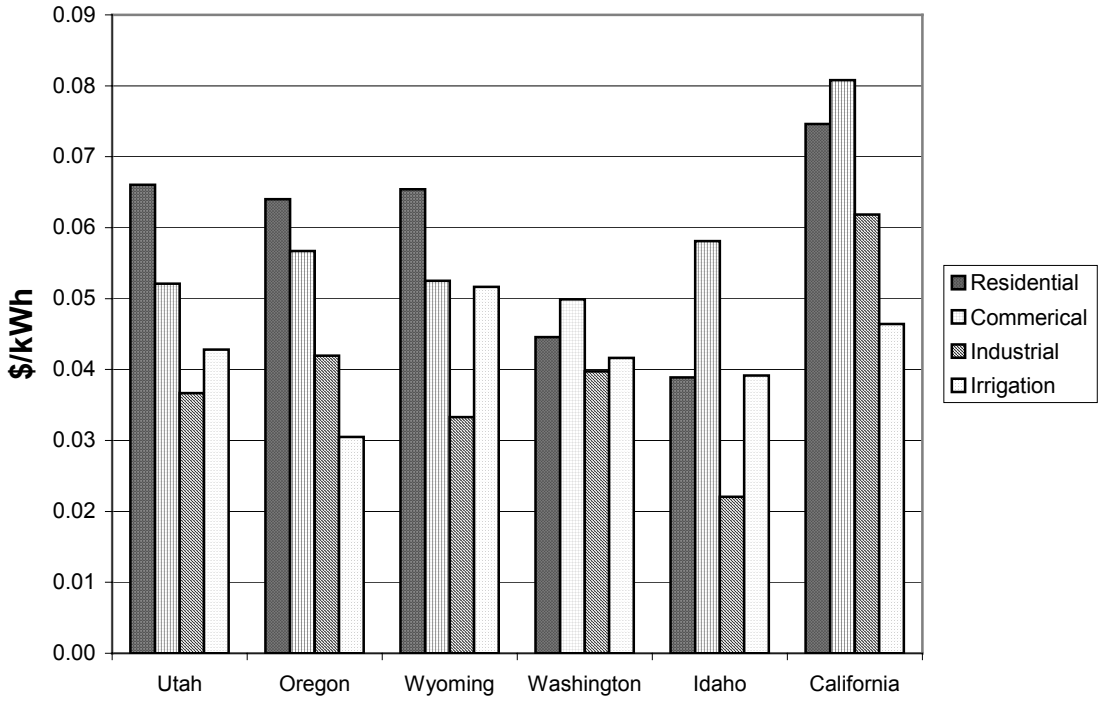

Figure 2.7-17. Average retail rate by customer class by state (2002).

Source: PacifiCorp

Power Supply Costs. Power supply costs include the federal and state operations and maintenance (O&M) expenses associated with generation as well as a return on rate base that is determined by each state's regulatory agency. According to FERC Form 1 for 2001, the facilities included in the Project had operating expenses of approximately $4.1 million. Net generation for these plants during the year 2001 was approximately 566 million kWh. The resulting operating expense averaged about $0.007 per kWh. In addition, the utility has a net investment in the system that is allowed an average return of 8.6 to 8.9 percent by regulatory commissions in the six states in which the utility operates. The total undepreciated cost of the Project, including land, structures, dams, reservoirs, and equipment, is approximately $66.4 million. The total power supply cost for the Project was less than $0.017 per kWh. The power supply cost associated with the operation of the Project is low relative to other sources of power supply and helps PacifiCorp maintain rates that are lower than they would be in the absence of the Project.

Sources of Power. PacifiCorp's primary sources of power are hydroelectric and thermal plants and purchased power. To ensure that it meets its load requirements in an efficient manner with minimum risk, PacifiCorp augments its thermal and hydroelectric generation resources with a mix of long-term contracts and short-term spot power purchases. Figure 2.7-18 displays the contribution of each source of power in 2002. In that year, the contribution from both thermal and hydroelectric sources was lower than expected owing to plant outages and lack of precipitation; thus, PacifiCorp was more reliant on purchased power. PacifiCorp is expecting the following contributions in 2003: 6 percent from hydro, 66 percent from thermal, and 28 percent from purchased power.

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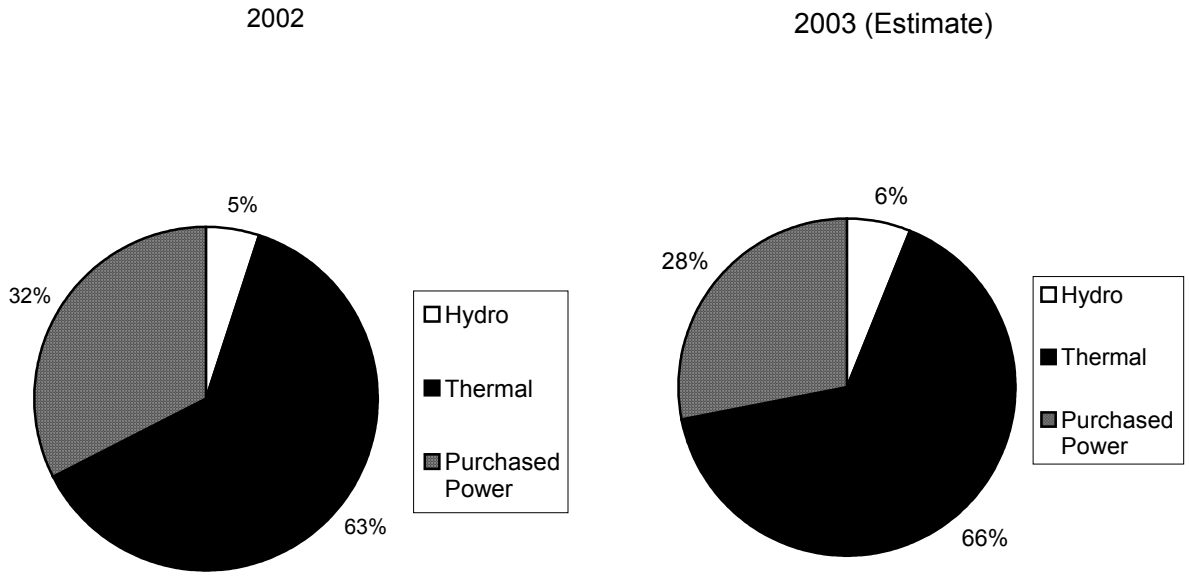

Figure 2.7-18. Percent of total sources of power.

Source: PacifiCorp Annual Report, 2002

The Project has a total installed capacity of approximately 151 MW and, as mentioned above, generated about 566 million kWh in 2001. This represented 14 percent of PacifiCorp's total hydroelectric generation capacity and approximately 2 percent of PacifiCorp's total generation in 2001.

Regulation. PacifiCorp is under the jurisdiction of utility regulatory authorities in each of the states within the service area, thus the regulatory landscape is constantly changing. Each regulatory authority regulates prices, services, accounting, and other matters. During 2001, the regulatory agencies in Utah, Oregon, and Wyoming approved PacifiCorp's request for increased electricity rates. As of February 2002, a rate case in California was pending.

The level of activity to deregulate the industry has varied from state to state. The following list provides a summary of recent regulatory activities in each of the states in the service area:

- **Utah:** The electric utility industry is fully regulated in Utah. No deregulation plan was proposed during the 2002 session.

- **Oregon:** In March 2002, PacifiCorp complied with SB 1149 by providing all customers with a cost-of-service rate option and allowing industrial and commercial customers a choice of energy providers. SB 1149, which was passed in 1999, also requires PacifiCorp to offer a portfolio of rate options that include new renewable energy resources to residential customers.

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- **Wyoming:** No deregulation plan has been proposed.
- **Washington:** No deregulation plan has been proposed.
- **Idaho:** A restructuring study committee has been established, but no deregulation plan has been proposed.
- **California:** In 1998, California became one of the first states to implement industry restructuring with the goal of establishing a competitive market for electric generation. The initial attempt failed due to the volatility experienced in the West Coast energy market in 2001, resulting in the bankruptcy of one of the state's largest utilities. FERC implemented a pricing mitigation plan that limited the price for spot market purchases.

Natural Gas. Because the existing Project facilities do not use natural gas, a discussion involving the distribution of natural gas to areas in the vicinity of existing Project facilities and in the general study area is not necessary.

Transportation. Interstate 5 is the most significant north-south transportation artery within the study region, providing access to Ashland, Medford, and the Portland metropolitan area in Oregon to the north as well as to Weed, Redding, and Sacramento to the south in California. Along the coast, U.S. Route 101 is the primary north-south corridor connecting the majority of the coastal communities in the study area. Klamath Falls, Oregon, can be accessed by U.S. 97 from the north, by State Routes 140 and 66 from the population centers of Ashland and Medford (which are along the I-5 corridor to the west), and by U.S. Route 97 from Weed, California, from the south. Copco Road provides access to the northern shores of Iron Gate reservoir and Copco Lake. The Auger Beswick road provides access to the southern shore of Copco Lake. The Auger Beswick road becomes the Topsy Grade and follows the south shore of the Klamath River to the J.C. Boyle reservoir, where it intersects with State Route 66. A more detailed description of the roads that serve the Project facilities and recreation areas can be found in Section 3 of the Land Use, Visual, and Aesthetic Resources Final Technical Report. This section includes maps as well as information on the mileage of roads by surface type and land ownership.

U.S. Route 96 follows the Klamath River from the point where it crosses under I-5 north of Yreka, downstream to the confluence with the Trinity River in Weitchpec. State Route 169 continues along the Klamath River, but it does not connect up with any other roads and dead ends before reaching the river's end at the Pacific Ocean. From Weitchpec, other population centers can be accessed by following State Route 96 to State Route 299 in Willow Creek. Eastbound State Route 299 leads to I-5 in Redding, and westbound State Route 299 leads to U.S. Route 101 in Eureka.

Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." The purpose of the EO is to avoid the disproportionate placement of any adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations. The President directed EPA to ensure that agencies analyze the environmental effects (including human health, social, and economic effects) on minority and low-income communities.

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A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than the general population of the larger surrounding area. The term "minority population" includes persons who identify themselves as African American, Asian or Pacific Islander, American Indian or Alaskan Native, or Hispanic. Race refers to Census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, or Central or South American.

The U.S. Census Bureau does not provide a specific definition for "low-income." Rather, the term is used interchangeably with "poverty." For this study, low-income populations were identified using the Census Bureau's ratio of income in 1999 to poverty level. Individuals whose income to poverty ratios are below one are considered low income.

This section identifies the low-income or minority populations living within the study area using the U.S. 2000 Census. The data used to characterize the existence of low-income or minority populations are presented in Table 2.7-12a in Section 2.7.1. Attempts at obtaining information from the tribes to augment these data were not successful.

2.8 DISCUSSION

The following sections characterize existing Project conditions.

2.8.1 Population

Within the six-county study area, the total population is 464,507. The three counties that make up the upstream region have a combined population of 289,345. The combined population of the downstream region is 175,162. The upstream region contains more than 60 percent of the study area population, with Jackson County, Oregon, comprising almost 40 percent of the total study area population. The physical structures of the Project are all within the counties of Klamath in Oregon and Siskiyou in California. These two counties combine for 37 percent of the upstream region's population and just under 25 percent of the six-county study area population. Ashland, Medford, Klamath Falls, Altamont, Yreka, Mt. Shasta, and Weed have the greatest populations among the counties included in the study.

The populations of the 50-mile buffer areas are almost equal to the county populations. Thus, the 50-mile buffer does not appear to add any new information or perspective. The 5-mile buffer for the upstream counties represents about 20 percent of the upstream county population total. This suggests that it can be important to separate the 5-mile buffer from the county population to better characterize local effects in the Project area. In contrast, the coastal population of the downstream counties captures about 80 percent of the downstream county population total. Thus, the county aggregates are likely to adequately reflect effects felt within the 5-mile coastal corridors.

Over time, the county populations in the study area have exhibited relatively low annual growth rates. The population changes have been more severe at the subcounty level, with some of the smaller communities experiencing population reductions during this time period.

The largest racial group in the study area is white, representing more than three-fourths of the population in the study area. The American Indian population constitutes the second largest

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racial group in all but Jackson County, where the second largest racial group consists of individuals who characterize themselves as being from "Two or More Races." The downstream region has a slightly more diverse racial makeup.

Age distributions are similar across communities, with about one-fourth of the population below 18 years and one-third above 50 years. The city of Trinidad is the only exception, with about 14 percent of its population below 17 years and about half of its population above 50 years.

2.8.2 Housing

The study area has adequate housing as indicated by high vacancy rates. Vacancy rates above 5 percent are generally thought to indicate surplus of housing units available for rent. Overall, there are about twice as many owner-occupied housing units as there are renter-occupied housing units. Jackson County has the highest percentage of owner-occupied housing and Humboldt County has the lowest percentage. The communities closer to the Klamath River and the coast have a tighter housing market and a lower indicator value of community well-being (i.e., as measured by the ratio of owner-occupied housing units).

2.8.3 General Economic Development

Each of the counties in the study area has experienced a net job growth over the period of 1980 to 1999. In general, however, the average annual growth rates for the study area counties have been lower than their respective state growth rates, and the study area counties showed negative job growth for the period of 1980 to 1985. The exception is Jackson County, Oregon, which has experienced continuous job growth at average annual rates greater than the Oregon average.

Throughout the study region, services, retail trade, and government are the three industries with the greatest percentage of total county employment. For the upstream region as a whole, farm employment represents 4 percent of the total and for the downstream region it represents 3 percent of the total. Recreation and tourism have become important industries for many of the smaller communities along the river, replacing lost jobs from the timber industry. Recreation and tourism jobs are included in the services and retail trade industries in the databases that track employment at the county level. The manufacturing industry has experienced a decrease in importance over the past 20 years, whereas the services industry has seen consistent increase in importance.

For the communities within the 5-mile buffer area, the services and retail trade sectors account for about two-thirds of the industry employment. A comparison with the 1990 Census data shows a decline in employment in the agriculture, forestry, fishing, and hunting category for several communities, including Dorris, Westhaven-Moonstone CDP, and Gold Beach. A few communities experienced modest growth in the share of employment in this category, most notably Klamath CDP.

Other than short-term changes in construction employment, the recreation and tourism sector and potentially the commercial fishing sector are most likely to be affected by changes in the current Project and PM&E measures under the terms of the new license. In addition, the agriculture sector is tied to the availability and cost of Klamath River water for irrigation purposes, but these factors are not components of the hydropower license.

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The county unemployment rates for the year 2000 are all higher than the state averages for California and Oregon, both of which had statewide unemployment rates of 4.9 percent in 2000. Trends in unemployment rates for the individual counties over the period of 1992 to 2001 generally followed the state trends, but remained above their respective states. The unemployment situation is even worse at the community level. Excepting Ferndale, Myrtletown, and Pine Hills, most of the communities in the 5-mile buffer area had unemployment rates that were higher than those reported at the county or state level. Tribal authorities report unemployment rates as high as 40 percent within the tribal community (Waddell, 2002).

Total 1999 personal income for the combined downstream counties was $3,726 million, with Humboldt County earning $2,776 million, Del Norte County earning $469 million, and Curry County earning $481 million. The upstream county total was nearly twice as high at $6,464 million. County-level per capita personal income for each study area county is less than the state averages for California and Oregon. Jackson County has the highest per capita income of all counties in the study area, while Del Norte County has the lowest. In general, the communities within the 5-mile buffer area are characterized by lower median household and per capita incomes than those observed at the county or state levels. The only exception is the city of Trinidad, which has a higher per capita and median household income than the state average. The lower levels of income are probably the result of the lower-paying jobs in the service sector that have replaced the timber and wood products industry as the primary employment sector in the area.

The per capita income of the American Indian population in each of the six counties is significantly lower (about 50 percent lower) than that observed for the entire population in each of the six counties. In addition, the proportion of low-income American Indians is higher in the 5-mile buffer area than for the general population in all counties except for Curry County. The communities within the 5-mile buffer area are characterized by pockets of American Indians with incomes below poverty level. With lower personal income, higher poverty rates, higher unemployment rates, and greater reliance on the Klamath River for their livelihood, communities within the 5-mile buffer have a keen interest in how changes in the current Project and PM&E measures may affect their livelihood and way of life.

2.8.4 Specific Economic Development

Under current conditions, the Project is related to the economy in the Project area and perhaps to the economies of the broader study area. PacifiCorp contributes to local employment in the Project area. The operation and maintenance of the Project facilities results in the employment of 19 individuals for a total annual payroll of about $820,000.

Recreation is a major component of the Project area economy. The recreation industry includes whitewater boating (private and commercial), sportfishing (private and commercial), and gold mining in the Lower Klamath River area. In the Upper Klamath River area, the recreation industry includes boat fishing, waterskiing, resting/relaxing, shoreline fishing, RV camping, and whitewater boating. Total nonlocal expenditures for all recreational activities for the 5-mile buffer in the Upper Klamath River area are estimated at $840,900 to $909,600. Total nonlocal expenditures for all recreational activities for the 50-mile buffer in the Upper Klamath River area are estimated at $1,648,000 to $1,716,700. On the Lower Klamath River, recreation activities include primarily whitewater boating, mining, in-river fishing, and ocean sportfishing. In 2002,

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expenditures ranged from $6,177,700 to $6,517,800 in the 5-mile area and from $7,336,500 to $7,676,600 for the area which extends to the 50-mile buffer. The recreation expenditures represent less than 1 percent of personal income for the six-county study area, or even the three-county Upper and Lower Klamath study areas. However, these recreation earnings can be significant for communities within the 5-mile buffer.

While whitewater boating activity on the river has increased over time, in-river fishing has varied from year to year. Angler effort (as measured by angler trips or angler hours), and catch increased from 1979 to 1982. Effort as well as catch declined in 1983 and 1984. The period 1985 to 1988 saw an increase of 60 percent in angling effort and catch, when it reached its peak at over 64,000 angler days. The late 1980s and early 1990s were characterized by declining effort and catch. Although the sportfishing industry on the Lower Klamath River seems to have recovered from the declines in the early 1990s by approaching 25,000 angler days in 2001, angler effort and catch have never come close to the numbers seen in the mid 1980s. Ocean angler visitor days follow a similar pattern, reaching their peak of more than 180,000 angler days in 1987, their low point in 1998 of 32,400, and back up to 80,000 angler days in 2001.

Commercial and American Indian commercial fishing are also a major component of the Project area economy. To protect the federally listed Klamath River coho, all salmon fishing in the KMZ has been restricted. Recovery of coho stocks would likely result in modifications to salmon fishery management recommendations for the KMZ and other parts of northern California and southern Oregon coastal fisheries. The personal income impacts associated with the salmon troll fishery largely track the landings data, but also reflect the steep decline in the ex-vessel price of salmon over the period. Across all four ports in the study area, personal income impacts were at their highest point (i.e., almost $40 million) over the 1976-1980 period (2001 dollars). They almost approached this high point again in 1988 when they reached about $35 million. Personal income impacts reached their bottom at $139,000 in 1992. In 2001, they were back up to $2 million, which is only 5 percent of the 1976-1980 average. Had the price held firm over the period, the personal income impacts would have been three times as great, but would still have fallen far short of the high mark. Study results suggest that it is likely that some of the commercial fleet that used to fish for salmon have regeared and switched their effort to other species as a result of the salmon restrictions. This shift in fishing effort could be responsible for overfishing of some of the targeted species.

Of the fish resources available in the basin, 50 percent must, by law, go to the Yurok and Hoopa Valley tribes. The Yurok receive 80 percent of the tribal allocation and the Hoopa receive the remaining 20 percent. The Karuk Tribe fishing is regulated to a spot at the Ishi-Pishi Falls (Tripp, 2003) and is not limited to a specific allocation. From 1987 through 1989, commercial tribal harvests of Chinook averaged about 27,500 Chinook a year. In 1989, the harvest, at an average weight of 15.4 pounds, sold for $852,000 ($1.1 million in 2001 dollars). The 1996 harvest was 43,276 fall and spring Chinook (average weight of $13.5 pounds), which sold for $525,000 ($575,000 in 2001 dollars). The decrease in total revenue can only partially be explained by the decrease in weight and number of fish. Because of increased supplies from other sources, the market price for salmon had fallen over the period. The 1999 harvest was 2,077 fall Chinook, increasing to 4,922 fall Chinook in 2000 and then increasing again to 9,345 fall Chinook in 2001. Assuming that the fishers received the market price for their catch, and assuming an average weight of 13 pounds, the 2001 revenues may have been around $195,590.

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In addition to commercial harvest, these tribes also fish salmon for subsistence and for ceremonial reasons. In many years, the subsistence fishery has dominated the commercial fishery, especially in years when the commercial fishery was absent, such as 1990-1995 and 1997-1998. Excluding the Trinity River, in recent years (1999-2001), the subsistence fishery has exceeded the commercial harvest by about four to five times. For example, the 2001 subsistence catch was 32,591 fish. Although the tribal significance of fishing for salmon extends well beyond its commercial value and its value as a source of food, these economic factors are nonetheless important considering the high percentage of American Indians in the study area earning below poverty level incomes. Salmon fishing continues to play a role in the economic well-being of the American Indian people in the study area.

Irrigated agriculture is another important component of the Project area economy. According to the 1997 U.S. Census of Agriculture, there were 1,744 farms and ranches that used irrigation water supplied by USBR's Klamath Project. Of the total farms and ranches using irrigation water, 80 percent are in Siskiyou and Klamath counties, the two counties that are in the Project area.

The Klamath Project and the Klamath Hydroelectric Project are connected through the Keno reservoir. The water diverted through Keno supports about 490 farmers (or 41 percent of the total number of farmers supported by the Klamath Project) and irrigates about 95,600 acres of Klamath project farmland and 4,000 acres of non-Klamath Project land. Thus, water diverted through Keno irrigates about 45 percent of the total irrigated acres in the Klamath Project (Green, 2003).

2.8.5 Local Fiscal Conditions

In addition to employment, PacifiCorp contributes to the economies of the Project area through various taxes. During FY 2002 to 2003, Klamath County received a total of $35 million in property taxes. PacifiCorp's contribution was about $ 1.7 million ($105,160 to the city of Klamath Falls and $1.58 million to Klamath County) in FY 2002 to 2003, or about 4.5 percent of the total (Long, 2003). In addition to the property taxes levied at the county level, the city of Klamath Falls also levies property taxes (about $5,000) on the East Side and West Side facilities. Siskiyou County received a total of $6.54 million in property taxes in FY 2002-03. PacifiCorp's contribution was about $1.1 million, or about 18 percent of the total property tax receipts (Hammar, 2003). In 2002, the city of Yreka received $64,767.03 (1 percent of 647,670.30 in gross revenues) in franchise taxes from PacifiCorp (Ramirez, 2003).

2.8.6 Public Services

Project area public service providers include fire, police, schools, and medical services.

Although the Project facilities in Oregon are outside its service area, Keno FPD has come to the aid of PacifiCorp in the past (Ketchum, 2003). The station at 14800 Puckett Road serves as the headquarters for the Keno FPD and is the nearest fire station to the Project facilities. Keno FPD also provides emergency medical service. Keno FPD has mutual assistance agreements with all other fire districts in Klamath County. Keno FPD indicated that it would take approximately 4 minutes to respond to an emergency call from the Project facilities at Keno. The average

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response time to an emergency call from the J.C. Boyle dam is 15 minutes while that from the J.C. Boyle powerhouse is 20 to 25 minutes (Ketchum, 2003).

The Project facilities in California (Copco No. 1 and No. 2, Iron Gate, and Fall Creek) are all within the jurisdiction of the Hornbrook Fire District. Hornbrook Fire District is a volunteer fire department dispatched through the California Department of Forestry. Northern Siskiyou Ambulance in Siskiyou County provides emergency services within the Project area. Northern Siskiyou Ambulance is a privately-owned, emergency medical provider that provides round the clock emergency medical service to it's service area. Average response time to the Project facilities is 20 to 25 minutes. The breakdown is approximately 15 minutes to the dam and another 10 minutes to the powerhouse. The ambulances also work with the California Department of Forestry and the Hornbrook Volunteer Fire Department, who are the first responders and normally have about a 10-minute head start. The ambulances provide transport to helicopter landing zones when necessary (Frost, 2003).

The Klamath County Sheriff's Department provides law enforcement services to the Project facilities in Klamath County, Oregon, and has a dispatch center out of Klamath Falls. The response time to an emergency call into any one of the Project facilities in Klamath County is 10 to 15 minutes (Dailey, 2003). Siskiyou County Sheriff's Department provides law enforcement services to the Project facilities in Siskiyou County, California. The area within the Project facilities, (i.e., the Yreka area), is served by the station located at 311 Lane Street. The response time to an emergency call from one of the Project facilities in Siskiyou County is 30 to 45 minutes.

The schools in Klamath County, Oregon, are within the Jackson Education Service District. Within this service district, the Klamath County School District has a total of 20 schools and the Klamath Falls City Schools consist of nine additional schools. In California, the Project facilities are all in Siskiyou County, which has 28 school districts. Children living in the vicinity of Iron Gate reservoir and Copco Lake are likely to attend an elementary school in the Hornbrook, Willow Creek, Bogus, or Montague school district, all of which feed into Yreka High School.

Property Value

The development of the Project facilities at Keno in Klamath County, Oregon, and Copco in Siskiyou County, California, has contributed to the value of the land adjacent to these two facilities.

2.8.7 Infrastructure

Table 2.7-68 shows the water, stormwater, wastewater, and solid waste disposal service providers for the Project facilities.

Electricity within the Project area of Klamath County, Oregon, and Siskiyou County, California, is provided by PPL. Generation capacity is derived from hydroelectric, natural gas, and coal-fired plants. The Project represents approximately 14 percent of PacifiCorp's total hydroelectric generation capacity and 2 percent of PacifiCorp's total capacity. PacifiCorp also purchases power to meet its regulatory supply obligations to its customers.

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The Project area is reasonably accessible via a transportation network of federal, state, local, and private roads.

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3.0 HIGH-LEVEL SOCIOECONOMIC ANALYSIS OF THE LANDSCAPE OPTIONS—PHASE 2

Between April 2002 and November 2003, the socioeconomic work group met 16 times to review and discuss the socioeconomic study plans. In January 2003, the work group agreed to have PacifiCorp develop a Phase 2 study plan from the existing outline, where the objective of the study was to assess the changes in the socioeconomic condition in the study area resulting from the differences in the proposed Project and the current Project. The work group also agreed to separately address the high-level alternatives analysis.

In March 2003, it was decided to introduce a new Phase 2 study plan related to the high-level socioeconomic analysis of the landscape alternatives defined by the plenary group. The current Phase 2 study plan then became the Phase 3 study plan and was renamed "7.3 Analysis of Effects of Differences Between the Proposed Project and the Current Project on the Socioeconomic Environment—Phase 3 of the Socioeconomic Study."

In October 2003, the plenary redirected the work groups to identify subgroups who would be tasked with populating the System Landscape Options Matrix (SLOM) in accordance with the plan developed by the members of the process subgroup. This direction from the plenary rendered the Phase 2 study plan irrelevant except in so far as it provides reference material for the socioeconomic members of the subgroup. Therefore, the proposed Phase 2 study plan is not included in the FTR.

The Phase 3 study plan, although never formally approved by work group participants, is described in the next section. In lieu of incorporating additional consideration language into the Phase 3 study plan, work group members decided to develop a socioeconomic issues paper. By identifying areas of disagreement among work group participants, the issues paper explains why the Phase 3 study plan was not approved by stakeholders.

See the Consultation Record (Exhibit E-1A to the Final License Application) for the socioeconomic issues paper and Appendix E to the Consultation Record for the draft Phase 2 study plan.

4.0 ANALYSIS OF EFFECTS OF DIFFERENCES BETWEEN THE PROPOSED PROJECT AND THE CURRENT PROJECT ON THE SOCIOECONOMI ENVIRONMENT—PHASE 3

4.1 DESCRIPTION AND PURPOSE

The third phase of the relicensing socioeconomic work was to assess the changes in the socioeconomic condition in the study area resulting from the differences in the proposed Project and the current Project, which include PM&E measures (e.g., new environmental and social measures). This analysis involves examining only the incremental effects resulting from changes in the current Project and PM&E measures.

The effects of the proposed Project are defined in terms of the changes relative to the baseline condition characterized by the Phase 1 study. This Phase 3 study provides information to satisfy FERC license application requirements for assessing expected incremental Project-related effects on the socioeconomic environment, as specified in the applicable sections of 18 CFR Parts 4 and 16.

The Phase 3 study addresses the following key questions related to estimating expected changes in the socioeconomic condition resulting from the differences between the proposed Project and the current Project:

1. Which major economic sectors will be affected and what would be the effects on those sectors?

2. How would the effects on economic sectors translate into changes in employment and earnings in the economies of the study region?

3. What would be the effects on population growth, and community services in the study area?

4. What would be the changes in market and nonmarket economic benefits and costs (i.e., described in monetary, nonmonetary, or qualitative terms)?

5. How would the potential benefits and costs be distributed within and across regions in the study area (i.e., which societal groups would bear the burdens and who would reap the benefits)?

4.2 OBJECTIVES

The principle objective of the Phase 3 study is to assess the proposed Project's contributory effects on the socioeconomic condition of the study area when compared to the current Project**.** The study plan developed to efficiently meet this study objective and to address the key study questions includes the following analyses:

- Regional economic impact analysis to capture changes in local employment, output, and earnings in the study area due to the differences between the proposed Project and the current Project. A component of the regional economic impact analysis is the sector analysis, which

defines the effect of the proposed Project on major economic sectors (e.g., recreation and tourism, construction, commercial fishing, agriculture).

- Descriptions of the changes in other socioeconomic resources (e.g., population, community services) in the study area due to the differences between the proposed Project and the current Project.

- National-level economic benefit-cost analysis to capture the changes in net benefits to the public as a result of the differences between the proposed Project and the current Project.

4.3 RELICENSING RELEVANCE AND USE IN DECISIONMAKING

The results of this Phase 3 study provide information to satisfy FERC license application requirements specific to Project-related effects on the socioeconomic environment as specified in the applicable sections of 18 CFR Parts 4 and 16.

PacifiCorp will use the Phase 3 study results to describe the relationship between the differences between the proposed Project and the current Project as they relate to socioeconomic endpoints such as population, housing, economic development, local and tribal government revenues and expenditures, public services, infrastructure, water-based recreation and commercial and subsistence fishing. The analysis is limited to potential incremental Project effects and does not provide a comprehensive model of the local regional, or national economies. Information from this study will be integrated as appropriate with other recreation, cultural, and biological resource information about the study area to help evaluate proposed Project PM&E measures.

4.4 METHODS AND GEOGRAPHIC SCOPE

This study involves conducting three primary analyses: (1) a regional economic impact analysis, (2) an analysis of changes in other socioeconomic resources, and (3) a benefit-cost analysis. These analyses are intended to assess the expected effects of the differences between the proposed Project and the current Project as they relate to stakeholders in the region and to measure the aggregate economic effects from a national perspective. The methodologies of each analysis vary, but the basic tasks are the same. These tasks are as follows:

1. Description of the proposed Project in terms of changes from the current operation of the Project and related protection, mitigation, and enhancement measures and identification of the associated economic and socioeconomic measurement endpoints that are likely to be affected by the changes.

2. Identification of the geographic scope of the study area, and the subregions within the study area that are likely to experience different impacts. (See Section 4.4.1.3 for the broad description of the geographic scope.)

3. Identification of the pathways from the changes in Project operations and PM&E measures to economic and socioeconomic endpoints.

4. Identification of information needs, information resources, and gaps in data and development of solutions for meeting the data requirements and collection of data.

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5. Review and analysis of the data and information.

6. Presentation of methodologies and selection of the appropriate methodologies to use in evaluating potential incremental Project effects and development of the model.

7. Application of the methodologies.

8. Identification of key assumptions and constraints associated with each type of economic and socioeconomic analysis, including, for example, issues associated with making projections into the future using essentially static models.

9. Description of results and summarization of conclusions.

The primary basis of analysis is a comparison of the socioeconomic conditions "with" and "without" the potential changes resulting from the proposed Project over the 30-year Project life. The following sections describe the proposed Project and data sources and provide details on the remaining above tasks as they relate to the three separate economic and socioeconomic analyses.

4.4.1.1 Proposed Project Description

This section describes potential changes resulting from the proposed Project that the study will evaluate. The socioeconomic study specialists have coordinated with the other resource study specialists to identify potential incremental Project effects with significant linkages to socioeconomic resources. It is important to assess the extent to which such relationships can be disentangled from the non-Project factors that influence those same socioeconomic resources.

4.4.1.2 Identify and Review Existing Information

Data Sources

PacifiCorp has gathered and reviewed pertinent socioeconomic data and information for the study area. This study relies on data obtained from dialogues with resource agencies, local and tribal government officials, and various members of the public as well as Internet sources, public reports and data, published literature, and information obtained from the other Project resource reports, especially recreation, water quality and hydrology, cultural, and fishery resources. The types of data for each of the socioeconomic resources developed are described in the following methods sections.

4.4.1.3 Socioeconomic Impacts

The Phase 3 study assesses the nature and extent of the incremental proposed Project's effects on socioeconomic conditions by conducting three primary types of analyses: (1) the regional economic impact analysis, including the analysis of the primary economic sectors directly affected by the changes resulting from the proposed Project; (2) analysis of other regional socioeconomic effects; and (3) the benefit-cost analysis. Each analysis is discussed in the next subsections.

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Regional Economic Development

Regional economic development relates to the health and viability of the local/regional economy, measured in terms of employment, output, earnings, and tax revenues. The purpose of the regional economic impact analysis is to provide a basis for assessing the different expected economic effects of the proposed changes to the current Project on various interest groups, income classes, and economic units. Economic units are defined as regional or local economies that have a common economic bond and destiny. Interest groups include stakeholders in distinct sectors of the economy. The study measures economic consequences of the proposed changes to the current Project in terms that are most meaningful to these economic units and interest groups.

The economic perspectives of importance in this analysis are those of the region, subregions, income classes, and stakeholder groups so that the measurements reflect the narrow interest of such groups, ignoring the effects on others. The purpose of this analysis is to contrast economic gains and losses among various entities within the region of direct influence.

An essential component of the regional economic impact analysis is the sector analysis. The purpose of the sector analysis is to identify the sectors of the regional economy that the proposed changes to the current Project are likely to affect and qualitatively describe or quantitatively estimate the expected economic changes in that sector. To the extent that the changes in the economic sector are quantified, these results are used as inputs in the regional economic impact analysis to assess the effects of changes in that sector on the economy of the region.

Examples of sectors that could be affected by changes from the current Project operations and PM&E measures include but may not be limited to the following:

- Marine commercial fishing, American Indian river commercial fishing, and American Indian subsistence fishing
- Recreation and ecotourism businesses (e.g., ocean sportfishing, river sportfishing, white-water boating, recreational mining, and reservoir recreation) that rely on the Klamath River resources in the study area
- Irrigated agriculture that relies on the Project for water supply
- Construction
- Ecosystem Restoration
- Municipal water and wastewater services

Geographic Scope. The geographic scope of the sector analysis and the regional economic impact analysis depend on the spatial extent of the potential Project's sphere of influence. The overall study area is defined in Section 4.4.1.4. The purpose of this subtask is to verify the identity of the regions and subregions within this study area to capture the local economic impacts resulting from the incremental changes to the current Project.

Pathway to Economic Endpoints. This task was coordinated with the work of each PacifiCorp study team to describe how the group of associated actions making up the proposed Project (the

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hydrologic modifications, construction and operation, changes in water quality, and fishery resources) is likely to affect the regional and subregional economy within the study area. These actions involve changes in expenditures (or revenues) that provide data for input into models of the regional economies. The study measures the following variables:

- Employment
- Output
- Earnings
- Tax Revenues

Linking incremental Project impacts to the models of the local economy may, to some extent, depend on the definition of the proposed Project. By way of illustration, a number of potential impacts that could occur at some point during the 30-year planning horizon include the following:

- Stimulus of the construction industry during the construction phase of the Project
- Availability and cost of water for irrigation agriculture
- Availability and therefore the value of the marine commercial fish catch
- Quality and quantity of recreation activities and, therefore, ecotourism-related revenues
- Mitigation and restoration expenditures designed to provide PM&E measures

The scope of the study assumes that sector analysis results and their associated linkages to the regional economic impact models are achieved through the variables identified in the Input or Data Requirements section below.

The sector analysis is designed to estimate changes in total revenues for the sector in question or other measures of anticipated economic outcomes, such as rate of return on investment, earnings, employment and shifts in production among competing regions. Pathways to five potential economic sectors are as follows:

- Changes in the direct cost of constructing or removing facilities, changes in costs of operating and maintaining facilities, and changes in expenditures to restore or enhance the ecosystem are likely to be captured in the construction sector.

- The potential Project's hydrologic modifications and any changes in water supply available for irrigated agriculture can lead directly to changes in farm production costs and thus the behavior of farmers and total revenues for the agricultural sector.

- The potential Project's hydrologic modifications and changes in PM&E measures can lead to ecosystem changes, such as fishery productivity, that in turn lead to changes in behavior (e.g., commercial fish landings, recreational fishing trips) and total revenues or expenditures for the commercial fishing sector and recreation and ecotourism businesses.

- The potential Project's hydrologic modifications can lead to reservoir system management changes that result in changes in lake levels and in-stream flow, which in turn lead to changes in behavior (recreation and ecotourism businesses) and total revenues or expenditures for the sector.

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- The potential Project's hydrologic modifications can lead to changes in municipal utility costs and thus to changes in the behavior of municipal and industrial water supply consumers.

Inputs or Data Requirements. The task of data collection is to identify what information is needed, what information resources exist, what gaps in data are present, and then to develop solutions for meeting the data requirements. Specific information needs depend on the results from previously listed activities. The process for collecting the data varies by sector. Data requirements depend on the approaches adopted for estimating changes in total revenues and expenditures. Preliminary data requirements are identified for each of the economic sectors discussed in the Model Development and Calibration section. In each case, the data collection will distinguish construction periods from O&M periods so the analysis of impacts can be evaluated on that basis.

Model Development and Calibration. Because the sector analysis is a necessary step in developing the information to be entered into regional economic models, the sector models are described first, followed by the regional economic impact analysis model.

Sector Analysis Models. Each sector may require a distinct approach for estimating potential changes in total revenues and other economic measures of impacts. This study reviews the literature on approaches for the different sectors as well as specific models that may have been developed for these industries in the region. Existing sector models, which may be applicable to the study area, allow evaluations such as the following:

- **Construction Industry**. The proposed Project may include a construction component. The changes in engineering cost information were estimated by PacifiCorp.

  To illustrate, the following is a list of information needs:

  1. Changes in local employment resulting from construction and operation of new facilities and ecosystem mitigation/restoration activities

  2. Construction costs broken down by labor costs and material costs and by county within the region and outside the region

  3. Operations and maintenance costs broken down by labor costs and material costs and by within the region and outside the region

  4. Average number of employees in construction work force over life of Project or variable estimates, if average figures would be misleading

  5. Duration of the construction projects and thus the employment periods for the construction workforce (when would the projects commence and what are their expected completion dates?)

  6. Expected number or percentage of construction workers who would be daily commuters and the percentage of these workers that will permanently relocate to the region to fill these jobs

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7. Total construction payroll

8. Number of full-time employees who would be hired to operate the new facilities, when would they be hired and the percentage to be hired locally

9. The associated annual operations payroll

The predicted effects of the proposed Project on construction employment, revenues, and earnings were estimated with the use of economic models using construction industry data typical in each region. The analysis of the economic effects of the Project as a result of changes in the construction industry were used in the regional economic impact analysis discussed below.

- **Irrigation Agriculture**. Agricultural models estimate the economic effects of input costs, input availability, and productivity on the irrigation agriculture industry. (Production cost changes and productivity link directly to estimated changes in the quantity of water available for irrigation.) This shows the effects of input costs, productivity, and product price changes on the level and value of production, levels of input use, and the profitability of irrigation agricultural production in relation to that of alternative enterprises relative to the baseline condition. This study investigates the availability and suitability of existing models of irrigation agriculture in the region (e.g., models developed for the USBR Klamath River Irrigation Project.). Ideally, the models account for the economics at the external margin (marginal acres or marginal farms) as well as median or typical farm circumstances. Such models also indicate the regional distribution of agricultural production as a result of changes in the production cost for the relatively small percentage of farms that rely on the Project for irrigation water. Changes in the value of production for these farms link to one or more regional economic model sectors to estimate the regional impact of these changes.

  Absent access to suitable existing models, alternative methods of characterizing economic impacts to this sector were investigated, including a qualitative description of changes to this sector. Any quantitative results for the irrigation agriculture sector likely became inputs to the regional economic impact analysis and the benefit-cost analysis discussed below.

- **Commercial Fishing**. It is assumed that potential incremental Project-related impacts on the commercial fishing industry are primarily limited to the coastal communities in downstream counties (i.e., Curry, Humboldt, and Del Norte). As with sportfishery, these Project-related local impacts would depend on several factors, including: (1) projections for Project-related changes in the size and perhaps the composition (native vs. hatchery) of fish populations; (2) the timing of these changes; (3) relationships between fish populations, water quality, fishing effort (i.e., production functions), and harvest; and (4) changes in the management of the fishery (i.e., allocations among the tribal, sport, and commercial fisheries). Depending on the reliability and validity of the inferences, Project-related impacts were assessed either qualitatively or quantitatively, the latter using the IMPLAN model for the affected individual counties or county aggregates.

  Specifically, PacifiCorp investigated the availability of models linking these relationships to changes in landings that together with ex-vessel price provide estimates of commercial salmon fishing revenues, which is an input into the IMPLAN model. It is important to adopt

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a methodology that accounts for shifts in effort (e.g., vessels, labor, processing plants) among the different fisheries as well as changes in total effort. Depending on the nature and extent of the expected changes in the commercial fishery, a qualitative analysis was sufficient to characterize the changes in this sector.

- **Recreation in the Project area and on the Klamath River downstream of Iron Gate dam**. The analysis began with a representation of the recreation sector and its relationship to the water quality, water flow, and fishery quality factors that may change as a result of the proposed Project changes. Expenditures on whitewater rafting, angling, and other recreational goods and services tend to change in relation to changes in recreation visitor days and visitor trips. Therefore, changes in total expenditures in this industry depend on expenditure levels and changes in the recreation visits.

  The socioeconomic specialists coordinated with the recreation study specialists to obtain visitor expenditure information in their surveys of users or from interviews with local recreation outfitters and service providers. This information was supplemented by expenditure data reported in government reports, public databases, and the empirical literature. The expenditure information was used to estimate the economic impacts of changes in recreation expenditures on the recreation industry in general, and where possible to identify shifts among types of recreation activities that may point to the potential winners and losers within the industry. The expenditure categories include: (1) fees (such as outfitter fees, access fees, and other); (2) recreation supplies, materials, and services; and (3) gas, meals, and accommodations.

  Information to support estimating potential Project-related changes in nonlocal recreation trips in the study area was obtained from the recreation resources studies (Study Plans 3.1 and 3.2), from interviews with government officials and recreation support businesses, and from research reports and the empirical literature. These data included visits by reservoir and Klamath River users who primarily engage in the activities that are potentially affected by the Project (i.e., shoreline day-users, recreational miners, campers, anglers, and whitewater boaters).

  For both the upstream and the downstream counties, the existing literature was used to evaluate the extent to which one can infer reasonable bounds on the changes in nonlocal recreation trips and expenditures that might result from potential Project-related changes in the existing condition. Such bounds depend on several factors, including: (1) projections for Project-related changes in the size and perhaps the composition (native vs. hatchery) of fish populations as well as for water quality changes; (2) the timing of these changes; (3) relationships among fish populations, water quality, and recreation trips; and (4) changes in the management of the fishery (i.e., allocations among the tribal, sport, and commercial fisheries). Similarly, changes in whitewater boating activity levels and expenditures depend on Project-related changes in flow conditions including the timing (i.e., time of day, days of the week) and seasonality. Changes in flow conditions could also affect recreation mining opportunities. Changes in reservoir management could affect reservoir recreation activities, and so on.

  Depending on the reliability and validity of the inferences, incremental Project-related impacts were assessed either qualitatively or quantitatively. To the extent that quantitative

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estimates were developed, they were used in the regional economic impact analysis to assess the regional effects of the changes. Interpolations to the community level were made where they could be supported by the available data.

- **Ecosystem Restoration.** Ecosystem restoration and mitigation activities were addressed in much the same way as was described above for the construction sector.

- **Municipal and Industrial Wastewater Treatment.** To the extent that water quality decreases as a result of changes from the current Project, municipal and industrial wastewater treatment costs were affected. If significant, these cost changes were linked to a regional economic model sector (water supply and sewage systems) to evaluate the economic impact. Otherwise potential changes were characterized in qualitative terms.

Regional Economic Impact Analysis Models. Regional economic development relates to the health and viability of the local/regional economy, measured in terms of employment, output, earnings, and tax revenues. The estimated changes in these quantities that are attributable to the proposed changes to the current Project come from the sector analysis. These analyses provide estimates of new injections of dollars into the local economy. Because of trade and production linkages in the economy, secondary (indirect as well as induced) economic impacts may result from the direct (or primary) changes captured in the sector analyses. For example, an increase in expenditures to construct a project facility requires an increase in expenditures for intermediate goods needed to meet that demand. These expenditures, in turn, create demands on other local industries. Alternatively, leakages are payments made to nonresidents for imported goods, materials, and labor. Payments to nonresidents are not returned to the local economy after they leave; as a result, they have no local impact. The IMPLAN model accounts for such leakages.

Because of the nature of the data, the analysis generally was conducted at the county and multicounty levels. However, the analysis also included inferences on potential incremental Project impacts to the local communities.

The study team assessed the incremental Project's regional economic impacts on employment, earnings, output, and tax revenue by using a regional input/output model, (i.e., IMPLAN). The model allowed evaluation of Project impacts on the distribution of income among income classes. The I-O analysis incorporated an area consisting of Klamath, Jackson, and Curry counties, Oregon, and Siskiyou, Humboldt, and Del Norte counties, California, and was based on a change in final demands. The above section on Sector Analysis describes sectors of the economy directly affected by the proposed changes to the current Project.

Key Assumptions/Constraints. The sector analysis was constrained by the existence of sector behavioral models with appropriate linkages to the potential Project hydrologic modifications and ecosystem changes and related costs of production influences on key economic sectors.

Potential changes in the current Project or the future operation of potential PM&E measures also could affect the socioeconomic condition of American Indian tribes. Historically, the natural resources of the Klamath River system contributed to the subsistence of the people of these tribes. Just as the historical decline in anadromous fish populations has diminished tribal reliance on subsistence fishing and has negatively affected the socioeconomic condition of American Indian tribes and people, enhancements to the salmon fisheries, and other natural resources could

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lead to increased subsistence and thus an improved socioeconomic condition of the American Indian tribes relative to the existing condition. PacifiCorp gathered data on subsistence fishing trends and projections from the tribes. In addition, the socioeconomic study specialists coordinated with the tribes and the cultural study specialists to seek information from the tribes on the interrelationships between natural resources, tribal cultures, and potential changes in the socioeconomic conditions of the tribes resulting from the proposed changes to the current Project.

Input/output models assume fixed coefficients and therefore overstate long-term consequences. For example, the use of the IMPLAN modeling tool limits the study to a static analysis that does not account for the evolution of the regional economy or that of particular industries over time. Nor does it account for competing demands for the inputs to production. In this case, the effect is that they will ignore the opportunity for workers to find other employment, for land to be used for alternative enterprises, and capital to be redirected to other investments. Therefore, it was necessary to adjust the economic impact results to reflect the appropriate long-run re-employment of land, labor, and capital in the region.

These regional economy models are static and do not capture potential changes in the market as a result of technological innovations that have emerged over the last 80 years. The pathways to economic effects were defined based on illustrative alternative effects. If new information reveals that the Project will induce other changes in the local or regional economy, researchers will adjust the scope of these studies.

Even with these limitations, an I-O analysis using IMPLAN provides a level of analysis that is consistent with the requirements of FERC. The primary advantage of this approach is that it clearly identifies those counties in the study area that are likely to experience the greatest impacts from potential changes in the current Project.

Results. The sector study produced an analysis of the economic impact of the proposed changes to the current Project on each of the economic sectors discussed above. The outputs of the several sector analyses provided insight regarding the impact of the Project changes on the sector distribution and level of production, rates of return on investment, and changes in the input mix to production. The value of production changes provided direct linkages to the regional economic impact analysis models.

The purpose of the regional economic impact analysis is to provide a basis for assessing the different expected economic effects of the proposed changes to the current Project on various interest groups, income classes, and economic units. Economic units are defined as regional or local economies that have a common economic bond and destiny. Interest groups include stakeholders in distinct sectors of the economy. The study measured predicted economic consequences of the changes to the current Project in terms that are most meaningful to these economic units and interest groups.

The economic perspectives of importance in this analysis are those of the region, subregions, income classes, and stakeholder groups so that the measurements reflect the narrow interest of such groups, ignoring the effects on others. The analysis contrasted economic gains and losses among various entities within the region of direct influence.

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The results detailed the estimated economic impacts on the regional economies in terms of earnings, employment, and value of production from the proposed changes to the Project.

Other Regional Socioeconomic Effects

The study describes socioeconomic resource effects for each of the identified subregions in the study area. Resources include the following:

- Population
- Housing
- Local government fiscal conditions
- Public services (police, fire, emergency personnel, schools)
- Infrastructure (transportation, utilities)
- Locations of businesses and households

Geographic Scope. The purpose of this section is to identify the communities in the Project area that may experience varied socioeconomic effects.

Pathway to Socioeconomic Endpoints. The changes to the current Project either directly affected socioeconomic resources or indirectly affected them through changes in other resources. The projected impact of the changes in the current Project on population, housing, local government fiscal conditions, public services (such as police, fire, emergency personnel, schools) was assessed qualitatively and with the use of socioeconomic models integrated directly with the regional economic impact models. The analysis focused on the areas of greatest impact.

Inputs or Data Requirements. This study used data obtained from resource agencies, local government, and tribal officials, members of the public as well as Internet sources, public reports and data, published literature, and information obtained from the other resource studies.

Model Development. This study focused on those socioeconomic factors that are likely to be influenced by the proposed changes in the current Project, including potential PM&E measures. This put incremental Project effects on such resources into perspective relative to the communities' broader concerns. Changes in the socioeconomic resources were evaluated relative to the current condition.

Once the current conditions were defined in Phase 1, this step assessed the nature and extent of the incremental Project's effects on those conditions. This analysis relied on the other resource reports and other data sources to describe the necessary relationships between the proposed changes to the current Project and the resources that served as inputs into the socioeconomic study. For example, any changes in construction employment may lead to changes in local populations and place increased demands on housing and public services. Also, construction activities may stress the local infrastructure. As an alternative example, changes in the suitability of the recreation opportunities in a given region will result in changes in the demands for local goods and services and potentially employment that may lead to changes in local populations. These socioeconomic effects are typically measured in connection with the regional economic modeling activity.

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The nature and extent of potential incremental Project impacts on the region was assessed for each of the relevant aspects of socioeconomic resources, as follows (the scope of these assessments was refined subsequent to completing the first phase analysis and to having a description of the proposed Project):

Population. This aspect addressed the extent to which the changes in the current Project induce or could induce changes in the local population that could affect the region.

Housing. This aspect evaluated the availability of local housing to accommodate any incremental Project-induced in-migration.

Local and Tribal Government Revenues and Expenditures. This section relies on information from PacifiCorp to address increases or decreases in local taxes or fees paid by PacifiCorp because of the changes to the current Project.

Public Services. This section evaluates effects of potential changes in Project operations or facilities on local service providers for police, fire, emergency personnel, medical services, and schools.

Recreation Resources. The changes in resources to support recreation (especially boating, shoreline day-uses, camping, angling, mining, and whitewater boating) resulting from potential changes in current Project operations or facilities in the study area was described in the recreation resource report, as detailed in Study Plans 3.1 and 3.2. The socioeconomic study incorporated those findings as appropriate. In addition, the socioeconomic study described the estimates of changes in visitor recreation patterns and expenditures resulting from potential changes in Project operations or PM&E measures. Finally, the socioeconomic study reported on the potential negative impacts of recreation activity to American Indian tribes and people.

Infrastructure. Two types of infrastructure were addressed in the socioeconomic study: utilities (water, wastewater, electricity) and transportation (roads, highways, and bridges).

Utilities. This section assesses effects of the potential changes in current Project operations or facilities on services and costs of water and stormwater, wastewater treatment, solid waste disposal, electricity, and natural gas. The assessment includes a qualitative discussion of how Project costs may affect rates and rate setting as well as a discussion of the existing contract PacifiCorp has with USBR, the Link River Agreement. While the existing contract has a strong nexus to the existing FERC license, it is unknown what, if any, agreements will be made going forward between PacifiCorp and the federal government.

Transportation. This section analyzes truck traffic generated by potential changes in current Project operations or facilities. Estimates were added to the future traffic estimates and the effects evaluated using standard roadway capacity analysis. This section also addresses the changes in recreation travel patterns as a result of the Project, using information on changing recreation visitation as derived by the recreation resource studies.

Environmental Justice. This section examines differences between the proposed and current Project as they relate to environmental, economic, social, or health effects on low-income and/or minority populations living in the study area to determine any disproportionate placement of burden on such groups.

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Locations of Businesses and Households. This section relies on information from the land use (Study Plan 4.1) and the recreation studies (Study Plans 3.1 to 3.5), as well as PacifiCorp, to ascertain whether the Project changes would displace or otherwise physically affect any businesses or residences. PacifiCorp would develop acquisition procedures, relocation assistance, and other mitigation alternatives as needed.

Key Assumptions/Constraints. The socioeconomic study specialists coordinated with the tribes and the cultural study specialists to seek information from the tribes on the interrelationships between natural resources, tribal cultures, and changes in the socioeconomic conditions of the tribes resulting from the proposed changes to the current Project.

Results. The results of the study were consist with an evaluation of incremental Project impacts on socioeconomic conditions.

Net Economic Benefits

The benefit-cost analysis identified and evaluated the benefits and costs related to the differences between the proposed Project and the current Project. This type of analysis is the standard economic method for determining whether the benefits exceed the costs. This analysis is more complete than the regional economic impact analysis, in part because it includes key nonmarket values such as recreation. The purpose of the benefit-cost analysis is to identify and describe the expected market and nonmarket economic benefits and costs associated with the proposed changes to the current Project. To the extent that such effects are quantified in dollar terms, they can then be aggregated to compute net economic benefits. In addition, some net benefits can be described in qualitative terms or quantitative terms using nonmonetary metrics (e.g., ecological metrics), so that they, too, can be factored into the assessment of economic efficiency. Market and nonmarket effects may include (but are not limited to) the following resources:

- Power Production
- Market, nonmarket, and indirect effects from changes in ecological services (e.g., restored sport, commercial and tribal fisheries; restored aquatic habitat, changes in property values, changes in flood moderation, changes in municipal water supply, changes in irrigation water supply)
- Real resource costs associated with constructing, operating and maintaining new facilities and/or removing or altering existing facilities
- Real resource costs associated with changes in Project operations
- Real resource costs associated with potential PM&E measures

The list of potential Project benefits and costs depends on clear descriptions of the proposed Project.

Geographic Scope. The benefit-cost analysis attempted to capture the significant economic effects of the potential Project changes to make a determination on net economic benefits. The analysis assumed a national perspective for purposes of determining net economic benefits.

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Pathway to Economic Endpoints. This task was to identify the linkages between the proposed Project and the resources that would be affected by the differences between the current Project and the proposed Project. The above list includes examples of economic benefits and costs associated with the Project. The primary Project purpose is to supply power. In addition, hydroelectric power production involves the use of natural resources and thus alters the ecological service flows that are generated by those natural resources. This task was to conceptually trace through the hydrologic-ecological-economic linkages to describe how the proposed Project can lead to changes in market, nonmarket, and indirect effects relative to a continuation of the current Project and PM&E measures. Some of the economic values associated with this list are market commodities and others are not.

The sector models allow assessment of the benefits and costs of the Project changes on the market values (commercial fishing, agriculture, and water supply). These models allow translation of listed impacts into changes in consumer and producer surplus—a translation required for benefit-cost analysis that is a step beyond the analysis of impacts. In addition, alternative methods for evaluating the anticipated economic effects from changes in the ecological services due to the proposed changes to the current Project are assessed.

Inputs or Data Requirements. The specific data requirements depend on the results of the pathway analysis and the approaches adopted for estimating changes in producer and consumer surpluses or otherwise characterizing the expected economic effects resulting from the proposed changes to the current Project. Data needs are identified below for a subset of potential effect categories.

- **Power Production Data Requirements.** For the changes in power production resulting from the proposed Project (measured relative to power production under the existing license) information was needed on:

  - Most likely alternative source of power
  - Estimate of the cost savings relative to the most likely alternative source of power.
  - Estimate of pollutant/emission units avoided due to the potential Project
  - Cost per unit of emission reduction

  Any such cost-savings represent an economic benefit of the Project and were described in both qualitative and quantitative terms.

  Information was also needed on the real resource costs associated with the changes in power production, including the following:

  - Constructing, operating, and maintaining new facilities and/or removing or altering existing facilities
  - Changes in Project operations
  - Changes in PM&E measures
  - Changes in unmitigated ecological service losses

  These real resource costs were described in quantitative and qualitative terms. Data needs associated with direct expenditures related to changes in the Project facilities, operations, or PM&E measures are listed in the Sector Analysis section of the study plan.

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- **Market, Nonmarket, and Indirect Effects of Changes in Ecological Services.** Besides producing power, hydroelectric projects can provide water supply (e.g., municipal and industrial water supply and irrigation water) and flood moderation services. Although the Project was not designed to provide these services, it does provide a limited quantity of each of these services. This task identified the data needs associated with evaluating the expected changes in such services resulting from the proposed changes to the current Project.

  As was mentioned above, hydroelectric projects can also affect other natural resources, especially the river. Potentially affected ecological services include instream flow and water quality and the biological resources that depend on these attributes. Potential economic goods and services affected by changes in the current Project and PM&E measures include changes in recreation opportunities (especially whitewater boating and sportfishing), tribal fishing opportunities, commercial fishing output, cultural resources, passive use values, and property values. Again, the specific data needs depend on the method of analysis. Table 4.4-1 identifies methods of analysis corresponding to the different types of effects.

Model Development. This section defines benefits and costs, describes the theoretical basis for measuring them, and suggests the appropriate valuation methods. PacifiCorp measured benefits and costs against the current operation of the Project under its existing license and the current waterway environment as the baseline existing Project. Economic benefits are usually assessed by completing a separate valuation of each Project effect. An example of economic valuation methods for selected potential Project benefits is provided in Table 4.4-1. Column one identifies the resources potentially affected by the Project. The economic benefits associated with such changes are listed in column two. Often the same beneficial effect, such as sportfishing, can be affected by multiple resources. Therefore, approaches that capture the combined influence of multiple resource changes may be required to avoid double counting of benefits. This cautionary note also applies to the third column, which identifies valuation methods to estimate the economic benefits.

This analysis quantified the impact on resources that can be measured in dollars by translating them into a benefit-cost accounting framework. It analyzed data that cannot be measured in dollars by qualitative analyses or analysis methods that quantify effects in units other than dollars (e.g., ecological units).

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Table 4.4-1. Summary of resources and associated benefits of the ecological services.

Resource	Benefits	Valuation Method
Water Quality	Market Commodities • Guided Recreation/ecotourism • Fish (commercial fishing)	• Market Supply and Demand • Ex-vessel landings and prices
	Nonmarket Commodities • Recreation (sportfishing, near shore recreation, swimming) • Aesthetics (property values)	• Recreation demand (travel cost demand, random utility models) • Stated preference • Hedonics • Benefit Transfer
	Indirect: Ecosystem Services • Aquatic habitat • Other?	• Stated preference • Habitat equivalency analysis
	Passive Use values	• Stated preference • Benefit transfer
Fisheries	Market Commodities • Fish (commercial fishing)	• Market Supply and Demand
	Nonmarket Commodities • Sportfishing • Subsistence Fishing	• Recreation demand (travel cost demand, random utility models) • Stated preference • Hedonics • Benefit Transfer
	Passive use values	• Sated preference • Benefit Transfer

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Table 4.4-1. Summary of resources and associated benefits of the ecological services.

Resource	Benefits	Valuation Method
Hydrology (Instream flow, water quantity, water levels)	Market Commodities • Fish (Commercial fishing) Nonmarket Commodities • Recreation opportunities (whitewater boating, flat water boating, sportfishing, near shore recreation) • Subsistence fishing • Aesthetics (Property values) Indirect Ecosystem Services • Irrigation • Flood Control • Water supply • Sediment trapping • Other? Passive Use Values	• Market Supply and Demand • Recreation demand (travel cost demand, random utility models) • Stated preference • Hedonics • Benefit Transfer • Production function (cost savings) • Averted behavior • Stated preference • Habitat equivalency analysis • Stated preference • Benefit transfer
Terrestrial	Market Commodities Nonmarket Commodities Indirect Ecosystem Services	
Visual/Aesthetics	Nonmarket Commodities	
Cultural	Nonmarket Commodities • Cultural enhancements • Cultural recreation/education opportunities Tribal Values Passive Use Values	• Recreation demand (travel cost demand, random utility models) • Stated preference • Hedonics • Benefit Transfer • Ethnographic study • Stated Preference • Benefit Transfer
Recreation Facilities/Access	Nonmarket Commodities • Recreation Opportunities	• Recreation demand (travel cost demand, random utility models) • Stated preference • Benefit Transfer

The economic cost analysis is the opportunity cost to society of diverting resources away from the production of other valued goods and services. The initial step in a cost assessment is similar, no matter which approach is ultimately selected. This step involves modeling or otherwise predicting the incremental Project's affect on the behavior of private industry, individuals, and governments. The costs are then modeled using one of four approaches:

- Direct cost method
- Partial equilibrium analysis
- Multimarket models
- General equilibrium analysis

The economics study team described these valuation methods and recommended a cost estimation method for each effect resulting from changes in the current Project. For example, incremental costs related to constructing, operating, and maintaining facilities were estimated using the direct cost method, which relies on standard engineering-cost-estimation methods. PacifiCorp estimated all other costs (by using a partial equilibrium approach).

Key Assumptions/Constraints. The benefit-cost analysis is constrained by the existence of behavioral models with appropriate linkages to the potential Project hydrologic modifications, ecosystem changes, and cost and productivity estimates from various other studies.

Not all effects were quantified in dollars.

Generally, the results of the benefit-cost analysis are sensitive to the choice of discount rate. EPA recommends a rate of 2 percent to 3 percent for public projects as this rate is believed to most closely approximate the consumption rate of interest (EPA, 2000). Office of Management and Budget recommends a 7 percent rate, as an estimate of the average pretax rate of return generated by private sector investments (OMB, 1992). The current U.S. Army Corp of Engineers policy requires a 6 1/8 percent discount rate.

Results. The benefit-cost analysis produced measures of the net economic benefits of the proposed changes to the current Project. The study team estimated the net benefits from a national point of view. Net benefits were characterized using a combination of monetary and nonmonetary units as well as qualitative terms. The discussion included information related to how the benefits and costs were distributed among identifiable subgroups of the population.

4.4.1.4 Geographic Scope of Socioeconomic Analysis

The geographic scope of the socioeconomic analysis is determined by the incremental Project's sphere of influence on the socioeconomic environment. Thus, the Phase 1 study:

- Identifies a relevant study area for assessment of impacts
- Identifies potentially affected communities and potentially relevant ordinances.

The preliminary study area for the socioeconomic analysis included Klamath, Jackson, and Curry counties in Oregon and Siskiyou, Humboldt, and Del Norte counties in California, as these are the counties that contain the Project boundaries or whose economies, local services, and human resources are potentially affected by the proposed changes to the current Project. Even within these counties, the nature and extent of the incremental Project effects included in the socioeconomic study were limited by the study areas of the other resource studies that provide inputs into the socioeconomic analysis.

Readily accessible socioeconomic data were collected and presented for two additional regions within the above-mentioned state and county boundaries. The regions consist of two corridors

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extending from the Link River dam down the Klamath River to the Ocean, at which point they spread to the coast terminating at the boundaries of the KMZ (Humbug Mountain, Oregon, and Horse Mountain/Shelter Cove, California). One corridor extends 5 miles on each side of the river and 5 miles inland at the coast. The other region extends up to 50 miles each side of the river and up to 50 miles inland along the coast. Where possible, interrelationships between changes in current Project operations and PM&E measures and the socioeconomic factors pertinent to these regions are described.

PacifiCorp is studying the feasibility of and potential options for reintroducing anadromous fish populations to areas upstream of Iron Gate dam, as well as potential enhancements to existing anadromous fish populations below Iron Gate dam. Based on the results of these ongoing investigations, PacifiCorp will consider whether or not additional socioeconomic analyses are warranted.

4.5 RELATIONSHIP TO REGULATORY REQUIREMENTS AND PLANS

The socioeconomic study provides the information necessary to satisfy FERC license application requirements specific to Project-related incremental effects on the socioeconomic environment as specified in the applicable sections of 18 CFR Part 4 and 16.

4.6 TECHNICAL WORK GROUP COLLABORATION

Please refer to Section 2.6 for a summary of the socioeconomic work group collaboration. For more information on the collaborative process, refer to Appendix E-1A in Exhibit E of the final license application.

4.7 STUDY OBSERVATIONS AND FINDINGS

4.7.1 Description of the Affected Environment

This section summarizes the proposed Project and PM&E measures as they relate to changes in resources that impact the socioeconomic condition. The proposed Project-induced resource changes and PM&E measures that could affect the socioeconomic condition are described below.

4.7.1.1 Recreation Resources

Proposed improvements and increased management presence at selected recreation sites (primarily on Iron Gate reservoir) would allow for some increased use levels while minimizing visitor and resource conflicts. These proposed improvements are summarized in Section ES7.0 of the Executive Summary to the final license application and are described in detail in the Recreation Resource Management Plan (RRMP). In addition, the recreation specialists used the available information from the aquatics, hydrology, and water quality specialists and their best professional judgment to assess potential Project-induced affects on the suitability of the Project area to support the various types of recreation activities. It is estimated that recreation visitor days will increase in the Upper Klamath River area over time and that a portion of that increase would be caused by the proposed PM&E measures. The induced increment to annual visitation would increase from about 3,300 recreation days upon implementing the new measures to about 19,000 visitor days per year.

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4.7.1.2 Water Quality and Fish Habitat

The decommissioning plan, the Fish and Water Quality FTRs, and sections of Exhibit E are the resources to consult for additional details. Removing the Link River hydroelectric development from service will result in a net benefit to the listed sucker species (and other species) by eliminating entrainment and by improving water quality in the Link River. Although this action will not lead to allowable harvests of the sucker species, it is of cultural consequence to the Klamath tribes. In addition, this action will increase the amount of usable habitat for all aquatic species, including state of Oregon sensitive species redband trout (also recognized as a species of concern by federal resource management agencies) and slender sculpin, and it will aid in fish migration through the Link River reach. ODFW (1997) reported that redband trout in the Klamath River are a unique stock indigenous to the river and its tributaries and referred to them as the "Klamath River redband stock." These enhancements are not expected to lead to changes in sport or subsistence catch.

In all, the aquatics and water quality PM&E measures are expected to increase water quality, increase habitat for resident species, increase spawning habitat for trout and other resident species, enhance trout habitat connectivity, and have a dampening affect on stranding, which is already negligible. Several PM&E measures are anticipated to benefit anadromous populations downstream of Iron Gate dam. Continued operation of the Iron Gate fish hatchery is expected to maintain the hatchery's contribution to downstream populations. Without the hatchery, there would likely be a significant loss in harvestable fish. Two other measures would contribute favorably to downstream populations: (1) Heating of steelhead egg incubation water will allow for larger smolt size at release and increased smolt-to-adult survival; (2) An enhanced data collection effort is proposed to improve management and thus the long-term viability of the in-river anadromous fishery. These changes would benefit the downstream in-river sportfishery, American Indian commercial and subsistence fisheries, ocean salmon sportfishery, and commercial fishery.

4.7.1.3 Wildlife and Botanical Resources

The terrestrial PM&E measures will (1) reduce the level of adverse impact to vegetation and wildlife next to Project facilities, recreation sites, roads, and power lines; (2) improve wildlife habitat connectivity through enhanced flows for riparian habitat in the J.C. Boyle bypass and peaking reaches and on-site habitat restoration activities along Project reservoirs and river reaches; and (3) provide a monitoring plan to track habitat improvements. The details on these measures and enhancements are provided in the Terrestrial Resources FTR. The net effect of these enhancements would be to increase the value of wildlife and botanical resources and the quantity and quality of the ecological services that these resources provide to the public.

4.7.1.4 Visual and Aesthetic Resources

The visual and aesthetic resources study identified several Project facilities that present a moderate or high degree of contrast with the natural environment that could be reduced through painting or vegetative screening. The benefit of implementing these visual enhancements would be improved quality of the visual environment.

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The following measures to enhance visual and aesthetic resources in the Project area are proposed. These measures are described in more detail in the RRMP.

J.C. Boyle

- Red Barn—The operations and maintenance building (known as the red barn) is visible across the J.C. Boyle reservoir from the Topsy recreation site and presents a moderate degree of contrast. The visibility of the barn could be reduced through vegetative screening or painting it a more neutral color.

- Powerhouse Facilities—The J.C. Boyle powerhouse facilities present a high degree of contrast with the natural landscape. In particular, the penstock, surge tank, and powerhouse covers are painted a light tan color that is highly visible from nearby areas. The visual contrast of some or all of these facilities could be reduced through vegetative screening or painting a more neutral color. Although not a Project feature, the J.C. Boyle substation also is visible from a short distance down the canyon. Visibility could be reduced through vegetative screening.

Iron Gate

- Powerhouse Facilities—The Iron Gate penstock is painted a light tan color that contrasts with the reddish iron color of the back of the Iron Gate dam. This contrast is observed down river. The contrast could be reduced by painting the penstock and powerhouse covers a color that matches the color of the dam.

These enhancements would tend to increase the quality of the recreation and sightseeing opportunities in the affected areas.

4.7.1.5 Cultural Resources

PacifiCorp contracted with the Klamath River Inter-Tribal Fish and Water Commission to produce an integration report that will be based on the results of tribal ethnographic studies prepared by the Klamath, Shasta, Karuk, and Yurok tribes. (See the Cultural Resources FTR and the cultural sections of the final license application for details.) The individual tribal studies documented the critical importance of the Klamath River and its salmon and other associated resources to their past culture and to the continuation of their present and future culture. The tribal reports urged recognition and documentation of a National Register of Historic Places (NRHP)-eligible ethnographic riverscape. The forthcoming integration report will discuss common themes among the Klamath basin tribes and provide a basinwide overview, evaluation, and assessment of broad tribal concerns about basinwide water management and its effects on historic properties. Management implications of possible designation of a NRHP eligible riverscape will be explored in the integration report.

Enhancement measures for cultural resources are primarily embodied within the FERC-required Historic Properties Management Plan (HPMP). The HPMP in preparation now will:

- Take into consideration the management actions prescribed in other plans required by the new license, such as recreation plans, wildlife management plans, or fisheries plans

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- Identify the nature and significance of historic properties that may be affected by Project maintenance and operation and any proposed improvements to Project facilities and public access

- Identify goals for the preservation of historic properties, establish guidelines for routine maintenance and operation, and establish procedures for consulting with appropriate State Historic Preservation Offices (SHPOs), Tribal Heritage Preservation Officers (THPOs), Indian tribes, historic preservation experts, and the interested public concerning effects on historic properties or contributing elements of a historic district

4.7.1.6 Power Production

As described in Exhibit D of the final license application, PM&E changes to operation of the Project will result in a 23.2 million kWh reduction in average annual power generated at the Project.

4.7.1.7 Other Resources

Any proposed Project-induced changes in municipal water supply, flood control, irrigated agriculture, or property values are expected to be minimal.

4.7.2 Assessment of Project Impacts

This section summarizes the results of the analyses of key socioeconomic questions related to the proposed Project and PM&E measures. The proposed Project-induced resource changes and PM&E measures affect various aspects of the socioeconomic condition, including local economic development (e.g., employment and earnings), economic development-induced changes in other local socioeconomic resources (e.g., population growth, use of community resources), and net social benefits.

4.7.2.1 Economic Development

Regional economic impacts were evaluated for the construction and recreation sectors, as well as for other industry sectors. The following sections describe the assumptions and methods used to evaluate these impacts.

Regional Economic Impacts to the Construction Sector

Because the construction activities related to Project improvements are limited to the upstream region, an IMPLAN input-output (IO) model of the upstream region was constructed. The upstream region comprises Klamath and Jackson counties in Oregon, and Siskiyou County in California.

For this analysis, the following assumptions were made:

- The region of influence for the economic impact analysis is the upstream region, which comprises Klamath and Jackson counties, Oregon, and Siskiyou County, California.

- Disposable labor income is 70 percent of total labor income.

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- The base year of analysis is 2000[2], but the impacts were adjusted to reflect year 2003 price levels.

Construction of proposed PM&E measures is expected to occur over a 5-year period beginning in 2006. The total capital costs over the 5-year period for these Project improvements and enhancements is $34,405,778 in 2003 dollars. Annual capital expenditures are expected to be the same for each year. The labor and materials portions of the $34,405,778 are $15,230,883 and $19,174,895, respectively. Table 4.7-1 shows the capital cost estimates over the 5-year construction period by the resource area as well as the total annual capital costs across all resource areas. In addition to the split between labor and materials, Table 4.7-1 shows the local portion of the expenditures on labor and materials.

The operation of the proposed Project and PM&E measures is expected to commence in 2006 and continue throughout the 30-year license period. As with the costs associated with the construction phase of the PM&E measures, the costs associated with the O&M phase are also split between labor and materials as well as local and nonlocal. Table 4.7-2 shows the total O&M costs of the proposed Project and PM&E measures over the 30-year license period as well as the total annual O&M costs across all resource areas. In addition to the split between labor and materials, Table 4.7-2 shows the local portion of the expenditures on labor and materials.

Because regional economic impacts arise from the infusion of "exogenous" dollars into the local economy, only the local portion of the expenditures on labor and materials are used to evaluate the economic impacts of expenditures on construction materials and labor. For this analysis, the local portion of the expenditures on labor was assumed to be the disposable portion of the income received by the local labor while the local portion of the expenditures on materials was assumed to be the entire amount.

The construction sector impacts were evaluated for the actual construction and for the operation of the facility. The following sections describe the impacts associated with the construction and operation phases of the proposed Project and PM&E measures.

[2] Available IMPLAN model.

Table 4.7-1. Capital cost of proposed Project and PM&E measures, 2003 dollars.

Resource Area	Total Capital Cost	Percent Labor/ Materials	Labor	Materials	Percent Local Labor	Percent Local Materials	Local Labor	Local Materials
Aquatic	$15,072,778	30/70	$4,521,833	$10,550,945	60	60	$2,713,100	$6,330,567
Water Resources	$1,010,000	40/60	$404,000	$606,000	60	50	$242,400	$303,000
Terrestrial	$837,000	65/35	$544,050	$292,950	90	90	$489,645	$263,655
Recreation, Visual, Land Use	$11,266,000	50/50	$5,633,000	$5,633,000	70	50	$3,943,100	$2,816,500
Cultural	$5,370,000	65/35	$3,490,500	$1,879,500	75	80	$2,617,875	$1,503,600
Decommissioning	$850,000	75/25	$637,500	$212,500	75	80	$478,125	$170,000
TOTAL	**$34,405,778**		**$15,230,883**	**$19,174,895**			**$10,484,245**	**$11,387,322**
Annual Capital Cost*							**$2,096,849**	**$2,277,464**

Source: PacifiCorp, 2004.

* Annual costs are estimated by dividing the total costs by the number of years.

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Table 4.7-2. Operations and maintenance cost of PM&E measures, 2003 dollars.

Resource Area	Total O&M Cost	Percent Labor/ Materials	Labor	Materials	Percent Local Labor	Percent Local Materials	Local Labor	Local Materials
Fisheries	$26,775,840	30	$8,032,752	$18,743,088	90	70	$7,229,477	$13,120,162
Water Resources	$5,190,000	40	$2,076,000	$3,114,000	90	70	$1,868,400	$2,179,800
Terrestrial	$2,290,000	65	$1,488,500	$801,500	90	90	$1,339,650	$721,350
Recreation, Visual, Land Use	$6,951,000	50	$3,475,500	$3,475,500	95	50	$3,301,725	$1,737,750
Cultural	$2,750,000	65	$1,787,500	$962,500	90	80	$1,608,750	$770,000
Decommissioning	$0		$0	$0			$0	$0
TOTAL	$43,956,840		$16,860,252	$27,096,588			$15,348,002	$18,529,062
Annual O&M Cost*							$511,600	$617,635

* Annual costs are estimated by dividing the total costs by the number of years.

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Construction Phase. Table 4.7-3 shows the regional economic impacts arising from the annual construction capital expenditures on labor and materials. As the numbers in the table show, in addition to the direct employment (about 40 per year)[3] resulting from the $2,096,849 in local construction payroll expenditure, the construction phase of the proposed PM&E measures would result in secondary (indirect and induced) employment within the upstream region. Thus, the estimated annual indirect and induced employment within the upstream region would be 26 and 27 jobs, respectively. The annual estimated indirect and induced income within the region would be $981,219 and $664,202, respectively, in 2003 dollars. In addition, there would be an annual estimated $2,546,923 and $2,402,639 in indirect and induced industry output, respectively, in 2003 dollars.

Owing to the short-term nature of construction, the regional economic impacts associated with the construction of the proposed PM&E measures are temporary.

Operation Phase. Table 4.7-3 also shows the regional economic impacts arising from the annual O&M expenditures on labor and materials. As the numbers in the table show, in addition to the direct employment (about eight additional full-time equivalents [FTEs])[4] resulting from the $511,600 in local O&M payroll expenditure, the operational phase of the proposed Project and PM&E measures would result in secondary (indirect and induced) employment within the upstream region. Thus, the estimated annual indirect and induced employment within the upstream region would be 11 and 15 jobs, respectively. The annual estimated indirect and induced income within the region would be $400,151 and $371,829, respectively, in 2003 dollars. In addition, there would be an annual estimated $865,490 and $1,013,267 in indirect and induced industry output, respectively, in 2003 dollars.

Table 4.7-3. Estimates of indirect and induced impacts associated with the construction and operation phases of the proposed Project and PM&E measures.

	Construction Phase	**Operation Phase**
Employment		
Indirect	26	11
Induced	27	15
Total Secondary Employment	53	26
Personal Income		
Indirect	$981,219	$400,151
Induced	$664,202	$371,829
Total Secondary Personal Income	$1,645,421	2,073,869
Industry Output		
Indirect	$2,546,923	$865,490
Induced	$2,402,639	$1,013,267
Total Secondary Industry Output	$4,949,562	5,180,766

Income estimates are in 2003 dollars.

[3] Assuming an average hourly construction wage of $25.50, including benefits, which translates to an annual FTE construction wage of $53,000.

[4] Assuming an annual $65,000 per FTE for operations and maintenance personnel.

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Owing to the longer-term nature of operation, the regional economic impacts associated with the operation of the proposed Project and PM&E measures are permanent. However, these economic impacts are likely to change if the underlying economic linkages and leakages that produced them change over the course of the operation of the proposed Project and PM&E measures. Moreover, economies adjust over time such that what may be seen as an increase in income and employment may actually be the result of shifts in resource use between the various industries in the economy. Thus, the additional jobs and income discussed in the preceding paragraphs may not necessarily represent a net gain for the region in the long term.

Regional Economic Impacts to the Recreation and Tourism Sector.

Regional economic impacts of recreation are typically assessed on the basis of visitor trip expenditures[5] The money spent by visitors on food, lodging, and transportation is the input into the local economy. Proposed improvements and increased management presence that impact/affect the amount or type of money spent will affect the local economy. For this study, the economic impacts evaluated are those due to the incremental changes in visitation levels that are caused by the changes in Project operations and PM&E measures under the terms of the proposed Project measured relative to a continuation of the existing Project.

Typically, only the trip expenditures of nonresident visitors are considered when assessing the impact of recreation on a local economy. The primary reason for excluding local residents' trip expenditures is that these expenditures do not represent infusions of new dollars into the local economy. However, any changes in the visitation levels brought about by the proposed improvements and increased management presence that result in increased recreation opportunities are likely to shift trip destinations so that more residents stay in the region. This would have the effect of reducing leakages out of the local economy. Thus, there would be a net increase in money spent on recreation in the local economy, leading to a positive economic impact. But most studies do not include expenditures by local residents as regional economic impacts; rather the prevailing assumption is that local residents would shift their expenditures to other local goods and services (English et al., 1995).

Upper Klamath River Area. Proposed improvements and increased management presence in the Klamath Hydroelectric Project area are described in the Recreation Section of license application and FTR. On this basis an IMPLAN input-output (IO) model of the upstream region was constructed. The upstream region is comprised of Klamath and Jackson Counties in Oregon, and Siskiyou County in California.

For this analysis, the following assumptions were made:

- The region of influence for the economic impact analysis is the upstream region which is comprised of Klamath and Jackson Counties, Oregon and Siskiyou County, California.

- The base year of analysis is 2000[6], but the impacts were adjusted to reflect year 2003 price levels.

[6] Available IMPLAN model.

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Two data sources were used to derive the total trip expenditures by expenditure category. The changes in visitation levels resulting from the proposed PM&E measures were based on the estimates developed by EDAW. EDAW conducted the recreation surveys for PacifiCorp as part of the relicensing studies (see Appendix 4A and the Recreation Resources FTR). Visitation levels are in terms of recreation days which is assumed to be the same as a visitor day. Visitor trip expenditure data also came from the EDAW 2002 survey (see Table 2.7-40 in this report for the average expenditures per person across all expenditure categories in 2002 dollars). Table 4.7-4 shows the incremental change in visitor days under the proposed PM&E measures for 2010 (the first year after all the proposed PM&E measures have been implemented) and 2036 (the end of the license period) for all recreation activities.

Table 4.7-4. Incremental change in visitor days under the proposed PM&E measures

Recreation Activity	Year 2010	Year 2036
Waterskiing	600	2,030
RV camping	420	1,440
Power boating	190	650
PWC use	80	260
Sightseeing	340	1,160
Swimming	180	620
Target Shooting	150	520
Wildlife viewing	330	1,130
Hiking	360	1,210
Whitewater boating	160	550
Fishing	1,400	4,750
Tent camping	330	1,110
Resting/relaxing	1,060	3,590
Total	5,600	19,020

Source: EDAW, Inc.

The proportion of local to nonlocal visitors is assumed to be the same as that from the EDAW survey for all the recreation activities[7]. In the case of whitewater boating, all visitors are assumed to be nonlocal within the 50-mile buffer area (essentially at the county level). Table 4.7-5 shows the local portion of the per visitor trip expenditures by expenditure type for all recreation activities.

[7] The following assumptions were made with respect to the nonlocal visitors as a percentage of the overall number of visitors in each recreation activity: Boat Fishing (88%), Waterskiing (93%), Resting/Relaxing (81%), Shoreline Fishing (80%), RV Camping (87%), Other (79%), and No Primary (87%).

Table 4.7-5. Nonlocal per visitor trip expenditures by expenditure type in 2002 dollars.

Recreation Activity	Accommodations	Food and Beverages	Transportation	Supplies and Services	Guide Fees	Expenditures/ person/visitor day[1]
Boat Fishing	$0.33	$1.57	$1.44	$0.77	$0.28	$4.39
Waterskiing	$0.05	$2.83	$3.13	$1.26	$0.00	$7.27
Resting/Relaxing	$0.09	$1.01	$1.23	$0.97	$0.00	$3.30
Shoreline Fishing	$0.58	$1.36	$4.47	$2.08	$0.00	$8.49
RV Camping	$0.12	$2.10	$2.68	$2.28	$0.00	$7.17
Whitewater Boating (Lower Bound)[2]	$5.00	$5.00	$5.00	$5.00	$94.50	$155
Whitewater Boating (Upper Bound)[3]	$50.00	$10.00	$10.00	$10.00	$94.50	$215
Other	$0.30	$1.05	$1.02	$1.16	$0.13	$3.65
No Primary	$0.22	$1.44	$2.50	$1.55	$0.12	$5.83

Source: EDAW, Inc.

[1] The numbers in this column represent the nonlocal expenditures within the 50-mile buffer area (assumed to be the same as the county) whereas the numbers in Table 2.7-40 included local as well as nonlocal expenditures.

[2] Lower bound refers to the lower bound on expenditures ($5) shown in Table 2.7-58 for all expenditure categories with the exception of guide fees. Because commercial outfitters are assumed to account for 70 percent of the total whitewater boating activities on the upper Klamath, nonlocal visitor expenditures are adjusted to reflect this.

[3] Upper bound refers to the upper bound on expenditures ($50) shown in Table 2.7-58 for all expenditure categories with the exception of guide fees.

The regional economic impacts of recreation are evaluated using an IMPLAN IO model of the upstream region. The inputs into the IO model are the incremental nonlocal visitor expenditures by recreation activity shown in Tables 4.7-6 and 4.7-7, which are derived by multiplying the values in the two preceding tables, i.e., Tables 4.7-4 and 4.7-5, for the years 2010 and 2036, respectively.

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Table 4.7-6. Total nonlocal visitor expenditures by recreation activity for the year 2010.

Recreation Activity	Accommo-dations	Food and Beverages	Transportation	Supplies and Services	Guide Fees
Waterskiing[1]	$29	$1,624	$1,799	$724	$0
RV Camping	$50	$843	$1,076	$915	$0
Power Boating[1]	$9	$514	$570	$229	$0
PWC Use[1]	$4	$216	$240	$97	$0
Sightseeing[3]	$72	$470	$814	$503	$38
Swimming[3]	$38	$249	$431	$266	$20
Target Shooting[2]	$42	$151	$146	$166	$18
Wildlife Viewing[2]	$93	$332	$321	$366	$40
Hiking[3]	$76	$498	$862	$532	$40
Whitewater Boating (Lower Bound)	$766	$766	$766	$766	$20,675
Whitewater Boating (Upper Bound)	$7,658	$1,532	$1,532	$1,532	$20,675
Fishing[4]	$551	$2,013	$3,270	$1,614	$252
Tent Camping	$39	$662	$845	$719	$0
Resting/Relaxing	$95	$1,021	$1,244	$986	$0
Total (Lower Bound)	**$1,864**	**$9,357**	**$12,382**	**$7,882**	**$21,084**
Total (Upper Bound)	**$8,756**	**$10,123**	**$13,148**	**$8,648**	**$21,084**

[1] Assumed expenditures similar to Waterskiing.

[2] Assumed expenditures similar to Other.

[3] Assumed expenditures similar to No Primary.

[4] Assumed two-thirds of fishing is Boat Fishing and one-third is Shoreline Fishing.

All expenditure values are in 2000 dollars.

Numbers may not add up owing to independent rounding.

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Table 4.7-7. Total nonlocal visitor expenditures by recreation activity for the year 2036.

Recreation Activity	Accommo-dations	Food and Beverages	Transportation	Supplies and Services	Guide Fees
Waterskiing[1]	$97	$5,493	$6,088	$2,449	$0
RV Camping	$170	$2,889	$3,688	$3,136	$0
Power Boating[1]	$31	$1,759	$1,949	$784	$0
PWC Use[1]	$12	$704	$780	$314	$0
Sightseeing[3]	$246	$1,603	$2,501	$1,545	$117
Swimming[3]	$131	$857	$1,337	$826	$62
Target Shooting[2]	$147	$523	$506	$576	$63
Wildlife Viewing[2]	$319	$1,136	$1,099	$1,252	$136
Hiking[3]	$257	$1,672	$2,609	$1,612	$122
Whitewater Boating (Lower Bound)	$2,632	$2,632	$2,632	$2,632	$71,072
Whitewater boating (Upper Bound)	$26,323	$5,265	$5,265	$5,265	$71,072
Fishing[4]	$1,869	$6,828	$11,094	$5,477	$855
Tent Camping	$131	$2,227	$2,843	$2,417	$0
Resting/Relaxing	$321	$3,458	$4,212	$3,339	$0
Total (Lower Bound)	**$6,364**	**$31,780**	**$41,338**	**$26,359**	**$72,428**
Total (Upper Bound)	**$30,055**	**$34,413**	**$43,970**	**$28,991**	**$72,428**

[1] Assumed expenditures similar to Waterskiing.

[2] Assumed expenditures similar to Other.

[3] Assumed expenditures similar to No Primary.

[4] Assumed two-thirds of fishing is Boat Fishing and one-third is Shoreline Fishing.

All expenditure values are in 2000 dollars.

Numbers may not add up owing to independent rounding.

In 2010, the incremental changes in recreation contributes to the well being of the upstream region through the direct and secondary (indirect and induced) economic impacts resulting from visitor trip expenditures. Visitor expenditures are expected to generate one to two additional jobs in indirect employment and one additional job in induced employment. Visitor expenditures also generate $23,930 to $28,717 in indirect personal income and $5,373 to $6,442 in induced personal income to the regional economy of the upstream region. In addition, there would be an annual estimated $61,515 to $74,201 in indirect and $14,768 to $17,709 in induced industry output. Table 4.7-8 summarizes the estimates of indirect and induced economic impacts of visitor expenditures in 2010.

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Table 4.7-8. Estimates of indirect and induced impacts associated with incremental changes in recreation use, year 2010.

	Lower Bound	**Upper Bound**
Employment		
Indirect	1	2
Induced	0	0
Total Secondary Employment	1	2
Personal Income		
Indirect	$23,930	$28,717
Induced	$5,373	$6,442
Total Secondary Personal Income	$29,302	$35,159
Industry Output		
Indirect	$61,515	$74,201
Induced	$14,768	$17,709
Total Secondary Industry Output	$76,283	$91,909

Income estimates are in 2003 dollars.

In 2036, visitor expenditures are expected to generate five to six additional jobs in indirect employment and one additional job in induced employment. Visitor expenditures would also generate $81,032 to $97,486 in indirect personal income and $18,195 and $21,872 in induced personal income to the regional economy of the upstream region. In addition, there would be an annual estimated $208,328 to $251,929 in indirect and $50,011 to $60,116 in induced industry output. Table 4.7-9 summarizes the estimates of indirect and induced economic impacts of visitor expenditures in 2036.

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Table 4.7-9. Estimates of indirect and induced impacts associated with incremental changes in recreation use, year 2036.

	Lower Bound	Upper Bound
Employment		
Indirect	5	6
Induced	1	1
Total Secondary Employment	6	7
Personal Income		
Indirect	$81,032	$97,486
Induced	$18,195	$21,872
Total Secondary Personal Income	$99,226	$119,357
Industry Output		
Indirect	$208,328	$251,929
Induced	$50,011	$60,116
Total Secondary Industry Output	$258,339	$312,046

Income estimates are in 2003 dollars.

Most of the above changes in employment and income are expected to occur within the 5-mile buffer area, given that this is the area where most of the recreation activities occur. Because the 5-mile buffer area is contained within the 50-mile buffer area, the expected changes in employment and income also occur within the 50-mile buffer area. In the case of whitewater boating, the majority of outfitters are from outside the 5-mile buffer area. Thus, the impacts associated with guide fees are expected to primarily occur in the 50-mile buffer area and not in the 5-mile buffer area.

Lower Klamath River Recreation Area. The ongoing operations of the Iron Gate hatchery are considered a PM&E measure under the terms of the proposed Project. About 80 percent of total hatchery operation costs have historically been absorbed by PacifiCorp. To the extent that the Iron Gate fish hatchery contributes to fish harvest allocations to the in-river sportfishery and ocean sportfishery, it contributes to the regional economic activity of the recreation sector in the Lower Klamath River area, including the coastal communities along the KMZ. The Iron Gate fish hatchery contributes about half of the total hatchery fish in the system, with the remaining coming from the Trinity hatchery.

According to a Klamath River Technical Advisory Team report (KRTAT, 2003), hatchery fish accounted for about 38 percent of ocean abundance of Klamath River fall Chinook in 2003. Combining all of these factors and assuming a proportionate relationship between ocean abundance, harvest allocations, and recreational fishing effort, suggests that the Iron Gate fish hatchery operations PM&E measure contributes to about 15 percent (i.e., .8*.5*.38) of the in-river and ocean sport recreation associated expenditures. For an average year in the past quarter century, it is estimated that these sportfishing activities have contributed roughly $5 million a

year to the local economy in the Lower Klamath River area (see Section 2.7.3.3). At 15 percent, this means that the share due to the Iron Gate fish hatchery is about $.75 million a year in income expenditures.

Other Industry Sectors

It is not anticipated that the incremental changes resulting from the proposed Project and PM&E measures would affect changes in employment and earnings in any other sectors of the economy in Klamath and Jackson counties, Oregon, and Siskiyou County, California. Any changes in American Indian subsistence fishing in this region are anticipated to be minimal.

Downstream of Iron Gate dam, there are potential effects on American Indian commercial and subsistence fisheries and the ocean salmon commercial fishery resulting from the Iron Gate fish hatchery PM&E measures. Although the precise contribution is not known, a ballpark figure of 15 percent is estimated. In recent years, the ocean salmon fishery has contributed about $2 million a year to the incomes of the coastal communities in the study area, suggesting that the Iron Gate fish hatchery may have contributed about $0.3 million (see Section 2.7.3.3.). Because half the allowable harvest is allocated to the tribes, the American Indian commercial and subsistence fisheries are likely enhanced by an amount roughly equivalent to all other recreational and sportfisheries combined. The subsistence benefits are estimated in the National Social Benefits and Costs section below. The ballpark figure of $700,000 in average annual subsistence benefits attributable to the ongoing operations of the Iron Gate fish hatchery represents a contribution to the economic well-being of the tribes in the region. The American Indian commercial fishery is much smaller by comparison.

Because the Klamath Irrigation Project is a separate entity from the Klamath Hydroelectric Project, changes in the proposed Project and PM&E measures are not anticipated to have any discernible effect on irrigated agriculture.

Summary of Regional Economic Impacts

For the upstream counties, of the two major sectors whose regional economic impacts were evaluated in this section, construction has the larger impact on employment, income, and output. The impacts from recreation expenditures are relatively small. The creation of an additional 53 (construction phase) or 26 (operation phase) jobs is not significant enough to help reduce the high unemployment rates observed for the communities within the 5-mile or 50-mile buffer areas. Similarly, the additional income and output, though welcome, is not significant enough to help raise the low per capita incomes observed for these communities.

For the communities downstream of Iron Gate dam, the recreation, subsistence, and commercial salmon fisheries are likely to be affected by the proposed Project. The available information suggest that the Iron Gate fish hatchery PM&E measures could contribute roughly 15 percent of the income that is generated by these sectors.

Although any additional jobs and income are a welcome boon to the economies of the communities within the 5-mile and 50-mile buffer area during a period of relatively high unemployment, it is quite possible that the magnitude of these changes may be smaller than the model predicts. Economies adjust over time such that what may be seen as an increase in income and employment may actually be temporary. Over time, shifts in resource use between the

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various industries in the economy may have lead to an increase in local employment even without the proposed Project. Thus, after the first few years, the additional jobs and income may not necessarily represent a net gain for the region.

4.7.2.2 Other Regional Socioeconomic Resources

Because construction is a temporary activity and most of the construction workers are expected to commute from either inside the upstream region or from neighboring counties, effects on population and housing are expected to be minimal.

Changes in property values are anticipated to be minimal because (1) the anticipated improvements in water quality, terrestrial habitat, and fish habitat are not likely to lead to increased property values in the area, and (2) the anticipated changes in reservoir water levels do not appear to be significant enough to change property values near the reservoirs.

The only anticipated changes in property tax payments are those related to the East Side and West Side facilities. The decommissioning of these facilities might lead to the removal of a relatively small amount of property from the property tax rolls. At any rate, the taxes paid on the property represent less than 0.1 percent of the annual property taxes that Klamath County and the city of Klamath Falls collected during FY 2002 to 2003. As a result of the anticipated minimal changes in population, the proposed Project and PM&E measures are expected to have minimal impacts on local infrastructure and public services**.**

Project expenditures will need to be recovered through PacifiCorp's rate charges to its customers in its six-state service area. Because Project expenditures will not be directly offset by any associated project revenues or cost reductions, the utility's rates will need to be increased relative to their level under continued Klamath generation without the Project. Given the size of PacifiCorp's service area, expenditures on any one project have a relatively small impact on rates charged to retail customers. Nonetheless, PacifiCorp makes every effort to make prudent expenditures on each project so that the cumulative effect of expenditures on all projects keeps PacifiCorp's rates as low as possible while still providing safe, reliable, and environmentally responsible service.

PacifiCorp believes that Project expenditures meet this criterion. Expenditures are being prudently made. While they will significantly increase Project costs, there will be numerous, valuable environmental benefits.

4.7.2.3 Environmental Justice

In so far as the impacts resulting from the incremental changes in the proposed Project and PM&E measures have a beneficial or minimal impact on the environment, the impacts to low-income or minority populations living in the study are beneficial though minimal. Thus, there are no disproportionate placements of any adverse environmental, economic, social, or health impacts on minority or low-income populations from the incremental changes in the proposed Project and PM&E measures.

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4.7.2.4 National Social Benefits and Social Costs

This section identifies and evaluates the social costs and benefits related to the differences between the proposed Project and the current Project. The purpose of the benefit-cost analysis is to identify and describe the expected market and nonmarket economic benefits and costs associated with the proposed changes to the current Project. To the extent that such effects are quantified in dollar terms, they are aggregated to compute net economic benefits. In addition, some net benefits are described in qualitative or quantitative terms using nonmonetary metrics (e.g., ecological metrics), so that they, too, can be factored into the assessment of economic efficiency. The benefit-cost analysis is not a precise science. Rather, it is intended to summarize the available information to support judgements about the economic efficiency (i.e., Do the benefits exceed the costs?) of the action as a whole. First the social costs are summarized and then the social benefits.

Social Costs

The social costs of the Project will include investment in PM&E facilities, associated increases in operating costs, and losses in power generation.

Investment in PM&E facilities is projected to be $34.4 million. These investments will be made in specific resource areas, as shown in Table 4.7-10:

Table 4.7-10. PM&E resource area investments.

Resource Area	Millions of 2003 Dollars
Aquatic	$15.1
Water Resources	$1.0
Terrestrial	$0.8
Recreation, Visual, and Land Use	$11.3
Cultural	$5.4
Decommissioning	$0.8
Total	$34.4

The investments will be made between 2006 and 2010, the first 5 years of Project operation under the new FERC license. As shown in Table 4.7-11, average annual investment will be about $6.9 million during the 5-year time frame.

Annual operating costs for the PM&E facilities are also shown in Table 4.7-11. They will total approximately $1.5 million per year, with specific resource costs ranging from $76,000 for operation of the terrestrial facilities to $893,000 for operation of the aquatic facilities. This analysis uses the same Project costs as are used in Exhibit D, but costs are measured in real rather than nominal dollars.

As described in Exhibit D, PM&E changes to operation of the Project will result in a 23.2 million kWh reduction in average annual power generated at the Project. The value of this lost

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power resource was estimated to be approximately $1.6 million per year. This estimate is based on an average incremental power value of $70 per MW hour. This value of power was generated by PacifiCorp's internal market clearing price models and represents the marginal opportunity cost (or market value) of power, using an average of California-Oregon Border (COB) and Mid-Columbia values. The basis for this calculation is discussed in more detail in Exhibit D.

The present value of all PM&E costs during the proposed 30-year operation of the Project was calculated under two alternative discount rates: 2 percent and 7 percent. This range of discount rates covers the alternative use of the funds used for the Project and estimates of the time value of money associated with those alternative uses. The lower bound of the range corresponds to consumers' real rate of time preference (i.e., how much more they require in future goods and services in order to forego current consumption). EPA recommends a rate of 2 to 3 percent for public projects to reflect the consumers' real rate of interest (EPA, 2000). The upper bound of this range relates to the average real rate of return on private investment and represents the opportunity cost of capital that could be invested elsewhere in the economy. For public and regulatory investments, the Office of Management and Budget recommends a 7 percent rate, as an estimate of the average pretax rate of return generated by private sector investments (OMB, 1992).

As shown in Table 4.7-11**,** the present value of all costs during the 30-year planning period is $101.6 million at a 2 percent discount rate and $66.6 million at a 7 percent discount rate.

Social Benefits

As described in Section 4.7.1, the proposed Project and PM&E measures will lead to a number of changes in valued resources, including recreation opportunities, fish populations, aquatic and terrestrial habitat for fish and wildlife, and aesthetics. The assessment of the value of the changes in recreation opportunities in the Upper Klamath River area and the Lower Klamath River area is documented in Appendix 4B. This analysis included the expected changes resulting from the changed facilities and management in the Project area as well as changes resulting from resource area PM&E measures, especially as they related to fish populations. Appendix 4B does not include nonrecreation benefits. These benefits are described in this section along with the recreation benefits.

Recreation Benefits. The incremental recreation benefits in the Upper Klamath River area resulting from the proposed Project and PM&E measures are estimated using the product of the projected increases in recreation activity days over time (see EDAW, 2003) and the associated dollar values per recreation user day (see Appendix 4B). The net present value (NPV) of the incremental recreation stream is about $9.9 million at a 2 percent rate of discount and about $3.9 million using a 7 percent discount rate.

The incremental recreation benefits in the Lower Klamath River area are primarily the result of the fish resource PM&E measures summarized above, especially the continued operation of the Iron Gate fish hatchery. Continued operation of the Iron Gate fish hatchery is considered an aquatic PM&E under the terms of the proposed Project. To the extent that operations contribute to anadromous fish populations and harvest allocations to the in-river and ocean sportfisheries, they are responsible for generating the recreational fishing effort and consumer surplus that is tied to the fish populations. About 80 percent of total hatchery operation costs have historically

been absorbed by PacifiCorp. The Iron Gate fish hatchery contributes about half of the total hatchery fish in the system, with the remaining coming from the Trinity hatchery. According to the Klamath River Technical Advisory Team report (KRTAT, 2003), hatchery fish accounted for about 38 percent of ocean abundance of Klamath River fall Chinook in 2003. Combining all of these factors and assuming a proportionate relationship between ocean abundance, harvest allocations, and recreational fishing effort suggests that the Iron Gate fish hatchery operations PM&E contributes to about 15 percent (i.e., .8*.5*.38) of the in-river and ocean sport recreation user days.

Unlike the Upper Klamath River area, a growth in downriver fishing over time is not projected. Rather, the average effort from the past 25 years is used as a best estimate of future fishing days. For each year, over the term of the new license from 2006 to 2036, the in-river fishery would generate 28,400 angling days, of which about 4,620 days are attributed to the fish resource PM&E measures, for a total average value of $231,000 (2003 dollars). Similar calculations for the ocean salmon sportfishery gives an average annual value of $838,800. Summing across the two sportfisheries and taking the net present value from 2006 to 2036 gives $ 23.6 million NPV using a 2 percent discount rate and $11.7 million using a 7 percent discount rate.

Combining the estimates for Lower Klamath River area and Upper Klamath River area recreation benefits gives $33.5 million NPV at a 2 percent discount rate and $15.6 million NPV at a 7 percent discount rate. This estimate of recreation benefits does not include the benefits to the tribal commercial or subsistence fisheries or any passive use values associated with contributing toward a sustainable harvest of anadromous species. These and other benefits associated with the proposed Project and PM&E measures are discussed in the following sections.

American Indian Commercial and Subsistence Fisheries. Of the fish resources available in the basin, 50 percent must, by law, go to the Yurok and Hoopa Valley tribes. The Yurok Tribe receives 80 percent of the tribal allocation and the Hoopa Tribe receives the remaining 20 percent. The Karuk Tribe fishing is regulated to a spot at the Ishi-Pishi Falls (Tripp, 2003) and is not limited to a specific allocation.

Annual allocation recommendations for the remaining fish are made by the Klamath Fishery Management Council and the Pacific Fishery Management Council. The guidelines for allocating the remaining 50 percent are as follows: 15 percent of the nontribal share is allocated to the river recreational fishery, 17 percent of the nontribal share is allocated to the ocean recreation within the KMZ, and 68 percent of the nontribal share is allocated to commercial KMZ and non-KMZ recreational ocean fisheries. This suggests that fish resource PM&E measures as they relate to the allocation of fish resources to the tribes are more than twice as important as is the smaller allocation to the recreational fisheries. However, it is difficult to assign a dollar value to these tribal resources.

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Table 4.7-11. Estimated project costs (2003$).

	Capital Costs							Operating Costs							
Year	Aquatic	Water Resources	Terrestrial	Recreation, Visual, and Land Use	Cultural	Decommissioning	Total	Aquatic	Water Resources	Terrestrial	Recreation, Visual, and Land Use	Cultural	Total	Reduced Power Generation	Total
2006	3,014,600	202,000	167,400	2,253,200	1,074,000	170,000	6,881,200	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	9,971,553
2007	3,014,600	202,000	167,400	2,253,200	1,074,000	170,000	6,881,200	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	9,971,553
2008	3,014,600	202,000	167,400	2,253,200	1,074,000	170,000	6,881,200	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	9,971,553
2009	3,014,600	202,000	167,400	2,253,200	1,074,000	170,000	6,881,200	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	9,971,553
2010	3,014,600	202,000	167,400	2,253,200	1,074,000	170,000	6,881,200	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	9,971,553
2011	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2012	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2013	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2014	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2015	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2016	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2017	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2018	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2019	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2020	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2021	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2022	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2023	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2024	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2025	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2026	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2027	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2028	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2029	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2030	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2031	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2032	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2033	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2034	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
2035	-	-	-	-	-	-	-	892,533	173,000	76,333	231,700	91,667	1,465,233	1,625,120	3,090,353
Present Value															
@ 2% Discount Rate							32,434,258						32,816,033	36,396,928	101,647,219
@ 7% Discount Rate							28,214,279						18,182,141	20,166,181	66,562,600

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There are three pathways by which the enhanced anadromous fish populations and harvest allocations to the tribes contribute toward increasing social benefits: (1) cultural value, (2) commercial fishing, and (3) subsistence and recreation fishing. The cultural significance of the fishery is valued by the tribes in ways that do not lend themselves to a monetary translation. However, the broader public might benefit from and be willing to pay for these cultural benefits for the tribes. The value of the fish to the American Indian commercial fishery would typically be measured in terms of the changes in producer and consumer surpluses, but the tribes no longer keep records of their commercial sales. Also, the salmon market is a price-taker on the world market, so that it is unlikely that any rents are being earned in that market. However, to the extent that the tribal commercial fishermen would otherwise be unemployed, their net income would represent a benefit. Judging from recent years, this income would be small because the American Indian subsistence fishery has absorbed most of the tribal allocation. (See Table 2.7-66.) Therefore, the present analysis is limited to the subsistence fishery.

Recognizing that the cultural value of the subsistence fishery would not be captured, it is possible to obtain a ballpark estimate of the economic benefit to the tribes. From 1990 to 2001, Klamath River subsistence take of fall and spring Chinook salmon has averaged about 30,800 fish (see Table 4.7-12). The weight of the fish has been variable, but assuming an average of about 14 pounds per fish, and using 2001 prices, gives an average value of $700,000 per year and an NPV of $15.3 million at a 2 percent discount rate and $ 7.6 million at a 7 percent discount rate (see Table 4.7-12). This represents the wholesale value of the fish. It is a conservative underestimate of the value of subsistence fishing because it does not reflect any consumer surplus associated with catching or eating the fish. For example, the in-river and ocean recreational sportfisheries were estimated to generate $ 23.6 million (2 percent discount rate) or $ 11.7 million (7 percent discount rate) in consumer surplus, and they have less than half the tribal allocation. However, the methods of estimating consumer surplus associated with the sportfisheries do not apply to the subsistence fishery.

Commercial Fishery. As was mentioned above, the ocean salmon fishery participates in the global market, which is a competitive market. Therefore, it is unlikely to generate producer surplus. In addition, it is assumed that the substitutes for salmon caught in these waters preclude generating consumer surplus.

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Table 4.7-12. Klamath River subsistence take of fall and spring Chinook salmon (1990-2001).

Year	Subsistence Take
1990	17,092
1991	18,470
1992	11,118
1993	17,674
1994	20,258
1995	30,050
1996	33,117
1997	34,636
1998	22,080
1999	24,374
2000	46,289
2001	94,526

Average Annual Subsistence Catch = 30,807.

Average Annual Value of Subsistence Catch = $700,000.00.

Average value: 14 pounds. Average price: $1.61/pound.

Note: These estimates of take do not include the American Indian commercial take or any take from the Trinity River.

U.S. Fish and Wildlife Service (USFWS) estimates for Klamath River portion in 1983-1993. The Fisheries Department of the Hoope Valley Business Council has monitored the Trinity River fishery since 1982. The Yurok Tribe Fisheries Program monitored the Klamath River portion in 1994 and 1995.

Source: Table B-5, PFMC, 2002.

Other Social Benefits. As was described in Section 4.7.1, several additional resource enhancements will result from the proposed Project and PM&E measures, including reductions in entrainment of sucker species, increases in water quality and aquatic habitat and connectivity, improvements in wildlife habitat connectivity, reductions in visual disamenities, and improved resource management planning, including adaptive management. These resource changes would lead to an increase in valued ecological service flows that ultimately contribute to human needs and wants. A dollar value to these improvements was not assigned, but it is important to include them in this discussion and in the balancing of the resource costs and benefits associated with the proposed license. Likewise, the cultural significance of the incremental changes resulting from the proposed Project and PM&E measures relative to continued operations of the existing Project was not characterized. Please consult the Cultural Resources FTR for these discussions. However, it was observed that the reduction in entrainment of sucker species, the improvements to fish and terrestrial habitat, and the maintenance of anadromous fish populations are movements in a positive direction.

In the socioeconomic resources study plan, the potential for changes in property values, flood moderation, municipal water supply, and irrigation water supply was identified as an area of study. However, no such Project-induced effects were identified.

Summary. The quantifiable social benefits of the proposed Project and PM&E measures are conservatively estimated to have an NPV of about $48.8 million (2 percent discount rate) or $22.2 million (7 percent discount rate) (see Table 4.7-13). Omitted from the quantitative analysis is society's willingness to pay for the enhancements to fish populations, aquatic habitat and connectivity, wildlife habitat connectivity, aesthetics, American Indian commercial catch, and the consumer surplus from the tribal subsistence fishery. These values are only partially reflected in the value of recreation opportunities and wholesale subsistence fish.

Table 4.7-13. Net present value of social benefits.

Benefit Category	2 Percent Discount Rate	7 Percent Discount Rate
Upper Klamath River Recreation	$9.9 million	$3.9 million
Lower Klamath River Recreation	$23.6 million	$ 11.7 million
American Indian Subsistence Fishing	$15.3 million	$ 7.6 million
Total Quantified Benefits	$48.8 million	$ 22.2 million

4.8 DISCUSSION

The socioeconomic study addresses the employment and earnings impacts on the regional economy, the associated changes in related socioeconomic variables such as population and local public services, and the net social benefits and costs of the proposed Project and PM&E measures measured relative to continued operations of the existing Project.

For the upstream counties, of the two major sectors whose regional economic impacts were evaluated in this section, construction has the larger impact on employment, income, and output. The impacts from recreation expenditures are relatively small. The creation of an additional 53 (construction phase) or 26 (operations phase) jobs is not significant enough to help reduce the high unemployment rates observed for the communities within the 5-mile or 50-mile buffer areas. Similarly, the additional income and output, though welcome, is not significant enough to help raise the low per capita incomes observed for these communities.

Although any additional jobs and income are a welcome boon to the economies of the communities within the 5-mile and 50-mile buffer area during a period of relatively high unemployment, it is quite possible that the magnitude of these changes may be smaller than the model predicts. Economies adjust over time such that what may be seen as an increase in income and employment may actually be temporary. Over time, shifts in resource use between the various industries in the economy may lead to an increase in local employment even without the proposed Project. Thus, after the first few years, the additional jobs and income may not necessarily represent a net gain for the region.

For the communities downstream of Iron Gate dam, the recreation, subsistence, and commercial salmon fisheries are likely to be affected by the proposed Project. The available information

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suggest that the Iron Gate fish hatchery PM&E measures could contribute roughly 15 percent of the income that is currently generated by these sectors. Other fish resource PM&E measures could also contribute positively toward sustaining these fisheries.

As a result of the minimal changes in employment in the upstream counties, it is not anticipated that the proposed Project will induce changes in local populations or demands for local services, such as schools and housing. Likewise, the proposed Project is not expected to induce increased demands for local public services, such as emergency response services. The increase in recreation visitors will be modest. The proposed Project may result in a very small (less than .1 percent) decrease in local property taxes paid to Klamath County and the city of Klamath Falls, respectively.

Owing to the anticipated minimal (though beneficial) impacts from the proposed PM&E measures, there are no disproportionate adverse environmental, economic, social, or health impacts on minority or low-income populations living in the study area. Thus, the proposed PM&E measures are not expected to result in any environmental justice issues.

The NPV of social costs was estimated at $101.6 million using a 2 percent discount rate and $66.6 million using a 7 percent discount rate. The quantifiable social benefits of the proposed Project and PM&E measures are conservatively estimated to have an NPV of about $48.8 million (2 percent discount rate) or $22.2 million (7 percent discount rate). This includes (1) the improved recreation opportunities in the Upper Klamath River area; (2) the protected Lower Klamath River in-river and ocean sportfisheries; and (3) the wholesale value of the Lower Klamath River tribal subsistence fishery. Omitted from the quantitative analysis is society's willingness to pay for the enhancements to fish populations, water quality and aquatic habitat and connectivity, wildlife habitat connectivity, aesthetics, American Indian commercial catch, and the consumer surplus from the tribal subsistence fishery. These economic values are only partially reflected in the value of recreation opportunities and the wholesale value of subsistence fish.

The lower bound estimate should not be interpreted as a precise figure. Rather, it provides a ballpark estimate of the lower bound based on a series of assumptions and analyses documented in this report. The upper bound on the social benefits was not estimated and depends on the nature and extent of the resource improvements and how they contribute to supporting human needs and wants. For example, this study did not attempt to estimate the anticipated impact of the proposed PM&E measure related to the increased ability to provide emergency water (and temperature) releases. This measure could reduce downriver fish kills and contribute toward achievement of spawning escapement, thus benefiting future adult populations. This, in turn, would lead to increases in the size of the harvests for American Indian commercial and subsistence fisheries, as well as the in-river and ocean sportfisheries and the ocean commercial fishery.

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