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Federal
Energy
Regulatory
Commission

Office of
Energy Projects

June 2004

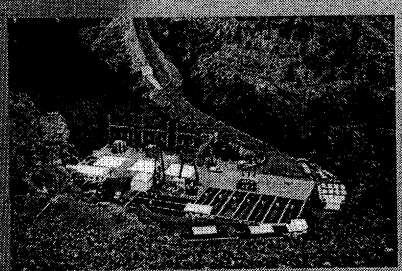
FERC/FEIS - 0165F

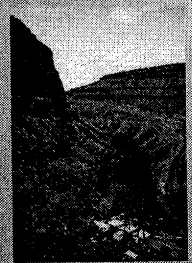
Final Environmental Impact Statement

Pelton Round Butte Hydroelectric Project, Oregon

(FERC Project No. 2030)

888 First Street, N.E., Washington, DC 20426





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FERC/FEIS – 0165F

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER RELICENSING

PELTON ROUND BUTTE HYDROELECTRIC PROJECT

FERC Project No. 2030-036
Oregon

Joint Applicants:
Portland General Electric
121 S.W. Salmon
Portland, OR 97204

and

The Confederated Tribes of the
Warm Springs Reservation of Oregon
P.O. Box 960
Warm Springs, OR 97761

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

June 2004

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

TO THE PARTY ADDRESSED:

Attached is the final environmental impact statement (EIS) for the Pelton Round Butte Hydroelectric Project (FERC Project No. 2030-036), located on the Deschutes River in Oregon.

The final EIS documents the views of the Federal Energy Regulatory Commission (Commission or FERC) staff regarding the relicensing of the project. Before the Commission makes a decision on relicensing, it will take into account all concerns relevant to the public interest. The final EIS will be part of the record from which the Commission will make its decision. An electronic copy of the final EIS may be viewed on FERC's website at www.ferc.gov using the "eLibrary" link and following the instructions (call 1-866-208-3676 for assistance). The TTY number is 202-502-8659.

Attachment: Final Environmental Impact Statement

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COVER SHEET

a. Title: Pelton Round Butte Hydroelectric Project, FERC Project No. 2030-036, Oregon

b. Subject: Final Environmental Impact Statement

c. Lead Agency: Federal Energy Regulatory Commission

d. Abstract:

Portland General Electric (PGE) and the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes) jointly filed an application for a new license for the existing 366.82-megawatt Pelton Round Butte Hydroelectric Project, located on the Deschutes River in north central Oregon.

The Pelton Round Butte Project consists of three developments: the Round Butte, Pelton, and Reregulating developments. The project occupies lands of the Deschutes National Forest, Mt. Hood National Forest, Willamette National Forest, Crooked River National Grassland, Bureau of Land Management, and Tribal lands of the Warm Springs Reservation of Oregon. The project is operated as a modified run-of-river project, where inflows to the Round Butte development generally match outflows from the Reregulating development.

The Deschutes River is part of the lower Columbia River drainage basin. The reach downstream of the project supports native anadromous salmonids, including spring-run and fall-run Chinook salmon and summer-run steelhead. Rivers upstream of the project support bull trout, redband trout, and other native species. Lake Billy Chinook supports an important fishery for kokanee salmon and trophy bull trout. State fish and wildlife agencies aspire to restore anadromous fish to areas upstream of the project through fish passage and habitat restoration. Land use in the project area is mostly rural with large areas of natural forest, open pastures, and low-density residential. Development includes timber harvesting, grazing, and recreational sites.

Key issues associated with relicensing this project are: restore and enhance runs of anadromous fish; improve dissolved oxygen concentrations downstream of the Round Butte dam; enhance local recreational opportunities; protect and enhance local vegetation and wildlife, including five federally listed species; and protect and enhance land use, including the local economy.

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The staff's recommendation is to relicense the project as proposed, with additional measures to protect and enhance environmental resources, including conducting recreational use surveys every 6 years to determine future recreational needs, and developing and implementing a landscape management plan to enhance the aesthetic resources of the project.

e. Contact: Nicholas Jayjack
Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, N.E.
Washington, D.C. 20426
(202) 502-6073

f. Transmittal: This final EIS prepared by the Commission's staff on the hydroelectric license application filed jointly by PGE and the Tribes for the existing Pelton Round Butte Hydroelectric Project (Project No. 2030-036) is being made available to the public on or about June 2004, as required by the National Environmental Policy Act of 1969[1] and the Commission's Regulations Implementing the National Environmental Policy Act (18 CFR Part 380).

[1] National Environmental Policy Act of 1969, as amended (Pub. L. 91-190. 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

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FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act,[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric developments subject to its jurisdiction, on the necessary conditions:

> That the project adopted...shall be such as in the judgment of the Commission will be 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 water-power development, for the adequate protection 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 referred to in Section 4(e)...[4]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[5]

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[2] 16 U.S.C. §§791(a)–825(r), as amended by the Electric Consumers Protection Act of 1986, Public Law 99495 (1986) and the Energy Policy Act of 1992, Public Law 102-486 (1992).

[3] Public Law 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. §803(a).

[5] 16 U.S.C. §803(g).

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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
Advisory Council	Advisory Council on Historic Preservation
AIR	Additional Information Request
APE	Area of Potential Effect
APLIC	Avian Power Line Interactions Committee
ATV	all-terrain vehicle
BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BNR	Branch of Natural Resources
BOR	U.S. Bureau of Reclamation
BP	before the present
BPA	Bonneville Power Administration
°C	degrees Celsius
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
CTWS	Confederated Tribes of the Warm Springs Reservation of Oregon
DLCD	Oregon Department of Land Conservation Development
DO	dissolved oxygen
DPS	distinct population segment
EFH	essential fish habitat
EIS	environmental impact statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FS	U.S. Forest Service
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
I&E	interpretation and education
IHNV	Infectious Hematopoietic Necrosis Virus
Interior	U.S. Department of the Interior
Joint Applicants	PGE and the Tribes
kV	kilovolt
kWh	kilowatt-hour
mg/L	milligrams per liter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
MU	Metolius Management Unit
MW	megawatt

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MWh	megawatt-hour
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NFS	National Forest System
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
NWPP	Northwest Power Pool
NTU	nephelometric turbidity unit
ODA	Oregon Department of Agriculture
ODEQ	Oregon Division of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
O&M	operations and maintenance
ONHP	Oregon Natural Heritage Program
ORV	outstanding remarkable value
PFC	proper functioning condition
PFMC	Pacific Fisheries Management Council
PGE	Portland General Electric Company
pH	hydrogen ion concentration
Program	Columbia River Basin Fish and Wildlife Program
PVC	polyvinyl chloride
RFD	roosting, foraging, dispersal habitat
RM	river mile
ROW	right-of-way
RV	recreational vehicle
SHPO	State Historic Preservation Officer
SWW	selective water withdrawal
TCP	traditional cultural property
TDG	total dissolved gas
THPO	Tribal Historic Preservation Officer
TMDL	total maximum daily load
Tribes	Confederated Tribes of the Warm Springs Reservation of Oregon
μg/L	micrograms per liter
μS/cm	micro-Siemens per centimeter
USGS	U.S. Geological Survey
WCB	Tribes' Water Control Board
WQC	401 Water Quality Certification
WQMMP	Water Quality Management and Monitoring Plan
WECC	Western Electric Coordinating Council

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EXECUTIVE SUMMARY

This environmental impact statement (EIS) evaluates the potential effects on the environment associated with relicensing the 366.82-megawatt Pelton Round Butte Hydroelectric Project No. 2030-036. On December 16 and 17, 1999, Portland General Electric Company (PGE) and the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes) filed separate and competing applications for a new license for the Pelton Round Butte Project. On November 21, 2000, the Federal Energy Regulatory Commission (Commission or FERC) approved the Long-term Global Settlement and Compensation Agreement, signed by PGE and the Tribes, along with the U.S. Department of the Interior (Interior), that resolved the applicants' competition for a new Pelton Round Butte license. Subsequently, on June 29, 2001, PGE and the Tribes (Joint Applicants) filed a Final Joint Application Amendment with the Commission (PGE and CTWS, 2001). On December 29, 2003, the Joint Applicants filed a Description of Proposed Preferred Alternative consistent with the terms of a pending settlement among the parties to the proceeding. The Joint Applicants updated the Description of Proposed Preferred Alternative on April 27, 2004.

In this EIS, we, the Commission staff, assess the effects of operating the project: (1) with no changes or enhancements to the current facilities or operations (No-action Alternative); (2) as proposed by the Joint Applicants (Proposed Action); and (3) as proposed by the Joint Applicants with additional or modified measures, including measures to further protect and enhance environmental resources (Staff Alternative). Specifically, this EIS evaluates the potential environmental effects and developmental costs associated with relicensing the Pelton Round Butte Project. Briefly, the principal issues addressed in the EIS include: (1) erosion and sedimentation control; (2) water quality; (3) fish passage; (4) hatchery production and operation; (5) fish habitat protection and enhancement; (6) barriers to wildlife movement and terrestrial connectivity; (7) potential effects on threatened and endangered species; (8) cultural resources; (9) recreation; and (10) land use, including the local economy.

NO-ACTION ALTERNATIVE

Under the No-action Alternative, the Pelton Round Butte Project would continue to operate under the terms and conditions of the existing license, and no new environmental protection or enhancement measures would be implemented. We use this alternative as the baseline against which we evaluate other alternatives. With the average annual generation of 1,609,778,000 kilowatt-hours (kWh), the existing project costs $21,140,040 annually to operate, has power benefits of about $77,043,980 and has net annual benefits of about $55,903,940.

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JOINT APPLICANTS' PROPOSED ACTION

The Joint Applicants' Proposed Action would implement the protection and enhancement measures detailed in the Final Joint Application Amendment, filed June 2001 (PGE and CTWS, 2001), as modified by the Description of Proposed Preferred Action, filed on December 29, 2003, and updated on April 27, 2004. Issues addressed through proposed measures include: (1) erosion and sediment control; (2) fluvial geomorphologic processes; (3) water quality and quantity; (4) improved inflow measurement; (5) instream flows and ramping rates: (6) restoration and enhancement of habitat for anadromous and resident fish: (7) aquatic connectivity; (8) vegetation and noxious weed management; (9) wetland and riparian habitat improvement; (10) wildlife barriers and entrapment; (11) avian protection; (12) threatened and endangered species; (13) cultural resources; (14) recreation facilities and management; (15) project effects on wild and scenic river reaches; (16) aesthetic effects of project facilities; and (17) power generation.

Under the Joint Applicants' proposal, the project would cost $26,267,110 annually to operate ($5,127,070 more than under the No-action Alternative), have annual power benefits of $76,153,300 ($890,680 less than under the No-action Alternative), and have a net annual benefit of $49,886,190 ($6,017,750 less than under the No-action Alternative). The project's average annual generation would be 1,591,168,000 kWh (18,610,000 kWh less than under the No-action Alternative).

STAFF ALTERNATIVE

After evaluating the Joint Applicants' Proposed Action, and the recommendations from the resource agencies and other interested parties, we considered what, if any, additional protection or enhancement measures would be necessary or appropriate with continued operation of the project. The Staff Alternative generally consists of the proposed action with additional or modified environmental measures, which include agency recommendations made pursuant to Sections 18, 4(e), and 10(j), or modifications thereof, as noted. Additional staff-recommended measures include: (1) recreational use surveys every 6 years during the peak recreation season (May through September); and (2) a landscape management plan for future improvement and maintenance of project facilities.

Under the Staff Alternative, the project would cost $26,265,050 annually to operate ($5,125,010 more than under the No-action Alternative), have annual power benefits of $76,153,300 ($890,680 less than under the No-action Alternative), and have a net annual benefit of $49,888,250 ($6,015,690 less than under the No-action Alternative). The project's average annual generation would be 1,591,168,000 kWh (18,610,000 kWh less than under the No-action Alternative and the same as under the Joint Applicants' Proposed Action).

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The staff alternative does not include some aspects of the preliminary fishway prescriptions filed under Section 18 of the Federal Power Act (FPA), by Interior, through the U.S. Fish and Wildlife Service, and by the U.S. Department of Commerce, through the National Marine Fisheries Service. We discuss the preliminary fishway prescriptions in detail in section 3.6.2, *Aquatic Resources*, and conclude that the specified schedules may not allow sufficient time to meet the milestones proposed by the Joint Applicants developed in consultation with the Fisheries Technical Subcommittee and that some of the technical requirements involving velocity criteria, tailrace studies, and acoustic studies may not be feasible or warranted. We recognize that the Commission may include these prescriptions in any license issued for the Pelton Round Butte Project because of their mandatory nature.

The staff alternative also does not include some of the preliminary conditions filed by the U.S. Forest Service and Interior on the behalf of the U.S. Bureau of Indian Affairs (BIA) and the U.S. Bureau of Land Management. In particular, preliminary 4(e) conditions filed by Interior for the BIA pertaining to long-term ramping rates and gravel augmentation are in direct conflict with other terms and conditions, including the Section 401 of the Clean Water Act Water Quality Certifications issued by the Tribe's Water Control Board and the Oregon Department of Environmental Quality. Other preliminary conditions involve plans, monitoring reports, and measures that are redundant, burdensome, or not justified. As with the preliminary fishway prescriptions, we recognize that the Commission may include valid final Section 4(e) conditions in any license issued for the Pelton Round Butte Project.

CONCLUSION

We chose the Staff Alternative as the preferred alternative because: (1) the project would provide a significant (1.6 million megawatt-hours) and dependable source of electrical energy for the region; (2) the project would avoid the need for an equivalent amount of fossil-fuel-fired, electric generation and capacity, thereby continuing to help conserve these nonrenewable energy resources and reduce atmospheric pollution; and (3) the protection, mitigation, and enhancement measures proposed by the Joint Applicants, combined with the additional measures recommended by staff, would adequately protect and enhance environmental resources and mitigate impacts of the project.

The overall benefits of this alternative would be worth the cost of proposed environmental measures and would outweigh the consequences of the other alternatives or license denial.

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1.0 PURPOSE OF ACTION AND NEED FOR POWER

On December 16 and 17, 1999, Portland General Electric Company (PGE) and the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes), respectively, filed separate and competing applications for a new major license for the Pelton Round Butte Project No. 2030-036. On November 21, 2000, the Federal Energy Regulatory Commission (Commission or FERC) approved the Long-term Global Settlement and Compensation Agreement, signed by PGE and the Tribes (Joint Applicants), along with the U.S. Department of the Interior (Interior). The Settlement resolved the applicants' competition for a new Pelton Round Butte license. Subsequently, on June 29, 2001, PGE and the Tribes jointly filed a Final Joint Application Amendment (PGE and CTWS, 2001). On December 29, 2003, the Joint Applicants filed a Description of Proposed Preferred Alternative consistent with the terms of a pending settlement among the parties to the proceeding. The Joint Applicants updated the Description of Proposed Preferred Alternative on April 27, 2004.

The 366.82-megawatt (MW) Pelton Round Butte Project is located on the Deschutes River, in north-central Oregon about 40 miles north of the city of Bend (figure A-1, appendix A). The project is located in Jefferson, Wasco, and Marion counties, Oregon, and occupies 142.6 acres of land of the Deschutes National Forest, Mt. Hood National Forest, Willamette National Forest, and Crooked River National Grassland; 3,361.1 acres of land managed by the U.S. Bureau of Land Management (BLM); and 2,161.9 acres of Tribal lands of the Warm Springs Reservation of Oregon.[6]

The project consists of three dams with integrated powerhouse structures and their associated developments (table 1).

[6] A 100-mile-long transmission line from the Round Butte switchyard to PGE's Bethel substation occupies lands of the Mt. Hood and Willamette National Forests. On August 28, 2002, the Commission issued an order establishing that it does not have jurisdiction over this line and amending the current license to delete the line from the project description. For purposes of annual charges, the order states that the line will remain within the project boundary until the licensees obtain all necessary permits/approvals from the U.S. Forest Service (FS) or the BLM, as appropriate, for continued use of federal lands.

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Table 1. Pelton Round Butte Project developments. (Source: PGE and CTWS, 2001)

Development	Location (RM)	Elevation (msl)	Reservoir Total storage (acre-feet)	Reservoir Usable storage (acre-feet)	Dam Length (feet)	Dam Height (feet)	Rated Capacity (MW)
Round Butte	110	1,945	535,000	274,000	1,382	440	247.12
Pelton	102.5	1,580	31,000	3,700	636	204	100.8
Reregulating	100	1,435	3,500	3,000	1,076	88	18.9

Note: RM – river mile
msl – mean sea level
MW – megawatt

1.1 PURPOSE OF ACTION

The Federal Power Act (FPA) provides the Commission with the exclusive authority to license non-federal water power projects on navigable waterways and federal lands. The Commission must decide whether to relicense the project and what conditions should be placed on any license issued. In deciding whether to authorize the continued operation of the hydroelectric project and related facilities in compliance with the FPA and other applicable laws, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

To ensure that the Commission makes an informed decision and to comply with the National Environmental Policy Act (NEPA) 42 U.S.C. 4321-4347, Commission staff prepared this environmental impact statement (EIS). In the EIS, we assess the environmental and economic effects of: (1) continuing to operate the project as it is currently operated with no additional protection or enhancement measures (No-action Alternative); (2) operating the project consistent with the measures proposed by the Joint Applicants (Proposed Action); and (3) operating the project as proposed by the Joint Applicants with modifications recommended by staff (Staff Alternative). Other alternatives considered but eliminated from detailed analysis include: (1) federal government takeover of the project; (2) issuing a non-power license; and (3) project retirement.

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Briefly, the principal issues addressed in the EIS include: (1) erosion and sedimentation control; (2) water quality; (3) fish passage; (4) hatchery production and operation; (5) fish habitat protection and enhancement; (6) barriers to wildlife movement and terrestrial connectivity; (7) potential effects on threatened and endangered species; (8) cultural resources; (9) recreation; and (10) land use and aesthetic resources.

1.2 NEED FOR POWER

The license for the Pelton Round Butte Project is jointly held by PGE and the Tribes. PGE is an integrated electric utility serving nearly 1.4 million people in the Portland, Oregon, metropolitan area. PGE has over 730,000 retail residential, commercial, and industrial customers. Power from the Pelton and Round Butte developments is sold to PGE customers and is transmitted via PGE's transmission and distribution system. The 247.12-MW Round Butte and 100.8-MW Pelton developments provide approximately 20 percent of PGE's 2,022-MW generating capability, which includes hydroelectric, coal, and gas facilities (PGE, 2003).

Typically, PGE dispatches its thermal generating facilities for base-load operations, subject to unit availability and energy market conditions. PGE's hydroelectric resources, other than the project, are also typically used for base-load operation, subject to streamflow and reservoir conditions, unit availability, license constraints and regional coordination of hydroelectric operations. These other hydroelectric projects are operated as run-of-river projects and therefore cannot replace the peaking power generated by the Pelton Round Butte Project.

The project is typically operated to provide power during daily load peaks. PGE's other significant load-following resource, contract power from the mid-Columbia projects, does not have this degree of flexibility because of environmental and operational constraints. The operational flexibility of the project is used by PGE to maintain the stability and reliability of the PGE system.

The Tribes originally constructed the 18.9-MW generating facilities at the Reregulating development, and the power was transmitted through PacifiCorp's transmission system and Cove substation to the Warm Springs substation. The previous 20-year contract with PacifiCorp for power from the development expired in December 2001. Now, the Tribes market the power as a wholesale utility and sell the power to PGE or to others on the open market.

To see how the demand for electricity is expected to change in the future in the Pelton Round Butte Project's service area, we looked at the regional need for power as reported by the North American Electric Reliability Council (NERC) for its Western Electric Coordinating Council (WECC) Region. The project is located in the Northwest Power Pool (NWPP) area of the WECC region. The NWPP area includes all or major portions of the states of Washington, Oregon, Idaho, Wyoming, Montana, Nevada, and

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Utah as well as a small portion of northern California and the Canadian provinces of British Columbia and Alberta. The NWPP area has a significant winter peak demand and depends heavily on hydroelectric generation (62 percent of installed capacity). For the period from 2003 through 2012, WECC expects winter peak demand and annual energy requirements in the NWPP area to grow at respective annual compound rates of 1.6 and 1.7 percent. With a significant percentage of hydroelectric generation in the region, it is expected that the ability to meet winter peak demand is adequate for the next 10 years. The ability to meet sustained seasonal energy requirements over the 10-year period depends on planned new generation additions (NERC, 2003). Assuming the new capacity is constructed as planned, resource capacity margins for the winter-peaking area range between 23.4 and 29.6 percent of firm peak demand for the next 10 years (NERC, 2003; WECC, 2003). We conclude that the region has a need for power over the near term and that the Pelton Round Butte Project, which supplies a part of the current regional electricity demand, could continue to help meet part of the regional need for power.

If licensed, the power from the Pelton Round Butte Project would continue to be useful in meeting PGE's needs as well as meeting part of the local and regional need for power. The project provides low-cost energy that displaces non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities avoids some power plant emissions and creates an environmental benefit. If the electric output of the project were replaced with fossil-fueled generation, greenhouse gas emissions could potentially increase by 249,500 metric tons of carbon per year.

1.3 INTERVENTIONS AND PROTESTS

On August 10, 2001, the Commission issued a notice accepting the Joint Applicants' Final Joint Amended Application for the Pelton Round Butte Project. This notice set October 10, 2001, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene, none in opposition:

Intervenors	Date of Filing
Jefferson County	September 5, 2001
U.S. Department of Agriculture	October 1, 2001
Trout Unlimited, American Rivers, Native Fish Society, and Oregon Trout	October 9, 2001
Waterwatch of Oregon	October 10, 2001
U.S. Department of the Interior	October 16, 2001
Oregon Department of Justice	October 16, 2001

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Intervenor	Date of Filing
State of Oregon	October 23, 2001

1.4 SCOPING PROCESS

Before preparing this EIS, we conducted scoping to determine what issues and alternatives should be addressed. An initial scoping document (SD1), which was distributed to interested agencies and others, was noticed in the *Federal Register* on October 4, 2001. Two scoping meetings, both advertised in the local newspaper, were held on November 6 and 7, 2001, in Redmond, Oregon, and Warm Springs, Oregon, respectively, to request oral comments on the project. The transcripts are part of the Commission's public record for the project. In addition to the comments received at the scoping meetings, the following entities provided written comments:

Commenting Entities	Date of Filing
Portland General Electric	December 6, 2001
State of Oregon	December 7, 2001
Waterwatch of Oregon	December 7, 2001
National Marine Fisheries Service	December 7, 2001
Confederate Tribes of the Warm Springs Reservation	December 7, 2001
U.S. Department of the Interior	December 7, 2001
U.S. Forest Service, Deschutes and Ochoco National Forests	December 7, 2001
Conservation Groups (American Rivers, Trout Unlimited, Oregon Trout, and the Native Fish Society)	December 10, 2001

A revised scoping document addressing all of these comments was issued on July 2, 2002.

1.5 AGENCY CONSULTATION

On August 12, 2002, the Commission issued a notice that the application was ready for environmental analysis and solicited comments, recommendations, terms and conditions, and prescriptions to be filed by November 12, 2002. The responding entities and the dates of their comments are listed below:

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Entity	Date Filed
U.S. Bureau of Land Management	November 12, 2002
U.S. Forest Service	November 12, 2002
U.S. Department of the Interior	November 12, 2002
U.S. Department of Commerce, National Marine Fisheries Service	November 12, 2002
State of Oregon[7]	November 12, 2002
Confederated Tribes of Warm Springs[8]	November 12, 2002
Conservation Groups (American Rivers, Trout Unlimited, Oregon Trout, and the Native Fish Society)	November 12, 2002
Waterwatch of Oregon	November 12, 2002

The state of Oregon and the Joint Applicants filed comments in reply to the agency terms and conditions on February 6 and 7, 2003, respectively.

1.6 DRAFT EIS COMMENTS

On August 29, 2003, we issued the draft EIS for the Pelton Round Butte Hydroelectric Project. We noticed the draft EIS in the *Federal Register* and invited comments on the draft EIS by December 31, 2003.

The following entities filed comments pertaining to the draft EIS.

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[7] Under Oregon Revised Statute 543A.115, the state must file a final unified state position to FERC on its recommended conditions for licensing hydroelectric projects. This filing contains the final unified state position, Oregon Department of Fish and Wildlife (ODFW) recommendations under Section 10(j), and the Oregon Department of Environmental Quality's Section 401 Water Quality Certification (WQC) (issued on June 24, 2002).

[8] Joint filing by the Tribes' Water Control Board (WCB) and Tribes' Branch of Natural Resources (BNR) including the WQC issued by the Tribes on June 25, 2002, and Section 10(a) recommendations.

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Commenting Entity	Filing Date
Waterwatch of Oregon	December 23, 2003
Oregon Water Resources Department[9]	December 29, 2003
Portland General Electric Company and Confederated Tribes of the Warm Springs Reservation	January 12, 2004
U.S. Forest Service, Ochoco/Deschutes National Forest	December 29, 2003
Confederated Tribes of the Warms Springs Reservation Natural Resources Departments	December 30, 2003
U.S. Department of the Interior	December 30, 2003
U.S. Environmental Protection Agency	December 31, 2003
National Marine Fisheries Service	December 31, 2003
Jefferson County	December 31, 2003

The draft EIS comment letters and our responses are included in appendix C.

[9] Filed on behalf of the Oregon Department of Fish and Wildlife.

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2.0 PROPOSED ACTION AND ALTERNATIVES

In this section, we describe the proposed action and alternatives considered. Section 2.1 describes the No-action Alternative under which the Pelton Round Butte Project would continue to be operated with the current license conditions. This alternative provides the current conditions against which other alternatives are compared. Section 2.2 describes the proposed action of issuing a new license and includes the terms and conditions of the Final Joint Amended Application for License. Section 2.3 describes the modifications to the proposed action that includes the Staff Alternative with additional measures to those proposed by the Joint Applicants. Section 2.4 discusses other alternatives that were considered but were eliminated from detailed evaluation in the draft EIS.

2.1 NO-ACTION ALTERNATIVE

Under the No-action Alternative, the project would continue to operate under the terms and conditions of the existing license and no new environmental measures would be implemented. Any ongoing effects of the project would continue. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.1.1 General Description of the Existing Facilities and Operations

The Pelton Round Butte Project consists of three developments on the Deschutes River. Starting at the upstream end of the project, the three developments include the Round Butte (river mile [RM] 110), Pelton (RM 102.5), and Reregulating (RM 100) developments. The project's three developments have an installed capacity of 366.82 MW. The project is located in Jefferson, Wasco, and Marion Counties, Oregon, and occupies lands of the Deschutes National Forest, Mt. Hood National Forest, Willamette National Forest, Crooked River National Grassland, BLM, and Tribal lands of the Warm Springs Reservation of Oregon.

The project is operated as a modified run-of-river project, where the average daily discharge from the Reregulating development is about equal to the average daily inflow to the Round Butte development about 95 percent of the time. The Round Butte and Pelton developments are operated as peaking facilities, where higher electrical output is generated at times that correspond to the peak power demand periods. Typically, these developments generate in a daily cycle with generation starting between 6 a.m. and 7 a.m. and continuing until between 10 p.m. and 11 p.m. The Reregulating development tends to generate continuously to maintain flows in the Deschutes River. Daily operating fluctuations of the upper two reservoirs (Lake Billy Chinook and Lake Simtustus) are typically in the range of 1 foot and 1.5 feet, respectively. In contrast, the Reregulating

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reservoir fluctuates up to 27 feet daily to shape the outflow in the river downstream of the project to approximate the unregulated project inflows.

Daily fluctuations at Lake Billy Chinook occur all months of the year, except during the winter drawdown. The reservoir is typically lowered 8 to10 feet from November through February to allow for approximately 35,000 acre-feet of storage of spring runoff primarily for hydroelectric purposes.

Discharge from the project is typically between 4,300 and 4,430 cubic feet per second (cfs) in the summer (April 1 through September 30) and between 5,000 cfs and 5,140 cfs in the winter (October 1 through March 31).

More detailed discussions of project operations are included in the following sections.

2.1.2 Round Butte Development

The Round Butte development (RM 110) is the most upstream development of the project and generates the majority of electricity for the project. The dam is made of compacted rock and is 1,382 feet long, 440 feet high, with a 1,800-foot-long concrete spillway. The development has a concrete intake structure with a concrete gate tower located 700 feet upstream of the crest of the dam, and a 1,425-foot-long steel-lined penstock. The concrete powerhouse contains three 82.35-MW, vertical Francis-type turbine generating units, for a total capacity of 247.12 MW.[10]

The Round Butte switchyard is located approximately 1,000 feet southeast of the powerhouse. A 7.9-mile-long, 230-kilovolt (kV) primary transmission line connects the Pelton powerhouse to the Round Butte switchyard.

The Round Butte dam creates Lake Billy Chinook, a 4,000-acre reservoir at elevation 1,945 feet above mean sea level (msl). The reservoir has a total storage capacity of 535,000 acre-feet and a usable capacity of 274,000 acre-feet. The reservoir includes 9 miles of the Deschutes River, 7 miles of the Crooked River, and 13 miles of the Metolius River.

The Round Butte development also includes fish hatchery facilities and an upstream fish passage trap-and-aerial cable and abandoned fish hatchery facilities. In addition, there are a number of small office buildings for administrative and biological services, as well as shops and storage buildings adjacent to the dam and powerhouse.

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[10] On July 25, 2001, the Commission approved an amendment to the current license that would add one 70-kilowatt (kW) turbine generating unit with associated support structure at the Round Butte powerhouse. This turbine has not yet been installed.

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Lake Billy Chinook provides seasonal storage and currently is drawn down as much as 85 feet (to elevation 1,850 feet msl) in the winter, although in a typical year, the lake may only be drawn down about 10 feet (to elevation 1,935 feet msl) from November through February or March and then refilled during April and May. Article 38 of the current FERC license requires the lake to be held at the highest practicable level from June 15 to September 15 each year. Article 3(d) of the current state license no. 217 requires PGE to maintain a stable pool elevation with a fluctuation not to exceed 1 foot (between elevation 1,945 feet msl and 1,944 feet msl) from June 15 to September 15 of each year.

Although the discharge from the Round Butte development may vary during the course of the day, the amount of water passed downstream of the Reregulating development in a 24-hour period is approximately the same as the inflow to Lake Billy Chinook.

The current FERC and state licenses for the Pelton Round Butte Project require that flows downstream of the project, as measured at U.S. Geological Survey (USGS) gage no. 14092500 (Deschutes River near Madras, Oregon) located at RM 100 (immediately downstream of the dam), must be at least 3,000 cfs or inflow to the project, whichever is less, from July 1 through February 28, and at least 3,500 cfs or inflow, whichever is less, from March 1 through June 30. To ensure that downstream flows meet this requirement, PGE, as operator of the project, typically provides a flow of 105 to 108 percent of the required minimum flows.

Although the Madras USGS gage currently is used to document compliance with minimum flows, PGE maintains a parallel gage at RM 100 that is used to automatically control flows discharged from the Reregulating development turbines and spillway gates. Historically, there have often been small discrepancies between the flows measured at each gage due to variations in the electronics and in the time when flow is measured. In addition, the stage versus flow rating curves for the two gages are different. The gages use a common stilling well that has a history of plugging with silt, leading to erroneous readings.

In addition to the minimum flow requirements, PGE is required to limit changes in the Deschutes River, as measured at the RM 100 gage, to 0.1 feet per hour and 0.4 feet per day, except from May 15 to October 15, when ramping rates are limited to 0.1 feet per hour and 0.2 feet per day.

Under certain circumstances, when project inflows are below the required minimum flows of 3,000 or 3,500 cfs, the discharge at RM 100 has been reduced to maintain required reservoir elevations. During those times, PGE determines the required discharge by calculating inflow based on a "snapshot" of reservoir elevations, described as follows.

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Reservoir elevations are measured every 6 hours, and water volumes are determined using reservoir storage tables. The total storage volume of the three reservoirs is compared with the water volume 6 hours earlier, and if the new volume is within 500 second-foot-days (approximately 1,190 acre-feet), it is assumed that the inflow and outflow are equal. The procedure is continued until the minimum flow requirement is restored.

2.1.3 Pelton Development

The Pelton development (RM 102.5) includes a 636-foot-long, 204-foot-high concrete thin-arch dam with an integral gravity-type concrete spillway. A concrete intake that is integral with the dam feeds three steel penstocks that are approximately 100 feet long. The powerhouse contains three 32.4-MW vertical Francis-type turbine generating units, for a total capacity of 100.8 MW.

The Pelton development creates Lake Simtustus, a 7-mile-long, 540-acre reservoir at 1,580 feet above msl. Total storage capacity of the reservoir is 31,000 acre-feet, and the usable capacity is 3,700 acre-feet.

A concrete fish ladder, now retired, extends approximately 3 miles from the Pelton forebay to the Reregulating dam tailrace. The lower portions of the fish ladder are now used for rearing spring Chinook salmon smolts from the Round Butte hatchery. Other facilities include a 15-foot by 20-foot generator house and an administrative building on the west side of the river.

Daily fluctuations in Lake Simtustus are typically less than 0.75 feet, but due to inflows from the Round Butte development, the reservoir fluctuations may exceed 3.5 feet as much as 25 percent of the time. PGE's FERC license currently allows them to draw the reservoir down as low as elevation 1,573 feet above msl (7 feet) in the winter (from September 1 through May 31) and as low as elevation 1,576 feet msl (4 feet) in the summer (from June 1 through August 31).

2.1.4 Reregulating Development

The Reregulating development (RM 100) includes a 1,076-foot-long, 88-foot-high rock-filled dam. Approximately 250 feet of the dam is a concrete gravity-type dam and spillway with an integral intake and powerhouse. The powerhouse contains one 18.9-MW, adjustable blade, bulb-type turbine generating unit. The dam creates the Reregulating reservoir, a 2.5-mile-long, 190-acre reservoir at 1,435 feet above msl. Total storage capacity of the reservoir is 3,500 acre-feet, with a usable capacity of 3,000 acre-feet. A 200-foot-long, primary transmission line extends from the Reregulating generator

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to a 69,000-kV bus at the step-up transformers adjacent to the Reregulating powerhouse. The transformer is the interconnection point with PacifiCorp's transmission system.[11]

Fish passage facilities, extant but no longer in operation, extend from the Reregulating dam tailrace to the Pelton forebay. Other structures include a small emergency generator house and a warehouse building adjacent to the powerhouse.

As described above, the Reregulating development is used to provide relatively stable flows in the lower Deschutes River. The development's reservoir storage and turbine and spillway gate discharges are regulated to redistribute upstream peaking flows and maintain steadier around-the-clock downstream river flows approximately equal to the daily average inflow to Round Butte. The turbines and spillway gates are automatically controlled in response to river stage readings recorded by PGE's gage at RM 100.The Reregulating reservoir elevation fluctuates as much as 27 feet (elevation 1,435 feet msl to elevation 1,408 feet msl) daily. Typical fluctuations are approximately 15 feet.

2.2 PROPOSED ACTION

The Final Joint Application Amendment filed on June 29, 2001, sets forth the measures that the Joint Applicants propose to undertake during the term of any license issued for the project. In response to the draft EIS and ongoing settlement discussions, the Joint Applicants filed a Description of Proposed Preferred Alternative on December 29, 2003, including the drafts, annotated outlines, or summaries of seven plans. These seven documents included detailed descriptions of proposed enhancement measures that reflected the conditions of a pending settlement as of December 29, 2003. The Joint Applicants filed an Updated Description of Proposed Preferred Alternative on April 27, 2004, including revisions to the Pelton Round Butte Fund Implementation Plan, the Lower River Implementation Plan, the Project Operating Plan, and new Road

[11] On April 11, 2002, the Joint Applicants filed a clarification letter stating that two small transmission lines owned by PacifiCorp were inadvertently included in their license application for the project. These lines include a 3.2-mile-long, 69-kV transmission line that extends from the Reregulating development to the Warm Springs substation and a 10.5-mile-long, 69-kV line that extends from the Reregulating development to the Round Butte switchyard.

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Maintenance Agreement with Jefferson County.[12] They encompass and augment the Joint Applicants' originally proposed enhancements stipulated in the Final Joint Application Amendment.

2.2.1 Proposed Project Operation

Under the Draft Project Operating Plan, filed on December 29, 2003, and updated on April 27, 2004, the project would continue to operate in much the same manner as described for the No-action Alternative. The Joint Applicants would continue to operate the Round Butte and Pelton developments for peak energy production and operate the Reregulating development to match project outflows with daily average project inflows.

To improve the accuracy of the modified run-of-river operations and reduce effects on water quality and aquatic resources, the Joint Applicants propose to increase minimum flows and reduce ramping rates below the Reregulating development, reduce seasonal drawdowns of Lake Billy Chinook and daily drawdowns of the Reregulating reservoir, monitor flows more accurately at the Madras gage downstream of the project, and improve monitoring of project inflows.

2.2.2 Proposed Environmental Measures

In addition to the proposed project operational regime, as described in the Draft Project Operating Plan, the Joint Applicants propose to implement the following protection and enhancement measures to protect environmental resources associated with the project.

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[12] These plans are the (1) Project Operating Plan for the Pelton Round Butte Project, working draft dated December 15, 2003, and updated on April 23, 2004 (Draft Project Operating Plan); (2) draft Fish Passage Plan, dated December 23, 2003 (Current Fish Passage Plan); (3) Pelton Round Butte Project Terrestrial Resources Management Plan, final annotated outline, dated November 14, 2003 (Annotated *Outline for Terrestrial Resources Management Plan*); (4) *Summary of Recreation, Land Use, and* Aesthetic Measures for the Pelton Round Butte Project, dated December 2003; (5) Pelton Round Butte Fund Implementation Plan, draft plan, dated December 24, 2003, and updated on April 27, 2004, (Draft Pelton Round Butte Fund Implementation Plan; (6) Pelton Round Butte Lower River Implementation Plan, summary of draft plan, dated December 19, 2003, and updated March 18, 2004 (Lower River Implementation Plan); (7) Draft Long-Term Monitoring Program Description, dated December 23, 2003, and (8) Road Maintenance Agreement. Even though the Joint Applicants indicate that the Project Operating Plan, Pelton Round Butte Fund Implementation Plan, and the Lower River Gravel Assessment are final documents, we will continue to treat them as a draft plans until a settlement among the Joint Applicants and stakeholder is executed.

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Water Use and Quality

- Maintain the current summer operating policy for Lake Billy Chinook, which allows for 1-foot maximum daily reservoir fluctuations (from elevation 1,944 to 1,945 feet msl) between May 15[13] and September 15 of each year.

- Restrict seasonal drawdown of Lake Billy Chinook to a maximum of 20 feet (elevation 1,925 feet msl) during normal winter operations, except during specific extraordinary circumstances, including: (1) flood events during which drawdown is needed for safe passage of flood flows to minimize damage to life and property; (2) unforeseen occurrences during drawdowns necessary to complete emergency repairs on project facilities; (3) periodic scheduled maintenance activities that require drawdown to complete normal repairs on project facilities (including spillway gates, the intake structure, or dam structures); and (4) regional power system emergencies.

- Maintain the current operating policy for Lake Simtustus with a maximum drawdown limit of elevation 1,576 feet msl between June 1 and August 31, and elevation 1,573 feet msl between September 1 and May 31.

- Institute a new maximum daily drawdown limit of 21 feet to elevation 1,414 feet msl for the Reregulating reservoir.

- Maintain average minimum flows equal to monthly target flows, as measured at the Madras USGS gage (no. 14092500), of 4,500 cfs in December through February; 4,571 cfs in March; 4,170 cfs in April; 4,000 cfs in May through July; 3,500 cfs in August; 3,800 cfs in September through October; and 4,049 cfs in November, or inflow to Lake Billy Chinook, whichever is less,[14] with a

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[13] For years in which the spring inflow falls below 3,500 cfs, the refill date is June 15.

[14] The minimum flow targets proposed by the Joint Applicants equal or exceed the following: (1) monthly target flows specified in the Oregon State Water Right Certificate for the lower Deschutes River dated October 21, 1996; (2) monthly flows stipulated in the state of Oregon Water Quality Certificate; and (3) monthly flows stipulated by the Tribes' Water Quality Certificate. When the lowest daily inflow during the previous 7 days is below the target flow, the allowed minimum flow would be equal to the lowest daily inflow recorded during the last 7 days.

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100- to150-cfs allowance for refilling Lake Billy Chinook[15] to meet the summer operating policy of maintaining the reservoir within the top 1 foot of the operating range between June 15 and September 15.

- Adjust minimum outflows from the Reregulating dam on a daily basis, rather than a weekly basis.

- Develop and implement a chart to instruct operators on measures to refill Lake Billy Chinook and Lake Simtustus.

- Use water stored in Lake Billy Chinook to augment outflows from the project to maintain an instantaneous release of 3,000 cfs downstream of the Reregulating dam from September 16 to November 15. Augmentation of outflows would be subjeet to a maximum release of 200 cfs and a maximum drawdown of Lake Billy Chinook of 4 feet.

- Limit changes to lower river stage (immediately downstream of the Reregulating dam[16]) to 0.05 feet per hour and 0.2 feet per day from May 15 through October 15 and to 0.1 feet per hour and 0.4 feet per day from Oetober 16 through May 14, except during specific extraordinary circumstances.

- Hold river flows downstream of the Reregulating development to within +/–10 percent of the average daily inflow to Lake Billy Chinook measured over the preceding day under most conditions.

- Improve the accuracy of the Madras USGS gage in coordination with the USGS.

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[15] When inflows are equal to or greater than 3,650 cfs, the project operators would be allowed to reduce outflows to 150 cfs less than the monthly target flow (or inflows) between November 15 and May 15 to ensure that Lake Billy Chinook is filled to its summer operating level by May 15. In this event, the *allowed minimum flow* would be 150 cfs less than the minimum flow defined by the monthly target flow or the "or inflow" provision, except as noted below. From March through June, if *daily inflows* are less than 3,650 cfs and greater than 3,500 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,500 cfs. If *daily inflows* are 3,500 cfs or less, the *refill allowance* would be 0. From November through February, if *daily inflows* are less than 3,150 cfs and greater than 3,000 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,000 cfs. If daily inflows are 3,000 cfs or less, the refill allowance would be 0.

[16] Because natural oscillations in river stage at the USGS Madras gage can result in river-level fluctuations of up to 0.15 feet, the Joint Applicants propose to record the time and control signal value for all stage change instructions at the Reregulating development and report any signal changes that exceed the proposed hourly rate of change. In addition, the Joint Applicants propose to provide written documentation of all measured stage changes at the USGS Madras gage that deviate more than 0.15 feet from the control set-point value.

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- Document compliance with the minimum flow requirements by calculating project inflows through a combination of operating records and gage readings.

- Install new real-time gages upstream of the Round Butte dam to improve the accuracy of the measurements of inflow to Lake Billy Chinook.

- Track indicators of predicted long-term low-flow conditions in the lower Deschutes River throughout the license period to anticipate long-term low-flow conditions (lower than what has historically been observed at the Madras gage).[17]

- Implement selective water withdrawal (SWW) from Lake Billy Chinook to improve downstream water quality and fish passage as part of a fish passage plan, including constructing a new SWW facility, redirecting currents in the lake to attract and collect downstream migrant fish, and managing downstream water quality and water temperatures by mixing deep and shallow intake water at the Round Butte dam.[18]

- Establish and contribute $21.5 million to a Pelton Round Butte Fund,[19] as described in the Draft Pelton Round Butte Fund Implementation Plan, filed on December 29, 2003, and updated on April 27, 2004, for anadromous fish reintroduction and a sustainable and harvestable fishery in the Deschutes River limited to land aequisition; water rights acquisition; water conservation projects; conservation easements; construction of fish passage facilities and removal of fish passage barriers at projects not licensed by the Commission; instream habitat improvements; riparian and wetland protection and enhancement; and protection and restoration of riparian corridors, wetlands and spawning and rearing habitats adversely affected by off-site project recreation.

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[17] If such a condition (a long-term flow trigger) is reached, the Joint Applicants would consult with the Fish Committee, ODEQ, and the Tribes' WCB to identify any negative effects on aquatic resources and federal Wild and Scenic recreational outstandingly remarkable values, identify potential mitigation measures, and determine if changes in project operations should be implemented.

[18] If the Commission includes the Joint Applicants' proposal for SWW in any license issued for the project and if the Joint Applicants determine that the SWW is ineffective or causes unacceptable impacts on downstream water quality, then the Joint Applicants would file an application to amend the license to permit the implementation of alternative measures.

[19] The Pelton Round Butte Fund includes two components: $10 million reserved for a Water Rights Fund and $11.5 million reserved for a General Fund. An additional $1 million would be deposited into the Water Rights Fund if a water acquisition project planned for 2004 is not completed

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- Develop and implement a long-term, adaptive monitoring program to evaluate the effectiveness of new protection and enhancement measures and to determine if there are continuing project effects on water quality.[20]

Fisheries and Aquatic Resources

- Implement an adaptive fish passage plan, as described in the Current Fish Passage Plan, in cooperation with the Fish Committee. Goals of the plan include developing self-sustaining populations of anadromous spring-run Chinook salmon, summer-run steelhead, and sockeye salmon upstream of Round Butte dam, and to allow access to and through project waters for summer-run/fall-run Chinook, Pacific lamprey, bull trout, rainbow (redband) trout, and other native species. Key components of the plan would include: (1) the baseline phase during which current conditions in the project area are assessed and a draft fish passage plan is developed; (2) the experimental passage phase during which first-phase assumptions are tested with some changes in project operations to improve downstream and upstream fish passage; (3) the interim passage phase during which successful elements of the experimental phase are institutionalized in the project operations through engineering and constructing passage infrastructure improvements; and (4) the final passage phase, which includes final construction and implementation of volitional (voluntary) upstream passage facilities and annual biological monitoring of fish passage success.[21]

- Implement and fund specific habitat enhancements, as described in the Draft Lower River Implementation Plan, filed on December 29, 2003, and updated on April 27, 2004, in the Deschutes River and Trout Creek downstream of the project, including higher minimum flows and more restrictive ramping regimes, improved monitoring of project inflows and outflows, a plan for larger woody debris in Lake Billy Chinook for downstream fish habitat enhancements, and the experimental placement and effectiveness evaluation of spawning gravels, including both geomorphic and biological monitoring, riparian fencing, and restoration measures.

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[20] The Joint Applicants' plan for monitoring project operations is included as section 7 of the draft Water Quality Management and Monitoring Plan (WQMMP) filed with WQC applications. The final WQMMP would be incorporated as part of the WQCs upon approval by the Tribes' WCB and ODEQ.

[21] If the Fish Committee determines and recommends that the re-establishment of fish passage is no longer prudent and the fisheries managing agencies of the federal, state, and Tribal governments accept this recommendation, the Joint Applicants could seek Commission approval for alternative protection and enhancement measures, including additional habitat acquisition efforts.

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- Fund enhancements for resident fish resources in Lake Simtustus and Lake Billy Chinook, including continuing the steelhead post-smolt liberation; funding annual monitoring of the bull trout fishery in Lake Billy Chinook; and participating with the U.S. Fish and Wildlife Service (FWS) in the drafting of a bull trout recovery plan for the Deschutes River basin.

- Implement improvements to the Round Butte hatchery facilities and spawning program, and continue steelhead and Chinook smolt production.

- Develop and implement a long-term, adaptive monitoring program to evaluate the effectiveness of protection and enhancement measures and to determine if there are continuing project effects on aquatic resourees.

Terrestrial Resources

- Modify the existing project boundary to include 10,797 acres of Joint Applicant lands located in the Metolius Mule Deer Winter Range (7,700 acres), Trout Creek subbasin (3,000 acres), and Campbell Creek subbasin (97 acres).

- Develop and implement a Terrestrial Resources Management Plan on lands owned or administered by the Joint Applicants, FS, BLM, State of Oregon, and other private landowners to minimize and mitigate project-related impacts to terrestrial wildlife and vegetation.

- Implement habitat management measures to maintain and enhance upland, wetland, and riparian habitats and other unique habitats in the project vicinity, as part of the Terrestrial Resources Management Plan. Activities would include implementing an exotic and invasive vegetation management program; improving winter range for mule deer; planting native species to enhance wetland and riparian/riverine habitat; installing water guzzlers; improving opportunities for animal movement and reducing the risk of entrapment/mortality at the Pelton fish ladder; managing roads and recreational areas to minimize wildlife disturbance; implementing future habitat improvements; supporting law enforcement in the protection of wildlife habitats and species; preparing annual work plans and 5-year progress reports, implementing an Endangered Species Alert Program, and providing support for a Geographic Information System (GIS) database.

- In coordination with the development of a proposed shoreline management plan to address erosion related to private in-water development and high-priority recreational sites, implement vegetative and land use measures as part of the Terrestrial Resources Management Plan to reduce shoreline erosion.

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Activities include conducting a feasibility analysis; planting native trees and shrubs in selected locations; constructing riparian protection fences; and implementing best management practices for riparian habitats.

- Implement measures to limit the effects of project operations on wildlife species, as part of the Terrestrial Resources Management Plan, filed on December 29, 2003, including funding and implementing a bald eagle comprehensive management strategy for project lands; monitoring nesting productivity for golden eagles, prairie falcons, osprey, and waterfowl; monitoring winter waterfowl use of reservoirs; installing nesting platforms and bird boxes; conducting annual breeding bird surveys; funding mule deer trend counts and radio telemetry studies; supporting measures for protecting threatened and endangered species, including bat populations; and a plan for raptor-proofing distribution lines as needed.

- Develop and implement a transmission line right-of-way (ROW) management plan for the project's 7.9-mile-long primary transmission line that would consider vegetation, soils, hydrology, threatened and endangered species, exotic and invasive species, visual screening and blending of the ROW with surrounding landscapes, and recreational access to the ROW.

Recreational Resources

- Develop and implement the Recreation Resources Implementation Plan, as described in the Summary of Recreation, Land Use, and Aesthetic Measures, (filed on December 29, 2003), to implement the proposed recreation protection and enhancement measures, listed below.

- Improve recreational resources at the following existing recreational sites located within the project boundary: Cove Palisades State Park (Crooked River day-use area, Cove Marina and cabins, and Lower and Upper Deschutes River day-use area), Perry South Campground, Street Creek boat launch, Chinook Island day-use area, Indian Park, Pelton Park, Round Butte Overlook Park, Pelton wildlife overlook, and BLM Beach east of Three Rivers recreation area; and the following existing recreational sites located outside of the project boundary, but within the project vicinity: Monty Campground, Balancing Rocks, Cove Palisades State Park (Crooked River and Deschutes River campgrounds), and existing trails near Madras. The scope of the proposed improvements would be site-specific, but cumulatively would include improved road and parking delineations; improved and resurfaced roads; replaced docks and ancillary structures; repaired and repaved boat launch ramps; improved picnic areas; improved camp site areas; consideration of the physically disabled in the design and construction of recreation facilities and

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access; improved signage and interpretive facilities; improved and formalized existing trails and development of new trails; new boat moorages and designated swimming areas; improved visual characteristics through screening and site changes; and improved viewing platforms.

- Partially fund annual operations and maintenance (O&M) costs at the Cove Palisades State Park and fund 30 percent of the annual O&M costs at Monty Campground, and fully fund O&M at Perry South Campground and day-use areas, Street Creek boat launch, Chinook Island day-use area, Indian Park, Pelton Park, and Pelton wildlife overlook.

- Evaluate whether navigational hazards on Lake Billy Chinook should be marked or removed.

- Study the need for, and fund improvements to, the communications network in the project area to ensure that emergency response personnel at the project and associated recreation sites can communicate with each other and contact external emergency services.

- Fund a feasibility study to evaluate an off-shore moorage program, and if feasible, fund up to 50 moorages on Lake Billy Chinook.

- Improve and fund annual maintenance at four dispersed shoreline campsites within the project boundary on Lake Billy Chinook (BLM Beach, cove area near Cove Marina, west shore area of Crooked River arm, and west shore area of the Deschutes River arm). Fund the appropriate land management agencies for closures and rehabilitation of other dispersed campsites if the respective agency formally commits to close the site and enforce the closure.

- Provide one additional year-round land-based patrol for the project area and two additional part-time water-based patrols for the reservoir to be used during peak times.

Land Use and Aesthetic Resources

- Fund project-related road maintenance, including funds for annual maintenance for Dizney Lane and Pelton Dam Road and funds for Jefferson County's annual maintenance costs through the Jordan Road slide area as described in the Road Maintenance Agreement with Jefferson County (filed on April 27, 2004).

- Enter into an agreement with FS for road reconstruction and maintenance on FS Roads 11 (10 percent of cost) and 1170 (66 percent of cost), as described in the Summary of Recreation, Land Use, and Aesthetic Measures.

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- Fund and implement a shoreline erosion plan[22] for project reservoirs to assess 31 identified erosion sites and to implement erosion control measures at priority sites and to manage private in-water developments within the project boundary.

- Implement aesthetic improvements to the project facilities , as specified in the Summary of Recreation, Land Use, and Aesthetic Measures (filed on December 29, 3003).

Cultural Resources

- Adopt and implement the Cultural Resource Management Plan (CRMP) developed by the Joint Applicants that includes cultural resource monitoring and testing, general cultural resource management policies, management procedures for maintaining and protecting the historical resources in the project area, an interpretation and education (I&E) provision, and site-specific management procedures and protection measures at sensitive cultural sites.

2.2.3 Water Quality Certification

On June 26, 2001, the Joint Applicants filed applications with the Water Control Board of the Confederated Tribes of Warm Springs (Tribes' WCB) and the Oregon Division of Environmental Quality (ODEQ) for WQCs for the Pelton Round Butte Project, as required by Section 401 of the Clean Water Act. On June 24, 2002, the ODEQ issued a WQC for the Pelton Round Butte Project with conditions A through T designed to ensure that the project would be consistent with the Clean Water Act, state water quality standards, and other appropriate requirements of state law related to water quality. Subsequently, on June 25, 2002, the Tribes' WCB issued its 401 Water Quality Certification (WQC) for the project with condition nos. 1 through 16 designed to ensure that the project would be consistent with the Clean Water Act, Tribal water quality standards, and other appropriate requirements of Tribal law related to water quality. Conditions for both WQCs are summarized as follows.

ODEQ WQC condition A involves a draft Water Quality Management and Monitoring Plan (WQMMP).[23] Condition B involves the construction and operation of the Joint Applicants' proposed SWW facility. Conditions C through F and H through K involve compliance with water quality parameters, including temperature, dissolved oxygen (DO), hydrogen ion concentration (pH), nuisance phytoplankton growth, total

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[22] As part of a shoreline management plan.

[23] See Exhibit A of the state of Oregon's June 24, 2002 WQC. The final WQMMP, dated September 2002, was filed with the state of Oregon's terms, conditions, comments, and prescriptions on November 12, 2002.

dissolved gas (TDG), turbidity, toxic substances, and bacteria. Condition G involves measures related to the protection of salmonid spawning and rearing, resident fish, aquatic life, and wildlife including monitoring, spill management, ramping rates, seasonally variable minimum streamflows ranging from 3,800 cfs to 4,500 cfs, seasonal reservoir elevations, run-of-river operations, stream gaging, fish passage, woody debris, sediment transport/spawning gravel, and upper basin habitat enhancement and restoration. Conditions L through T are standard conditions related to discharge permits; compliance schedules; modification; project changes, repairs, and inspections; certification posting; compliance; and fees.

The Tribes' WQC condition no. 1 involves compliance related to protection of anadromous fish passage, salmonid spawning and rearing, resident fish, and aquatic life including habitat improvement projects; long-term water quality monitoring and adaptive management; woody debris; gravel; project operations, including run-of-river operations, stream gaging, and monthly variable Q80[24] flows ranging from 3,431 cfs to 4,571 cfs; seasonal reservoir elevations; and fish passage. Conditions 2 through 6 involve construction and operation of the Joint Applicants' proposed SWW facility to meet water quality standards for parameters, including DO, temperature, pH, nuisance phytoplankton, and TDG. Conditions 7 and 8 involve clarification of water quality violations including implementation of the draft WQMMP to ensure compliance with the antidegradation policy and understanding naturally occurring conditions. Condition 9 involves a spill prevention, control, and countermeasure plan and waste management guidelines. Conditions 10 through 16 are standard conditions related to modification, repairs and maintenance, water quality oversight costs, inspections, project change notification, and certification posting.

2.2.4 Section 18 Fishway Prescription

Section 18 of the FPA provides the Secretaries of the Interior and Commerce the authority to prescribe fishways.[25] By letters dated November 8, 2002 and November 12, 2002, the NOAA Fisheries (as delegated by the Secretary of Commerce) and the FWS (as delegated by the Secretary of the Interior) filed preliminary Section 18 prescriptions, for the construction, operation and maintenance of upstream and downstream fishways. The NOAA Fisheries passage goals are to restore spring and fall Chinook salmon, sockeye salmon, and steelhead to their historic range above the project in the Deschutes River system. FWS' objective is to ensure successful fish passage for spring Chinook salmon, sockeye salmon, steelhead, lamprey, bull trout, and rainbow trout.

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[24] The Q80 flow is the flow exceeded 80 percent of the time for a given month.

[25] Section 18 of the FPA provides: "The Commission shall require the construction, maintenance, and operation by a licensee at its own expense of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior, as appropriate."

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The NOAA Fisheries' preliminary Section 18 prescriptions include general prescriptions to provide upstream and downstream passage for anadromous fish species for the full term of any license issued for the project. Preliminary upstream fishway prescriptions include interim trap and haul using the existing Pelton Trap to collect fish for release into Lake Billy Chinook at Round Butte dam forebay, performance standards, and monitoring plans; and design investigation, review, approval, monitoring plans, installation, operation and maintenance plans, and post-construction effectiveness evaluations for an adult release facility and a volitional fishway. Preliminary downstream fishway prescriptions include design investigations, review, and approval; final design of screen facilities; stage one-downstream fishway and construction; stage-two downstream fishway and construction; operation and maintenance plans; juvenile fishway performance standards; monitoring plans; and post-construction effectiveness evaluations.

FWS filed under Section 18 a request for a reservation to prescribe additional or modify prescriptions, and review and approve all fishway plans; measures to ensure fish passage facilities are fully operational and free of obstructions such as trash, sediment, logs, and debris that would hinder passage; development of a fishway operation and maintenance plan; measures to ensure that future operations do not impair restoration of fish populations; access to the project and project records for FWS personnel inspections; a fish passage plan consistent with the fish passage plan proposed by the Joint Applicants; and an implementation and monitoring plan. FWS' preliminary upstream fishway prescriptions include interim trap-and-haul fishways and monitoring plans; design investigation, review, and approval; construction; operation and maintenance plans; monitoring plans; installation and operation; and post-construction effectiveness evaluations for an adult release facility and a volitional fishway. FWS' preliminary downstream fishway prescriptions include design investigations, review, approval, and final design; construction; operation and maintenance plans; monitoring plans; and post-construction effectiveness evaluations for a downstream fishway at the Round Butte dam. Section 3.6.2.3, *Fish Passage Plan*, in *Aquatic Resources*, presents detailed descriptions of the preliminary Section 18 fishway prescription.

2.2.5 Section 4(e) Federal Land Management Conditions

As authorized under Section 4(e) of the FPA, FS and Interior (BLM and U.S. Bureau of Indian Affairs [BIA]) submitted preliminary 4(e) conditions for the proposed project on November 12, 2002. FS included 23 preliminary conditions for inclusion in any license issued for the project. Interior included 31 preliminary conditions for inclusion in any license issued for the projeet (preliminary condition nos. 1–3, general; 4–16, BIA; and 17–30b, BLM)

FS preliminary condition nos. 1 through 4 are standard conditions that would involve obtaining FS approval on final project design and project changes, and yearly

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consultation with FS to ensure the protection and development of natural resources. The remaining conditions (nos. 5 through 23) are site-specific enhancement measures summarized below.

Preliminary conditions related to aquatic resources include nos. 5 (fish passage plan), 6 (fish habitat protection and enhancement plan), 7 (lower Deschutes River wood restoration), 8 (fish habitat monitoring), and 9 (native fish population monitoring). Terrestrial resources are the subject of preliminary condition nos. 18 (comprehensive terrestrial resource management plan) and 23 (comprehensive transmission line operation and maintenance plan). Recreational resources are the subject of preliminary condition nos. 10 (Lake Billy Chinook recreation management), 12 (Haystack Reservoir), 14 (interpretation and education program), and 22 (transmission line recreational use). Land use is the subject of preliminary condition nos. 11 (FS roads 11 and 1170), 15 (shoreline erosion management), 20 (transmission line restrictions on forest management objectives), and 21 (long-term stand management). Aesthetic resources are the subject of preliminary condition nos. 13 (project aesthetics) and 19 (transmission line aesthetics). Cultural Resources are the subject of preliminary condition nos. 16 (programmatic agreement) and 17 (management of cultural resources).

Interior's preliminary condition nos. 1 to 3 are standard conditions calling for the licensee to provide annual reports consisting of resource management plans, annual work plans, and monitoring and compliance reports; consultation; and inspection to ensure compliance with final 4(e) conditions. The remaining preliminary conditions (BIA 4–16 and BLM 17–30b) are site-specific enhancement measures summarized below.

BIA preliminary conditions involving minimum flows and water quality include condition nos. 4 (project inflow, seasonally variable minimum instream flows ranging from 4,200 to 4,800 cfs, and reservoir fluctuations), 5 (ramping rates), and 6 (water quality monitoring plan). Fisheries are the subject of condition nos. 7 (gravel augmentation plan), 8 (fish passage plan and monitoring), 9 (hatchery and fisheries reintroduction plan), 10 (fisheries habitat compensation plan), and 11 (large woody debris plan). Terrestrial resources are the subject of condition nos. 12 (wildlife habitat compensation plan) and 13 (terrestrial resources management plan, transmission line ROW management plan, raptor protection plan). Recreational resources are addressed in condition no.15 (recreation management plan), land use in condition no. 14 (shoreline erosion management plan), and cultural resources in condition no. 16 (cultural resources reporting).

BLM preliminary conditions addressing fisheries include preliminary condition nos. 17 (fish passage plan), 18 (fisheries habitat compensation plan), 19 (large woody debris plan), 20 (fish habitat monitoring), and 21 (native fish population monitoring). Terrestrial and threatened and endangered species resources are the subject of preliminary condition nos. 28 (terrestrial resource management plan, riparian habitat restoration and management, exotic and invasive vegetation management, bald eagle

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management, raptor protection strategy), 29 (threatened, endangered, and sensitive species protection), 30 (transmission line ROW management plan), and 31 (terrestrial connectivity at the Pelton fish ladder). Recreational resources are the subject of preliminary condition nos. 22 (dispersed recreation management), 23 (upland recreation management), and 24 (interpretation and education plan). Land use is the subject of preliminary condition no. 25 (shoreline erosion management). Cultural resources are the subject of preliminary condition nos. 26 (programmatic agreement) and 27 (CRMP).

2.3 MODIFICATION TO THE PROPOSED PROJECT

After evaluating the Joint Applicants' proposal and the recommendations from the resource agencies and other interested parties, we considered what, if any, additional protection or enhancement measures would be necessary or appropriate with continued operation of the project. The Staff Alternative consists of the Proposed Action (section 2.2) with the following additional or modified measures:

- conduct recreational use surveys every 6 years during the peak recreational season (May through September) and file the results with the Commission; and
- develop and implement a landscape management plan for future improvement and maintenance of project facilities.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

2.4.1 Federal Government Takeover of the Project

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2.4.2 Issuing a Nonpower License

A nonpower license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a nonpower license and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider a nonpower license a realistic alternative to relicensing in this circumstance.

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2.4.3 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alternative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions and cessation of power generation at the project. This would result in the following effects:

- Energy currently generated by the project would be lost. The Pelton Round Butte Project produces an average of about 1.6 million megawatt-hours (MWh) of electrical power per year.
- There would be significant costs involved in retiring the powerhouse and appurtenant facilities.
- The environmental enhancements currently proposed by the Joint Applicants would be foregone.
- If the dam and control structures were removed and the original riverine shoreline re-established, existing recreational, residential, and commercial facilities operated by the Joint Applicants, the FS, and municipal interests would be compromised.
- The potential for environmental effects such as release of sediments accumulated behind the dam to the river downstream, loss of lacustrine habitats, and wetlands could occur.

Removal of the three dams would restore a free-flowing river and riverine habitat, eliminate any fish entrainment mortality that may be occurring, provide unobstructed fish passage past the developments, provide unobstructed recreational riverine boating, and enhance the potential for the Tribes and other recreationists to re-establish some of their traditional uses of the river prior to impoundment.

Despite these potential benefits, we do not regard this alternative as reasonable, because the adverse effects associated with project removal outweigh the potential benefits.

The second project retirement alternative would involve retaining the dams and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative, although the Oregon Department of Fish and Wildlife (ODFW), Conservation Groups, and the NOAA Fisheries did request that project removal be examined as an alternative. We have no basis for recommending this action.

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Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

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3.0 ENVIRONMENTAL CONSEQUENCES[26]

In this section, we describe the resources that are part of the affected environment and provide an analysis of the potential effects on these resources. In response to the draft EIS, the Joint Applicants modified some of the proposed operational and environmental measures, and several agencies and other entities filed revised recommendations to be consistent with a pending settlement agreement. However, other agencies and entities defer to their original terms, conditions, and recommendations. Therefore, in this section, we present the measures originally proposed in the Final Joint Application Amendment, then identify which of these measures have been modified by the Joint Applicants and where agencies have revised their recommendations. We analyze the Joint Applicants' current proposal and agencies' revised recommendations, but retain our analysis of the agency recommendations that were based on the Final Joint Application Amendment. Because implementation of enhancement measures or development and implementation of the management plans, as discussed for each resource area, would affect project economics and other resource areas, we make our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*. Project economics are discussed in section 4.0, *Developmental Analysis*.

3.1 GENERAL LOCALE

The Pelton Round Butte Project is located on the Deschutes River in north-central Oregon. The Deschutes River basin drains approximately 10,500 square miles, including most of the northeastern side of the Oregon Cascades and much of the central Oregon deserts (figure A-2, appendix A). The Deschutes River originates at Lava Lake, approximately 250 miles south of its confluence with the Columbia River at Moody, Oregon. The Deschutes River drops 4,589 feet from an elevation of 4,739 feet at Lava Lake to 150 feet at the Columbia River.

The project is located along the mainstem of the Deschutes River (between RM 100 and 110) and inundates two major tributaries: the Metolius River and the Crooked River. The Metolius River drains approximately 315 square miles of the eastern front of the Cascades. The Metolius River originates from three springs approximately 29 miles north and east of the project. The Crooked River drains approximately 4,300 square miles of the high desert and agricultural lands east of the project.

The climate in the Deschutes River basin ranges from semi-arid plateau lands to the east of the project with 10 inches of annual precipitation per year to the wet, high

[26] Unless otherwise indicated, all information is from PGE and CTWS (2001, 2003), PGE (1999), or CTWS (1999a). All references to additional information request (AIR) nos. 1 through 15 pertain to the response to the request for additional information filed by the Joint Applicants (CTWS and PGE, 2002).

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Cascade Mountains with approximately 120 inches of annual precipitation per year. Annual temperatures in the project area range from – 38 degrees Fahrenheit (°F) to 100°F and above. Topography within the Deschutes River basin is typically rugged and includes portions of the Cascade Mountains, the Blue Mountains, and the High Lava Plains physiographic provinces. The eastern slope of the Cascades is characterized by ponderosa pine forest and upland grasslands along the project to mixed coniferous forests at higher elevations. Much of the project area is composed of broad benchlands cut by deep basalt canyons.

Land use in the project area is mostly rural, with large areas of forest and mountains to the west, open grazing lands and ranches around project reservoirs, and urban residential communities to the east.

3.2 CUMULATIVELY AFFECTED RESOURCES

According to the Council on Environmental Quality's regulations for implementing NEPA (§1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time to include hydropower and other land and water development activities.

Based on information in the license applications, agency comments, other filings, comments from the scoping process, and preliminary staff analysis, we identified water quality, anadromous fish, and recreation as resources that could be cumulatively affected by the continued operation of the Pelton Round Butte Project in combination with other activities on the Deschutes River. We used the resource area to determine the geographic and temporal scope of the EIS analysis.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary.

For water quality, we include the three primary tributaries flowing into the project: the Crooked, Metolius, and Deschutes rivers, and the Deschutes River downstream of the project to the confluence of the Columbia River. We chose this geographic scope because other activities, such as agriculture, timber practices, urban waste disposal, in combination with the project operations may influence water quality, such as DO concentrations, acidity, and nutrient loads, in the Deschutes River basin.

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For anadromous fish, we include the Deschutes River from the project downstream to the confluence of the Columbia River, and from the project upstream to the spawning barriers on the Deschutes, Crooked, and Metolius rivers, as the overall scope of analysis. The analysis includes all habitat that was historically accessible to anadromous fish within these rivers, up to and including the Opal Springs Hydroelectric Project (FERC Project No. 5981) and the U.S. Bureau of Reclamation's (BOR) Bowman dam on the Crooked River, and Ochoco Irrigation District's Ochoco dam on Ochoco Creek. We chose this geographic scope because project developments, in coordination with irrigation, agriculture, and other dams may influence upstream and downstream anadromous fish passage and spawning opportunities in the Deschutes River basin.

For recreation, we include BOR's Haystack reservoir in addition to the project's recreational facilities. We chose this geographic scope because Haystack reservoir may receive overflow recreational use when crowding occurs at Lake Billy Chinook.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS includes past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope will look 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource.

3.3 GEOLOGY AND SOILS

3.3.1 Affected Environment

3.3.1.1 Geologic Setting

Volcanic rocks less than 65 million years old dominate the geology of the Deschutes River basin (O'Connor et al., 1999). These rocks are mainly lavas and associated eruptive rocks. The age of the lava flows generally decreases from east to west. At the west boundary, the Cascade Mountain range is an active volcanic arc.[27] The eastern side of the basin is formed of older, weathered volcanic, volcaniclastic, and sedimentary rocks, while relatively resistant Columbia River Basalts underlie the northern area. Volcanic rocks in the south and west portions of the basin are also relatively strong and resistant.

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[27] A generally curved linear belt of volcanoes above a subduction zone, and the volcanic and plutonic rocks formed there.

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The geology and topography significantly affect the hydrology of the basin. The higher, younger Cascade Mountain range to the west captures a disproportionately large (for its contributing area) amount of precipitation, much of which seeps into the porous volcanic rock to emerge as springs in the Metolius, Crooked, and Deschutes rivers. The storage and transport of this groundwater results in a relatively uniform discharge, resulting in river flows that are relatively steady throughout the year.

Overburden includes glacial, alluvial, and lacustrine (lake) deposits and, locally, wind-carried deposits. The amount and type of sediment depends on the age of the local bedrock. Generally, the older bedrock in the east portion of the basin is more highly erodible and produces more fine sediments, and likely the greater amount of sediments, while the younger volcanic rocks in the south and southwest are stronger and tend to produce gravel-sized material. The resistant Columbia River Basalts similarly produce relatively little sediment, most of it being coarse gravel and cobble sizes. Glaciations and volcanic eruptions have produced large amounts of sediment from time to time, which are then available for transport into the river system.

Regional uplift in the last 6 million years has caused downcutting of the Deschutes River and its major tributaries. The streams have incised into narrow, steep canyons. In many areas, the canyon walls are susceptible to landsliding, especially where weaker or intensely weathered rocks are exposed near the canyon bottom, and some landslides cover several square miles. The Jordan Road slide, on the Jordan Road near Cove Palisades State Park, is a specific slide that has been identified as affecting access to the area because the road has settled.

3.3.1.2 Seismicity and Volcanism

Seismic activity in and near Oregon is concentrated off the west coast and along the Cascade subduction zone, with more dispersed areas of activity in eastern Idaho and northern Oregon/southern Washington (USGS, 2001a). Few earthquakes have been recorded in the Pelton Round Butte vicinity. Within the past 25 years, seismic activity in the Cascade subduction zone has been concentrated in northern California and in Oregon as far north as Klamath Falls, and in Washington, at and north of Mount Saint Helens (USGS, 2001a). The USGS Earthquake Hazards Program provides information on historical earthquakes in and near Oregon as early as 1873, which are consistent with the locations of recorded earthquakes in the last 25 years (USGS, 2001b).

The USGS-produced probabilistic seismic hazard maps indicate that a peak acceleration with a 2 percent probability of exceedance in 50 years is approximately 17 percentage gravitational acceleration at Madras. This is approximately the "1 in 2,500 year" earthquake, which compares with a peak acceleration of 60 percentage gravitational acceleration along the Pacific coast (USGS, 2001c).

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Volcanism in the Pelton Round Butte area is related to the active volcanoes along the Cascade subduction zone. This zone is at the western boundary of the Deschutes River basin. Mount Saint Helens, within the same volcanic arc in southern Washington, has provided the most dramatic example of possible volcanic activity. Peaks close to Pelton Round Butte show little sign of activity.

3.3.1.3 Fluvial Geomorphology and Sediment Transport

There are a variety of sediment sources in the Deschutes River basin. Volcanism and glaciation have contributed large amounts of sediment from time to time. Currently, landslides, debris flows, and erosion associated with the river and its tributaries contribute the most sediment (Grant et al., 1999).

Erosion has occurred at many locations along project shorelines. PGE conducted surveys along the project shorelines and identified 31 erosion sites, which are summarized in table 2.

Table 2. Erosion site descriptions, related recreation sites, and corresponding habitat types at 31 identified shoreline erosion sites within the project boundary. (Source: PGE, 1999)

Site No.	Location/Description	Related Recreation Site or Undeveloped[a]	Habitat Type[b]
1	Lake Billy Chinook, Crooked River arm, east bank by highway bridge	Undeveloped	SB
2	Lake Billy Chinook, Crooked River arm, west bank, north of bend in highway	LBC-50, 51, 52	JP
3	Lake Billy Chinook, southeast side of "The Island" on Crooked River arm	Undeveloped	CL
4	Lake Billy Chinook, northeast side of "The Island" on Crooked River arm	LBC-S-43	CL, GL
5	Lake Billy Chinook, Crooked River arm, south side of small peninsula opposite the tip of "The Island"	LBC-S-41	CL
6	Lake Billy Chinook, Crooked River arm, north side of small peninsula opposite the tip of "The Island"	LBC-S-38, 39	SB, CL, WL
7	Lake Billy Chinook, south of state of Oregon boat launch on Deschutes River arm	LBC-S-48 Upper Deschutes boat launch	JP
8	Lake Billy Chinook, upper Deschutes day-use area	Upper Deschutes day-use area	JP, DEV

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Site No	Location/Description	Related Recreation Site or Undeveloped[a]	Habitat Type[b]
9	Lake Billy Chinook, west bank of Deschutes River arm	Undeveloped	SB
10	Lake Billy Chinook, west bank of Deschutes River arm	Undeveloped	SB
11	Lake Billy Chinook, south of Round Butte dam, east bank below waterfall	LBC-S-36	MS
12	Lake Billy Chinook, south of Round Butte dam, on peninsula below observatory	Undeveloped	SB
13	Lake Simtustus, north of Round Butte dam, immediately downstream of unnamed creek outlet	Undeveloped	R
14	Lake Simtustus, south of Indian Park Campground on the west bank	Undeveloped	R
15	Lake Simtustus, west bank at Indian Park Campground	Indian Park Campground	R
16	Lake Simtustus, shoreline at Pelton Park Campground	Pelton Park Campground	DEV
17	Reregulating reservoir, west bank opposite Campbell Creek outlet	Undeveloped	R
18	Reregulating reservoir, west bank opposite Pelton waterfowl pond	Undeveloped	GL
19	Reregulating reservoir, north of Pelton waterfowl pond	Undeveloped	R
20	Lake Billy Chinook, east bank along Juniper Canyon outlet on Metolius River arm	Undeveloped	GL
21	Lake Billy Chinook, between Juniper Canyon and Big Canyon outlets	LBC-S-34	JP, GL, RB
22	Lake Billy Chinook, north bank Metolius River arm opposite Big Canyon outlet	Undeveloped	GL, CL
23	Lake Billy Chinook, west bank along Big Canyon outlet on Metolius River arm	LBC-S-33	GL, CL, JP
24	Lake Billy Chinook, south shore Metolius River arm	Undeveloped	GL
25	Lake Billy Chinook, north shore Chinook Island	LBC-S-10-16	MS
26	Lake Billy Chinook, end of road east of Three Rivers Marina	LBC-S-26, 27, 28 Three Rivers Marina	JP
27	Lake Billy Chinook, immediately upstream of Fly Creek outlet	Undeveloped	BB

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Site No.	Location/Description	Related Recreation Site or Undeveloped[a]	Habitat Type[b]
28	Lake Billy Chinook, south shore Metolius River arm	Undeveloped	BB, GL
29	Lake Billy Chinook, south shore along Spring Creek outlet, near Perry South day-use area	Undeveloped	MC
30	Lake Billy Chinook, north shore below entry point of Metolius River	Undeveloped	MC
31	Lake Billy Chinook, south shore immediately downstream of Metolius River entry	Undeveloped	MC

[a] Refers to proximity to undeveloped dispersed recreational sites (site numbers noted), developed recreational sites (site name noted), or undeveloped area with no dispersed or developed recreational sites.

[b] Habitat Types: MC – mixed conifer, JP – juniper, BB – bitterbrush, RB – rabbitbrush, SB – sagebrush, MS – mixed shrub, R – riparian, WL – wetland, GL – grassland, CL – cliff/rock talus, DEV – developed/disturbed.

A comprehensive investigation of the effects of Pelton Round Butte on the geomorphology of the lower Deschutes River was carried out in preparation for the license applications (Grant et al., 1999; O'Connor et al., 1999). As part of this investigation, Fassnacht (1998) developed a model to estimate the frequency and magnitude of streamflow and bedload sediment transport both before and after project development, while McClure (1998) identified trends in changes of river cross sections with time. The study concluded that relatively little sediment has been transported from the upper Deschutes River basin in (geologically) modern times. The result is that the Pelton Round Butte development has had little effect on the transport of coarse sediment in the river. Surveys of Lake Billy Chinook show a sedimentation rate of approximately 30 tons per square mile of drainage basin per year, which is a relatively low amount. However, although the amount of sediment transport is small, the projeet captures and retains all coarse sediment from upstream.

The range of flows in the Deschutes River is relatively small, because of the contribution of water from springs to the river and its tributaries. It appears that the riverbed sediments are stable for all but extreme flows (on the order of the maximum 1 percent of flows). The result of the limited flow range, together with the lack of sediments from upstream under both pre-project and existing conditions, is that the river morphology has been altered little by the project.

The effect of Pelton Round Butte as well as other projects on finer sediment (i.e., silt and clay) has been to reduce the amount of these "fines" traveling through and

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being deposited within the river system. The effect of this reduction on river morphology is unknown but is thought to be small (O'Connor et al., 1999).

3.3.2 Environmental Effects and Recommendations

3.3.2.1 Erosion Control

The Joint Applicants propose, in the Final Joint Application Amendment, to develop and implement a shoreline erosion plan as part of a larger shoreline management plan to address all project-related shoreline erosion. The plan would discuss the conditions, probable causes of, and potential remedies for shoreline erosion, describe agreed-upon actions, and provide for those actions to be developed and implemented in consultation with the Shoreline Erosion Team.

The Joint Applicants propose to provide a third-party expert within 1 year of issuance of any license, in consultation with the Shoreline Erosion Team, to perform a baseline survey to identify, map, and assess all existing erosion sites that are project related and are significantly affecting terrestrial habitats, fish habitats, or water quality or that, if the site is located on reservation lands, is causing or is likely to cause significant loss of shoreline. Within 3 years of any license issued for the project, the Joint Applicants would commence rehabilitation at 11 sites identified in the shoreline erosion control plan.

The Joint Applicants propose to conduct an annual monitoring program beginning in the first year after any license issuance and following the pattern and standards established by the baseline survey. An annual report would be prepared describing mitigation activities, maintenance of erosion control sites, and coordination with other resource management plans and document consultation activities.

The Joint Applicants propose to develop site-specific rehabilitation measures for currently identified sites and sites identified during the baseline survey and subsequent annual monitoring. Preference would be given to "soft" erosion control techniques, such as bioengineering, planting native species, sediment replenishment, and anchoring woody debris; however, "hard" measures, such as use of geotextiles and rock armoring, would not be precluded. Prioritization of sites and selection of appropriate remediation measures would be made in consultation with landowners and the Shoreline Erosion Team. Permitting actions would be initiated within 1 year of the beginning of consultation.

BIA preliminary 4(e) condition no. 14 calls for the Joint Applicants to develop and implement a shoreline erosion management plan for all erosion sites within the project boundary. The plan would include prioritization of erosion sites and remediation measures along with ongoing monitoring of erosion conditions. As part of the plan, BIA

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specifies that the Joint Applicants should conduct detailed surveys of the project area to identify priority sites and establish protection measures within 5 years of issuance of any license, giving preference to erosion control measures using vegetation plantings and use of native riparian species. In addition, BIA specifies that the Joint Applicants should prepare a detailed annual work plan and an annual shoreline erosion monitoring report, which would include: (1) an assessment of sites not more than 2 months after implementation of control measures and, then, thereafter at 6-month intervals; and (2) details about shoreline inspections and surveys following any flood event with a 20-year or greater recurrence interval or a drawdown of Lake Billy Chinook or Lake Simtustus that exceeds 2 times the normal rate.

BLM preliminary 4(e) condition no. 25 calls for the Joint Applicants to develop a shoreline erosion management plan, within 1 year of license renewal, to implement appropriate erosion control measures and repair erosion sites as addressed in Kroen (1998) (see table 2) and monitor effectiveness of erosion prevention measures. As part of the plan, the Joint Applicants would stabilize and rehabilitate shorelines at dispersed sites to 80 percent of site potential and conduct surveys at 5-year intervals to monitor the effectiveness of the rehabilitation; perform additional rehabilitation, if necessary; and identify any new sites that require closure or rehabilitation.

NOAA Fisheries and FWS recommend that the Joint Applicants develop and implement a shoreline management plan that includes public and private areas and is tiered to the recreational resources management plan and the terrestrial resources management plan. The shoreline management plan would clarify the effects of shoreline erosion from boater use, recreational sites, freezing and thawing, winter drawdown, and water quality coming into the reservoir from the three major rivers. The FWS recommends that the Joint Applicants develop a site remediation plan for all erosion sites within 2 years of any new license issuance and in consultation with the FWS, BLM, ODFW, and FS.

ODFW, in its revised recommendations, recommends that the Joint Applicants develop and implement a comprehensive shoreline management plan that is tiered to the recreational resources management plan and the terrestrial resources management plan. The shoreline management plan would provide a framework to develop and implement a shoreline monitoring program with opportunities for corrective actions where additional shoreline protection is needed and would identify appropriate and inappropriate use of dock facilities and work with local governments to manage future dock development on private shorelines. The ODFW also recommends that the Joint Applicants develop a shoreline erosion plan consistent with the Joint Applicants' current proposal.

ODEQ, as part of its WQC, would require the Joint Applicants to implement the shoreline erosion measures and continue the shoreline planting program as proposed in the Final Joint Application Amendment, in addition to monitoring for turbidity.

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FS preliminary 4(e) condition no. 15 specifies that the Joint Applicants should develop a shoreline management plan within 3 years of new license issuance. The plan would provide a means to implement appropriate erosion control measures identified in the shoreline management plan within the first 10 years of any license issued for the project. At a minimum, the shoreline management plan would address and outline measures to repair erosion sites on National Forest System (NFS) lands along shorelines as listed in Kroen (1998). In addition, the plan, which would be updated every 5 years, would provide a basis to stabilize and rehabilitate shorelines at dispersed sites as listed in Rolloff et al. (1998) and establish a program to monitor effectiveness of rehabilitation, identify sites at which additional rehabilitation is required, and identify new sites that require closure and rehabilitation.

Our Analysis

Erosion has been identified at 31 sites along the shoreline and in upland areas. Contributing causes include wave action from wind, boats, and other recreational activities.[28] Because of the extensive amount of erosion at the project, we agree with the Joint Applicants and the agencies about the need to assess and remediate existing erosion and to coordinate those efforts with associated resource areas. The plans proposed by the Joint Applicants and recommended by the agencies would provide similar benefits. We conclude that a shoreline erosion plan proposed by the Joint Applicants and developed in consultation with ODEQ, ODFW, FWS, FS, and BLM would provide a reasonable basis for assessment, treatment, and monitoring of both public and private areas.

3.3.2.2 Jordan Road Slide

The Joint Applicants, in the Description of Preferred Alternative filed December 29, 2003, and updated on April 27, 2004, propose to be responsible for the cost of repairs and maintenance of any future slides on Jordan Road or any other roads adjacent to Lake Billy Chinook or Lake Simtustus, consistent with the Road Maintenance Agreement with Jefferson County. Road maintenance payments would include a lump sum of $500,000 in year 5 and annual installments of $80,000 in years 6 through 25 (2004 dollars, indexed for inflation).

Our Analysis

Investigations and ongoing monitoring of the Jordan Road slide indicate that there is a negligible risk to public safety due to the very slow, but continuing, movements of the slide. Movements of the Jordan River slide show a relationship with the reservoir

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[28] We discuss erosion-related effects of recreation in section 3.10.2.3, *Shoreline Management Plan*, in *Land Use and Aesthetic Resources*, and the effects of erosion on terrestrial resources in section 3.7.2.4, *Shoreline Management*, in *Terrestrial Resources*.

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level, making the connection between the slide and project operations obvious. The Joint Applicants' proposed measures would ensure maintenance of safe access along Jordan Road and other roads adjacent to the project reservoirs as defined in the Road Maintenance Agreement with Jefferson County if slides occur.

3.3.2.3 Sediment Transport and Gravel Angmentation

The Joint Applicants, in their Description of Preferred Alternative filed December 29, 2003, and updated on April 27, 2004, propose to address sediment transport monitoring and experimental gravel augmentation in the lower Deschutes River.

Radio-tagged rocks and colored tracer rocks or rocks with exotic lithologies would be placed at 6 to 7 surveyed cross sections (as defined in the gravel study plan) downstream of the Reregulating dam. The cross sections would be examined each year to see if tracer particles had been displaced by that year's flow. At each new site, radio-tagged rocks would be located following flow events exceeding 6,500 cfs and tracer rocks would be located and sections resurveyed during summer after high flows have receded. Columns of painted rock, or scour chains if the rock columns are difficult to install, would be placed at each of the cross sections to assess depth of scour and subsequent filling. The number and locations of columns or chains would be determined in consultation with the Fish Committee. Bedload transport would be measured near the Warm Springs Bridge on rising and falling limbs of flows exceeding 5,500 cfs. If no sediment transport is observed at three peak events of 5,500 cfs, the threshold would be increased in consultation with the Fish Committee.

The Fish Committee could recommend a different tracer rock examination and cross-section resurvey interval after 5 years, based on observations to date.

If the above study components show that sediment transport is occurring, the size of bed materials would be resampled at the sites used by McClure (1998), including surficial pebble counts at all 12 of the McClure sites and bulk sampling at 6 of those sites.

The Joint Applicants also propose to conduct and evaluate gravel augmentation experiments, in consultation with the Fish Committee. Gravel augmentation would include the distribution of 300 cubic yards of gravel among at least 3 sites between the Reregulating dam and Shitike Creek. Gravel would be added in 2007 and monitoring would commence in 2008. Tracer rocks would be placed to track movement of the imported gravel. Each gravel deposit would be surveyed when placed. In subsequent years, the deposits would be surveyed when flows exceed 6,500 cfs and would be surveyed after smaller peak flows, if the tracer gravel has moved. As part of the survey, the Joint Applicants would monitor the adjacent riverbank, the area downstream of the first two response reaches, and the effects on instream pools. The Joint Applicants would submit annual results of the monitoring study to a three-member expert review panel to determine whether gravel augmentation is appropriate. After 5 years of study, the expert

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panel would submit a report detailing its recommendations regarding the need for a gravel augmentation program. The panel would make a recommendation to the Fish Committee regarding the implementation of a long-term gravel augmentation program if the panel determines that (1) the project causes impacts that could be mitigated by auginentation, (2) augmentation did not adversely affect downstream bank stability or cause pool filling, and (3) augmentation would be beneficial to fish habitat and fish populations. Based on the panel's recommendations, the Fish Committee would determine whether (1) a long-term gravel augmentation program should be implemented, in which case the licensces would develop and implement the plan in coordination with the Fish Committee; or (2) the then current study program should be extended, in which case an extended program would be developed and, once approved, implemented with review after 5 years.

The recommendations of the ODFW and the Tribes' Branch of Natural Resources (BNR) are in agreement with the Joint Applicants' proposal. The FS, NOAA Fisheries, and ODFW filed revised recommendations consistent with the current proposal.

The FWS and BLM recommend that the Joint Applicants: (1) develop a detailed monitoring program in cooperation with the agencies to evaluate changes in substrate size and quality downstream of the project, and (2) use the monitoring data to evaluate the effects of operations on the river channel and aquatic fauna in the lower Deschutes River. As part of this effort, FS recommends that the Joint Applicants monitor substrate changes at flows greater than 6,500 cfs by placing tracer rocks in three transects above Shitike Creek and in four transects below Shitike Creek, as well as upstream of the project in Deschutes River and lower Crooked River, and remeasure particle-size distribution and conduct bedload transport sampling if the riverbed moves at flows less than 8,100 cfs.

BIA preliminary 4(e) condition no. 7 specifies that that the Joint Applicants should develop a gravel augmentation plan for the reach between the Reregulating dam and Shitike Creek, including a baseline assessment of gravel habitat, a plan for initial augmentation at a minimum of 3 sites within 6 months of acceptance of the gravel augmentation plan, a 3-year assessment, and further augmentation based on the information from the first 3 years. The BIA recommends that the Joint Applicants develop annual work plans, and, as part of the gravel augmentation plan, monitor the extent and quality of gravels at a minimum of 10 sites every 5 years, re-survey cross sections and conduct tracer gravel studies each year that flow exceeds 6,000 cfs, and sample suspended bedload sediment at Warm Springs Bridge.

Our Analysis

Gravel augmentation may provide additional spawning habitat for fish. The Draft Lower River Implementation Plan provides for measurement and assessment of bedload characteristics and scour occurrence downstream of the project at higher flows, and for

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assessment of the benefits of a gravel augmentation program. If the augmentation is shown to be beneficial, the proposal provides for the development of a gravel augmentation plan.

The experimental gravel augmentation, using a limited amount of gravel, could provide a basis for developing a full-scale augmentation plan. Because the effects of sediment transport and gravel augmentation primarily affect aquatic resources, we discuss this issue in section 3.6, *Aquatic Resources*.

3.3.3 Unavoidable Adverse Effects

Under the continued operation of the project, each reservoir would continue to interrupt the sediment transport process and reduce the availability of coarse sediment, including gravel to the lower Deschutes River. Gravel augmentation would help to mitigate this adverse effect.

3.4 WATER QUANTITY

3.4.1 Affected Environment

The Deschutes River basin is the second largest watershed in Oregon and one of the major sub-basins of the Columbia River system. With the drainage area of 10,500 square miles, the Deschutes River basin covers approximately 11 percent of the state of Oregon. The basin is bounded to the west by the Cascade Mountains, to the south by lava plateaus, to the east by the Ochoco Mountains, and to the north by the Columbia River. The Deschutes River basin is shown in figure A-1 (appendix A).

The Deschutes River originates at Lava Lake in the Cascade Mountains and flows for approximately 250 miles in a northerly direction to its confluence with the Columbia River west of the town of Biggs. Along its course, the river drops 4,589 feet from an elevation of 4,739 feet at its source to 150 feet at the Columbia River. The two major tributaries of the Deschutes River—the Crooked River and the Metolius River—meet at Lake Billy Chinook. Other major streams upstream of the Round Butte development include the Little Deschutes River, Tumalo Creek, and Why-chus Creek (also known as Squaw Creek). Major tributaries to the Deschutes River downstream of the project include the Shitike Creek, Trout Creek, Warm Springs River, and White River. Groundwater contributes substantially to the river flow, resulting in unusually stable annual hydrographs. This groundwater contribution and the subsequent hydrograph stability are common characteristics of each of these watercourses.

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3.4.1.1 Crooked River

The Crooked River, the largest tributary of the Deschutes River, flows 130 miles before it enters the Deschutes River. Flows originate from winter snowfall and spring runoff in the upstream watershed and from spring flows as the Crooked River approaches the confluence with the Deschutes River at Lake Billy Chinook.

Two major reservoirs, operated by BOR, regulate flows of the upper Crooked River. Arthur Bowman dam, at RM 70, forms the Prineville reservoir, which has a surface area of 3,030 acres and maximum storage of 154,700 acre-feet. Ochoco reservoir, on Ochoco Creek, at RM 10, has a surface area of 1,100 acres and a maximum storage of 48,020 acre-feet.

From April through October, most of the Crooked River flows are diverted for irrigation purposes near and upstream of Prineville. However, Crooked River is regenerated along about 10 miles of stream upstream of the confluence with the Deschutes River that includes a spring complex Opal Springs. Analysis of the flows in the Crooked River, as measured by USGS gage no. 14087400 (Crooked River below Opal Springs) and no. 14087400 (Crooked River near Terrebonne, upstream of Opal Springs) shows that, although the two drainage areas differ by only 60 square miles, the gage located below Opal Springs has a mean annual flow that is nearly 5 times higher. On an annual basis, a 10-mile-long reach of Crooked River upstream of the USGS gage no. 14087400 contributes 1,236 cfs to the Crooked River. Because most of the flow upstream of Terrebonne is diverted during the late summer for irrigation, the flow at the Opal Springs gage is presumed to consist almost entirely of groundwater discharge, except during big storm events or reservoir releases.

The Joint Applicants use USGS gage no. 14087400 (Crooked River below Opal Springs), located at the headwaters of Lake Billy Chinook, to estimate the contribution of flows from the Crooked River to the Deschutes River. The mean annual flow at this gage is 1,562 cfs, with mean monthly flows ranging from 81 percent to 139 percent of the mean annual flow. The 10 percent exceedance flow (2,220 cfs) is only 85 percent higher than the 90 percent exceedance flow (1,200 cfs), which is attributed to the fairly uniform groundwater contribution. Tables 3 and 4 summarize flow statistics for USGS gage no. 14087400.

3.4.1.2 Metolius River

The Metolius River is one of the largest spring-fed drainages in Oregon. It originates in the forested hills of the Cascade Range from springs 2 miles south of Camp Sherman. The Metolius River flows 41.2 miles before it meets the Deschutes River at Lake Billy Chinook. No human-made dams or reservoirs regulate the Metolius River.

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Table 3. Flow summary (in cfs) for USGS gage no. 14087400, Crooked River below Opal Springs, from 1961–2001 (Source: USGS, 2003)

	Daily	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Min.	1,090	1,150	1,170	1,160	1,140	1,090	1,120	1,100	1,100	1,100	1,140	1,160	1,120	1,232
Mean	1,562	1,611	1,795	1,970	2,113	1,684	1,351	1,270	1,299	1,361	1,426	1,374	1,506	1,570
Max.	6,130	5,520	5,110	5,410	4,970	5,590	5,070	1,880	2,060	1,690	1,800	3,200	6,130	2,266

Table 4. Flow exceedance for USGS gage no. 14087400, Crooked River below Opal Springs, from 1961–2001. (Source: USGS, 2003)

Percent Exceedance	5	10	20	30	40	50	60	70	80	90	95
Flow (cfs)	2,980	2,220	1,610	1,470	1,400	1,350	1,310	1,280	1,240	1,200	1,180

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The Metolius River has a remarkably uniform flow because it is primarily spring fed; very little water is diverted for consumptive use. USGS gage no. 14091500, located in the river's watershed at the headwaters of Lake Billy Chinook is used to determine the contribution of flow from the Metolius River to the Deschutes River. The mean annual flow at this gage is 1,501 cfs, with a ratio of mean monthly flows to mean annual flow between 91 and 109 percent. The 10 percent exceedance flow (1,800 cfs) and 90 percent exceedance flow (1,230 cfs) differ by only 32 percent. Tables 5 and 6 provide flow statistics for USGS gage no. 14091500.

3.4.1.3 Upper Deschutes River

The largest portion of water in the Deschutes River basin originates from the high Cascade Range along the western part of the basin, where high elevation and oceanward position promote greater precipitation and substantial winter snowpack. Farther east within the Cascade Range rain shadow, annual precipitation and runoff diminish rapidly, resulting in semi-arid rainfall and runoff conditions for much of the basin. Crane Prairie and Wickiup reservoirs regulate the Deschutes River upstream of the project. The Wickiup and Crane Prairie reservoirs are owned by Interior through the BOR and are operated under contracts by local irrigation districts. Crane Prairie reservoir, at RM 238, has a surface area of 4,940 acres and maximum storage of 68,800 acre-feet. Wickiup reservoir, at RM 226, has a surface area of 11,170 acres and maximum storage of 200,000 acre-feet. Large amounts of water in the upper Deschutes River basin are used for agricultural irrigation. Most water is diverted from the Deschutes River near Bend and distributed north through several hundred miles of canals. Water withdrawals are so extensive that river flows are considerably reduced during the irrigation season. Because many of the canals are cut into highly fractured young basaltic lava, they lose large quantities of water. Most of the leakage percolates into the water table and is a major source of groundwater recharge in the irrigated parts of the basin.

The mean annual flow along the 250 miles of the Deschutes River varies because of flow diversions and spring flow (table 7). Groundwater from springs contributes greater than 80 percent of the mean annual flow along the entire length of the river. USGS gage no. 14076500 (Deschutes River near Culver) is used to estimate the contribution of the upper Deschutes River to project inflows. Tables 8 and 9 provide flow statistics for this gage.

3.4.1.4 Lower Deschutes River

Flows released at the Reregulating dam are measured at USGS gage no. 14092500 (Deschutes River near Madras) at RM 100. Mean annual flow at the gage at Madras is 4,575 cfs, and it is estimated that 91 percent of this flow originates as groundwater discharge.

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Table 5. Flow summary (in cfs) for USGS gage no. 14091500, Metolius River near Grandview, from 1912–2001. (Source: USGS, 2003)

	Daily	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Min.	1,080	1,100	1,080	1,140	1,160	1,160	1,180	1,150	1,100	1,100	1,080	1,080	1,100	1,173
Mean	1,498	1,524	1,574	1,544	1,555	1,610	1,631	1,518	1,421	1,369	1,348	1,398	1,488	1,501
Max.	7,100	4,730	6,580	3,220	2,930	2,340	2,780	2,170	1,980	1,790	2,330	3,870	7,100	1,925

Table 6. Flow exceedance for USGS gage no. 14091500, Metolius River near Grandview from 1912–2001. (Source: USGS, 2003)

Percent Exceedance	5	10	20	30	40	50	60	70	80	90	95
Flow (cfs)	1,940	1,810	1,680	1,580	1,500	1,450	1,400	1,350	1,300	1,230	1,180

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Table 7. Flows at different locations in the upper Deschutes River. (Source: USGS, 2003)

USGS Gage No. (Name)	RM	Period of Record	Drainage Area (square miles)	Meau Annual Flow (cfs)	Estimated Groundwater Contribution (percent)
14050000 (Deschutes River below Snow Creek near La Pine)	244	1937–1991	132	148	100
14054000 (Deschutes River below Crane Prairie reservoir near La Pine)	238	1922–1991	254	209	90
14056500 (Deschutes River below Wickiup reservoir near La Pine)	226	1938–1991	483	732	96
14064500 (Deschutes River at Benham Falls near Bend)	181	1924–1991	1759	1,383	90
14070500 (Deschutes River below Bend)	164	1915–1991	1899	487	--[a]
14076500 (Deschutes River near Culver)	121	1952–2001	2705	930	81

[a] Unable to estimate because of the influence of the Little Deschutes River.

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Table 8. Flow summary (in cfs) for USGS gage no. 14076500, Deschutes River near Culver, from 1952–2001. (Source: USGS, 2003)

	Daily	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Min.	425	568	530	524	465	442	428	425	432	445	450	470	520	670
Mean	927	1,355	1,419	1,378	885	609	643	559	542	571	751	1,173	1,287	926
Max.	4,790	3,370	3,410	2,670	2,320	2,260	1,950	1,170	1,200	1,240	2,660	3,190	4,790	1,538

Table 9. Flow exceedance for USGS gage no. 14076500, Deschutes River near Culver, from 1952–2001. (Source: USGS, 2003)

Percent Exceedance	5	10	20	30	40	50	60	70	80	90	95
Flow (cfs)	1,890	1,650	1,290	1,100	965	780	617	546	514	491	477

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The mean annual flow of the Deschutes River at the gage at Moody (14 miles upstream from the confluence with the Columbia River) is 5,852 cfs. While about 80 percent of the mean annual flow of the Deschutes River at Moody originates as groundwater, very little additional groundwater discharges directly into the mainstem of the Deschutes River below the gage at Madras. Increases in streamflow in this stretch of river are mainly due to inflow from three tributaries: Shitike Creek, Warm Springs River, and White River.

Minimum, mean, and maximum flows at the Madras and Moody gages are shown in table 10 for two periods: pre-project and post-project. A period before 1958, the year of completion of the Pelton and Reregulating dams, was used to define a pre-project period. The Round Butte dam was completed in 1964; consequently, the period after 1964 was used to represent the post-project conditions.

Two major tributaries of the Deschutes River downstream of the project are the Warm Springs and White rivers. The White River originates to the west from the glaciated slopes of Mt. Hood and flows 44 miles to its confluence with the Deschutes River. The Warm Springs River also originates high in the Cascade slopes, flowing easterly to the Deschutes River. On a mean annual basis, the Warm Springs and White rivers contribute flows of 448 cfs and 423 cfs, respectively, to the Deschutes River. These flows represent 42 percent and 40 percent of the mean annual inflow between the Madras and Moody gages. Another 115 cfs, or 11 percent of the mean annual inflow between the two gages, originates from Shitike Creek, with the remaining 7 percent attributed to a few smaller tributaries.

3.4.1.5 Project Reservoirs

Lake Billy Chinook, the reservoir behind Round Butte dam, inundates about 9 miles of the Deschutes River, 7 miles of the Crooked River, and 13 miles of the Metolius River (figure A-2, appendix A). At elevation 1,945 feet msl, Lake Billy Chinook has a surface area of approximately 4,000 acres and a volume of approximately 535,000 acre-feet. Usable storage for the currently licensed 85-foot drawdown is 274,000 acre-feet. The average depth of the reservoir is 120 feet, with the maximum depth reaching 415 feet. Lake Billy Chinook has a summer hydraulic residence time of 2 to 3 months.

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Table 10. Flow summary (in cfs) for USGS gages in the lower Deschutes River. (Source: USGS, 2003)

	Daily	Jan	Feb	Mar	Apr	May	Juue	July	Aug	Sept	Oct	Nov	Dec	Annual
USGS gage no. 14092500 (Deschutes River near Madras)							**Pre-project (1925–1956)**							
Min.	2,990	3,580	3,530	3,620	3,430	3,260	3,180	3,020	3,000	2,990	3,060	3,130	3,430	3,524
Mean	4,398	4,735	5,053	5,413	5,496	4,438	4,136	3,715	3,582	3,629	3,747	4,241	4,643	4,398
Max.	12,700	12,400	11,000	12,300	12,100	12,500	7,600	5,880	4,820	4,800	5,540	7,460	12,700	5,605
							Post-Project (1965–2001)							
Min	2,770	2,970	2,770	3,070	3,450	3,460	3,570	3,120	3,370	3,380	3,000	3,160	2,950	3,838
Mean	4,731	5,460	5,494	5,611	5,214	4,495	4,312	4,059	3,976	4,015	4,272	4,764	5,144	4,745
Max	17,800	12,800	17,800	12,100	9,900	9,320	9,490	5,650	5,770	5,610	7,770	8,900	10,400	5,941
USGS gage no. 14103000 (Deschutes River at Moody, near Biggs)							**Pre-project (1897–1956)**							
Min.	3,380	3,910	4,010	4,300	4,130	3,890	3,670	3,480	3,400	3,380	3,460	3,610	3,860	4,147
Mean	5,861	6,448	7,065	7,274	7,732	6,675	5,748	4,809	4,389	4,405	4,585	5,349	6,093	5,859
Max.	37,800	37,800	30,600	26,900	16,000	16,700	11,400	9,720	7,250	7,250	8,880	26,000	26,800	8,379
							Post-project (1965–2001)							
Min.	3,330	3,440	3,560	3,940	3,970	3,910	3,870	3,440	3,570	3,540	3,330	3,700	3,500	4,313
Mean	5,869	7,251	7,616	7,373	6,781	5,926	5,300	4,642	4,430	4,478	4,792	5,517	6,408	5,894
Max.	63,400	36,600	63,400	17,600	13,400	16,500	12,400	6,700	6,450	6,170	8,620	13,200	25,500	7,627

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The reservoir provides seasonal storage for the Round Butte development. In a typical water year, the reservoir is drawn down approximately 10 feet from November through March and is refilled during April and May.[29] Lake Billy Chinook is to be kept at a stable pool elevation with a fluctuation less than 1 foot from June 15 to September 15. Generally, the reservoir has been kept within this limit each year. Only twice between 1967 and 1997 did the reservoir not reach its target elevation of 1,944 feet msl[30] on June 15; however, in these 2 years, the target elevation was reached in late June and mid-July. In all years, the elevation was kept at or higher than 1,944 feet msl until September 15. Because Round Butte is a peaking plant, Lake Billy Chinook typically fluctuates on a daily basis, but daily fluctuations have historically been limited to 1 foot.

Lake Simtustus extends approximately 7 miles up the Deschutes River to the tailrace of Round Butte dam. At the normal maximum elevation of 1,580 feet msl, it has a surface area of 540 acres and a volume of approximately 31,000 acre-feet. At a normal minimum winter elevation of 1,573 feet msl, the lake has a usable storage of 3,700 acre-feet. The average lake depth is 57 feet, with a maximum depth of approximately 165 feet. Lake Simtustus has a summer hydraulic residence time of 5 to 7 days. On a daily basis, Lake Simtustus typically fluctuates less than 0.75 feet. Historically, however, these fluctuations have occasionally exceeded 3.5 feet. The existing license allows Lake Simtustus to be drawn down to as low as elevation 1,573 feet msl (7 feet) in the winter (from September 1 through May 31) and to as low as elevation 1,576 feet msl (4 feet) in the summer (from June 1 through August 31).

The 2.5-mile-long reservoir behind the Reregulating development has an area of approximately 190 acres and a volume of approximately 3,500 acre-feet at elevation 1,435 feet msl. Usable storage between elevations 1,408 feet msl and 1,435 feet msl is approximately 3,270 acre-feet. The hydraulic residence time of the Reregulating reservoir is approximately 12 to 14 hours under normal summer conditions. The average depth of the Reregulating reservoir is 20 feet, and the maximum depth at the dam is approximately 45 feet. The reservoir is used to redistribute upstream peaking flows and provide relatively uniform flows throughout the day. The Reregulating reservoir typically fluctuates up to 20 feet on a daily basis, with a maximum fluctuation of 27 feet.

Average daily discharges from the Reregulating reservoir are approximately equal to the inflow to Lake Billy Chinook. Differences between daily inflows and outflows may, however, occur during refill of Lake Billy Chinook and during storage release periods. These differences are summarized on a monthly basis in table 11. For example, in January, the difference between inflow and outflow was between 90 to 100 cfs

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[29] Although the allowable drawdown is 85 feet, Lake Billy Chinook was drawn down more than 25 feet only twice between 1967 and 1997. The maximum historical drawdown was 33 feet.

[30] Article 38 from the current license requires PGE to hold Lake Billy Chinook at the highest practicable level to December 15 to enhance recreational use.

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approximately 30 percent of the time and was less than 100 cfs approximately 49 percent of the time. According to table 10, the minimum average daily flow in January is about 2,970 cfs. Ten percent of that flow would be about 300 cfs. Therefore, according to table 10, in January, the difference between inflow and outflow would be less than 10 percent of the inflow (300 cfs) at least 92 percent of the time. In other months, the percentage of time when the difference is less than 10 percent would be closer to, or equal to, 100 percent of the time. Table 11 displays the relative magnitude of the difference between inflow and outflow as well as the frequency that the differences occur. Even during storage releases and reservoir refill time, the difference between inflows and outflows is generally within 10 percent.

Table 11. Percentage of time each month when inflows to Lake Billy Chinook are different than outflows from the Reregulating reservoir. (Source: USGS, 2003; PGE and CTWS, 2001)

	Flow Difference (percent of time)							
Month	**Less Than 70**	**70–80**	**80–90**	**90–100**	**100–110**	**110–120**	**120–130**	**More Than 130**
January	2	5	12	30	29	9	5	8
February	5	8	12	31	30	8	5	2
March	1	4	13	39	33	7	2	1
April	1	3	8	45	34	7	2	1
May	0	0	9	52	33	4	0	0
June	0	0	5	48	43	4	0	0
July	0	0	1	52	46	1	0	0
August	0	0	0	52	47	1	0	0
September	0	0	1	48	47	4	1	0
October	0	0	5	43	45	6	1	0
November	0	1	5	41	39	9	4	0
December	1	4	7	32	33	12	4	6

3.4.1.6 Water Use

The Pelton Round Butte Project is operated for hydroelectric power generation, not for water supply or other uses. Water in the drainage areas of the Crooked and upper Deschutes rivers upstream of the project is used primarily to irrigate agricultural lands.

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The largest water diversions for irrigation occur from the Deschutes River near Bend, Oregon, the Crooked River, and Ochoco Creek. The Metolius River has minimal water extracted from it. The principal consumptive uses of the Deschutes River water downstream of the project are for irrigation and industrial and municipal purposes, although these uses are considered minor, while the principal non-consumptive uses include recreation and protection of aquatic life and wildlife.

3.4.1.7 Water Rights

Currently, PGE holds water rights to use 11,700 cfs of the Deschutes River water for hydroelectric generation at the Pelton Round Butte Project, including impounding the water as needed for project operation. This water right carries a priority date of July 26, 1961.

The Tribes currently hold water rights to use 6,000 cfs of the Deschutes River water for hydroelectric generation at the Reregulating dam, including impounding the water as needed for the operation of the project. This water right also carries a priority date of July 26, 1961.

Oregon State licenses issued for the operation of the Pelton Round Butte Project have a provision that the water right granted for hydropower generation is subject to, and inferior in, the point of right of use to any permits granted for domestic, municipal, irrigation, or any other beneficial consumptive use of the Deschutes River and its tributaries. Therefore, these beneficial consumptive uses take priority over hydropower generation.

3.4.2 Environmental Effects and Recommendations

To address project effects on Deschutes River flows, the Joint Applicants propose to increase minimum flows and reduce ramping rates below the Reregulating development, reduce seasonal drawdowns of Lake Billy Chinook and daily drawdowns of the Reregulating reservoir, monitor flows more accurately by using the Madras USGS gage no. 14092500 downstream of the project, and improve monitoring of project inflows. The following sections describe the measures proposed by the Joint Applicants and agencies as well as the results of our analysis of the effects of the proposed measures on water quantity in the project area.

3.4.2.1 Minimum Flows

In the Final Joint Application Amendment, the Joint Applicants proposed to maintain minimum flows below the Reregulating dam equal to the state of Oregon Water Right Certificate no. 73237 for the lower Deschutes River, dated October 21, 1996, or inflow, whichever is less. In their response to the draft EIS, the Joint Applicants

modified their proposed flows, increasing the flows in March, April, and November so that the minimum flows in all months would be equal to or greater than the Q80 flows required by the Tribes' WCB (table 12). When inflows are less than the minimum or "target" flow, the allowed minimum flow would be equal to the lowest daily inflow that was recorded during the past 7 days, and the allowed minimum flow would be re-calculated each day.[31]

Table 12. Comparison of monthly minimum flows (in cfs) proposed by the Joint Applicants, recommended by various agencies and other entities, and contained in the Tribes' Water Quality Certificate. (Source: Staff)

Month	Joint Applicants' Project Operating Plan, filed December 29, 2003, and npdated on April 27, 2004,[a,b] ODFW,[a,b] NOAA Fisheries[a]	Final Joint Application Amendment, filed June 29, 2001,[a] ODEQ,[a,b] American Rivers,[c] Waterwatch,[c] BLM,[a,d] FWS,[a] FS[a,d]	Tribes' WCB[a]	BIA[e]
January	4,500	4,500	4,263	4,500
February	4,500	4,500	4,267	4,500 (February 1–15) 4,200 (February 16–28)
March	4,571	4,500	4,571	4,200 (March 1–15) 4,800 (March 16 –31)
April	4,170	4,000	4,170	4,800
May	4,000	4,000	3,721	4,800
June	4,000	4,000	3,686	4,800
July	4,000	3,500	3,540	4,800 (July 1–15) 4,200 (July 16–31)
August	3,500	3,500	3,446	4,200
September	3,800	3,800	3,431	4,200 (September 1–15) 4,500 (September 16–30)

[31] This represents a modification of the proposal that was made in the Final Joint Application Amendment, in which the minimum flow would be defined as the average of the inflows over the past 7 days.

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Month	Joint Applicants' Project Operating Plan, filed December 29, 2003, and updated on April 27, 2004,[a,b] ODFW,[a,b] NOAA Fisheries[a]	Final Joint Application Amendment, filed June 29, 2001,[a] ODEQ,[a,b] American Rivers,[c] Waterwatch,[c] BLM,[a,d] FWS,[a] FS[a,d]	Tribes' WCB[a]	BIA[e]
October	3,800	3,800	3,512	4,500
November	4,049	3,800	4,049	4,500
December	4,500	4,500	4,225	4,500

[a] Daily average minimum flow equal to specified target flow or inflow, whichever is less. Daily average minimum flow may be reduced by up to 150 cfs to ensure the refilling of Lake Billy Chinook to elevation 1,944 feet msl by June 15.

[b] From September 16 to November 15, inflows would be supplemented to ensure a minimum flow of 3,000 cfs subject to a maximum supplement of 200 cfs and maximum drawdown of Lake Billy Chinook of 4 feet.

[c] Minimum flow would be equal to specified target flow (no provision for "inflow if less").

[d] Minimum outflow would not at any time be less than 3,000 cfs.

[e] If the minimum of the average project inflows over the previous 7 days would be less than the target flow, then the Joint Applicants would release the lesser flow. These minimum flow targets could be further reduced by 100 cfs in January and February and by 200 cfs in March and April to facilitate refilling Lake Billy Chinook.

A "refill allowance" would be used in the period November 15–May 15 to ensure refilling of Lake Billy Chinook to elevation 1,944 feet msl by May 15. The refill allowance would be as follows:

1. When project inflows exceed 3,650 cfs, a refill allowance of 150 cfs would be available during the reservoir refill season.[32] In this event, the allowed minimum flow would be 150 cfs less than the minimum flow defined by the

[32] This allowance would be used to refill Lake Billy Chinook to its summer operating level by May 15.

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monthly target flow or the "or inflow" provision, except as noted in the following text.

2. From March to June, if daily inflows are between 3,500 cfs and 3,650 cfs, the refill allowance would be reduced to the difference between the daily inflow and 3,500 cfs. If daily inflows are 3,500 cfs or less, the refill allowance would be 0.

3. From November through February, if daily inflows are between 3,000 cfs and 3,150 cfs, the refill allowance would be the difference between the daily inflow and 3,000 cfs. If daily inflows are 3,000 cfs or less, the refill allowance would be 0.

The Joint Applicants also propose that the refill allowance be extended from May 15 to June 15, if daily inflows less than 3,650 cfs occur during the reservoir refill season. The refill allowance during this additional month would be the same as discussed above.

The Joint Applicants also propose to prepare Lake Billy Chinook reservoir refill curves with the objective to minimize the use of the refill allowance.

Generally, flows downstream of the Reregulating development would be held to within +/–10 percent of the measured project inflows except in the following situations: (1) days with measured inflow in excess of 6,000 cfs; (2) any event that triggers the Project Emergency Action Plan; (3) power emergencies, as defined in the Western Systems Coordinating Council (WSCC) Minimum Operating Reliability Criteria (March 8, 1999); (4) equipment failures or emergencies at one of the project dams or powerplants; and (5) reservoir drawdowns needed for safe passage of anticipated flood flows to minimize damage to life and property. Flows measured at the Madras USGS gage during the day would be allowed to be up to 260 cfs less than the target daily flow, but not for longer than two consecutive 30-minute readings, to allow for measurement errors.

FWS and FS recommend and ODEQ WQC condition G.6 specifies the same minimum flows as originally proposed by the Joint Applicants (table 12). FS recommends that target flows as stated in the ODEQ WQC be met and supports the 150-cfs allowance for refill of Lake Billy Chinook.[33] FS and BLM also recommend that flows at the Madras gage always be maintained at 3,000 cfs or greater, even when inflow to Lake Billy Chinook is less. NOAA Fisheries and ODFW in their revised recommendations recommend that same flows as currently proposed by the Joint Applicants in the Draft Projeet Operating Plan filed on December 29, 2003, and updated on April 27, 2004.

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[33] We note a difference in the FS-recommended minimum flow in July (3,500 cfs), which is 500 cfs lower than the ODEQ-specified flow.

The Tribes and BIA specify different target flows than those proposed by the Joint Applicants. The Tribes' WQC would require minimum monthly flows equal to the 80 percent monthly exceedance flows for the 1925–1999 period of record at the Madras gage. BIA preliminary 4(e) condition no. 4 calls for target flows that are equal to the lesser of the proposed target flow (table 11) or the minimum of the average project inflows over the prior 7 days. These minimum flow targets could be further reduced by 100 cfs in January and February and by 200 cfs in March and April to facilitate refilling Lake Billy Chinook. BIA's preliminary conditions also specify that in order to refill Lake Billy Chinook to within 1 foot of full pool by May 1, the licensee may request that BIA allow a temporary deviation of minimum flows. The request would be submitted by no later than April 1 in any year.

Table 12 shows the monthly flows currently proposed by the Joint Applicants and agencies.

Some NGOs and state agencies do not agree with the provisions that the Joint Applicants propose, such as "or inflow, whichever is less" and the refill allowance for refilling Lake Billy Chinook. Waterwatch states that these two clauses would diminish the value of natural habitat in the river. ODEQ and ODFW, however, agree with the proposed minimum flows. These entities are concerned that deleting these clauses would result in an inability to refill Lake Billy Chinook in some years, causing negative effects on biota in the reservoir and on recreation. At the time the draft EIS was prepared (August 2003), the state agencies supported the Joint Applicants' proposal presented in the Final Joint Application Amendment but recommended that, when inflows drop below 3,000 cfs between September 16 and November 15, the Joint Applicants supplement outflows to bring outflows back to at least 3,000 cfs to meet the spawning requirements of fall Chinook. This flexible minimum flow rate has a 4-foot limit on reservoir drawdown and would be subject to supplemental outflows of up to 200 cfs. The Joint Applicants have accepted this proposal in their Draft Project Operating Plan.

The Joint Applicants propose in the Draft Project Operating Plan filed on April 27, 2004, to track indicators of predicted long-term low-flow conditions in the lower Deschutes River throughout the license period to anticipate long-term low-flow conditions that are lower than that historically observed at the Madras gage. If such a condition (a "long-term flow trigger") is reached, the Joint Applicants would consult with the Fish Committee, ODEQ, and the Tribes' WCB to identify any negative effects on aquatic resources and federal Wild and Scenic River recreational outstandingly remarkable values, identify potential mitigation measures, and determine if changes in project operations should be implemented.

Our Analysis

Operation of the Pelton Round Butte Project results in a modification of the seasonal timing, duration, and magnitude of the flow releases to the lower Deschutes River. As a result of the project's operation, which is driven by a rule curve of Lake Billy Chinook (the project's principal impoundment), flows in the lower Deschutes River are higher in the fall and lower in the spring than what they would be without the project. In order to protect fish habitat in the lower Deschutes River and provide adequate flows for recreation, Oregon State Water Right Certiflcate no. 73237 for the lower Deschutes River, dated October 21, 1996, specifies the minimum flows required in the Deschutes River downstream of the Reregulating development. The Joint Applicants propose to provide these minimum flows, subject to provisions for low inflow and low Lake Billy Chinook conditions.

In the Final Joint Application Amendment, the Joint Applicants provide the results of their computer simulations for a 30-year period (1967–1996) for different operational scenarios (different minimum flow alternatives). The alternatives considered include existing minimum flows and proposed target flows with provisions for low inflow and low Lake Billy Chinook conditions. BIA provided its own computer-simulated results for the Pelton Round Butte Project operations for the same two scenarios: (1) as proposed by the Joint Applicants in the Final Joint Application Amendment; and (2) as specified by the BIA in its preliminary 4(e) conditions. The Joint Applicants' simulations show that maintaining their proposed minimum flow under all inflow conditions (including when inflow to the project is less than the target flow) would result in a frequent inability to fill Lake Billy Chinook to elevation 1,944 feet msl by June 15. In 8 years of the 30-year period, the reservoir would be well below elevation 1,944 feet msl on June 15, and in another 5 years, the reservoir would be a few feet below the target elevation. Some of these years are most likely consecutive years (i.e., very low reservoir level in a certain year prevents the reservoir from refilling in a subsequent year), leading to prolonged periods of low reservoir levels. In the Final Joint Application Amendment, the simulation results for the Joint Applicants' proposed minimum flows, or inflow if less, indicate that Lake Billy Chinook would not be filled to its target summer level in 7 of 30 years.

As a next step in determining the potential minimum flow scenarios, in the Final Joint Application Amendment, the Joint Applicants simulated project operation under the proposed minimum flow, or inflow if less, with refill allowances of 50 cfs, 100 cfs, and 150 cfs. With a 50-cfs refill allowance, the target summer reservoir level would not be reached in 3 of 30 years. With a 100-cfs refill allowance, the target summer reservoir level would be reached every year by the end of July. However, in 5 of 30 years, the target summer reservoir level would be reached after June 15. With a 150-cfs refill allowance, the target summer reservoir level would be reached shortly after June 15 in 2 of 30 years. In other years, the target summer elevation would be reached at or before

June 15. In all years, once filled, the reservoir level would be kept at or higher than target elevation during the recreational season.

The Joint Applicants, in the Draft Project Operating Plan, define the refill allowance as a function of project inflows. As shown in figure 1 in the Draft Project Operating Plan, Lake Billy Chinook would be refilled by May 1 when inflows exceed the monthly target flows, by May 15 when inflows are below the target flows but above 3,650 cfs and by June 15 when inflows are below 3,650 cfs.

Except during the winter months (December through February), the BIA-recommended minimum flows would be up to 800 cfs higher than those proposed by the Joint Applicants. In some months, the BIA-recommended flows would have a very low frequency of occurrence (table 13).[34]

Table 13. Minimum flows proposed by the Joint Applicants in the Draft Project Operating Plan and recommended by BIA as a percentage of exceedance of flow from 1923 to 1965 (pre-project conditions).

	Joint Applicants		BIA	
	Mean Daily Flow[a] (cfs)	Exceedance[b] (percent)	Instantaneous Flow[a] (cfs)	Exceedance[b] (percent)
January	4,500	46	4,500	46
February 1 to 15	4,500	61	4,500	62
February 16 to 28	4,500	61	4,200	81
March 1 to 15	4,571	79	4,200	91
March 16 to 31	4,571	76	4,800	68
April	4,170	80	4,800	62
May	4,000	62	4,800	28
June	4,000	50	4,800	16
July 1 to 15	4,000	26	4,800	2
July 16 to 31	4,000	26	4,200	6
August	3,500	49	4,200	12
September 1 to 15	3,800	33	4,200	11
September 16 to 30	3,800	33	4,500	0.2

[34] The term "unregulated" does not imply completely unregulated conditions; it refers to the period prior to the completion of the Round Butte Project.

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	Joint Applicants		BIA	
	Mean Daily Flow[a] (cfs)	Exceedance[b] (percent)	Instantaneous Flow[a] (cfs)	Exceedance[b] (percent)
October	3,800	44	4,500	7
November	4,049	60	4,500	26
December	4,500	44	4,500	44

[a] Sources: PGE and CTWS (2003); letter from Interior dated November 12, 2002.

[b] Source: USGS, 2003.

In BIA's model, the minimum flows would have priority over the recreational levels at Lake Billy Chinook. In cases where conflicts between the two requirements occur, the minimum releases would always be met, even if that would result in drawing down Lake Billy Chinook beyond the target minimum recreational level until the absolute minimum level of elevation 1,925 feet msl is reached.

BIA provided modeled monthly duration curves of flows and Lake Billy Chinook summer recreational levels for both the Joint Applicants' minimum flow scenario in the Final Joint Application Amendment and BIA's minimum flow scenario. The results indicate that under the BIA model, the recreational level requirement could not be met about 6 percent of the time or equivalent to about two summers in 30 years. In the most critical case, the reservoir level would be drawn down about 1.4 feet below the minimum summer recreational level of 1,944 feet msl. Under the Joint Applicants' proposal in the Final Joint Application Amendment, the recreational level would not be met about 1 percent of the time, or about 1 month in 30 years, during a 3-month summer recreational period, which is consistent with the Joint Applicants' results.

Comparison of monthly duration curves of flows downstream of the Reregulating development for the Joint Applicants' proposal in the Final Joint Application Amendment and BIA preliminary 4(e) condition no. 4 shows that the BIA scenario would result in higher flows in late spring/early summer. Outflows in September and October would be consistently higher under BIA conditions, with a bigger difference between the two scenarios in September. BIA outflows generally would be lower in January and February. In other months, the differences between outflows for the two scenarios would be small.

The generally higher outflows for the BIA preliminary 4(e) condition no. 4 specifiлcation would be closely linked to the recommended Lake Billy Chinook seasonal drawdown pattern. BIA specifies that Lake Billy Chinook should be maintained to within 1 foot of full pool from May 1 through September 15. Fall drawdown would start on September 15 and would be completed by the end of December. Therefore, BIA calls for a shorter drawdown period, which would permit higher outflows in late fall. At the

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same time, a longer refill period and a slower required rate of rise of the reservoir would allow for more flexibility in the spring/summer operation. For BIA's preliminary conditions, the only months with noticeably lower outflows, when compared with the Joint Applicants' proposal, would be January and February, because BIA would start the refill of Lake Billy Chinook in January, 2 months earlier than the Joint Applicants' proposal. Therefore, the minimum flows that BIA recommends could not be achieved with the Joint Applicants' proposed rule curve, and a drawdown and refill pattern proposed by the Joint Applicants would have to be modified.

It should be noted that BIA modeling was based on the Final Joint Application Amendment. Some differences in results would occur with the Draft Project Operating Plan; however, we believe that the general conclusions about differences between the two proposals would remain unchanged, because BIA-recommended flows continue to be more restrictive than those currently proposed by the Joint Applicants.

The minimum flows that the Tribes' BNR recommends are either equal to or lower than the target flows now proposed by the Joint Applicants in the Draft Project Operating Plan and, therefore, there would be no conflict with the Tribes' interest.

As previously noted, several agencies recommend that hard (or absolute) minimum flows be established to protect aquatic resources from exposure to low flows during extreme drought conditions. We analyze this issue in section 3.6.2.1, *Minimum Flows, in Aquatic Resources*.

The Conservation Groups recommend a hard flow minimum of 3,000 cfs. The USGS inflow record from 1923 to 2000 shows that flows were at or above 3,000 cfs 99.9 percent of the time. During the 77-year period, inflow dropped below 3,000 cfs on only 30 days. The very low frequency of flows below 3,000 cfs is attributed to spring-fed flows from the Metolius River and the Opal Springs complex. However, a substantial increase in water demand has been documented in recent years in the Deschutes River drainage area upstream of the project. Increasing human impacts, droughts, and global warming would likely reduce the groundwater supplies that provide most of the flow into Lake Billy Chinook. We believe that an absolute minimum flow of 3,000 cfs could potentially result in substantial and prolonged drawdowns of Lake Billy Chinook over the term of any license issued and, therefore, do not support a requirement for an absolute minimum flow of 3,000 cfs. As discussed above, the Joint Applicants now agree with the recommendation to maintain a flow downstream of Reregulating development of 3,000 cfs from September 16 and November 15 to benefit fall Chinook spawning during extreme drought periods.

The Joint Applicants propose not to hold river flows downstream of the Reregulating development within +/–10 percent of the measured project inflow when inflow is higher than a trigger flow of 6,000 cfs to ensure the structural safety of project facilities and protect life and property during flood events. The FS and BLM have

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suggested that extending the +/–10 percent inflow rule to higher flows would offer a greater level of environmental protection (see section 3.6.2.1, *Minimum Flows*, in *Aquatic Resources*). In their response to Additional Information Request (AIR) no. 7, the Joint Applicants provided the analysis of historical high-flow events. This analysis shows that a flow of 6,000 cfs is reached on an average of 13.5 days prior to the peak inflow. Flows of 7,000 cfs and 8,000 cfs are reached on an average of 9 and 4.8 days, respectively, prior to the peak inflow. Because larger inflow events typically have rapid increases in inflow prior to the peak, shifting the trigger flow from 6,000 cfs to 8,000 cfs could result in insufficient time to draw down the reservoir as required for project safety. We agree with the Joint Applicants that a trigger flow of 7,000 cfs or 8,000 cfs would limit the project's flexibility to respond to high-flow events and, therefore, consider a trigger flow of 6,000 cfs to be adequate.

3.4.2.2 Flow Monitoring and Operational Compliance

The Joint Applicants proposed, in the Final Joint Application Amendment, to document compliance with flow requirements through a combination of operations records and gage readings. To accurately monitor project outflows, the Joint Applicants propose improvements to the gage at Madras. Project inflows would be based on the inflows measured at the improved gages on the Crooked, Deschutes, and Metolius rivers, plus an estimate of ungaged inflow. In the Draft Project Operating Plan, the Joint Applicants now propose to install two or more new lake level monitoring stations in Lake Billy Chinook at locations selected to reduce level measurement errors caused by wind and other effects. The Joint Applicants propose to estimate project inflows every 6 hours using the "storage change" method. Inflow would be calculated from measured water levels in the project reservoirs, reservoir storage versus elevation tables, and the Madras USGS gage hourly flow record. The inflow from the gages on the Crooked, Deschutes and Metolius rivers would be summed every 6 hours, and this sum would be subtracted from the 6-hour total inflow estimate to provide an estimate of the ungaged inflow to Lake Billy Chinook. This single 6-hour estimate of ungaged inflow would be combined with prior 6-hour estimates of the ungaged inflow (using a rolling average) to estimate the "average ungaged" project inflow. The net estimated hourly inflow would then be calculated as the sum of the average ungaged inflow and the flows measured at the three upstream USGS gages. The estimated daily inflow would be the average of the day's 24 estimated hourly inflow values.

The Joint Applicants want the allowance of 260 cfs to accommodate flow measurement inaccuracies and to control system variations and the inability of the turbine and spillway gates to exactly produce the specified minimum flow. According to the Joint Applicants' proposal, the instantaneous flow at the Madras gage would not be more than 260 cfs less than the target daily flow for any two consecutive 30-minute readings at the Madras gage. The project operator would issue incident reports for any events during which the measured flow release is more than 260 cfs below the allowed minimum flow

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for more than 30 minutes. ODFW and NFMS filed revised recommendations for compliance monitoring consistent with the Joint Applicants' current proposal as outlined in the Draft Project Operating Plan.

BIA preliminary 4(e) condition no. 4.a specifies that new reservoir level monitoring stations be installed to enable direct estimate of inflows from the mass balance equation because the inflow from the streams that discharge directly into the reservoirs and significant groundwater discharge can only be accounted for with accurate measurements of the storage changes. BIA preliminary conditions do not include allowances for measurement error.

Our Analysis

Operational compliance monitoring is necessary to ensure that licensees comply with license conditions. We also support the Joint Applicants' proposal to install modern flow monitoring equipment at the Madras gage and fund improvements at the existing gaging stations on the Crooked, Metolius, and Deschutes rivers upstream of the project. We support Joint Applicants' proposal to install new reservoir level monitoring stations in Lake Billy Chinook to measure the change in storage and to account for wind effects and varying atmospheric pressure. We conclude that installing modern reservoir level monitoring stations would enable a more accurate and reliable estimate of inflows through the application of the mass balance equation. Therefore, the Joint Applicants would not have to rely on the current method of estimating ungaged inflows. This methodology would capture all project inflows, including a significant amount of groundwater that discharges directly into the reservoirs. The Joint Applicants indicate that wind effects on Lake Simtustus and the Regulating reservoir are minor due to their small sizes and protected locations and contend that additional reservoir level monitoring stations would be ineffective. They also indicate that some allowance for deviations between the flow setpoints at the Reregulating dam and the actual measured flow is required, regardless of improvements to gaging equipment. We have reviewed the Draft Project Operating Plan filed by the Joint Applicants and conclude that the proposed compliance monitoring without additional reservoir level monitoring stations and with the additional provisions to report incidents of use of the 260-cfs allowance would be adequate to ensure compliance with any license issued for the project. We also conclude that provision of the 260-cfs allowance is needed to accommodate minor deviations in flows associated with establishing flow setpoints or measurement errors.

3.4.2.3 Water Rights

PGE proposes to modify a subordination clause of its water right allocation in order to provide some certainty as to future project inflows. This proposed modification of the subordination clause would make the 76,000 acre-feet of active storage in Lake Billy Chinook subordinate to only municipal and quasi-municipal uses.

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Waterwatch recommends that the Commission impose a condition that lifts the subordination clause with regard to all future uses while applying the current subordination clause to all previously issued water rights, both instream and out-of-stream. The OWRD position is that discussion of the subordinate clause is outside the scope of the Commission's relicensing process and requires participation of other parties not involved in this process.

The Joint Applicants propose in the Description of Preferred Alternative filed on December 29, 2003, and revised on April 27, 2004, to establish a Water Rights Fund as part of the Pelton Round Butte General Fund that would be used to acquire or lease instream water rights or participate in water conservation projects. Each of these projects would result in increased instream flows that would benefit aquatic habitat. The Joint Applicants would provide $10 million for this fund.

The Joint Applicants have agreed to seek a water rights acquisition project in 2004 prior to issuance of a new license. The proposed project, a purchase of priority water rights on Squaw Creek, would significantly increase fish habitat capacity in this important steelhead stream. If this acquisition cannot be completed prior to issuance of a new license, the Joint Applicants would complete an equivalent project as soon as practicable.

Our Analysis

This is a legal or policy issue that is not appropriately addressed in a NEPA document.

3.4.3 Unavoidable Adverse Effects

None.

3.5 WATER QUALITY

3.5.1 Affected Environment

Water quality conditions in the project area are generally very good and are well suited for the production of resident and anadromous trout and salmon. The large volume of high-quality water that is delivered from spring sources into the three main tributaries to Lake Billy Chinook contributes to the maintenance of relatively stable levels of inflow, low water temperatures, high DO levels, and low levels of turbidity. Favorable conditions generally persist as the water flows through the project reservoirs and the 100-mile length of the lower Deschutes River.

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Because of its location in the state of Oregon and on the Warm Springs Reservation, the project must comply with both state and Tribal water quality standards. Beneficial uses identified by the ODEQ and the Tribes' WCB are shown in tables 14 and 15. Despite the generally good water conditions that prevail in the project area, some violations of state and Tribal standards for water temperature, DO, chlorophyll *a*, and pH have been documented. As a result, several sections of the lower Deschutes River, as well as Lake Billy Chinook, have been designated by the State of Oregon as being water quality limited (table 16). We list the water quality standards that the Joint Applicants identified as being of potential concern in table 17.

3.5.1.1 Lake Billy Chinook and Its Tributaries

Lake Billy Chinook receives water from three rivers that differ in flow, temperature regime, and chemical constituents. Irrigation return flow and passage through urban centers in the upper Deschutes River watershed affects water quality in the Crooked and Deschutes rivers. The Crooked, Deschutes, and Metolius rivers are all high in dissolved phosphorus from natural sources. The Crooked River, and to a lesser extent the Deschutes River, may be artificially enriched in dissolved nitrogen as a result of agricultural practices and urban development.

Differences in water temperature between the three primary tributaries result in complex mixing and flow dynamics throughout Lake Billy Chinook. The warmer waters of the Crooked River, being less dense, generally float over the colder denser waters from the Metolius and Deschutes rivers. Most of the mixing of Crooked River waters occurs at depths of 30 to 90 meters (approximately 100 to 300 feet).

In the Metolius River arm of Lake Billy Chinook, the typical pattern is for cold, dilute water from the Metolius River to sink toward the bottom of the reservoir arm, undergoing limited mixing on the surface and at mid-depths. The surface water in the Metolius River arm is usually composed almost entirely of water from the Crooked River, mixed slightly with water from the Deschutes River.

Mixing in the Deschutes River arm is similar to that in the Metolius River arm, although the patterns are not as pronounced. Crooked River water occurs at the surface of the reservoir immediately downstream of the inlet from the Deschutes River. The water from the Deschutes River flows below this relatively warm and higher conductivity water and mixes at depths within the arm.

Based on limnological surveys that PGE conducted between 1994 and 1996, Lake Billy Chinook stratifies in the summer and develops a thermocline at a depth of approximately 10 meters (30 to 35 feet). This isolates the surface waters from those at depth and influences the flow and mixing of waters in the reservoir. Stratification lasts from May until October. Between October and May, the vertical temperature gradient is greatly reduced, but the reservoir may not mix completely in all years.

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Table 14. Beneficial uses for the Deschutes River basin designated by ODEQ. (Source: PGE, 1999)

Beneficial Uses	Mainstem from Mouth Upstream to Regulating Dam	Mainstem from Regulating Dam Upstream to Bend Diversion Dam, and for the Crooked River Main Stem	Mainstem above Bend Diversion Dam, and for the Metolius River Main Stem	All Other Basin Streams
Public domestic water supply[a]	X	X	X	X
Private domestic water supply[a]	X	X	X	X
Industrial water supply	X	X	X	X
Irrigation	X	X	X	X
Livestock watering	X	X	X	X
Anadromous fish passage	X	X	X	X
Salmonid fish rearing	X	X	X	X
Salmonid Fish spawning	X	X	X	X
Resident fish and aquatic life	X	X	X	X
Wildlife and hunting	X	X	X	X
Fishing	X	X	X	X
Boating	X	X	X	X
Water contact recreation	X	X	X	X
Aesthetic quality	X	X	X	X
Hydro power		X		

[a] With adequate pretreatment (filtration and disinfection) and natural quality to meet drinking water standards.

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Table 15. Beneficial uses for the Deschutes River basin designated by the Tribes. (Source: PGE, 1999)

Use No.	Beneficial nses	Deschutes River Tributaries	Deschutes River Mainstem Downstream to Regulatiug Dam	Deschutes River Mainstem Downstream from Regulating Dam to the Point Where it Flows Off the Warm Springs Reservation (RM 68)	Pelton Round Bntte Project Reservoir Complex	Metolius River and Tributaries
1	Public domestic water supply	X	X	X	X	X
2	Private domestic water supply	X	X	X	X	X
3	Industrial water supply	X	X	X	X	X
4	Irrigation	X	X	X	X	X
5	Livestock watering	X	X	X	X	X
6	Anadromous fish passage	X	X	X	X	X
7	Salmonid fish rearing	X	X	X	X	X
8	Salmonid fish spawning	X	X	X	X	X
9	Resident fish and aquatic life	X	X	X	X	X
10	Wildlife and hunting	X	X	X	X	X
11	Fishing	X	X	X	X	X
12	Boating/rafting	X	X	X	X	X
13	Water contact recreation	X	X	X	X	X

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Use No.	Beneficial uses	Deschutes River Tributaries	Deschutes River Maiustem Downstream to Regulating Dam	Deschntes River Mainstem Dowustream from Regulating Dam to the Point Where it Flows Off the Warm Springs Reservation (RM 68)	Peltou Round Butte Project Reservoir Complex	Metolius River and Tributaries
14	Aesthetic quality	X	X	X	X	X
15	Hydro Power		X		X	X
16	Cultural and religious practices	X	X	X	X	X

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Table 16. Oregon's water quality limited streams–303 (d) List. (Source: PGE, 1999)

Name and Description	Parameter	Criteria	Season	Supporting Data or Information
Deschutes River				
Mouth to White River	pH		Summer	ODEQ data (Site 402176; RM 1.0): 23 percent (7 of 30) summer values exceeded standard (6.5–8.5) with a maximum value of 9.1 between WY 86-95.
	Temperature	Rearing 64°F (17.8°C)	Summer	ODEQ data (Site 402176; RM 1.0): 50 percent (16 of 32) summer values exceeded standard (64°F) with a maximum value of 76°F and with exceedances recorded each year between WY 86-95; 7-day average of daily maximum of 74.0°F exceeded standard (64°F) in 1995.
White River to Reregulating dam	DO	Salmonid spawning: water DO <11 milligrams per liter (mg/L)	October 1 to July 31	ODEQ data (Site 415252; RM 96.8): 21 percent (6 of 21) October to June values exceeded spawning DO standard (11 mg/L or 95 percent saturation) with a minimum of 8.9 mg/L (86 percent) between WY 86–95 (coldwater fishery, spawning approximately from October to June).
	Temperature	Oregon bull trout 50°F (10°C)	Summer	ODEQ data (Site 415252; RM 96.8): 100 percent (24 of 24) summer values exceeded bull trout temperature standard (50) with a maximum value of 64 between WY 86–95; 7-day average of daily maximum of 57.6°F exceeded standard (50°F) in 1995.

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Name and Description	Parameter	Criteria	Season	Supporting Data or Information
Lake Simtustus	Chlorophyll *a*	15 μg/L	Spring to fall	PGE data: High level of productivity with chlorophyll *a* values ranging from 20–40 μg/L in the summer months and late summer blue-green algae blooms noted in study. PSU data: A Chlorophyll *a* value of 19.1 that exceeded chlorophyll *a* criteria (15 μg/L) was measured near the center chlorophyll criteria (15 μg/L) was measured near the center of the lake in June 1982 with an algal bloom noted.
	pH	6.5 to 8.5	Summer	PGE data: pH exceeded 8.5 during 1995 and 1996. PGE data: A pH value of 8.9 was measured near the center of the lake in 6/82.
Lake Billy Chinook	Chlorophyll *a*	15 μg/L	Spring to fall	PGE data: High level of productivity with chlorophyll *a* values ranging from 20–40 μg/L in the summer months and late summer blue-green algae blooms noted in the study. PSU data: 33 percent (1 of 3) Chlorophyll *a* values ranging between 2.3 to 21.8 exceeded chlorophyll *a* standard (15 μg/L) near the dam in 1982 with algal blooms noted.
	pH		Summer	PGE data: Based on a 1995 study, pH in the surface water of the lakes regularly exceeds 9.0 in the summer. PSU data: 100 percent (3 of 3) pH values ranging between 8.8–9.4 exceeded pH standard (6.5 to 8.5) near the dam in 1982 with algal blooms noted.

Notes: mg/L – milligrams per liter
PSU – Portland State University
WY – water year (October 1 to September 30)
PGE – Portland General Electric
μg/L – micrograms per liter

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Table 14. Water quality standards of potential concern. (Source: FGE, 1990)

Standards of Concern	Reason Standard May be Affected
Biological criteria	Discharges from the Reregulating dam may adversely affect biological communities in the lower Deschutes River.
DO	The Deschutes River from the Reregulating dam to the confluence with the White River is included on ODEQ's 1998 303(d)[a] list of water quality limited water bodies. DO in the tailrace below the Reregulating dam does not always meet the relevant standard. Various points of Lake Billy Chinook and Lake Simtustus also may not meet the relevant standard.
Temperature	The Deschutes River from the Reregulating dam to the mouth is included on ODEQ's 1998 303(d) list of water quality limited water bodies. Discharges from the project may increase temperature in the lower river at various times of the year. As with DO, various parts of Lake Billy Chinook and Lake Simtustus may not meet the relevant standard.
pH	Lake Billy Chinook and Lake Simtustus, as well as the lower Deschutes River from the mouth to White River (at RM 46), are included on ODEQ's 1998 303(d) list of water quality limited water bodies. pH values in Lake Billy Chinook and Lake Simtustus exceed 8.5 during the summer. Discharges from the project could affect pH in the lower Deschutes River.
TDG	Spills over the spillways of the dams occur rarely in times of flood. The physical configuration of the spillways and tailraces of the dams do not allow for deep-plunging discharges, and prevent the possibility of gas supersaturation. High values of DO in the reservoir may approach the TDG standard.
Nuisance phytoplankton growth	Lake Billy Chinook and Lake Simtustus are included on ODEQ's 1998 303(d) list of water quality limited water bodies. Chlorophyll *a* concentrations greater than the guideline value specified in Oregon Administrative Rule 340-41-150 have been observed in Lake Billy Chinook and Lake Simtustus.

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Standards of Concern	Reason Standard May be Affected
Antidegradation policy	Because there are potential water quality effects from the project, an antidegradation analysis is necessary to ensure that effects would be minimized.

[a] Section 303(d) of the Clean Water Act requires states to develop a list of waterbodies that do not meet water quality standards and to submit an updated list to the U.S. Environmental Protection Agency every 2 years.

Lake Billy Chinook is well oxygenated during the winter throughout its depth, although the DO concentration varies slightly with depth. During the summer, the reservoir experiences noticeable DO depletion in the hypolimnion. DO values of less than 4.0 mg/L are common near the bottom at the deepest stations. Near the surface, DO values stay at or above 10 mg/L throughout the year.

The seasonal pattern of pH in Lake Billy Chinook is similar to that of temperature and DO, i.e., not completely uniform vertically during the winter, with strong vertical stratification in the summer. Values of pH near the surface regularly exceed 8.5 during the summer, with a maximum value of 9.4 and a median value of 8.6, based on monthly samples from 1994 through 1996. Values are not as extreme, with a median of 7.5 and a maximum of 8.3, at the approximate depth of the power intake.

Turbidity in Lake Billy Chinook is generally less than 2 nephelometric turbidity units (NTUs). Because of algal production in the epilimnion, turbidity tends to be higher near the surface than at greater depths, particularly in the summer when the reservoir is stratified. High turbidity was observed deep in the reservoir after a major flood that occurred in February 1996, which caused a plume of highly turbid water to flow into and through the deeper portions of the reservoir.

Blooms of blue-green algae occur regularly in Lake Billy Chinook during late summer. Although localized concentrations of chlorophyll *a* can be quite high during these events (individual values greater than 60 μg/L) the average concentration of chlorophyll *a* measured on depth integrated samples taken from the epilimnion during 1994 through 1996 was 18 μg/L. The annual cycle of chlorophyll *a* abundance shows low values during the winter and increasing values through the spring to a peak in June, followed by a decrease in July. Another peak occurs in October. The spring peak is associated with increasing abundance of diatoms, while the October peak is associated with a bloom of blue-green algae.

3.5.1.2 Lake Simtustus and the Reregulating Reservoir

Lake Simtustus is thermally stratified in the summer from approximately mid-May until mid-September, with a thermocline developing at a depth of approximately 4 meters

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(14 feet). Stratification breaks down in September, and the reservoir is vertically isothermal by late October. The reservoir continues to cool until March or April.

During the winter, the reservoir has a uniform DO concentration throughout its depth. In May, as stratification sets in, the epilimnion begins to display elevated DO concentrations. DO concentrations reach a peak in the epilimnion in June, well above saturation levels. The hypolimnion remains well-oxygenated throughout the year.

Seasonal patterns in pH in Lake Simtustus are similar to those in Lake Billy Chinook, but more intense. Lake Simtustus shows a more intense stratification, with summertime pH values at the surface regularly exceeding 9.4, based on monthly samples. The median pH was 8.8 and the maximum 9.7, based on monthly samples. In contrast to Lake Billy Chinook, pH in Lake Simtustus is vertically uniform during the winter. In the hypolimnion of Lake Simtustus, pH was usually 8.0 or lower, and did not exceed 8.5 during 1994 through 1996.

The pattern of turbidity in Lake Simtustus is similar to that of Lake Billy Chinook. Most values are below 2 NTUs. The maximum value of 4.5 NTUs measured in Lake Simtustus was associated with the February 1996 flood.

The annual cycle of chlorophyll *a* abundance in Lake Simtustus is similar to that in Lake Billy Chinook, but more intense. Chlorophyll *a* concentrations in Lake Simtustus are generally higher than in Lake Billy Chinook. The peak chlorophyll *a* concentration measured in Lake Simtustus during 1994 to 1996 was 80 μg/L, and the mean of depth integrated samples taken over the study was 30 μg/L. Although there is a fall chlorophyll *a* peak in September, blue-green algae do not dominate the phytoplankton in the fall.

Water enters the Reregulating reservoir through the powerhouse of Pelton dam from the hypolimnion of Lake Simtustus. The Reregulating reservoir is small relative to the flow from Pelton dam, so the hydraulic residence time is short (typically less than 12 hours), and there is little difference in the water quality characteristics of flows entering and leaving the reservoir.

3.5.1.3 Lower Deschutes River

The lower Deschutes River below the project represents the mixing of the three primary tributaries (the Crooked, upper Deschutes, and Metolius rivers) as they pass through the project. As such, many of the constituents measured below the project are intermediate between the values of the tributary rivers. Because the Deschutes River above the project is itself intermediate between the Crooked River and the Metolius River for many constituents, the Deschutes River below the project is quite similar to the Deschutes River above the project.

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Conductivity values measured in the Deschutes River below the project have a similar median, but have a smaller range than the Deschutes River above the project (table 18). These differences reflect the mixing of the main tributaries as they travel through the project reservoirs.

Table 18. Minimum, maximum, and median water quality values measured in the Crooked, upper Deschutes, Metolius, and lower Deschutes rivers during June 1994 through October 1996. (Source: PGE, 1999, as modified by staff)

Parameter		Crooked	Upper Deschutes	Metolius	Lower Deschutes
Specific conductance (μS/cm)	Min.	124	54	40	83
	Max.	196	156	81	148
	Median	161	110	59	11
Water temperature (°C [°F])	Min.	8.3 [46.9]	6.0 [42.8]	4.5 [40.1]	6.9 [44.4]
	Max.	14.3 [57.7][a]	15.5 [59.9][a]	9.8 [49.6]	14.3 [57.7][a]
	Median	12.8 [55.0][a]	11.9 [53.5][b]	7.2 [45.0]	11.6 [52.9][b]
DO (mg/L)	Min.	9.3[a]	7.8[a]	8.1[a]	6.6[a]
	Max.	13.9	12.3	14.4	12.3
	Median	10.6[a]	11.1	11.7	10.6[a]
Turbidity (NTU)	Min.	0.0	0.0	0.1	0.4
	Max.	9.5	1.8	1.3	4.1
	Median	0.7	0.9	0.9	1.1
pH (units)	Min.	7.6	7.5	7.0	7.2
	Max.	8.7[a]	8.7[a]	8.2	8.5
	Median	8.2	8.2	7.7	8.1

Notes: DO – dissolved oxygen

NTU – nephelometric turbidity unit

μS/cm – micro-Siemen per centimeter

[a] Values exceed applicable state or Tribal water quality criteria.

[b] Values exceed applicable Tribal water quality criteria, but not state criteria.

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The range of temperature measured below the project is somewhat less than that in the Deschutes River above the project, with a maximum monthly value of 14.8 degrees Celsius (°C [58.8°F]) and minimum of 6.9°C (44.4°F). The median temperature of 11°C (52.0°F) is also somewhat lower than in the Deschutes River above the project, reflecting the influence of Metolius River water (table 18). The effect of mixing with the Metolius River and Crooked River can be seen in the broadening of the range of temperatures measured below the project.

DO below the project displays a greater range than in the tributaries above the project, with a median value intermediate between the Metolius and Deschutes rivers (table 18). During the course of the 1994 through 1996 study, one monthly value of DO less than 8.9 mg/L was recorded below the project. Most values were between 9 and 13 mg/L. Longitudinal measurements indicate that DO is often at concentrations less than saturation immediately below the Reregulating dam, but increases to supersaturation within the first 8 to 18 miles downstream of the dam due to photosynthetic activity in the river.

Turbidity did not differ between the Deschutes River below the project and the three tributary rivers, based on the monthly samples. The range of values below the project (0.5 to 4.2 NTUs) was somewhat greater than in the Deschutes River and Metolius River above the project, a reflection of the high values recorded in the Crooked River (table 18).

Values of pH measured monthly in the Deschutes River below the project ranged from 7.1 to 8.5, with a median value of 8.0. The maximum value is less than the maximum value recorded in the Deschutes River and Crooked River above the project (8.7 for each). The median value in the Deschutes River below the project is similar to the Crooked River and the Deschutes River above the project, but markedly higher than for the Metolius River (table 18).

3.5.2 Environmental Effects and Recommendations

The Joint Applicants proposed in the Final Joint Applicant Amendment several measures that are expected to substantially improve water quality within the project reservoirs and in the Deschutes River downstream of the project. These included the design, construction and operation of a SWW facility, implementing near-term riparian corridor improvements and a long-term WQMMP. The Joint Applicants have modified these proposed measures[35] to now include the establishment of the Pelton Round Butte Fund Implementation Plan, which includes a Water Rights Fund and a General Fund, and Draft Lower River Implementation Plan.

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[35] Description of Preferred Alternative filed on December 29, 2003, and updated on April 27, 2004.

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The proposed SWW facility in Lake Billy Chinook would allow water to be drawn from the surface of the reservoir as well as from the existing deep intake. This would enable the project to modify the temperature of the water discharged from Lake Billy Chinook, as well as to redirect surface currents in the reservoir to facilitate fish passage. The Joint Applicants have conducted extensive modeling studies to evaluate the effects of different blends of surface and deep withdrawals on reservoir currents and water quality conditions within Lake Billy Chinook, Lake Simtustus, and the lower Deschutes River. The proposed SWW facility would be constructed after all pre-requisites have been met for transition to the interim phase of the Current Fish Passage Plan (see section 3.6.2.3, *Fish Passage Plan*, in *Aquatic Resources*). These include issuance of any new license and disease clearance from the Tribal Council and the State of Oregon to transfer fish from the lower Deschutes River into the waters upstream of the project.

The Joint Applicants propose to provide substantial funding for habitat enhancement measures through the Pelton Round Butte Fund Implementation Plan and the Draft Lower River Implementation Plan. They note that streamside protection measures implemented by the Tribes have helped to reduce water temperatures, and that these measures can also be expected to result in an improvement in other water quality parameters.

The Joint Applicants propose a number of measures that would assist with meeting biological criteria established by the Tribes' WCB and ODEQ. Most of these measures are targeted at improving habitat conditions for resident and anadromous trout and salmon, and are evaluated in detail in section 3.6, *Aquatic Resources*. These measures include the Pelton Round Butte Fund Implementation Plan and the Draft Lower River Implementation Plan the Current Fish Passage Plan, continued operation of the Round Butte hatchery, operational restrictions, transfer of large woody debris to the lower Deschutes River, sediment transport monitoring, and an experimental gravel augmentation program. The Joint Applicants' proposed shoreline planting program, which would also assist with meeting biological criteria, is evaluated in section 3.7, *Terrestrial Resources*.

ODEQ and the Tribes' WCB issued final conditions for water quality certification of the project on June 24, 2002, and June 25, 2002, respectively. Both agencies included conditions requiring that the proposed SWW facility be operational within 5 years after issuance of any new license. Both WQCs also included a draft WQMMP, and require the Joint Applicants to revise and file the final plan with each agency within the specified time frame. A final WQMMP was flled in November 2002 with the state of Oregon's terms and conditions. The WQMMP includes provisions for monitoring water quality and implementing adaptive management when it is needed to comply with state or Tribal water quality standards. The WQMMP also includes a provision that the Joint Applicants would institute controlled spills at the Reregulating dam if the DO concentration in the Reregulating dam discharge drops below 11.0 mg/L or 95 percent saturation.

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Conditions filed by other agencies, the Tribes, and NGOs all indicate support for construction of the proposed SWW facility, and several provided conditions or recommendations pertaining to monitoring requirements, which we discuss and evaluate in section 3.4.2.2, *Flow Monitoring and Operational Compliance*, in *Water Quantity*. Several agencies also included conditions or recommendations that specify different levels of effort be directed toward habitat restoration. Since these measures are directed primarily at improving conditions for aquatic resources, we evaluate them later in section 3.6, *Aquatic Resources*.

We evaluate the effects of measures proposed to improve water quality in the following sections.

3.5.2.1 Water Temperature

The standard set by the Tribes for salmonid spawning is 12.8°C (55.0°F) maximum, and the standard for all life stages of bull trout is 10.0°C (50.0°F) maximum. The bull trout standard applies year-round within the project reservoirs at the depths in which bull trout occur or would be expected to occur under natural conditions, and in the lower Deschutes River downstream to approximately Maupin (RM 58). Salmonid spawning and rearing criteria apply in the lower Deschutes River downstream of Maupin, and the timing is dependent on the periodicity of these salmonid life stages.[36]

ODEQ revised its temperature standard in March 2004 (Oregon Administrative Rule Chapter 340-41) to include more species, to vary with time of year, and to be geographically explicit. Standards that apply to the Deschutes River basin are listed below:

1. Salmon and steelhead spawning use: the 7-day-average maximum temperature may not exceed 13.0°C (55.4°F).
2. Core coldwater habitat use: the 7-day-average maximum temperature may not exceed 16.0°C (60.8°F).
3. Salmon and trout rearing and migration: the 7-day-average maximum temperature may not exceed 18.0°C (64.4°F).
4. Migration corridor: the 7-day-average maximum temperature may not exceed 20.0°C (68.0°F).
5. Bull trout spawning and juvenile rearing: the 7-day-average maximum temperature may not exceed 12.0°C (53.6°F).

[36] Zimmerman and Reeves (1999) report that steelhead spawn in the lower Deschutes River from mid-March through May, and resident rainbow trout spawn from mid-March through August. Fall Chinook salmon spawn from late September through November (Witty, 1999).

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The Metolius River above Lake Billy Chinook exceeds 10.0°C (50.0°F) only for a few hours each afternoon from mid-June through August. Temperatures in the Crooked River and in the Deschutes River upstream of the project are greater than 12.8°C (55.0°F) during the same period, but are less than 18.0°C (64.4°F).

Although surface waters in Lake Billy Chinook become quite warm during the summer months, a substantial volume of the reservoir remains below the relevant criteria for bull trout and for salmonid rearing. The results of water temperature modeling presented in the Joint Applicants' Section 401 WQC application indicate that the 17.8°C (64.0°F) Tribal salmonid rearing criterion is met at depths below approximately 50 feet during the summer months, and temperatures meeting the 10°C (50°F) Tribal bull trout standard exist at greater depths in the Metolius and Deschutes arms of Lake Billy Chinook. These data are consistent with the locations where kokanee and bull trout are found or expected to be found. In Lake Simtustus, a substantial volume of the reservoir meets the 17.8°C (64.0°F) Tribal salmonid rearing criterion during the summer months, but the 10°C (50°F) Tribal bull trout standard is not met at any depth.

Water temperatures in the lower Deschutes River downstream of the Reregulating dam exceed the 10°C (50°F) Tribal bull trout standard during the late summer and early fall months. However, based on mass balance calculations adjusting for the estimated warming during travel in the absence of the reservoirs, the annual range of temperatures measured below the Reregulating dam is similar to what would exist at that point in the Deschutes River in the absence of the reservoirs (Raymond et al., 1998). Lower river temperature modeling showed that releases from the project cool the river in the spring and early summer, and warm the river slightly from mid-August to mid-December (figure 1). The average extent of the modeled increase in mean weekly maximum temperature ranged from 0.5°C (32.9°F) at RM 4 to 0.7°C (33.26°F) at RM 100 (Huntington et al., 1999).

The Joint Applicants modeled the potential effects of a SWW facility on water temperatures and other water quality parameters within Lake Billy Chinook and Lake Simtustus and in the lower Deschutes River downstream of the Reregulating dam. The effects of a number of different "blends" of water withdrawn from the existing deep intake and from a location closer to the surface of the reservoir were evaluated. The WQMMP would require that the proportion of water that is withdrawn from the surface and deep intakes fall within the range bounded by two of the modeled blends (Blend 13 and Blend 16), which were selected by the Joint Applicants and agencies to define an acceptable range of proportions as defined in the WQMMP. The seasonal proportions of surface withdrawal associated with each blend, and predicted effects on water temperatures in the lower Deschutes River below the Reregulating dam are shown in figures 2 and 3. The model results shown in these figures indicate that both blends would shift the timing of seasonal water temperature trends back toward the pre-dam conditions, and would provide summer water temperatures that are generally lower than those that

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were predicted to have occurred pre-project. Drawing most of the water from the reservoir surface is also predicted to provide surface currents that should assist with guiding downstream migrating fish toward the intake and associated bypass facilities.

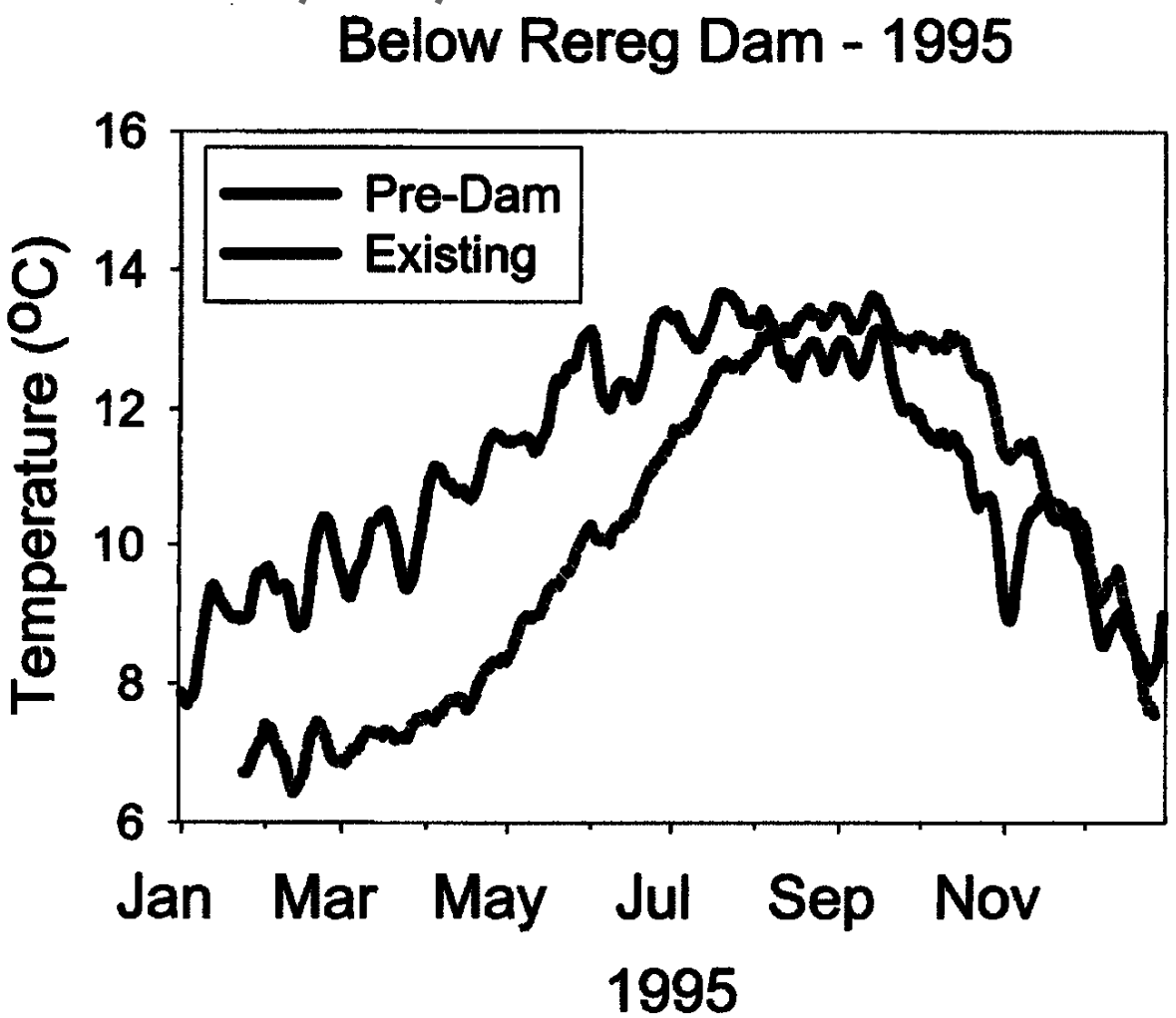

Figure 1. Existing and simulated pre-dam temperatures downstream of the Reregulating dam based on 1995 hydrology and meteorology. (Source: Khangaoankar et al., 2002, as modified by staff)

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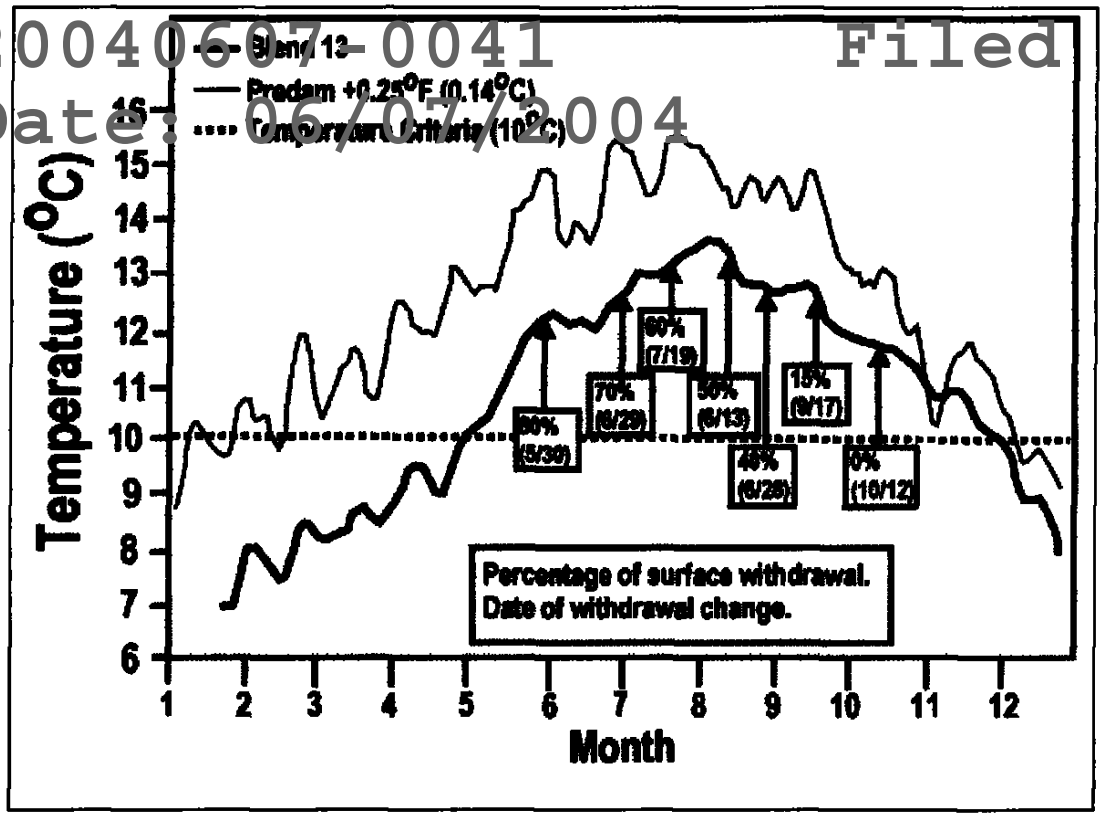

Figure 2. Simulated water temperatures in the lower Deschutes River under Blend 13. (Source: CTWS and PGE, 2002)

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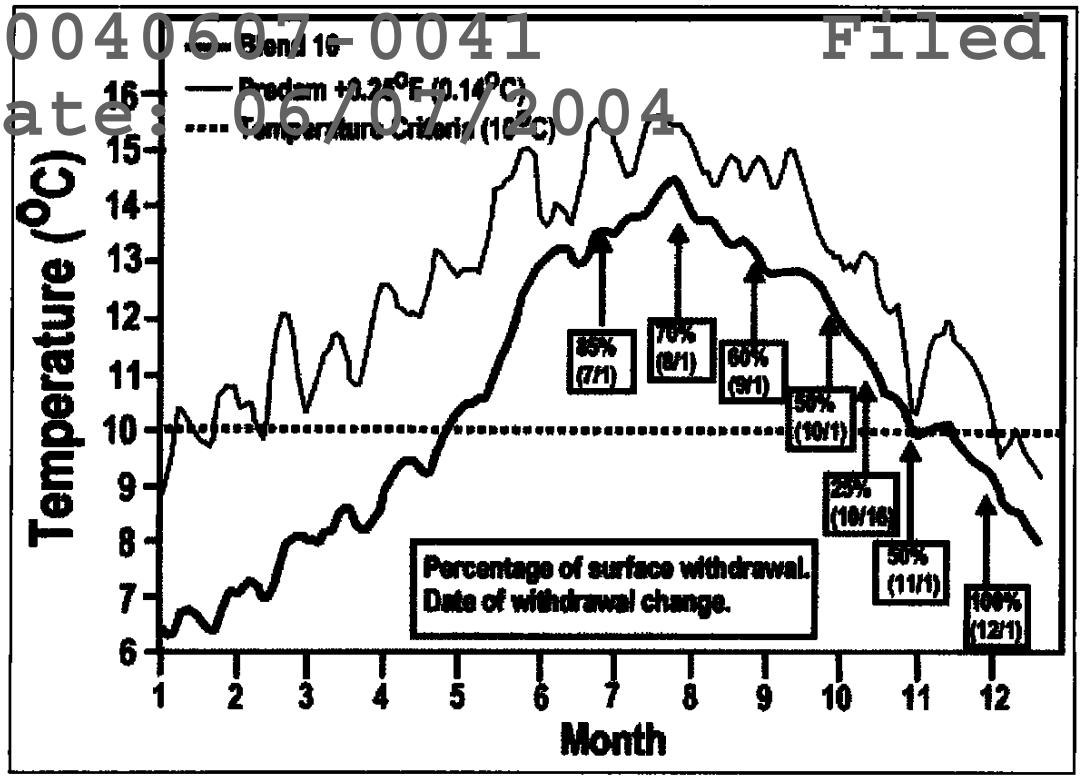

Figure 3. Simulated water temperatures in the lower Deschutes River under Blend 16. (Source: CTWS and PGE, 2002)

Within Lake Billy Chinook, modeling predicts that the withdrawal of warmer surface waters, primarily from the Deschutes and Crooked rivers, during winter and spring would allow the accumulation of colder and denser Metolius River water that tends to fill the bottom of the reservoir. This would lead to a colder mean reservoir temperature as summer approaches, thereby improving habitat for bull trout and other salmonids. Modeling also indicates that coldwater habitat for salmonids in Lake Simtustus and the Reregulating reservoir would also be increased. Although the Tribal bull trout 10°C (50°F) criterion would not be met at all depths within the reservoirs, as in the current condition, a much greater volume of water would meet the criterion after the proposed SWW facility is implemented.

The WQMMP includes provisions for monitoring and reporting outflow temperatures and adjusting the proportions of water that are withdrawn from the surface and deep intakes as needed to comply with water temperature standards. This plan is discussed further in section 3.5.2.6, *Monitoring and Adaptive Management*, in *Water Quality*.

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3.5.2.2 Dissolved Oxygen

The state DO standard for coldwater aquatic life is 8.0 mg/L, or 90 percent saturation when barometric pressure, altitude, and temperature conditions preclude attainment of 8.0 mg/L. The state standard for salmonid spawning during the period from spawning until fry emergence is 11.0 mg/L, unless the minimum intergravel DO as measured by a spatial median is 8.0 mg/L or greater, in which case the DO criterion is 9.0 mg/L. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/L or 9.0 mg/L criteria, DO concentrations must be at least 95 percent of saturation. The Tribal salmonid spawning standard is similar to the state standard, except that the 11.0 mg/L standard for the state is an instantaneous value, while the Tribal standard is a 7-day mean.

The lower Deschutes River from the Reregulating dam to the White River is included in the 1998 303(d) list because, according to ODEQ data, 6 of 21 relevant DO measurements taken from water years 1986 through 1995 fell below the DO standard of 11.0 mg/L, or 95 percent saturation, during the summer. The relatively low DO concentration measured immediately below the project during the summer and early fall is caused by drawing water from deep in Lake Billy Chinook and Lake Simtustus for power generation. In both Lake Billy Chinook and Lake Simtustus, DO concentrations fall below the 8.0 mg/L standard in deeper water during the summer, but DO generally remains above 8 mg/L at depths of less than 15 m (approximately 50 feet).

Modeling indicates that implementation of SWW would improve DO conditions in the project reservoirs, substantially increasing the volume of water in Lake Billy Chinook and in Lake Simtustus that meets the 8.0 mg/L coldwater life criterion (figures 4 and 5). DO concentrations below the project should also improve; discharges from the Reregulating dam are predicted to meet the relevant DO criterion year-round under both Blend 13 (figure 4) and Blend 16 (figure 5). Furthermore, the WQMMP includes a provision that would require the Joint Applicants to implement controlled spills at the Reregulating dam, if they are needed to maintain ambient DO concentrations above 11.0 mg/L or 95 percent saturation downstream of the Reregulating dam. The WQMMP also includes a provision that would allow the standard to be reduced to 9.0 mg/L if monitoring results confirm that intergravel DO exceeds 8.0 mg/L at all times.

3.5.2.3 pH

The state and Tribal pH standard for the Deschutes River basin has been set at a range of 6.5 to 8.5 to coincide with the natural range of local waters. Waters discharged from the Reregulating dam normally do not exceed the pH standard, although one pH value over 8.5 was measured on September 19, 1999. This value was measured under unusual conditions when flows were spilled at the Pelton development due to a project shutdown caused by a wildfire. Seasonal pH values reported by Eilers et al. (2000)

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ranged between approximately 7.6 and 8.2 just downstream of the Reregulating dam, and pH increased to between 7.7 and 8.7 about 20 miles downstream of the project, with little change evident downstream of that point in the river.

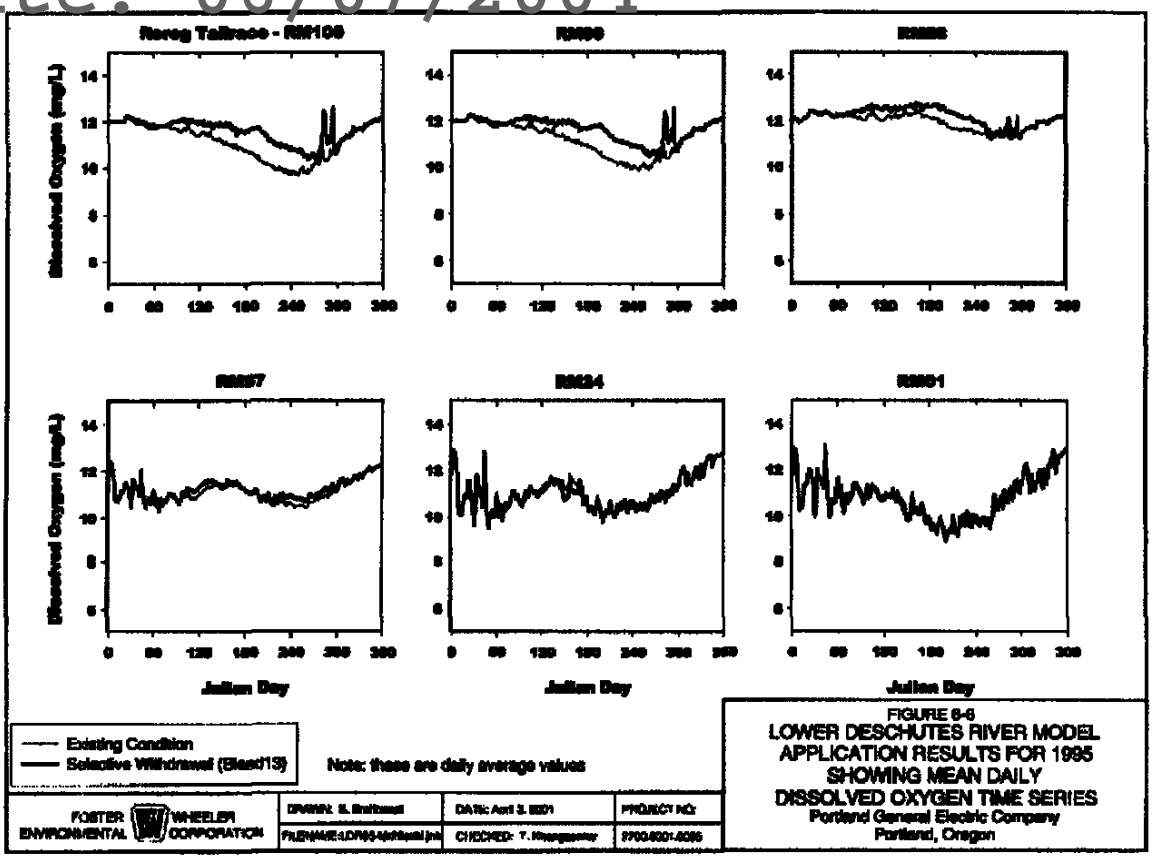

Figure 4. Simulated dissolved oxygen levels in the lower Deschutes River under existing conditions and under Blend 13 using 1995 conditions. (Source: Foster Wheeler, 2001, as cited in PGE and CTWS, 2001)

According to measurements reported by the Joint Applicants, pH regularly exceeds 8.5 during the summer in the surface waters of the project reservoirs, as it does in the tributaries above the project. Elevated pH occurs in productive lakes and rivers as the result of photosynthetic activity. In Lake Billy Chinook, the median pH in surface waters during the summer was 8.6 during 1994 through 1996, with a maximum recorded value of 9.4. Values at depth were less extreme, with a median of 7.5 and a maximum of 8.3 at the approximate depth of the project intake. In Lake Simtustus, summer pH values at the surface regularly exceed 9.4, with median and maximum values of 8.8 and 9.7, respectively.

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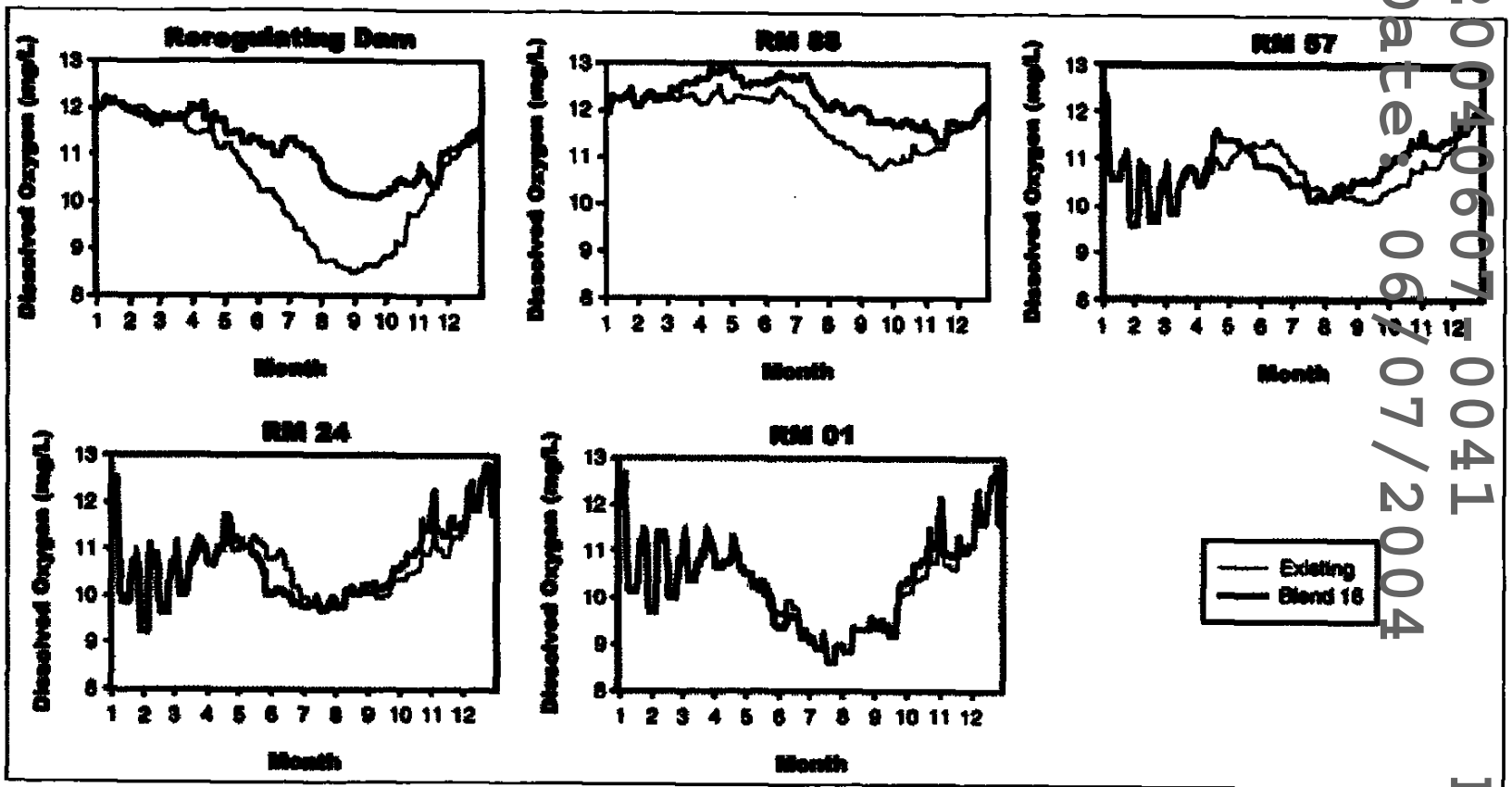

Figure 5. Simulated dissolved oxygen levels in the lower Deschutes River under existing conditions and under Blend 16 using drought conditions. (Source: Khangaonkar et al., 2002)

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Modeling results indicate that implementing SWW would cause a larger portion of Lake Billy Chinook to meet the pH standard, but pH is predicted to increase slightly in Lake Simtustus (figures 6 and 7). The model also predicts a slight increase in pH in the first 12 miles downstream from the Reregulating dam, but the effect would be reduced downstream of that point, and by the river mouth pH levels would be the same as under existing conditions. Discharges from the Reregulating dam would be expected to continue meeting the pH criterion, with the possible exception of minor, brief, and isolated instances during the summer months.

In their WQCs, both the ODEQ and the Tribes' WCB conclude that Lake Billy Chinook and Lake Simtustus would continue to fall within the exemption from the pH standard, since the reservoirs existed as of January 1, 1996, and the exceedance of the pH standard occurs as a result of primary productivity supported by nutrients that arise from sources not associated with the reservoir.

The WQMMP includes provisions for adaptively modifying the SWW blending to address non-attainment of the pH standard, should it occur. Because elevated pH of the project discharge could occur as the result of withdrawal of surface water from Lake Billy Chinook (due to photosynthetic activity in the reservoir's epilimnion), the likely modification would be the reduction in the amount of surface withdrawal relative to bottom withdrawal. The change in proportion would be determined on a case-specific basis, if such modification could be undertaken consistent with temperature, DO, and fish passage considerations.

3.5.2.4 Total Dissolved Gas

The applicable state and Tribal standard for TDG is that waters shall not exceed 110 percent of saturation, except when stream flow exceeds the 10-year, 7-day average flood. Because of the large hydraulic capacities of their powerhouses, passage of water over the spillways at the Pelton and Round Butte developments occurs very infrequently, in association with project shutdowns or extreme high-flow events. Spills are more frequent at the Reregulating development, but the Joint Applicants report that conditions are not amenable to producing gas supersaturation at any of the developments, because spill discharges enter shallow water and do not plunge to great depth. TDG was measured below the Reregulating dam during spills in 1999, and no excessive values were reported.

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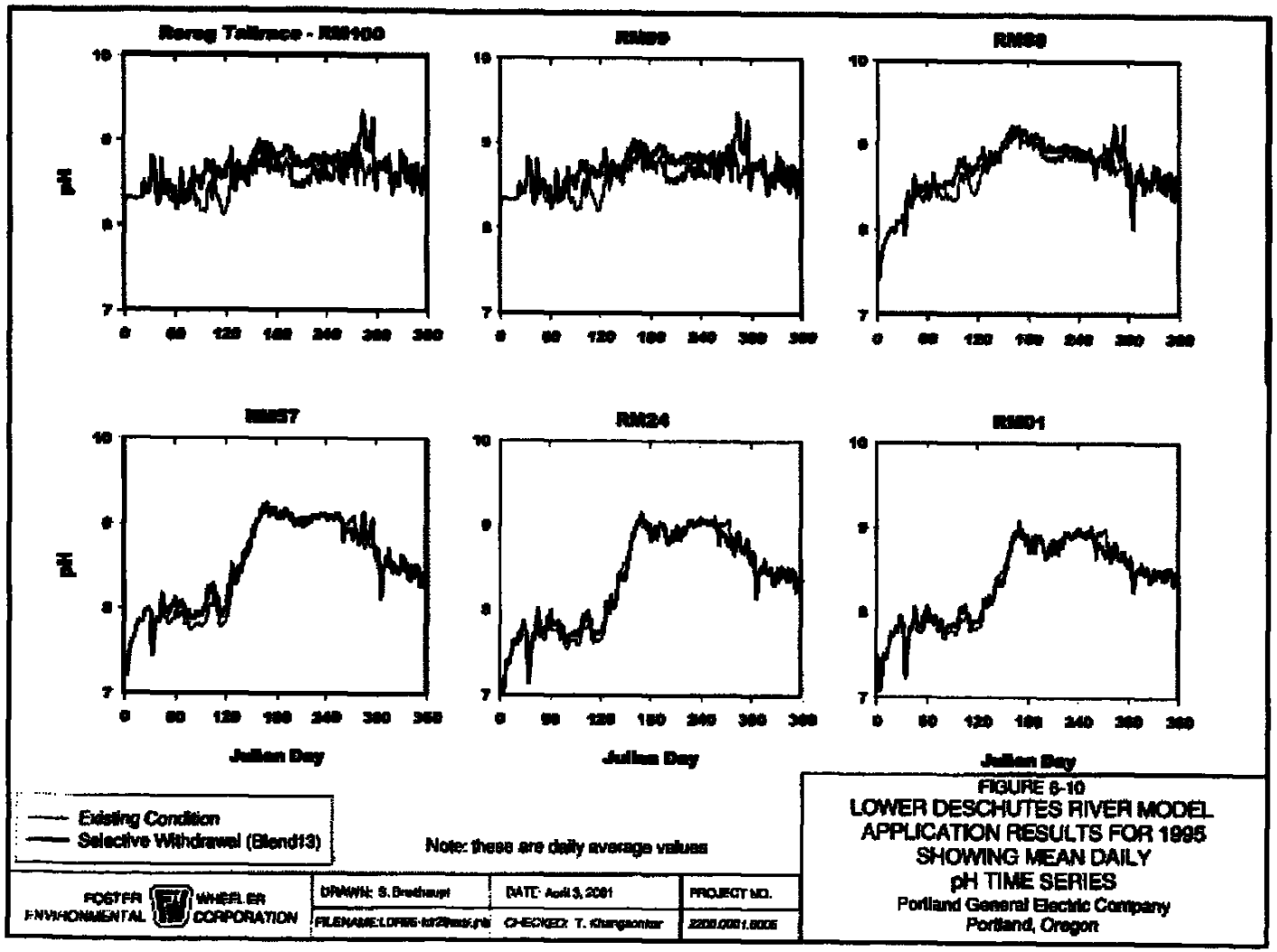

Figure 6. Simulated pH levels in the lower Deschutes River under existing conditions and under Blend 13 using 1995 conditions. (Source: Foster Wheeler, 2001, as cited in PGE and CTWS, 2001)

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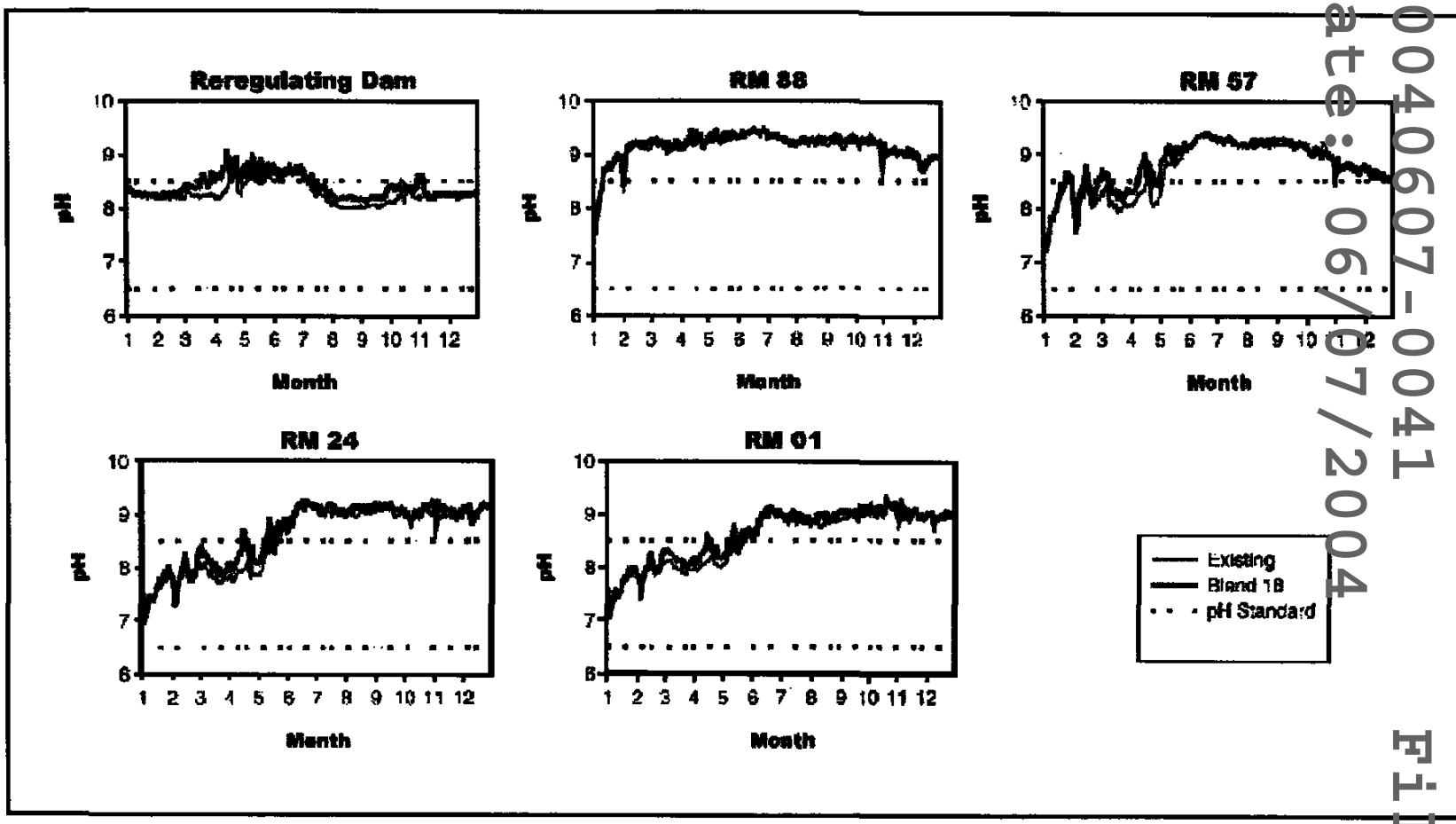

Figure 7. Simulated pH levels in the lower Deschutes River under existing conditions and under Blend 16 using 1995 conditions. (Source: Khangaonkar et al., 2002)

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TDG could be elevated to a minor extent via air injection into the Pelton and Round Butte turbines, which occurs when the units are brought online and shut down. However, these periods are of very short duration and likely incorporate very little atmospheric gas. No air is admitted or injected into the turbine at the Reregulating development.

Spillage at the Reregulating dam could increase in the future if it is found to be necessary to meet DO standards based on monitoring and adaptive management procedures specified in the WQMMP. A requirement to monitor TDG during spills for 2 years after implementing SWW is included in the WQMMP.

The only known instances of high TDG concentrations are associated with intense algal photosynthesis in surface waters not frequented by fish and not discharged from the project. This effect may be reduced if near-term upstream habitat enhancement and restoration measures serve to reduce the nutrient loads that are delivered into Lake Billy Chinook and Lake Simtustus from upstream tributaries. Proposed measures that might reduce nutrient loads include livestock exclusion; planting of grass, shrubs, and trees; maintenance of wetlands; and acquisition of water rights.

3.5.2.5 Nuisance Phytoplankton Growth

Abundant plant nutrients, typically nitrogen and phosphorus, under the proper ambient conditions, could stimulate nuisance algal growths. The magnitude of such growths can be determined by measuring chlorophyll *a*, a photosynthetic pigment which is correlated to biomass. Although the state has specified a chlorophyll *a* value of 15 μg/L to identify waterbodies where phytoplankton may impair recognized beneficial uses that applies to all rivers and reservoirs, the Tribes' WCB has not established a similar value for reservoirs that stratify, such as Lake Billy Chinook and Lake Simtustus.

Chlorophyll *a* concentrations measured in Lake Billy Chinook, Lake Simtustus, and the lower Deschutes River exceeded the relevant ODEQ guideline of a 15-μg/L summertime value, during the period of study from 1994 to 1996. The abundance of chlorophyll *a* in the reservoirs is the result of the relatively high concentrations of nutrients entering the reservoirs from the tributary rivers and streams. This condition does not appear to adversely affect any beneficial use of either reservoir, as indicated by the heavy recreational use of Lake Billy Chinook, the excellent condition of salmonid fish populations and fisheries, and the lack of complaints in survey responses and by other users.

Concern has been expressed that existence of the project may cause or enable transformations in forms of nitrogen that could contribute to excess algal production in the Deschutes River below the project. However, data collected by the Joint Applicants indicate that nutrients, principally nitrogen, are sequestered within the reservoirs and

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made unavailable downstream. For the 3 years that data are available, the average reduction in nitrate concentration below the project for all dates was 48 percent, and the average reduction during the summer season (April through September) was 43 percent.

The results of water quality modeling suggest that implementing SWW may result in a slight decrease in phytoplankton growth within the reservoirs. The Joint Applicants propose an adaptive management approach to ensure compliance with the nuisance phytoplankton growth standard. The WQMMP includes continued monitoring of chlorophyll *a* levels and secchi disk depths to evaluate changes in phytoplankton growth associated with implementation of SWW. If average chlorophyll *a* concentrations exceed average pre-SWW concentrations by more than 10 percent for 2 consecutive years, the Joint Applicants would be required to consult with ODEQ and the Tribes' WCB regarding the need to conduct a recreational user survey to assess whether or not beneficial uses have been impaired. If the results indicate that impairment has occurred, the Joint Applicants would be required to assess the feasibility of implementing a control strategy for attaining compliance that is technically and economically practicable.

Our Analysis

Modeling conducted by the Joint Applicants, as summarized in the preceding sections, indicates that implementing SWW would both provide surface currents to facilitate the outmigration of juvenile salmonids through Lake Billy Chinook and substantially improve water quality conditions in the project reservoirs and in the lower Deschutes River. The volume of water that meets the state and Tribal bull trout standard would likely increase in Lake Billy Chinook, the volume that meets the state coldwater life and Tribal salmonid rearing standard would be increased in all project reservoirs, and the seasonal temperature regime in the lower Deschutes River would be made much more similar to the pre-project condition. Modeling also predicts that implementing SWW would substantially improve DO concentrations in all three project reservoirs and in the lower Deschutes River. Although modeling predicts that there may be a slight increase in pH in Lake Simtustus and in the lower Deschutes River, the WQMMP includes provisions for monitoring of pH, and consultation with ODEQ and the Tribes' WCB to develop an approach to reduce pH if adverse effects are observed. Based on the increased potential for providing effective fish passage through Lake Billy Chinook and the substantial predicted benefits to water temperature and DO conditions, with the inclusion of monitoring provisions to evaluate and minimize any adverse effects of changes in pH, we conclude that implementing SWW would provide a substantial benefit to water quality conditions and important beneficial uses. Many of these benefits would extend to all three of the project reservoirs and through the entire 100-mile length of the lower Deschutes River.

The types of habitat improvement measures that the Joint Applicants propose to implement in their proposed Pelton Round Butte Fund Implementation Plan and the Draft

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Lower River Implementation Plan could benefit water quality conditions by reducing water temperatures, increasing flows and DO, and reducing nutrient loads that are delivered into Lake Billy Chinook. These physical changes would likely also reduce algal blooms and pH spikes associated with photosynthetic activity. Habitat enhancement measures would also help to support beneficial uses, including salmonid fish rearing and spawning, resident fish and aquatic lives, fishing, and aesthetic qualities. The potential benefits of habitat enhancement measures to aquatic resources and to achieving the objectives of the Current Fish Passage Plan are evaluated later, in section 3.6.2.4, *Fish Habitat Enhancement*, in *Aquatic Resources*.

The Joint Applicants propose a number of other measures that would assist with meeting biological criteria and supporting beneficial uses identified by the Tribes' WCB and ODEQ. Most of these measures are targeted at improving habitat conditions for resident and anadromous trout and salmon, and are evaluated in detail in section 3.6, *Aquatic Resources*. These include the Current Fish Passage Plan, continued operation of the Round Butte hatchery, operational restrictions, transfer of large woody debris to the lower Deschutes River and gravel monitoring. A shoreline planting program proposed by the Joint Applicants, which would also assist with meeting biological criteria, is evaluated in section 3.7, *Terrestrial Resources*. These measures would enhance many of the beneficial uses in the project area, including salmonid fish rearing and spawning, resident fish and aquatic life, fishing, and aesthetic qualities.

3.5.2.6 Mouitoring and Adaptive Management

The WQMMP prepared by the Joint Applicants includes plans for monitoring and implementing adaptive management measures, if necessary, to meet state and Tribal standards for temperature, DO, pH, and nuisance phytoplankton growth. It also includes a comprehensive water quality monitoring plan, which describes the specific schedules and locations at which these and other parameters would be measured. We list the proposed monitoring locations and the method, type and frequency of sampling in table 19. The plan calls for continuous monitoring of water temperature at 16 locations, including a vertical profile with 12 recorders suspended in the forebay of Lake Billy Chinook, and another vertical profile with four recorders in the forebay of Pelton dam. There would be eight temperature loggers in the lower river, and real-time temperature monitoring equipment would be installed at the three USGS gaging stations upstream and one USGS gaging station downstream of the project.

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Table 19. Location, method, type and frequency of water quality sampling proposed in the WQMMP. (Source: CTWS and PGE, 2003)

Site No.	Site Description	Site Location[a]	Method of Sampling[b]	Type of Sampling[c]	Frequency
1	Dizney riffle	D 160 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Monthly
2	Reregulating dam tailrace	D 161 km	Temperature	Continuous	Real time
			Hydrolab	Continuous	1 hour
			Hydrolab	Gab	Monthly
			Nutrients[d]	Grab	Monthly
			Chlorophyll *a*[e]	Grab	Monthly
3	Pelton dam tailrace	D 165 km	Temperature	Continuous	1.5 hours
			Hydrolab	Grab	Monthly
4	Pelton dam forebay	D 166 km	Temperature	Continuous	1.5 hours
			Hydrolab	Profile	Monthly
			Secchi	Grab Profile	Monthly
			Zooplankton	Grab	Quarterly
			Nutrients[d]	Grab Profile	Monthly
			Chlorophyll *a*[e]	Grab Profile	Monthly
				Grab Profile	
5	Willow Creek inflow	W 1 km	Temperature	Continuous	1.5 hours
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Monthly
6	Round Butte dam tailrace	D 178 km	Temperature	Continuous	Real Time
			Hydrolab	Continuous	1 hour
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Monthly
			Chlorophyll *a*[e]	Grab	Monthly
7	Round Butte dam forebay	D 179 km	Temperature	Continuous	1.5 hours
			Hydrolab	Profile	Monthly
			Secchi	Grab Profile	Monthly
			Zooplankton	Grab	Quarterly
			Nutrients[d]	Grab Profile	Monthly
			Chlorophyll *a*[e]	Grab Profile	Monthly
				Grab Profile	
10	Crooked River arm at bridge	C 5 km	Hydrolab	Grab Profile	Monthly
			Secchi	Grab	Monthly
			Zooplankton	Grab Profile	Quarterly
			Nutrients[d]	Grab	Quarterly
			Chlorophyll *a*[e]	Grab	Monthly
11	Crooked River inflow	C 10 km	Temperature	Continuous	Real Time
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Quarterly

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Site No.	Site Description	Site Location[a]	Method of Sampling[b]	Type of Sampling[c]	Frequency
13	Deschutes River arm at bridge	D 189 km	Hydrolab	Grab Profile	Monthly
			Secchi	Grab	Monthly
			Zooplankton	Grab Profile	Quarterly
			Nutrients[d]	Grab	Monthly
			Chlorophyll *a*[e]	Grab	Monthly
14	Deschutes River inflow	D 192 km	Temperature	Continuous	Real Time
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Monthly
16	Metolius River arm at Chinook Island	M 8 km	Hydrolab	Grab Profile	Monthly
			Secchi	Grab	Monthly
			Zooplankton	Grab Profile	Quarterly
			Nutrients[d]	Grab	Monthly
			Chlorophyll *a*[e]	Grab	Monthly
17	Metolius River inflow	M 19 km	Temperature	Continuous	Real Time
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Monthly
26	Crooked River at Lone Pine Bridge	C 48 km	Hydrolab	Grab	Monthly
27	Deschutes River at lower Bridge	D 216 km	Hydrolab	Grab	Monthly
28	Dry Creek	D 149 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Biannual
29	Kaskela	D 127 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Biannual
30	Nena	D 93 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Biannual
31	Sandy Beach	D 72 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Monthly
			Nutrients[d]	Grab	Monthly
32	Mack Canyon	D 39 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Biannual
33	Rockpile Campground	D 2 km	Temperature	Continuous	1 hour
			Hydrolab	Grab	Biannual

[a] Site location given by river system and kilometers from its confluence: C - Crooked River, D - Deschutes River, M - Metolius, and W - Willow Creek.

[b] Temperature data would be collected with programmable recorders. Hydrolab multi-probes would be used to collect other water quality measurements such as temperature, DO, conductivity, turbidity, and pH. Continuous Hydrolab sampling at the Reregulating dam tailrace site would also record TDG and chlorophyll *a*.

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- Profile sampling data would be collected at various depths (0, 2, 4, 6, 8, 10, 20, 30, 40, 50, 75, and 100 m). The continuous temperature profile in Lake Simtustus would be conducted at 0, 4, 10, and 40 m in depth.
- Nutrients would include nitrate-nitrogen, ammonia-nitrogen, total Kjeldahl nitrogen, total phosphorus, and orthophosphate. Monthly sampling would not include November, January, and February.
- Monthly sampling of chlorophyll *a*, as an indicator of algae biomass, would not include November, January, and February.

Monthly grab or profile samples would be taken at 16 sites in the tributaries, reservoirs, and lower Deschutes River to measure temperature, DO, conductivity, total dissolved solids, turbidity, and pH. Also, a continuous recorder would take hourly readings of these parameters in the tailrace of the Reregulating dam. This unit would also record TDG and chlorophyll *a*. Another recorder in the tailrace of Round Butte dam would record hourly measurements of water temperature, DO, conductivity, and pH. If pH or DO concentrations measured below the Reregulating dam exceeded water qnality standards, additional water quality probes would be placed in the tributary inflows to collect short-term continuous data. As indicated in table 19, nutrients including nitrate-nitrogen, ammonia-nitrogen, total Kjeldahl nitrogen, total phosphorus, and orthophosphate would be measured monthly at 12 sites. Secchi visibility would be measured monthly at four sites in Lake Billy Chinook and at one site in Lake Simtustus, and *E. coli* samples would be taken at the same locations and schedule as the chlorophyll *a* samples.

Zooplankton, macroinvertebrate, and periphyton monitoring are also proposed as part of the WQMMP. Zooplankton would be sampled quarterly at four sites over a 4-year period after SWW is implemented. Macroinvertebrate and periphyton monitoring would be repeated using the same methods as previous surveys (Kvam et al., 2001; Kvam, 2001), and would involve two spring and two fall sampling events starting 3 years after SWW is implemented. The plan also describes provisions for monitoring project operations, including project inflows and outflows, river stage changes downstream of the project, and reservoir elevations. Monitoring of other parameters or attributes that are more directly related to aquatic resources and aquatic habitats, including large woody debris, instream gravel, and fish populations, are evaluated later in sections 3.6.2.5, 3.6.2.6, and 3.6.2.8, respectively. Monitoring efforts specified in the WQMMP would be summarized in annual reports that would be submitted to the ODEQ, the Tribes' WCB, and the Fish Committee during February and at the annual Fish Committee Workshop to be held in March of each year.

The Joint Applicants have consulted with ODEQ and the Tribes' WCB in developing the draft WQMMP, and both agencies included the draft WQMMP with the WQCs for the project. The final WQMMP dated September 2002 was filed with the state of Oregon's recommended terms and conditions, and was also included in the description

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of the proposed preferred alternative filed by the Joint Applicants. Both the ODEQ and the Tribes' WCB reserve the right to modify management plans for temperature, DO, pH, and nuisance phytoplankton growth if additional measures are found to be feasible and necessary in order to meet load allocations specified in future Total Maximum Daily Loads (TMDLs).[37]

The FWS and BLM recommend that the Joint Applicants monitor water quality with permanent stations downstream of the Reregulating dam for DO, water temperature, and pH for the term of any new license issued for the project, and that they modify project operations when it is necessary to comply with water quality standards according to the WQCs issued by the ODEQ and the Tribes' WCB. The Conservation Groups also recommend that the Joint Applicants develop and undertake a long-term comprehensive water quality monitoring program. We view these recommendations as being consistent with the WQMMP developed by the Joint Applicants.

BIA preliminary 4(e) condition no. 6.a specifies that the Joint Applicants ensure that water in the three reservoirs and water released into the lower Deschutes River comply with Tribal water quality standards for bacterial pollution, creation of tastes or odors, aesthetic conditions, DO, temperature, pH, TDG, nuisance phytoplankton growth, and turbidity. The WQMMP that the Joint Applicants developed in consultation with the ODEQ requires monitoring for compliance with all of these standards with the exception of tastes and odors and aesthetic conditions. In their Findings and Evaluation Report, the Tribes' WCB indicates that it does not expect the project to affect tastes and odors and indicates that the potential for any effects on aesthetic conditions are addressed in the Joint Applicants' oil spill prevention control and countermeasures plan. We, therefore, conclude that the Joint Applicants' proposal is consistent with BIA's recommendations regarding compliance with the Tribes' water quality standards.

BIA preliminary 4(e) condition no. 6.b specifies that the Joint Applicants develop and implement a water quality monitoring plan to monitor the parameters identified above, and to provide monitoring results in an annual report. With the exception of tastes and odors, which are not expected to be affected, we conclude that compliance with the terms of the ODEQ and the Tribes' WCB WQC conditions, which include implementing the WQMMP, would fulfill this BIA objective.

BIA preliminary 4(e) condition no. 6.c specifies the Joint Applicants to file a report on deviations with Interior, the Tribes' BNR, and the Commission within 1 week after failure to achieve water quality standards for any of the parameters identified in BIA preliminary 4(e) condition no. 6.a. BIA also states that the Joint Applicants should file a

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[37] Section 303(d) of the Clean Water Act requires TMDLs to be prepared for all waterbodies that do not meet water quality standards. The TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources.

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monitoring report on deviations that includes an analysis of the extent of the impairment, identified fisheries habitat within the area of the impairment, any visual effects on fisheries from the impairment, and any measured effects that would lead to impairment including standard parameters such as temperature, water column DO, and intergravel DO. We believe that adequate feedback to inform the Tribes' WCB and ODEQ of any inconsistencies with water quality standards and to implement necessary adaptive management measures have already been incorporated into the WQMMP that the Joint Applicants have developed in consultation with these parties. These include e-mail updates on water temperatures, DO and pH that would be provided on a monthly basis and whenever a change in the mix of surface and bottom discharges occurs. The Tribes' WCB and ODEQ have indicated that the monitoring, reporting, and adaptive management provisions required by the WQMMP are sufficient for them to be reasonably assured that the project would comply with both state and Tribal water quality standards. In addition, revised 10(j) recommendations filed by NOAA Fisheries include a water quality monitoring program that is fully consistent with the monitoring provisions included within the WQMMP.

In their comments on the draft EIS, the Joint Applicants indicated that providing notification each time that the blend is changed would be impractical, because the mix of surface and bottom water passed through the SWW facility may be adjusted frequently in response to weather patterns and incoming water temperatures. The Joint Applicants propose to provide the agencies with periodic updates as well as a historical record of changes in the surface/bottom mix, along with corresponding measured temperature of the water released from the project. Assuming that these updates would be provided on a weekly or monthly basis, we conclude that this would provide adequate documentation of SWW operations to facilitate the consideration of any adaptive management measures that may be needed.

3.5.3 Unavoidable Adverse Effects

Although modeling suggests that pH levels in Lake Simtustus and in the lower Deschutes River may increase slightly compared to existing conditions, monitoring and adaptive management provisions provided within the WQMMP would ensure that any effects on beneficial uses would be detected and could be addressed through adaptive management. There is the potential that some of the habitat improvement work and recreational improvements proposed by the Joint Applicants may cause short-term increases in turbidity.

3.5.4 Cumulative Effects

Implementing SWW would be expected to reduce summer water temperatures and increase DO concentrations in the project reservoirs and in the Deschutes River downstream of the Reregulating dam. Therefore, cumulative effects would be beneficial.

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3.6 AQUATIC RESOURCES

3.6.1 Affected Environment

The following section describes aquatic resources and habitat in the project area. The first part describes aquatic habitat and resident fish resources, and the second part describes anadromous fish resources. The discussion of anadromous fish resources includes a summary of historical fish production, factors that have contributed to habitat degradation, fish passage and protection measures implemented to date, and information on the current distribution and abundance of fall Chinook salmon, spring Chinook salmon, sockeye salmon, summer-run steelhead and Pacific lamprey.

3.6.1.1 Aquatic Habitats aud Resident Fish Resources

This section describes existing habitat conditions and resident fish resources in the lower Deschutes River, in the three project reservoirs, and in the three main tributaries to Lake Billy Chinook: the Metolius, Deschutes and Crooked rivers.

Crooked River

The lower Crooked River flows for a distance of 70 miles from Bowman dam to Lake Billy Chinook. Bowman dam, which was constructed in 1961 without fish passage facilities, formed the Prineville reservoir. The lower Crooked River consists of three relatively distinctive reaches. In the section immediately above Lake Billy Chinook (RM 6 to RM 18), the river flows relatively undisturbed at the bottom of a deep, basalt gorge. Summer flows in this section are dominated by large springs with very good water quality. The middle reach (RM 18 to RM 57), generally meanders through a wide flood plain. Most of the summer flow in this reach is withdrawn for agriculture, and low summer flows and high water temperatures reduce its value as salmonid habitat. The upper reach, which extends to Bowman dam, flows through a canyon. Flows in this section are maintained by a deep-water release from Prineville reservoir. Cool water temperatures allow good salmonid production with dense populations of wild rainbow trout and mountain whitefish. McKay and Ochoco creeks are major tributaries that enter the Crooked River in this section. The construction of Ochoco dam in 1918 about 10 miles from its confluence with the Crooked River blocked access up Ochoco Creek. McKay Creek, which was historically an important steelhead spawning stream, has a dense population of rainbow trout.

The reach of the Crooked River immediately downstream from Bowman dam supports a mixture of native rainbow trout, hatchery rainbow trout that emigrate downstream from Prineville reservoir, and mountain whitefish. The density of trout in this section increased approximately 6- to 8-fold since winter minimum flows were

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increased from 10 cfs to 30 to 75 cfs between 1989 and 1995.[38] This reach also supports small numbers of smallmouth and largemouth bass, brown bullhead, and low densities of non-game fish. Non-game species predominate in the middle reach, including longnose and speckled dace, sculpins, northern pikeminnow, chiselmouth, redside shiner, and bridgelip and largescale suckers. The lower reach supports native rainbow trout and the same assemblage of non-game fish that are present upstream. Downstream of Opal Springs dam, kokanee,[39] bull trout, brown trout, and hatchery rainbow trout are present. Since enlargement in 1982, the Opal Springs dam has been an impassable barrier that stops upstream fish migration 0.5 mile above Lake Billy Chinook.

Middle Deschutes River and Why-chus Creek

The middle Deschutes River extends from the head of the Deschutes River arm of Lake Billy Chinook at RM 120 upstream to Big Falls at RM 132, the historical barrier to anadromous fish. Because of irrigation withdrawals upstream, most of the summer flow comes from numerous springs that provide approximately 1,000 cfs of inflow over the length of this reach, with significant spring inflows starting about 2 miles upstream of Big Falls. Fishing for rainbow trout and brown trout in the middle Deschutes River can be outstanding.

Why-chus Creek, the principal tributary on the middle Deschutes, flows approximately 19 miles to where it joins the Deschutes River 3 miles above the reservoir. Approximately 2 miles of the stream are seasonally dewatered by agricultural diversions above the town of Sisters. Above these diversions, riffle-dominated habitat has sufficient cobble/gravel substrate to support a fair population of rainbow trout. Fish habitat surveys of Why-chus Creek revealed several barriers to upstream fish migration downstream of Sisters, including one reach where summer streamflows were too low to allow passage.[40] Removal of wood and modification of the stream channel by the U.S. Army Corps of Engineers following the 1964 flood lowered habitat quality near the town of Sisters. Good spawning and rearing habitats exist in lower Why-chus Creek below where Alder Springs enters Why-chus Creek, 2.5 miles upstream from its confluence with the Deschutes River.

Indigenous resident species currently found in the middle Deschutes River and in Why-chus Creek include rainbow trout, bull trout, mountain whitefish, mottled sculpin,

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[38] In its comments on the draft EIS, Interior states that the legislation authorizing Bowman dam and the Crooked River Project requires a minimum release of 10 cfs for the benefit of downstream fish life. Discretionary releases at higher rates are normally achieved except during periods of severe drought.

[39] Kokanee are the resident form of sockeye salmon.

[40] In its comments on the draft EIS, FS states that instream water rights have been acquired to maintain flows in the reach near Sisters for minimal fish passage in the summer.

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northern pikeminnow, chiselmouth, longnose dace, speckled dace, and bridgelip and largescale suckers. Introduced species include three-spined stickleback, mottled sculpin, smallmouth bass, brown bullhead, and brown trout. Kokanee spawn in the middle Deschutes River and in Why-chus Creek, but the number of spawners is small in comparison to the Metolius River.

Metolius River

The Metolius River gathers its flows from a number of springs and spring-fed tributaries, flowing 29 miles through coniferous forests before it enters Lake Billy Chinook. Several of the tributary streams are very cold, and provide critical spawning and early rearing habitats for bull trout. These spring-fed streams have large amounts of dense cover in the form of wood and undercut banks. The upper mainstem of the Metolius River and some of the tributaries also provide spawning habitat for kokanee salmon, rainbow trout, and brown trout. The river supports catch-and-release fisheries for rainbow trout and trophy bull trout that ascend the stream from Lake Billy Chinook to spawn. Hatchery rainbow trout were planted up until recently, but the stream is now managed for wild trout. During the mid-1990's, densities of rainbow trout in the upper Metolius were very low, but recent spawning surveys have shown an increase in the number of adult trout in the upper Metolius River from 1996 to 1998. Mountain whitefish are abundant in the Metolius River, and brook trout are present in low numbers. Other resident fish species include shorthead sculpin, slimy sculpin, torrent sculpin, longnose dace, bridgelip suckers, and largescale suckers.

Lake Billy Chinook

The construction of Round Butte dam at RM 110 near the head of Lake Simtustus created Lake Billy Chinook in 1964. The reservoir extends 9 miles up the Deschutes River Canyon, 7 miles up the Crooked River Canyon, and 13 miles up the Metolius River Canyon. The reservoir has a maximum depth of 415 feet and a surface area of approximately 4,000 acres at full pool. The reservoir level is maintained within 1 foot of full pool from June 15 to September 15. The reservoir is drawn down about 10 feet in typical winters, and rarely more than 20 feet. Because of its depth and relatively good water quality, Lake Billy Chinook has an abundance of pelagic coldwater habitat. The reservoir supports important recreational fisheries for kokanee, smallmouth bass, and trophy bull trout. The fishery for kokanee is very popular, with between 95,000 and 150,000 angler hours expended annually. There is also a recreational and commercial fishery for signal crayfish, which are very abundant.

Bull trout spawn in the Metolius River basin, and use Lake Billy Chinook as adult rearing habitat, feeding primarily on kokanee. Protective regulations have led to increasing numbers of large bull trout in the reservoir, and since 1993, many trophy bull trout over 10 pounds have been caught annually in Lake Billy Chinook. A Tribal angling

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permit, in addition to a state fishing license, is required for non-Tribal anglers to fish in the Metolius River arm of the reservoir, and only Tribal members are allowed to harvest crayfish in that area. In 1997, the Tribe established a sanctuary area where no angling is allowed in the head of the Metolius River arm. This regulation is designed to protect bull trout staging for their spawning run during the early summer. Other native resident fish species known to occur in Lake Billy Chinook include mountain whitefish, largescale and bridgelip sucker, longnose dace, northern pikeminnow, and chiselmouth. Introduced species include brown trout, smallmouth bass, largemouth bass, bluegill, black crappie, and goldfish.

Lake Simtustus and the Reregulatiug Reservoir

Lake Simtustus was created with the completion of Pelton dam in 1958 at RM 102.5. The reservoir is 7 miles long and is relatively narrow, with a normal surface area of 540 acres. Current license requirements restrict elevation fluctuations to 7 feet, but the elevation fluctuates little during normal operations. Because it was created in a steep canyon area, only about 12 percent of the reservoir is less than 10 feet deep. Due to a lack of suitable spawning habitat, the reservoir has been stocked with rainbow trout, brown trout, and kokanee over the past several decades. Rainbow and brown trout that survive and overwinter in the reservoir are generally 12 to 16 inches in length, and a few trout in the 10- to 20-pound range are harvested each year. Since 1996, PGE has released approximately 25,000 post-smolt steelhead into Lake Simtutstus each year, and these fish have been reported to contribute at a high rate to the fishery. Lake Simtustus is co-managed by the ODFW and the Tribes as a resident trout and kokanee fishery. The Tribes charge a fee for angling by non-Tribal members, who must also have a state angling license.

The Reregulating dam, also completed in 1958, is located at RM 100, 2.5 miles downstream from Pelton dam. The elevation of the Reregulating reservoir fluctuates approximately 20 feet daily to maintain steady outflows into the Deschutes River while electricity is generated on a peaking basis at the Round Butte and Pelton developments. At full pool, the reservoir extends 2.5 miles upstream to Pelton dam. Because of the large water-level fluctuations, and for security considerations with respect to fish facilities, no public use is allowed at this reservoir and no fish are stocked there.

Lower Deschutes River and its Tributaries

The lower Deschutes River extends approximately 100 miles from the Reregulating dam downstream to the confluence with the Columbia River. Confined at the bottom of a rimrock-lined canyon in a semiarid region, the lower Deschutes drops from an elevation of 1,393 feet msl at the Reregulating dam to 160 feet at the mouth. Principal tributaries from the west include Shitike Creek; Warm Springs River; White River; and Eagle, Wapanitia, and Nena creeks. Streams entering from the east include

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Trout, Bakeoven, and Buck Hollow creeks. On the west side, Shitike Creek and the Warm Springs and White rivers are significant streams with perennial flow that support resident and anadromous fish. On the east side, only Trout Creek has significant numbers of resident fish, although all three of the east-side tributaries are significant steelhead producing streams.

Because of its relatively uniform flow, the lower Deschutes River has many characteristics of a spring stream. The banks are generally well-vegetated to the water line and partially undercut in many locations. The main exception is where livestock grazing has not been controlled. Grazing management and protection efforts by land managers over the last 15 years have dramatically enhanced riparian vegetation along much of the mainstem Deschutes River and parts of the tributary drainages. The riparian zone consists of grasses, shrubs, and trees, primarily white alder. Because white alder is a relatively short-lived species, many dead alder eventually fall into the stream, adding to habitat diversity.

Exposed gravel bars are very rare, and, when observed, are evidence of a significant flood within the past several years. Overall, gravel suitable for spawning salmonids is relatively scarce, constituting approximately 1 percent of the substrate in the lower Deschutes River (Aney et al., 1967). Flows that are sufficient to move spawning gravel appear to be infrequent, and gravel formations known as "spawning dunes" created by spawning fall Chinook salmon can remain visible for years (Grant et al., 1999). Gravel suitable for trout spawning appears to be abundant in the 3-mile section between the Reregulating dam and Shitike Creek; Zimmerman and Reeves (1999) counted 1,430; 1,504; and 1,241 trout redds at index sites in this section during 1995; 1996; and 1997, respectively.

Two of the three major west-side tributaries, Shitike Creek and the Warm Springs River, are located on the Warm Springs Reservation and are managed by the Tribes. Both streams originate at relatively high elevations in the Cascade Mountains and have significant base flows from spring sources. White River, the other major west-side tributary, is a glacially influenced stream that delivers a considerable amount of glacial silts and sands into the lower Deschutes River at RM 46.

The east-side tributaries derive most of their flow from runoff and have little or no flow at times. Trout Creek is marginally perennial, but much of its summer flow is diverted for agriculture. For the past 15 years, Trout Creek has been the subject of an intensive fish habitat restoration program funded by Bonneville Power Administration (BPA) and conducted by the ODFW and the U.S. Department of Agriculture Soil Conservation Service (now called the Natural Resources Conservation Service). Bank stabilization, riparian fencing, cover placement, and irrigation ditch screening has been accomplished over much of the basin. Bakeoven and Buck Hollow creeks have suffered from overuse by livestock; however, recent work by numerous agencies has started to protect these streams.

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Fisheries for resident fish are targeted primarily at native rainbow trout. Rainbow trout are the most abundant in the reach extending from the Reregulating dam to the town of Maupin (RM 58). Abundance varies between years and locations, but averages 1,450 rainbow trout greater than 6 inches in length per mile. A "slot limit" permitting the harvest of two rainbow trout between 10 and 13 inches has been in effect since 1979, and angling from boats is not allowed. This regulation was imposed for safety reasons, but has been retained as a conservation measure. Bull trout are not abundant, but some subadult and adult bull trout from populations in Shitike Creek and the Warm Springs River enter the Deschutes River to forage. Mountain whitefish are probably the most abundant fish species, but anglers in the Deschutes River rarely target them. Other resident species of fish found in the lower Deschutes River include shorthead sculpin, longuose dace, largescale sucker, chiselmouth, and northern pikeminnow.

3.6.1.2 *Anadromous Fish Resources*

Historical Fish Production

Historically, the Deschutes River basin was very productive for both anadromous and resident salmonid fisheries. An impassible barrier at Big Falls limited anadromous fish production in the Deschutes River to the lower 132 miles. The entire Crooked River system, with hundreds of miles of stream, was available for the production of Chinook salmon and steelhead, and the Metolius and Warm Springs rivers and Shitike Creek produced spring Chinook salmon. Sockeye salmon historically returned to Suttle Lake in the upper Metolius River basin, one of only two historic sockeye salmon runs in Oregon. Steelhead production was substantial in Why-chus Creek and the Crooked River system, as well in some seasonal tributaries to the lower Deschutes River. Resident rainbow trout were abundant throughout the Deschutes River basin, and distinct populations of bull trout likely spawned in the upper Deschutes River, Fall River, Tumalo Creek, the Metolius River, Shitike Creek, and the Warm Springs River.

Habitat Degradation

The decline in anadromous and resident fish populations since the arrival of Euro-American settlers in the late 19th and early 20th centuries has been linked to habitat alterations, the creation of barriers, and over-harvest of fish runs in the Columbia River basin. Habitat alterations have been extensive in the Crooked River, the upper Deschutes River, and in Why-chus Creek. Beaver trapping, stream diversion for agriculture, and construction of small hydroelectric dams have all caused habitat losses. The reduction in summer and fall streamflows has resulted in the downcutting and drying-out of former meadows and a corresponding reduction of riparian vegetation in east-side tributaries to the Deschutes River, including the Crooked River and Trout Creek systems.

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Poorly regulated net-and trap-fisheries in the Columbia River contributed to the loss of some fish stocks. The introduction of non-native brook trout and brown trout and the creation of upstream passage barriers have been implicated in the loss of bull trout populations in the Deschutes River upstream of Big Falls. The introduction of non-native bass, catfish, and carp has also reduced the production of native fish in parts of the Deschutes River basin.

When construction of the Pelton dam began in 1956, both resident and anadromous fisheries resources had been significantly reduced from historical levels. Chinook salmon had been essentially eliminated from the Crooked River system, and wild anadromous sockeye salmon had been eliminated from the Metolius River system. Between 1948 and 1958, annual counts of adult spring Chinook salmon at the hatchery racks on the Metolius River were 580 or less. Because of diversions for agriculture, Why-chus Creek had become seasonally dry near the town of Sisters, and steelhead production in this stream had decreased to less than 1,000 fish in most years. Numbers of steelhead returning to the Crooked River subbasin had also declined, and the returning adults were scattered throughout the subbasin. In 1962, steelhead production in the Crooked River was further reduced by BOR's construction of Bowman dam at RM 70 on the Crooked River, which did not have fish passage facilities.

Fish Passage Measures

The original license for the Pelton Project included requirements for both upstream and downstream fish passage. Upstream passage was provided using a 2.8-mile-long fish ladder that provided passage around the Reregulating reservoir and Pelton dam. Downstream passage out of Lake Simtustus was achieved using an artificial outlet with a horizontal inclined-plane screen known as the "Pelton skimmer." Authorization to construct Round Butte dam by a 1960 license amendment included provisions for both upstream passage via an aerial tramway and downstream passage via an artificial outlet with a traveling screen. The Fish Commission of Oregon, under supervision of a multi-agency steering committee, evaluated the passage facilities after completion of Round Butte dam in 1964. In 1966, the committee concluded that, because downstream migrants were not being collected in sufficient numbers at the Round Butte dam forebay, fish passage over Round Butte dam was not successful, and anadromous populations above the project could not be maintained. The committee initiated an evaluation of hatchery production as an alternative to fish passage for maintaining upstream anadromous fisheries resources. Some upstream passage for Chinook salmon and steelhead adults continued through 1968, although most fish returning were transferred to state hatcheries for brood purposes. From 1968 to the present, wild anadromous fish production has been limited to the lower 100 miles of the Deschutes River and its tributaries.

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All of the major fish passage facilities constructed at the project are still intact. The lower portions of the Pelton fish ladder are currently used for rearing hatchery spring Chinook salmon, and the Pelton fish trap, located near the downstream end of the ladder, is used to collect adult steelhead and spring Chinook salmon broodstock for PGE's hatchery operations.

Spring Chinook Salmon

Spring Chinook salmon enter the Deschutes River system in April, May, and June. They normally move to cooler headwater areas rather quickly, ripen over the summer, and spawn during late August and September. Fry emerge from the gravel in later winter or early spring. Some of these fish move out of the tributary streams as juveniles during the fall, and probably overwinter in the mainstem Deschutes River before emigrating to the ocean. Other spring Chinook salmon juveniles stay in the tributary for about 18 months and emigrate directly to the ocean as age 1+ smolts. Most return as age-4 fish, at an average size of 10 to 12 pounds.

Currently, natural production of wild spring Chinook salmon in the Deschutes River basin is limited to the Warm Springs River, its tributaries, and Shitike Creek. Tribal and ODFW fisheries managers have estimated the run size of spring Chinook salmon in the Deschutes River annually since 1977. From 1980 to 1995, run sizes of wild spring Chinook salmon have ranged from 241 to 2,939 (table 20). In years of low projected run size, angling for spring Chinook salmon has been prohibited. No sport angling for spring Chinook salmon was allowed during 1981, 1984, 1994, 1995, 1997, 1998, and 1999. Only very restricted Tribal angling was allowed in 1995, 1996, and 1998. A harvest cap of 48 fish was allowed in 1998.

Table 20. Estimated total run size and harvest of hatchery and wild spring Chinook salmon in the Deschutes River, 1980–1998. (Source: PGE and CTWS, 2001)

	Total Run[a]		Deschutes River Harvest[b]	
Year	Hatchery	Wild	Hatchery	Wild
1980	144	1,512	60	450
1981	492	1,575	0	0
1982	2,027	2,157	673	721
1983	1,403	2,086	418	545
1984	1,573	1,290	0	0
1985	NA	NA	NA	NA
1986	NA	NA	NA	NA
1987	3,402	2,692	1,312	909
1988	3,952	2,517	1,656	870

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Year	Total Run[a]		Deschutes River Harvest[b]	
	Hatchery	Wild	Hatchery	Wild
1989	6,864	2,193	2,085	784
1990	5,228	2,939	1,706	1,072
1991	4,417	1,413	1,878	596
1992	4,746	1,770	1,932	705
1993	2,472	915	815	377
1994	655	435	0	0
1995	1,153	241	35	4
1996	1,742	1,365	136	57
1997	1,871	950	0	0
1998	875	325	53	45

[a] Wild run size calculated from Tribal and recreational harvest, brood stock for Round Butte hatchery, and escapement to Warm Springs National Fish hatchery.

[b] Does not include harvest in the ocean or in the Columbia River.

PGE constructed Round Butte hatchery at the base of Round Butte dam in 1972 to mitigate for lost production of wild spring Chinook salmon and summer-run steelhead upstream of the project. Spring Chinook salmon production requirements for the project, established in a 1970 agreement between PGE and the Fish Commission of Oregon and the Oregon Game Commission, are an annual average return of 1,200 spring adult fish into the Pelton fish trap at the Reregulating dam. Although initial hatchery returns of spring Chinook salmon were very low, production requirements were met between 1985 and 1993. Increased returns were due to changes in rearing techniques, including the use of chilled water to slow egg development and transferring fish to the lower sections of the Pelton fish ladder for the last 6 months of rearing. Following trends in other Columbia River tributaries, return rates for spring Chinook from 1993 to 1998 have declined.

Starting in 1995, Chinook salmon production at Round Butte hatchery and the Pelton fish ladder was expanded to produce additional BPA-financed spring Chinook salmon for release into the lower Deschutes River and the Hood River. In addition, the FWS operates a federal hatchery that rears and releases spring Chinook salmon into the Warm Springs River. Production of spring Chinook salmon at this facility averages about 750,000 smolts.

Fall Chinook Salmon

The Deschutes River stock of fall Chinook salmon (also referred to as summer/fall Chinook salmon) ascend the Columbia River as maturing adults during mid- to late

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summer and fall and enter the Deschutes River from July through November. Unlike spring Chinook salmon, these fish hold and spawn in the mainstem Deschutes River. Spawning takes place mainly during October and November. Because of the mainstem spawning and rearing during periods of relatively warm temperatures, incubation and growth occurs much faster than for spring Chinook salmon that spawn in cool headwater streams. Fry emerge from March through June. Juvenile residence in the Deschutes River is only several months long. Smolts leave the same spring or summer they emerge from the gravel.

Fall Chinook salmon spawn at preferred sites from the mouth of the Deschutes River upstream to the Reregulating dam. When the project was first constructed in the 1950's, few fall Chinook salmon entered the Pelton fish trap or spawned in the section of the Deschutes River immediately downstream of the Reregulating dam; however, from the late 1960's through the early 1980's, large numbers of fall Chinook salmon spawned in the upper portions of the lower Deschutes River, including the area near the Reregulating dam. In the late 1980's through the 1990's, spawning numbers in the upper portion of the river declined, while fall Chinook salmon spawning in the lower portion of the Deschutes River below Sherars Falls increased dramatically (table 21). Although a number of hypotheses have been advanced, it is not known why this apparent shift in distribution has occurred.

Table 21. Estimated harvest and escapement of wild fall Chinook salmon in the Deschutes River above and below Sherars Falls, 1980–1998. (Source: PGE and CTWS, 2001)

	Total Escapement		
Year	**Upstream of Sherars Falls**	**Downstream of Sherars Falls**	**Deschutes River Harvest[a]**
1980	3,514	2,883	3,458
1981	5,417	3,331	3,131
1982	6,445	3,821	3,522
1983	3,890	2,284	2,174
1984	2,548	1,684	1,957
1985	4,784	4,052	2,261
1986	7,983	2,843	2,581
1987	4,385	1,227	2,297
1988	3,782	1,597	2,474
1989	1,627	4,572	1,865
1990	1,461	1,490	1,110

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Year	Total Escapement Upstream of Sherars Falls	Total Escapement Downstream of Sherars Falls	Deschutes River Harvest[a]
1991	1,469	3,809	213
1992	1,269	3,990	41
1993	1,035	7,204	11
1994	1,483	18,248	77
1995	2,078	12,631	53
1996	2,781	7,687	84
1997	3,947	17,736	140
1998	6,702	11,173	583

[a] Jonasson and Lindsay (1988) estimated that 64 percent of harvest of Deschutes fall Chinook salmon occurs in ocean fisheries and 10 percent of harvest occurs in the lower Columbia River.

Because of the decrease in the numbers of fall Chinook salmon spawning above Sherars Falls, the recreational fishery for fall Chinook salmon was closed from 1992 through 1997. Tribal subsistence harvest has also been strictly controlled during these years. Harvest in both fisheries was allowed in 1998, but Tribal harvest was limited to 400 fish, and the sport fishery was limited to 3 days a week. During 1999, harvest was allowed under the same restrictions.

Sockeye Salmon

Sockeye salmon historically spawned in Link Creek above Suttle Lake in the Metolius River subbasin. Construction of a small power dam at the outlet of Suttle Lake early in the century, and another dam on Lake Creek downstream in the 1930's, eliminated the anadromous portion of this population. The resident portion of this population[41] remained in Suttle Lake, and was likely the source for the kokanee population that became established in Lake Billy Chinook in the early 1970's.

The Metolius hatchery, operated by the Oregon Fish Commission on Spring Creek, a tributary to the Metolius River, released sockeye salmon juveniles into the Metolius River system from 1948 through 1961. These fish are thought to have been the major source of sockeye salmon that returned to the Pelton fish trap when runs were first counted in the late 1950's and early 1960's. A small run of sockeye salmon in the lower Deschutes River has continued even though there is no longer passage at the project. The

[41] In each population of sockeye salmon, a portion may remain in the lake to mature as kokanee, the resident form, without migrating to the ocean.

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run likely persists due to a number of kokanee from Lake Billy Chinook that revert to the anadromous form and outmigrate as smolts.

Wild kokanee now use the large rearing area in Lake Billy Chinook, but it is potentially available for the production of sockeye salmon smolts. If passage is restored upstream of the project, sockeye salmon might be the anadromous species that would achieve the highest numbers due to the abundance of rearing habitat and the already successful production of the non-anadromous population.

Steelhead

Summer-run steelhead enter the lower Deschutes River from June through October and pass Sherars Falls from July through October. Summer-run steelhead spawn annually in the mainstem lower Deschutes River, the Warm Springs River system, White River, Shitike, Wapinitia, Eagle and Nena creeks, and the Trout Creek, Bakeoven Creek and Buck Hollow Creek systems. White River Falls, an impassable barrier, limits spawning in the White River to the lower 2 miles. Spawning in the lower Deschutes River and west-side tributaries usually begins in April and continues through May. Spawning in east-side tributaries occurs from January through mid-April. Steelhead appear to be very opportunistic; in some years they ascend even small tributaries during short periods of high water. The majority of the juveniles rear for 2 years before smolting and emigrating to the ocean.

The summer-run steelhead production requirement for the project, specified in a 1970 agreement among PGE, the Fish Commission of Oregon, and the Oregon Game Commission, is an average return of 1,800 adults into the Pelton fish trap. To meet this requirement, Round Butte hatchery annually releases 162,000 summer-run steelhead smolts into the Deschutes River just below the Reregulating dam. The average production goal has been met for summer-run steelhead, although in some recent years, numbers of fish were considerably below the 1,800 annual target. These lower return frequencies are consistent with low ocean survival for steelhead in recent years throughout the Northwest.

Numbers of summer-run steelhead entering the lower Deschutes River annually have been estimated since 1977, when a trapping facility was first placed in the fish ladder at Sherars Falls (RM 43). Escapement above Sherars Falls is determined by mark recapture methods. These numbers are added to harvest estimates from surveys of recreational and Tribal fisheries downstream of Sherars Falls. The estimated escapement of wild steelhead above Sherars Falls has varied from 9,624 in 1985 down to 482 in 1994. Increasing numbers of stray hatchery steelhead from other basins have entered the Deschutes River the past 10 years. Because of low run numbers in some recent years and the fear that stray steelhead spawning with wild Deschutes River steelhead would cause a reduction in fitness, wild Deschutes River summer-run steelhead were listed as threatened

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under the Endangered Species Act (ESA) in early 1999. During the past few years, the wild run has increased from its low point in 1994 (table 22).

Table 22. Estimated total catch and run size of hatchery and wild steelhead in the Deschutes River, 1980–1998. (Source: PGE and CTWS, 2001)

	Total Run[a]			Catch[b]	
Year	Hatchery	Stray Hatchery[c]	Wild	Hatchery	Wild
1980	5,500	500	4,100	3,643	6,655
1981	3,800	1,200	6,900	2,540	7,845
1982	3,524	1,249	6,567	2,751	6,478
1983	7,250	7,684	8,228	6,561	9,278
1984	7,563	3,824	7,721	2,130	2,195
1985	7,382	5,056	9,624	1,862	2,040
1986	9,064	9,803	6,207	1,911	1,529
1987	9,209	8,367	5,367	4,523	12,650
1988	3,849	2,909	3,546	840	544
1989	2,758	3,659	4,278	3,986	5,684
1990	1,990	2,852	3,653	2,827	2,336
1991	3,778	8,409	4,826	2,323	3,915
1992	2,539	4,261	904	1,620	2,017
1993	1,159	4,293	1,487	1,562	2,161
1994	1,781	4,391	482	1,453	1,206
1995	2,708	11,855	4,662	2,167	1,687
1996	5,932	23,618	3,458	3,657	1,993
1997	5,042	17,703	1,820	2,379	2,215
1998	3,527	11,110	3,800	944	585

[a] Estimated number of steelhead that migrated past Sherars Falls.

[b] Includes both fish caught and harvested and caught and released.

[c] Adult steelhead produced from hatcheries outside of the Deschutes River basin (primarily from hatcheries located on the Snake River).

The summer steelhead fishery in the lower Deschutes River begins in July of each year, when the adults enter the river and begin their upstream migration. Harvest continues through the end of December. The recreational fishery occurs throughout the

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lower mainstem Deschutes River, whereas the Tribal fishery occurs primarily in the area downstream of Sherars Falls. Since 1979, recreational harvest has been limited to marked hatchery steelhead.

Pacific Lamprey

Pacific lamprey are native to the Deschutes River basin and historically spawned in areas above the project. The spawning run of adult Pacific lamprey usually enters freshwater from April to June, and completes migration into streams in September. Adults overwinter in freshwater streams and move upstream to the headwaters to spawn from April to October of the following year. Spawning occurs over gravel with a mix of pebble and sand in the tail area of pools and riffles. The adults die between 3 and 36 days after spawning. After hatching, the larvae burrow into the substrate and filter-feed on diatoms, detritus, and algae. After 5 to 7 years, they migrate to the ocean and become parasitic to soft-scaled fish. Pacific lamprey remain in the ocean for 20 to 40 months before they return to freshwater to spawn.

Historical distribution of Pacific lamprey in the Columbia River basin followed that of salmon. Lamprey have decreased significantly as the number of dams and developments have increased within the Columbia River basin. Lamprey were never enumerated as either upstream-migrating adults or as downstream-migrating juveniles during the early years of fish passage at the project. Some adult lamprey entered the Pelton fish trap at the Reregulating dam until the mid-1970's; however, the numbers were very low. Adult lamprey are known to spawn in Shitike Creek, which enters the Deschutes River 3 miles downstream of the project, and in the Warm Spring River. A Tribal subsistence fishery for lamprey occurs at Sherars Falls, where a few hundred to a few thousand adults are thought to be harvested each year.

3.6.2 Environmeutal Effects and Recommendations

The Joint Applicants propose several measures designed to benefit aquatic resources, including increased minimum flows, reduced ramping rates, reduced seasonal drawdown of Lake Billy Chinook, implementation of the Current Fish Passage Plan to explore the feasibility of implementing SWW and the restoration of fish passage, and measures to enhance fish habitat and water quality both upstream and downstream of the project. These measures were developed in a process that has included extensive consultation with the fisheries agencies, the Tribes, and NGOs via participation in a Fisheries Technical Subcommittee that has met regularly over the past several years to guide technical studies, evaluate results, and develop potential enhancement measures.

The agencies, the Tribes, and NGOs have filed preliminary conditions and recommendations that endorse many of the Joint Applicants' proposals, including its general approach to implementing SWW and the Current Fish Passage Plan. However,

there are some substantial differences, especially regarding project operations and the amount and types of habitat enhancement work that should be performed by the Joint Applicants to compensate for project effects. The following sections describe the measures proposed by the Joint Applicants and agencies as well as the results of our analysis of the effects of the proposed measures on aquatic resources in the project area.

Conditions and recommendations pertaining to aquatic resources were included in the 401 WQCs filed by ODEQ and the Tribes' WCB; preliminary Section 18 fishway prescriptions filed by NOAA Fisheries and FWS, preliminary 4(e) conditions filed by BIA, BLM, and FS; 10(j) recommendations filed by FWS and ODFW; and 10(a) recommendations filed by the Tribes' BNR, Conservation Groups, and FS. NOAA Fisheries also agrees with and incorporates by reference all FWS 10(j) recommendations that provide measures for the protection and enhancement of Chinook salmon, sockeye salmon, and steelhead.

3.6.2.1 Minimum Flows

In the Final Joint Application Amendment, the Joint Applicants proposed to maintain minimum flows below the Reregulating dam equal to the state of Oregon Water Right Certificate no. 73237 for the lower Deschutes River, dated October 21, 1996, or inflow, whichever is less. In their response to the draft EIS, the Joint Applicants modified their proposed flows, increasing the flows in March, April, and November so that the minimum flows in all months would be equal to or greater than the Q80 flows required by the Tribes' WCB (table 12). When inflows are less than the minimum or "target" flow, the allowed minimum flow would be equal to the lowest daily inflow that was recorded during the past 7 days, and the allowed minimum flow would be re-calculated each day.[42]

As described in section 3.4.2.1, the Joint Applicants' revised proposal includes an allowance for reducing outflows by up to 150 cfs when it is needed to ensure that Lake Billy Chinook is filled to its summer operating level (elevation 1,944.0 feet msl) by May 15. Also, river flows below the Reregulating development would be held to within +/–10 percent of the prior day's estimated daily average inflow with certain exceptions, which we discuss below in our analysis.

In the Joint Applicants' Description of the Preferred Alternative that was filed on December 29, 2003, the Joint Applicants added a proposed "fish emergency clause," which would allow deviation from the "or inflow" minimum flow provision and from the SWW flow-blending scheme. Under this clause, the Joint Applicants would consult with

[42] This represents a modification of the proposal that was made in the Final Joint Application Amendment, in which the minimum flow would be defined as the average of the inflows over the past 7 days.

an interagency Fish Committee to consider whether such deviations are needed to avoid harm to native species, in years in which inflow is expected to be below 3,000 cfs or flow conditions may result in in-river conditions that are judged by the Fish Committee to be unacceptably poor. In the same filing, they also proposed to augment flows by 200 cfs to benefit fall Chinook salmon spawning when inflows drop below 3,000 cfs between September and November 15, subject to a maximum 4-foot drawdown of Lake Billy Chinook.

The Joint Applicants modified other aspects of their Draft Project Operating Plan in their Description of Preferred Alternative filed on December 29, 2003, and updated on April 27, 2004. The refill provision was modified as follows:

- **Refill Allowance Provision when Inflows are 3,650 cfs aud Greater.** The projeet would be allowed a "*refill allowance*" between November 15 and May 15 (the reservoir refill season). The licensees may use this *refill allowance* to store water in Lake Billy Chinook to ensure that Lake Billy Chinook is filled to its summer operating level (minimum elevation 1,944 feet msl) by May 15. When project inflows exceed 3,650 cfs, a *refill allowance* of 150 cfs would be available during the reservoir refill season. In this event, the *allowed minimum flow* would be 150 cfs less than the minimum flow defined by the monthly target flow or the "or inflow" provision, except as noted below.

- **Refill Allowance Provision when Inflows are Less thau 3,650 cfs.** From March through June, if *daily inflows* are less than 3,650 cfs and greater than 3,500 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,500 cfs. If *daily inflows* are 3,500 cfs or less, the *refill allowance* would be 0.

- **Refill Allowance Provision wheu Inflows are Less than 3,150 cfs.** From November through February, if *daily inflows* are less than 3,150 cfs and greater than 3,000 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,000 cfs. If daily inflows are 3,000 cfs or less, the refill allowance would be 0.

- **Delay to June 15 for Lake Billy Chinook Refill.** If *daily inflows* less than 3,650 cfs occur during the reservoir refill season, the *refill allowance* provision would be extended from May 15 to June 15. During this additional month, the *refill allowance* would be determined based on the provisions in the two preceding bullets. The rules for defining the *allowed minimum flow* when inflows are less than 3,650 cfs would also apply in this period.

In the same filing, the Joint Applicants added a proposal to track indicators of predicted long-term low-flow conditions in the lower Deschutes River throughout the term of any new license issued. A long-term low-flow trigger or multiple long-term

low-flow triggers would be established that signal predicted onset or realized onset of long-term low-flow conditions in the river that are lower than that historically observed at the Madras Gage. If the long-term low-flow trigger is reached, the Joint Applicants propose to consult with the Fish Committee, ODEQ, and the Tribes' WCB to identify any negative effects on aquatic resources and federal Wild and Scenic recreational outstandingly remarkable values resulting from the lower river flows, identify potential mitigation measures in the lower Deschutes River basin, and determine whether any changes in project operations should be implemented to ameliorate these effects.

ODEQ WQC condition G.6, FS, FWS, BLM, Waterwatch, and American Rivers agreed with the monthly target flows that the Joint Applicants proposed in the Final Joint Application Amendment, and both ODEQ and NOAA Fisheries have filed revised 10(j) recommendations that include the flows now proposed by the Joint Applicants. The Tribes' WCB WQC condition E would require the Q80 (80 percent monthly exceedance) flows that were proposed in the Tribes' license application. The Q80 flows are similar to, but generally slightly lower than those proposed by the Joint Applicants. As noted above, the Joint Applicants revised their proposed monthly target flows such that they equal or exceed the Q80 flows in each month (table 12).

As described in section 3.4.2.1, BIA preliminary 4(e) condition no. 4 specifies its own set of monthly target flows, which are higher than the Joint Applicants' proposed target flows in most months (table 12). If inflows are below the target flows, minimum flows would be the minimum of the average project inflows over the prior 7 days. These minimum flow targets could be further reduced by 100 cfs in January and February and by 200 cfs in March and April to facilitate refilling Lake Billy Chinook. BIA's preliminary conditions also specify that in order to refill Lake Billy Chinook to within 1 foot of full pool by May 1, the licensee may request that BIA allow a temporary deviation of minimum flows. The request would be submitted by no later than April 1 in any year.

Some of the agency recommendations also differ from the Joint Applicants' proposal regarding how flows would be determined during low inflow conditions, under what condition deviation from the +/–10 percent rule would be allowed, whether storage in Lake Billy Chinook would be used to augment river flows under some conditions, how the 150-cfs refill allowance would be implemented, and monitoring and reporting requirements. We evaluate these differences below, in our analysis.

Our Analysis

Under the Joint Applicants' proposal, outflows from the project would track inflows very closely under most operating conditions. When the daily average inflow is lower than the monthly target flow, the minimum outflow would be equal to the lowest

daily inflow recorded during the previous 7 days.[43] When the daily average inflow is higher than the monthly target, the outflow would be constrained to within 10 percent of the prior day's estimated daily average inflow under most conditions (as detailed below). The primary effect of the monthly target flows would be to force the project operators to match inflows more precisely when inflows are at or below the monthly target flow. When inflows are at least 10 percent above the target flow, project operators would have the flexibility to adjust outflows by 10 percent above or below inflows.[44]

Limitation of outflow variations to within 10 percent of inflows would provide a flow regime that is exceptionally stable in comparison to most regulated rivers, and would protect aquatic resources from substantial variations in outflow from the project that could occur in the absence of this provision. Since depth also changes with flow, velocity changes caused by a 10 percent change in outflow would be less than 10 percent in most of the river channel. Due to the relatively incised nature of the river channel and its associated steep bank slopes, a 10 percent change in flow also causes very little change in wetted area. This conclusion is supported by an analysis that the Joint Applicants conducted to evaluate the effect of short-term flow reduction events on steelhead spawning habitat (attachment B-2 of PGE and CTWS, 2001). In this analysis, the Joint Applicants evaluated the effects of 10 percent increases and decreases from the average flow conditions on water depths and wetted perimeter at five transects located in known spawning areas. Increasing flows by 10 percent caused water depths to increase by 0.21 to 0.37 feet at the five transects, while wetted perimeter increased by 0.4 to 1.1 percent. Decreasing flows by 10 percent caused depths to be reduced by 0.23 to 0.4 feet, and wetted perimeter was reduced by 0.4 to 1.1 percent.

The Q80 flows specified by the Tribes' WCB are lower than the Joint Applicants' target flows in 9 out of 12 months. In cases where the Q80 flows are lower than the target flows proposed by the Joint Applicants, the Q80 flows would allow greater variation in project outflow when inflows are between the Q80 flow and the target proposed by the Joint Applicants. These flow variations have the potential to cause minor adverse effects on aquatic resources downstream of the project. However, the Tribes' WCB would also require that there be no more than a 10 percent variation from project inflow under most conditions, which would limit the extent of any adverse

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[43] For example, for any given day in January, if the daily average inflow on the previous day was less than the monthly target of 4,500 cfs, the target outflow would be determined based on the average daily inflow for the previous 7 days. If the average daily inflow on the previous day was 4,450 cfs and the average daily inflow for the previous 7 days was 4,244 cfs, the target outflow for that day would be 4,244 cfs.

[44] For example, for any given day in January, if the daily average inflow on the previous day was 5,000 cfs, outflow from the project could vary between 4,500 and 5,500 cfs without violating either the monthly flow target or the 10 percent rule. This operational flexibility could be used to follow electrical load, lower reservoir levels in anticipation of flood events, or refill Lake Billy Chinook to meet summer recreational needs.

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effects. As noted above, the extent of changes in water depth and wetted perimeter caused by a 10 percent variation in outflows are very minor in nature, so the potential for causing fish stranding and other adverse effects would be limited.

In most months, the target flows specified by BIA are higher than the target flows proposed by the Joint Applicants, and in some months, they would have a very low frequency of occurrence (table 13). In their February 6, 2003, response to preliminary terms, conditions, and prescriptions, the Joint Applicants contend that BIA's minimum flow and reservoir levels would be impossible to comply with without frequent and severe drawdowns of Lake Billy Chinook. While the proposed condition does allow for releasing inflows when inflows are less than the proposed target flows, compliance would be based on instantaneous flows never being less than the minimum. To allow for measurement errors, flow releases would need to be somewhat higher than the target flow, which the Joint Applicants estimate would result in drawdown of Lake Billy Chinook[45] by 30 to 50 feet in average to wet years, and drawdowns of over 100 feet could occur after 2 consecutive dry years. Drawdowns of this magnitude could have substantial adverse effects on reservoir habitat for the ESA-listed bull trout, the recreationally important fishery for kokanee salmon, recreational resources, aesthetics, and cultural resources.[46] We conclude that the small increases in flows that would be provided downstream of the project under BIA's proposal would provide only minor benefits to instream habitat, and that these benefits would be very small in comparison to the adverse effects of drawdowns that would occur in Lake Billy Chinook.

The Joint Applicants recommend that exception to the +/–10 percent rule be allowed in the following conditions: (1) days with measured inflow in excess of 6,000 cfs; (2) any event that triggers the Emergency Action Plan; (3) power emergencies, as defined in the WSCC's Minimum Operating Reliability Criteria (March 8, 1999); (4) equipment failures or emergencies at one of the project dams or powerplants; and (5) reservoir drawdowns needed for safe passage of anticipated flood flows to minimize damage to life and property. The Tribes' WCB WQC condition E and ODEQ WQC condition G.7 would require and FWS and ODFW recommend that an exception only be allowed when flows exceed 6,000 cfs <u>and</u> at least one of the other four conditions occur. In their December 31, 2003, comments on the draft EIS, the Joint Applicants indicate that this additional requirement would defeat most normal practices of reservoir operation for flood management and preclude many normal maintenance activities. For example, this

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[45] These calculations assume that outflows would be required to exceed inflows by 5 percent to allow for measurement error during months when inflows are lower than BIA's proposed target flows.

[46] In its comments on the draft EIS, the Tribes' BNR expressed a number of concerns regarding the effects of lowered water levels in Lake Billy Chinook, including the potential for accelerated bank erosion on Tribally owned property and adverse effects on cultural and archaeological sites, wetlands, rearing habitat for early lifestages of fish, water quality, recreational use, operability of the proposed SWW and fish passage facilities, ESA-listed species, aesthetics, and power generation.

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would limit the Joint Applicants' ability to manage flood events associated with rain on heavy snowpack, which are often preceded by flows lower than 6,000 cfs. ODEQ WQC condition G.6 would require and ODFW recommends that outflows be supplemented by up to 200 cfs when needed to maintain a minimum flow of 3,000 cfs between September 16 and November 15, subject to a 4-foot drawdown limit on Lake Billy Chinook. As noted above, the Joint Applicants incorporated this provision into their Draft Project Operating Plan included in their December 29, 2003, filing. Studies conducted in the lower Deschutes River by Aney et al. (1967) indicate that low-flow conditions can reduce the quantity of available spawning habitat and affect the quality of incubation habitat by lowering intragravel DO levels. We agree that supplementing flows in the September 16 to November period when flows are less than 3,000 cfs could benefit the spawning success of fall Chinook salmon, although the volume of augmentation is so small relative to the total river flows that the level of benefit would likely be minor.

The BLM and FS recommend that outflows not be reduced below 3,000 cfs unless the Joint Applicants can demonstrate that lower flows "shall continue to enhance and maintain Outstandingly Remarkable Values" associated with the Wild and Scenic sections of the lower Deschutes River. Waterwatch recommends that minimum flows below the project should not be reduced below those specified in the state water right even if inflows drop to lower levels. The Conservation Groups recommend that any license issued for the project should allow the Joint Applicants to retain the flexibility to use reservoir storage in drought emergencies and to move the target date for refilling the reservoir to later than June 15, if necessary, to maintain instream water right flows to the lower river. These recommendations were not proposed with any specified limitations, and could potentially result in substantial and prolonged drawdowns of Lake Billy Chinook. Major drawdowns could have substantial adverse effects on reservoir habitat for the ESA-listed bull trout, the recreationally important fishery for kokanee salmon, recreational resources, aesthetics, and cultural resources. The primary basis for these recommendations is concern that continued increases in consumptive water use (due to population growth in the upper portions of the basin) could cause a decline in flows in the lower Deschutes River. Although we agree that increases in consumptive water uses in the upper basin may have adverse effects on aquatic resources throughout the lower Deschutes River, policy decisions in this area fall under the jurisdiction of the OWRD.

The Joint Applicants have adopted two new measures that would allow consideration of the potential benefits of using water stored in the project to address both short-term and long-term flow issues. In their December 29, 2003, filing, the Joint Applicants proposed a "fish emergency clause" that would allow deviation from the "or inflow" minimum flow provision or from the current SWW flow-blending scheme. Under this clause, the Joint Applicants would consult with an interagency Fish Committee to consider whether such deviations are needed to avoid harm to native species in years in which inflow is expected to be below 3,000 cfs or flow conditions may result in in-river conditions that are judged by the Fish Committee to be unacceptably

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poor. In their April 27, 2004, filing, the Joint Applicants also propose to monitor long-term flow trends and establish a "low flow trigger" that would initiate consultation with the Fish Committee and the water quality certifying agencies to identify any negative effects on aquatic resources and federal Wild and Scenic recreational outstandingly remarkable values, identify potential mitigation measures in the lower Deschutes River basin, and determine whether changes in project operations should be implemented to ameliorate such effects. We believe that these measures would have the beneficial effect of providing a means for protecting aquatic resources during low-flow events. However, the Commission would maintain final authority for any change in project operations.

In the Final Joint Application Amendment, the Joint Applicants requested the ability to reduce outflows to 150 cfs less than inflows, if the level in Lake Billy Chinook is projected to be below elevation 1,944 feet msl between June 15 and September 15. The Tribes' WCB WQC condition E and ODEQ WQC condition G.5 would require and the FWS, BLM, and FS recommended this allowance. The Joint Applicants modified the proposed refill provision slightly in their December 29, 2003, Draft Project Operating Plan, such that the allowance would be reduced to 100 cfs and the target refill date would be extended to June 15 when inflows are less than 3,500 cfs. The revised 10(j) recommendations filed by ODFW and NOAA Fisheries are consistent with the Joint Applicants' December 29, 2003, filing. The Joint Applicants modified their requested refill allowance once more in the modified Draft Project Operating Plan that was provided in their April 27, 2004, filing, reducing the allowance such that flows would not be reduced due to refill below 3,500 cfs from March through June, and flows would not be reduced below 3,000 cfs from November through February. BIA's preliminary 4(e) conditions allow minimum flows to be reduced to 100 cfs below inflow in January and February, and 200 cfs below inflows in March and April, but for any other deviations the preliminary 4(e) conditions specify that the Joint Applicants submit a request to the BIA and the Tribes' BNR to temporarily deviate from the minimum flow requirements by no later than April 1 of any year.[47] The Conservation Groups indicate that they are opposed to any provision that reduces downstream flows, due to potential adverse effects on aquatic and riparian species, and they express a specific concern about reducing flows during the spring and summer, because of potential effects on steelhead and rainbow trout spawning, egg incubation, and fry emergence.

Although the Conservation Groups argue that reducing the downstream flows would adversely affect various lifestages of steelhead and rainbow trout, we feel that the potential for affecting these lifestages is limited by the small amount of the allowance in relationship to overall stream flows during the refill period. Average flows during March, April, May, and June are 5,611; 5,214; 4,495; and 4,312 cfs, respectively. The lowest average daily flows that have occurred in these months between 1965 and 2001

[47] BIA provides specific instructions on what this request must contain on pages 55 to 56 of its November 12, 2002, letter stating its preliminary 4(e) conditions.

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are 3,070; 3,450; 3,460; and 3,570 cfs, respectively. Reducing the outflows by 150 cfs would cause a stage reduction of approximately 0.05 feet and would reduce the overall flow level by no more than 5 percent. We also believe that the limited potential effect of the refill allowance does not justify requiring that the Joint Applicants request permission from BIA for an allowance. We note that the Tribes' WCB supports refilling of Lake Billy Chinook by June 15, and states that the reservoir "should" be filled by April 1 and also in the fall to protect riparian vegetation and cultural resources. As we noted above, extended drawdowns of Lake Billy Chinook could also have substantial adverse effects on habitat for the ESA-listed bull trout, the recreationally important fishery for kokanee salmon, aesthetics, and recreational resources. For additional analysis relating to the management of Lake Billy Chinook levels, please also see our analysis in section 3.6.2.2, *Ramping Rates and Reservoir Levels*.

BIA preliminary 4(e) condition no. 4.b.2 specifies that the Joint Applicants conduct monitoring of lower Deschutes River fisheries habitat availability and use. It does not specify what habitat components or attributes would be monitored, but states that the Joint Applicants should "utilize ongoing monitoring techniques in combination with the baseline study and sites established in the Department [of the Interior]'s instream flow study to assess fisheries habitat." Without knowing specifically what is proposed, it is difficult to evaluate the potential benefits of this measure.

BIA preliminary 4(e) condition no. 4d specifies that the Joint Applicants submit monthly project operations reports to the Secretary of the Interior, the Tribes' BNR, and the Commission to document compliance with license conditions, to submit a report on deviations within 1 week of the occurrence of any deviations, and to submit a monthly project operation report within 30 days following the end of the occurrence of any deviations. The operations report would include a graphical plot of 15-minute flow data below the Reregulating dam and daily water surface elevations in the three project reservoirs. The report on deviations would include a plot of flow data from 24 hours before to 24 hours after the period of a deviation, the facts, circumstances, or reasons for the event, and procedures that would be implemented to prevent similar events in the future. The monitoring report on deviations would document monitoring of effects on fisheries resources, including an analysis of the reduction in wetted habitat during the deviation event, assessment of stranding during the event, and assessment of dewatering during the event.

Any license issued for the project would include provisions for documenting and reporting to the Commission any deviations related to minimum flows. Copies of these reports could be sent to the agencies, including the Tribes, Interior, FWS, NOAA Fisheries, ODEQ, and ODFW. We do not see a need for monthly project operation reports to be sent to the Secretary of the Interior or the Tribes' BNR, because the Commission is responsible for ensuring that licensed projects comply with all terms specified in any license issued for the project, including minimum flows.

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3.6.2.2 Ramping Rates and Reservoir Levels

Under current operating procedures, ramping rates below the project are limited to 0.1 feet per hour and 0.2 feet per day (as measured at the Madras USGS gage) from May 15 through October 15, and 0.1 feet per hour and 0.4 feet per day during the rest of the year. These ramping rates were developed over time in cooperation with various agencies and are not current license requirements. As an enhancement to recreational safety and downstream river resources, the Joint Applicants propose to include more stringent limits during normal operations as part of any license issued for the project. The proposed limits would restrict changes to 0.05 feet per hour and 0.2 feet per day from May 15 through October 15, and 0.1 feet per hour and 0.4 feet per day during the rest of the year. Deviation from these limits would be allowed during any of four events: (1) flood events; (2) any event that triggers the project Emergency Action Plan; (3) rapid changes in inflows, when the rate of inflow change exceeds the proposed stage change limits; and (4) equipment failures or emergencies at the Reregulating development. In their response to AIR no. 5, the Joint Applicants propose that a flood event be defined as a river flow exceeding 10,000 cfs.

The Tribes' WCB WQC condition E and ODEQ WQC condition G.4 would require, BIA preliminary 4(e) condition no. 5 specifies, and the FWS, BLM, FS, and ODFW recommend the hourly and daily ramping rates as proposed by the Joint Applicants, although the Tribes' WCB and BIA do not include the exceptions identified by the Joint Applicants. BIA also specifies long-term downramping rates to provide additional protection during the steelhead and fall Chinook salmon spawning and incubation periods. From April 1 through July 31, the downramping rate would be limited to 500 cfs over any moving 60-day period when the instantaneous flow is 4,500 cfs or less as measured at the USGS gage at Madras. From October 1 through February 28, the downramping rate would be limited to 800 cfs over any moving 30-day period when the instantaneous flow is 4,500 cfs or less as measured at the USGS gage at Madras.

The Joint Applicants propose to maintain the current summer operating policy for Lake Billy Chinook, which allows for 1-foot daily fluctuations (from elevation 1,944 to 1,945 feet msl) between June 15 and September 15 of each year. They also propose to restrict drawdown of Lake Billy Chinook to a maximum of 20 feet (elevation 1,925 feet msl) during the winter and to maintain the current operating policy for Lake Simtustus with a maximum drawdown limit of 4 feet below full pool between June 1 and August 31, and 7 feet below full pool between September 1 and May 31. A new maximum drawdown limit of 21 feet below full pool is proposed for the Reregulating reservoir. The Joint Applicants propose that exceptions to the drawdown limits for all three reservoirs be made under the following conditions: (1) drawdown needed for safe passage of anticipated flood flows to minimize damage to life and property; (2) drawdown required to complete repairs on project facilities; and (3) power

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emergencies, as defined in the WSCC Minimum Operating Reliability Criteria. In their Draft Project Operating Plan the Joint Applicants propose to publish annual project operations reports and to provide preliminary and final incident reports within 15 and 45 days, respectively, of any apparent violation of operating constraints such as minimum flows, ramp rates, or reservoir elevations.

The Tribes' WCB WQC condition E and ODEQ WQC condition G.5 would require and FWS and ODFW recommend the reservoir drawdown limits proposed by the Joint Applicants for all three reservoirs with some additional requirements pertaining to Lake Billy Chinook. FWS recommends that it be consulted if Lake Billy Chinook is not projected to refill by June 15, and both ODEQ and ODFW stipulate that they should also be consulted in this event. ODEQ and the Tribes' WCB would require and ODFW recommends that Lake Billy Chinook not be drawn down more than 10 feet during normal winter operations. FWS and ODFW also recommend that the Joint Applicants develop and implement a chart that clearly instructs project operators on measures to refill Lake Billy Chinook or Lake Simtustus (i.e., a schedule for adjusting outflows) from a range of drawdown elevations, which should be incorporated into a standard operating procedure. The Tribes' WCB states that Lake Billy Chinook "should" be filled to elevation 1,944 by April 1 and also in the fall to protect riparian vegetation and cultural resources. BIA preliminary 4(e) condition no. 4.c specifies that Lake Billy Chinook be refilled to elevation 1,944 or above from May 1 through September 15.

BIA preliminary 4(e) condition no. 5 specifies the filing of a monthly operations report to the BIA, to the Tribes' BNR, and to the Commission to demonstrate compliance with the ramping rate condition. BIA also states that the monthly project operation reports should be submitted within 7 days for any deviations relating to ramping rates and within 30 days for any event relating to reservoir elevations. A monthly project operation report is also specified within 30 days following the end of a deviation relating to ramping rates. The monitoring report would include assessments of stranding and of dewatering during the deviation event.

Our Analysis

BIA preliminary 4(e) condition no. 5 developed its proposed long-term ramping rates, as well as its proposed minimum flow targets, from information provided in Aney et al. (1967), a study that examined the effect of flows on spawning and incubation habitat of rainbow trout, steelhead, and fall Chinook salmon during field studies conducted on the lower Deschutes River between 1961 and 1966. BIA also enlisted Mr. Aney to examine the current condition of the study sites (Aney, 2002) to evaluate the relevance of the previous study's findings.

We reviewed the Aney et al. (1967) report to evaluate the basis for BIA's preliminary conditions pertaining to long-term ramping rates, reservoir elevations, and

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their effects on flows in the lower Deschutes River. Our findings from this review are summarized below:

- Aney et al. (1967) focused much of their analysis on the spring spawning and incubation period for rainbow and steelhead trout, which they considered to be a critical period. Trout and steelhead eggs and alevins were considered to be more vulnerable to exposure to poor incubation conditions than fall Chinook salmon for the following reasons: (1) they spawn in shallower water than fall Chinook salmon; (2) rising water temperatures during their incubation season cause overall DO levels to diminish; (3) DO levels in the intragravel environment may be further diminished due to reduced river flows; and (4) the latter two factors cause DO levels to diminish toward the end of their incubation and emergence period, at the same time that metabolic activity and DO requirements are increasing to peak levels.

- Sampling of natural redds indicated that embryo survival rates for trout and steelhead were highly variable, averaging 60 percent in section 1 (Pelton Reregulating dam to Shitike Creek), 47 percent in section 2 (Shitike Creek to the Warm Springs River), 30 percent in section 3 (Warm Springs River to White River), and 1 percent in section 4 (White River to the confluence with the Columbia River).

- Survival rates showed a strong positive correlation with the minimum intragravel DO level measured in each redd over the incubation period. Embryos exhibited high survival rates when DO levels remained above 5.5 mg/L, and low survival was observed when minimum DO levels were less than 4 mg/L.

- Nearly all trout and steelhead selected spawning sites that had a water depth of at least 0.5 feet, and more than half of the selected sites with a water depth of over 1 foot.

- DO levels in trout and steelhead redds were higher than in undisturbed gravels initially, but decreased over time and became similar to levels in undisturbed gravel.

- DO levels dropped faster in redds that experienced reductions in flow between spawning and emergence compared to redds that experienced more stable flow conditions. This conclusion was based on DO measurements made in 10 redds that were constructed at flows approximately 17 to 28 percent higher than the flows that occurred during incubation.

- Aney et al. (1967) concluded that discharge at the time of spawning appeared to be less critical than the stability of flow conditions during incubation.

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- Based on intragravel DO measurements obtained from undisturbed gravel in 2 years with near-typical discharge patterns (1963 and 1966), Aney et al. developed a regression equation that predicted mean intragravel DO content at different levels of river flow. Using this regression, it was predicted that a mean intragravel DO level of at least 4 mg/L would be achieved 90 percent of the time if the mean monthly discharge was 4,500 cfs. A mean stream discharge of 4,800 cfs was predicted to result in a mean intragravel DO content of at least 5 mg/L about 85 percent of the time.

- Based on their findings, Aney et al. (1967) recommended a minimum discharge release of 4,800 cfs from March 15 to July 15 to protect trout and steelhead spawning and incubation, 4,500 cfs during September 15 to February 15 to protect salmon spawning and incubation, and a minimum flow release of 4,200 cfs at all other times. The flow recommendations for the spring and fall appeared to be based primarily on maintaining adequate intragravel DO levels, while the basis for the 4,200 cfs recommendation was not readily apparent.

Taken as a whole, we found that the Aney et al. (1967) report demonstrated that incubation conditions had a substantial effect on embryo survival rates for rainbow trout and steelhead during the period that the study was conducted. In the time that has elapsed since the study, several factors, including changes in substrate condition caused by a major flood that occurred in 1996, have likely affected incubation conditions. This flood likely improved substrate conditions in some areas and adversely affected substrate conditions in others. It is also likely that future incubation conditions would be improved by the more stable flow conditions that would result from the Joint Applicants' Draft Project Operating Plan, which would hold instantaneous outflows to within 10 percent of the daily average inflow[48] under most conditions.

The finding that very low DO levels occurred in redds that had experienced a reduction in flow between spawning and incubation suggests that preventing reductions in discharge during the incubation period could increase the embryo survival rates for trout and steelhead. However, we believe that the authors overstated the extent to which intragravel DO levels could be controlled by altering flow levels. Their regression analysis of intragravel DO levels and river flows did not appear to take into account the effect of water temperatures, which tend to increase as river flows diminish during the incubation period for trout and steelhead, causing a substantial reduction in overall DO levels.

The Aney et al. (1967) report suggests that there is some potential for increasing the survival to emergence of rainbow trout and steelhead by using reservoir storage to prevent flows from decreasing substantially during the egg incubation and emergence

[48] As measured on the prior day.

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period. However, surveys conducted by the Joint Applicants indicate that trout fry are extremely abundant along the river shoreline during the early summer, indicating that survival to emergence is adequate and probably does not limit trout populations. In addition, most steelhead spawn in tributary streams and would not benefit from stabilizing flow levels in the mainstem river. Fall Chinook salmon would be unlikely to benefit from stabilizing river flows, because flows and ambient DO concentrations generally increase during the fall and winter months when incubation occurs for this species. Augmenting river flows during the incubation period would require changes in reservoir storage that could affect flood control operations and reduce the ability to achieve and maintain summer target elevations in Lake Billy Chinook, with potential for causing adverse effects on the ESA-listed bull trout, the recreationally important fishery for kokanee salmon, recreation, aesthetics and cultural resources. Conditions and recommendations developed by nearly all of the stakeholders in this proceeding have indicated a strong interest in achieving and maintaining summer target elevations in Lake Billy Chinook.

In its comments on the draft EIS, the Tribes' BNR voiced strong concern about the use of storage in Lake Billy Chinook to maintain the minimum flows or long-term ramp rates specified by BIA in its preliminary 4(e) conditions. These included the potential for causing accelerated bank erosion on Tribally owned property and adverse effects on cultural and archaeological sites, wetlands, rearing habitat for early lifestages of fish, water quality, recreational use, operability of the proposed SWW and fish passage facilities, ESA-listed species, aesthetics, and power generation. The Tribes conclude by stating that "in order to meet a 'run of river' mandate and the WCB philosophy to make the project as 'invisible' as possible in its environmental effects, the Tribes will not support changes in operation which will result in drafting the reservoirs specifically to meet the minimum flow scenario recommended by Interior."

Regarding the operations report, ramping rate report on deviations, reservoir level report on deviations, and ramping rate monitoring report on deviations that are specified by BIA, any license issued for the project would include provisions for documenting and reporting to the Commission any deviations related to ramping rates or reservoir levels. Copies of these reports could be sent to the agencies, including the Tribes, Interior, FWS, NOAA Fisheries, ODEQ, and ODFW. We do not see a need for monthly reports to be sent to the Secretary of the Interior or the Tribes' BNR for the same reason we discussed in section 3.6.2.1, *Minimum Flows*.

In December 2003, Interior filed a number of reports relating to flow requirements in the lower Deschutes River (Entrix, 2003a; Entrix, 2003b; Aney, 2003; and Newton, 2002). We have reviewed Interior's contractor reports and have not found any evidence that would clearly support the need to use storage in Lake Billy Chinook to implement the minimum flows or long-term ramping rates that were included in Interior's preliminary 4(e) conditions. The CTWS Tribal Council and the Joint Applicants both

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filed extensive responses to Interior's comments on the draft EIS, including detailed critiques of the reports that were filed by Interior. They both came to this same conclusion.

3.6.2.3 Fish Passage Plan

The Joint Applicants proposed in the Final Joint Application Amendment to implement the Current Fish Passage Plan to evaluate the feasibility of implementing a program to re-establish passage for anadromous and resident fish species through the Pelton Round Butte Project. The plan includes four phases: (1) a Baseline Phase during which current conditions in the project area are assessed and a draft fish passage plan is developed; (2) an Experimental Passage Phase during which first-phase assumptions are tested with some changes in project operations to improve downstream and upstream fish passage; (3) an Interim Passage Phase during which successful elements of the experimental phase are institutionalized in the project operations through engineering and constructing passage infrastructure improvements; and (4) a Final Passage Phase, which includes final construction and implementation of volitional upstream passage facilities and annual biological monitoring of passage success. Plan implementation is currently in the Experimental Passage Phase.

Program components include: (1) an adaptive management and decision-making process for the fish passage program; (2) the four phases envisioned for the program; and (3) the initial vision of which program elements reside in each phase, the schedule for implementing those elements, and the pre-requisites for initiating effort of those elements. Technical components of the effort include: (1) stock selection; (2) fish health management; (3) lower Deschutes River temperature and water quality management, (4) the selection, design, approval, construction and evaluation of facilities; (5) methods for evaluating passage efficiency; (6) performance measures related to maximizing ecosystem integrity and other identified measures of success; and (7) the relationship between the fish passage program and the Round Butte Hatchery Program.

The Joint Applicants filed an updated fish passage plan (Current Fish Passage Plan) in response to the draft EIS. Much of the work performed to date has focused on modeling to assess the potential for altering reservoir currents to improve fish passage and improve water quality conditions by implementing SWW at Round Butte dam, developing conceptual designs of upstream and downstream fish passage facilities at Round Butte dam, evaluating the risk of adversely affecting bull trout and redband trout by introducing fish diseases (primarily Infectious Hematopoietic Necrosis Virus [IHNV] Type 2 and whirling disease, both of which can infect most resident and anadromous salmonids) to areas upstream of the project, and assessing the production capacity of habitat upstream of Round Butte dam. The Joint Applicants identified the following pre-requisites to the initiation of the Interim Passage phase: (1) the final project license is

issued; (2) amendments to basin management plans are adopted by ODFW;[49] (3) modeling predicts the ability to reorient surface currents in Lake Billy Chinook to facilitate movement of outmigrants to the Round Butte dam forebay and to meet water quality requirements in waters affected by the project; (4) the conceptual design and evaluation of the SWW structure and collection facility are completed and a preferred alternative is selected;[50] (5) the fish health management program is finalized and approved by responsible agencies; (6) the interim passage portion of stock selection/supplementation plan is agreed upon by the Tribes and ODFW (and NOAA Fisheries if wild steelhead are used for reintroduction); (7) the lower Deschutes water temperature and water quality management program is approved by ODEQ and the Tribes; (8) the design for temporary downstream fish passage facilities at Round Butte dam is finalized and approved; and (9) the testing and verification phase study plan outline is developed and approved.

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NOAA Fisheries and FWS filed preliminary Section 18 fishway prescriptions for the Pelton Round Butte Project on November 8, 2002, and November 12, 2002, respectively. Additional conditions or recommendations pertaining to fish passage include preliminary 4(e) conditions filed by BIA, BLM, and FS, 401 WQC conditions filed by the Tribes' WCB and ODEQ, 10(j) recommendations filed by FWS and ODFW, and 10(a) recommendations filed by the Conservation Groups and the Tribes' Department of Natural Resources. In addition, ODFW filed revised 10(j) recommendations designed to be consistent with the settlement negotiations that led to development of the Joint Applicants' Current Fish Passage Plan. These conditions and recommendations are summarized below by the following categories: (1) General; (2) Interim Trap and Haul; (3) Adult Release Facility; (4) Upstream Volitional Fishways; (5) Downstream Fish Passage - Design and Construction; (6) Downstream Fish Passage - Operation, Maintenance and Evaluation; (7) Restoration Success; and (8) Stock Selection and Predation.

General Couditions and Recommendations

FWS § 18-1 through 7 would: (1) reserve the FWS' authority to modify prescriptions; (2) retain the FWS' right to review and approve all final fishway plans prior to construction; (3) require reservoirs to be managed to maximize upstream and downstream passage; (4) require that fishways be kept in proper order and clear of debris that would hinder passage; (5) require development of a fishway operation and maintenance plan; (6) require planning and performance of periodic evaluations of fishway effectiveness, and implementing any operational or physical changes that are

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[49] These amendments were adopted on December 12, 2003.

[50] The Current Fish Passage Plan includes the construction of temporary screening facilities at the time that the SWW structure is constructed; these temporary facilities would be replaced by permanent facilities after initial reservoir passage criteria have been achieved.

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necessary to achieve optimal upstream and downstream fish passage conditions; and (7) require that access be provided for inspection of fishways.

FWS § 18-8 specifies that the Joint Applicants develop, fund, and implement a fish passage plan to provide effective upstream and downstream passage of spring and fall Chinook salmon, summer steelhead, sockeye salmon, Pacific lamprey, bull trout and rainbow trout. The plan would be developed in consultation with the Fish Committee, with revisions by January 1 of each calendar year. Components should include: (1) a specific schedule of timelines; (2) analysis of self-sustaining anadromous fish runs; (3) evaluation of performance measures; (4) evaluation of spawning, rearing, and movement of reintroduced anadromous species; (5) stock selection criteria for reintroduced anadromous species; (6) movement of native resident fish species upstream and downstream through project facilities; (7) trap and haul of adult fish during the Interim Phase but a goal of volitional passage in the final passage phase; (8) a tributary trapping program to mark outmigrating smolts during the interim phase; (9) continued studies to identify operational and structural changes to assist juvenile migration; and (10) development of target population sizes for self-sustaining runs of each species.

FWS § 18-9 specifies that the Joint Applicants prepare a Section 18 implementation and monitoring plan providing specific information on how the Joint Applicants intend to comply with requirements of the FWS Section 18 prescription. The plan would include: (1) quantified program goals, objectives and strategies; (2) criteria by which to measure progress towards program goals; (3) procedures for redirecting effort, including funding, as necessary under adaptive management to achieve the stated goals and objectives; (4) a schedule for implementation of activities to achieve goals and objectives; (5) a monitoring plan to evaluate progress towards, and achievement of goals and objectives; and (6) a format for reporting annually on the previous year's progress and the next year's work plan. FWS also reserves the right to accept, reject, or modify the implementation and monitoring plan and/or the Annual Report.

BIA preliminary 4(e) condition no. 8 specifies that the Joint Applicants: (1) develop and implement a fish passage plan for the full complement of anadromous and native fishes that historically migrated through the project area; (2, 3, and 4) prepare 8-year, 13-year, and 18-year fish passage and monitoring reports, including plans for needed improvements; (5) file annual work plans; (6) meet fish passage standards specified in the FWS preliminary Section 18 prescription; (7) file annual fish passage monitoring reports starting 2 years after issuance of any new license; (8) reduce hatchery production as natural production levels increase; and (9) develop contingency plans to provide alternative means of fish passage if needed.

BLM preliminary 4(e) condition no. 17 specifies that the Joint Applicants develop a fish passage plan within 1 year of issuance of any new license to provide for the re-establishment of sustainable and harvestable populations of Chinook salmon, steelhead trout, sockeye salmon, and lamprey upstream of the project and successful passage of

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redband and bull trout through and within the project. BLM also agrees with FWS' preliminary Section 18 prescriptions.

FS preliminary 4(e) condition no. 5 is the same as BLM preliminary 4(e) condition no. 17, but also specifies that the Joint Applicants should conduct testing to determine survival of smolts migrating through Lake Simtustus; implement measures to minimize the risk of introducing new fish diseases in the upper basin and implement monitoring as described in the Fish Disease Risk Management Plan; monitor fish transported at the project and assess mortality of fish caused by fish passage operations and facilities; describe how fish passage success or failure would be determined, and what other fish passage alternatives would be explored if selective withdrawal proves unsuccessful.

The Tribes' WCB WQC condition F requires that the Joint Applicants implement enhancement measures that would effectively enable fish passage and allow for re-connection of harvestable fish and anadromy, without adversely affecting resident fish species in the project reservoirs or anadromous and resident fish species in the lower Deschutes River. If successful fish passage has not been achieved within 10 years, alternative methods of re-connecting fish populations would be developed and approved by the managing agencies, and implemented by year 15 of any license issued for the project. The Joint Applicants may request that these time frames be adjusted by the Tribes' WCB after due consultation with appropriate agencies.

The Tribes' BNR supports the Joint Applicants' proposed approach for providing fish passage, but recommends that alternative passage options be prioritized and included in the fish passage plan. The Tribes' BNR also recommends gathering information on the current status of Pacific lamprey and feasibility of providing passage for this species, development of numerical production ranges for the goals of connectivity, biodiversity, natural production, escapement, and facility effectiveness.

ODEQ WQC condition no. 9 requires the Joint Applicants to construct fish passage facilities consistent with the fish passage plan and to consult with ODFW regarding any modification in the design of or operation of the facilities.

The ODFW recommends that the Joint Applicants implement a long-term program to establish sustainable anadromous runs of Chinook salmon, steelhead, and sockeye salmon. In consultation with the Fish Committee, the Joint Applicants should implement a fish passage plan for effective upstream and downstream passage for anadromous and resident species of fish. The fish passage plan must include effectiveness monitoring, annual work plans, and a phased approach that includes an experimental, interim, and final phase. The ODFW also recommends development of an alternative protection and enhancement package if the Joint Applicants and the Fish Committee agree to abandon fish passage.

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The Conservation Groups recommend that the Join Applicants provide downstream as well as upstream passage to reintroduce anadromous species of fish, reconnect existing upstream and downstream bull trout populations, and reconnect populations of other resident native fish, including redband trout. The Conservation Groups support the proposed time lines and hypothesis-driven adaptive management approach documented in the Joint Applicants' response to AIR no. 10. They contend that efforts to make fish passage successful must continue unless the Fish Committee and the Joint Applicants agree that there is no justification for continuing; and that any decision to abandon fish passage must be offset by additional habitat work above and/or below the project.

Interim Trap aud Haul

NOAA Fisheries § 18-7.2.1 specifies that the Joint Applicants use the existing Pelton fish trap to capture and move adult anadromous salmonids by truck to Lake Billy Chinook.

NOAA Fisheries § 18-7.2.2 specifies a 98 percent survival rate within the first 5 years after the fish passage program begins.

NOAA Fisheries § 18-7.2.3 specifies that the Joint Applicants, within 18 months after issuance of any new license, submit fish handling protocols and operation and maintenance procedures for review and approval, including: (1) annual monitoring reports on the number of fish by species that are observed and transported, (2) daily observations on the physical condition of the fish (with appropriate corrective measures implemented within 60 days after a problem is identifled),[51] (3) continuous record of DO and water temperature within the fishways, and (4) modifications needed to ensure effective, safe and timely passage or to achieve 98 percent survival by year 5 of any license issued for the project.

FWS § 18-10 would have the same requirements as NOAA Fisheries 7.2.3, except that the FWS specifies that any delay, injury and/or mortality of fish would be reported to the FWS within 24 hours, and the survival objectives would be 90 percent by year 5 and 95 percent by year 10.

The ODFW recommends target survival rates for adult upstream passage of 90 percent by 10 years and 95 percent by 15 years after issuance of any new license.

In its revised 10(j) recommendation, ODFW recommends survival goals for adult upstream passage of 95 percent during the first 5 years of operation and 98 percent after 5 years. This recommendation is consistent with the Current Fish Passage Plan.

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[51] If corrective measures cannot be accomplished within the 60-day period, the Joint Applicants would notify and consult with NOAA Fisheries and resource agencies.

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Adult Release Facility

NOAA Fisheries § 18-7.2.4 specifies that the Joint Applicants, within 1 year after issuance of any new license, submit for review and approval a preliminary design of the adult release facility, and, within 18 months, develop a final design, construction, operation, and monitoring plan, including a timeline for construction of the adult relcase facility.

FWS § 18-11 and 12 would have the same requirements as NOAA Fisheries 7.2.4. (Although FWS refers to the designs to be provided at both 12 and 18 months as final designs; we believe that the FWS probably intended to request preliminary and final designs as NOAA Fisheries did).

NOAA Fisheries § 18-7.2.5 specifies that the Joint Applicants, within 18 months after issuance of any new license, submit for review and approval a monitoring plan to include annual reports on the number of fish by species that are released, daily observations on the physical condition of the fish using the facilities (with appropriate corrective measures implemented within 60 days after a problem is identified), a continuous record of DO and water temperature within, in front of, and adjacent to the exit(s) to the facility, and modifications needed to ensure effective, safe and timely passage or to achieve 98 percent survival by year 5 of any license issued for the project.

FWS § 18-13 would have the same requirements as NOAA Fisheries 7.2.5, except that FWS specifies the reporting of fish released by age class as well as by species and size, that any delay, injury and/or mortality of fish would be reported to FWS within 24 hours, and the survival objectives would be 90 percent by year 5 and 95 percent by year 10.

NOAA Fisheries § 18-7.2.6 specifies that the Joint Applicants, within 2 years after issuance of any new license, install and operate an adult release facility.

FWS § 18-14 would have the same requirements as NOAA Fisheries 7.2.6, except the FWS specifies that the licensces notify the FWS in writing when the facility becomes operational.

NOAA Fisheries § 18-7.2.7 specifies that the Joint Applicants develop plans (in consultation with NOAA Fisheries) to conduct post-construction effectiveness evaluations to document upstream movement of anadromous flsh, fish passage efficiency, passage time and mortality, injury, and fallback rates for a representative range of operating scenarios. If notified by NOAA Fisheries that deficiencies are observed, provide a remediation plan within 30 days. Evaluation would continue until all reasonable measures to maximize upstream passage effectiveness have been performed. Thereafter, NOAA Fisheries specifies that the Joint Applicants conduct evaluations at least once every 5 years.

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FWS § 18-15 would have the same requirements as NOAA Fisheries 7.2.7, except that the FWS specifies that the plans would be developed within 6 months after the initiation of adult release facility operations, that upstream movement would be monitored for both anadromous and resident species of fish, and that notification of the need for and review of the remediation plan would be performed by the FWS.

Upstream Volitional Fishways

NOAA Fisheries § 18-7.2.8 specifies that the Joint Applicants, by year 20 after issuance of any new license, develop and submit for review and approval conceptual designs for a volitional upstream passage facility.

FWS § 18-16 would have the same requirements as NOAA Fisheries 7.2.8.

NOAA Fisheries § 18-7.2.9 specifies that the Joint Applicants, by year 22 after issuance of any new license, submit for review and approval selected alternatives and specifications for the construction and operation of volitional fishways for providing upstream passage.

FWS § 18-17 would have the same requirements as NOAA Fisheries 7.2.9, except FWS specifies design plans and specifications be submitted within 20 years, and FWS did not mention the inclusion of alternatives.

NOAA Fisheries § 18-7.2.10 specifies that the Joint Applicants, by year 23 after issuance of any new license, submit for review and approval fishway operation and maintenance plans including schedules, inspections, and contingencies.

FWS § 18-18 would have the same requirements as NOAA Fisheries 7.2.10, except that plans would be submitted within 22 years.

NOAA Fisheries § 18-7.2.11 specifies that the Joint Applicants, by year 23 after issuance of any new license, submit for review and approval monitoring plans to include submission of an annual report.

FWS § 18-19 would have the same requirements as NOAA Fisheries 7.2.11, except that plans would be submitted within 22 years, and the FWS specifies that the report should include the number of fish by species that are observed and conveyed upstream, daily observations on the physical condition of the fish (with any delay, injury, or mortality of fish to be reported to the FWS within 24 hours and appropriate corrective measures implemented within 60 days after a problem is identified), and a continuous record of water temperature, flow and velocity within the fishways and in front of and adjacent to the entrance(s) and exit(s) of the fishways.

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NOAA Fisheries § 18-7.2.12 specifies that the Joint Applicants, in consultation with NOAA Fisheries, install and begin operation of upstream volitional fishways within 24 years.

FWS § 18-20 would have the same requirements as NOAA Fisheries 7.2.12, except FWS specifies that the licensees should notify FWS in writing when the facility becomes operational.

NOAA Fisheries § 18-7.2.13 would have the same requirements for post-construction effectiveness evaluations as NOAA Fisheries 7.2.7 (adult release facility).

FWS § 18-21 would have the same requirements as FWS 15 (adult release facility).

In its revised 10(j) recommendations, ODFW recommends that the Joint Applicants investigate the feasibility of volitional passage after it has been determined that downstream passage survival targets for Lake Billy Chinook have been achieved. Volitional passage would then be implemented unless the risk of disease transfer is found to be too great, the stray rate for out-of-basin fish is not acceptable, volitional passage is not feasible, or it is determined to be preferable to continue trap-and-haul operations for some additional specified period. This recommendation is consistent with the Joint Applicants' Current Fish Passage Plan.

Downstream Fish Passage – Design and Construction

NOAA Fisheries § 18-7.3.1 specifies that the Joint Applicants, within 6 months after issuance of any new license, develop plans for completing design investigations to design and install a downstream fishway at Round Butte dam that meets smolt criteria. Investigations should include: hydraulic conditions under all operating scenarios, testing using a physical model to insure proper siting of fishway facilities, information on swimming performance, behavior, and migratory pattern of juvenile anadromous species upstream of the dam, and investigations to determine appropriate screens to guide and route fish safely downstream.

FWS § 18-22 would have the same requirements as NOAA Fisheries 7.3.1, except that information on swimming performance, behavior, and migratory pattern would be developed for both resident and anadromous species of fish.

NOAA Fisheries § 18-7.3.2 specifies that the Joint Applicants, within 1 year after issuance of any new license, submit for review and approval the results of fishway design investigations and preliminary design plans and specifications for the construction and operation of downstream fishways.

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NOAA Fisheries § 18-7.3.3 specifies that the Joint Applicants, within 18 months after issuance of any new license, submit for approval final design plans, including a mechanical screen cleaner or some other suitable device, a fish bypass and sampling facility, and water-to-water transfer capability for trucking smolts to below the Reregulating dam.

FWS § 18-23 would have the same requirements as NOAA Fisheries 7.3.2 and NOAA Fisheries 7.3.3, except FWS specifies that the SWW (described in section 3.5, *Water Quality*) and fish passage facilities be designed for construction at the same time (however, the FWS indicates that it may reconsider the proposed two-staged construction approach if means can be found to avoid, reduce, and mitigate for negative effects).

NOAA Fisheries § 18-7.3.4 specifies that the Joint Applicants, within 2 years after issuance of any new license, if feasible, install and operate the proposed SWW facility, to be fitted with a bottom exclusion screen and temporary surface screening and bypass facilities.

FWS § 18-26 would have the same requirements as NOAA Fisheries 7.3.4, except FWS specifies that the SWW and permanent downstream fish passage facilities (including screens, bypass and sampling facilities) should be constructed at the same time, within 2 years after issuance of any new license.

NOAA Fisheries § 18-7.3.5 specifies that the Joint Applicants, within 5 years after issuance of any new license, install permanent juvenile fish screen, bypass, and sampling facilities that have been approved by NOAA Fisheries and other resource agencies.

NOAA Fisheries § 18-7.3.7.1 specifies that the Joint Applicants design the fish screen, bypass, and sampling facilities to meet applicable hydraulic criteria (NMFS, 1995) for approach velocity, sweeping velocity, screen porosity, exposure time, and other factors.

In its revised 10(j) recommendations, ODFW recommends that downstream passage facilities be constructed in accordance with the design approach and schedule identified in the proposed preferred alternative. The design approach would lead to the construction of the SWW structure with temporary screening and collection facilities by the spring of 2008, with permanent downstream passage facilities to be operational by 2012. Although juvenile salmonids captured at the Round Butte collection facility during the primary emigration period would be transported to the lower Deschutes River bypassing Lake Simtustus, the Fish Committee may request that downstream-migrating salmonids be transported into Lake Simtustus to use the available rearing habitat. Following consultation with the Fish Committee, the Joint Applicants would install a guidance net system at Pelton dam and operate the existing downstream passage facility (Pelton skimmer) during part or all of the primary migration season and transport downstream migrants to the lower Deschutes River. ODFW's revised 10(j)

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recommendation is consistent with the Joint Applicants' Current Fish Passage Plan, with the exception that the Joint Applicants indicate that the permanent downstream passage facilities would become operational in 2013, not in 2012.

Downstream Fish Passage – Operation, Maintenance and Evaluation

NOAA Fisheries § 18-7.3.6 specifies that the Joint Applicants, within 2 years after issuance of any new license, submit for approval a plan describing the anticipated operation, maintenance, schedules, inspections, and contingencies for downstream fish passage facilities.

FWS § 18-24 would have the same requirement as NOAA Fisheries 7.3.6, except the FWS specifies that the plan be submitted within 18 months after issuance of any new license.

NOAA Fisheries § 18-7.3.7.2 specifies that the Joint Applicants, within 5 years after issuance of any new license, achieve injury and morality rates of less than 2.0 and 0.5 percent, respectively, from the entrance into the collection facility to the point of release below the Reregulating dam. Injury and mortality rates from 2.0 to 4.0 percent and 0.5 to 2.0 percent, respectively, would need additional enhancements, and higher injury and mortality rates would need major operational or structural changes.

NOAA Fisheries § 18-7.3.7.3 specifies that survival from the head of each arm of Lake Billy Chinook to the point of release below the Reregulating dam (Downstream Project Survival) be at least 75 percent by year 10 and at least 95 percent by year 15 after the intake screen is operational.

FWS indicates in its formulation of the preliminary fishway prescription that it would use the same criteria as NOAA Fisheries 7.3.7.1, 7.3.7.2, and 7.3.7.3 for hydraulic performance, downstream collection survival, and project survival as part of the post-construction effectiveness monitoring specified in FWS § 18-27.

In its revised 10(j) recommendation, ODFW recommends survival goals for downstream passage facility survival (from the Round Butte collection facility to the release point in the lower Deschutes River) of 93 percent for the interim facility during the first 5 years of operations and 96 percent for the permanent screening facility. ODFW also recommends goals for reservoir downstream passage associated with interim passage facilities of greater than 50 percent survival from any tributary averaged over 4 years of study and greater than 75 percent survival associated with permanent collection facilities calculated as a 4-year rolling average. This recommendation is consistent with the Current Fish Passage Plan.

NOAA Fisheries § 18-7.3.8 specifies that the Joint Applicants, within 2 years after issuance of any new license, submit for approval downstream fishway monitoring plans

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including the use of sonar and a downstream trap to monitor entrainment. Annual reports should include the number of fish by species, size and age class that are observed at an appropriate fish counting facility and conveyed downstream, daily observations on the physical condition of fish using the facilities (with appropriate corrective measures implemented within 60 days after a problem is identified), a continuous record of water temperature, flow, and velocity within the fishways and in front of and adjacent to the entrance(s) and exit(s) of the fishways, modifications needed to ensure effective, safe and timely passage, and measures or modifications necessary to attain 75 percent project survival by year 10 of any license issued for the project and to attain 95 percent project survival by year 15 of license issued for the project.

FWS § 18-25 would have the same requirements as NOAA Fisheries 7.3.8, except FWS specifies that the plan be submitted within 6 months after issuance of any new license, and reporting of any observed delay, injury and/or mortality of fish to FWS within 24 hours.

NOAA Fisheries § 18-7.3.9 specifies that the Joint Applicants, upon initiation of downstream fishway operations and in consultation with NOAA Fisheries and other agencies, develop and implement plans to document hydraulic conditions over the full range of operating conditions, and downstream movement, fish passage efficiency, passage time and mortality and injury for a representative range of operating scenarios. If notified by NOAA Fisheries that deficiencies are observed, provide a remediation plan within 30 days after notification. After the remediation plan is approved by NOAA Fisheries, the licensees would file the plan with the Commission and implement the plan according to the approved schedule. Evaluations are to continue until it has been demonstrated that all reasonable measures to maximize downstream passage effectiveness have been performed. Thereafter, conduct evaluations at least once every 5 years. This preliminary condition also specifies that the turbines at Round Butte dam be operated at an efficiency "that will provide the most safe, timely, and effective passage conditions for anadromous species passing the Round Butte Dam."

FWS § 18-27 would have the same requirements as NOAA Fisheries 7.3.9, except that the FWS specifies that the plan should be prepared within 6 months after the initiation of downstream fishway operations, and that notification of the need for and review of the remediation plan would be performed by the FWS.

In its revised 10(j) recommendation, ODFW recommends that operation, maintenance, and monitoring of downstream fishways be conducted in accordance with Fish Committee-approved plans, which the Joint Applicants propose to submit for approval at the time that facilities become operational. The Joint Applicants would conduct test and verification studies to provide guidance in proceeding with the initiation and early evaluation of the fish passage effort. The revised proposed preferred action provides outlines for the following categories of testing and verification studies: (1) facility evaluation; (2) fish health; (3) physical reservoir changes with SWW; (4)

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water quality changes with SWW, (5) juvenile salmonid studies; (6) adult upstream passage; and (7) adult migration/survival/spawning. Each year, detailed study plans would be developed in consultation with the Fish Committee following these outlines.

Restoration Success

The FS recommends that the Joint Applicants develop interim and long-term goals for the production of adult and juvenile Chinook salmon, sockeye salmon, steelhead, and lamprey for stream reaches above the project. The FS also recommends that the Joint Applicants establish performance standards for anadromous fish and resident fish for downstream project and dam passage survival and upstream dam passage survival.

To compensate for unavoidable losses of fish caused during passage through the project reservoirs and passage facilities to be constructed under the fish passage plan, BLM, FS, FWS, and the Conservation Groups recommend that passage losses be monitored and enhancement measures be developed to mitigate for observed losses.

In its revised 10(j) recommendation, ODFW recommends that the Joint Applicants monitor populations of anadromous fish, bull trout, redband trout, and kokanee/sockeye salmon to determine the effects of reintroduction. Monitoring studies would include spawning surveys for approximately 12 years after initiation of downstream passage, continuing on an annual basis until the ratio of recruits to spawners is greater than or equal to 1. In addition, ODFW identifies specific criteria and goals for evaluating downstream passage success, as well as steps that would be taken to develop alternative passage strategies or to achieve non-passage mitigation in the event that the proposed passage measures are not successful. These recommendations are consistent with the Joint Applicants' Current Fish Passage Plan.

Stock Selection and Predation

The FWS recommends that the Joint Applicants conduct 3 years of comprehensive surveys of smallmouth bass and bull trout diets in Lake Billy Chinook and northern pikeminnow in Lake Simtustus after smolt migration is greater than or equal to 10,000 anadromous smolts. The FWS also recommends control of northern pikeminnow in Lake Simtustus if the reservoir is used as a pathway for outmigrating juveniles.

The FWS also recommends that the Joint Applicants conduct stock assessments of anadromous and resident fish populations within 2 years of issuance of any new license for selecting stocks of fish for anadromous reintroduction. The FWS also recommends that the Joint Applicants review stock performance every 5 years and conduct genetic studies on wild and hatchery steelhead in the basin to assist in stock assessment for the reintroduction of steelhead.

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In its revised 10(j) recommendation, ODFW recommends that the Joint Applicants conduct predation studies in Lake Billy Chinook as recommended by FWS, except that the Joint Applicants would not have to study or control predation by northern pikeminnow in Lake Simtustus. ODFW proposes to develop annual operating plans for the Round Butte hatchery that would guide brood stock selection for the production and conservation programs and does not recommend any stock selection. These recommendations are consistent with the Joint Applicants' Current Fish Passage Plan.

Our Analysis

The majority of the preliminary prescriptions and recommendations filed by agencies and other stakeholders are consistent with the Current Fish Passage Plan proposed by the Joint Applicants, although they provide much more specificity regarding consultation requirements and objectives for the performance of upstream and downstream passage facilities.

Some aspects of certain preliminary prescriptions and recommendations are inconsistent with the Joint Applicants' proposed fish passage plan or with conditions or recommendations filed by other stakeholders. We evaluate these by topic area in the following sections. We consider the conditions and recommendations listed above but not discussed below to be consistent with the fish passage plan, which we believe would provide substantial benefits to the aquatic resources in the project area, if implemented incorporating the terms and conditions, as modified below.

Schedule

In their comments dated February 6, 2003, filed in response to agency preliminary terms and conditions, the Joint Applicants identified concerns pertaining to schedule requirements specified in many of the preliminary prescriptions and recommendations listed above (FWS § 18 items 23 through 26, NOAA Fisheries §18 items 7.3.2 through 7.3.5). The Joint Applicants indicated that the schedules recommended or prescribed by the agencies do not allow enough time for design, agency reviews, modeling, phased construction, and testing. Through the settlement negotiation process, the Joint Applicants have refined their proposed schedule, which is presented in the Current Fish Passage Plan. This schedule would provide for the construction of the SWW facility with temporary screening and collection facilities in 2008 and the installation of permanent screening facilities in 2013.[52] We find that this schedule represents a reasonable balance between the desire to move forward with implementation and the need to allow adequate time for design review and evaluation of the effectiveness of SWW implementation. We

[52] In their reply to comments on the draft EIS, the Joint Applicants indicate that this schedule may need to be modified depending on the length of the remaining FERC process to issue a final license that is no longer subject to administrative or judicial review.

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agree with the Joint Applicants' view that the SWW and screening facilities include unique design challenges that would require a thorough and deliberate approach to maximize the potential for success. Incorporation of a temporary screening facility at Round Butte dam would allow biological evaluations of fish passage through Lake Billy Chinook to be initiated at the same time that the effectiveness of the SWW for redirecting surface currents is being evaluated, while at the same time protecting against the potential for increasing entrainment losses of bull trout and kokanee. It would also allow restoration efforts to begin before a final decision is made to proceed with the installation of permanent downstream passage facilities. We encourage FWS and NOAA Fisheries to review the time frames specified in their preliminary fishway prescriptions to ensure that they are compatible with the current engineering schedule and milestones as described above.

The Joint Applicants also expressed concern over the schedule identified in the FWS and NOAA Fisheries preliminary fishway prescriptions for the preparation of facility monitoring and O&M plans, which they would develop within 6 months to 2 years after issuance of any new license. The Joint Applicants propose to develop operations plans for each facility as it is completed, modifying the operations plan if necessary after each facility is evaluated. The Joint Applicants also propose that monitoring plans be developed for each facility after its final design has been completed. We agree with the Joint Applicants' position that it is not practical or necessary to develop O&M or monitoring plans for a facility before the final design has been completed. We encourage FWS and NOAA Fisheries to review the time frames specified in their preliminary fishway prescriptions to ensure that they are compatible with the projected completion dates for the final design of each facility.

The Joint Applicants also disagreed with FWS' preliminary condition that specifies that permanent screening facilities be constructed at Round Butte dam at the same time that the SWW facility is constructed. The Joint Applicants propose that these facilities be constructed in two phases to allow the effectiveness of the SWW to be evaluated before the expense of installing permanent screening facilities is incurred. As noted above, the Joint Applicants have proposed to install temporary screening facilities to prevent entrainment and to enable biological evaluations of fish passage through Lake Billy Chinook to commence. We agreed with the two-phased construction approach proposed by the Joint Applicants, because it would allow progress toward restoration of fish passage while allowing uncertainties to be explored and evaluated before the cost of installing permanent screening facilities is incurred.

In addition, the Joint Applicants express concern about FWS and NOAA Fisheries preliminary conditions that specify that the construction of volitional upstream passage facilities within 24 years after issuance of any license issued for the project. They state that both the first and the second editions of the fish passage plan, which was developed with the Fisheries Technical Subcommittee, call for the transition to the Final Phase with

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volitional upstream passage "after the Interim Passage Phase is complete, downstream passage is determined to be successful, and the risk of introducing diseases from returning adults upstream has been addressed to the satisfaction of the ODFW and the Tribes." We conclude that it would be too burdensome to commit to the installation of volitional upstream passage facilities before the success of downstream passage facilities and the risks of disease transmission have been evaluated and addressed, and encourage the FWS and NOAA Fisheries to modify their preliminary fishway prescriptions to incorporate these prerequisites.

Consultation Requirements

The NOAA Fisheries and FWS preliminary fishway prescriptions include a number of provisions for the review of preliminary and final designs of fish facilities, operation and maintenance plans, monitoring plans and effectiveness evaluation plans (table 23). Given the extent of the technical challenges that must be overcome to restore fish passage, consulting with the Fish Committee as fully as possible could be beneficial to the development and review of all facility designs and related plans.

Table 23. Facility designs, O&M plans, monitoring plans, and evaluation plans included in the FWS and NOAA Fisheries preliminary fishway prescriptions. (Source: Staff)

Facility	Description
Trap and haul	Fish handling protocols and O&M plan. To include annual monitoring reports on fish transported, fish condition,[a] water quality conditions, and modifications needed.
Adult release facility	Preliminary and final designs.
	Fish handling protocols and O&M plan. Same requirements as the trap-and-haul fish handling protocols and O&M plan, FWS specifies that any delay, injury or mortality of fish be reported to them within 24 hours.
	Effectiveness evaluation. To include documentation of upstream movement, fish passage efficiency, passage time and mortality, injury, and fallback. If NOAA Fisheries or FWS identify a deficiency, file a remediation plan within 30 days.
Upstream volitional fishways	Conceptual designs.
	Selected alternatives and specifications.

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Facility	Description
	O&M and monitoring plans. FWS specifies that annual monitoring reports should include the number of fish passed, fish condition, and water quality conditions. FWS also specifies that any delay, injury or mortality of fish be reported to them within 24 hours, and corrective measures implemented within 60 days.
	Monitoring plans.
	Effectiveness evaluation plans. Requirements same as for adult release facility.
Downstream fishways	Plans for completing design investigations.
	Preliminary design plans.
	Final design plans.
	O&M plans.
	Monitoring plans. Annual reports to include the number of fish passed, fish condition, water quality, flow conditions, and evaluation of fish entrainment. FWS also specifies that any delay, injury or mortality of fish be reported to them within 24 hours, both NOAA Fisheries and FWS specify that appropriate corrective measures be implemented within 60 days.
	Effectiveness evaluation plans. To include documenting hydraulic conditions, downstream movement, fish passage efficiency, passage time, mortality, and injury. If NOAA Fisheries or FWS identify a deficiency, file a remediation plan within 30 days.

[a] Appropriate corrective measures to be implemented within 60 days after a problem is identified.

The monitoring plans and effectiveness evaluations identified in the NOAA Fisheries and FWS preliminary prescriptions would provide important feedback to management agencies on the effectiveness of each facility and on progress towards the restoration of anadromous fish runs as well as connectivity for resident fish. Monitoring plans for the adult release facility and the downstream passage facilities also provide for timely notification and remediation of any significant deficiencies that become apparent.

In addition to the monitoring plans and effectiveness evaluations summarized in table 23, FWS specifies that the Joint Applicants revise the fish passage plan on an annual basis (Section 18 no. 8), and prepare a Section 18 implementation and monitoring plan (Section 18 no. 9). BIA preliminary 4(e) condition no. 8 specifies that the Joint Applicants should file annual monitoring reports and work plans, but that the full fish

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passage plan would only be revised at 8, 13, and 18 years after issuance of any new license.

In their response to AIR no. 18, the Joint Applicants discuss their proposed approach to making revisions to the fish passage plan as appropriate milestones are attained. They note that the second edition of the fish passage plan (Ratliff et al., 2001) calls for annual reviews, with major review and possible adaptations every 5 years. They clarify that this was meant as an estimate of the approximate interval at which significant adaptive changes would take place and major updating of the fish passage plan document would occur. In the draft EIS, we agreed with the Joint Applicants' position that revisions of the fish passage plan should be timed to coincide with the attainment of major milestones, and that routine planning and reporting be accommodated in annual work plans and monitoring reports. We recommended that major revisions to the fish passage plan be completed at the following milestones: (1) completion of the final design O&M and monitoring plans for the SWW facility (approximately December 2004); (2) completion of the SWW testing and verification phase (approximately November 2011); and (3) after downstream passage facilities have been in operation for 10 years (approximately 2022).

In their comments on the draft EIS, NOAA Fisheries, Interior, and ODFW note that restoring fish passage would be a difficult and complex process, and that every year studies at the project would generate pertinent new information that must be reflected in the plan. We acknowledge that such annual revisions would facilitate adaptive management, and now conclude that it would be reasonable to update and revised the fish passage plan on annual basis. We note that the current version of the fish passage plan does not specify a schedule for plan reviews, although it does specify that annual work plans would be developed.

We believe that the implementation and monitoring plan described in the FWS § 18-9 is largely redundant with the purposes of the fish passage plan and the annual work plans and monitoring reports specified by BIA in preliminary 4(e) condition no. 8. It would be important for the Joint Applicants to demonstrate compliance not only with the FWS Section 18 prescription, but also with the NOAA Fisheries Section 18 prescription as well as preliminary 4(e) conditions from BIA, BLM, and FS. Developing separate implementation and monitoring plans for each agency with mandatory conditioning authority would be time consuming and costly to prepare and to implement. Consultation during the preparation of annual monitoring reports and work plans, together with annual updating and revision of the fish passage plan should provide sufficient opportunity for the review of monitoring results and consideration of any changes in program direction that are needed in order to comply with all final Section 18 fishway prescriptions conditions.

We conclude that it would be beneficial for the Joint Applicants to consult with the Fish Committee in the development of each of the following work products to ensure

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their consistency with mandatory conditions: (1) all of the plans and designs identified in Table 25; (2) annual monitoring reports and work plans; and (3) annual revisions to the fish passage plan. This process may include the development of draft documents in consultation with the Fish Committee, provision of draft documents to the Fish Committee for review, and documentation about how comments and recommendations on the draft documents were addressed or resolved.

Technical Issues aud Concerns

In their reply comments dated February 6, 2003, filed in response to agency terms and conditions, the Joint Applicants question the need for monitoring hydraulic conditions in the Round Butte tailrace and for constructing a physical model of the Round Butte forebay, as NOAA Fisheries § 18-7.3.1 condition specifies. NOAA Fisheries lists these as investigations that would be needed to develop the design of downstream fishways. The Joint Applicants report that a physical model cannot simulate flow conditions resulting from differences in water temperature in the forebay, which is why they developed and calibrated a numerical model for this purpose. They also note that because no downstream fish passage facilities would be constructed in or around the project tailrace, there is no need to investigate hydraulic conditions in the tailrace to develop designs for these facilities. We agree that there is no need to construct a physical model of the forebay or to investigate hydraulic conditions in the project tailrace for developing downstream fishway designs. It is likely that hydraulic conditions in the Round Butte tailrace would need to be evaluated if volitional upstream passage facilities are installed at Round Butte dam in the future. Gathering this type of information is a standard component of the design process for upstream passage facilities. However, there is no need to proceed with gathering this information before the prerequisites for implementing the final phase of the fish passage plan have been fulfilled.

The Joint Applicants also discuss a statement in the prelude to the FWS preliminary prescription (pages 166 to 167) and in the NOAA Fisheries preliminary § 18-7.3.1 prescription, which specifies that the deep water intake be screened with an exclusion device that would meet NOAA Fisheries smolt criteria for approach and sweeping velocities, but not for screen mesh size. The Joint Applicants indicate that the screen would meet NOAA Fisheries smolt criteria for mesh size, but that meeting NOAA Fisheries smolt criteria for sweeping velocities is not possible for an exclusion screen, because all of the flow in the vicinity of the screen would be approaching the intake (i.e., there is no bypass flow to create a sweeping velocity). We agree with the Joint Applicants' position that it is impossible to meet NOAA Fisheries smolt criteria for sweeping velocities at the deep water exclusion screen. In their comments on the draft EIS, NOAA Fisheries and FWS indicate that they are continuing to work with the Joint Applicants and other agencies to refine and further develop the proposed downstream passage facility, and they indicate that the revised design should adequately address the technical issues and concerns.

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The Joint Applicants also contend that there is no need to evaluate mortality at Round Butte dam as FWS § 18-26 specifies. They note that they are proposing to fully screen both the deep water and the surface intakes, which should provide full exclusion of fish. For the same reason, they contend there would be no benefit in requiring that the turbines at Round Butte dam be operated only at "an efficiency that will provide the most effective, safe, and timely passage conditions," as FWS § 18-27 specifies. Although Interior does not state its specific concerns that relate to turbine efficiency, its concerns may be related to providing adequate attraction flows toward the downstream passage facility at the times when smolts are outmigrating and to addressing impingement or injuries that could be caused by hydraulic conditions within the fish screening system. We note that the Joint Applicants' Current Fish Passage Plan and ODFW's revised 10(j) recommendation call for the Joint Applicants to install pumps to provide up to 3,000 cfs of attraction flow, if it is determined to be needed. In the Current Fish Passage Plan, the Joint Applicants also propose to identify and implement any feasible measures that may be required to achieve downstream passage survival standards or to reduce any impingement that is observed on the deepwater exclusion screen. We conclude that these provisions should address the issues raised by FWS, and we agree with the Joint Applicants that there is no need to evaluate entrainment mortality or to limit the operating range of the Pelton Round Butte turbines.

Finally, the Joint Applicants disagree with FWS' recommendation that they should conduct genetic studies on wild and hatchery steelhead in the basin to assist with stock assessment for the reintroduction of steelhead. They note that genetic studies are quite expensive and state that the limited current knowledge of the steelhead genome makes interpreting the meaning of differences in genetic measurements impossible. However, genetic studies conducted in other basins have been useful for determining the genetic distance between steelhead populations, including the evaluation of introgression with hatchery stocks (Nielsen, 1998). Substantial numbers of hatchery steelhead have strayed from other basins into the lower Deschutes River, and the effects of interbreeding of these fish with wild Deschutes steelhead has been identified as a serious concern. Because steelhead spawn in a number of tributaries to the lower Deschutes River, it is likely that populations that spawn in different tributaries may be subject to different levels of introgression with hatchery stocks, especially in comparison with fish that spawn in the mainstem Deschutes River. Although we conclude that there may be value in undertaking the genetic studies recommended by FWS to determine the extent of hatchery introgression in each spawning area and to assist with identifying appropriate stocks for use in re-introduction, it is ultimately the responsibility of the fisheries agencies to gather the information that agencies need to make basin-wide decisions, including determining which steelhead stocks to reintroduce upstream of the project. We note that ODFW, in its comments on the draft EIS, indicates that it would develop an annual operating plan for the hatchery that would guide brood selection for the production and conservation programs.

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Performance Criteria

NOAA Fisheries, FWS, ODFW, and the Joint Applicants identify specific performance criteria for upstream and downstream passage survival (table 24). Such criteria may provide a useful means for monitoring progress towards restoring passage for anadromous fish and for improving connectivity among resident fish species. However, Conservation Groups have expressed concern that setting goals and targets that are too aggressive could lead the Joint Applicants, or other stakeholders, to conclude that passage should be abandoned if these targets cannot be met. We share this concern and believe that any decision to abandon passage should be made only after full and complete consultation with the Fish Committee, and that survival objectives incorporated into the fish passage plan or identified in final Fishway Prescriptions should be formulated and identified as targets and not as mandatory objectives. This is consistent with the approach that has been proposed by the Joint Applicants in the Current Fish Passage Plan and in ODFW's revised 10(j) recommendations. Both the Joint Applicants and ODFW indicate that if passage survival targets are not achieved, the Joint Applicants would consult with the Fish Committee to consider possible adjustments to study efforts to investigate the causes and the implementation of any feasible measures or modifications within their control that could be implemented to achieve these objectives. They also identified the specific steps that would be undertaken, in consultation with the Fish Committee, to develop and evaluate alternative passage strategies or to achieve non-passage mitigation in the event that the proposed passage measures are not successful.

Table 24. Fish passage performance targets identified by NOAA Fisheries, FWS, and ODFW/Joint Applicants.[a] (Source: Staff)

Standard	Condition or Recommendation
Upstream passage survival—defined as the proportion of fish collected in the Pelton trap that are successfully released at the adult release facility in Lake Billy Chinook	NOAA Fisheries: Achieve a 98 percent survival rate within 5 years after the passage program begins. FWS: Achieve a 90 percent survival rate within 5 years after issuance of any new license and 95 percent by 10 years after issuance of any new license. ODFW/Joint Applicants: 95 percent during the first 5 years of operations, 98 percent after 5 years.

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Standard	Condition or Recommendation
Downstream project/reservoir survival—NOAA Fisheries/FWS: from entry into reservoir to below the tailrace of the Reregulating dam; ODFW/Joint Applicants: reservoir passage only	NOAA Fisheries: Achieve a 75 percent survival rate by year 10 after the surface intake screen is operational, and a 95 percent survival rate by year 15. FWS: Same as NOAA Fisheries. ODFW/Joint Applicants: Collection of >50 percent of tagged fish from each tributary at the interim passage facilities, collection of >75 percent of tagged fish from each tributary at the permanent passage facilities.
Downstream collection survival—from collection to release in the project tailrace	NOAA Fisheries: Less than 0.5 percent mortality and less than 2.0 percent injury within 5 years after the surface intake screens are operational. FWS: Same as NOAA Fisheries. ODFW/Joint Applicants: 93 percent survival for the interim facility during the first 5 years of operation, 96 percent for the permanent facility.

[a] ODFW's recommendations are consistent with the measures of success identified by the Joint Applicants in the Current Fish Passage Plan.

As described above under *Restoration Success*, several agencies recommend that the Joint Applicants develop a plan to compensate for losses of fish that occur during passage through the project reservoirs or future passage facilities to be constructed under the fish passage plan. As described below, the Joint Applicants propose habitat enhancement measures consistent with ODFW's revised 10(j) recommendations, which ODFW intends to offset unavoidable losses to outmigrating fish. We evaluate these measures in the following section.

3.6.2.4 Fish Habitat Enhancement

Habitat restoration and enhancement measures may provide benefits to existing anadromous and resident fisheries downstream of the project and to resident fisheries upstream of the project. Improving habitat conditions in the Metolius, Crooked and Deschutes rivers upstream of the project could also increase the potential for restoring self-supporting populations of anadromous fish to these areas in conjunction with implementation of the fish passage plan. Enhancement efforts could also serve to improve water quality conditions through improved riparian conditions and increased instream flows.

In the Final Joint Application Amendment, the Joint Applicants proposed to provide: (1) $1.475 million to fund near-term fisheries habitat enhancement efforts (to be expended over the first 5 years of any license issued for the project) focused on riparian

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corridor improvements; (2) staff funding (for a half-time employee) to provide a clearinghouse/coordination function to implement cooperative habitat enhancement projects; and (3) $15,000 annually in seed, matching, or habitat-enhancement projects plus the continued donation of heavy equipment operators, and biologist time to help plan and conduct on-the-ground cooperative fisheries enhancement projects. The Joint Applicants have also recently acquired and protected lands encompassing approximately 1.5 miles of Why-chus Creek (Squaw Creek), a tributary to the upper Deschutes River, and 2.5 miles of Trout Creek, which enters the lower Deschutes River near RM 88 (figure A-2).[53]

As the result of settlement negotiations, the Joint Applicants no longer propose the three measures that are described above. In their December 29, 2003, filing, they propose to implement two new enhancement measures as follows: (1) the Pelton Round Butte Fund Implementation Plan, and (2) the Draft Lower River Implementation Plan. These two proposals are consistent with ODFW's revised 10(j) recommendations nos. 10 and 14.

The Draft Pelton Round Butte Fund Implementation Plan, as filed on December 29, 2003, would establish a $20-million fund that would be used to fund enhancements related to increasing the success of anadromous fish reintroduction at the project and the sustainable and harvestable fishery in the Deschutes River. Resource projects implemented through the fund would be limited to land acquisition, water rights acquisition, water conservation projects, conservation easements, construction of fish passage facilities and removal of fish passage barriers (except at FERC-licensed projects), instream habitat improvements, riparian and wetland protection and enhancement, and off-project recreation effects. A Governing Board, which would include representatives from the Joint Applicants, the Tribes' DNR, the Tribes' WCB, FWS, NOAA Fisheries, BIA, FS/BLM, NGOs, ODFW, ODEQ, and OWRD, would administer the fund.

The Joint Applicants filed a revised Pelton Round Butte Fund Implementation Plan on April 27, 2004. The revised plan provides for $10 million to be dedicated to a Water Rights Fund and $11.5 million to be provided for a General Fund. The Water Rights Fund would be used to acquire or lease instream water rights, or participate in

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[53] The Joint Applicants propose several measures for terrestrial resources that would benefit aquatic habitats on Trout Creek, including restoration of riparian vegetation along approximately 3 miles of Trout Creek and transfer of a 102-acre-feet water right for the Trout Creek Ranch to the Oregon Water Trust for a permitted instream water right. Further, the Joint Applicants purchased the Camp Polk property, which protects about 1.5 miles of riparian habitat in the Why-chus Creek basin and transferred ownership to the Deschutes Basin Land Trust and the 49-acre water right to the Oregon Water Trust. The Joint Applicants also contributed to the purchase of land at Alder Springs, which includes another mile of riparian habitat along Why-chus Creek. The Ochoco National Forest now manages this land as part of the Crooked River National Grasslands.

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water conservation projects in the Deschutes River basin, and the General Fund would be used for the full range of purposes described above for the Draft Pelton Round Butte Fund. In addition, $1 million would be provided for acquisition of water rights in Why-chus Creek. This funding would be added to the Water Rights Fund if a project cannot be substantially completed by the date of the first deposit into the Water Rights Fund (scheduled to occur in 2005).

The Draft Lower River Implementation Plan, as filed on December 29, 2003, identified a number of one-time fish habitat enhancement projects in the lower Deschutes River basin that the Joint Applicants would agree to implement. These one-time enhancement projects would be in addition to those projects implemented via the Pelton Round Butte Fund. Projects specified in the Draft Lower River Implementation Plan include fencing and riparian restoration projects on the lower Deschutes River, and a number of projects in upper Trout Creek (e.g., culvert replacements, riparian fencing and planting, recreation site relocation or closure, off-site water development, spring protection, and road obliteration), berm removal on mainstem Trout Creek, and fencing/riparian improvement on five lower Deschutes River tributaries. The Draft Lower River Implementation Plan also specifies activities relating to gravel transport and experimental gravel augmentation, large woody debris management, and project operations, which we address elsewhere in the EIS.

In their Updated Description of the Preferred Alternative filed on April 27, 2004, the Joint Applicants and the parties to settlement negotiations revised the Lower River Implementation Plan to remove certain, unspecified habitat improvement projects,[54] but would retain the major project in that plan, a 15-mile, $1.5-million habitat improvement on Trout Creek.

In their 401 WQCs, ODEQ WQC condition no. 12 and the Tribes' WCB WQC condition no. 1.A both include conditions consistent with the Joint Applicants' original proposal to provide $1.475 million to fund near-term habitat enhancement efforts.

The Tribes' BNR recommends that the Joint Applicants develop a Fish Habitat Trust Fund to mitigate for inundated lands and losses associated with fish passage, focusing on habitat upstream of the project but also pursuing habitat acquisitions in the lower Deschutes River. BLM preliminary 4(e) condition no. 6 and FS preliminary 4(e) condition no. 18 specify and the BLM, FWS, and the Conservation Groups recommend

[54] We have assumed that the projects that would be removed include all of one-time habitat enhancements specified in table 1 and table 2 of the Lower River Implementation Plan that would not occur on Trout Creek. This includes fencing and riparian improvement on five lower Deschutes River tributaries, riparian restoration on off-reservation Tribal lands, and Kortge area riparian enhancements.

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habitat enhancement plans that would be designed to compensate for all or part[55] of the riverine habitat that is inundated by the project reservoirs, and each of these agencies recommend a separate program to monitor and compensate for fish that are lost during passage through the project. The agencies and the Conservation Groups identify the following list of high priority actions to be implemented:

1. 100 acres of riverine habitat through land acquisition and protection for Why-chus Creek, Trout Creek and McKay Creek, a tributary to the Crooked River (figure A-2);
2. 50 acres of riverine habitat protection through effective riparian easements and maintenance in the upper basin and Trout Creek, including maintenance and monitoring through the term of any license issued for the project;
3. Acquisition of water rights and transfer to permanent instream water rights for 30 cfs on Why-chus Creek and 10 cfs on McKay Creek (the equivalent of 49.5 acres of riverine habitat); and
4. General aquatic habitat mitigation and enhancement on FS and BLM lands in the Why-chus Creek, Trout Creek, McKay Creek, Metolius River, Crooked River and Deschutes River basins.

The Conservation Groups recommend that these actions be completed within the first 15 years after issuance of any new license, and the other agencies indicate that priority should be placed on projects to be completed within 15 years. The FS specifies and the FWS and the Conservation Groups recommend that the plans include implementation of enhancement measures both upstream and downstream of the project. FS and BLM specify and FWS recommends that the amount of habitat enhancement be designed to compensate for the amount of riverine habitat that is inundated on federally reserved lands, which constitute 227 out of a total of about 700 acres of riverine habitat that is inundated by the project. These agencies also recommend that credit ratio of 3:1 be applied when the habitats that are used for mitigation are lower in quality than the habitat that is inundated by the project.

BIA preliminary 4(e) condition no. 10 specifies that the Joint Applicants deposit $750,000 annually into a Fisheries Habitat Compensation Fund to be used for implementing habitat enhancement measures. Enhancement measures would be developed in consultation with BIA and the Tribes' BNR, using the following "priority groups": (1) habitat restoration, conservation, and/or acquisition in the Deschutes River

[55] BLM and FS both recommend enhancement for inundated riverine habitat on lands managed by their respective agencies, which include 191 acres of habitat on land managed by the BLM and 35 acres on land managed by the FS. FWS and ODFW recommend that enhancement be provided to compensate for 227 acres of riverine fish spawning and rearing habitat located on Federally managed lands. The Conservation Groups recommend that the goal should be to compensate for all riverine habitat inundated by the project reservoirs (approximately 41 miles).

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below the Reregulating dam, the mainstem river channel, and those areas of tributaries of the Deschutes River on or bordering the reservation; (2) fish protection and restoration projects for native fish species, especially those that are used for subsistence and cultural purposes; and (3) secondary habitat restoration, conservation, and/or acquisition projects upstream of the project. The Joint Applicants would submit annual work plans and a fisheries habitat report every 5 years that monitors and assesses progress towards compensation for project effects. BIA determined a replacement target of 350 acres based on the amount of inundated riverine habitat on streams and riparian areas on or adjacent to reservation lands. The annual funding level of $750,000 is intended to compensate for approximately 11 acres of habitat per year. BIA estimated a cost of approximately $70,000 per acre by estimating the costs of a representative suite of enhancement measures, which they determined would provide 21 acres of replacement habitat at a cost of $1.5 million.

Our Analysis

In addition to blocking access for anadromous fish to upstream habitats, the Pelton Round Butte Project converted approximately 41 miles of riverine habitat into lentic (slack water) habitat. The historical accounts given in Nehlson (1995) indicate that the inundated portions of the Deschutes, Metolius and Crooked rivers provided important salmon and steelhead holding water and moderate year-round temperatures ideal for nursery production of immature salmonids. Nehlson's account also indicates that the inundated portions of these streams had many gravel bars, suggesting that some sections may have been important for spawning.

Construction of the project also increased the available habitat for several important species of fish. Lake Billy Chinook provides 4,540 acres of preferred rearing habitat for bull trout and kokanee and could support a substantial run of sockeye salmon if effective fish passage is provided. In their reply comments dated February 6, 2003, filed in response to agency terms and conditions, the Joint Applicants note that the recreational fishery in Lake Billy Chinook currently supports an annual harvest of approximately 83,000 wild salmonids (primarily kokanee), and that it may have the potential to support a substantial run of sockeye salmon. Habitat modeling conducted by the Joint Applicants suggests that run sizes could be in the range of 17,000 to 200,000 spawners annually, and the lower end of this range is similar to the run size of 22,342 spawners that was estimated by Chilcote (1976) based on comparisons with other sockeye salmon lakes. In addition, the Joint Applicants indicate that implementation of SWW may foster limnological changes that would increase the production of zooplankton targeted by kokanee, which would likely increase the potential production of kokanee, sockeye salmon, and bull trout.

Two factors suggest that a significant level of enhancement and restoration of upstream habitats may be necessary in order to re-establish self-sustaining runs of spring

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Chinook salmon or steelhead upstream of the project. First, the habitat descriptions given in Nehlson (1995) indicate that the current condition of most of the remaining habitat in the upstream tributaries has been degraded considerably due to past and current land use practices. Second, even using the best available technology to provide passage through the project area, it is likely that some losses would occur, especially during downstream passage. We evaluate these factors individually below.

In their response to AIR no. 9, the Joint Applicants evaluated the effect of different levels of habitat enhancement on the projected run sizes of spring Chinook salmon and steelhead that would be achieved given high, medium and low rates of passage survival through the project (Beamesderfer, 2002). For the analysis, survival rates of 90, 75, and 60 percent were used to represent high, medium and low rates of downstream passage survival. We used the output of Beamesderfer's analysis to estimate the run sizes of spring Chinook salmon and steelhead that would occur under the different levels of habitat enhancement that are recommended by the Joint Applicants and the agencies. To estimate the number of acres of habitat that would be enhanced under the Joint Applicants' proposal, we used the cost of $70,000 per acre that BIA developed as the basis of its habitat enhancement proposal. We also assumed that effective fish passage at the Pelton Round Butte Project would result in the eventual provision of fish passage at Opal Springs dam. Passage at Opal Springs would substantially increase access to habitat in the Crooked River basin.

The results of our analysis indicate that run sizes would be strongly affected by the rate of passage survival (table 25). For both species, run sizes under conditions with high passage survival are approximately twice as large as those that are estimated to occur under conditions with low passage survival. The analysis also indicated that the maximum amount of habitat enhancement evaluated would increase the run size of spring Chinook salmon by 77 percent (from 199 to 353 adults) for the low passage survival condition, by 58 percent (from 312 to 493 adults) for the medium passage survival condition, and by 62 percent (from 448 to 725 adults) for the high passage survival condition. For steelhead, the maximum level of habitat enhancement increased the estimated run size by 26 percent under all three passage conditions.

The results of our analysis indicate that the rate of survival of spring Chinook salmon and steelhead smolts migrating downstream through the project will have a pronounced effect on the run sizes of spring Chinook salmon and steelhead that would return to the upper Deschutes basin. It is likely that there will be a similar relationship between passage survival and the run sizes of sockeye salmon that become established in Lake Billy Chinook.

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Table 25. Average run sizes of spring Chinook salmon and steelhead to areas upstream of the project estimated for different levels of habitat enhancement and low, moderate and high rates of downstream passage survival. (Source: Staff)

Enhancement Proposal	Acres of Habitat Enhanced	Miles of Habitat Available iu the Upper Deschutes Basin[a]	Percent of Current Habitat	Average Spring Chinook Salmon Spawners (Assnmes Passage at Opal Springs Dam)[b]			Average Steelhead Spawners (Assumes Passage at Opal Springs Dam)[c]		
				Low Passage Survival	Medium Passage Survival	High Passage Survival	Low Passage Survival	Medium Passage Survival	High Passage Survival
Current Conditions	0	73.2	100	199	312	448	545	751	957
Final Joint Application Amendment/WCB	28[d]	74.8	102	205	319	459	551	759	967
FS/BLM/FWS	227	86.7	118	249	371	539	592	815	1,038
Joint Applicants/ODFW[e]	350	93.9	128	277	404	588	617	849	1,082
BIA	350	93.9	128	277	404	588	617	849	1,082
Conservation Groups	691	114.2	156	353	493	725	686	945	1,204

[a] Represents the total current habitat given in Beamesderfer (2002), including habitat upstream of Opal Springs dam on the Crooked River, plus habitat that is added or restored by the enhancement proposals. The stream miles added by enhancement proposals were calculated using the length to area relationship of inundated riverine habitat as summarized by the FS on page 7 of its December 12, 2002, letter providing justification for its terms and conditions for the project (691 acres of riverine habitat in 41 miles of inundated streams).

[b] Estimated from figure 9.B.4 in Beamesderfer (2002).

[c] Estimated from figure 9.B.2 in Beamesderfer (2002).

[d] Acreage for the Joint Applicants proposal was estimated using a cost of $70,000 per acre of mitigation based on cost estimates provided by BIA on page 55 of attachment C of Interior's November 12, 2002, letter providing preliminary 4 (e) conditions for the project.

[e] Estimated based on funding proposed in the April 27, 2004, Pelton Round Butte Fund Implementation Plan. Enhancement measures that would be implemented through the Draft Lower River Implementation Plan were not included, because these measures would not affect habitat conditions upstream of the project.

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We note that the rate of downstream fish passage survival that could be achieved by implementing the fish passage plan would not be known until fish passage facilities have been installed and evaluated. We also note that it is very difficult to predict the amount of increased production that would occur from the implementation of specific enhancement projects. These uncertainties could ultimately affect our estimates of the amount of habitat enhancement required to achieve a given run size of adult fish.

Restoration of self-sustaining runs of anadromous fish to habitat upstream of the project could require many years to achieve, and we are not certain at this point in time that the effort would succeed. A more certain, near-term benefit could be provided to both Tribal and recreational fisheries if habitat enhancement measures were implemented downstream of the project. In their response to AIR no. 12, the Joint Applicants indicate that there is considerable potential to benefit lower Deschutes River fisheries through fencing of riparian zones, at a relatively low cost of $3,000–5,000 per mile. Implementing habitat enhancements in the lower river could increase the number of Chinook salmon and steelhead that are available for harvest in most years. This measure, along with several measures to enhance habitat in Trout Creek, is proposed in the Draft Lower River Implementation Plan.

We note that many of the habitat enhancement measures that could be implemented through the Pelton Round Butte Fund Implementation Plan would likely occur in areas where the existence or the operation of the project would not affect habitat conditions. Why-chus Creek (a tributary to the Deschutes River) and McKay Creek (a tributary to the Crooked River) are located upstream of the project area, as are the portions of the Metolius, Crooked and upper Deschutes rivers, where most habitat restoration efforts would probably occur.[56] Similarly, many enhancement measures specified in the Draft Lower River Implementation Plan are designated for Trout Creek well upstream of its confluence with the Deschutes River, in areas that are unlikely to be affected by operation of the project.

Although many of the enhancement measures would address habitat concerns that are not directly tied to project effects, we conclude that implementing measures to improve habitat conditions upstream of the project would increase the likelihood that self-sustaining runs of spring Chinook salmon and summer steelhead could be restored, and that measures implemented downstream of the project could provide benefits to downstream recreational and Tribal fisheries.

[56] Although portions of these tributaries are inundated by Lake Billy Chinook, restoration actions would most likely focus on riverine sections upstream of the project.

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3.6.2.5 Woody Debris Management

The Pelton Round Butte Project impedes the movement of large woody debris into the lower Deschutes River from upstream areas. Although the large size and shape of the river channel causes most woody debris to be transported out of the river or deposited high on the river banks, improving the transport of woody debris from the upper river basin would likely increase in the availability of woody debris. Woody debris can play important roles in the formation of islands and side channels, in providing cover, and in maintaining habitat complexity. In the past, most large woody debris that has accumulated in Lake Billy Chinook has been collected to remove boating hazards, and some has been cabled to shorelines to improve fish habitat.

As one component of the Draft Lower River Implementation Plan, the Joint Applicants now propose to develop and implement a large wood management plan in consultation with the Tribes' DNR. The purpose of the plan is to provide for: (1) the management of floating wood (greater than 7.9 inches by 6.6 feet [20 centimeters by 2 meters]) that enters Lake Billy Chinook, and (2) placement of large wood along the project reservoir shorelines for the protection of riparian plantings. Although the description of the large wood management plan provided in the Joint Applicants' Draft Lower River Implementation Plan does not specify that any wood would be transferred to the lower Deschutes River, this is implied by the description of monitoring activities, which would include "evaluation of the effectiveness of placed wood, including river transport (for wood moved below the project), use by wildlife and fish, and as appropriate, erosion control for the establishment of shoreline riparian vegetation."

The Tribes' WCB WQC condition C would require that all large wood entering the reservoirs be collected and reintroduced below the project. It recommends that placement should include installed structures along the banks to provide for habitat diversity, streambank stability and enhancement of the environment, and also that some wood should be released during high flow events to settle in the lower river. It also recommends that some habitat protection and enhancement funds be used to supplement the supply of large wood from sources in addition to what accumulates in the reservoirs.

ODEQ WQC condition no. 10 would require that all large wood (greater than 20 cm by 3 m) entering Lake Billy Chinook be removed and placed into the lower Deschutes River. ODEQ recommends that the Joint Applicants consult with ODFW and the Tribes' BNR to obtain guidance on the placement of any significant amounts of large wood that may accumulate after large flow events. They further specify that the Joint Applicants should obtain all necessary regulatory licenses, permits, or approvals that are required prior to wood placement.

BLM preliminary 4(e) condition no. 19 and FS preliminary 4(e) condition no. 7 specify that the Joint Applicants develop and implement a large woody debris plan that would outline how and when woody debris would be transferred from Lake Billy

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Chinook and placed in the lower Deschutes River. Both agencies stipulate that their agency should be consulted during plan development, and that the plan should be prepared and implemented within 1 year after issuance of any new license. Both agencies also indicate that the plan could also include work in Lake Billy Chinook.

FWS recommends that the Joint Applicants fund and implement fish habitat restoration using wood captured in Lake Billy Chinook, focusing this effort on the lower Deschutes River.

BIA preliminary 4(e) condition no. 11 specifies that the Joint Applicants develop a large woody debris plan to transfer all of the large woody debris that accumulates in all three of the project reservoirs to the lower Deschutes River. BIA stipulates that the plan include: (1) methods for collection, transport, and delivery of large woody debris; (2) guidelines for disbursement to optimize benefits to fish habitat; and (3) procedures to ensure that disbursement methods are based on biological criteria and would minimize adverse effects.

ODFW and NOAA Fisheries filed nearly identical revised 10(j) recommendations relating to woody debris management. Both agencies recommend that the Joint Applicants develop a plan within 1 year in consultation with the state and federal agencies and Tribes' DNR. They specify that the plan should include:

1. a description of the methods to be used for collection, transfer, and placement of large wood entering Lake Billy Chinook;
2. guidelines for placement of large wood in the lower Deschutes River or Lake Billy Chinook;
3. notification and reporting requirements for when wood is collected, transferred, and placed;
4. guidelines for transferring large wood, including: (a) the transfer of floating wood collected east of Rattlesnake Point in the Metolius arm and the Deschutes and Crooked River arms to the lower Deschutes River; (b) anchoring of wood found floating west of Rattlesnake Point in the Metolius arm for shoreline wildlife loafing sites, riparian vegetation plantings, erosion control, or shallow water juvenile salmonid cover; (c) replacement of an equal volume, type, and size of wood that is retained in the Metolius arm to the lower Deschutes River; and (d) logs in Lake Billy Chinook that are found to have been illegally cut from the Metolius River would, if possible, be replaced in the Metolius River;
5. Integration of the Terrestrial Resources Work Group assessment of available sites for riparian vegetation establishment;
6. A monitoring plan to evaluate the effectiveness of placed wood, including anchor stability, river transport, use by wildlife and fish, and, as appropriate,

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erosion control for establishment of shoreline riparian vegetation, including adaptation of the plan to maximize the effectiveness of placed wood.

Our Analysis

The Joint Applicants conducted a study that examined the historical and current distribution and abundance of large woody debris in the project area, which focused on the Metolius and lower Deschutes rivers. The Crooked and upper Deschutes rivers were not included in the study because forested sections of these streams that might provide large woody debris are located very far upstream from the project area (Minear, 1999). The study found that very large pieces of in-channel wood were relatively abundant in the Metolius River in 1944 (4.7 pieces per mile), but had decreased in abundance by 1995 (1.4 per mile). In-channel wood of this size was rare in the lower Deschutes River in 1944 (<0.1 per mile) and in 1995 (0.1 per mile). Deciduous trees from riparian areas, primarily white alder, appeared to provide most of the in-channel wood in the lower river. Large woody debris is occasionally delivered into Lake Billy Chinook from its tributaries during major flood events.

Large woody debris that enters the lower Deschutes River from tributaries is only rarely retained within the active channel, and Minear's comparison of its abundance between 1944 and 1995 indicates that the project has not had a substantial effect on the abundance of in-channel wood. Furthermore, the amount of large woody debris that is delivered into Lake Billy Chinook in most years appears to be quite limited (even the major 1996 flood event only delivered approximately 36 large logs into the reservoir). However, it is possible that wood that is placed in specific locations could be retained for longer and would provide more habitat benefit than woody debris that is carried into the river during flood flows. Also, as indicated in the revised 10(j) recommendations submitted by ODFW and NOAA Fisheries, wood anchored along shorelines could provide a range of benefits relating to erosion control and improvements to fish and wildlife habitats. We therefore conclude that the Joint Applicants should develop a plan for managing large woody debris that accumulates in Lake Billy Chinook and placing it in the lower Deschutes River in locations that have been selected to maximize habitat benefits. The plan would be developed within 12 months after issuance of any new license, in consultation with the Tribes' WCB and DNR, BLM, FS, FWS, BIA, and ODFW. Because it is not possible to predict the quantity, size, and timing that large woody debris would become available, the plan should allow for specific placement locations to be determined after a specified number of pieces of large woody debris have accumulated in one or more of the project reservoirs.

3.6.2.6 Spawning Gravel Monitoring and Augmentation

Geomorphology studies conducted by the Joint Applicants indicate that there are few obvious effects on channel and valley morphology that are traceable to the project

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(O'Connor et al., 1999). Although the reservoirs trap gravel delivered from upstream tributaries, it appears that effects on the amount and quality of spawning gravels available to trout and salmon have been limited, because bedload movement occurs only infrequently and at low rates in the Deschutes River downstream of the project (Fassnacht, 1998). The limited rate of bedload movement is related to the stability of the river's flow regime, which is attributable to most of its flow being contributed from spring sources[57] However, there is concern that subtle changes in the quantity or quality of spawning habitat downstream of the project may be responsible for reduced numbers of fall Chinook salmon spawning between the Reregulating dam and Sherars Falls since the early 1980's. In the Draft Lower River Implementation Plan, as filed on December 29, 2003, the Joint Applicants propose to implement a gravel study plan in consultation with the Fish Committee to assist with resolving questions regarding project effects on spawning habitat. The plan was modified and updated in a document entitled *Pelton Round Butte Settlement Working Group Fisheries Resource Subgroup Topic C2: Lower River Gravel*, which was filed with the Joint Applicants' Updated Description of Proposed Preferred Alternative on April 27, 2004. The updated plan consists of the following measures:

1. Place radio-tagged rocks and colored tracer rocks (or rocks with exotic lithologies) at six to seven cross sections downstream of the Reregulating dam at locations to be determined in conjunction with members of the Fish Committee (three cross-sections upstream of Shitike Creek and three to four cross-sections downstream of Shitike Creek);
2. Establish survey cross sections at the tracer gravel sites and resurvey after flow events greater than 6,500 cfs;
3. Measure bedload transport near the Warm Springs bridge on rising and falling limbs of flows exceeding 5,500 cfs;
4. Place columns of painted rocks or scour chains at each cross section to determine depth of scour and subsequent filling;
5. Resample bed material at the sites used in the McLure (1988) study if annual monitoring, data, and assessments from the above study components show that sediment transport is occurring.
6. Conduct and evaluate experimental gravel augmentation as follows:
   - distribute a total of 300 cubic yards of gravel among at least three sites between the Reregulating dam and Shitike Creek,
   - place tracer rocks at each of the selected sites to track any movement of the imported rocks, and

[57] Although winter drawdown of Lake Billy Chinook and operation of upstream water storage reservoirs on the Crooked River and Ochoco Creek serve to dampen some flood events, only minor changes to lower river flows have occurred since the project's construction (Fassnacht, 1998).

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– survey the topography of each site and of downstream "response" reaches upon placement of the gravels, and resurvey the sites in years when flows exceed 6,500 cfs or if tracer gravels have moved.

The Joint Applicants also propose to submit annual monitoring reports to a three-member expert review panel to determine whether gravel augmentation is appropriate. The expert review panel would consist of experts in geomorphology and fisheries and would be selected by the Joint Applicants, subject to approval by the Fish Committee. After 5 years of study, the expert review panel would submit a report detailing their recommendation regarding the need for a gravel augmentation program.

If, following 5 years of study and review, the expert review panel determined that (1) the Pelton-Round Butte Project is causing impacts that could be mitigated by gravel augmentation, including examination of whether the project may be having deleterious effects on channel bedforms and spawning gravel quantity and quality, (2) that the augmentation test did not adversely affect downstream bank stability or cause downstream pool filling, and (3) that augmentation would be beneficial to fish habitat and fish populations (as indicated by the results of the biological monitoring program described below), the expert review panel would make a recommendation to the Fish Committee regarding the implementation of a long-term gravel augmentation program.

Based on the recommendation of the expert review panel, and any other relevant information, the Fish Committee would determine whether a long-term gravel augmentation action plan should be implemented, or whether the study program should be extended. If long-term gravel augmentation is required by the Fish Committee, the Joint Applicants would develop and implement the action plan in coordination with the Fish Committee. Any such plan would include appropriate monitoring components. If the study program needed to be extended, the Joint Applicants would develop this extended study plan for review and approval by the Fish Committee and management agencies. After approval, the Joint Applicants would implement the continued study program, with a 5-year review of this study program scheduled.

The gravel augmentation study would include the following biological monitoring components:

- Determine the relative use of spawning sites above and below Shitike Creek by fall Chinook salmon and rainbow/steelhead to determine if relative spawner use is shifting downstream as spawning habitat quality and quantity decreases upstream.

- Measure steelhead/rainbow spawning habitat area above and below Shitike Creek to compare the relative change in actual area of spawning at three sites upstream of Shitike Creek with three sites downstream of Shitike Creek.

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- Measure the use of experimental gravel patches compared to use of other spawning areas upstream of Shitike Creek.

- Measure spawning gravel quality parameters above and below Shitike Creek at sites identified in the Deschutes River Gravel Study (Huntington, 1985) and at the experimental augmentation sites. These parameters would include permeability and inter-gravel DO.

- Compare the survival of rainbow trout embryos within redds at the three study sites above Shitike Creek to the survival of embryos both in the three experimental gravel augmentation patches and the three study sites below Shitike Creek.

- Monitor invertebrate populations at the gravel augmentation sites and nearby control sites.

The 401 WQCs issued by ODEQ WQC and the Tribes' WCB, are generally consistent with the gravel monitoring measures proposed by the Joint Applicants as described above, although ODEQ and the Tribe's WCB did not specify that experimental gravel augmentation would be implemented unless bedload transport was documented. NOAA Fisheries and ODFW's revised 10(j) recommendations are nearly identical to the Joint Applicants' proposal, except that the agencies provide less detail on the biological monitoring components other than specifying that the experimental gravel augmentation plan should include monitoring the quality of augmented gravels for salmonid spawning and use by spawning fish.

The FWS, BLM, and FS provide a similar suite of recommendations regarding spawning gravel monitoring and augmentation. All three agencies recommended that the Joint Applicants develop a detailed monitoring plan consistent with their response to AIR no. 13, to use the monitoring data to validate the sediment transport model, and to make necessary changes to project operations to address observed effects. FWS recommends that monitoring should be triggered at flows that exceed 6,500 cfs, while BLM and FS recommend that monitoring be initiated when flows exceed 6,000 cfs. All three agencies recommend that tracer rocks be placed at three transects upstream of Shitike Creek and at four transects below Shitike Creek, and that additional transects should be established upstream of the project in the middle Deschutes River and the lower Crooked River. All three agencies also agreed that the particle size distribution should be re-measured and bedload transport sampling conducted if the river bed is found to move at flows lower than 8,100 cfs. All agree that the need for gravel augmentation should be determined based on validation of the flows that were modeled to initiate sediment transport, that gravel augmentation experiments should focus on patches of gravel in Chinook salmon spawning habitat in the reach between the Reregulating dam and Shitike Creek, and that the amounts of gravel to be used should be developed in consultation with the agencies. FWS also recommends that the Joint Applicants should comply with procedures required

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under NEPA, ESA, and the Wild and Scenic Rivers Act including planning, surveys, implementation and monitoring.

BIA preliminary 4(e) condition no. 7 specifies an extensive gravel monitoring and augmentation program, including initial placements of 250 to 1,000 cubic yards of gravel at each of three initial gravel augmentation sites. BIA's recommendation includes the following elements: (1) a baseline assessment of gravel habitat between the Reregulating dam and the confluence with the Warm Springs River; (2) development of an initial plan for adding between 250 and 1,000 cubic yards of gravel at each of three sites; (3) submittal of a 3-year gravel augmentation report; (4) continuation of gravel augmentation for the term of any new license issued; (5) submittal of annual work plans; (6) monitoring the extent and condition of spawning gravels at a minimum ten sites including the gravel augmentation sites; (7) submittal of monitoring reports reporting conditions prior to augmentation and then at 5-year intervals starting 5 years after issuance of any new license, (8) re-surveying cross-sections and conducting tracer gravel studies each year when flows exceed 6,000 cfs for 2 days or more; (9) sampling of suspended and bedload sediment from the Warm Springs Bridge during all flows that exceed 6,000 cfs including at least 5 samples per event; and (10) filing of an annual report, including a description of any proposed amendments to the gravel augmentation plan, which would be developed in consultation with the BIA and the Tribes' BNR.

Our Analysis

In their response to AIR no. 12, the Joint Applicants reviewed available information on fall Chinook salmon spawning in the lower Deschutes River, and evaluated five hypotheses that could explain why fewer fish have spawned upstream of Sherars Falls since the early 1980's. A summary of their evaluation of each hypothesis is provided below.

Hypothesis 1. The decrease in spawning in the upper portion of the lower Deschutes River is caused by a loss of spawning gravel below the project.

The Joint Applicants provide several lines of evidence that do not support this hypothesis. First, the geomorphic studies conducted by the Joint Applicants indicate that the project has had only minor effects on the streambed, and spawning size gravels are still abundant in the reach. Rainbow trout continue to spawn in large numbers in this reach,[58] using the smaller fraction of gravels that would be the most vulnerable to

[58] Zimmerman and Reeves (1999) enumerated redds at all steelhead and rainbow trout spawning locations in the 10 miles between the Reregulating dam and the mouth of Trout Creek early in 1995 and at five study sites during the next 2 years. At these five sites, a total of 1,430, 1,504, and 1,241 rainbow trout redds were observed in 1995, 1996, and 1997, respectively. Three of these sites were located between the Reregulating dam and Shitike Creek and two were located downstream of Shitike Creek.

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depletion due to interruption of transport from upstream areas. In addition, trends in the numbers of Chinook salmon spawning above and below the confluence of Shitike Creek have been similar, even though this creek delivers a large amount of gravel into the Deschutes River about 3 miles downstream of the Reregulating dam. McLure (1998) showed that gravel inputs from Shitike Creek during both the 1964 and 1996 floods enlarged bars and islands in the Deschutes River immediately downstream of its confluence.

Hypothesis 2. Construction of the generation unit in the Reregulating dam in 1982 eliminated spill at the Reregulating dam and allowed low DO levels to negatively affect survival of fall Chinook salmon eggs and alevins in the Deschutes River downstream.

The Joint Applicants also provided several lines of evidence that do not support this hypothesis. They noted that aeration from turbulence and photosynthesis from aquatic vegetation increases DO within a short distance downstream, while the reduction in fall Chinook salmon spawning extended much further downstream (figure 8). Also, they note that DO levels in the lower Deschutes River increase when fall turnover occurs in Lake Billy Chinook in early October, around the same time that fall Chinook salmon begin spawning in the lower Deschutes River.

Hypothesis 3. The large numbers of redds in the upper part of the lower Deschutes River when annual aerial counts began in 1972 were an artifact of the 1964 flood and the presence of the project.

The Joint Applicants described several lines of evidence that support this hypothesis. First, fish counts at the Pelton trap and observations of fall Chinook salmon spawning suggest that relatively few fall Chinook salmon migrated into and spawned in the vicinity of the Reregulating dam in the period between when the trap was constructed in 1956 and 1964, when a major flood deposited large quantities of fine sediments into the lower Deschutes River everywhere below Shitike Creek.[59] However, in the 3-mile reach between the Reregulating dam and Shitike Creek, Aney et al. (1967) measured a significant increase in gravel permeability between 1964 and 1965. The Joint Applicants believe that it is likely that in the fall of 1965, adult Chinook salmon concentrated spawning in this 3-mile reach after bypassing more silt-laden conditions downstream. Adult Chinook salmon returning from the 1965 brood would have first returned in 1968, and this coincides with a 500 percent increase in the number of adult fall Chinook salmon entering the Pelton fish trap in 1968 (figure 9).

[59] According to the Joint Applicants' AIR response, the major floods of December 1964 and January 1965 caused extensive erosion throughout the Deschutes River basin. Bridges were washed out on Shitike Creek and on the Warm Springs River, and irrigation systems on lower Trout Creek were lost.

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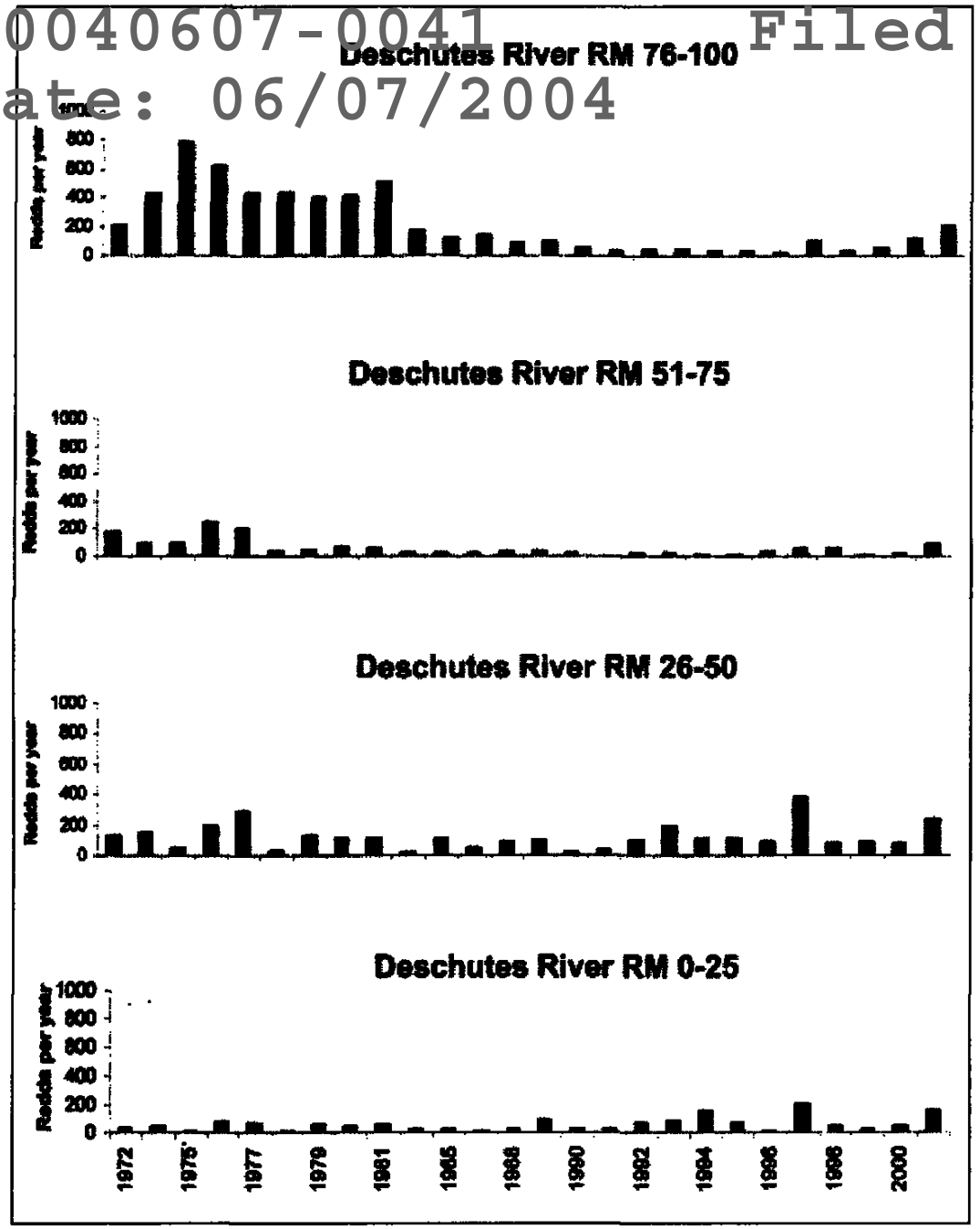

Figure 8. Number of fall Chinook salmon redds observed per year in random and index areas of the lower Deschutes River by 25-mile segment. (Source: CTWS and PGE, 2002)

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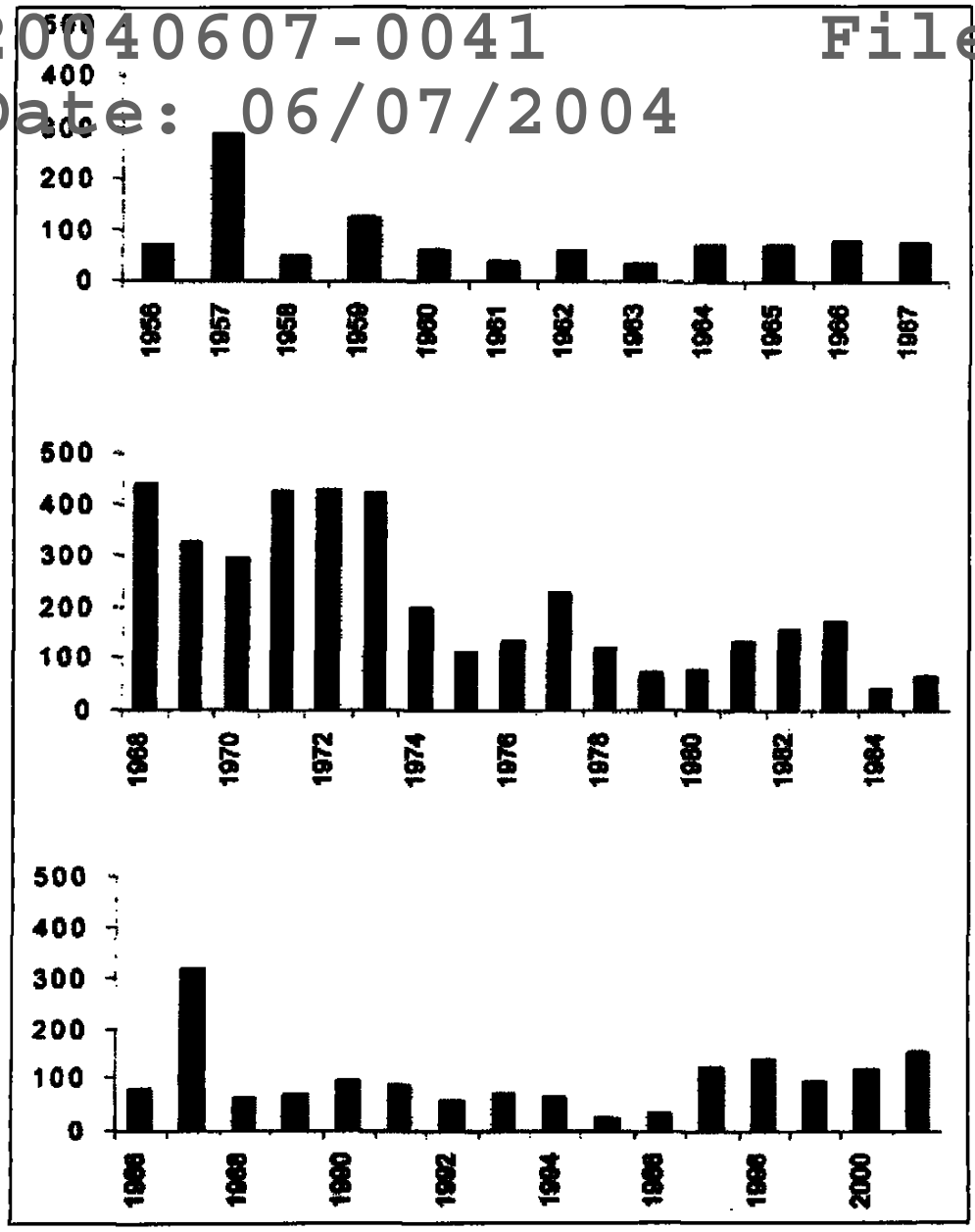

Figure 9. Number of fall Chinook salmon captured in the Pelton fish trap during three different periods. (Source: CTWS and PGE, 2002)

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Hypothesis 4. Juvenile fall Chinook salmon in the upper portion of the lower Deschutes River are caught in a "thermal trap" where, because of cooler spring temperatures, smolts emigrate later in the summer and encounter poor passage and survival in the lower Deschutes and Columbia rivers in most years.

The Joint Applicants examined the number of fall Chinook salmon redds upstream of Sherars Falls in relation to summer water temperatures that the spawners would have encountered during their outmigration as smolts. They found a relatively strong negative correlation between adult return rates and water temperatures in July and August during the year of outmigration. They noted that cooler Columbia River temperatures are normally associated with higher flows and usually more productive conditions, all of which are factors that likely combined to create juvenile passage and rearing conditions that contributed to the large runs above Sherars Falls during the late 1960's and 1970's. Low-flow conditions in the mid-1980's through the mid-1990's likely contributed to the opposite trend. Higher water temperatures and lower flows in the Columbia River mainstem from the late 1970's onward followed the completion of several large storage dams in the upper Columbia basin. The Joint Applicants also noted that low water during the late summer is known to delay upstream passage at Sherars Falls, and may increase vulnerability to overharvest by in-river fisheries.

Hypothesis 5. Much of the increase in fall Chinook salmon spawning downstream from Sherars Falls is likely related to better juvenile survival associated with riparian recovery and greatly enhanced shoreline-associated juvenile habitats.

To support this hypothesis, the Joint Applicants described the extensive land purchases and efforts that have been made to exclude livestock in the lowermost 25 miles of the Deschutes River in the 1970's and 1980's. They documented extensive recovery of riparian vegetation and stream bank conditions and provided photographs in their AIR response that documented extensive improvements to riparian habitat that have occurred between the early 1980's and the late 1990's.

Review of these five hypotheses provides a sufficient basis to call into question the assumption that interruption of the transport of spawning gravels by the project has adversely affected salmonid spawning habitat in the lower Deschutes River. Heavy usage of the river by spawning rainbow trout indicates that high quality spawning gravels are still abundant, suggesting that it may be premature to assume that implementing a gravel augmentation program or plan would benefit anadromous or resident fish in the lower Deschutes River. Furthermore, it is apparent that undertaking a gravel augmentation program on the scale that BIA stipulates in their preliminary 4(e) conditions would not only have a substantial cost, but would also involve extensive disturbance of the stream bank and instream habitat at the proposed gravel augmentation sites. The gravel volume recommended in the preliminary condition would involve delivering and spreading 25 to 100 large (10 cubic yards) truck loads of gravel at each of

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the three sites. Spreading the gravel would most likely involve the use of heavy machinery in the stream bed and in adjacent riparian areas.

Although the studies conducted by the Joint Applicants indicate that effects of the project on gravel transport have been relatively minor, further evaluation of potential effects is warranted by the high value and importance of aquatic resources in the lower Deschutes River and because of uncertainty that remains about the factors that have caused recent changes in the distribution of fall Chinook salmon spawning activity. Accordingly, continued evaluation of project effects on the condition and availability of spawning gravels and the potential benefits of gravel augmentation would be reasonable, and the limited gravel augmentation experiments proposed by the Joint Applicants provide an effective method to directly evaluate the potential benefits of gravel augmentation.

3.6.2.7 Fish Hatchery Program and Disease Risk Management

The Joint Applicants propose to continue funding the operation of the Round Butte hatchery including: (1) continue smolt production to maintain production goals of an average return of 1,800 adult steelhead and 1,200 (600 females) adult and jack spring-run Chinook salmon; and (2) continuing the post-smolt steelhead liberation program (approximately 25,000 per year) in Lake Simtustus. Both of these programs would be reviewed every 5 years, and hatchery smolt production would be adjusted downward to account for increases in naturally-produced fish associated with implementation of the fish passage plan. The Joint Applicants also propose several improvements to hatchery facilities, including constructing a building over the 24 six-foot-diameter circular rearing tanks to protect them from sun and snow load and to improve working conditions, installation of water supply and hose stations to aid in protecting hatchery residences against summer wildfires, and installation of air conditioners in each of the three hatchery residences.

As part of the proposed fish passage plan, the Joint Applicants are also developing a fish health management program in conjunction with the ODFW Fish Pathology Section and Oregon State University microbiologists with expertise in fish pathogens. The initial purpose of this program is to minimize the risk that certain significant and virulent pathogens would become established upstream of the project before the potential for reintroducing anadromous runs is determined and a final decision on implementing fish passage at the project is made. The plan would also need to identify techniques to control disease risk if passage is implemented, such as defining criteria for sorting and selection of adult fish that would be passed upstream.

The agencies and the Tribes' BNR favor continued hatchery production of spring Chinook salmon and steelhead at least in the near-term, and ODFW has indicated its concurrence with the Joint Applicants' proposal to continue the post-smolt steelhead

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program in Lake Simtustus. Several parties noted that the existing hatchery program has not provided adequate protection for fall Chinook salmon, sockeye salmon, or Pacific lamprey. They also noted that the current production goals have only rarely been met for spring Chinook salmon, and have not always been met for steelhead. In addition, several parties noted that the existing production targets were negotiated during a time period when ocean survival and returning anadromous runs were coming out of a low cycle of productivity, and run sizes were depressed by poor habitat conditions, suggesting that target numbers should have been higher.

ODFW recommends that the Joint Applicants continue hatchery operations to meet existing hatchery target goals for spring Chinook salmon and steelhead. In its revised 10(j) recommendations, ODFW indicates that it has come to agreement with the Joint Applicants that operation of the hatchery and ladder should remain under the jurisdiction of ODFW, while the Pelton trap and truck-and-haul responsibilities should be managed by the Joint Applicants with coordination with ODFW staff. ODFW and the Joint Applicants have also come to agreement that ODFW would develop an annual operating plan and annual budget that would include details of hatchery operations, including a production plan and a release plan. The operating plan and budget would be subject to revision by the Joint Applicants, and if ODFW disagrees with the revisions, ODFW and the Joint Applicants would negotiate a resolution to disputed portions of the budget. ODFW also recommends several upgrades to hatchery and trapping facilities. At the Pelton fish trap, ODFW recommends installing a heated and lighted work area, a motorized hopper gate, upgrading the alarm system and repairing the truck water fill plumbing. At the hatchery, ODFW recommends installation of sound barriers in offices and improving the septic system and bathroom ventilation. ODFW also notes that a water treatment system may be required for incubation and rearing facilities in the future if passage of adult anadromous fish above the project increases the incidence of pathogens in the water supply.

The Tribes' BNR recommends that the Joint Applicants re-examine pre-project production levels of adult and juvenile anadromous fish for all species, revisit the current hatchery production goals and revise them if they are found to be inadequate, explore artificial production strategies for sockeye salmon, and continue to fund operation and maintenance of the Round Butte fish hatchery to address the continuing effects of the project.

FWS recommends that the Joint Applicants continue to meet the current goals for returning 1,200 adult spring Chinook salmon and 1,800 adult summer steelhead for the term of any license issued for the project and supporting the fish passage plan including capturing, holding and sorting of anadromous and resident adults, disease risk assessment, and passage of gametes (sperm or eggs) during the interim phase of the fish passage plan. In addition, FWS recommends that the Joint Applicants develop a plan to

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address project effects on Pacific lamprey if lamprey cannot be successfully reintroduced upstream of the project.

BIA preliminary 4(e) condition no. 9 specifies a number of actions pertaining to management of hatchery operations and restoration of sockeye salmon and Pacific lamprey. BIA preliminary 4(e) condition no. 9.a stipulates that the Joint Applicants develop a Hatchery and Fisheries Reintroduction Plan including the following components: (1) the number and sizes of fish of all species to be produced according to the reintroduction program; (2) rearing and release strategies for each stock; (3) a provision for monitoring disease transference; (4) a fisheries management strategy consistent with maximizing natural production of wild fish while ensuring Tribal harvest; (5) and a provision to allow adjustments to hatchery production based on the level of success of the fish passage program in restoring and increasing population sizes upstream and downstream of the project. BIA preliminary 4(e) condition no. 9.b specifies continued production of smolts to meet existing targets of 1,800 adult steelhead and 1,200 adult and jack spring Chinook salmon and scaling back hatchery production if natural production of these species increases. BIA preliminary 4(e) condition no. 9.c would require the Joint Applicants to develop a reintroduetion program to increase the natural production of sockeye salmon and Pacific lamprey. BIA preliminary 4(e) condition no. 9.d and preliminary 4(e) condition no. 9.e specify that the Joint Applicants file annual work plans and monitoring reports, and BIA preliminary 4(e) condition no. 9.f would enable the Joint Applicants to propose amendments to the Hatchery and Fisheries Reintroduction Plan to scale back production if natural production related to fish passage increases for the hatchery or supplementation species.

Several agencies make recommendations pertaining to disease management concerns. The Tribes' BNR recommends that the Joint Applicants continue to work with the Tribes, ODFW, and federal agencies to minimize the risk of introducing new diseases in the upper watershed, and to continue disease monitoring throughout the term of any license issued. ODFW recommends that the Joint Applicants fund and implement fish health monitoring upstream and downstream of the project through at least the Interim Phase of the Current Fish Passage Plan, with monitoring in the Final Passage Phase to be determined based on the results of monitoring in the Interim Phase. ODFW also recommends that the licensees be responsible for providing a fish health specialist and fish health services and supplies associated with the hatchery program and the fish passage plan. ODFW notes that holding and sorting of adult fish captured at the Pelton fish trap would likely require additional holding ponds, and other new facilities including areas for disinfection of equipment and vehicles, and a fish health examination and storage area including a heated work area. FWS recommends that the Joint Applicants: (1) continue a study to investigate and develop non-lethal disease tests and methods for conducting real time disease checks on adult fish prior to upstream passage; (2) fund an assessment of Bacterial Kidney Disease in resident wild populations of rainbow trout below the Pelton fish ladder; (3) construct a secure holding facility and covered outside

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work area to allow sampling, testing, marking, treatments, and genetic sampling before fish are transferred for release upstream of the project; (4) construct a small heated building for storing equipment and performing fish health exams; (5) provide a station for disinfecting trucks and equipment; and (6) provide for additional hatchery personnel to operate the Pelton trap and hauling trucks.

Our Analysis

There appears to be a general consensus that the hatchery program should be continued in the near term to allow continued support of recreational and Tribal fisheries for spring Chinook salmon and steelhead until naturally produced runs that can support these fisheries have become established. While several agencies and the Tribes' BNR have raised valid concerns about the basis of the current production targets,[60] we believe that continuation of the current targets is appropriate considering the scope of the commitment that the Joint Applicants have made toward restoration of naturally produced anadromous fish runs to areas upstream of the project. We therefore make a recommendation that the Joint Applicants should continue to fund operation of the Pelton Round Butte hatchery to meet existing hatchery production targets until naturally produced runs of fish have attained levels that are capable of supporting productive recreational and Tribal fisheries. In order to continue providing a recreational fishery for rainbow trout in Lake Simtustus, we also recommend that the Joint Applicants continue the post-smolt steelhead stocking program in Lake Simtustus as they propose.

It is also clear that the scope of fish handling and hatchery operations would continue to expand as the fish passage program transitions into the Interim Fish Passage Phase. As ODFW and FWS indicate, this would require additional labor requirements and numerous improvements to fish handling, disease monitoring, rearing and support facilities over the course of the term of any new license issued. Most of the facility improvements recommended by ODFW and FWS appear to be relatively modest in relation to overall program costs. In the draft EIS, we concluded that the Joint Applicants needed to develop a methodology for consulting with hatchery staff and the Fish Committee to identify, fund, and implement necessary improvements in facilities and increases in labor requirements as the needs arise. We concluded that the Joint Applicants should consult with hatchery staff and the Fish Committee to identify facility improvements and changes in labor requirements on an annual basis. Both the Joint Applicants' Current Fish Passage Plan and ODFW's revised 10(j) recommendations

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[60] Hatchery production requirements for the project were established in a 1970 agreement among PGE, the Fish Commission of Oregon, and the Oregon Game Commission. Current targets are for 1,800 adult steelhead and 1,200 adult spring Chinook salmon to return to the Pelton fish trap located downstream of the Reregulating dam. Unlike spring Chinook salmon and steelhead, the run of fall Chinook salmon in the lower Deschutes River is supported entirely by natural production, without hatchery supplementation.

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indicate that agreement has been reached on a process for determining annual operating plans and budgets required for hatchery operations, and we consider this issue to be resolved. We expect that specific monitoring and disease studies that are necessary to minimize the risk of disease transmission would be identified in and funded as part of the Joint Applicants' Fish Health Management Program, which is an integral component of the fish passage plan.

Regarding measures proposed for establishing a sockeye salmon run, the Current Fish Passage Plan indicates that the Fish Committee has determined that it would be preferable to attempt to build a sockeye salmon run from the native wild kokanee population that has colonized Lake Billy Chinook. However, if the Fish Committee determines that hatchery supplementation is necessary to re-establish an anadromous population of sockeye salmon above Round Butte dam, the Joint Applicants have agreed to provide funding for the necessary changes in equipment to convert an agreed-upon amount of the existing hatchery capacity to the production of kokanee.

Both the Joint Applicants' Current Fish Passage Plan and ODFW's revised 10(j) recommendations include measures to assess Pacific lamprey habitat, to conduct a passage feasibility study if sufficient habitats are found upstream of the project, and to implement a plan for the experimental reintroduction of Pacific lamprey into identified habitats upstream of the project. If passage is determined to be infeasible, the Joint Applicants would develop and implement an alternative Pacific lamprey mitigation and enhancement plan. Although there would be low potential for increasing the number of this species, we recognize the cultural value of this species to the Tribe and conclude that a feasibility study would be reasonable to determine if reintroduction of Pacific lamprey is feasible.

3.6.2.8 Long-Term Monitoring

The Joint Applicants are in the process of developing a Long-Term Monitoring Program Description, filed on December 29, 2003, in consultation with the Fish Committee. The long-term monitoring program would include monitoring of fish passage, ecological integrity, and water quality. The Fish Committee, agency resource managers, and decision makers would use this information to determine whether modifications in management approach may become necessary or desirable to meet established goals and objectives and to ensure compliance with license conditions related to the fish passage program. The Joint Applicants propose to finalize the Long-Term Monitoring Program Description within the first year after issuance of any new license. Any overview of the three main components of monitoring, as presented in the Long-Term Monitoring Program Description, with the exception of water quality (addressed in section 3.5.2, *Environmental Effects and Recommendations*, in *Water Quality*), is given below:

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Long-term evaluation of fish passage success would involve monitoring of a variety of parameters falling within three main categories: biological, habitat capacity, and passage efficacy. Monitoring biological measures of success would involve monitoring of parameters related to reservoir and tributary spawning, smolt production, escapement, harvest, competition, and disease. Monitoring components related to habitat capacity include habitat availability, instream habitat, bank stability, and riparian vegetation. Finally, monitoring of passage efficacy would be accomplished by monitoring parameters related to migration delays, smolt injury/descaling, smolt mortality, and facility efficiency.

Long-term evaluation of ecological integrity would involve monitoring of connectivity, biodiversity, and natural production. Connectivity would be monitored by analyzing the number of links between distinct habitat areas. Biodiversity would be monitored by evaluating the number of native fish species per trophic level and the number of functional feeding groups. Natural production would be monitored by determining the number of life histories per species; the population sizes of wild spawners, juveniles, and smolts for each native fish species; and the number of recruits per spawner for each native species over time. Several agencies recommended that the Joint Applicants continue habitat surveys for monitoring habitat effectiveness in tributaries upstream of the project, indicating that this work would be important for monitoring habitat enhancement measures and to validate or recalibrate life cycle models to identify data gaps and where habitats can be most effectively restored to meet population goals. FS preliminary 4(e) condition no. 8 and BLM preliminary 4(e) condition no. 20 specify and FWS and ODFW recommend that surveys be conducted at a 5- to 10-year interval at a rate of approximately 10 miles of tributary streams per year. FWS also recommends that the life cycle models and production capacity estimates[61] for spring Chinook salmon, summer steelhead, and sockeye be re-evaluated annually for the first 10 years of any license issued, and every 5 years thereafter.

Our Analysis

The discussion of monitoring activities described in the Long-Term Monitoring Program Description provides an overview of the proposed monitoring components, but does not provide any detail about the proposed methodology, including the timing and geographic extent of monitoring activities. All of the agency recommendations listed above appear to be within the scope of the monitoring activities outlined by the Joint Applicants. The Joint Applicants propose to develop the outline into a detailed monitoring plan in consultation with the Fish Committee. We note that some components of the proposed monitoring plan appear to be related to the overall, long-term management and administration of the fishery in areas outside of the project

[61] The Joint Applicants developed life-cycle models and production capacity estimates to evaluate the feasibility of re-introduction during the experimental phase of the Fish Passage Plan.

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boundary, and, therefore, any resource benefits of these components would not be directly related to the project.

3.6.3 Unavoidable Adverse Effects

Unavoidable adverse effects of the Pelton Round Butte Project include losses of fish during passage through the project, and interruption of sediment transport processes. Even if fish passage is successfully implemented at Round Butte dam, it is likely that there would be some fish lost during reservoir passage, from injuries sustained in the screening and bypass facilities, and from entrainment of fish into the turbines at the Pelton and Reregulating developments. Each reservoir would continue to interrupt the transport of larger sediments including gravel, causing some reduction in availability of substrates suitable for use by spawning trout, salmon and steelhead in the lower Deschutes River.

3.6.4 Cumulative Effects

Development of the Pelton Round Butte Project has affected anadromous fish by converting approximately 40 miles of riverine habitat into reservoir habitat and by blocking access to historical spawning habitats in the upper watershed. Construction of diversions for irrigation and other consumptive uses and the construction and operation of Bonneville and The Dalles dams on the lower Columbia River also have affected anadromous fish movement and passage into the Deschutes River basin.

Continued population growth and development in the upper Deschutes River basin have the potential to affect anadromous fish by reducing river flows and adversely affecting water quality. Passage conditions at dams on the lower Columbia River generally have been improving in recent years because of the installation and refinement of downstream passage facilities and spill, flow augmentation, and other measures that were identified in the 1995 and 2000 Biological Opinions and designed to protect ESA-listed stocks of salmon and steelhead in the Columbia River basin. We anticipate that passage conditions would continue to gradually improve over the term of any new license issued, although adult returns would continue to fluctuate with changes in ocean survival. Changes in the global climate may affect rearing conditions in the ocean and in freshwater habitats over the term of any new license issued, although the magnitude and nature of these changes cannot be predicted with any degree of accuracy at this time.

Implementing the measures proposed by the Joint Applicants would benefit anadromous fish by: (1) restoring access to historical spawning and rearing habitats upstream of the project through implementation of the proposed fish passage plan; (2) improving water quality in the project reservoirs and in the lower Deschutes River through implementation of the SWW; (3) protecting and restoring aquatic habitats through near-term riparian corridor improvements and the movement of large woody

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debris from Lake Billy Chinook into the lower river; and (4) enhancing the stability of habitat downstream of the project by implementing greater restrictions on project operations. As a result, cumulative effects on anadromous fish would be positive.

3.7 TERRESTRIAL RESOURCES

3.7.1 Affected Environment

3.7.1.1 Vegetation

The Pelton Round Butte Project area is located at the transition between the East Slope Cascades and the High Lava Plains physiographic province (ODFW, 1993). The topography is generally flat to rolling, except where the Deschutes, Metolius, and Crooked rivers have cut deep canyons through the basalt. Elevations range from about 1,435 feet msl at the Reregulating dam to almost 2,800 feet msl along the cliffs in the Metolius River arm of Lake Billy Chinook. In this arid climate, summers are hot, winters are cold, and annual precipitation averages only 9 to 10 inches.

The terrestrial resource study area includes lands and waters within the project boundary and extends outward 0.25 miles from the top of the canyon rim and 0.25 miles downstream from the Reregulating reservoir. The study area also includes several jointly owned parcels within the Metolius Mule Deer Winter Range to the west, and along Trout Creek to the northeast of the project.[62] PGE proposes to include these parcels within the project boundary under any new license that is issued.

PGE classified and mapped 11 primary cover types within the study area. Juniper woodland and various shrubland cover types comprise almost half of the mapped area. Juniper woodland and juniper mosaics (where juniper is dominant but other species, such as bitterbrush or sagebrush, are intermixed) are abundant in areas around the reservoirs and on the Metolius Mule Deer Winter Range. Sagebrush occupies the driest areas around the reservoirs. Bitterbrush is most common near Lake Billy Chinook and the Metolius Mule Deer Winter Range.

The study area includes large areas of perennial grasslands. These grasslands occur at low elevations, especially on steep west and south-facing slopes near Lake Billy Chinook. The most common species in this cover type are bluebunch wheatgrass, Thurber's needlegrass, Sandberg's bluegrass, and Idaho fescue. Annual grasslands,

[62] Jointly owned parcels within the Metolius Mule Deer Winter Range are grouped in six general areas to the west of the project boundary. Some of the parcels are adjacent to Lake Billy Chinook, and others are situated within approximately 10 miles of the project boundary. The Trout Creek Ranch is located about 12 miles northeast of the Reregulating reservoir.

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dominated by cheatgrass, also occur at low elevations near all three reservoirs and on the Metolius Mule Deer Winter Range.

Mixed conifer forest is found primarily along the Metolius arm of Lake Billy Chinook. This cover type is generally a mix of ponderosa pine, Douglas fir, incense cedar, and juniper. On south-facing slopes, stands are typically open, while they tend to be younger and more dense on north-facing slopes. Snowberry and serviceberry are common understory shrubs.

The Metolius arm also supports several stands of ponderosa pine, and a few are present on the Metolius Mule Deer Winter Range. Ponderosa pine stands are mid-successional or younger, with a moderate cover of perennial grasses and few shrubs.

Cliffs and talus slopes occur along the canyon walls adjacent to all three reservoirs. Most cliffs are steep and support little vegetation, but talus is interspersed with sagebrush, grassland or mixed shrub types, and is often bordered by mock orange, chokecherry, and serviceberry.

Riparian vegetation grows in small patches and narrow bands along Lake Simtustus (50 acres), Lake Billy Chinook (26 acres), and the Reregulating reservoir (66 acres). The dominant species in this cover type are variable, and may include ponderosa pine, cottonwood, willow, white alder, red-osier dogwood, chokecherry, and Himalayan blackberry. PGE has mapped approximately 64 acres of riparian/wetland vegetation on the jointly owned Metolius Mule Deer Winter Range, Campbell Creek, and Trout Creek parcels.

The largest wetlands associated with the project are located around the Reregulating reservoir. Wetlands on the east side of the reservoir include the Pelton waterfowl pond, where the most common species are cattails, hardstem bulrushes, sedges, and rushes. The Reregulating reservoir supports about 20 acres of wetlands. Lake Simtustus supports about 10 acres, and about 8 acres of wetlands have been mapped at Lake Billy Chinook. The largest wetland mapped on the jointly owned lands is located at Fly Lake. The dominant species at this 12-acre site are cattails, water smartweed, sedges, and rushes.

Special-Status Plant Species

Based on searches of the FWS and Oregon Natural Heritage Program (ONHP) databases and consultation with FS and BLM, PGE determined that 27 special-status plant species could occur in the project area, including lands around the reservoirs and the jointly owned lands (table 26). None of these are federally listed as threatened or endangered, but five are considered species of concern at the federal level. PGE conducted field surveys for special-status plants in 1996 and 1997 and located seven of

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the special status target species: beaked cryptantha, creamy stickseed, Peck's penstemon, peltula (lichens), short-leaved penstemon, Scribner's grass, and texosporium (lichens).

Table 26. Special status plants that may occur or are known to occur within the study area. (Source: PGE, 1999)

Common Name (Scientific Name)	Status	Habitat Requirements and Likelihood of Occurreuce
Beaked cryptantha (*Cryptantha rostellata*)	FSS, BLMS	Documented; dry, rocky areas with sagebrush, from foothills to timberline.
Columbia watercress (*Rorippa columbiae*)	SoC, FSS, BLMS, ORC, ONHP 1	Vernal pools, shallow margins of rivers and lakes
Creamy stickseed (*Hackelia diffusa v. cottonii*)	ONHP 4	Documented; cliffs and talus slopes
Cushion coryphantha (*Coryphantha vivipara v. vivipara*)	BLMS, ONHP 1	Desert valleys and foothills
Estes' artemisia (*Artemisia ludoviciana ssp. estesii*)	SoC, FSS, BLMS, ONHP 4	Sandy, gravelly substrates along the Deschutes River from 2,000–2,500 feet msl
Ground cedar (*Lyocopodium complanatum*)	FSS, BLMS, ONHP 2	Moist conifer stands, lowlands to mid-elevation in the mountains
Hairy elmera (*Elmera racemosa v. puberulenta*)	ONHP 4	Rocky crevices and mountain ridges
Hamblen's lomatium (*Lomatium farinosum var. hambleniae*)	BLMS, ONHP 2	Rock, scabland swales
Hedgehog cactus (*Pediocactus simpsonii v. robustior*)	BLMS, ONHP 3	Desert valleys, rocky ridges, and low mountains
Hepatic monkey-flower (*Mimulus jungermannioides*)	SoC, BLMS, ORC Candidate, ONHP 1	Moist, vertical walls or overhangs associated with drainages and sometimes adjacent to water

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Common Name (Scientific Name)	Status	Habitat Requirements and Likelihood of Occurrence
Klamath gooseberry (*Ribes inerme v. klamathense*)	ONHP 3	Thickets, wooded slopes, and open ridges
Lesser bladderwort (*Utricularia minor*)	FSS, BLMS, ONHP 2	Ponds, lakes, and slow-moving water
Many-flowered onion (*Allium pleianthum*)	ONHP 3	Sagebrush steppe, often in heavy clay soil
Mountain lady's-slipper (*Cypripedium montanum*)	ONHP 4	Dry to moist woods in partial shade; shrub or forest-covered valleys
Peck's penstemon (*Penstemon peckii*)	SoC, FSS, BLMS, ONHP 1	Documented; slopes and open flats in ponderosa pine forests from 2,600–4,400 feet msl
Peltula (*Peltula euploca*)	ONHP 3	Documented; vertical rimrock in open, semi-arid locations
Porcupine sedge (*Carex hystricina*)	FSS, BLMS, ONHP 2	Wet ground near streams and springs, lowlands to mid-elevations
Scribner's grass (*Scribneria bolanderi*)	BLMS, ONHP 4	Documented; dry to rocky soils in shrub-steppe
Short-lobed penstemon(*Penstemon seorsus*)	ONHP 3	Documented; dry plains and foothills
Short-seeded waterwort (*Elatine brachysperma*)	ONHP 3	Saturated soils, pond margins
Sierra onion (*Allium campanulatum)*	FSS, BLMS;	Shrub-steppe, ponderosa pine/fir woodlands; dry flats, moderate to high elevations
Spinescent flameflower (*Talinum spinescens)*	BLMS, ONHP 2	Shrub-steppe basalt outcrops and scablands
Tall agoseris (*Agoseris elata)*	FSS, ONHP 2	Meadows and open woodlands, mid- to upper elevations
Texosporium (*Texosporium sancti-jacobi)*	SoC, BLMS, ONHP 2	Documented; soil crusts in grasslands within shrub-steppe, often on decomposed grass and dung
Torrey's rush (*Juncus torreyi)*	BLMS, ONHP 2	Wet places near lakes and streams, lowlands to mid elevations
Water lobelia (*Lobelia dortmanna)*	FSS, ONHP 2	Forested ponds, lakes, and streams

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Common Name (Scientific Name)	Status	Habitat Requirements and Likelihood of Occurrence
Watson desert-parsley (*Lomatium watsonii*)	FSS, BLMS, ONHP 2	Documented in Jefferson County; associated with big sagebrush on open hillsides

Notes: BLMS – BLM special status species

FSS – FS sensitive species

ONHP 1 – threatened with extinction or presumed to be extinct throughout their entire range

ONHP 2 – threatened with extirpation or presumed to be extirpated from the state

ONHP 3 – more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout their range

ONHP 4 – of conservation concern, but not currently threatened or endangered

ORC – Oregon candidate species; taxa having the potential of qualifying as threatened or endangered within the state of Oregon, after additional study and evaluation

SoC – federal species of concern

Noxious Weeds

Oregon Department of Agriculture (ODA) lists 99 plants as noxious weeds in Oregon (ODA, 2002). Based on literature review and information obtained through agency consultation, PGE determined that 25 species that are designated as noxious or considered invasive non-native plants could occur in the project area. PGE conducted surveys for noxious and invasive weeds on lands adjacent to the reservoirs and in the Metolius Mule Deer Winter Range parcels in 1998. Surveyors identified and mapped occurrences of 11 of these species (table 27). Most weed populations were noted along project access roads, around the powerhouses and at recreational facilities, where vehicle and foot traffic likely serve as vectors for the spread of weed seed. Surveyors observed two species, squarrose knapweed and spotted knapweed, which are designated as priority noxious weeds in Oregon. Squarrose knapweed was found to be scattered along roads adjacent to the reservoirs. Spotted knapweed was observed at scattered locations on the Metolius Mule Deer Winter Range.

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Table 27. Noxious weeds and invasive non-native plants documented to occur in the study area. (Source: PGE 1999)

Common Name (Scientific Name)	ODA Status	Locations
Bull thistle (*Cirsium vulgare*)	B[a]	Project lands, MMDWR
Canada thistle (*Cirsium arvense*)	B[a]	Project lands, MMDWR
Common St. John's wort (*Hypericum perforatum*)	B[a]	Project lands
Diffuse knapweed (*Centaurea dalmatica*)	B[a]	Project lands, MMDWR
European spiny lettuce (*Lactuca serriole*)	--	MMDWR
Himalayan blackberry (*Rubus discolor*)	B	Project lands
Medusahead (*Taeniatherum caput-medusae*)	B	Project lands, MMDWR
Russian olive (*Elaeagnus angustifolia*)	--	Project lands
Spotted knapweed (*Centaurea maculosa*)	B[a], T	MMDWR
Squarrose knapweed (*Centaurea virgata*)	A, T	Project lands
Teasel (*Dipsacus sylvestris*)	--	Project lands

Notes: MMDWR – Metolius Mule Deer Winter Range

A – Occurs in Oregon in small enough infestations to make eradication/containment possible or is not known to occur at present.

B – Regionally abundant, may have limited distribution in some counties; where fully integrated statewide management plan is infeasible, biological control would be the main control approach.

T – Priority noxious weed for which ODA would implement a statewide management plan.

[a] Weeds for which biological control agents are available.

3.7.1.2 Wildlife

The project area provides habitat for a variety of wildlife species that use riverine and reservoir habitat, basalt cliffs, and the mix of conifer stands, shrublands and grasslands along the canyon rim. The project area includes important winter range for

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mule deer, and limited amounts of riparian and wetland habitats that are especially important for songbirds, amphibians, beaver, mink, river otter, and other wildlife species.

Amphibians and Reptiles

Range maps and habitat conditions indicate that 20 species of amphibians potentially occur in the project area. During PGE's surveys in 1994 and 1996–1998, biologists documented the occurrence of six of these (i.e., western toad, Pacific chorus frog, tailed frog, bullfrog, long-toed salamander, and rough-skinned newt) in riverine pools, ponds, and riparian habitats. Three of these (i.e., Pacific chorus frog, bullfrog, and long-toed salamander) are known to breed in the project area. During the surveys, biologists also documented 13 of the 15 reptile species likely to occur in the project area. The northwestern fence lizard was observed at every survey site, and northern side-blotched lizards were observed near each of the reservoirs.

Birds

PGE conducted seasonal bird surveys in 1996 and 1997. Biologists documented a total of 91 songbird, woodpecker, and corvid species. Relatively few birds were observed during fall and winter. Almost 90 percent of the species were observed during spring and summer, indicating they probably breed in the project area. Breeding was confirmed for 23 of the species. The most commonly observed species include American robin, chipping sparrow, Townsend's solitaire, spotted towhee, and yellow-rumped warbler.

The project reservoirs provide resting habitat for large numbers of waterfowl during the fall and winter. Surveys conducted between 1988 and 1998 indicate that use is highest on the Reregulating reservoir, where daily operations provide foraging opportunities in shallow water and exposed mudflats. The east side of the reservoir is closed to public access and human activity is rare on the west side, as well. The low levels of disturbance, plus the proximity of agricultural fields that provide additional foraging opportunities, also contribute to high levels of waterfowl use on the Reregulating reservoir.

Foraging opportunities on Lake Billy Chinook and Lake Simtustus are more limited, due to the steep, rocky shorelines, lower abundance of submerged and emergent aquatic vegetation, and deeper, less productive water. Although recreational levels are low at Lake Billy Chinook and Lake Simtustus during late fall, winter, and early spring, considerably more activity, and thus more human disturbance, occurs on these two reservoirs than on the Reregulating reservoir.

With the exception of a single brood of cinnamon teal, the only waterfowl species known to breed in the project area are mallards, common mergansers, and Canada geese.

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For the most part, mallards nest at the Pelton waterfowl pond and at Fly Lake on the Metolius Mule Deer Winter Range. Most common merganser broods were observed in the upper Metolius and Deschutes River arms of Lake Billy Chinook. Most Canada goose broods were also observed in the Metolius arm of Lake Billy Chinook.

Numerous other species of waterbirds, shorebirds, wading birds, gulls, and terns also use the project reservoirs during spring and fall migrations and during the winter. A few of these are also present year-round, and some (e.g., double-crested cormorant, coot, pied-billed grebe, great blue heron, killdeer, and spotted sandpiper) are known to nest in the project vicinity.

The population of raptors in the project area is exceptionally diverse, with over 25 species of eagles, hawks, falcons, and owls likely to occur. The bald eagle, golden eagle, osprey, prairie falcon, red-tailed hawk, great horned owl, and barn owl are known to nest in the vicinity.

Eleven species of upland game birds are known to occur in the project area. The blue grouse, ruffed grouse, California quail, mountain quail, mourning dove, and band-tailed pigeon are native to Oregon. Five other species (i.e., chukar, gray partridge, ring-necked pheasant, wild turkey, and rock dove) were introduced for sport hunting. California quail and chukar are the most common upland gamebirds in the project area.

Mammals

The most important big game species in the project area is the mule deer. Most of the project area, including jointly owned lands in the Metolius Mule Deer Winter Range, lies within the Metolius Management Unit (MU). Based on late winter counts in the MU, the population in 1999 was about 5,700. The state's management objective for the MU is 6,200 deer (ODFW, 2002a).

The Grizzly MU borders the project reservoirs to the east. Most deer in the Grizzly MU are year-round residents, but the narrow band of habitat adjacent to the reservoirs serves as winter range for migrants, as well. The population in the MU as of 1999 was estimated at 7,700 deer, a little over 90 percent of the state's management objective of 8,500 deer (ODFW, 2002a).

To the north and west of the project area, the Warms Springs Reservation supports a year-round population of over 3,000 mule deer. Numbers increase to about twice that during the winter, with the population estimated at 7,100 (plus or minus 27 percent) in 1998. The Tribes' radiotelemetry studies indicate that during the winter, about 1,500 mule deer concentrate on range within 2 miles of the project reservoirs.

Deer populations fluctuate a great deal in response to winter weather and forage conditions. Recent population estimates indicate that populations are returning to the

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levels that preceded the severe winter of 1992–1993 (ODFW, 2002a). As of 2001, the estimated population of mule deer in Oregon was 283,000. The state-wide management objective is 336,800.

PGE has conducted seasonal surveys of mule deer since 1988. Winter surveys in 1992–1993 showed a strong negative correlation between snow depth and deer concentrations. In the upland plateaus along the canyon rim at the eastern edge of the Metolius Mule Deer Winter Range, PGE counted 10.9 deer per mile when the snow was 11 inches deep. At Fly Lake, just 8 miles west, with a snow depth of 2 feet or more, the deer count was only 0.6 per mile.

The projeet area also provides important habitat for Rocky Mountain elk. As of 1998, the state estimated that about 150 elk winter in the Metolius MU (ODFW, 2002b). During the summer, animals moving east from the Cascade crest increase the number to 300–400 animals. About 30 elk occupy lands adjacent to the Metolius arm, on the Warm Springs Reservation.

Pronghorn antelope and California bighorn sheep were once common in central and eastern Oregon. Currently, neither species is known to occur in the project area, although pronghorns have re-established in the Crooked River National Grasslands during the past 30 years, and ODFW has transplanted bighorns along the Deschutes River to the north.

The number of black bears and the number of cougars in the Metolius MU are considered to be "medium density" compared to other areas in the state. Populations of both species are thought to be increasing fairly rapidly since their reclassification from bountied species, as part of a predator control program, to game mammals. PGE employees have observed cougars along the access road near the Round Butte dam.

Fur-bearing mammals in the project area include the bobcat, American beaver, northern river otter, common raccoon, mink, and muskrat. There is potential habitat for red fox and gray fox, but the project area is located at too low an elevation to support habitat for species such as marten, fisher, Canada lynx, or wolverine.

PGE conducted bat surveys in 1998, documenting 12 of the 14 species that are known or likely to occur in the project area, including seven special-status species (discussed below). The most abundant bats in the project area were little brown myotis and Yuma myotis.

Based on their range and habitat requirements, at least 90 other small- and medium-sized mammals are likely to occur in the project area, in addition to those described above. Small- and medium-sized mammals play an important role in shrub-steppe and grassland ecosystems. They contribute a large portion of the diet of raptors, coyotes, and some snakes, and also serve to mix, aerate, and fertilize soils, disperse seeds,

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and improve the nutritional quality of forage and browse for big game (Vander Haegen et al., 2001).

Special Status Wildlife Species

PGE's consultation with FS, BLM, and ODFW indicated that 53 special status species could occur in the project area (appendix B). One of these—the bald eagle—is federally listed as threatened or endangered. We present information about the bald eagle in section 3.8, *Federally Listed Threatened and Endangered Species*.

With the exception of surveys for amphibians and bats, PGE did not conduct focused studies for each of the special status species identified in appendix B. However, vegetation cover typing, rare plant and noxious weed surveys, and a variety of other field efforts completed between 1988 and 1998 allowed ample opportunity for biologists to record incidental observations, in addition to the findings of systematic surveys for breeding birds, waterfowl, and raptors.

Four bat species (western small-footed myotis, pallid bat, big brown bat, and Pacific western big-eared bat) were captured in a single cave near Lake Billy Chinook. Bat guano was observed under bridges at Lake Simtustus and Lake Billy Chinook, suggesting the bats were using these sites as night roosts. The only bats found to use project facilities were Yuma myotis. Yuma myotis used the fish channel in the Round Butte dam as a maternity roost in 1998 and used a grout tunnel on the west abutment of the dam as a night roost.

3.7.2 Environmeutal Effects and Recommendations

3.7.2.1 Habitat Acquisitious aud Proposed Terrestrial Resources Management Plan

To provide protection and enhancement for terrestrial resources, the Joint Applicants have acquired 7,700 acres in the Metolius Mule Deer Winter Range; 3,000 acres in the Trout Creek basin; and 97 acres in the Campbell Creek basin adjacent to the Reregulating reservoir. The acquisitions include almost 7 miles of riparian habitat along Trout, Campbell, Fly and Juniper Canyon creeks. To provide additional enhancements of wetlands and riparian habitats, the Joint Applicants propose to enhance wetlands at Fly Lake, Potter Springs/Geneva Homestead, and Burnt Snag Pond. The Joint Applicants have implemented a variety of habitat improvements on the lands acquired for terrestrial resources, such as closing unnecessary roads and removing barbed-wire fence; closing and restoring a 5-acre quarry site; removing juniper and seeding bitterbrush; and installing water guzzlers and bluebird boxes.

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In addition to acquiring the jointly owned lands described above, the Joint Applicants have participated in several cooperative efforts to protect terrestrial resources in the project vicinity. After purchasing the 148-acre Camp Polk property, including 145 acres of bog/meadow and 1.9 miles of riparian habitat in the Why-chus Creek basin, the Joint Applicants transferred ownership to the Deschutes Basin Land Trust and transferred the 49-acre water right to the Oregon Water Trust. The Joint Applicants would continue to provide support for annual O&M on this parcel.

The Joint Applicants contributed $100,000 to the purchase of land at Alder Springs, which protects another 1.0 mile of riparian habitat in the Why-chus Creek basin, as well as providing 840 acres of mule deer winter range. The Ochoco National Forest manages the Alder Springs parcel as part of the Crooked River National Grasslands. The Joint Applicants have provided funding for other Crooked River National Grasslands efforts to protect and restore riparian habitats.

In the Final Joint Application Amendment, the Joint Applicants proposed a near-term measure to enhance wildlife habitat. Now, the Joint Applicants propose to establish and finance a Pelton Round Butte Fund. As discussed in section 3.6, *Aquatic Resources*, the General Fund portion of the Pelton Round Butte Fund would be used to acquire and enhance riparian, riverine, and wetland habitat in the Deschutes watershed. Establishment of the Pelton Round Butte Fund should provide an effective mechanism for protecting and improving terrestrial resources, as well as aquatic systems.

To coordinate existing and proposed enhancement measures, the Joint Applicants propose to develop a comprehensive terrestrial resources management plan. The terrestrial resources management plan would include strategies for restoring riparian and wetland habitat, improving winter range, monitoring and controlling noxious weeds, closing roads (seasonally or permanently) to prevent disturbance to wildlife, evaluating potential recreational opportunities and constraints in areas that are managed primarily for wildlife, and improving wildlife passage and safety at the Pelton fish ladder. The terrestrial resources management plan would also address development of a comprehensive bald eagle management plan and any other measures needed to protect threatened, endangered or sensitive species and habitats. The Final Annotated Outline for the Terrestrial Resources Management Plan filed by the Joint Applicants indicates that in addition to the resource-specific strategies, the plan would identify mechanisms for coordination with other landowners and schedules for implementation, monitoring, and funding.

The Joint Applicants have proposed in the Final Joint Application Amendment and the agencies have recommended several types of monitoring through the term of any new license issued. In addition to surveys for raptors (discussed later in this section), the Joint Applicants propose to conduct a mule deer winter range telemetry study and annual deer trend counts and sightability studies and to monitor deer and elk conditions and use of winter range. The Joint Applicants would monitor annual nesting productivity for

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waterfowl by counting duck and goose broods during May and June, monitor waterfowl winter use annually, and conduct waterfowl nest surveys every 5 years. The Joint Applicants would conduct annual breeding bird surveys on project lands and jointly owned lands. In addition to effectiveness and compliance monitoring, the Joint Applicants would emphasize adaptive management, and develop a process for evaluating actions and implementing changes or new measures as necessary to meet resource goals and objectives.

The resource management agencies and the Tribes are in agreement with the general scope of the terrestrial resources management plan as it is described in the Final Annotated Outline for the Terrestrial Resources Management Plan, dated November 14, 2003.

Our Analysis

The Pelton Round Butte Project benefits many wildlife species. Foraging areas and the prey base for bald eagles are abundant in the reservoirs, and the reservoirs provide resting habitat for large numbers of waterfowl during the spring and fall migration. Adverse effects include blocks to the upstream and downstream movement and dispersal of species, such as river otter, beaver, and amphibians; water-level fluctuations that limit habitat suitability for nesting waterfowl; and disturbance due to project related recreation and maintenance activities.

The Joint Applicants have implemented extensive onsite habitat improvements. However, the Joint Applicants own only 818 acres (less than 10 percent) of the land within the current project boundary. To provide increased enhancement for wildlife, the Joint Applicants have acquired almost 10,800 acres that they propose to incorporate into the project boundary. The jointly owned parcels are not located where they would be directly affected by daily or seasonal reservoir operations, project maintenance, or project-related recreation, but wildlife species that would benefit from protection and enhancement of habitat in the jointly owned parcels are the same as those that now occur along the reservoir margins within the existing project boundary.

Mammal species expected to benefit from protection and management of the 10,800 acres of jointly owned land include mule deer, mountain lion, bobcat, coyote, black-tailed jackrabbit, California ground squirrel, yellow-bellied marmot, bushy-tailed woodrat, and a number of voles, mice, and shrews. None of the jointly owned parcels include large enough bodies of water to provide suitable habitat for river otter, but beaver, raccoon, and mink would be likely to use riparian and wetland habitats at Fly Lake and Trout Creek, in particular. Acquisition and enhancement of riparian, wetland, and riverine habitats through the Pelton Round Butte Fund would have the potential to benefit a variety of aquatic furbearers.

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Over 100 bird species, including a large number of raptors, upland game birds, and songbirds, would benefit from the protection and enhancement of the jointly owned lands. These include northern harrier, sharp-shinned hawk, American kestrel, mourning dove, California quail, red cross-bill, ash-throated flycatcher, Bullock's oriole, chipping sparrow, and numerous others.

Reptiles common to the project vicinity have a wide distribution. It is likely that all 13 reptile species observed in the project area (e.g., northern side-blotched lizard, southern alligator lizard, gopher snake, western yellow-belly racer, western rattlesnake) would benefit from the conservation of these lands, as well.

Typical of arid climates, the project vicinity supports relatively few amphibian species. Fly Lake, Fly Creek, Trout Creek, and Burnt Snag Pond are likely the most important of the jointly owned parcels in supporting amphibians, such as the Pacific chorus frog and long-toed salamander.

In light of the amount and quality of habitat already acquired by the Joint Applicants, we conclude that no additional land purchase would be necessary for wildlife mitigation. Incorporating the jointly owned lands within the project boundary and providing long-term management and enhancement would adequately address the ongoing effects of project facilities and operations on wildlife. Inclusion of these lands would complement federal, state, and Tribal programs in the region. This action would also contribute to the conservation efforts of non-governmental organizations, such as the Deschutes Basin Land Trust, Trust for Public Lands, and Oregon Water Trust. Long-term management of the jointly owned lands would provide substantial benefits to many of the same species and similar habitats as those affected by the project.

We agree monitoring would be a critical part of managing wildlife habitat over time, and agree with the Joint Applicants, FS preliminary 4(e) condition no. 18, and BLM preliminary 4(e) condition no. 28 that an adaptive management approach to monitoring would be useful, because it would provide a systematic means of evaluating each element of the terrestrial resources management plan with respect to original objectives, and then adjusting actions to incorporate the new findings. Adaptive management would be especially beneficial in identifying which measures are most effective and should be aggressively pursued, and which are least effective and should be modified or terminated. According to the Final Annotated Outline for the Terrestrial Resources Management Plan, the Joint Applicants would work with the agencies and the Tribes to identify what parameters would be monitored, the geographic scope of monitoring, the metrics of indicators that would be measured, the anticipated responses to management action, and the time frame over which changes are anticipated to occur.

Our recommendation that the Joint Applicants develop an adaptive management plan as part of the terrestrial resources management plan is consistent with FS

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preliminary 4(e) condition no. 18 and BLM preliminary 4(e) condition no. 28 and would meet the objectives of ODFW.

Consistent with the Joint Applicants' proposal and BIA preliminary 4(e) condition no. 12 and the FWS recommendation, we recommend incorporating the lands acquired for habitat enhancement into the project boundary. Including these lands as part of the project would ensure that they are managed for wildlife habitat benefits through the term of any new license issued.

We agree that a plan to facilitate Tribal access to the acquired lands for the Tribes' use of biological resources of cultural importance is needed, as described in BIA preliminary 4(e) condition no. 12. Such a plan would help to minimize conflicts with other uses that may also be permitted (e.g., recreation). To ensure consistency with other elements of the CRMP relating to traditional cultural properties, we recommend incorporating access facilitation into the CRMP (section 11, *Cultural Resources).*

Also consistent with BIA preliminary 4(e) condition no. 12, we recommend that the Joint Applicants prepare annual work plans and 5-year progress reports as part of the terrestrial resource management plan. Work plans and progress reports would provide a means of scheduling, implementing, and tracking the accomplishment of each plan element over time.

Consistent with BIA preliminary 4(e) condition no. 13, we recommend the Joint Applicants maintain a GIS database, develop and implement an Endangered Species Alert Program, specify construction standards, provide education for employees, incorporate best management practices, prepare annual work plans, and submit annual monitoring and compliance reports. This recommendation is also consistent with BLM preliminary 4(e) condition no. 28, with the exception of explicit details regarding which specific parameters PGE should monitor. As described above, development of an adaptive management plan is a step-wise process, and it would be more reasonable to develop appropriate monitoring parameters in consultation with the resource agencies.

Consistent with FWS recommendations, we recommend that the Joint Applicants re-establish the Terrestrial Resources Work Group that assisted in designing the initial studies, identifying primary resource concerns, and developing strategies to improve habitat for botanical and wildlife resources. The Terrestrial Resources Work Group's knowledge about the project and history of participation in project-related planning to date would help to ensure that the adaptive management approach developed as part of the terrestrial resources management plan is appropriate to site-specific habitat conditions. It would also help to maximize efficiency during implementation of the terrestrial resources management plan. The Joint Applicants would consult with the Terrestrial Resources Work Group at least annually, provide annual progress reports, and update the terrestrial resources management plan at 5-year intervals.

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We recommend that the Joint Applicants integrate the terrestrial resources management plan with the recreational resources management plan. Since recreational facilities and activities could potentially adversely affect wildlife habitat, close coordination between the two plans would be needed to minimize the potential for habitat loss or disturbance.

This approach would be consistent with the Tribes' BNR recommendation in that we also recommend coordination with the resource management agencies and the Tribes to develop the terrestrial resources management plan, and we also support implementation of an adaptive management plan of some kind. The Joint Applicants would need to provide adequate funding for monitoring and long-term management, but in our view, the Joint Applicants are in the best position to determine the most economical and efficient means of doing this, whether through establishment of a trust fund, as recommended by the Tribes, or via some other mechanism.

ODFW believes public access should be integrated with resource values to protect wildlife habitat and prevent trespassing onto neighboring private lands in the Metolius Mule Deer Winter Range and Trout Creek parcels. ODFW also recommends that the public access plan encourage a variety of uses, such as educational, scientific, and interpretive programs; hunting; bird-watching; and hiking. In our view, the specific uses that should be permitted or encouraged would be best decided on a site-by-site basis by the Joint Applicants in consultation with the Terrestrial Resources Work Group, because the level, type and timing of protection that is needed may vary a great deal from site to site, depending on species occurrence, habitat conditions, and other factors.

We agree with the FWS recommendations that the Joint Applicants should identify and protect habitats of special concern and identify additional measures for research, protection, or enhancement, if additioual sensitive species are listed during the term of any new license issued to ensure that project facilities and operations do not adversely affect terrestrial resources. This recommendation is consistent with the Joint Applicants' proposals to identify and implement measures to protect sensitive plants, animals, and habitats, as part of the terrestrial resource management plan.

BLM preliminary 4(e) condition no. 29 calls for the Joint Applicants to consult with BLM and prepare a biological evaluation, if necessary, before taking any actions that would affect a BLM sensitive species or its habitat. The Joint Applicants would consult with BLM and FWS (or NOAA Fisheries) and prepare a biological assessment, if necessary, before taking any action that could affect a federally listed species or species proposed for listing.

We agree that a mechanism is needed to provide for protection of special status species, currently listed species, and species that could be listed in the future, but we conclude that a separate plan for consultation is not necessary, because consultation and protection measures would be included in the terrestrial resources management plan.

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ODFW originally recommended that the Joint Applicants develop opportunities for bat habitat improvements, such as retrofitting structures, caves, or tunnels. ODFW now recommends that the Joint Applicants maintain known Yuma myotis maternity and night roost sites at Round Butte dam and contribute funds to protect a maternity roost for Townsend's big-eared bats near Willowdale and a maternity roost for the little brown myotis near Opal Springs.

Within the project area, cover type mapping indicates that cliffs and canyon walls provide more than 1,000 acres of potential roost habitat, in addition to forest and shrub vegetation on the canyon rim, project facilities, and other human-made features. During surveys in 1998, PGE detected the presence of 12 bats species (Perkins, 1998). Examination of females of eight species that were captured indicated breeding in the project area or nearby. No information that suggests habitat is limiting or that bat populations would benefit from retrofit of structures, caves, or tunnels has been filed to date.

However, we agree with ODFW that protection of known roosts sites at locations where project operations could otherwise adversely affect them would be beneficial. For example, if maintenance is needed at Round Butte dam that would disturb bats, concerns should be addressed through the threatened and endangered species element of the terrestrial resources management plan described above.

To our knowledge, no information about the Willowdale or Opal Springs sites has been filed in the record. We are unaware of any information about these sites in the record that would enable us to determine their specific locations or ownerships, describe existing conditions, evaluate potential threats, identify measures that would be effective in protecting or improving habitat, or estimate the costs of such measures. Based on the available information, we conclude that project operations and facilities do not affect these populations located outside of the project boundary.

3.7.2.2 Riparian and Wetland Measures

Riparian and wetland habitats are important elements of the landscape, especially in the semi-arid west (Naiman et al., 1993; Kauffman et al., 2001). They represent unique microclimates; support high levels of plant species diversity and structural complexity; and provide food resources, hiding cover, and movement corridors for wildlife. Under current project operations, daily and seasonal reservoir fluctuations may influence the function of riparian and wetland habitats around the reservoir margins (Nilsson et al., 1991).

The Joint Applicants propose several measures to improve riparian and wetland habitat around the reservoirs. They would expand the Pelton waterfowl pond from 2.9 acres to about 3.8 acres and develop a new set of standard operating procedures to improve habitat quality. The Joint Applicants propose to plant emergent wetland species,

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including cattails and hardstem bulrush, at suitable sites associated with the project reservoirs, such as the upper Metolius River arm and in Lake Simtustus near the mouths of Seekseequa and Willow creeks. The Joint Applicants would also develop a riparian planting program. The first step would be to conduct a 2- to 3-year feasibility assessment to collect information needed to improve the success of riparian plantings. The Joint Applicants would construct and maintain a livestock exclusion fence to protect about 2 miles of existing and potential riparian habitat along the east side of the Reregulating reservoir. To further improve riparian conditions in this vicinity, the Joint Applicants would remove juniper trees that are encroaching into existing cottonwood stands.

The Joint Applicants would continue to protect riparian habitats on the jointly owned lands and would enhance about 10 acres of wetlands at Fly Lake, Potter Springs, and Burnt Snag Pond, and about 6.9 miles of Fly, Juniper Canyon, Campbell, and Trout creeks. Specific measures include removal of invasive juniper from riparian habitats, enforcement of road closures to prevent all-terrain vehicle (ATV) damage and disturbance, construction of a small wetland at Potter Springs, and willow plantings at Burnt Snag Pond.

In addition to the protection of project lands or jointly owned lands, PGE has participated in a number of regional efforts to protect and improve wetlands and riparian habitats. PGE contributed funding to purchase the Alder Springs parcel on Why-chus Creek, now part of the Ochoco National Forest and managed by Crooked River National Grassland. PGE purchased the Camp Polk property, also on Why-chus Creek, and transferred it to the Deschutes Basin Land Trust. The 49-acre water right for the Camp Polk property was then transferred to the Oregon Water Trust. PGE also is planning to transfer the 102-acre Trout Creek Ranch water right to the Oregon Water Trust.

The Joint Applicants would use the Pelton Round Butte Fund to acquire land and improve riverine, riparian and wetland habitat in the Deschutes watershed, primarily as a measure to improve conditions for salmonids. However, projects implemented through the fund and through the Lower River Implementation Plan would also benefit terrestrial resources.

FS preliminary 4(e) condition no. 18 would link the riparian habitat restoration and management element of the terrestrial resources management plan to FS preliminary 4(e) condition no. 6, which addresses fish habitat (section 3.6.2, *Environmental Effects and Recommendations,* in *Aquatic Resources*). FS preliminary 4(e) condition no. 18 provides for the Joint Applicants' acquisition (in fee title or via conservation easement) of a minimum of 145 acres of riparian habitat. Under this condition, the Joint Applicants would manage acquired lands to achieve "good condition," defined as 80 percent site potential, based on BLM's proper functioning condition (PFC) assessment process (BLM, 1998) or another current riparian classification system. Depending on habitat values of lands acquired, FS preliminary 4(e) condition no. 18 could result in acquisition of up to 492 acres of riparian habitat.

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FS preliminary 4(e) condition no. 18 and BLM preliminary 4(e) condition no. 28 both specify that the riparian habitat restoration and management element of the terrestrial resources management plan should include measures to manage shoreline wood. We assume that the use of wood as part of shoreline planting projects would be coordinated with BIA (preliminary 4[e] condition no. 11, regarding development of a large woody debris plan (section 3.6.2, *Environmental Effects and Recommendations*, in *Aquatic Resources*) and with stabilization projects identified as part of the shoreline management plan (section 3.3.2, *Environmental Effects and Recommendations*, in *Geology and Soils*).

BIA preliminary 4(e) condition no. 12 specifies that the Joint Applicants develop and implement a wildlife habitat compensation plan to restore, conserve, and/or acquire wildlife habitat in sufficient quality and quantity to address the ongoing project effects on vegetation and wildlife habitat on the Warm Springs Reservation. The plan would identify procedures including criteria for selecting or restoring habitat and petitioning the Commission to include parcels acquired for this purpose within the project boundary within 1 year of acquisition. According to this plan, the Joint Applicants would restore, conserve, develop, and/or acquire wildlife range; riparian areas suitable for nesting of all bird species; wildlife passage areas to minimize project-related impediments to wildlife movement; or habitat with biological resources of cultural importance. Under this condition, the Joint Applicants would consult with the Tribes to assess the values of existing riparian and wetlands habitat in the project area, using the Tribes' mitigation policy, to ensure that they provide adequate mitigation for the 78 acres of riparian habitat and 18 acres of wetlands that were inundated on Tribal lands. Depending on habitat values, BIA recommends a replacement ratio of 2:1 or 3:1 for these habitat types.

As one of the items that should be included in the riparian habitat restoration and management section of the terrestrial resources management plan, BLM indicates that its preliminary 4(e) condition no. 28 would apply to 82 percent of the 145 acres (minimum) of riparian habitat that would be acquired for fish habitat compensation under BLM preliminary 4(e) condition no. 18. BLM preliminary 4(e) condition no. 28 calls for monitoring, and if objectives are not met, purchase of additional riverine and riparian habitat.

The Tribes' BNR recommends the Joint Applicants acquire at least 4,000 acres, but no more than 19,000 acres, in addition to the approximately 10,800 already purchased. The Tribes' BNR believes a replacement ratio of 3:1 or 5:1 is needed to mitigate for the effects of inundation on all habitat types (e.g., uplands, wetlands, riparian, and unique habitats). According to this recommendation, the Joint Applicants would manage these lands in perpetuity under the conditions of any new license issued, or would transfer the lands to public ownership.

The ODFW originally made a recommendation similar to the riparian habitat restoration and management component of FS preliminary 4(e) condition no. 18. ODFW

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now recommends implementation of the Pelton Round Butte Fund as a means of acquiring and enhancing additional riverine, riparian, and wetland habitat in the Deschutes basin.

According to ODFW, within 5 years of issuance of any new license, the Joint Applicants would fund and implement the off-site wetland habitat improvement projects identified in the Final Joint Application Amendment at Fly Lake, Potter Springs and Burnt Snag Pond. Within 3 years of issuance of any new license, the Joint Applicants would fund and implement a riparian feasibility study, including planting trees and shrubs on the reservoir shorelines, with propagation and planting to continue for 10 years and monitoring to continue through the term of any new license issued. ODFW recommends the Joint Applicants coordinate these efforts with adjacent landowners. ODFW also recommends the Joint Applicants investigate opportunities to acquire wetlands that may be associated with parcels that are to be purchased for riverine or riparian enhancement.

Our Analysis

Lake Simtustus currently supports about 10 acres of wetlands and 50 acres of riparian habitat. The existing license allows a maximum drawdown of 4 feet below full pool during the summer and 7 feet below full pool during the remainder of the year, but project operations do not typically require drawdowns of more than about 3 feet. Surface elevations typically vary about 1 foot from day to day, but variations can exceed 3.5 feet as much as 25 percent of the time.

Under current conditions, Lake Billy Chinook supports about 8 acres of wetlands and about 26 acres of riparian habitat. The current license allows the project operators to draw down Lake Billy Chinook by 85 feet during the winter; however, it is usually drawn down about 10 feet during the fall and winter. Daily fluctuations are about 1 foot.

There is no seasonal drawdown of the Reregulating reservoir. Daily fluctuations are about 20 feet, with 27 feet being the maximum. Despite these dramatic fluctuations, the Reregulating reservoir supports about 20 acres of wetlands and about 66 acres of riparian habitat.

Although some habitat improvements may be slowly gained over a long period by reducing the amplitude of peaking fluctuations, the effects of the proposed changes in operation would be very similar to current conditions. Fluctuations in water surface elevation would continue to directly affect aquatic furbearers, nesting waterfowl, and amphibians and would indirectly affect them through the effects of reservoir operations on vegetation.

We anticipate no substantial increase in wetland or riparian habitats associated with the project reservoirs during the term of any new license issued. The plants best

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adapted to the stress imposed by daily fluctuations and seasonal drawdowns are often invasive non-natives. We note that the species with the highest survival rate of all PGE's test plantings to date is an invasive non-native species, the Russian olive. It may be difficult to establish and maintain functional stands of native trees, shrubs, and herbaceous plants under existing conditions. An arid climate, droughty soils, and steep and rocky slopes around most of Lake Simtustus and Lake Billy Chinook would also continue to limit the development of these native cover types. Although topography and soils are more conducive to plantings around the Reregulating reservoir, daily fluctuations of 20 feet would continue to limit development of these native cover types and would be more likely to continue to support Himalayan blackberry, another invasive, non-native species.

Because enhancement of onsite riparian habitat and wetlands would continue to be limited by ongoing project operations, we conclude that the Joint Applicants should implement offsite improvements of these habitat types. As described in section 3.7.2.1, *Habitat Acquisitions and Proposed Terrestrial Resources Management Plan*, we recommend incorporation of the jointly owned lands acquired for habitat enhancement into the project boundary to ensure that they are protected and managed for wildlife through the term of any new license issued. These parcels would include approximately 50 acres of riparian and wetland habitat, in addition to 180 acres of riparian and wetland habitat that have established near the reservoirs. The Joint Applicants' contributions to the Deschutes Basin Land Trust and Deschutes Resource Council have resulted in the protection of an additional 145 acres of bog/meadow complex and 1.5 miles of riparian habitat at the Camp Polk Meadow Preserve, and 5 acres of wetland habitat and about 1 mile of riparian habitat at Alder Springs, both located in the Why-chus Creek basin. We conclude that a separate plan to acquire more riparian and riverine habitat would duplicate these efforts and would not provide substantially greater benefits for wildlife than those that should be achieved by implementation of riparian protection measures administered by Oregon's Departments of Water Resources, Forestry, and Fish and Wildlife. Parcels to be included as part of the Terrestrial Resources Management Plan represent blocks of habitat, rather than narrow stream corridors, and many are adjacent to federal or state lands that are also protected from development and disturbance. Contribution to this network of parcels would provide a broad range of benefits for wildlife that use shrub-steppe habitat, cliffs, and riparian habitat, as well as those that depend on flowing water. Because of the substantial benefit provided by these measures, we do not recommend the additional measures specified in FS preliminary 4(e) condition no. 18 and BLM preliminary 4(e) condition no. 28 and recommended by ODFW. However, acquisition and protection of additional riverine, riparian, and wetland habitat that may be funded through the Pelton Round Butte Fund or the Lower River Implementation Plan would contribute to regional benefits for terrestrial resources.

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3.7.2.3 Roads and Proposed Recreational Enhancements

Several participants in the relicensing process identified a need to manage roads to reduce disturbance to wildlife, especially in deer winter range. The effects of recreation, including boating, waterskiing, and activities at established and dispersed recreational sites around the reservoirs, were also identified as concerns. Disturbance has the potential to interfere with breeding, feeding, resting, and movement. The Joint Applicants' recreational studies indicate that recreational levels have increased substantially over the term of the current license, and the effects that further increases might have on raptors during the term of any new license issued were identified as being of particular importance. In the following text, we discuss road management, and potential project effects on the golden eagle, prairie falcon, and osprey. Section 3.8, *Federally Listed Threatened and Endangered Species*, provides discussion of project effects on the federally listed bald eagle.

The Joint Applicants have closed 13 miles of roads as part of the travel and access management plan. The Summary of Recreation, Land Use, and Aesthetic Measures, filed on December 29, 2003, identifies 11.55 additional miles of FS/BLM roads on federal lands near Canadian Bench, Eldorado Flats, Balancing Rocks, Fly Creek, and the Peninsula that would be closed, obliterated, and/or decommissioned. These road segments are adjacent to or cross jointly owned lands that would be incorporated into the project boundary, if approved by the Commission, or receive project-related use. The summary also calls for the Joint Applicants to continue participating with the Crooked River National Grasslands, BLM, County, and adjacent landowners in seasonal road closure programs.

To help minimize the effects of recreation on terrestrial resources, the Joint Applicants conducted a riparian development suitability analysis to identify where recreational activity or development in the project area might conflict with wildlife, vegetation, or sensitive habitats. The Joint Applicants propose to make GIS mapping available to the agencies and the Tribes, based on the results of this study, for use in future recreation planning, and to provide funding for a half-time GIS position for the first 15 years of issuance of any new license. The Joint Applicants propose to provide funding for additional law enforcement personnel to help prevent unintentional disturbance or intentional harassment of wildlife or sensitive habitats.

To evaluate the effects of recreation or other habitat disturbances on wildlife, the Joint Applicants propose to continue monitoring annual nesting productivity of golden eagles and prairie falcons that nest in the project area, and to continue monitoring osprey nesting productivity every other year. The Joint Applicants have also proposed to provide funding for an eagle protection study, which could be used to investigate the potential effects of disturbance on bald or golden eagles.

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FS preliminary 4(e) condition no. 18 recommends that the Joint Applicants close and decommission all unnecessary roads on lands acquired for habitat enhancement within 5 years of issuance of any new license, including several specific road segments totaling 21 miles. In addition to closing these roads, the Joint Applicants would develop a mechanism to share costs or provide funding to FS at 3- to 5-year intervals through the term of any new license issued to manage road closures. According to this condition, the Joint Applicants would contribute funds to a county or state law enforcement agency to monitor and enforce road closures during the winter.

BLM preliminary 4(e) condition no. 28 calls for the same road closures the Joint Applicants propose, but also specifies that the Joint Applicants should close and decommission any BLM roads within the project boundary that are determined by the Terrestrial Resources Work Group to be unnecessary for travel and access.

ODFW recommends that the Joint Applicants fund one additional land-based law enforcement officer and two part-time marine or law enforcement personnel. The funding should cover all costs associated with these personnel, including vehicles, equipment and supplies. ODFW recommends that one of the seasonal officers should be attached to the Fish and Wildlife Division of the Oregon State Police, or have certification to coordinate with other enforcement programs. The personnel identified in this recommendation would help to ensure that recreational activities are consistent with habitat enhancement goals for the properties, according to guidance that would be provided in the terrestrial resources management plan and recreational resources management plan.

FS preliminary 4(e) condition no. 18, BLM preliminary 4(e) condition no. 28, FWS, the Tribes' BNR, and ODFW all recommend annual monitoring of bald and golden eagles and prairie falcons, and monitoring every 3 years or in 2 of 5 years for osprey. FS preliminary 4(e) condition no. 18 and the FWS recommend development of a raptor protection strategy and species-specific monitoring plans to address potential project effects. The Tribes' BNR indicates that the trust fund described earlier as part of the terrestrial resources management plan would be needed to deal with concerns that may result from increases in disturbance in the project area in the future.

Our Analysis

The major recreational facilities associated with Lake Simtustus and Lake Billy Chinook are Cove Palisades State Park, Round Butte Overlook Park, Chinook Island Day Use Area, Pelton Park, Indian Park, the upper and lower Deschutes day-use areas and Campground, and two FS facilities along the Metolius River arm. A parking area, two overlook structures, and an access trail are the only facilities at the Reregulating reservoir. The Joint Applicants have documented over 50 dispersed recreational sites

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around the reservoirs. We describe existing recreational resources in detail in section 3.9.1, *Affected Environment*, in *Recreational Resources*.

Survey findings reported in the Final Joint Application Amendment do not indicate that recreation in the project area measurably affects golden eagles, prairie falcons, or osprey. The surveys indicate that the number of osprey nesting in the vicinity (i.e., within about 1.25 miles of the project reservoirs) increased from 9 in 1991 to 33 in 1998. The number of golden eagles nesting in the vicinity has remained about the same, with about 12 to 15 territories being occupied each year. The number of prairie falcons nesting in the cliffs and rimrock around the reservoirs and along the river upstream of the project has varied from year to year since 1993 (in part, perhaps, because nests are difficult to see unless adults are present), with as many as six occupied nests in 1994 to as few as one occupied in 1997 and 1999.

The Joint Applicants propose a number of upgrades to improve reservoir access and recreational quality. They do not propose any measures they believe would increase the total number of visitors in the vicinity of the reservoirs or at FS-managed campgrounds or day-use areas in the Metolius River arm. We discuss the Joint Applicants' proposal; the agencies' and the Tribes' terms, conditions, and recommendations; and staff recommendations regarding upgrades in section 3.9.2, *Environmental Effects and Recommendations,* in *Recreational Resources*.

Work at established recreational sites would cause minor noise disturbance during construction. Because work would occur in areas that have already been developed for recreational use, additional work would likely cause only a small incremental increase in noise and traffic.

Work to either obliterate or formalize existing dispersed recreational sites would have a higher potential to cause disturbance, because current access as well as use of the sites is irregular, and wildlife using these areas may not have habituated to human activity. This situation illustrates the need for coordination between terrestrial resource management and recreational resource management. As part of the terrestrial resources management plan, we recommend the Joint Applicants consult with the agencies and the Tribes to evaluate the need for timing restrictions and/or buffer restrictions to prevent disturbance.

Long-term effects of recreational enhancements on wildlife are more difficult to predict. The Joint Applicants indicate that none of their proposed measures would increase recreational capacity, and we agree that most improvements would be directed toward formalizing and enhancing existing facilities. However, the recreational needs assessment indicated a demand for additional trails for hiking and mountain biking in the project area, and the Joint Applicants have proposed to provide funding for trail development. The level of disturbance to wildlife would depend to a large degree on

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where the trails are located and how they are managed, but this type of disturbance—dispersed and irregular—has a high potential to disturb a variety of wildlife species.

We also anticipate that on-water use (e.g., boating, fishing, waterskiing, and using personal watercraft) would continue to increase through the term of any new license issued. Boating has been identified as one of the most disturbing kinds of activity to nesting raptors, although it is important to note that raptor responses to any kind of disturbance are highly variable.

We recommend the road closures,[63] consistent with the Joint Applicants' proposals, because this measure would help to minimize disturbance to wildlife, especially to deer on winter range, and would help to reduce disturbance to vegetation. However, the Commission has no authority over segments of FS/BLM roads that are located on federal land, and cannot require the Joint Applicants to manage them. We would encourage the Joint Applicants to identify, in consultation with the Terrestrial Resources Work Group, other options for addressing the closure of such roads.

We agree with FS preliminary 4(e) condition no. 18 and the ODFW recommendation that additional law enforcement is needed, but in our view, the Joint Applicants' proposal to provide funding for one full-time law enforcement position through the term of any new license issued should be adequate to address concerns about monitoring and enforcement of measures to protect plants, wildlife and sensitive habitats, including road closures.

We recommend that within 1 year of issuance of any new license, the Joint Applicants consult with the agencies and the Tribes to design and implement nesting productivity surveys for golden eagles and prairie falcons on an annual basis, and for ospreys every other year. We recommend the Joint Applicants provide the agencies and the Tribes with an annual report of the monitoring results and meet with the agencies and the Tribes annually to determine whether specific protective measures are needed. Implementation of these recommendations would provide important information about population trends and a mechanism for addressing project-related concerns, if any are identified. These recommendations would be consistent with the FWS and ODFW recommendations.

We do not recommend the Joint Applicants monitor all fledgling foraging areas considered vulnerable to disturbance, as indicated in FS preliminary 4(e) condition no. 18 and BLM preliminary 4(e) condition no. 28, because we think the information needed to

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[63] Closures (gating, obliteration and decommissioning) proposed by the Joint Applicants in the Final Annotated Outline for the Terrestrial Resources Management Plan would affect FS Road 6520-140; FS Roads 6670-060 and -100; 6510-160, -100, and -020; and 6400-400, -410, -420, -430, and -460; BLM Road 6400-460; FS Road 1170-800 and -890; and FS Road 1170-960. These road segments total 11.55 miles.

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manage disturbance should be available through the recreation development suitability analysis and GIS mapping, recreational resource management and shoreline management planning activities, the threatened and endangered species element of the terrestrial resources management plan, and annual nesting and productivity monitoring. A more detailed, closely focused study of fledgling behavior and response to disturbance would be an appropriate use of the funding the Joint Applicants have agreed to provide for the general purpose of studying protection needs of bald or golden eagles in the project area. We do not recommend the Joint Applicants include monitoring of sites of potential disturbance as part of the overall raptor monitoring program, because the results of the annual nesting and productivity monitoring should be sufficient to identify concerns, which would then be managed within the threatened and endangered species element of the terrestrial resources management plan.

3.7.2.4 Shoreline Management

Participants in relicensing identified two aspects of shoreline management as being important considerations in addressing terrestrial resources. Reservoir operations contribute to shoreline erosion, with subsequent loss of riparian vegetation. Recreational activities that are concentrated along the reservoir shoreline also contribute to shoreline erosion, and can cause disturbance to a number of wildlife species that depend on wetlands, riparian habitat, and uplands cliffs and talus slopes.

The Joint Applicants' proposed shoreline management plan is discussed in more detail in section 3.3.2, *Environmental Effects and Recommendations,* in *Geology and Soils*. Section 3.10.2, *Environmental Effects and Recommendations,* in *Land Use and Aesthetic Resources*, addresses erosion control at priority sites. It also includes a permit system to manage shoreline development, such as installation of new docks or other in-water structures.

The Joint Applicants propose specific measures to reduce or limit the effects of dispersed recreation on shoreline stability and vegetation at Lake Billy Chinook and Lake Simtustus. Some sites would be obliterated and restored to stable, more natural conditions, while others would be hardened to prevent further erosion. To help manage potential disturbance to wildlife around the reservoirs, the Joint Applicants propose to provide funding for additional law enforcement, as discussed in section 3.9.2, *Environmental Effects and Recommendations,* in *Recreational Resources*.

Each of the agencies (FS, BIA, BLM, and ODFW) submitted preliminary terms, conditions, or recommendations relating to shoreline management. We summarize each of these in section 3.3.2.1, *Erosion Control*, in *Geology and Soils*.

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Our Analysis

We agree with the Joint Applicants' proposed approach to developing a shoreline management plan that would also address shoreline erosion, because management of shoreline development and recreational activities would be key in repairing existing erosion sites and reducing the potential for future erosion. An extensive shoreline erosion inventory has already been completed and the Joint Applicants propose to consult with the agencies and the Tribes to: (1) assess the cause of erosion at each site; (2) select treatment methods for each site; and (3) prioritize sites for implementation. Implementing erosion control measures as part of the shoreline management plan would help to ensure that the measures would be consistent with other resource objectives (e.g., protection measures for bald eagles and wetland plant communities). For this reason, we do not recommend development of a separate erosion control plan, as described under BIA preliminary 4(e) condition no. 14, BLM preliminary 4(e) condition no. 25, and as recommended by FWS. To minimize duplication of planning efforts, we do not recommend establishment of a Shoreline Work Group; otherwise, our recommendation would be consistent with the ODFW recommendation.

We agree with FWS and ODFW that the shoreline management plan should be closely integrated with the terrestrial resourees management plan and recreational resources management plan. Designing erosion control measures to also improve native plant diversity and wildlife habitat potential would maximize the terrestrial resource benefits of such efforts.

We agree, as recommended in BLM preliminary 4(e) condition no. 25, that the "Properly Functioning Conditions Assessment" (PFC) process (BLM, 1998) could serve as a useful reference in developing a shoreline management plan, because it would provide a systematic approach to evaluating and prioritizing erosion sites. Whether the PFC assessment or a similar process is used, we recommend that the Joint Applicants, agencies, and the Tribes develop objectives, performance standards, and monitoring protocols that reflect site-specific conditions, including the constraints of reservoir operations and competing land uses.

As discussed in section 3.9.2.2, *Carrying Capacity and User Conflicts*, in *Recreational Resources*, we agree with the Joint Applicants that a new position should be established to coordinate the implementation of recreation, land use, and aesthetic measures. We agree with the Joint Applicants and ODFW that close coordination with local governments is needed to develop management guidelines for private shoreline development. The success of such measures would depend to a large degree on local support; for this reason, we recommend that the Joint Applicants work with local residents, as well as local governments, to design and implement them, as part of the shoreline management plan.

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3.7.2.5 Pelton Fish Ladder Crossings and Escapes

Because of its location and design, the Pelton fish ladder has a high potential for blocking wildlife movement between the canyon rim and the reservoir. The potential for entrapment is also high, especially at high flows. Project records show that wildlife species entrapped in the fish ladder have included chorus frogs, mallard ducks, Canada goose goslings, and mule deer. The ladder is not fenced, with the exception of horizontal chain-link over the lower 0.4 mile to protect juvenile salmon, and there are no escape ramps.

To improve crossing opportunities for wildlife, the Joint Applicants recently constructed one new bridge to provide additional opportunities for safe passage for large animals. As described in the Final Annotated Outline for the Terrestrial Resources Management Plan, the Joint Applicants would construct five low-tech overhead crossings, and would modify the small culverts passing underneath the fish ladder so that the ends are flush with the ground. To improve opportunities for animals to escape from the ladder, the Joint Applicants recently constructed two escape ramps and propose to install a diversion device in the lower end of the dirt canal section. The Joint Applicants would continue to monitor entrapment and mortality in the fish ladder to determine if additional measures are needed to protect wildlife. The Joint Applicants would monitor wildlife use of the five overhead and six culvert crossings for 2 years following their installation. If the results of the monitoring indicate they are effective, the Terrestrial Resources Work Group would determine whether additional small animal crossings should be installed.

BLM preliminary 4(e) condition no. 30b, the FWS, ODFW, and FS agree with these measures. BLM preliminary 4(e) condition no. 30b specifies that one of the escape ramps should be located on BLM land. The FWS and ODFW recommend that the Joint Applicants monitor the effectiveness of the crossings and escapes. The FS recommends that the Joint Applicants should use the effectiveness monitoring process that the BLM developed, and if mortalities increase to levels deemed unacceptable by BLM, the Joint Applicants should construct additional crossings and/or escapes. The ODFW recommends that the Joint Applicants consult with the Terrestrial Resources Work Group to develop an appropriate monitoring plan. If the Terrestrial Resources Work Group determines that mortalities increase over existing conditions, ODFW recommends that the Joint Applicants consult with the Terrestrial Resources Work Group to identify and implement additional protection measures.

In addition to constructing modifications to the crossings, BIA preliminary 4(e) condition no. 13 states that the Joint Applicants should develop additional protection measures if the proposed alterations do not reduce entrapment or improve passage, modify the ladder if operational changes increase the risk of entrapment, or remove the ladder if and when it is no longer needed (i.e., if alternative fish facilities are constructed).

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Our Analysis

There are now six bridges (including two constructed for vehicle access) over the Pelton fish ladder that provide opportunities for wildlife to cross the ladder. The Joint Applicants' track studies indicate that a number of species use the bridges, including deer, coyotes, bobcats, raccoons, mink and river otters. Smaller mammals (e.g., porcupines, ground squirrels, rabbits, and mice) and reptiles were also noted to use the bridges.

One large culvert and six small culverts ranging in diameter from 12 to 23 inches provide potential passageways under the fish ladder for small mammals, reptiles and amphibians. However, the lower ends of the six small culverts extend well out from the slopes below them, and would only allow down-slope movement to most such species, with a rough landing.

The Joint Applicants report that the additional bridge and two escape structures identified by the agencies and Tribes as being needed to improve wildlife safety were constructed in 2001. Because these actions fulflll the intent of the recently filed terms, conditions, and recommendations, we conclude that no additional bridges and no additional escape structures are needed. We also agree with the Joint Applicants' proposal to install a diversion device to prevent animals that enter the dirt section of the ladder from being swept into the downstream concrete sections, which would also be consistent with terms and preliminary conditions described above. We support the Joint Applicants' agreement with the agencies and the Tribes to install five narrow wooden walkways or similar structures for small animals. Cutting the ends of the existing culverts so that they are flush with the ground and maintaining them in usable condition would provide six additional crossings for small animals.

The Joint Applicants propose to include the Pelton Fish Ladder Wildlife Protection Strategy as one of the elements of the terrestrial resources management plan and would continue to monitor entrapment and mortality, as well as to inspect and maintain the crossings. We have no objection to the Joint Applicants' agreement to monitor the effectiveness of the five low-tech overhead and six culvert crossings for 2 years and to install additional crossings if the Terrestrial Resources Work Group determines it would be beneficial. As part of this monitoring, the Joint Applicants should regularly monitor and maintain the culverts and overhead crossings to ensure they are safe and passable, throughout the term of any new license issued. The Joint Applicants should continue to monitor and document wildlife injuries or mortalities in the canal within 5 years of installation of the wildlife escapes. At the end of this period, the results of the survey should be reported to the Terrestrial Resources Work Group, and determine whether further action is needed.

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3.7.2.6 Vegetation Management

Two closely related aspects of vegetation management were identified as being important in the project area. These include strategies to protect and improve upland habitats, focusing on big game winter range; and monitoring and control or containment of noxious and invasive non-native weed species.

FS and BLM indicate that many of the federally owned parcels of big game winter range in the project vicinity are adjacent to or surrounded by private lands. They are concerned that increases in development over time would reduce the value of these lands for wildlife. The quality of winter range is one of the most important factors affecting big game populations in Oregon (ODFW, 2002a).

Noxious weeds are a growing threat to Oregon's environment because of their potential to degrade native plant communities, outcompete rare species, reduce wildlife habitat values and reduce the productivity of agricultural lands (ODA, 2001). The number of state-listed noxious weeds in Oregon increased from 60 in 1990 to 99 in 2000. The Joint Applicants' survey documented the occurrence of 11 noxious weeds and invasive non-native plants in the project area.

The Joint Applicants proposed in the Final Joint Application Amendment to develop, fund and implement a vegetation management strategy as part of the terrestrial resources management plan. This program would cover lands within the project boundary and the jointly owned lands. The primary focus would be to improve forage conditions (which could include measures such as removing, containing or controlling noxious weeds or invasive plants, seeding or mechanical treatment to improve regeneration of preferred forage species) and maintain a desirable level of interspersion of forage and cover areas.

The Joint Applicants also propose to develop, fund, and implement an exotic and invasive vegetation management program as part of the terrestrial resources management plan. This program would cover lands within the project boundary, jointly owned lands, recreational facilities associated with the project reservoirs and specific segments of FS roads.[64] The Final Annotated Outline for the Terrestrial Resources Management Plan, filed on December 29, 2003, indicates the Joint Applicants would include some BLM and FS recreation sites and trails (110 acres of land administered by BLM and 287 acres of land administered by USFS) in the exotic and invasive vegetation management plan. Under this plan, the Joint Applicants would also be responsible for weed management along a 2.5-mile section of the M-110 road from Round Butte dam; the 2.3-mile spur

[64] In the Final Annotated Outline for the Terrestrial Resources Management Plan, the Joint Applicants propose to manage weeds along some road segments that are not within the project boundary, because they receive project-related use. These FS or BLM roads include 1170; 35; 63; 64; 6400-400 -410, -420, -430 and -460; 65, 6510-160; 6520; 6670; and 6620. These road segments total 13.35 miles.

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road looping northeast from the M-110 road; and the 0.8-mile road that provides access to Warm Springs Power Enterprises.

The weed program would include provisions for: (1) inventory and mapping infestations; (2) annual monitoring to detect and eradicate existing and new infestations; (3) control, suppression or containment of large-scale infestations; (4) maintaining native plant composition and revegetating weed-infested and disturbed sites; and (5) limiting exotic and invasive plant dispersal and minimizing soil disturbance. The program would also include coordination with the agencies and the Tribes, and completion of any necessary NEPA documentation.

FS preliminary 4(e) condition no. 18 and BLM preliminary 4(e) condition no. 28 indicate they agree with the Joint Applicants' proposals for vegetation management. FS and BLM also indicate agreement with the Joint Applicants' proposals regarding management of exotic and invasive vegetation, but state that the Joint Applicants should monitor and manage weeds within 150 feet of roads, within 50 feet of trails, and within 300 feet of campgrounds that FS believes are project related. FS and BLM identify 13 to 15 miles of roads and 4 established campgrounds, 4 day-use areas, the Tam-A-Lau Trail, and several unnamed trails associated with dispersed recreational sites and campgrounds they believe should be included in the weed plan.

The Tribes believe funding for management of invasive vegetation should be increased to $85,000 per year for the first 10 years, and then re-evaluated, based on the success of control efforts, as indicated by monitoring results.

The ODFW recommends that within 2 years of issuance of any new license, the Joint Applicants should consult with the Terrestrial Resources Work Group and other stakeholders to develop and implement an exotic and invasive vegetation management program on jointly owned lands, lands within the project boundary, at recreational facilities adjacent to project reservoirs, and along some BLM and FS roads near the project. ODFW's recommendation reflects the Joint Applicants' proposal, but also specifies that the program should provide for inventory and mapping within 1 year of issuance of any new license.

Our Analysis

Measures the Joint Applicants have implemented and propose to implement to improve vegetation on jointly owned parcels include seeding bitterbrush, reducing the cover of juniper, and closing roads. We agree with the Joint Applicants' proposal to continue these measures and integrate them into a vegetation management strategy that would be part of the terrestrial resources management plan. We also recommend the Joint Applicants evaluate opportunities for improving habitat through vegetation manipulation on all lands within the project boundary, and, in particular, along the power line ROWs that remain within the boundary. Our recommendations regarding vegetation

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management would be consistent with FS and BLM preliminary conditions. Because they would not apply to the area of potential effect (APE) defined by the Tribes' BNR, they would not be consistent with the recommendations of the Tribes' BNR.

Based on the Joint Applicants' surveys, most occurrences of noxious weeds are along project access roads, around powerhouses, and at recreational facilities, but several species are widespread on the Metolius Mule Deer Winter Range and in the region. We recommend the Joint Applicants consult with the agencies and the Tribes to develop a plan to monitor and manage exotic and invasive weeds, as proposed. Because we anticipate that successful weed control would require a cooperative effort by all landowners and land managers around the reservoir, we recommend the Joint Applicants also consult with local residents in developing the exotic and invasive weed management plan.

The weed plan should cover lands within the project boundary, jointly owned lands, recreational facilities associated with the reservoirs, and specific segments of FS/BLM roads, as identified in the Joint Applicants' proposal (see footnote 62). As mentioned in section 3.7.2.3, *Roads and Proposed Recreation Enhancements*, the Commission does not have the authority to require the Joint Applicants to manage roads or recreation sites on federal or Tribal lands. However, we have no objection to measures that would provide for the Joint Applicants to manage weeds on 397 acres of federal lands administered by BLM or FS and along three road segments on the Warm Springs Reservation. We encourage the Joint Applicants to consult with the Terrestrial Resources Work Group to identify alternatives for management of weeds on these lands (e.g., cost-sharing).

The vegetation management plan should provide detailed accounts of species that have been documented in the project vicinity, and quantify and map the distribution and abundance of each species. The plan should also describe and evaluate management strategies, define control intensities that meet management objectives, present an integrated treatment scenario, including plans for long-term monitoring, and detail a plan for action, showing a schedule for implementation, funding requirements, and mechanisms for annual review and revision of the plan to incorporate information collected during monitoring efforts.

We further recommend the Joint Applicants incorporate noxious weed monitoring into other programs (i.e., erosion control, shoreline management, and recreation management) that it would be implementing to maximize the potential for detection and early treatment. Noxious weed monitoring should be included as an element within the erosion monitoring program, because eroding soils are considered high-probability areas for the establishment of invasive, non-native plants. It should also be addressed in the shoreline management plan, as a set of best management practices that should be implemented on a project-wide basis. Noxious weed monitoring should also be

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incorporated into the recreation resources management plan to provide education for visitors about how to reduce the risk of infestation and spread.

3.7.2.7 Transmission Line Management

Depending on their design and location, transmission lines could pose a risk of collision or electrocution to raptors, waterfowl, or other birds (APLIC, 1994; APLIC and Raptor Research Foundation, 1996). Participants in the relicensing process identified transmission line effects on raptors as a wildlife concern.

As discussed in section 2.0, the Commission determined that the only lines over which the Commission has jurisdiction are the 7.9-mile long, 230-kV transmission line connecting the Pelton powerhouse to the Round Butte switchyard; and a 200-foot-long, 69- kV lines extending from the Reregulating powerhouse to the step-up transformer in the Pelton switchyard.

The Joint Applicants propose to develop a transmission line ROW management plan within 1 year of issuance of any new license. The plan would include strategies for managing vegetation, soil, hydrology, sensitive species and habitats, exotic and invasive vegetation, and access. However, the annotated outline for the transmission line ROW management plan presented in the Final Joint Application Amendment indicates the plan would cover only the 7.9-mile Pelton-Round Butte transmission line.

According to BIA preliminary 4(e) condition no. 13, the Joint Applicants would develop a transmission line ROW management plan that would include measures to protect raptors based on Avian Power Line Interactions Committee (APLIC) guidelines, procedures for dealing with raptor nests constructed on transmission towers or power poles, road closures that may be needed during nesting, and permanent road closures where feasible. BIA preliminary 4(e) condition no. 13 also calls for the Joint Applicants to develop procedures for managing noxious weeds consistent with those the Tribe implements; standards for vegetation trimming, removal, and control consistent with the terrestrial resources management plan; standards for road maintenance and procedures for obliteration of roads; and provisions to maintain aesthetic values.

The Joint Applicants would develop a plan to minimize the risk of avian electrocution and collision with powerlines. FWS recommends that any pole involved in a fatality and all new or rebuilt poles should conform to guidance provided by APLIC (1994). Also, the Joint Applicants should consult with the agencies to determine whether there is a need to develop a Memorandum of Understanding specific to this project.

Our Analysis

The 7.9-mile-long, 230-kV Pelton-Round Butte transmission line does not likely represent a risk of electrocution, because the distance between conductors and between

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conductors and grounded hardware associated with lines carrying over 69 kV exceeds the wingspan of raptors and smaller birds.

Raptors and songbirds are not likely to collide with power lines in the project area; raptors have keen vision and both raptors and songbirds are agile in flight. The species most often involved in collisions are ducks, geese, and large waterbirds, such as great blue herons, where power lines cross rivers, reservoirs, wetlands, or flooded fields. These species are also less maneuverable in flight. However, the power lines that would remain within the project boundary do not cross any of the reservoirs, and the line running between the Pelton powerhouse and the Round Butte switchyard is located for most of its distance along the top of the canyon rim. For these reasons, we do not anticipate there would be a high risk of bird collisions with the lines.

Although we do not anticipate there would be a high risk of electrocution or bird collisions with the lines, we agree a plan is needed to minimize the risks. Within 1 year of issuance of any new license, we recommend the Joint Applicants consult with the Terrestrial Resources Work Group to develop and file a plan that includes provisions for: (1) inventory of existing lines and structures to determine whether redesign, retrofit, or replacement are needed; (2) implementation of any improvements that are needed to bring the lines and structures up to standards outlined by APLIC (1994, 1996); (3) a plan to monitor, document, map, and investigate any collisions or electrocutions that may occur; and (4) a schedule of surveys, reporting, and consultation. This recommendation is consistent with BIA preliminary 4(e) condition no. 13.

The vegetation management aspects of transmission line ROW management and noxious weed management should be incorporated into the vegetation management plan for the project, as described earlier in this section. Preparation of a separate plan for managing vegetation along with the transmission line ROW, either to improve wildlife habitat or to control or contain weeds, would be an unnecessary duplication of efforts already addressed in other elements of the terrestrial resources management plan.

3.7.3 Unavoidable Adverse Effects

Reservoir fluctuations would continue to limit the establishment of healthy riparian cover types around the margins of the project reservoirs. These fluctuations would continue to affect amphibians, aquatic furbearers, and nesting waterfowl.

3.8 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

3.8.1 Affected Environment

NOAA Fisheries provided information that one federally listed anadromous fisheries species, the middle Columbia River steelhead, occurs at the project (February 6,

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2003). The FWS indicates that the bull trout, a federally threatened species, occurs at the project. Based on information provided by FWS, federally listed wildlife species that may occur in the project area are the Canada lynx, the northern spotted owl, and the bald eagle (FWS letter, dated November 12, 2002).

3.8.1.1 Steelhead

Steelhead in the Deschutes River downstream of Pelton dam belong to the middle Columbia River steelhead Evolutionarily Significant Unit (ESU). This ESU was federally listed as threatened on March 25, 1999. The ESU extends from the Columbia River basin and tributaries, from Wind River in Washington and Hood River in Oregon up to (and including) the Yakima River in Washington. Steelhead from the Snake River basin are not included in the ESU. The listing determination includes only naturally spawned anadromous populations residing below impassable natural barriers; resident forms of rainbow trout are not included in the listing. NOAA Fisheries concluded that the Deschutes River hatchery stock (ODFW Stock 66) should not be considered part of the ESU, because it is not currently essential for its recovery. NOAA Fisheries had originally designated critical habitat for the middle Columbia River steelhead ESU that included all accessible stream reaches in the Columbia River tributaries (excluding the Snake River) between Hood River in Oregon and the Yakima River in Washington, and included the Deschutes River upstream to Pelton dam. However, on April 30, 2002, NOAA Fisheries withdrew the designation of critical habitat for this and 18 other steelhead ESUs.

Deschutes River steelhead are summer-run, entering the Columbia River in early summer and entering the Deschutes beginning in July and extending into August and September. Based on counts at Pelton dam, steelhead in the Deschutes River basin exhibit a variety of life history strategies and adults historically migrated upstream through the project area throughout the year, with peak upstream movements in July, late fall, and early spring. Spawning of wild steelhead in the Deschutes River basin downstream of the project occurs from March through May. Although some spawning occurs in the mainstem Deschutes, a high proportion of the spawning occurs in lower Deschutes tributaries. Although most steelhead stocks are capable of returning to the ocean after spawning (kelts) and migrating back upstream to spawn in subsequent years, this has not been documented in Deschutes steelhead.

After emergence from spawning gravels in spring or early summer, steelhead fry move to shallow-water, low-velocity habitats such as stream margins and low-gradient riffles and forage in open areas lacking instream cover. As steelhead grow larger, they tend to prefer microhabitats with deeper water and higher velocity as feeding locations. Steelhead overwinter in pools, especially low-velocity deep pools with large rocky substrate or woody debris for cover, including backwater and dammed water. Juveniles are known to use the interstices between substrate particles as overwintering cover. At

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the end of the freshwater rearing period, steelhead migrate downstream to the ocean as smolts, typically at a length of 15 to 20 centimeters (5.9 to 7.8 inches). Deschutes River steelhead smolts migrate through the lower Deschutes and Columbia rivers from March through June. Additional information about the steelhead fishery and population trends is provided in section 3.6.1.2, *Anadromous Fish Resources*, in *Aquatic Resources*.

3.8.1.2 Bull Trout

The Columbia River Distinct Population Segment (DPS) for bull trout was listed as a federally threatened species in June 1998. This DPS was also included in the November 1, 1999, listing for bull trout in the coterminous United States. The Columbia River DPS includes all populations occurring throughout the entire Columbia River basin within the United States, and all tributaries, excluding bull trout found in the Jarbridge River, Nevada. Local populations in the Deschutes River basin are included in this listing.

Bull trout can express four life-history patterns: resident, fluvial, adfluvial, and anadromous. Resident bull trout complete their entire life cycle in the cold natal headwater streams in which they spawn and rear, whereas migratory bull trout spawn in tributary streams where juveniles rear for 1 to 4 years before migrating either to a lake (adfluvial), a river (fluvial), or, in certain coastal areas, the sea (anadromous) where they mature. Anadromous forms have not been identified in Oregon. Migratory bull trout may use a wide range of habitats ranging from first- to sixth-order streams and varying by season and life stage. After several years of growth, and with the onset of maturity, adfluvial bull trout retrace their earlier migration back to their natal stream to spawn. In some systems, distances migrated between natal spawning stream and downstream rearing areas can be over 100 miles. Fluvial populations have been documented to become adfluvial when habitat conditions change (e.g., when a reservoir is created in a watershed). Resident and migratory life-history forms may be found together, and it is suspected that bull trout give rise to offspring that can exhibit either resident or migratory behavior.

Bull trout are late summer and fall spawners, typically spawning during periods of decreasing water temperature from August to November depending upon the area. Preferred spawning habitat consists of low-gradient headwater streams or mainstem reaches with extremely cold temperatures (5 to 9°C [41 to 48°F]), groundwater upwelling, and loose, clean gravel. Incubation lasts from 100 to 145 days, depending on water temperature. After hatching in March and April, juveniles may remain in the substrate for several weeks or longer prior to emerging in spring (March to May). Time from egg deposition to emergence may surpass 200 days. Bull trout growth varies depending on life-history strategy and associated temperature and prey availability. Resident adults range from 150 to 300 millimeters (6 to 12 inches) in total length, and

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migratory adults, which typically rear where forage is more abundant and temperatures are warmer, commonly reach 600 millimeters (24 inches) or more.

Critical habitat is currently proposed for bull trout only in the Columbia and Klamath River basins. Two critical habitat subunits are proposed for the Deschutes River basin. One proposed critical habitat unit is the lower Deschutes River core area, and the other is the currently unoccupied upper Deschutes River core habitat. The two areas are separated by Big Falls, a natural impassable barrier on the Deschutes River (RM 132). The proposed lower Deschutes critical habitat subunit includes approximately 358 miles of stream in the lower Deschutes River basin, including the Deschutes River confluence at the Columbia River, Pelton Reservoir, Lake Simtustus, and Lake Billy Chinook, and portions of the following basins: Warm Springs River, Shitike Creek, Crooked River upstream to Princeville, Metolius River and several tributaries including Whitewater River, Jefferson Creek, and Why-chus Creek. Local populations of bull trout that occupy this area include the Warm Springs, Shitike Creek, Whitewater River, Jefferson/Candle/Abbot complex, and Canyon/Jack/Heising/mainstem Metolius complex.

The Metolius River system and Lake Billy Chinook support a popular trophy fishery for bull trout. The majority of the large bull trout that spawn in the Metolius basin are adfluvial and use Lake Billy Chinook for rearing. Post-spawning adults normally move back to Lake Billy Chinook in the fall after spawning and feed on kokanee to regain their condition. In the lower Deschutes River basin (downstream of the Pelton Round Butte Project), spawning bull trout populations occur in Shitike Creek and in the Warm Springs River system. These are both west-side tributaries with significant perennial flow located on the Warm Springs Indian Reservation. From these two spawning and initial rearing areas, yearling and older bull trout distribute downstream into the mainstem Deschutes.

3.8.1.3 Canada Lynx

The Canada lynx was listed in 2000 as a threatened species. It is unlikely that Oregon supports a resident population of Canada lynx, but individuals may be present as transients from time to time (65 FR 16,052–16,086). Nine museum specimens collected prior to 1927 confirm they were present historically, but the lack of trapping records suggests they did not occur in large numbers.

Most lynx occurrences in the Pacific Northwest are associated with moist Douglas fir, spruce/fir, or fir/hemlock forests at elevations between about 4,900 and 6,500 feet in elevation (Ruediger et al., 2000). In north-central Washington, lynx also are associated with lodgepole pine forest between 4,500 and 7,000 feet msl. Wherever they have been studied in Canada or the United States, biologists have observed that lynx are strongly associated with snowshoe hares, and are most abundant where snowshoe hares are most abundant (Aubry et al., 1999). Lynx occurrences outside such habitats are rare.

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However, one Canada lynx was collected in Wallowa County in northeastern Oregon in 1964, in grassland habitat, and one was collected from Harney County in southeastern Oregon in 1993 (McKelvey, 1999). FWS recommends further evaluation of habitat on the Deschutes, Ochoco, and Malheur National Forests that could serve as a corridor between the Cascades and the Blue Mountains (FWS, 2001).

We conclude that the Canada lynx could be present in the project area occasionally as a transient, dispersing between potential habitat in the Cascades to the west and the Rocky Mountains to the east. The Pelton Round Butte Project area provides no suitable habitat for this species, due to low elevations and warm, dry cover types, even in forested areas along the Metolius River arm. Because no changes in project facilities or operations are proposed that would affect this species or its potential habitat, we conclude that relicensing the project would not affect the Canada lynx, and do not discuss the species further in this document.

3.8.1.4 Northern Spotted Owl

The northern spotted owl was listed as a threatened species in 1990 (55 FR 26,114–26,194), and FWS designated critical habitat (habitat that contains all the elements needed for conservation of a species, including space, food, water, cover, breeding, and rearing sites) in 1991 (57 FR 1,796–1,838). Critical habitat is located within the Metolius watershed in the Deschutes National Forest, extending to about 1 mile upstream of Monty Campground. As of 1996, the nearest spotted owl nest site in the project vicinity was located in critical habitat in the Deschutes National Forest about 6 miles west of Monty Campground and about 8 miles from the nearest proposed project boundary at Fly Lake (FS, 1996).

As of 2001, Deschutes National Forest reported 43 known owl nest sites in the forest (DNF, 2002). Of the 29 surveyed in 2001, 10 were occupied. Plans for further investigation of all known active and historical nest sites and nest stands in the Deschutes National Forest are underway.

The northern spotted owl is strongly associated with multi-storied mature and old-growth conifer forests for nesting. However, the northern spotted owl may use younger conifer or mixed stands for roosting, foraging, or dispersal (RFD habitat), and the Tribes' BNR biologists have documented juveniles during the winter near Lake Billy Chinook. During pre-licensing consultation, Deschutes National Forest and the Tribes' BNR indicates their surveys adequately covered suitable habitat and showed no owl pair activity centers in the project vicinity; for this reason, PGE did not conduct field surveys for spotted owls.

PGE mapped approximately 1,000 acres of mixed conifer forest in the study area, primarily in the Metolius River arm, that could provide suitable RFD habitat. The current condition of this habitat is unknown. Over 23,000 acres of forest in this vicinity burned

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in the Eyerly Fire during the summer of 2002. The fire burned at high intensity during its early stages, especially in the Spring Street and Fly creek drainages, and with moderate to high intensity in the Bean Creek drainage (FS, 2002). The effect of the fire on RFD habitat would almost certainly be negative in the short term, due to immediate mortality of fire-killed trees and future losses due to heat stress and insect damage (Gaines et al., 1995). Habitat quality could improve over the long-term, depending on soils, slope, aspect, stand characteristics, and stand restoration.

3.8.1.5 Bald Eagle

Because of the success of recovery efforts throughout the United States, FWS proposed in 1999 to remove the bald eagle from the list of threatened and endangered species (64 FR 36,453–36,464). The de-listing rule is not yet final. Once de-listed, the bald eagle would no longer be protected under the ESA, but would continue to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Bald eagle populations in Oregon comprise both resident and wintering populations. As of 1998, the breeding population in the Pacific recovery region was estimated at about 1,500 pairs (64 FR 36,453–36,464). The average success rate for occupied breeding areas in the region has been at least 65 percent since 1995. Productivity has averaged about 1.0 young per occupied territory since 1990. This productivity rate exceeds the minimum of 0.7 young per occupied territory that has been estimated as necessary to maintain stable populations over the long term (64 FR 36,453–36,464). The number of occupied breeding territories in the High Cascades portion of the recovery zone, which includes the Pelton Round Butte Project area, increased from 48 in 1997 to 58 in 2001 (Isaacs and Anthony, 2001).

The number of occupied nesting territories in the project area increased from three in 1989 to seven in 1996, and to eight in 2000. One nest is located within a mile of Lake Simtustus. Seven nests have been located between 0.25 mile and 4.5 miles of Lake Billy Chinook. The Joint Applicants report that the Eyerly Fire in July 2002 destroyed the Eyerly, Spring Creek, and Fly Creek nest stands and may have damaged the Big Creek nest stand (the Joint Applicants' response to AIR no. 15). The fire also burned the two winter roost sites near Perry South Campground and Spring Creek.

Nest success in the project area has varied from nest to nest and from year to year. Despite this variation, the ratio of successful to occupied territories between 1997 and 2001 has averaged 0.68 (the Joint Applicants' response to AIR no. 15). This 5-year average slightly exceeds the statewide average and High Cascades zone averages of 0.62.

The number of young per occupied territory in the project area over the past 5 years has been 1.02. This figure also exceeds statewide and High Cascades zone 5-year averages of 0.99 and 0.95, respectively.

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The bald eagle pair nesting near Canadian Bench has been unsuccessful in each year since it was established in 2000. The pair near Lake Simtustus has been successful each year since 1993. The pair nesting in Fly Creek was successful in 7 of the past 8 years. The Box Canyon and Lower Desert pairs were successful in 7 of the past 9 years. The Spring Creek and Metolius pairs have been successful in 3 of 7 years and in 6 of 9 years, respectively. In response to concerns about the potential effects of disturbance on nesting pairs at Spring Creek and along the Metolius River arm, the Joint Applicants cooperated with FS to implement seasonal road closures in 2001 and 2002, but neither pair nested successfully.[65]

In addition to year-round residents, the project area also supports fall and winter migrants. During surveys conducted between 1989 and 1997, biologists counted from 13 to 35 bald eagles arriving in late October and remaining through late November. These birds congregate in the upper end of the Metolius River arm, where they feed on spawned out kokanee salmon. Some of these bald eagles were observed to use a communal roost near the confluence of the Metolius with Lake Billy Chinook.

Late winter migrants arrive in early February and depart by late March or early April. Peak counts during PGE's 1989–1998 winter surveys ranged from 27 to 215 birds, with counts of 125 eagles or more in 3 of the survey years. These migrants also concentrated on the Metolius River arm, probably in response to abundant kokanee, and, in some years, kokanee die-offs. They may also be attracted to mule deer carcasses on the Metolius Mule Deer Winter Range and migrant waterfowl on the project reservoirs. In the late winter/early spring, bald eagles were observed to use two winter roosts on the Metolius River arm.

PGE conducted a study of bald eagle food habits between 1995 and 1997. Examination of prey remains at two nests in 1996 and 1997 showed that bald eagles rely primarily on fish during the nesting period. Kokanee accounted for over half the prey remains in both years. Biologists observed that kokanee made up about 69 percent of the diet in 1996, and only 58 percent in 1997. The lower number of kokanee prey remains in 1997 may correlate with reduced kokanee populations that were documented in Lake Billy Chinook in 1997.

Other than fish, the most common prey items were black-tailed jackrabbit, Nuttall's cottontail, California ground squirrel, and yellow-bellied marmot. Biologists also identified bird remains, and found that avian prey accounted for 3 to 8 percent of the diet.

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[65] The Canadian Bench and Lower Desert nest sites are located just west of the Deschutes arm of Lake Billy Chinook. The Fly Creek and Box Canyon nest sites are located near the upper end of the Metolius arm of Lake Billy Chinook, on the south and north sides of the Metolius River, respectively. The Spring Creek and Metolius nest sites are in the same general vicinity. The Lake Simtustus nest site is in the Seekseequa Creek drainage, on the west side of the reservoir.

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3.8.2 Environmental Effects and Recommendations

3.8.2.1 Steelhead

The Joint Applicants propose several measures that are designed to benefit anadromous fish, including steelhead. These include the restoration of passage to historical spawning and rearing areas upstream of the project, implementing SWW to improve water quality conditions in the project reservoirs and in the lower Deschutes River, implementing fish habitat enhancements measures specified in the lower Deschutes River and its tributaries, establishing a Pelton Round Butte Fund (including a Water Rights Fund and a General Fund) for implementing additional habitat enhancement measures upstream and downstream of the project, anchoring or transferring large woody debris from Lake Billy Chinook into the lower river, conducting an experimental gravel augmentation program in the lower Deschutes River, and implementing greater restrictions on project operations to enhance the stability of spawning and rearing habitats in the lower Deschutes River downstream of the project.

The majority of the preliminary terms and conditions recommended by the fisheries agencies are consistent with the measures proposed by the Joint Applicants. BIA provided several preliminary conditions that could have additional effects on steelhead, including additional constraints on project operations, increasing the Joint Applicants' commitment to fish habitat enhancement projects and for implementing a larger experimental gravel augmentation program. We evaluated the effects of these proposed measures on aquatic habitat in sections 3.6.2.1, *Minimum Flows*, 3.6.2.4, *Fish Habitat Enhancement*, and 3.6.2.6, *Spawning Gravel Monitoring and Augmentation*, in *Aquatic Resources*.

Our Analysis

Currently, steelhead seeking to migrate upstream from Lake Simtustus into the middle Deschutes and Crooked River systems are not able to move above Round Butte dam for spawning. The net effect of providing fish passage for adult steelhead upstream of Round Butte dam is expected to be beneficial in terms of increasing spawning and rearing habitat. The proposed measures include an adaptive management approach to be used for the development and evaluation fish passage facilities; evaluation of downstream and upstream fish passage efficiency; objectives for measures of success for ecosystem integrity, numerical production, and facility effectiveness; monitoring of long-term passage efficiency and adult returns; and life-history research and monitoring during the Interim Passage Phase and into the Final Passage Phase to provide information to make adjustments to the passage program. In addition, the proposed measures include final design and construction of a new SWW facility to redirect currents in Lake Billy Chinook, attract and collect downstream migrants, and manage reservoir and downstream water quality. The SWW facility would allow generation water to be pulled from the

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surface of the reservoir as well as from the existing deep intake, while excluding and collecting downstream migrants.

Juvenile steelhead spawned above Round Butte dam must pass through Lake Billy Chinook on their outmigration and are susceptible to predation by bull trout and other littoral species, such as northern pikeminnow, smallmouth bass, brown trout, and rainbow trout. The effects of predation on reintroduced juvenile steelhead are unknown; however, additional studies would be conducted during the Interim Phase of the fish passage program to evaluate the effects of predation on reintroduced salmonids in Lake Billy Chinook. It is anticipated that adverse effects would be eliminated or minimized through the use of research and structured adaptive management.

The quality of adult holding, spawning, and rearing habitat upstream of Round Butte dam has been affected by human land use activities that are not associated with the project. Irrigation withdrawals have reduced flows in Why-chus Creek since the late 1800's. By 1912, the streamflow in the area near Sisters was entirely diverted for irrigation. Some of the best spawning gravels were located in the upper portions of this stream; however, the lowermost 15 miles of Why-chus Creek contain excellent spawning gravel and adequate flows (15 to 20 cfs) are maintained by springs. Proposed measures include protecting and restoring riparian habitats associated with recently acquired lands (about 1.5 miles and 2.5 miles of Why-chus Creek and Trout Creek, respectively) that should provide benefits to steelhead in the long term.

The proposed measures that affect steelhead include an adaptive management approach to be used to develop and evaluate fish passage facilities, evaluation of downstream and upstream fish passage efficiency, objectives for measures of success for ecosystem integrity, numerical production, and facility effectiveness, monitoring of long-term passage efficiency and adult return, and life-history research and monitoring during the Experimental and Interim Passage Phases and into the Final Passage Phase to provide information to make adjustments to the passage program. In the final passage phase, there would be a focus on confirming the feasibility of developing volitional upstream passage facilities. The Joint Applicants propose to continue funding steelhead and Chinook salmon smolt production and to review the program as reintroduction efforts are implemented with a long-term goal of coordinating the hatchery and reintroduction efforts to fully address project effects. Smolt production at the hatchery would eventually be phased down as appropriate to complement the success of the passage effort and numbers of naturally spawned steelhead returning to the project.

Implementation of the measures proposed by the Joint Applicants would benefit this ESU compared with baseline conditions by providing upstream adult passage to spawning and rearing habitat above the project and downstream passage for juvenile fish. Improvements to water quality through the multi-level SWW facility at Round Butte dam would improve conditions for juvenile rearing and adult spawning downstream of the project. Improvements to downstream flows by changes to project operations would

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stabilize flows in the lower Deschutes River. Additional measures, including implementation of the riparian and wetland components of the terrestrial resources management plan, would improve tributary spawning and rearing habitats in Trout and Why-chus creeks, and improve habitat complexity in the lower Deschutes River.

The Joint Applicants also propose to implement a number of specific enhancement measures through the proposed Lower River Implementation Plan, and to provide funding for additional measures through the proposed Pelton Round Butte Fund. Measures specified in the Draft Lower River Implementation Plan that would benefit steelhead habitat include a small-scale experimental gravel augmentation program for improving spawning habitat (involving the placement of 300 cubic yards of gravel), livestock fencing, and development of off-river watering sites for livestock in the lower Deschutes River, riparian improvements in several small tributaries, and measures to improve riparian, stream channel, and passage conditions in Trout Creek. Implementing additional, unspecified enhancement measures through the proposed Pelton Round Butte Fund Implementation Plan (which includes a Water Rights Fund and a General Fund) would likely provide additional benefits to steelhead.

Although the measures proposed by the Joint Applicants are expected to provide an overall benefit to the middle Columbia River steelhead ESU, some adverse effects can be expected. Fish tagging and tracking activities may result in injury or mortality of individuals of protected species, even though these activities would provide a long-term benefit for the species as a whole. Similarly, some level of injury and mortality would be expected to be caused to fish at the passage facilities that would be constructed under the Current Fish Passage Plan. However, the number of individual fish that would be subjected to potential injury during fish tagging and tracking activities would be small, and losses associated with fish passage would be monitored and feasible modifications would be made if survival objectives are not met.

As we discussed in section 3.6, *Aquatic Resources*, preliminary conditions provided by the BIA include several measures that would have additional effects on aquatic species. BIA specifies additional operational restrictions that are intended to improve spawning and rearing conditions in the lower Deschutes River. The primary effect of these operational changes on steelhead would be to increase flows slightly during the spawning and incubation period in dry years. We believe that the magnitude of this benefit would be limited, because there is no indication that flows are currently limiting incubation success, and because most steelhead spawn in tributaries that are unaffected by project operations.

BIA also specifies implementation of a substantial gravel augmentation study, which would involve an initial placement of 250 to 1,000 yards of gravel at each of three sites, and continuation of annual gravel augmentation based on monitoring results. While this measure would most likely increase the availability of spawning habitat for steelhead, there is also the potential for adversely affecting water quality (by introducing

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or suspending sediments during gravel placement) or damaging aquatic or riparian habitats when the gravel is being placed in the river. Gravel that is redistributed during flood events could also fill in pool areas that provide important holding habitat. Because we cannot rule out the potential for adverse effects associated with fish tagging and tracking activities, fish passage, and gravel augmentation, we conclude that this relicensing action is likely to adversely affect the middle Columbia River steelhead ESU.

3.8.2.2 Bull Trout

Many of the measures proposed by the Joint Applicants would also benefit resident fish species, including bull trout. These measures include the provision of fish passage, which would improve habitat connectivity; implementation of the SWW to improve water quality conditions in the project reservoirs and in the lower Deschutes River; implementation of fish habitat enhancements through the Draft Lower River Implementation Plan and Pelton Round Butte Fund Implementation Plan (which includes a Water Rights Fund and a General Fund); anchoring or transferring large woody debris from Lake Billy Chinook into the lower river; and implementation of greater restrictions on project operations to enhance the stability of rearing habitats in the lower Deschutes River downstream of the project.

The majority of the preliminary terms and conditions recommended by the fisheries agencies are consistent with the measures proposed by the Joint Applicants. BIA provided two preliminary conditions that could have additional effects on bull trout, including additional constraints on project operations and a more extensive commitment to enhancing fish habitat. We evaluated the effects of these proposed measures on aquatic habitat in sections 3.6.2.1, *Minimum Flows*, and 3.6.2.4, *Fish Habitat Enhancement*, in *Aquatic Resources*.

Our Analysis

Currently, bull trout seeking to move upstream from Lake Simtustus are not able to move into Lake Billy Chinook and the Metolius River system for spawning. These bull trout originally moved downstream past Round Butte dam through the turbines, but without passage upstream, they are not able to spawn and are lost to the Metolius and Lake Billy Chinook population. The net effect of providing fish passage for adult bull trout upstream to Lake Billy Chinook from Lake Simtustus and the lower Deschutes River is expected to be beneficial in terms of increasing the spawning population pool, allowing population connectivity, increased genetic exchange, and the reduced potential for cannibalism. The proposed measures include an adaptive management approach to be used for the development and evaluation of fish passage facilities; evaluation downstream and upstream fish passage efficiency; objectives for measures of success for ecosystem integrity, numerical production, and facility effectiveness; monitoring of long-term passage efficiency and adult return; and life-history research and monitoring. These

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activities would continue during the Interim Passage Phase and into the Final Passage Phase to provide information to make adjustments to the passage program.

Some concern exists that restoring fish passage may also result in allowing diseases such as whirling disease and IHN2 to move above the project dams where they may have an adverse effect on bull trout populations. Currently, it appears that the risk of spreading disease would be minimal and manageable under the protocols developed in the fish passage plan and the fish health management program.

Although the number of bull trout that pass through the project turbines appears to be small, entrainment through turbine intakes is a potential source of mortality for bull trout. The interim passage phase of the fish passage plan includes final design and construction of a new SWW, an interim downstream migrant collection facility, and a permanent downstream migrant facility in the forebay of Lake Billy Chinook to address downstream survival of bull trout and connectivity. Long-term passage efficiency would be monitored.

Factors causing fractured and isolated populations of bull trout are natural barriers and construction of dams. However, the creation of Lake Billy Chinook has provided a large habitat area with ample prey base, so bull trout have the opportunity to grow larger in size than historical bull trout in the Deschutes River basin. Spawning and rearing habitats used by bull trout in the Metolius River basin are considered to be in good condition, yet woody debris levels have decreased in the Metolius River since the 1940's.

Continued monitoring of bull trout populations is essential to understanding factors influencing bull trout dynamics and evaluating the efficacy of proposed measures. The proposed measures include an adaptive management approach to be used for the development and evaluation of fish passage facilities; evaluation of downstream and upstream fish passage efficiency; objectives for measures of success for ecosystem integrity, numerical production, and facility effectiveness; monitoring of long-term passage efficiency and adult return; and life-history research and monitoring during the Experimental and Interim Passage Phases and into the Final Passage Phase to provide information to make adjustments to the passage program. In addition, a fish health management program would address uncertainties associated with the potential to spread fish pathogens to bull trout upstream of the project with reintroduction of anadromous salmonids. The Joint Applicants would continue to support the Bull Trout Working Group. The Joint Applicants propose to participate in the Bull Trout Working Group and assist in cooperative bull trout studies. They would also continue to fund monitoring of the annual harvest of bull trout during the height of the bull trout fishery in March and April until the species is delisted.

Implementing these measures would benefit bull trout compared to baseline conditions by providing upstream and downstream passage for adults and juveniles allowing access to habitats below the project and improving connectivity within the

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Columbia River DPS. Potential adverse effects on this DPS are associated with re-establishment of access above the project to anadromous salmonids; these effects include the potential for introducing diseases and the potential for competition for prey and habitat and injury or mortality caused during fish tagging or tracking activities or associated with fish passage facilities. Additional measures would improve tributary spawning and rearing habitats in Why-chus Creek, and improve habitat complexity in the lower Deschutes River.

Preliminary conditions recommended by BIA that could affect bull trout include a more extensive commitment to habitat enhancement measures and additional operational constraints. We note, however, that the Joint Applicants have increased the scope of their proposed habitat enhancement efforts, as described in the Pelton Round Butte Fund Implementation Plan,[66] to a level that is comparable to that specified by BIA. Some of BIA's operational constraints could have adverse effects on bull trout. In particular, BIA-recommended long-term ramping rates during the steelhead and fall Chinook salmon spawning and incubation periods would cause the level of Lake Billy Chinook to be reduced from target levels, especially in low-flow years. This has the potential to adversely affect bull trout by reducing the amount of bull trout rearing habitat in Lake Billy Chinook or by reducing the abundance of kokanee, which are their primary prey in Lake Billy Chinook.

Although many of the measures proposed by the Joint Applicants would benefit bull trout and their habitat, we cannot rule out the potential for adverse effects from introducing diseases and for competition for prey and habitat associated with the restoration of anadromous fish to areas upstream of the project, or for adverse effects from drawdowns that would be caused by BIA's proposed long-term ramping rates. Accordingly, we find that relicensing would be likely to adversely affect the Columbia River bull trout DPS. We conclude that the proposed project with our recommendations may affect, but is not likely to adversely modify or destroy, proposed critical habitat for the Columbia River bull trout DPS.

3.8.2.3 Northern Spotted Owl

The Joint Applicants do not propose and the agencies and the Tribes do not recommend any specific measures to protect the northern spotted owl. We agree that no specific protection measures are necessary at this time, because the project area does not support nesting habitat, and no actions are proposed that would remove or reduce the quality of RFD habitat that may be present along the Metolius River arm.

As discussed in section 3.7.2.1, *Habitat Acquisitions and Proposed Terrestrial Resources Management Plan,* in *Terrestrial Resources*, the Joint Applicants are

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proposing to develop and implement a strategy to protect threatened, endangered and sensitive species as part of the terrestrial resources management plan. We agree with this proposal, and note that it is consistent with agencies' and Tribes' recommendations. As also discussed in section 3.7.2.1 we agree with EA preliminary 4(e) condition no. 13 that development of an Endangered Species Alert Program and maintenance of a GIS database should be part of this strategy. We conclude that this approach would help to ensure timely detection of and response to potential changes in owl occurrence, habitat conditions, or listing status throughout the term of any new license issued. With this measure in place, we conclude that relicensing the project under any action alternative may affect, but would not be likely to adversely affect, the northern spotted owl. Relicensing the project would have no effect on the species' designated critical habitat. We will request FWS concurrence with these findings.

3.8.2.4 Bald Eagle

As part of the terrestrial resources management plan, the Joint Applicants propose to develop, fund, and implement a comprehensive bald eagle management plan for the project area. The Joint Applicants would consult with the agencies and the Tribes to prepare separate nest site and roost site management plans for existing nests and roosts associated with the reservoirs and any that may be established in the future. The Joint Applicants would continue to conduct annual surveys to evaluate nest site productivity and winter use of the reservoirs and roost sites. The Joint Applicants would survey potential nesting habitat in the tributaries of the upper Metolius River arm every 3 years, and report any new nest sites to the cooperating agencies.

As described in section 3.7.2, *Environmental Effects and Recommendations,* in *Terrestrial Resources*, the Joint Applicants would also provide funding for an eagle protection study addressing bald eagles, golden eagles, or both species. The study would be designed to determine if project-related activities would adversely affect nesting behavior, nest success or productivity, juvenile foraging behavior, or juvenile survival.

To help reduce the risk of disturbance, the Joint Applicants would continue to cooperate in implementing seasonal road closures to protect nesting birds. As described in section 3.9.2, *Environmental Effects and Recommendations*, in *Recreational Resources,* the Joint Applicants would also implement an interpretive program at Perry South Campground and the Street Creek boat launch to educate visitors about the need for bald eagle protection.

FS preliminary 4(e) condition no. 18, BLM preliminary 4(e) condition no. 28, and FWS and ODFW recommendations are consistent with the Joint Applicants' proposal. FS preliminary 4(e) condition no. 18 specifies that the Joint Applicants should implement protection guidelines consistent with the *Working Implementation Plan for Bald Eagle Recovery in Oregon and Washington* (WDFW, 1990). The FWS recommendation is

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similar to the FS and BLM conditions, but makes a specific recommendation for the Joint Applicants to prepare management plans only for two known nest sites and three communal roost sites. Each of the agencies identifies its primary concern as being the potential for disturbance caused by recreation near bald eagle nest sites and foraging areas.

Our Analysis

Bald eagles typically begin to lay eggs in February and March. Eaglets hatch in mid-April to mid-May and remain in the nest for 10 to 12 weeks, fledgling between the end of June and the middle of August (Johnsgard, 1990). Depending on timing, human activity near nest sites has the potential to cause temporary or permanent nest abandonment, to increase the risk of over-cooling, over-heating, and predation on eggs or young; or to cause injury or mortality to juveniles through premature fledging (Fyfe and Olendorff, 1976; Knight and Skagen, 1988; Richardson and Miller, 1997). Boating and fishing on the reservoir, activities which peak during the summer, could disturb foraging eagles at a time when they are feeding young at the nest and their energy requirements are high (McGarigal et al., 1991). Dependent juveniles may also be strongly influenced by disturbance in July and August (Watson and Pierce, 1998).

Disturbance can adversely affect wintering bald eagles by increasing their energy demands and causing physiological stress (Stalmaster and Kaiser, 1998). However, recreational use in the project area is relatively low during the winter, and disturbance is less likely to occur.

We agree there is a high potential for disturbance to nesting bald eagles as a result of recreation in the project area. However, it is important to note that raptor responses to disturbance vary from pair to pair (Stalmaster and Kaiser, 1998; Watson and Pierce, 1998; Grubb et al., 2002). Differences may be due to the inherent or learned tolerance of individual pairs, as well as to types of human activity, frequency of activity, and visual screening between nest sites and activity. We conclude it would be important to evaluate and manage the potential disturbance effects of existing and future recreation on a site-by- site basis, rather than by applying fixed buffers.

We agree with the Joint Applicants' proposal for consultation with the agencies and the Tribes; development and implementation of a comprehensive bald eagle management plan; nest site and roost site management plans for pairs that rely on project waters for foraging; annual nesting, productivity, and winter surveys; and funding and implementation for a study to evaluate disturbance effects on fledglings. This combination of measures would provide support for bald eagles currently nesting and wintering in the area and would be responsive to changes in bald eagle populations or habitat use. The Joint Applicants' proposal would be consistent with agency preliminary conditions and recommendations, including the recommendation that the Joint Applicants

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use the *Working Implementation Plan for Bald Eagle Recovery in Oregon and Washington* (WDFW, 1990) as guidance for nest site management planning.

In addition to protection and enhancement measures specific to bald eagles, several other Joint Applicant proposals would also benefit bald eagles in the project area. These include measures to improve fish habitat and fish populations, reduce the risk of collision or electrocution on transmission or distribution lines, develop and implement recreation and shoreline management plans, and provide funding for additional law enforcement.

The increased number of bald eagle territories in the project area and the fact that nesting success in the project area is comparable to or higher than state and zone averages indicate the project does not adversely affect bald eagles. These trends suggest the opposite, i.e., that the project is contributing substantially to bald eagle recovery in the region. For this reason, we conclude that relicensing the project may affect, but would not be likely to adversely affect, the bald eagle. We will request formal consultation with FWS regarding this finding.

3.8.3 Unavoidable Adverse Effects

None.

3.9 RECREATIONAL RESOURCES

3.9.1 Affected Environment

3.9.1.1 Regioual Recreational Opportunities

Recreational resources in the project area are extensive and varied. The Pacific Crest Trail and the Cascade Mountains to the west of the project provide extensive fishing, hiking, hunting, biking, skiing, and snowmobiling opportunities in semi-wilderness and wilderness environments. To the north and south of the project, the Deschutes River and its tributaries provide numerous riverine recreational opportunities, including shoreline fishing, whitewater boating, and camping. To the east of the project, recreational opportunities are those associated with a high desert, including hunting, camping, climbing, biking, hiking, and motorized vehicle sports.

Federal agencies manage the majority of recreational sites in the region, which are associated with large tracts of federal land. State agencies and the Tribes manage other recreational sites, and private owners manage a relatively small number of recreational sites. Recreational resources under federal management include the FS-managed Ochoco National Forest to the east of the project and the Deschutes National Forest within and adjacent to the western project boundary. The two forests encompass vastly different

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terrain and provide different recreational opportunities. The Ochoco National Forest includes high desert lands, forest lands and mountains, with small portions of forest in wilderness (4 percent) designation and Wild and Scenic River (1 percent) designation. Much of Ochoco National Forest is used for grazing and approximately 89 percent is accessible to vehicular traffic.

The northern terminus of the forest abuts the Warm Springs Reservation of Oregon and the project boundary around Lake Billy Chinook. Recreational resources in the forest near the project include numerous peaks, wilderness areas, the Wild and Scenic Metolius River, hiking trails, biking trails, and public campgrounds.

BLM manages a large mosaic of lands adjacent to the project, including approximately 5,000 acres in the project vicinity. These lands include Wild and Scenic Rivers sections of the Deschutes River and Crooked River upstream of the project. BLM also manages lands that abut the project, including the Island Research Natural Area, a large mesa between the Deschutes River and Crooked River arm of Lake Billy Chinook. The mesa, with unique examples of native plant and animal communities, has recently been closed to hiking and other recreational activities. Recreational activities that occur on BLM lands in the region include boating, hiking, fishing, hunting, dispersed camping, climbing, and off-road recreational sports.

The Crooked River National Grassland, an area to the east of the project that includes over 173,000 acres of land within Jefferson County, encompasses lands administered by FS, BLM, State of Oregon, and Jefferson County as well as private lands. The FS manages the grassland for sustained yield of forage, timber, water, recreational, and fish and wildlife resources. Numerous designated areas within the grassland are managed for specific recreational attributes. These sites include the Crooked River Recreation Area, the Deschutes River Scenic Corridor, Haystack reservoir, and several dispersed recreational areas.

State-managed recreational resources in the region include Cline Falls State Park, Peter Skene Ogden Wayside, Prineville Reservoir State Park, Tumalo State Park, and Smith Rocks State Park. These sites provide recreational opportunities consistent with those found within the region on federal lands and include riverine- and reservoir-based activities, as well as dispersed hiking, boating, climbing, hunting, and other activities.

The Warm Springs Reservation owns large tracts of land north and west of the project. A few public recreational areas, primarily associated with the project, provide public access and recreation on these lands.

3.9.1.2 Project Area Recreational Opportunities and Uses

Lake Billy Chinook, Lake Simtustus, and the Reregulating reservoir are the primary recreational resources within the project boundary (figure A-1, appendix A).

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The reservoirs provide a wide variety of recreational activities, including water-based activities such as boating, jet skiing, waterskiing, fishing, and swimming. Recreationists also visit the project for camping, wildlife viewing, hiking, sightseeing, and biking.

Lake Billy Chinook, the largest project reservoir, with a surface area of approximately 4,000 acres, backs up 13 miles of the Metolius River, 9 miles of the Deschutes River, and 7 miles of the Crooked River. The eastern shore of the reservoir is easily accessed from the Redmond area and the town of Madras, and there are currently few restrictions on boat speed or dispersed recreation.

The primary recreational activities at Lake Billy Chinook are water-based, including boating, boat fishing, and water skiing. Other activities include sightseeing, hiking, and overnight camping. Numerous boat launches on the three arms of the lake provide reservoir access. Several public campgrounds and day-use areas are located adjacent to the lake. In addition, private recreational developments, including seasonal homes, are located on the southwestern shoreline of Metolius River arm at the Three Rivers Ranch and farther west.

Lake Simtustus, downstream of Lake Billy Chinook on the Deschutes River, is a long narrow reservoir with an approximately 540-acre surface area. Because of its long, thin character, the Oregon State Marine Board limits boat speed to a 10 mph on much of the lake, which limits recreational activities primarily to boat and shoreline fishing, swimming, and camping. Public access is at three public recreational areas—the Pelton Park, Lake Simtustus Recreational Vehicle (RV) Park and Indian Park. Apart from these sites and project developments, most of the shoreline is steep and undeveloped.

The Reregulating reservoir is a small reservoir at the downstream end of the project that is designed to off-set load-following operations at the upper two reservoirs and maintain flow in the lower Deschutes River. Subsequently, the Reregulating reservoir is cycled up and down 20 feet per day, dewatering much of the reservoir during normal recreational hours. Because of these water-level fluctuations, public land on the east side of the reservoir shoreline is off-limits to recreational use. Consequently, little recreational activity occurs in the area, although good waterfowl habitat adjacent to the reservoir attracts naturalists to the area for wildlife viewing.

We summarize the primary recreational access sites and site recreational resources in table 28. The sites are also shown on figure A-1 in appendix A. Table 28 identifies the sites in relation to the project boundary and highlights the Joint Applicants' estimates of site needs and annual use.

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Table 28. Developed public recreational sites associated with project lands and waters. (Source: PGE and CTWS, 2001)

Management Agency and Recreational Site	Within Project Boundary	Site Resources	Site Assessment	Recreational Days[a]
FS—Perry South Campground (Lake Billy Chinook on Metolius River arm)	Yes	Moderately developed drive-in camping, boat launch, hiking trails, swimming area and dock, campsite host, toilets, drinking water	Needs some site upgrades, including Americans with Disabilities Act (ADA)-accessible facilities and new toilets; constrained area for development	20,508
FS—Monty Campground (1 mile upstream of Lake Billy Chinook on free-flowing section of Metolius River)	No	Less developed campground, 1 mile outside project boundary; hiking trails; 25 primitive campsites; toilets; car-top boat access	Needs some site upgrades, including defined camping and parking areas	3,375
FS—Street Creek boat launch (Lake Billy Chinook on Metolius River arm)	Yes	Drive-in boat launch, seasonally open to compensate for early season wildlife-related closures at Perry South Campground; facilities include boat launch with parking for vehicles with trailers and a portable toilet		NA

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Management Agency and Recreational Site	Within Project Boundary	Site Resources	Site Assessment	Recreational Days[a]
FS—Balancing Rocks	No	Dispersed recreation area, currently used for off-road vehicle use, camping, shooting, and observing the unique geologic formations	Needs to reduce inappropriate uses to preserve the unique geologic formations	NA
Tribes—Indian Park (Lake Simtustus)	Yes	Boat or vehicle access, open to public with fee permit; 25 campsites; drinking water; two composting toilets; unimproved boat launch	Erosion and progressive loss of vegetation on steep slopes, limited universal accessibility, lack of defined vehicle routes	3,763
Tribes—Chinook Island day-use area (Lake Billy Chinook on Metolius River arm)	Yes	Boat-in day-use facility, composting toilet, log boom, and wood plank trail	Needs maintenance of log boom; significant erosion to soft volcanic soils from boat wave action	NA
State of Oregon—Cove Palisades Park, Crooked River Campground (Lake Billy Chinook on Crooked arm)	No	Easily accessed from Redmond and Madras; campground away from reservoir, includes 93 tent and RV sites, drinking water, electricity, RV dump station, playground, restrooms and showers, horseshoes and basketball; includes lands that could be used for expansion	Generally in good condition, but crowded during peak-use weekends	22,453

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Management Agency and Recreational Site	Within Project Bonndary	Site Resonrces	Site Assessment	Recreational Days[a]
State of Oregon—Cove Palisades Park, Crooked River Day-use area (Lake Billy Chinook on Crooked River arm)	Yes	Primary access to Lake Billy Chinook, easily accessed from Redmond and the town of Madras, site includes boat launch, swimming beach, picnic areas, volleyball, fishing access interpretive signs	Capacity issues during summer months; most appropriate site within state park for improved universal accessibility because of flat terrain	397,365
State of Oregon—Cove Palisades Park, Cove Marina/ cabins (Lake Billy Chinook on Crooked River arm)	Yes	Marina with 120 slips, boat repair building, fueling dock, boat launch, store, four rental cabins, restrooms, picnic tables, sewage disposal station	Needs some general improvements to older facilities; limited universal accessibility	Included above
State of Oregon—Cove Palisades Park, Lower Deschutes River day-use area (Lake Billy Chinook on Deschutes River arm)	Yes	Drive-in day-use facility with boat launch, docks, trails, picnic areas, swimming areas, restrooms, showers	Limited universal accessibility, needs erosion control measures and site definition	Included above
State of Oregon—Cove Palisades Park, Upper Deschutes River day-use area	Yes	Drive-in day-use area with boat launch, playground, picnic area, swimming areas, restrooms, parking trails	Generally in good condition, typography limits universal accessibility	Included above

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Management Agency and Recreational Site	Within Project Boundary	Site Resonrces	Site Assessment	Recreational Days[a]
State of Oregon—Cove Palisades Park, Deschutes River Campground (0.5 miles from Lake Billy Chinook)	No	Drive-in campground away from reservoir, includes 94 tent sites, 84 RV sites, partial and full hookups, trails, playground, restrooms and showers, amphitheater, basketball, interpretive resources	Generally in good condition, needs some upgrades to older facilities	53,958
State of Oregon—Cove Palisades Park, Group Campground (Lake Billy Chinook between Crooked River arm and Deschutes River arm away from reservoir)	No[b]	Three drive-in group sites with for 25 to 50 people each	Limited expansion opportunities, no showers	Included in Deschutes River Campground and statistic above
State of Oregon—Cove Palisades Park, Trails (Lake Billy Chinook)	No[b]	Oregon maintains over 10 miles of trails adjacent to Lake Billy Chinook and between some of the recreational sites; trails include short interpretive loops and longer hikes	None of the trails provide for universal accessibility	NA

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Management Agency and Recreational Site	Within Project Boundary	Site Resources	Site Assessment	Recreational Days[a]
PGE—Pelton Park (Lake Simtustus)	Yes	Easily accessed from Redmond and the town of Madras; includes RV camping, tent camping, picnic area, marina, boat rentals, boat launch, docks, swimming area, general store, restroom and shower facilities, ADA facilities	Generally in good condition	45,502
PGE—Round Butte overlook (Lake Billy Chinook to Deschutes River on lower reservoir)	Yes	Drive-in, day-use overlook area with views of the Round Butte dam and Lake Billy Chinook; includes overlook building, interpretive signs, visitor host, restroom facilities, and picnic facilities	Limited universal accessibility	4,776
PGE—Pelton wildlife overlook (Reregulating reservoir)	Yes	Drive-in wildlife overlook and day-use area; includes interpretive signs, parking for 15 vehicles, short trails, viewing platform, portable toilet	Limited universal accessibility	8,671
Dispersed-use Sites	No	Estimated 113 sites within project area		5,517

Management Agency and Recreational Site	Within Project Boundary	Site Resources	Site Assessment	Recreational Days[a]
Private—Three Rivers Recreation Area	Yes	Private residential development on the Metolius arm of Lake Billy Chinook	No access provided for the general public	63,808
			Total annual visitation	629,825

NA – Data are not available.

[a] A recreation day is a visit by one individual to a recreational area for a reasonable portion or all of a 24-hour period.

[b] State lands that include this recreational site border the project boundary, but the recreational site is not within, or immediately adjacent to, the project.

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In addition to the developed recreational sites associated with project, the Joint Applicants identified 113 dispersed recreational sites in the project area (Rohloff et al., 1998). The majority of these sites are associated with Lake Billy Chinook, with approximately 48 percent of sites located along the shore and 34 percent on the canyon rim above the lake. The remaining sites are located near Lake Simtustus. Most dispersed recreational sites (18 percent) are used for camping; anglers and boaters established many of the shoreline sites; and drive-in campers established many of the canyon rim sites. Hiking, sightseeing, off-road vehicle use, and shooting are the next most popular activities after camping, at the dispersed sites.

The Balancing Rocks site is an important dispersed recreational site that is outside the project boundary, but located on the primary FS-managed access road leading to the Metolius arm of Lake Billy Chinook. Unique geological features, including narrow sandstone pedestals upholding larger rocks, provide the primary attraction to the area. The Joint Applicants recreational studies indicate that recreational use at Balancing Rocks is associated with recreationists camping and boating on Lake Billy Chinook.

The Joint Applicants used a variety of methods to estimate recreational use within the project area, including on-site and mail surveys, fee receipts, and traffic counts. Total recreational days for the project are 620,825, with average peak season use of 4,679 visitors per day. The majority of recreational use, over 75 percent, occurs at day-use and overnight recreational sites within Cove Palisades State Park. We summarize use statistics at the primary recreational sites in table 28.

3.9.1.3 Recreational Needs

The Joint Applicants prepared a needs assessment for the recreational resources within the project area to develop a basis for planning enhancement measures. The needs assessment was developed in consultation with FS, State of Oregon, BLM, the Tribes, and other interested stakeholders. Based on the needs assessment, the Joint Applicants believe that the current mix of recreational opportunities, ranging from primitive to fully developed recreational sites, is appropriate and should be continued. The assessment found that certain facilities should be upgraded over time to address universal accessibility, erosion, lack of picnic facilities, and lack of trail opportunities. In addition, their assessment found that the visitor experience could be improved by addressing conflicts associated with crowding and site capacity associated with Cove Palisades State Park and Perry South recreational areas. The Joint Applicants assert the mix of campgrounds is appropriate for the types of uses in the project areas, and that future development should focus on site improvements rather than expanding sites to allow increased use levels during peak periods.

At day-use areas, the assessment indicates that the number and type of boating facilities, such as boat launches and staging areas, are appropriate for the project area,

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and that no future improvements or new boating facilities should be developed that would increase the number of recreationists on the reservoirs or increase crowding at the existing facilities. The assessment indicates that several upgrades would be needed at existing facilities, including improvements to docks, boat ramps and improved barrier-free access. Also, parking at the Cove Palisades State Park day-use facilities should be improved to address overflow use without creating additional capacity issues. Other non-boating facilities, such as picnic areas and trails, would need some improvement due to ongoing recreational use, including additional picnic tables and more trail opportunities that link day-use areas to the campgrounds. In addition, some management changes should be implemented to reduce crowding and reduce conflicts between recreationists.

The needs assessment indicates that improvements at the primary recreational sites within the project area would be necessary to address the needs of the disabled. These improvements are site specific, but include designated parking areas, barrier-free toilets, docks and boat launch facilities, and barrier-free trails.

The assessment indicates that: (1) additional trails are needed in the project area, particularly in the Cove Palisades State Park; (2) a long-term strategy for trails would be required to identify appropriate sites and develop the necessary infrastructure for hiking, mountain biking, biking, and interpretive trails; and (3) off-road vehicle use should be prohibited in the project area.

Unregulated recreational use at dispersed sites, including Chinook Island, is causing erosion. Needs at Chinook Island include stabilizing the shoreline and protecting the soft volcanic banks from wave action and recreational effects. Other dispersed recreational sites require site-specific modifications and closures, as well as improved enforcement of closures and encouragement of appropriate recreational uses.

3.9.2 Environmental Effects and Recommendations

The primary findings of the Joint Applicants' assessment include the need for recreational site improvements, environmental resource protection, improved barrier-free access, better communication among agencies, and improved intra-agency management. The Joint Applicants developed proposed measures to address these needs. The Joint Applicants also state that a number of management changes would improve recreational resources in the project area. These include interagency coordinated management of projeet area resources, additional law enforcement for personal watercraft, additional land-based patrols, development of a fire management plan, improved telecommunications, and development of a shoreline management plan to reduce effects on natural resources and manage private developments on and adjacent to project waters. In this section, we discuss the effects of these proposed measures and the effects of the agency-recommended terms and preliminary conditions, on environmental resources. All of the recreational sites, except for the dispersed sites, are listed in table 28 and shown on

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figure A-1 in appendix A. The dispersed sites are discussed in the license application and listed in Rollo et al. (1998).

3.9.2.1 Recreational Use and Resource Measures

State-Owned Recreational Sites

The Joint Applicants proposed in the Final Joint Application Amendment extensive site modifications at all of the formal recreational sites within the project boundary. In response to the draft EIS, the Joint Applicant filed a Summary of Recreation, Land Use, and Aesthetic Measures. At Cove Palisades State Park, these measures include updates to the Cove Palisades State Park Master Plan and Pelton Round Butte Comprehensive Management Plan. Specifically, as described in the Summary of Recreation, Land Use, and Aesthetic Measures filed by the Joint Applicants in response to the draft EIS, the Joint Applicants propose to:

- provide new boat delineators/floating booms at the upper and lower Deschutes day-use swimming areas, similar to the one used at Crooked River day-use area;
- repair or replace approximately 30 dock sections and eight existing gangways;
- replace dock anchors with new pilings where feasible;
- repair and apply shotcrete to all boat launch retaining walls;
- repave the existing approached to boat launches at the Crooked River day-use area;
- better define existing launch lanes with new launch land delineators and signs at all boat launches;
- provide improved ADA-accessible picnic tables at all three day-use sites;
- Provide improved ADA-accessible parking near the boat launch at Upper Deschutes day-use area;
- develop new trails within the state park and surrounding project area, some segments of which would be ADA-accessible, including one or more of the following trail routes over a phased timeframe: (a) from Crooked River day-use area to the Cove Marina, (b) along the canyon rim linking the Crooked River Campground, east rim viewpoints, Round Butte Overlook Park, and Willow Creek, (c) from Deschutes River Campground to the lower Deschutes River day-use area, (d) from the Madras area along Willow Creek to Pelton

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Dam Road then connecting to the Lower Deschutes River Trail at Mecca Flats, and (c) extension of the Tam-a-lau Trial;

- fund seasonal O&M costs for two new self-contained floating restrooms for use by boaters on the Crooked River arm and the Deschutes River arm of the reservoir;

- provide additional funding to limit vehicles to designated parking lots and other costs associated with increasing management presence;

- assist in funding the removal of floating debris from the reservoir and provide continued debris removal services;

- provide funding on a 50/50 cost-share basis with Oregon Parks and Recreation Department to provide protection and interpretive improvements for the Crooked River petroglyph;

- develop a 15-site boat-in fee camping area in an area already used by visitors known as Streaker's Cove, including picnic tables, water service, vault toilet, and boat dock moorage;

- add two new boat launch docks at Crooked River day-use area and one launch dock at the upper Deschutes River day-use area to delineate launch lanes and provide additional launch moorage;

- improve Crooked River day-use area to the north along the ski beach area, including developing new lawn areas, providing additional parking, and adding new restrooms;

- slightly expand the Crooked River day-use area to the south with minor expansion only for additional parking; and

- expand the Upper Deschutes day-use area along the south shoreline into areas already affected by existing use, including developing new lawn areas, providing new restrooms, providing short-term boat moorage, stabilizing existing bank erosion, and potentially providing additional parking;

Tribal-Owned Recreational Sites

At the Chinook Island Day-Use Area, the Joint Applicants propose to:

- replace the floating log boom with a new wave barrier:

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- construct a short-term boat moorage for 16 boats with a swimming area and beach: and
- construct an interpretive trail with signs and a kiosk.

At Indian Park, the Joint Applicants propose to:

- establish an RV camp host site:
- install a concrete boat ramp with short term and overnight boat moorage:
- upgrade the campsites, including ADA compliance, and construct a group day-use area and designated swimming area;
  provide increased erosion control:
- improve road access into the park and redesign and upgrade interior access road and trial systems; and
- improve delineation of park roads and campsites spurs to help keep vehicles in designated areas.

BIA 10(a)-15 is generally consistent with the Joint Applicants proposal. Specific differences recommended by the BIA include creating a group day-use area at Indian Park and funding of a full-time Tribal officer to enforce Tribal laws on the reservation.

Applicant-Owned Recreational Sites

At Pelton Park, the Joint Applicants propose to implement the following recreational iinprovements within 10 years of issuance of any new license:

- reduce the amount of the exiting chain-link fencing, or use some other less visually obtrusive material within and adjacent to Pelton Park;
- modify 10 existing campsites for RV use by lengthening and leveling spurs and providing water and electrical hookups;
- reconfigure, buffer, and level several campsites and eliminate six campsites;
- relocate water hydrants to improve accessibility and reduce visitor impacts;
- provide additional grassy areas in the Pelton Park campground and day-use areas;
- improve the southern day-use arca by adding ADA-accessible picnic tables, cooking grills and additional grassy area (if feasible);

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- continue to improve the swimming beach by regrading and providing additional sand;
- provide a new toilet in the new group camp area and provide flush toilet in under-served areas of the campground;
- provide an ADA-accessible fishing pier;
- expand the existing campground trail system; and
- improve erosion control measures.

At Round Butte Overlook Park, the Joint Applicants propose to:

- upgrade the interpretive media and displays and coordinate improvements and themes with other I&E program elements;
- provide improved ADA accessibility to picnic tables, cooking grills, drinking fountains, restrooms and walkways per the draft proposed ADA access guidelines; and
- continue to improve parking and circulation with information signs and better define parking spaces and edging.

The Joint Applicants propose to improve recreational resources at Pelton Wildlife Overlook within 10 years of issuance of any new license, by:

- burying existing boulders surrounding the parking area to make them blend with the surround native vegetation and revegetate disturbed area;
- providing additional interpretive information, brochures and/or signs, about species likely to be observed at the overlook;
- providing a permanent ADA-accessible vault toilet to replace the temporary portable toilet;
- improving the two existing viewing platforms to provide improved downward visibility for persons with disabilities;
- firming up the pathways and a portion of the parking surface with smaller sized compacted crushed rock to provide improved ADA accessibility; and
- providing improved ADA accessibility to campsites, picnic tables, cooking grills, restrooms, and primary access routes per draft proposed ADA access guidelines.

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FS-Managed Recreational Sites

At the FS-managed Monty Campground, which is outside the project boundary, the Joint Applicants propose to improve site facilities within 10 years of issuance of any new license, including:

- removing the abandoned water system and standing pipes and replacing them with a new well and a hand-pump system;
- contributing 30 percent of the funding for NEPA compliance for campground upgrades;
- redesigning vehicle circulation and relocating portions of the interior road and surface the interior road with gravel; and
- providing ADA-accessible facilities, including two vault toilets and up to seven ADA-accessible campsites.

FS generally agrees with the intent and scope of the Joint Applicants proposed measures at Monty Campground, including the level of funding. Items that differ from the proposed measures and FS preliminary 4(e)-10 include the following: (1) completion of measures should be within 2 years of any license issued; (2) designation of 35 gravel surface spurs equipped with campsites, tables, and grills; (3) stabilization of bank erosion along access road and river; and (4) relocation of existing raft take-out.

At the FS-managed Perry South Campground and Day-use Area, which are within the project boundary, the Joint Applicants propose to implement improvements in two phases: the first phase would be completed within 5 years of issuance of any new license and the second phase would be completed within 10 years. Within 5 years of issuance of any license, the Joint Applicants would:

- resurface existing roads and parking areas with asphalt where needed, particularly near the boat ramp
- replace existing concrete ties at the boat ramp,
- retrofit the existing boat launch to be ADA accessible,
- replace or modify the 25-year-old boat dock to minimize maintenance using Oregon State Marine Board standards,
- install one vault for a 2-unit prefabricated concrete toilet;
- provide 20 additional overnight boat moorages parallel to the east bank of the cove,

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- provide RV spaces, and
- fund NEPA compliance of upgrades.

Within 10 years of issuance of any new license, the Joint Applicants would:

- provide ADA-accessible facilities consistent with the forest plan, including upgrading or replacing toilet facilities, conserving up to 10 appropriate campsites for ADA accessibility, and modifying the day-use picnic areas, boat launch, and dock facilities for barrier-free access;
- develop raptor interpretive signing using an FS two-panel design, and coordinate the signage with the I&E plan;
- provide RV space for host, including asphalt pad and septic system;
- formalize shoreline trail from the boat launch to the rope swing and revegetate disturbed areas along the trail route; and
- rehabilitate and protect the Spring Creek riparian zone throughout the campground, which may include constructing split rail fencing, and/or boulder placement along the stream banks, designating trail crossing, and planting native riparian vegetation where stream banks are impacted.

FS generally agrees with the scope, level of funding necessary, and the type of improvements that the Joint Applicants propose to implement at Perry South Campground and Day-use Area. FS preliminary 4(e)-10 provides more specificity about the type of improvements. Within 3 years (as opposed to 5 and 10 years proposed by the Joint Applicants) of issuance of any new license, the Joint Applicants would implement the following: (1) surface new and existing roads and spurs with asphalt; (2) make existing boat launch/ramp ADA compliant; (3) replace boat dock to minimize maintenance and accommodate drawdowns; (4) replace concrete ties at boat ramps with new ties of better material; (5) provide ADA-compliant toilets, campsites, boat launch, and dock facilities; (6) replace existing outhouse with a 2-unit prefabricated concrete vault toilet; (7) formalize shoreline trail from boat launch to rope swing and revegetate; (8) provide 20 overnight boat moorages parallel to east bank; (9) upgrade RV spaces; (10) stabilize shoreline erosion on east bank of cove along Spring Creek; (see FS 4[e]-15); (11) develop interpretive signage about raptors; and (12) rehabilitate and protect Spring Creek riparian zone.

At the FS-managed Street Creek Boat Launch, located within the project boundary, the Joint Applicants propose to provide a boat launch and parking for 10 vehicles with trailers, install a permanent barrier-free vault toilet, and develop a temporary courtesy loading dock at the boat ramp. The Street Creek Boat Launch

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improvements as described in FS preliminary 4(e)-10 are consistent with the Joint Applicants' proposal.

Dispersed Recreational Sites

The Joint Applicants propose to improve four dispersed shoreline campsites near Lake Billy Chinook outside the project boundary and fund annual maintenance of these sites within 10 years of issuance of any new license. These sites include "BLM Beach" near the Three Rivers Recreation Area, the cove downstream of Cove Marina, and the west shore of the Deschutes River arm downstream of the bridge. At each site, the Joint Applicants would rehabilitate and level tent pads, cooking areas, and install boat tie-ups. The Joint Applicants would install self-contained, floating restrooms or establish a "pack in–pack out" policy. The sites would be closed to open fires during periods of high fire danger.

In addition, within 10 years of issuance of any new license, the Joint Applicants would provide funding to the appropriate management agency for the closure and rehabilitation of all other dispersed campsites around the lake and in the project area, assuming that the respective land managing agency formally commits to both officially closing the sites(s) and supporting enforcement of the closure. Closures and rehabilitation would include the FS-managed road leading to Balancing Rocks, which would occur within the first year of issuance of any new license. At Balancing Rocks, the Joint Applicants would develop trails and a small roadside parking area. In addition, within the first year of issuance of any new license, the Joint Applicants would install and provide annual O&M funds for a new self-contained, floating restroom for boaters on Metolius River near BLM Beach.

FS agrees with the need for this proposal. FS recommends that the Joint Applicants should fund improvements and annual maintenance at four dispersed campsites on Lake Billy Chinook and provide funding to the appropriate land management agency for the closure and rehabilitation of all other dispersed campsites. These recommendations are consistent with the Joint Applicants' current proposal.

Also consistent with the level of funding and intent of the Joint Applicants proposal, FS preliminary 4(e)-10 recommends that the Joint Applicants provide $30,000 to FS to fund closure and rehabilitation of the road leading to the Balancing Rocks area, develop a trail system, and construct a small roadside parking area. Consistent with the Joint Applicants, FWS 10(a)-3 recommends that the Joint Applicants close the road leading into Balancing Rocks area, develop a trail, and provide a small roadside parking area.

BLM agrees with the Joint Applicants on the proposed improvements and closures at dispersed recreational areas. BLM preliminary 4(e)-22 recommends that the licensee fund improvements, including level tent pads and boat tie-ups, as well as annual O&M, at

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four dispersed campsites within 1 year following issuance of any new license. Further, BLM recommends that the Joint Applicants should permanently close other dispersed sites on BLM lands and provide and maintain a floating restroom moored off the beach on the east side of Three Rivers Marina.

Other Recreational Measnres and Plans

Operational and Maintenance Costs

The Joint Applicants propose to partially fund annual O&M costs at the Cove Palisades State Park, fund 30 percent of O&M costs at Monty Campground, and fully fund Perry South Campground and Day-use Area, Street Creek Boat Launch, Chinook Island Day-Use Area, Indian Park, Pelton Park, Round Butte Overlook Park, and Pelton Wildlife Overlook. Funding would be initiated within the first year of issuance of any new license, contingent upon the signing of a contract between the Joint Applicants and appropriate agency or tribe. The contract between the Joint Applicants and FS would allow the Joint Applicants to assume management responsibility of the FS-managed facilities.

FS, the Tribes, and BLM agree with this proposal for the Monty, Perry South, and Street Creek sites. Beginning in 2009, FS preliminary 4(e)-10 recommends that the Joint Applicants provide O&M to sustain facilities in good service and repair over term of license, including picking up garbage and litter each week, pumping toilets, and cleaning and restocking restrooms daily.

Interpretation and Education Program

The Joint Applicants propose to develop an integrated I&E within 5 years of issuance of any new license in consultation with land management agencies, local government, and the Tribes. The plan would address important resources in the project area, including fish and aquatic resources, terrestrial and wildlife resources, cultural resources and tribal culture and history, and energy production and project history. Annual work plans and reports regarding the Joint Applicants' implementation of the I&E program would be included in the recreation resources implementation plan (discussed below).

FS preliminary 4(e)-14 is consistent with the Joint Applicants' proposal and recommends that the licensee share in the development of an integrated interpretation and education plan for project area as described in the Final Joint Application Amendment (E-VI-24) for recreational, aquatic, terrestrial, and cultural programs. The interpretation and education program would be developed and implemented within 5 years of issuance of any new license.

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BLM also agrees with the Joint Applicants, and BLM preliminary 4(e)-22 recommends that the Joint Applicants to fund and maintain an interpretation and education program for the project area as described in the Final Joint Application Amendment.

Recreation Resources Implementation Plan

The Joint Applicants propose to develop and implement a recreation resources implementation plan within 1 year of issuance of any new license. The plan would define the Joint Applicants' responsibilities for implementation and effectiveness monitoring reporting and would contain a schedule for implementing recreational measures in the project area over the term of any new license issued. All aspects of the recreation resources implementation plan would be developed in consultation with federal, Tribal, state, and local governments, would be consistent with existing laws and plans, and would be consistent with the following objectives:

- Effective management of project area recreational resources in a manner consistent with agency and Tribal objectives;
- Adequate and safe public access to the reservoirs;
- Avoidance or minimization of recreation-related impacts on other sensitive resources; and
- Provision of a range of feasible and desirable recreation opportunities consistent with the Pelton Round Butte Comprehensive Management Plan, or any subsequent recreation management plan that replaces, amends, or supplements the plan.

The Joint Applicants would document the recreation resources implementation plan through annul reports. The reports would document the implementation of measures, describe the coming year's proposal for implementing scheduled recreation management actions, reconcile, and document differences between proposed measures and actual or additional measures; document consultation activities related to the plan, and document the results of monitoring of completed actions.

BIA preliminary 4(e)-15 recommends that the Joint Applicants develop a recreation resources management plan to facilitate recreational use that is consistent with Tribal goals and objectives and to address for recreational effects of the project. Generally, the BIA plan is consistent with the intent of the Joint Applicants' proposal. However, certain aspects of the condition differ from those proposed by the licensee, including the funding of a full-time Tribal officer.

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Our Analysis

Recreational use at the project has increased significantly over the term of the current license, and the infrastructure and resource protection measures currently in place are not adequate to meet the existing and anticipated demand for recreational access to project waters. The site-specific proposed and recommended measures would improve access to project waters and improve the recreational experience, as well as to help protect scenic and wildlife resources, without allowing for an increase in the total number of recreationists. Other proposals, such as the shoreline management plan (see section 3.10.2.3 in *Land Use and Aesthetic Resources*) and increased law enforcement and future permitting programs (section 3.9.2.2, *Carrying Capacity and User Conflicts*, in *Recreational Resources*), would be designed to address increasing recreationist demand over the term of any license issued.

The proposed site-improvement measures at the Cove Palisades State Park address recreational needs at the primary public access sites within the project boundary. The proposed measures are consistent with the Cove Palisades Master Plan and would improve the recreational experience by better defining areas for recreational use, separating some of the competing activities, adding new recreational resources, and protecting the aesthetic and wildlife attributes of the park. In addition, the proposed measures would provide increased access for people with disabilities. We recommend that the Joint Applicants implement these proposals as part of the recreation resources implementation plan and in close coordination and consultation with the State of Oregon.

The Joint Applicants' proposal and the FS-recommended measures at the FS-managed Monty Campground, which is located outside the project boundary, would provide important improvements to the recreational facilities on the Metolius River.

The Joint Applicants' proposal and the FS-recommended measures at the FS-managed Perry South Campground and Street Creek boat launch, which are located within the project boundary, would provide important improvements to the recreational facilities on the Metolius River arm of Lake Billy Chinook. Recreational use of these sites, as well as inconsistent maintenance, has degraded site infrastructure, and the proposed and recommended measures would upgrade the sites, improve access to the reservoir, and reduce recreationist effects on natural resources. Except for the implementation timeline (the Joint Applicants propose a two-phase implementation schedule over 10 years, and the FS recommends a 3-year implementation schedule), the proposed and recommended measures are generally consistent for these sites. Given the current and projected level of use of these sites, and the backlog of infrastructure needs at these sites, we agree with need for the FS preliminary terms and conditions, as well as the FS-recommended implementation schedule.

The Joint Applicants' proposal and the BIA-recommended measures at Indian Park, including campsite improvements, a concrete boat ramp, and improved barrier-free

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access would improve the condition of the site and reduce conflicts between recreationists. We agree with the Joint Applicants and the BIA about the need for these improvements at Indian Park.

We agree with the Joint Applicants and BIA on the need for recreational, interpretation and education, and resource protection measures at Chinook Island. These measures would assist other management efforts to protect shoreline banks and other sensitive resources, including wildlife, from adverse effects while still providing a positive recreational experience. However, we do not agree with BIA on the need to fund a full-time Tribal officer to patrol Indian Park and Chinook Island. We discuss this component of the BIA preliminary condition in section 3.9.2.2, *Carrying Capacity and User Conflicts*, below.

The Joint Applicants' proposal and the FS-recommended measures to partially fund O&M at the Cove Palisades State Park and fully fund O&M at the FS-managed Perry South, Street Creek, and Monty Campground would complement the FS desire for an improved level of maintenance at these sites.

The Joint Applicants' proposal and agency-recommended establishment of four shoreline camping areas would address some of the demand for boat-accessed overnight camping. The Joint Applicants found that most of the dispersed use is associated with boaters stopping at shoreline sites. The proposed and recommended establishment of four designated camping and day-use sites on Lake Billy Chinook would focus use on designated areas, protecting the more sensitive areas, while providing a formal basis to absorb some of the dispersed shoreline recreational use. In addition, we agree with FS and BLM about the need to develop a formal monitoring of recreational use at these sites every 6 years, which is discussed in more detail in section 3.9.2.2, *Carrying Capacity and User Conflicts*, below.

The Joint Applicants' proposal and the agency-recommended closure of dispersed recreational sites on Lake Billy Chinook would protect aesthetic and wildlife resources of these areas. Currently, overnight camping and day-use activities at dispersed sites have caused shoreline erosion, site compaction, and damage to terrestrial and cultural resources. The proposed closures, in combination with other proposed management changes and the recommended level of site improvement, would protect these areas from overuse. In addition, the proposed and recommended self-contained, floating restroom on the Metolius River arm near the BLM Beach would encourage recreationists to use designated toilet facilities and help ensure compliance with the closures of the dispersed sites.

The Joint Applicants' proposal and the FS-, FWS-, and BLM-recommended improvements to the Balancing Rock area would help protect these unique geological features from inappropriate recreational use. Although this site is outside of the project boundary, the Joint Applicants' recreational surveys indicate that recreationists in the

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Balancing Rock area often stay at the FS-managed sites within the project boundary on the Metolius River arm, and visitors camping at Perry South or Monty Campgrounds pass the Balancing Rocks area on their way to the camping areas. We recognize the Joint Applicants' and FS' need to protect these resources and acknowledge their cooperative effort to protect and enhance such resources.

The Joint Applicants' proposal and the FS- and BIA-recommended interpretation and education program would improve the recreational experience by providing information about the project and project-related recreational, wildlife, aquatic, and cultural resources. We agree with BIA about the need to ensure interpretation and education signage at Indian Park and Chinook Island is consistent with Tribal goals. Much of the proposed interpretation and education program would be centered around recreational sites that provide primary access to project lands and waters. The program would educate recreationists about appropriate uses and areas for recreational activities and would subsequently help protect project environmental resources.

The Joint Applicants' proposal and the FS-, BLM-, and BIA-recommended recreation resources implementation plan would provide a framework for the Joint Applicants to implement the recreational site improvements and coordinate recreational development and management between the numerous land managers in the project area. The proposed and recommended measures are extensive and would provide a basis for significant improvements to recreational resources. As outlined in the Final Joint Application Amendment, the Joint Applicants would use the Comprehensive Management Plan (CTWS et al., 1999), which was developed in consultation with the agencies and outlined as goals and objectives for recreational management at the project, as the basis for the recreation resources implementation plan. The recreation resources implementation plan would be developed in consultation with the agencies and completed within 1 year of issuance of any new license. However, although there is considerable overlap between the proposed and recommended plans, there are also differences, such as implementation timelines, and the BIA-recommended funding of a full-time Tribal officer (discussed further in section 3.9.2.2, *Carrying Capacity and User Conflicts*). We agree with the Joint Applicants about the need for a recreation resources implementation plan, as it would benefit the overall implementation of recreational and other environmental measures. Any recreation resources implementation plan should be developed in consultation with FS, the State of Oregon, BLM, BIA, and the Tribes, such that proposed measures and the management goals of the agencies are coordinated and do not conflict.

3.9.2.2 Carrying Capacity and User Conflicts

The Joint Applicants proposed in the Final Joint Application Amendment several management-related measures to improve the recreational experience, reduce user conflicts, and help ensure that the current level of use does not exceed the carrying

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capacity of project recreational resources. The proposed measures, as described in the Summary of Recreation, Land Use, and Aesthetic Measures, include the following:

- Within 1 year of issuance of any new license, fund one additional year-round land-based Jefferson County Sheriff's Department deputy to patrol the project area.

- Within 1 year of issuance of any new license, fund two additional part-time water-based Jefferson County Sheriff's Department Marine Patrol deputies to patrol reservoirs during peak use periods.

- Within 10 years of issuance of any new license, develop criteria to evaluate whether navigational hazards on Lake Billy Chinook should be marked or removed, including public safety concerns and the effect of removal on natural or cultural resource values, including fisheries, habitat, and visual quality.

- Within 10 years of issuance of any new license, mark or remove navigational hazards on Lake Billy Chinook.

- Implement a communications coverage study to evaluate the ability of emergency and safety personnel to communicate, understand day-to-day management of emergency and safety activities, and understand how general public communication occurs outside of the immediate reservoir area.

- Within 1 year of issuance of any new license, fund measures identified in the coverage study.

- Fund a feasibility study to evaluate the technical feasibility of an off-shore moorage program. If feasible, fund the installation of up to 50 moorages on Lake Billy Chinook if the responsible land managing agencies agree to develop, implement and enforce regulations regarding the use of the moorages and enforce the closure of other areas where boats tie-up to the shore. Potential suitable coves to be considered include areas east of Perry South Campground, Big Canyon, Juniper Canyon, and near The Island on arms of the Crooked and Deschutes rivers.

- Within 1 year of issuance of any new license, fund a new staff position to coordinate implementation of project recreational, land use, and aesthetics plans and protection and enhancement to provide the necessary coordination between other resource areas.

The ODFW recommendation is generally consistent with the Joint Applicants' proposal. In addition to the land and marine patrol, ODFW also recommends that the Joint Applicants implement other enforcement activities, including compliance with ATV

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use, eagle nest site and winter range area protection, dispersed camping closures, shooting ordinances, and wildlife harassment. Enforcement of these activities would be coordinated between the Joint Applicants and Oregon State Patrol. ODFW also recommends that the Joint Applicants integrate and coordinate enhancement measures for the terrestrial resources management plan and the recreation resources management plan to identify appropriate and inappropriate use of resources, strategies, and actions and to reduce conflicts between resource areas. The recommendation would necessitate that future recreational measures proposed by the Joint Applicants be coordinated with ODFW and other agencies where potential effects on fish and wildlife could occur.

FS preliminary 4(e) condition no. 10, BLM preliminary 4(e) condition no. 23, and the FWS support the additional marine and land patrols and are generally consistent with the Joint Applicants' proposal. FS preliminary 4(e) condition no. 10 also recommends that the Joint Applicants fund a communications consultant to analyze the feasibility of establishing project-wide communication coverage. The FS recommends that the Joint Applicants conduct recreational use surveys every 6 years during the peak recreational season (May through September). The surveys would use on-site observations and interviews to determine occupancy, use trends, and visitor preference information at the four dispersed sites, and the results would be included that year's annual report. When use exceeds 90 percent capacity, FS recommends that the Joint Applicants consider changes in management, including a reservation system.

BLM preliminary 4(e) condition no. 22 recommends that the Joint Applicants conduct recreational use surveys at BLM-managed dispersed recreational sites every 6 years under the term of any license issued. If recreational use exceeds 90 percent of the dispersed site capacity, then, in consultation with BLM and other resource agencies, the Joint Applicants could consider management changes, such as a reservation system.

BIA preliminary 4(e) condition no. 15 recommends that the Joint Applicants develop a recreational resources management plan to facilitate recreational use that is consistent with Tribal goals and objectives and that would address the recreational effects of the project. As it relates to capacity, the Joint Applicants would implement criteria for marking or removing navigational hazards on Lake Billy Chinook that is consistent with, and minimizes effects on, environmental resources; implement recreational use monitoring every 5 years under the term of any new license issued; and fully support, including salary, benefits and administration costs, one additional Tribal officer for the Warm Springs Police Department to patrol Chinook Island day-use area, Indian Park, and other recreational areas within the project and bordering the reservation.

Our Analysis

Pre-filing recreational studies indicate that although boating use at Lake Billy Chinook is below the physical carrying capacity at all times of the year, it exceeds the

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social carrying capacity during peak-use periods. The studies also indicate that use at some individual recreational sites, including the Cove Palisades State Park, exceeds capacity during peak-use periods. Consequently, conflicts exist between recreationists in crowded areas of the reservoir and resource damage has been linked to overcrowding in a few sensitive areas along the reservoir.

The primary problems with on-water congestion are boaters who ignore no-wake zones and jet-skiers on personal watercraft who use the narrow, busy sections of the reservoir. A secondary problem is docking boats along shoreline areas, which contributes to shoreline erosion and dispersed site compaction. The proposed and recommended additional marine patrols would help limit speeding, which would help reduce boater conflicts and improve safety.

Illegal parking along the public roads and inconsiderate or illegal behavior in the campgrounds have also caused conflicts between recreationists. The increased land patrol would help reduce some of these conflicts.

Crowding is associated with two related issues within the project area: user conflicts associated with illegal boating and land-based uses and environmental resource damage. We agree that the additional enforcement would help to resolve some of the growing user conflicts associated with illegal boating and land-based activities. However, in addition to meeting the legal jurisdictional responsibilities of Jefferson County, the Joint Applicants indicate that the role of the additional marine and land-based patrols would include enforcement of recreation and wildlife regulations and support of Tribal law enforcement activities. It is unclear from the application to what extent the county would agree to enforce land management goals for federal and state agencies, or the Tribal laws. Although we agree with the need for the proposed and recommended additional law enforcement, we are concerned that enforcement of habitat improvement, closure of federally managed lands, and wildlife protection and enhancement measures might not be able to be enforced by the county patrols. The Joint Applicants need to work closely with the federal, state, and Tribal management authorities to ensure recreationists' compliance with the environmental enhancement measures. If the county is unable to enforce fish and wildlife protection measures, including land closures, road closures, protection of eagle nests and winter range areas, the Joint Applicants should develop a system to coordinate enforcement with the resource agencies. As long as adequate monitoring is in place (discussed below), it is possible that the proposed new Joint Applicants' staff position, which would coordinate the implementation of recreational, land use, and aesthetic measures, could fill this role by coordinating enforcement with the various land managers.

We do not agree with BIA on the need to fund a full-time Tribal officer to patrol Indian Park and Chinook Island in addition to the Jefferson County patrol because it is not clear how this would improve recreational experiences. The Joint Applicants propose measures to improve law enforcement by funding additional marine and land-based

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Jefferson County patrols that would improve safety and reduce conflicts between recreationists. These improvements to law enforcement would be implemented in the project area, including Indian Park and Chinook Island. The Joint Applicants also have proposed to implement both interpretation and education programs and resource protection measures at Indian Park, which would help to inform recreationists about accepted and discouraged behavior. Because recreational use statistics in the license application show that use of these two sites is concentrated during summer months, we find that the proposed resource protection measures would significantly improve the recreational experience. Funding an additional full-time, year-round patrol for these two sites would provide minimal additional benefits to the recreational experience beyond the proposed measures.

If feasible, the proposed boat moorage program would provide an opportunity for recreationists to anchor overnight and could absorb some of the overnight boater use displaced from closures of the dispersed recreational sites. The moorage program could also help protect sensitive shoreline areas and reduce recreationist effects on shoreline erosion by providing opportunities for boaters to camp on the reservoir. The Joint Applicants' proposal and the recommended study to evaluate the need for and to assist in the removal of navigational hazards on Lake Billy Chinook could improve boater safety.

Accurate estimates of total recreational use, recreational use by activity, and assessments of recreational issues, collected on 6-year intervals in coordination with the FERC Form 80 filing, would provide data for assessing site capacity and adjusting recreational resource management practices to fit future recreational needs within the project area. The FS and BLM recommend monitoring every 6 years, which is consistent with the filing period of the FERC Form 80 (BIA recommends monitoring every 5 years). The licensee should define the scope and time line of recreational monitoring, as well as develop a basis to adjust management decisions in the face of changing needs, as part of a recreation resources implementation plan (discussed in section 3.9.2.1).

3.9.2.3 Off-site Recreational Resonrces

As described in the Summary of Recreation, Land Use, and Aesthetic Measures, the Joint Applicants propose to partially fund the infrastructure maintenance or improvements at Haystack reservoir. The Joint Applicants would distribute funds to the FS at three intervals under the term of any new license issued: $10,000 in year 5; $15,000 in year 20; and $15,000 in year 40.

The Joint Applicants also propose to implement measures at BLM-managed sites downstream of the project and outside of the project boundary, including:

- Beginning in year 5 of any license issued for the project, assist with campsite development at Mecca for 15 sites, improve the Mecca Campground road, improve road access to Mecca, contribute toward either a portion of the power

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line or a solar panel system at Trout Creek, and contribute to materials for plan Ponderosa Pines along the river.

- Beginning in year 7 of any license issued for the project, improve road access to Trout Creek campground and provide water at either Trout Creek or Mecca Campground.

FS preliminary 4(e) condition no. 12 recommends that the licensee enter into a cost-share agreement with the FS, provide FS $12,000 annually to fund 20 percent of the annual O&M at FS facilities at Haystack reservoir, or take over O&M for the campground operation. The FS believes that if recreational use at Lake Billy Chinook is capped, then displacement of recreationists may increase, and FS would recommend review of the appropriate funding percentage by quantifying the number of displaced recreationists from the projeet to Haystack reservoir every 5 years under the term of any new license issued. A quantified estimate of use would be implemented with survey protocol defined in Rolloff et al. (1998).

The BLM recommends that the Joint Applicants participate in a cost-share agreement with the BLM to maintain, upgrade, or construct recreational facilities on the lower Deschutes Wild and Scenic River section downstream of the project. Specifically, Interior recommends that the Joint Applicants:

- fund 20 percent of recreation management for the reach between the project and Sherars Falls;
- fund 50 percent of time and expenses for a seasonal interpretive specialist to coordinate programs, pamphlets, and displays to address recreational effects;
- fund the cost of implementing the lower Deschutes River Interpretive plan, including constructing interpretive displays and kiosks that focus on resource protection;
- provide one-third of the cost of replacing interpretive signs and displays; and
- acquire river frontage easements or fee title lands to provide additional recreational opportunities associated with the mainstem Deschutes.

Our Analysis

We do not find a physical nexus, with regard to recreational use, between Haystack reservoir and the project. Haystack reservoir is approximately 20 road miles from the project, when traveling on main roads. The shortest route for a driver familiar with the local back roads, or a driver carrying a detailed map, would be to drive through the town of Culver, approximately 13 miles from the Cove Palisades State Park.

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Haystack provides a different type of recreational experience than that afforded by the project. Haystack reservoir is a small agricultural reservoir, set in rolling hills and grasslands. The geological character of Haystack reservoir is dissimilar to the basalt canyon and high mesa character of the project. The reservoir has few recreational facilities, including an improved campground, informal pull-out and camping areas, and a small day-use area. Given Haystack reservoir's small size and limited recreational resources, and the fact that these resources are dissimilar to those found within the project, it is unlikely that recreationists leave the project for a similar reereational experience at Haystack. Rather, the unique attributes of the Haystack reservoir, including a relatively quiet camping experience, a warm-water fishery, less people, and less regulatory oversight, likely attract a different type of user.

The primary basis for the FS claim of displaced use from the project to Haystack reservoir is a study conducted by the Joint Applicants (Rolloff et al., 1998). FS contends that the study shows about 20 pereent of use at Haystack is displaced from the project. Although the study indicates that recreationists at Haystack use Lake Billy Chinook, and that use patterns have changed in response to crowding on Lake Billy Chinook, Rolloff et al. (1998) do not conclude that the project is responsible for the specific level of use at Haystack reservoir. In fact, the study was not designed to quantify the question of displaced use. In a discussion on the reasons for changes in recreational use the study states:

Realistically, it seems fair to say that some portion of the user population that "demands" reservoir recreation in Central Oregon is absorbed by Lake Billy Chinook thus decreasing the pressure on other reservoir sites. On the other hand, there is probably some portion of the user population who became involved in reservoir recreation because of Lake Billy Chinook, who have been displaced by changes in conditions at Lake Billy Chinook; that portion is now placing an increased burden on other sites. We do not have the data to identify the percentages associated with these two groups.

Rather than concludmg that displaced use from the project exists at Haystack reservoir, we believe the study suggests that recreationists using Haystack reservoir are interested in different types of recreational experiences than those afforded by the project.

Some of the recreational sites within the project are at or near their physical carrying capacity during some peak-use weekends, including Perry South Campground, Deschutes River Campground, and Crooked River Campground. In addition, some day-use areas are also at or near capacity, including Crooked River, upper Deschutes, lower Deschutes, Cove Marina, and Chinook Island. However, during these same periods, other recreational sites within the project boundary, including Indian Park, Lake Simtustus RV Park, and Monty Campground, are not at capacity. Although it is likely that increased crowding within the project has induced some recreationists to change their use patterns in search of quieter or different recreational experiences, the project is able

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to accommodate additional camping and day-use recreationists during these relatively few weekends of high use.

We acknowledge the Joint Applicants' proposal to contribute to the funding of recreational measures at Haystack reservoir. The contributions to FS for Haystack reservoir recreational sites could improve the recreational experiences associated with the reservoir. However, we believe that funding O&M at the Haystack reservoir would not address project-related effects.

In its justification for licensee-funding of reereational management needs on the lower Deschutes River, BLM states that "with the project completion in 1964, the recreating public's opportunity to enjoy these unique areas was lost." BLM goes on to hypothesize about recreational patterns for free-fiowing rivers if the project dams were never built.

Recreational use of the lower Deschutes River does not appear to be project related. All of these lands are well outside of the project boundary. Sherars Falls, a primary recreational area on the lower Deschutes River, is more than 50 river miles downstream of the project, and many more miles by road. Access to put-in and take-out facilities on the lower Deschutes River is not associated with any project recreational facility.

3.9.2.4 Recreational Use along Bethel-Ronnd Bntte Transmission Line ROW

The Joint Applicants propose to develop and implement a ROW management plan for the transmission-line ROW within the project boundary, including lands managed by the FS and Warm Springs Reservation. The primary purpose of the management plan is to address effects of the transmission line on terrestrial resources. One component of the proposed plan would address recreational use and potential effects associated with the Bethel-Round Butte transmission line.

FS preliminary 4(e) condition no. 22 recommends that the Joint Applicants enter into a cost-share agreement with FS, or provide funding to plan, design, and implement site improvements in the ROW, including: site hardening, tent pads, potable water sources, picnic shelters, vegetation management plans, signing, vault toilets, fire rings, grills, tables, and O&M. Specifically, FS recommends that the Joint Applicants:

- develop the site of the Fox Creek Group Camp and fund 50 percent of the development costs;
- fund the annual O&M for the Fox Creek Group site;
- close the French Creek-Breitenbush powerline road;

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- fund the annual O&M for the French Creek-Breitenbush powerline road closure;
- close the French Creek-Breitenbush arm powerline road (50 percent);
- fund the annual O&M for the French Creek-Breitenbush arm powerline road closure;
- fund 50 percent of the access and travel management plan;
- fund 50 percent of the powerline recreation monitoring plan; and
- prepare an annual report.

Our Analysis

As noted in section 1.0, *Purpose of Action and Need for Power*, by order dated August 28, 2002, the Commission removed the Bethel-Round Butte transmission line from the existing project license. Because the Commission no longer has jurisdiction to enforce provisions on the lands occupied by the Bethel-Round Butte transmission line, we do not recommend including any measures involving these lands in any license issued for the project.

3.9.3 Unavoidable Adverse Effects

None.

3.9.4 Cumulative Effects

The recreational measures proposed by the Joint Applicants, as well as those recreational measures recommended by resource agencies, would contribute to a beneficial effect on recreational resources associated within the project area. A primary goal of the proposed and recommended measures is to improve the recreational experience and manage recreational resources without significantly increasing the number of recreational facilities or the number of recreationists. We believe that the proposed improvements to facilities and the proposed management measures would achieve these goals by reducing user conflicts, distributing recreationists more evenly throughout the reereational season, and implementing permitting programs if needed. However, as recreational demand for boating and camping opportunities at the project increases over time, some recreationists may be displaced to dispersed sites adjacent to the projects. Although individually minor, the cumulative effect of increased used of the dispersed sites may adversely affect wildlife and recreational values of these sites. The proposed site stabilization measures and closures of dispersed recreational areas outside

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of the project boundary should help preserve the recreational and wildlife attributes of these sites as demand increases. Overall, we believe that the proposed site improvements and improved management strategies within and adjacent to the project would offset any cumulative adverse effects of increased dispersed recreational use.

3.10 LAND USE AND AESTHETIC RESOURCES

3.10.1 Affected Environment

3.10.1.1 Regional Land Use

Lands surrounding the project are primarily owned or managed by federal, Tribal, and state managers, with some private urban and agricultural lands along the primary transportation corridors. Transportation corridors include federal and state highways, regional railroads, and a regional airport.

Land-use patterns in the Deschutes River basin are characterized by irrigated and dry-land agriculture, forestry and wood products, livestock grazing, and large tracts of unused lands. More recently, recreational use has begun to influence local and regional economies as recreationists access the large tracts of public lands for a wide variety of activities.

3.10.1.2 Project Area Land Use, Management, and Ownership

The project boundary contains lands adjacent to, and in the vicinity of, the three project developments (Round Butte dam, Pelton dam, and Reregulating dam), around the three project reservoirs (Lake Billy Chinook, Lake Simtustus, and the Reregulating reservoir), and the transmission lines that link the project developments with the Round Butte switchyard.

The Joint Applicants conducted an assessment of land-use activities of project lands, as well as lands within 0.25 miles of the project boundary. The Joint Applicants directly manage approximately 18 percent of the lands within the project boundary: 9 percent through fee-simple ownership and 9 percent through flowage easements on federal, Tribal, and private lands. Public agencies and the Tribes primarily manage the remaining lands through numerous federal, state, Tribal, and local land management plans. Some private lands are also within the project boundary. As part of the pre-filing studies, PGE conducted a survey of land ownership and land use for the project and lands extending 0.25 miles from the project boundary. We summarize land ownership within the study areas in table 29.

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Table 29. Land ownership and management within the Joint Applicants' study area. (Source: PGE and CTWS, 2001).

Land Owner/ Management Entity	Acres Under Management Within the Study Area	Percent of Total Lands Within the Study Area
BLM	3,953	31
Crooked River National Grassland (FS)	1,659	13
Deschutes National Forest	543	4
Tribes	3,852	30
Private (excluding the Joint Applicants)	1,334	10
State of Oregon	617	5
PGE	617	5
Total	12,794	98

Approximately 83 percent of project lands are undeveloped, 12 percent are reservoir/open water, and 5 percent are developed. Of the developed lands, approximately 62 percent are agricultural, 2 percent are natural resource extraction, 8 percent are project facilities, 13 percent are recreational, and 13 percent are rural residential.

Agricultural lands include cultivated crop and pasture lands, but do not include undeveloped open range lands. Agricultural lands are predominantly on the east side of the project reservoirs on the canyon rim. These lands account for 1,184 acres, or approximately 3 percent of the Joint Applicants' study area.

Resource extraction activities include small abandoned quarries along the Deschutes River arm of Lake Billy Chinook that were used to supply road construction and maintenance materials. The Joint Applicants estimate that the total acreage used for resource extraction is about 37 acres, or 0.1 percent of the project study area.

Industrial facilities include all of the project developments, including dams, powerhouses, and switchyards, as well as disturbed areas and outbuildings for storage and parking. These lands account for 155 acres, all of which are within the project boundary.

Rural residential lands include private lands within and adjacent to the project that provide access to project waters. These lands primarily include the Three Rivers Ranch community and private residential lots along the Metolius River arm of Lake Billy

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Chinook. Many of these properties have docks, retaining walls, and booms that extend into the reservoir.

The developed recreational lands include those areas with facilities for recreational access to project lands and waters, including campgrounds, day-use areas, parking areas, boat ramps, and marinas. See section 3.9 for a detailed discussion of recreational resources. The total lands developed for recreational use within the study area are 260 acres, or 0.6 percent of the study area.

3.10.1.3 Project Setting and Features

The immediate project area includes about 30 river miles and is dominated by large tracts of natural-appearing landscapes. The landscape around the reservoirs is characterized by high plateaus dissected by deep river-cut canyons, with large basalt cliffs, rock formations, and steep talus slopes. From the canyon rim, the project reservoirs, particularly Lake Billy Chinook, are dominant features in the landscape. Distant views of the forested eastern slope and the high peaks of the Cascade Mountains, as well as the high desert to the east, are also available from the canyon rim and other points in the project area. The overall character of the landscape is rural.

The Joint Applicants conducted a Scenic Attractiveness Inventory of project lands and lands within 0.25 miles of the project boundary. Generally, views from the project reservoirs and from the canyon rim provide extensive natural landscapes with visual variety created by variations in topography, geology, vegetation, and the relationship of the reservoir to the landscape. In a few areas, developments, including private residences, recreational sites, roads, transmission lines, and project developments, dominate the viewshed. In most cases, architectural design and site engineering used local materials. Design elements that are inconsistent with the natural landscape, such as some of the reflective roofs on private residences, are generally viewed only by boaters from narrow viewsheds on the project reservoirs. With some exceptions discussed below, the Joint Applicants found that most developments blend well with the surrounding area and that visual effects are marginal.

The Joint Applicants identified areas of human development that stand out as dominant elements in the landscape, including the Three Rivers Recreation Area, portions of Jordan Road, the Round Butte switchyard, certain transmission lines, and erosion and excessive human use at some dispersed and developed recreational sites. The 40-plus private residences with docks and marinas at the Three Rivers Recreation Area are developed along the Metolius River arm of Lake Billy Chinook. The lake in this area is relatively wide and the canyon walls are relatively gently sloped. Consequently, much of the development can be seen from distances of 1 mile or more. With certain lighting, aspects of the development can dominate the visual setting, including bright exterior colors and reflective materials used on some buildings, as well as extensive clearings and

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excavation. Except for the in-water docks and portions of the marina, these lands are outside of the project boundary.

The Jordan Road provides all public access to Lake Billy Chinook and receives heavy use by recreationists. The road is owned and maintained by Jefferson County. Some roads required cut-and-fill construction in certain locations to provide access to the bridges from the canyon rims. In areas along the Crooked River arm and Deschutes River arm, the cut-and-fill construction method is visible from the reservoir and the canyon rim and indicates the location and alignment of the road. From the reservoir and viewpoints along the canyon rim, the road cuts are one of the more prominent human-made features.

Project developments associated with the Round Butte dam, Pelton dam and the Reregulating dam are generally seen by recreationists from the reservoirs and from public view points upstream of the developments. Consequently, views of the dams are generally well screened and not dominant in the landscape. Where views of the project developments are available, the viewpoints are generally from a height that contains the visual elements of the development in the large canyons. Project facilities, which are light gray in color and fairly low in profile, are not dominant visual elements. More prominent features include the Round Butte switchyard, which can be seen through screened views from the public road; the 230-kV transmission line between the switchyard and the Pelton dam, which follows the public road for about 1.5 miles; and the transmission lines that cross Lake Simtustus west of the Lake Simtustus RV Park.

The Joint Applicants assessed the visual effects of reservoir operations, including the daily cycles and the seasonal drawdowns. Although the current license allows the licensee to draw Lake Billy Chinook up to 85 feet, the reservoir is held within 1 foot of full pond during the primary recreational season of June 15 through September 15. The average winter drawdown to allow for storage of the spring freshet is about 7.5 feet. Lake Simtustus has an average operational cycle for both summer and winter of 2.5 feet. The Reregulating reservoir is cycled about 20 feet daily. The Joint Applicants determined that the greatest visual influence of project operations occurs during the winter months on Lake Billy Chinook, when the drawdown exposes a white band around the lake that contrasts with the dark colored canyon walls. Because of limited winter use, the visual effects of the seasonal drawdown are minimal.

3.10.2 Environmental Effects and Recommendations

3.10.2.1 Compatibility of Project Featnres with the Visual Setting

The Joint Applicants proposed in the Final Joint Application Amendment to enhance project facilities to be more attractive, reflect an appropriate level of development in all design elements, and be compatible with the surrounding landscape.

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As described in the Summary of Recreation, Land Use, and Aesthetic Measures, at each annual recreation resources implementation plan meeting (discussed in the *Recreational Resources* section), the Joint Applicants would prepare a list of project upgrades and painting projects.

Specifically, the Joint Applicants would:

- Use permeon to coat the outside surface of the fish ladder that is visible from the wildlife viewing platform at the Reregulating reservoir;
- On the Pelton Dam Road, investigate, in year 10 of any license issued for the project, whether feasible and economic solutions exist to reduce the color contrast associated with the road cuts;
- On the Pelton Dam Road, replace the existing guard rail material with "rusted rail" guardrail material within 10 years of any license for the project;
- At the Round Butte switchyard, replace the existing transformers with gray transformers when they are being replaced for regular maintenance and replacement;
- Apply compatible paint color on the Pelton Park store and apartment building;
- Treat the interior of the Round Butte Overlook Park building with compatible colors;
- Phase out existing fencing and replace with non-galvanized, vinyl-coated fencing when adjacent to PGE recreation sites or PGE-maintained public access roads to those parks;
- Paint the Jefferson County Sheriff's boat house with a color agreed upon with FS;
- Consult with agencies regarding appropriate colors for any fish facilities constructed pursuant to the Current Fish Passage Plan; and
- Consult with FS about appropriate surface treatments for any existing fish facilities on the top of Round Butte dam or in the forebay that remain as long-term components of the fish passage program.

FS preliminary 4(e) terms and conditions differ significantly from the Joint Applicants' proposal. FS preliminary 4(e) condition no. 13 recommends that the Joint Applicants develop a landscape management plan for project facilities within 1 year of issuance of any new license. The FS recommends that the Joint Applicants implement aesthetic enhancement measures as part of regularly scheduled maintenance within the

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first 10 years of any new license issued. The plan would address color and form contrasts of facilities, roads, and other land-form alterations. Specific measures recommended by the condition include enhancement of color and form contrasts:

- on dams and fish ladders by applying acid or stain agents to reduce contrasts in existing structure and by adding earth tone coloring agent in concrete mix for new structures;

- of switch yards, powerhouses, and metal buildings by application of paint or stain in earth tone colors selected to blend with the surrounding natural landscape colors;

- for parks and campgrounds surrounded by chain-link fencing by using vegetative or structural screening and/or dark, non-reflective earth tone polyvinyl chloride (PVC)-coated chain-link fencing wherever chain-link fencing is used; and

- on the Jordan Road and Simtustus Quarry talus slopes by applying soil tackifiers and biostimulants to facilitate revegetation.

FS preliminary 4(e) condition no. 19 recommends that the Joint Applicants develop and implement a transmission line landscape management plan with protection measures for recreational sites, scenic roads, and facilities. FS recommends that the Joint Applicants enhance the ROW clearing by varying the clearing width to create more irregular form/line effect, with feathered edges, shrubs and low growing hardwoods under the lines and hardwoods and conifers in the drainage bottoms. In addition, FS preliminary 4(e) condition no. 19 recommends that the Joint Applicants allow for the development of special forest products, such as Christmas tress, boughs, medicinal plants, and post/pole harvest. FS preliminary 4(e) condition no. 19 also recommends that the Joint Applicants stain towers with dark earth-tone colors to reduce the form and color contrast with surrounding landscapes, as well as replace the lines when they are retired with non-reflective materials and plant native vegetation to screen towers from foreground views.

Our Analysis

The Joint Applicants-proposed measures to address visual effects of the licensee-managed recreational areas would help to reduce visual contrasts between the developments and the surrounding landscape. Generally, the licensee-managed sites have mature vegetation and other landscaping elements that screen the sights from views along the reservoir and from the roads. Some additional measures to further reduce the visual contrast of these sites would improve the aesthetic quality of these recreational areas.

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FS preliminary 4(e) condition no. 13, which recommends that the Joint Applicants develop a landscape management plan for all project facilities, as well as roads and other land-for alterations, would provide a forum for the Joint Applicants to establish conditions for implementing changes to project facilities and recreational sites. Generally, project facilities blend with the landscape. The industrial components of the dam developments are not inconsistent with the landscape, and views of the developments are generally from the reservoir and other areas such that the developments do not dominate the landscape. The exception is the Round Butte dam that a relatively small number of recreationists see from Lake Simtustus. Colors and forms of project facilities generally blend with the surrounding areas. We disagree with FS about the need for the visual enhancements detailed in preliminary condition no. 13, particularly those measures that recommend staining, painting, or planting on and around the existing dams, roads and talus slopes. Because most of the project facilities blend with the landscape and do not significantly detract from visitor experience, the FS-recommended visual enhancements would provide limited improvements to the visual landscape. Furthermore, the FS recommendation may conflict with project-related historic properties.

Nonetheless, development of a landscape management plan would allow the Joint Applicants to develop aesthetic guidelines and methods for future improvements and maintenance of project facilities and recreational sites over the term of any license issued for the project. We recognize a need for a landscape management plan that outlines reasonable objectives and goals, including materials and colors, to be used during ongoing maintenance and new construction to minimize visual effects of project facilities. The goal of the plan would be to consider practical cost effective measures for reducing visual contrasts that adversely affect the experience of viewing the project from primary recreational areas, including painting selected project features in a manner compatible with the project's character and, if necessary, planting some visual screens to reduce visual contrasts of project facilities. The plan should be developed in consultation with FS, SHPO, and other interested stakeholders and filed with the Commission for approval within 1 year of issuance of any new license.

FS preliminary 4(e) condition no. 19 recommends that the Joint Applicants develop a transmission line landscape management plan for those portions of the Bethel-Round Butte ROW that cross the Willamette National Forest. Given that the lands associated with the Bethel-Round Butte transmission line are not part of any license issued for the project and, therefore, are not within Commission jurisdiction, we do not recommend including any proposed or recommended measures pertaining to the Bethel-Round Butte transmission line ROW in any license issued for the Pelton Round Butte Project.

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3.10.2.2 Land Use Resonrces in the Project Area

The Joint Applicants proposed in the Final Joint Application Amendment to fund project-related road maintenance, including funding annual maintenance for Dizney Lane and Pelton Dam Road, conduct engineering analysis and provide funds for Jefferson County's annual maintenance costs through the Jordan Road slide area. The Joint Applicants also propose to enter into agreements with the FS regarding upgrades to and maintenance of FS Roads 11 and 1170. Specifically, as described in the Summary of Recreation, Land Use, and Aesthetic Measures, within 5 years of issuance of any new license, the Joint Applicants propose to contribute 10 percent of total capital costs (up to $81,200) for FS Road 11, and 81 percent of total capital costs (up to $361,000) for FS Road 1170. In addition, the Joint Applicants would contribute toward annual maintenance costs at a rate of 10 percent for FS Road 11 and 81 percent for FS Road 1170. Both of these roads are outside of the project boundary, but provide the primary access to the Metolius arm of Lake Billy Chinook.

As part of ongoing settlement negotiations, the Joint Applicants propose to enter a Road Maintenance Agreement with Jefferson County (letter from J. Keil, Director, Hydro Licensing and Water Rights, PG&E, Portland, OR, and from J. Manion, General Manager, Warm Springs Power Enterprises, Warm Springs, OR, to the Commission, filed April 27, 2004). Specifically, the Joint Applicants would contribute funds totaling $2.1 million to Jefferson County to assist with maintenance of county roads within the project area. The agreement would define roads within the project area as those roads between the east and west rim of Lake Billy Chinook from the Crooked River arm to the Deschutes River arm, and payments would be spread out over the term of any new license issued for the project.

FS preliminary 4(e) condition no. 11 is generally consistent with the Joint Applicants' proposal. In addition to requiring the Joint Applicants to enter into a cost-share road agreement with the FS to maintain, upgrade, or construct FS Roads 11 (11 percent of cost) and 1170 (95 percent of cost), FS recommends a survey of traffic use every 5 years and adjustment of the annual maintenance share based on these surveys.

The FS also recommends two conditions that are not proposed by the Joint Applicants. The first condition, FS preliminary 4(e) condition no. 20, recommends that the Joint Applicants conduet a study on the lands adjacent to the transmission lines in the Willamette National Forest to determine the degree of the effect of the transmission line on forest management activities. The study would be based on topography, location of the transmission line relative to the stands requiring management, and the exiting road locations. FS recommends that a logging systems specialist conduct the study. Where the logging specialist determines that the transmission line negatively affects logging operations adjacent to the transmission line, the Joint Applicants would have to provide their share of the costs proportional to their share of the responsibility.

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The second condition, FS preliminary 4(e) condition no. 21, recommends that the Joint Applicants fund a study to develop a harvest schedule for removal of long-term hazards in the stands adjacent to the transmission line on the Willamette National Forest. The objective of the study would be to develop management rotation for the stands adjacent to the transmission line that considers such factors as current stand age, timber size, harvesting systems and future stand management, as well as rotation lengths, and timing, and location of treatments. FS recommends that the analysis include forest lands up to 0.25 miles adjacent to the ROW, but states that the areas considered for treatment are part of larger stands. The study would include management, access and logging considerations for these larger stands. In addition, the study would consider other needs such as access and logging systems relevant to the land management outside of the immediate zone adjacent to the transmission line.

BLM proposes one preliminary condition that is not included in the Joint Applicants' proposal. BLM preliminary 4(e) condition no. 30, item 3, recommends that the Joint Applicants prepare a travel and access management section of a transmission line ROW management plan. This section would include closure and decommissioning of all unneeded access roads; conformance to BLM road maintenance standards; coordinated vegetation management on all service and access roads; and funding every 3 to 5 years for the term of any license issued for road closure management.

Our Analysis

The Joint Applicants' proposed measures to fund project-related road maintenance for the Dizney Lane and the Pelton Dam Road would provide continued public access over project lands to projeet environmental resources. PGE (the current licensee) has maintained these roads in good condition during the current license. The roads are essential for licensee staff to access the developments, and are essential for providing public access to project waters. We agree with the Joint Applicants about the need to maintain project roads in good condition and provide public access along these roads for the term of any license issued for the project.

Jordan Road provides public access to the state park sites and the Deschutes and Metolius arms of Lake Billy Chinook. The proposed assistance to Jefferson County for analysis and maintenance of the Jordan Slide area could help the county maintain Jordan Road in good condition. In addition, the proposed road maintenance agreement would provide substantial assistance to Jefferson County and help ensure that public access to the project is maintained in good condition for the term of any new license issued.

The Joint Applicants' proposal and FS preliminary 4(e) condition no. 11 recommendation to enter into a cost-share agreement to maintain FS Roads 11 and 1170 would allow continued public access to the Metolius River arm of Lake Billy Chinook. The cost sharing arrangement could help FS to maintain these roads and would address

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some of the effects associated with recreational access to remote areas of Lake Billy Chinook. The primary difference between the Joint Applicants' proposal and FS preliminary 4(e) condition no. 11 is based on a disagreement about the level of responsibility for the improvements and maintenance (i.e., whether the Three Rivers Ranch is project related). FS preliminary conditions recommend that the licensee contribute a significant additional funding primarily to the improvements and maintenance of FS Road 1170.

We note that the Three Rivers Ranch is a private development on the Metolius River arm of Lake Billy Chinook. The ranch provides public rentals of house boats, jet skis, and some cabins, and it has a public boat launch, fuel dock, and marina.

As the Joint Applicants point out in their reply comments dated February 6, 2003, filed in response to agency term and conditions, much of the maintenance needs on FS Road 1170 is deferred from inadequate maintenance. We acknowledge the Joint Applicants' proposal to enter into a cost-sharing agreement as proposed. We note that the Joint Applicants propose to contribute 81 percent of the total capital costs (up to $361,000) for FS Road 1170. In addition, the Joint Applicants would contribute toward annual maintenance costs. We find the Joint Applicants' proposal to be reasonable.

FS preliminary 4(e) condition nos. 20 and 21, which recommend the study of lands adjacent to the transmission lines and removal of hazards in the timber stands, and BLM preliminary 4(e) condition no. 30, which recommends a travel plan, concerns land use associated with the Bethel-Round Butte transmission line. Given that the lands associated with the Bethel-Round Butte transmission line are not within FERC jurisdiction, we do not recommend including any proposed or recommended measures pertaining to the Bethel-Round Butte transmission ROW in any license issued for the Pelton Round Butte Project.

3.10.2.3 Shoreline Management Plan and Shoreline Erosion Plan

The Joint Applicants proposed in the Final Joint Application Amendment to develop and implement a shoreline management plan for the project reservoirs in order to manage private in-water developments within the project boundary. The shoreline management plan would include a new shoreline development permit system with design guidelines developed in consultation with Jefferson County, the Tribes, and other land management agencies. The permit system would be administered by Jefferson County and the Joint Applicants would fund annual administrative costs.

As described in the Summary of Recreation, Land Use, and Aesthetic Measures, the Joint Applicant would develop and implement a Shoreline Erosion Plan. The plan would discuss conditions and probable causes of, as well as remedies for, shoreline erosion; describe actions agreed upon by stakeholders; and provide that all actions conducted under the plan would be developed and implemented in consultation with the

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Shoreline Erosion Team, which would consist of federal, state, Tribal, and local government representatives. Also within the first year, the Joint Applicants would conduct a baseline survey, initiate annual monitoring, begin annual reports to the Shoreline Erosion Team, and provide for additional monitoring during certain operational situations. Within 3 years of issuance of any new license, the Joint Applicants would start the rehabilitation process at sites listed in the plan, Sites would include at a minimum Chinook Island, Indian Park Campground, Juniper Canyon, Big Canyon, dispersed sites on the east bank just south of the Round Butte dam, dispersed sites on the east site of the Island Research Natural Area, shoreline of the cove at Perry South Campground and along Spring Creek, the shoreline upstream of the Upper Deschutes day-use area, BLM beach east of the Three Rivers Marina, the shoreline and access road at Monty Campground, and Pelton Park.

The Joint Applicants also propose to implement measures to control erosion at Chinook Island. The plan includes a breakwater facility and shoreline stabilization, as well as some recreational measures considered in section 3.9, *Recreational Resources*.

Each of the agencies (FS, BIA, BLM, and ODFW) submitted preliminary terms, conditions, or recommendations relating to shoreline management. We summarize each of these in section 3.3.2.1, *Erosion Control* in *Geology and Soils*.

Our Analysis

The Joint Applicants-proposed and the FS- and ODFW-recommended shoreline management plan would provide a basis for developing and implementing guidelines for private shoreline development. In addition, the plan would outline methods and high-priority areas for erosion control remediation. Currently, erosion is occurring at several sites along the shoreline of the three reservoirs. Studies conducted by PGE as part of its initial consultation identify 31 sites and indicate that about 70 percent of the erosion sites are associated with undeveloped and informal recreational areas and that 30 percent are associated with primary recreational facilities. Erosion related to recreational activities is particularly persistent at Chinook Island, where the erodible volcanic soils are susceptible to both wave action and disturbance by recreationists walking and digging in exposed shoreline banks. The proposed stabilization measures, in combination with proposed recreational management measures, would help protect these sites from further degradation.

ODFW and FWS recommend integrating the shoreline management plan with the implementation of the recreational resources management plan and terrestrial resources management plan to adequately address comprehensive, long-term resource protection. Considerable overlap exists between some of the proposed and recommended recreational and terrestrial enhancement measures. For example, the Joint Applicants propose and the FS and BLM recommend measures to close dispersed shoreline

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recreational sites. Erosion associated with recreational use has been identified at some of these sites. Integrating the implementation of the shoreline management plan with the terrestrial and recreational plans would streamline implementation of protection measures, consultation, and funding. We agree that there is a need to integrate the shoreline management plan with the terrestrial resources management plan and the recreational resources management plan. One possible means for integrating these plans is in the recreation resources implementation plan, proposed by the Joint Applicants and recommended by staff in section 3.9.2.1, *Recreational Use and Resources*. Combining the plan with erosion control measures in the recreational resources management plan would ensure a certain level of integration and coordination between the Joint Applicants and the resource agencies. However, if this is impractical, then the Joint Applicants should develop the shoreline management plan separately and include a detailed discussion of how the plans would be integrated.

The ODFW recommended Shoreline Work Group would provide an additional administrative burden on the licensee that would be redundant with the consultation proposed for shoreline management plan development. We would not recommend inclusion of this part of the ODFW recommendation in any new license issued for the project.

The BIA- and BLM-recommended shoreline erosion management plan includes many details outlined in other agency conditions, such as detailed assessment of shoreline erosion, implementation of appropriate remediation measures at priority sites, coordination of management activities with other resource management plans, and annual reporting and monitoring. These conditions are generally consistent with those measures specified by FS and the recommendations of ODFW and FWS, but significantly extend the scope of the management plan and erosion remediation measures to include public lands. Other proposed plans are intended to remediate erosion on these lands, including the proposed terrestrial resources management plan and the recreation resources implementation plan. We do not agree with the need for the terms and conditions outlined in BIA preliminary 4(e) condition no. 14, which recommends inclusion of erosion control measures in the shoreline management plan.

We agree that there is a need to develop a shoreline management plan that outlines private development standards and establishes means to stabilize shoreline erosion areas throughout the project. Although there is limited opportunity for private development on project reservoirs, the plan would implement design guidelines for new docks and dock replacements, so that, over time, the visual and recreational effects of private docks would be reduced.

It would be beneficial to develop any shoreline management plan in consultation with the resource agencies, including the State of Oregon, FS, BLM, BIA, FWS, and the Tribes, and filed with the Commission for approval within 1 year of issuance of any new license. Consultation with the Oregon State Historic Preservation Officer (SHPO) also

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would be beneficial because we conclude in section 3.11 that project operations could affect historic properties.

3.10.3 Unavoidable Adverse Effects

None.

3.11 CULTURAL RESOURCES

3.11.1 Affected Environment

Cultural resources are the physical remains (e.g., sites, structures, or objects) left by people who occupied or visited areas during prehistoric and historic times. The cultural resources of the Pelton Round Butte Project area include three types of cultural resources: prehistoric sites relating to 13,000 years of American Indian cultural history; historic sites, buildings, and linear resources associated with Euro-American settlement and development since 1850; and traditional cultural properties (TCPs) of importance to Tribal members.

Archaeological investigations in central Oregon document human occupation of the area for the past 9,000 years. This occupation spans four broad time periods: Paleo-Indian, prior to 10,500 years before the present (BP); Early Archaic, from 10,500 to 7,000 BP; Middle Archaic, from 7,000 to 2,000 BP, and Late Archaic, from 2,000 BP to historic contact.

The distinctive fluted projectile points characteristic of the Paleo-Indian period have not been found in the project area, but have been documented in neighboring regions of central Oregon. Rockshelters and large-stemmed lanceolate and leaf-shaped projectile points from the Early Archaic period reflect use of plateaus and canyon bottoms in the project area by this time. The large number of Middle Archaic Period occupation sites includes broad-necked stemmed and notched projectile points and indicate that populations were growing and were using a broader range of resources. By the Late Archaic Period, the dominant projectile points are small, narrow-necked, notehed types, reflecting the introduction of the bow and arrow. During this last major period, the archaeological record indicates that population centers shifted to large villages near major rivers, with economies increasingly focused on the use of anadromous fish.

The project is located within the traditional use areas of the Paiute (Northern), Wasco, and Warm Springs Indians. Prior to the establishment Warm Springs Reservation in 1855, the Wascos lived along the Columbia River between Celilo Falls and the west end of the Columbia Gorge. The Warm Springs inhabited the Columbia River from Celilo Falls to the John Day River and in the lower Deschutes and John Day River drainages. The Northern Paiute people occupied lands from the middle Deschutes River

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southward to parts of Nevada and southeastern California. The Warm Springs and Wasco people, who shared a long history of intermarriage and cooperation, were relocated to the Warm Springs Reservation in the late 1850's. The Paiutes, geographically and culturally separate from the Warm Springs and Wasco people, were relocated to the Warm Springs Reservation in the 1870's following a period of warfare with the United States. Today, these three linguistically distinct Tribal groups are joined together into one political entity, the Confederated Tribes of the Warm Springs Reservation.

Euro-American contact in central Oregon began with the Lewis and Clark expedition in 1805 to 1806. Fur trappers entered the Deschutes and Crooked River drainages by the 1820's. Emigrants to the west generally followed the Oregon Trail, north of the Deschutes River basin. At least one group of emigrants, led by Stephen Meeks, sought a shortcut to the west and traveled along the Deschutes River in 1845. Settlement in the Deschutes River basin did not begin until the 1870's after the threat of hostilities with the Paiutes ended. Ranchers and farmers made claims, but the major influx of homesteaders occurred after completion of the railroad linking central Oregon to the Columbia River corridor in 1911.

The first hydroelectric plant in the project area was constructed on the Crooked River in the early 1910's. The Federal Power Commission issued a license for a dam at the Pelton site in 1924, but it was not built because the Bonneville dam on the Columbia River met the demand for electricity at that time. After World War II, the demand for electricity increased dramatically and, after the resolution of legal and regulatory struggles, PGE constructed the Pelton dam in 1956 and the Round Butte dam in 1961.

Based on cultural resource surveys conducted in the project area, 14 prehistoric archaeological sites, five historic archaeological sites, and two TCPs are considered National Register of Historic Places (National Register) eligible properties and 14 linear resources are considered contributing elements to linear properties that extend beyond the project boundaries.

The APE is defined as "the geographic area or areas within which an undertaking (relicensing) may cause changes in the character or use of historic properties, if any such properties exist (36 CFR 800). The APE for the Pelton Round Butte Projeet is defined for archaeological sites, buildings, and hydroelectric facilities where ground disturbance or other forms of degradation or loss may occur as a result of project-related activities. The areas within the APE encompass 83.4 miles of reservoir shorelines; 5,025 acres of recreational areas associated with the reservoirs, 690 acres associated with project facilities and transmission lines; and 44.5 acres associated with road corridors. The APE includes a 150-foot-wide (50 meter) zone at the upper reservoir margin as well as cultural features such as rockshelters and caves that are readily accessible from the shoreline, a 750-foot-wide (250 meter) buffer zone around the recreational areas and project facilities,

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the full ROWs along the transmission lines (from 100 to 325 feet) and a 45-feet-wide zone (15 meter) on each side of roadways (PGE and CTWS, 2002).

Joint Applicants separately conducted background studies and jointly conducted records research and field surveys from 1996 through 1999 to identify prehistoric and historic cultural resources. The literature reviews and field studies are synthesized and reported in a Final Technical Report (Pettigrew, 1998). The Joint Applicants adjusted and implemented the common research design of the Central Oregon Heritage Group developed by Pettigrew in 1996.

The inventory of archaeological sites within the project APE includes 110 prehistoric sites, of which 17 are previously recorded sites that were revisited (table 30). The total includes 71 open-air lithic scatters, 3 rockshelters/pictograph locations, and 36 rock feature sites. National Register evaluations were conducted at 19 sites (17 lithic scatters and 2 rockshelters) considered to have the highest risk of direct effect from project activities. Based on the evaluations, 14 prehistoric sites within the project APE are recommended as National Register eligible.

Table 30. Historic properties (considered National Register eligible) within the project APE.[a] (Source: PGE and CTWS, 2002, as modified by staff)

Site Number	Site Type	General Location	Owner/Administrator
Prehistoric sites			
35JE19	Rockshelter	Cove Palisades State Park	Ochoco National Forest
35JE20/21	Lithic scatter	Cove Palisades State Park	BLM (Prineville)
35JE58	Rockshelter	Metolius River arm	Private
35JE153	Lithic scatter	Cove Palisades State Park	Ochoco National Forest/State of Oregon
35JE185	Lithic scatter	Cove Palisades State Park	Ochoco National Forest
35JE295	Lithic scatter	Metolius River arm	Deschutes National Forest
35JE347	Lithic scatter	Reregulating reservoir	Private
35JE454	Lithic scatter	Metolius River arm	Tribes
35JE455	Lithic scatter	Metolius River arm	Tribes
35JE458	Lithic scatter	Reregulating reservoir	Tribes
35JE459	Lithic scatter	Reregulating reservoir	PGE
35JE461	Lithic scatter	Reregulating reservoir	PGE
35JE470	Lithic scatter	Lake Simtustus	Ochoco National Forest
35JE509	Lithic scatter	South of Metolius River	Deschutes National Forest

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Site Number	Site Type	General Location	Owner/Administrator
Historic sites			
ORJE8	Railroad camp	Lake Simtustus	BLM (Prineville)
ORJE21	Homestead	Cove Palisade State Park	State of Oregon
ORJE24	Homestead	Cove Palisade State Park	State of Oregon
ORJE32	Homestead	Cove Palisade State Park	Ochoco National Forest
ORJE34	Homestead	Cove Palisade State Park	Ochoco National Forest/State of Oregon
Linear sites			
CP-H6	Road	Round Butte dam	Ochoco National Forest
EG-01	Road	Madras West	Private
GB-3	Road	Madras West	BLM
GB-19	Road	Warm Springs	Tribes
HIS-1	Trail	Steelhead Falls	Ochoco National Forest
HIS-2	Road	Round Butte dam	BLM
HIS-6	Trail	Round Butte dam	BLM
HIS-14	Railroad	Madras West	BLM/private
I-5H	Fence	Round Butte dam	Ochoco National Forest
I-6H	Fence	Round Butte dam	Ochoco National Forest
I-7H	Fence	Round Butte dam	State of Oregon
I-10H	Fence	Round Butte dam	BLM
I-11H	Fence	Round Butte dam	Ochoco National Forest
RS-1	Road	Madras West	Private
Traditional cultural places			
Southern edge of Metolius Bench	TCP		Tribes
Seekseequa Junction	TCP		Tribes

[a] Not including the Bethel-Round Butte transmission line corridor.

The inventory of historic archaeological sites within the project APE includes 30 sites consisting of 17 homestead locations, 9 trash seatters, 2 railroad construction camps, 1 pit feature, and 1 collapsed rock ramp. National Register evaluations were conducted at

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8 sites. Four of these historic archaeological sites, plus one site that had previously been evaluated, are recommended as National Register eligible.

Five properties containing historic buildings were identified during archival research or field surveys, including a ranch site, house, garage, rock enclosure, and earthen weir for water storage. None of these historic structures are recommended as National Register eligible; however, the weir (CP-H5) is a contributing element to an eligible homestead, and the rock enclosure requires further research to evaluate. The survey report concluded that project facilities, which are less than 50 years old, did not possess exceptional historic significance sufficient to qualify them as National Register eligible. However, the report suggested reconsideration of the significance of the project facilities in 2007 after they attain the 50-year minimum age requirement, or prior to any major modification to the project facilities.

A total of 59 linear resources were identified within the project APE, including 15 roads, 33 fences, 5 trails, 1 railroad line, 3 ditehes, 1 rock wall, and 1 flume. Linear resources were evaluated based on an historic context focused on linear resource types (Pettigrew, 1998, appendix B). Based on this evaluation, 14 linear sites within the project APE are considered to have integrity and to have contributing elements that embody the distinctive characteristics of a type, period, or method of construction (criterion C of the National Register eligibility standards). Thus, if any of these linear resources are considered National Register eligible in their entirety, then these components would be contributing elements.

The Joint Applicants also conducted ethnographic studies to identify and evaluate TCPs in the project APE. The studies identified nine locations of potentially eligible TCPs in the project APE. TCPs must exhibit continuity of use over time to be considered National Register eligible.

Two TCPs are considered National Register eligible. The TCP at the southern edge of the Metolius Bench was used traditionally as a major plant and wildlife resource area of the Seekseequa community. The TCP at the Seekseequa Junction Area was the location of a major Paiute settlement on the Warm Springs Reservation, and the general area was the historical nucleus of settlement for the Paiutes who were relocated to the reservation in the 1880's. Both TCP locations are culturally important to the Seekseequa community on the Warm Springs Reservation and continue to be occupied and used by the community.

3.11.2 Environmental Effects and Recommendations

The continued operation of the Pelton Round Butte Project could affect historic properties. These effects include shoreline erosion associated with reservoir fluctuation, and ground-disturbing activities associated with facility maintenance, recreational use,

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and the protection of natural resources. A summary of potential effects on National Register-eligible properties within the project boundary is shown in table 31.

Table 31. Potential effects on National Register-eligible properties within the project boundary. (Source: PGE and CTWS, 2002)

Issue	Location	Eligible Sites	Potential Project Effects
Project operations	Reservoir shoreline drawn zone; Metolius River arm are Lake Billy Chinook and the Reregulating reservoir	35JE454 35JE455 35JE458 35JE459 35JE461	Continued erosion and silting of prehistoric cultural resources
Road and trail maintenance	Cove Palisades State Park, east rim; the Island and canyon, east of the Reregulating reservoir; east rim of Lake Simtustus; south of Metolius River arm of Lake Billy Chinook	35JE20/21 35JE347 35JE470 35JE509 ORJE21 ORJE34	Ground-disturbing activities on prehistoric cultural resources related to road and trail use, maintenance and/or improvements
Campground maintenance, use, and development	Cove Palisades State Park-Crooked River Campground; Deschutes National Forest-Perry South	35JE153 35JE295	Ground-disturbing activities and erosion due to campground facility maintenance, use and development
Recreational effects and vandalism	All areas open to public recreational use; Metolius Bench	35JE19 ORJE24 35JE58[a] TCP	Disturbance and damage from reereational activities and vandalism
Activities to protect or enhance natural resources	All areas within the project boundaries	35JE461	Ground-disturbing activities

[a] Effects at this site are not project related, but due to the significance of this resource, the Joint Applicants have agreed to implement the appropriate site recording and protection efforts.

3.11.3 Cultural Resonrces Management Plan

To ensure that relicensing would not have an adverse effect on the eligible archaeological sites (historic properties), the Joint Applicants propose to implement the provisions of the proposed final CRMP that includes general management policies for:

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(1) consultation and coordination with appropriate state and federal agencies and the Tribes, (2) avoidance of anticipated project effects, (3) preservation in place through site protection, (4) mitigation of adverse project effects through data recovery, and (5) confidentiality of site information.

The proposed final CRMP includes specific ongoing management procedures and programs for: (1) monitoring archaeological resources potentially affected by the project (begun in 1999); (2) evaluating sites through subsurface testing to determine National Register eligibility (16 sites within 6 years of issuance of any new license); (3) recovering data at sites where project effects cannot be avoided after consulting with the appropriate Tribes and agencies and the SHPO and Tribal Historic Preservation Officer (THPO); (4) completing survey and resurvey in the project APE to incorporate advances in survey methodology, re-evaluate the project facilities in 2007, survey other acquired lands prior to ground-disturbing activities, and survey areas not included in the previous surveys that are made accessible through ground-clearing fires or exceptionally low reservoir drawdowns; (5) minimizing vandalism through restricted access, site location confidentiality, training to recognize and report vandalism, and funding additional law enforcement personnel; (6) enhancing culturally important resources including habitat for fish, native animals including the mule deer, and plants such as tule; (7) reporting annually on implementation of the CRMP; (8) providing interpretation and education opportunities generally including interpretive signs, displays, and brochures at recreational facilities and trails and specifically for the petroglyph at the Cove Palisades State Park and participating in the FS Passports in Time public archaeology program; and (9) staffing, including a part-time cultural resources coordinator, and training of project staff in cultural resource management.

Specifically, for archaeological properties, the Joint Applicants proposes to: (1) establish a site monitoring program and conduct on-going site monitoring for the 5 sites affected by shoreline erosion and siltation; (2) avoid the National Register-eligible sites within transmission line ROWs during routine maintenance of transmission line ROWs through training of maintenance personnel and regular monitoring of site conditions; (3) avoid the 6 sites located along roads and trails during maintenance and use including coordination with those who own or administer the roads and trails; (4) coordinate with state and federal agencies to define specific protection and mitigation programs to protect 2 sites potentially affected by campground use, maintenance, and development; and (5) work with agencies to determine how best to restrict access to all archaeological sites and TCPs that could be affected by dispersed recreational use, and provide financial support and training for additional law enforcement officers to reduce the effects of vandalism and to reduce trespassing on the Warm Springs Reservation.

To achieve the general management policies for interagency consultation and coordination, the proposed final CRMP includes detailed procedures for: (1) identifying staff roles and training; (2) implementing protection and mitigation measures;

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(3) reviewing operation, maintenance, and construction activities including undertakings exempt from interagency case-by-case review, undertakings requiring case-by-case review, and undertakings in response to urgent conditions; (4) conducting future surveys; (5) inadvertent discovery of artifacts, looting or vandalism, and human graves or remains; (6) annual reporting; (7) providing interpretation and educational opportunities; (8) ensuring confidentiality; and (9) implementing and reviewing the CRMP.

The Joint Applicants state that the CRMP is consistent with the Central Oregon Heritage Group policies for cultural resource management, with management plans of the state and federal agencies, and with national programmatic agreements for the cultural resources on BLM lands. The Joint Applicants propose in the CRMP that other sites within the project boundary that are not National Register eligible would be managed according to BLM Manual 8100 (Identifying Cultural Resources) and FS Regulation 2360 (Recreation, Wilderness, and Related Resource Management Issues).

The Joint Applicants indicate that the final proposed CRMP would be reviewed with the Ochoco National Forest, Deschutes National Forest, Mt. Hood National Forest, Willamette National Forest, BLM Prineville and Lakeview Districts, BIA, SHPO, Tribal Cultural Resources Program Manager, THPO, National Park Service's Pacific Northwest Regional Office, the Advisory Council on Historic Preservation (Advisory Council) and the Commission, as consulting parties to the Section 106 consultation process. The Joint Applicants propose that the CRMP would be reviewed within 5 years of initial implementation and at 10-year intervals thereafter.

FS preliminary 4(e) condition no. 6 and BLM preliminary 4(e) condition no. 26 specify that Joint Applicants prepare and implement a Programmatic Agreement prior to implementation of a CRMP and that the Programmatic Agreement make provisions for: (1) funding for restoration and recovery of past and future damage to archaeological sites in the APE as defined in the CRMP; (2) surveying for site discovery and/or data recovery for future expansion facilities; and (3) conducting cultural resources sensitivity training to company personnel as identified in the CRMP. BLM preliminary 4(e) condition no. 26 also specifies that the CRMP acknowledge that the BLM has primary responsibility for the management of heritage resources on BLM land and that BLM's National Programmatic Agreement and Oregon Protocols (BLM, 1997) take precedent over the 36 CFR 800 regulations for Section 106 compliance. Both FS and BLM specify that the Programmatic Agreement should be completed within 3 months issuance of any new license. FS preliminary 4(e) condition no. 17 and BLM preliminary 4(e) condition no. 27 also reserve authority to condition the management of historic and cultural resources on NFS lands until after FS has reviewed a draft CRMP.

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Our Analysis

We have reviewed the cultural resource survey reports and the descriptions of potential project-related effects and proposed protection and enhancement measures presented in the license applications and in the proposed final CRMP. The Final Technical Report (Pettigrew, 1998) presents a detailed description of the project APE and its variations to reflect the types of resources, land ownership, and topography, as well as a thorough discussion of the types of resources expected and found in the project area.

The measures proposed by the Joint Applicants and endorsed by the agencies provide for the completion of survey and evaluation and are responsive to the potential project-related effects. We agree with the Joint Applicants' proposal to conduct additional surveys in the future to identify cultural resources on newly acquired lands prior to any ground-disturbance and on land not included in the previous surveys that may become accessible, as these lands might contain historic properties. Further, we agree that the use of state-of-the-art methodology during future survey opportunities, as provided for in the proposed final CRMP, is professionally responsible and appropriate.

The Final Technical Report (Pettigrew, 1998) acknowledges that the evaluation of potentially significant sites is incomplete. The program proposed by the Joint Applicants to complete evaluation through subsurface testing of those sites that could be affected by project-operations or other project-related activities is entirely appropriate, and we conclude that it would be warranted. Such an approach confines disturbance of potentially eligible sites to those most likely to be affected by the projects and leaves the remaining sites, not subject to unnecessary harm from the project, undisturbed. Likewise, we conclude that re-evaluating the significance of the project facilities after they reach the 50-year minimum age requirement in 2007, or thereafter, would be a reasonable measure.

Monitoring the shoreline sites to assess the effects erosion and siltation induced by project operations, and proceeding with protective measures where the erosional and silting effects cannot be controlled or avoided, as described in the final CRMP, is a reasonable approach to addressing the current and future effects of erosion and siltation on these sites. We agree that data recovery should be a last resort measure used only if other site protective measure prove ineffective. We conclude that shoreline monitoring of eligible sites and data recovery, if necessary, as provided in the final CRMP, is warranted. To ensure that future development does not inadvertently damage known or as yet unknown sites, we agree that the CRMP be implemented in coordination with the proposed shoreline management plan.

In addition to the project-related recreational facilities described in section 3.9, *Recreational Resources,* the Joint Applicants have documented over 50 dispersed recreational sites around the reservoirs. Survey findings reported in the proposed final CRMP indicate that dozens of sites could be affected by maintenance, use, and

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development of project recreational facilities, campgrounds, and dispersed recreational sites located on archaeological sites. Monitoring these sites as described in the final CRMP would enable the Joint Applicants, BLM, and FS to assess their condition and plan maintenance and development activities to avoid further disturbance to these sites. To ensure that recreational facilities maintenance and development activities do not unnecessarily harm known or as yet unknown sites, we agree that the final recreation resources implementation plan should be implemented in coordination with the CRMP (see section 3.9, *Recreational Resources*).

Procedures proposed in the final CRMP for routine maintenance activities along transmission lines and of roads trails are designed to avoid unnecessary harm to known sites. These measures focus on providing adequate information and training to project staff responsible for maintenance activities. The proposed final CRMP contains detailed provisions for training project O&M staff in cultural resourees management, including how to identify sites, how to avoid damage to sites during routine maintenance of project facilities, roads, and trails, and how to handle and report on activities that could affect sites. It also provides for professional oversight through a cultural resources coordinator. We would expect the cultural resources coordinator to meet the Secretary of the Interior's standard for cultural resource professionals or be provided sufficient training in cultural resource management to meet the standard. We conclude that the proposed measures for staff training and oversight, as described in the final CRMP, are reasonable and appropriate.

The proposed measures focused on informing the public about the prehistory, history, and traditional uses of placcs to be included in the interpretation and education plan would heighten the awareness of those who visit the project area about the value and fragility of cultural resources. These measures, in combination with increased staff training, confidentiality of site locations, and additional law enforcement presence during the recreational season, could serve to reduce vandalism to known sites both on project lands and on the Warm Springs Reservation. These measures, when taken together, are reasonable and warranted to address the vandalism and looting that occurs in the project area. We agree that implementation of the interpretation and education plan should commence after the recreation resources implementation plan is in place.

The proposed measures for enhancing resources of cultural importance to the Tribes' involve protection and enhancement of anadromous fish, native wildlife, and plants. As discussed in sections 3.6.2, *Effects and Recommendations,* in *Aquatic Resources,* and 3.7.2, *Effects and Recommendations,* in *Terrestrial Resources*, we endorse proposed measures that would protect and enhance anadromous fish, the mule deer populations, and native plants, especially at the Pelton waterfowl pond and concur that the development of a plan to facilitate Tribal access for the use of biological resourees of cultural importance is reasonable and warranted. We note that the Joint

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Applicants would implement the final CRMP in coordination with the Current Fish Passage Plan and terrestrial resource management plan.

The proposed final CRMP recognizes the prerogatives of BLM and FS mandates and responsibilities for cultural resources management on the lands they administer and does not seem to contradict or propose measures inconsistent with these mandates or with the national programmatic agreements. The proposed final CRMP addresses and includes specific provisions in response to all of the items specified in the FS and BLM preliminary Section 4(e) conditions. Therefore, we find the proposed CRMP to be consistent with preliminary Section 4(e) terms and conditions. We do, however, point out that the Programmatic Agreement would be executed prior to issuance of any new license for the project, and not within 3 months after issuance of any new license.

3.11.4 Unavoidable Adverse Effects

None.

3.12 NO-ACTION ALTERNATIVE

We evaluated the relative merits of the various recommendations against baseline condition (No-action Alternative) in the Deschutes River basin. Under the No-action Alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection or enhancement measures would be implemented.

3.13 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Our recommended action alternative to relicense this existing project would not irreversibly or irretrievably commit any significant developmental or nondevelopmental resources in the basin. At any point in the future, project facilities could be modified or removed and any operational effects altered. There is no major new capacity or construction proposed or recommended that would commit lands or resourees in an irreversible manner.

3.14 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The Pelton Round Butte Project would provide an annual average energy production of 1,591,168,000 kilowatt-hours (kWh) (with the Joint Applicants-proposed and staff-recommended enhancements) to help meet consumer demand for electricity and help industries meet electricity needs. Long-term productivity would extend at least as long as the duration of any license issued for the project (up to 50 years). The

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recommended alternative is designed to increase short-term recreational uses and long-term biological productivity of the ecosystem. This includes enhanced vegetation, fish habitat, and water quality, and protection of habitat for species of special concern, such as the federally listed bald eagle, middle Columbia river steelhead and bull trout.

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4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the water resources of the Deschutes River to generate power, estimate the economic benefits of the Pelton Round Butte Project, and estimate the cost of various environmental protection and enhancement measures and the effects of these measures on project operations.

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶ 61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. This economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision on what is in the public interest with respect to a proposed license.

For our economic analysis of alternatives, we used the assumptions, values, and sources shown in table 32.

Table 32. Staff assumptions for economic analysis of the Pelton Round Butte Project. (Source: Staff)

Assumption	Value
Power rate (2002)[a]	47.86 mills/kWh
Capacity rate (2002)[b]	Included in power rate
Period of analysis	30 years
Term of financing	20 years
Bond/debt ratio[c]	0.407
Weighted bond rate[d]	7.59 percent
Stock return[e]	10.5 percent
Cost of capital[f]	9.305 percent
Discount rate[g]	9.305 percent
Federal income tax rate	34.0 percent
Local tax rate	3 percent
Escalation rate after 2002	0 percent
O&M costs (2002$)[h]	$4,528,260
Net investment (2002$)[i]	$111,270,800

[a] The power rate selected by staff was based on a power value of 47.8 mills per kilowatt-hour (mills/kWh), which is the weighted average of expected annual on-peak and off-peak market prices for 2002 reported by PGE to the Oregon Public Utility Commission in Advice No. 00-15 dated November 1, 2000.

[b] Capacity value is assumed to be included in the power value.

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[c] Ratio of long-term debt to the sum of long-term debt plus total equity. Values taken from PGE's 2001 Form 10-K annual report (page 58).

[d] Interest charges on long-term debt for 2001 divided by average long-term debt including debt due within one year for 2000 and 2001. Values taken from PGE's 2001 Form 10-K report (pp. 56 and 75).

[e] Value taken from PGE Form 10-K annual report (page 7).

[f] Based on the stock return, bond/debt ratio and weighted bond rate as taken from PGE's Form 10-K annual report (see notes c, d, and e above).

[g] Assumed same as cost of capital.

[h] PGE provided a 2001 estimate for annual costs of $4,170,000 per year for the project, which includes O&M and FERC administrative fees, in the license application. Staff escalated that estimate to 2002 dollars. PGE would also begin paying a state of Oregon reauthorization fee, reported to be $311,000 in 2002. Although the fee would escalate over time, we do not account for that escalation in the economic model.

[i] PGE provided the current net investment values of each development as of December 31, 2001, as follows: Pelton – $16,596,553; Round Butte – $29,280,570; Re-regulating – $20,690,000. PGE also provided a list of protection, mitigation, and enhancement measures that have been completed prior to 2003, which totaled $11,497,500 in year 2000 dollars. PGE states that these costs are not included in the December 31, 2001, net investment values provided by PGE in the license application. PGE estimates relicensing costs, exclusive of enhancement measures of $24,000,000 in year 2000 dollars. Also, PGE completed the upgrades of Units 2 and 3 at Round Butte in 2002 at a cost of $10,750,000. Therefore, we have added those costs to the 2002 net investment of the No-action Alternative. Costs attributed to 2003 and later years have been added as future costs in the economic model for the Proposed Project alternative, and, as appropriate, to the proposed with staff-recommended measures alternative. Where necessary, net investment values were depreciated to December 31, 2002, dollars using straight-line depreciation over a 20-year period.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROPOSED PROJECT

As proposed by the Joint Applicants, the Pelton Round Butte Project would generate an average of approximately 1,591,168,000 kWh of electricity annually, have an annual power value of $76,153,300 (47.86 mills/kWh), and total annual costs of $26,267,110 (16.51 mills/kWh), resulting in a net annual benefit of $49,886,190 (31.35 mills/kWh).

The provision of minimum flows that are higher than are currently provided at the three developments would produce an overall decrease in project generation. The minimum flows would result in generation decreases of about 681 MWh per year at

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Round Butte and 24 MWh per year at Pelton. Generation at the Reregulating dam would increase by about 25 MWh per year. The total effect of minimum flows on the project is a loss of about 680 MWh per year. The loss would reduce the average annual power value of the project by about $32,540 at a power rate of 47.86 mills/kWh.

The Joint Applicants also propose to maintain flows downstream of the Reregulating dam within +/–10 percent of project inflows to Lake Billy Chinook, except when flows are over 6,000 cfs and if any one of the following events occurs: any event triggering the Emergency Action Plan, power emergencies as defined by the Western Systems Coordinating Council, equipment failures or emergencies at project dams or powerhouses, or during reservoir drawdowns for floods.

The Joint Applicants propose to provide supplemental minimum flows from September 16 through November 15 to ensure a minimum flow release of 3,000 cfs downstream of the Reregulating dam, subject to a maximum supplement of 200 cfs and a maximum drawdown of Lake Billy Chinook of 4 feet. There is a low historical frequency of inflows less than 3,000 cfs during that period (30 days in 77 years). We expect that the supplemental flows would have a negligible effect on generation.

Operation of downstream fish passage facilities at Round Butte proposed by the Joint Applicants would result in the loss of annual generation because of the increased head losses of 1.7 to 2.0 feet at the intake (about 2,000 to 5,900 MWh per year); fish transport flows of 40 cfs, which do not pass through the Round Butte turbines (about 9,000 MWh per year); and electrical energy consumption of the fish passage system (about 1,500 MWh per year). Staff estimates the loss to be an average of about 14,400 MWh per year. The loss would reduce the annual project power value by about $689,180. No changes proposed at the Pelton fish ladder or the Pelton fish trap would change the existing energy losses that occur due to the ongoing operation of those facilities. Those losses have been included in the energy estimates for the current project (No-action Alternative).

The proposed SWW system (included as part of the downstream fish passage modifications) would modify the hydrothermal and flow pattern structure in Lake Billy Chinook to enhance fish movement toward the forebay, while maintaining the water quality (i.e., temperature, DO, nitrogen, and other constituents) of flow releases. The system would allow water to be withdrawn from the surface or at a much lower depth of Lake Billy Chinook. Operation of the SWW system would reduce project generation due to losses in hydraulic head caused by the density differential head between the warm water in the intake tower and the cold water in the reservoir and hydraulic losses inside the SWW structure. PGE estimates these losses to range from 0.6 to 1.8 feet, resulting in an estimated annual loss of generation of 1,760 to 5,300 MWh. Staff assumes an average loss of 3,530 MWh, which corresponds to a loss in power value of about $168,950.

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4.2 POWER AND ECONOMIC BENEFITS OF THE STAFF-RECOMMENDED ALTERNATIVE

Resource agencies and NGOs recommended implementing a variety of measures at the project. Staff reviewed each recommendation and determined the measures that were most appropriate for implementation.

As recommended by staff, the Pelton Round Butte Project would generate an average of 1,591,168,000 kWh of electricity annually, have an annual power value of $76,153,300 (47.86 mills/kWh), and total annual costs of $26,265,050 (16.51 mills/kWh), resulting in a net annual benefit of $49,888,250 (31.35 mills/kWh).

Table 33 compares the power value, annual costs, and net benefits for the No-action Alternative, the Joint Applicants' proposal, and the Joint Applicants' proposal with additional staff-recommended measures. Note that staff did not adopt the Joint Applicants' proposal to develop and implement a transmission ROW management plan for the Bethel-Round Butte transmission line, because the Commission amended the project license to remove the line from the project in its order dated August 28, 2002.

Table 33. Summary of the annual net benefits for the Joint Applicants' proposal, the Joint Applicants' proposal with additional staff-recommended measures, and the No-action Alternative for the Pelton Round Butte Project. (Source: Staff)

	Joint Applicants' Proposed Action	Joint Applicants' Proposed Action with Additional Staff-Recommended Measures	No Action
Installed capacity (kW)	366,820	366,820	366,820[a]
Annual generation (kWh)[c]	1,591,168,000	1,591,168,000	1,609,778,000[b]
Annual power value	$76,153,300	$76,153,300	$77,043,980
(mills/kWh)	47.86	47.86	47.86
Annual cost	$26,267,110	$26,265,050	$21,140,040
(mills/kWh)	16.51	16.51	13.13
Annual net benefit	$49,886,190	$49,888,250	$55,903,940
(mills/kWh)	31.35	31.35	34.73

[a] The installed capacities of the Round Butte, Pelton, and Reregulating developments are: 247,120 kW; 100,800 kW; and 18,900 kW, respectively (Order Amending License and Revising Annual Charges, October 31, 2001).

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[b] The average annual generation for the Round Butte, Pelton, and Reregulating developments is: 1,016,994,000 kWh, 452,439,000 kWh, and 34,970,000 kWh, respectively, based on historical data for years 1967 to 1997 and the upgrades of Units 2 and 3 at Round Butte.

Table 34 shows the effect on costs and power values of individual measures proposed by the Joint Applicants and recommended by staff and others, including the additional measures that staff recommends.

Staff also agrees with the recommendation of ODEQ, FWS, NOAA Fisheries, and the Tribes' BNR to restrict the drawdown of Lake Billy Chinook to a maximum of 20 feet (to elevation 1,925 feet msl) during winter operation, with a target of no more than 10 feet. Based on predicted levels for 30 years, Lake Billy Chinook would never be drawn down more than 10 feet, so we do not expect implementation of the restriction to affect generation.

In section 5.1, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the staff alternative and why we believe the environmental benefits are worth these costs.

4.3 POWER AND ECONOMIC BENEFITS OF THE NO-ACTION ALTERNATIVE

Under the No-action Alternative, the Pelton Round Butte Project generates an average of 1,609,778,000 kWh of electricity annually, has an annual power value of $77,043,980 (47.86 mills/kWh), and total annual costs of $21,140,040 (13.13 mills/kWh), resulting in a net annual benefit of $55,903,940 (34.73 mills/kWh). These values reflect the upgrades to Units 2 and 3 at Round Butte completed on September 3, 2002, and December 16, 2002, respectively. PGE expected the upgrades would increase annual generation by about 60,500 MWh. The upgrades, which included turbine runner and transformer replacements, were completed at a cost of about $10,750,000. The increased generation was added to the estimated annual generation provided in the license application. The cost of the upgrades was added to the 2002 project net investment value. Although the turbine capacity ratings increased, the authorized installed capacity of the units did not change because the overall unit capacities are limited by the generators, which were not upgraded.

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Table 34. Summary of capital and one-time costs, annual costs, annual energy costs, and total annualized costs of environmental measures proposed by the Joint Applicants and recommended by staff and others for the Pelton Round Butte Project. (Source: Staff)

Environmental Measures	Entity	Capital and Oue-Time Costs (2002$)	Annnal Costs, Inclnding O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
Aquatic resources measures				
1. Provide minimum flows in accordance with the Joint Applicants' latest proposal dated December 31, 2003, as part of a lower Deschutes River habitat enhancement program (gaging improvements, use of large woody debris, gravel enhancement, and measures to maintain DO levels).	JA, ODFW, NOAA Fisheries, Staff	$139,760[a]	$40,730[a,b]	$61,600
2. Provide a minimum flow equal to state target flows (see table 12) with an allowance of 150 cfs to fill Lake Billy Chinook when inflow is less than the target minimum fiow.	ODEQ, FWS	$0	$32,540[c]	$32,540

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
3. Provide Q80 flows as target flows to be released to the lower Deschutes River with a 150-cfs refill allowance for Lake Billy Chinook if needed (see table 12).	Tribes' WCB	$0[c]	–$11,580[c, d]	–$11,580
4. Provide seasonally adjusted higher minimum flows than state target flows of 4,200 to 4,000 (table 12 and section 3.6.2.1).	BIA	$0[c]	$53,270[e]	$53,270
5. Provide same minimum flows as proposed, but supplement inflows from September 16 to November 15 to ensure minimum release of 3,000 cfs subject to maximum supplement of 200 cfs and maximum drawdown of Lake Billy Chinook of 4 feet.	JA, NOAA Fisheries, ODFW, Staff	$0[c]	Negligible[c, f]	Negligible

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
6. When inflows are less than target flows, maintain an outflow of 3,000 cfs, unless waived by BLM if the Joint Applicants show that lower flows would maintain ORV values.	BLM, FS, AR	$0[c]	$0[c, g] (cost included in item no. 2)	$0
7. Hold flows below Reregulating dam to within +/–10 percent of measured inflow, with exceptions and limit daily drawdowns to a maximum of 21 feet to elevation 1,414 feet msl.	JA, Tribes' WCB, ODEQ, FWS, ODFW, Staff	$0[c]	Negligible[c, h]	Negligible
8. Hold flows below Reregulating dam to within +/–10 percent of measured infiow, but retain flexibility to use Lake Billy Chinook, and to move the target date for refilling the reservoir to later than June 15.	AR, WW	Unknown[c]	Unknown[c, i]	Unknown
9. When exceptions to +/–10 percent rule are allowed, minimize deviations.	FWS	$0[c]	Negligible[c, j]	Negligible

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
10. Use storage in Lake Billy Chinook to maintain state minimum flows.	WW	$0[c]	$837,550[c, k] (in addition to cost of item no. 2)	$837,550 (in addition to cost of item no. 2)
11. Do not provide a 150-cfs allowance, but allow temporary deviations from minimum flows to refill Lake Billy Chinook.	BIA	$0[c]	$0[c] (included in cost of item no. 4)	$0
12. Provide the same minimum flows as proposed by the Joint Applicants, but do not allow reduction in outflows to refill Lake Billy Chinook.	AR	$0[c]	$55,760[m]	$55,760
13. Limit downramping to 500 cfs over any moving 60-day period when instantaneous flows are 4,500 or less at Madras gage, and, from October 1 to February 28, limit downramping to 800 cfs over any moving 30-day period when flows are less than 4,500 cfs.	BIA	$0[c]	$0[c, n] (included in item no. 4)	$0

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
14. Improve measurement equipment and reporting ability including reservoir level monitoring stations on all three reservoirs.	BIA	$70,000[c] (in addition to item no. 49)	$0[c]	$10,450 (in addition to item no. 49)
15. Monitor lower Deschutes River habitat availability.	BIA	$10,000[c]	$20,000[c]	$21,490
16. Provide monthly operations reports.	BIA	$0[c]	$5,000[c]	$5,000
17. Provide reports on deviations, as needed.	BIA	$0[c]	$10,000[c]	$10,000
18. Develop and implement a large woody debris plan.	JA, NOAA Fisheries, ODFW, BLM, FS, Staff	$10,000[c]	$10,000[c,o]	$11,490
19. Develop and implement a gravel augmentation plan to include the placement of 250 to 1,000 cubic yards of gravel annually at a minimum of 3 sites.	BIA	$100,000[c]	$725,000[c,p]	$739,930

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
20. Develop a gravel study and implementation plan for spawning gravel monitoring, including evaluation of historical fish counts, spawning data and spawning gravel quality; determine the need for gravel augmentation.	JA, Tribes' WCB, ODEQ, ODFW, FWS, BLM, FS, Staff	$100,000[c]	$36,200[c,q]	$51,130
21. Implement an experimental gravel augmentation program.	JA, ODFW, NOAA Fisheries, Staff	$175,000[c]	$8,250[c]	$34,380
22. Develop and implement a water level management program for project reservoirs including more restrictive ramping rates.	JA, Tribes' WCB, ODEQ, ODFW, FWS, BLM, Staff	$0[c]	$0[c] (cost included in the WQMMP, item no. 49)	$0
23. Consult with agencies if Lake Billy Chinook is not projected to refill by June 15.	FWS, ODEQ	$0[c]	$500[c]	$500

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
24. Restrict Lake Billy Chinook drawdowns to maximum of 20 feet (elevation 1,925 feet msl) during normal winter operation.	JA, Tribes' BNR, ODEQ, FWS, NOAA Fisheries, Staff	$0[c]	$0[c,r]	$0
25. Set a target maximum drawdown for Lake Billy Chinook during normal winter operations of no more than 10 feet.	JA, Tribes' BNR, ODEQ, FWS, NOAA Fisheries, Staff	$0[c]	$0[c,r]	$0
26. Develop and implement a chart to instruct operators on measures to refill Lake Billy Chinook and Lake Simtustus.	FWS	$5,000[c,s]	$0[c]	$750
27. Fill Lake Billy Chinook by April 1, if possible.	Tribes' WCB	$0[c]	Unknown[c,t]	Unknown

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
28. Operate project to refill Lake Billy Chinook to at least 1,944 feet msl by May 1 and maintain Lake Billy Chinook within 1 foot (1,944–1,945 feet msl) through September 15, unless drawdown is necessary under ramping rate requirements.	BIA	$0[c]	Unknown[c, u]	Unknown
29. Develop and implement a fish passage plan including the SWW if prerequisites are met.	JA, Tribes' WCB, ODEQ, ODFW, FS, BIA, BLM, FWS, NOAA Fisheries, AR, WW, Staff	$12,241,870[a]	$1,204,370[a, v]	$3,031,980
30. Develop and implement a lamprey passage evaluation plan.	JA, ODFW, FWS, Staff	$0	$27,780[w]	$27,780

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
31. Revise the fish passage plan annually and prepare and implement a Section 18 implementation and monitoring plan.	FWS	$20,000[c]	$20,000[c]	$22,990
32. Revise the fish passage plan after 8, 13, and 18 years and file an annual monitoring report and work plan.	BIA	$20,000[c]	$20,000[c, x]	$22,990
33. Provide information about passage alternatives, if SWW is unsuccessful.	BIA	$20,000[c]	$0[c]	$2,990
34. Provide temporary screening and bypass facilities during testing of the SWW facility.	JA, NOAA Fisheries, FWS, ODFW, Staff	$500,000[c]	$25,170[c, x]	$99,820
35. Evaluate hydraulic conditions in the Round Butte forebay and tailrace.	FWS, NOAA Fisheries	$100,000[c]	$0	$14,930
36. Evaluate mortality at Round Butte dam.	FWS, NOAA Fisheries	$200,000[c]	$0	$29,860

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
37. Design/construct the deep water screen to meet NOAA Fisheries smolt criteria for sweeping velocities, including a fish bypass.	FWS, NOAA Fisheries	$1,000,000[c]	$0	$149,290
38. Develop and implement a resident fish resource enhancement program in Lake Simtustus.	JA, ODEQ, ODFW, FWS, NOAA Fisheries, Staff	$20,710[a]	$13,110[a]	$16,200
39. Develop and implement a resident fish resource enhancement plan in Lake Billy Chinook.	JA, ODEQ, ODFW, FWS, NOAA Fisheries, Staff	$498,740[a]	$10,350[a]	$84,810
40. Develop and implement a hatchery program.	JA, ODFW, Tribe's BNR, FWS, BIA, Staff	$0[a]	$414,110[a]	$414,110
41. Conduct genetic studies on wild and hatchery steelhead in the basin.	FWS	$100,000[c]	$0	$14,930

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
42. Develop and implement a near-term habitat acquisition, protection, and enhancement program.	Tribe's WCB, ODEQ	$600,610[a]	$15,530[a]	$105,200
43. Establish and implement a Pelton Round Butte Water Rights Fund.	JA, ODFW, Staff	$3,429,960[a]	$0	$512,060
44. Establish a Pelton Round Butte General Fund	JA, ODFW, Staff,	$2,423,800[a]	$0	$361,850
45. Lower River Implementation Plan habitat enhancement measures and monitoring.	JA, ODFW, Staff	$469,850[a]	$0	$70,140
46. Implement habitat enhancement and restoration measures sufficient for 227 acres of inundated riverine habitat on federally reserved lands.	BLM, FS, FWS	$0[c]	$530,000[z]	$530,000

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
47. Implement habitat enhancement and restoration measures sufficient to compensate for 350 acres of inundated riverine habitat on, or adjacent to, reservation lands.	BIA	$0[c]	$750,000[z]	$750,000
48. Implement habitat enhancement and restoration measures to compensate for unavoidable loss of fish during passage through project reservoirs and passage facilities.	BLM, FS, FWS	$0[e]	Undeterminable[aa]	$0
49. Develop a Long-Term Monitoring Program and data management program (WQMMP).	JA, BIA, BLM, FWS, NOAA Fisheries, ODEQ, ODFW, FS, Staff	$51,760[a]	$103,530[a]	$111,260

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
Terrestrial resources				
50. Develop and implement terrestrial resources management plan to integrate existing habitat acquisition, and existing and proposed habitat protection and enhancement measures.	JA, FS, BIA. BLM, FWS, Tribes' BNR, ODFW, Staff	$448,340[a]	$243,540[a]	$310,470
51. Develop and implement an adaptive management component of the terrestrial resources management plan, including acquisition of additional land.	FS	Unknown	Unknown	Unknown
52. Acquire 145 acres of riverine and riparian habitat, consistent with fish mitigation and enhancement plan.	FS	$543,520[bb]	$520[bb]	$81,660
53. Acquire additional wetland acreage associated with riverine/riparian habitat.	FS	Unknown	Unknown	Unknown

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annnalized Cost (2002$)
54. Develop and implement a wildlife habitat compensation plan, including acquisition of 96 to 132 acres of riparian and wetland habitat.	BIA	$207,050–$284,700[bb]	$520[bb]	$31,430–$43,020
55. Acquire 4,000–19,000 acres as compensation for inundatcd lands.	Tribes' BNR	$1,242,320–$5,901,040[bb]	$1,550– $7,660[bb]	$187,020–$888,630
56. Establish trust fund to support terrestrial resources management plan measures and additional land acquisition and enhancement.	Tribes' BNR	Unknown	Unknown	Unknown
57. Develop opportunities for improvements to bat habitat at project facilities.	ODFW, Staff	$20,000[c]	$10,000[c]	$12,990
58. Develop opportunities for improvements to bat habitat at Opal Springs and Willowdale.	ODFW	Unknown	Unknown	Unknown

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
59. Monitor effectiveness of fish ladder wildlife protection (deer crossing) modifications.	JA, FS, BIA, BLM, FWS, ODFW, Staff	$5,000[c]	$5,000[c]	$5,750
60. Develop and implement a ROW management plan for the 7.9-mile-long, 230-kV transmission line from Pelton to the Round Butte switchyard.	JA, ODEQ, ODFW, FS, BIA, BLM, FWS, Staff	$20,000[cc]	$18,000[dd]	$20,990
61. Develop and implement an avian collision and electrocution prevention plan.	JA, BIA, BLM, FWS, ODFW, Staff	$50,000[c]	$1,000[c]	$8,460
62. Manage noxious and invasive weeds within 150 feet of specified roads, 300 feet of campgrounds, and 50 feet of trails, as part of exotic and invasive weed management plan.	FS, BLM	$14,000[bb]	$14,000[bb]	$16,090
63. Conduct site-specific monitoring of raptor nests and foraging areas.	FS, FWS	$20,000[c]	$10,000[c]	$12,990

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
Recreational resource measures				
64. Develop and implement improvements at Cove Palisades State Park.	JA, ODFW, Staff	$285,670[ee]	$0	$42,650
65. Develop and implement improvements to Monty Campground.	JA, FS, Staff	$48,440[a]	$9,320[a]	$16,550
66. Develop and implement improvements to Perry South Campground and day-use area.	JA, FS, Staff	$151,230[ff]	$18,640[a]	$41,220
67. Develop and implement improvements to Street Creek boat launch.	JA, FS, Staff	$116,690[ff]	$5,180[a]	$22,600
68. Develop and implement improvements to Chinook Island day-use area.	JA, BIA, Staff	$115,260[a]	$15,530[a]	$32,740
69. Develop and implement improvements to Indian Park.	JA, BIA, Staff	$252,150[ff]	$25,880[a]	$63,520

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
70. Develop and implement improvements to Pelton Park.	JA, Staff	$108,240[a]	$18,640[a]	$34,800
71. Develop and implement improvements to Round Butte Overlook Park.	JA, Staff	$24,220[a]	$10,350[a]	$13,970
72. Develop and implement improvements to Pelton wildlife overlook.	JA, Staff	$9,190[a]	$1,040[a]	$2,410
73. Develop and implement improvements to reservoir dispersed shoreline and adjacent areas.	JA, FS, BLM, Staff	$89,850[a]	$127,340[a]	$140,750
74. Mark and remove navigational hazards in Lake Billy Chinook.	JA, Staff	$5,000[c]	$2,000[c]	$2,750

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Environmental Measnres	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
75. Integrate protection in the terrestrial resources management plan and recreation resources management plan to identify appropriate and inappropriate uses of resources, strategies and actions to reduce conflicts between resource areas, and coordinate recreation with fish agencies.	JA, ODEQ, ODFW, Staff	Negligible[c]	Negligible[c]	Negligible
76. Fund one additional Tribal officer for the Warm Springs Police Department to patrol Chinook Island day-use area, Indian Park, and other recreation areas on reservation lands within the project boundary.	BIA	$0[c]	$50,000[c]	$50,000
77. Develop and implement an interpretive and education program.	JA, FS, BIA, Staff	$75,000[ff]	$20,000	$31,200

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Environmental Measures	Entity	Capital and One Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
78. Develop and implement recreational resource management and implementation plans and provide coordination among plans including provisions for staff, law enforcement, and studies of navigational hazards, off-shore moorings, monitoring, and communications network in the project area, and management of specific FS facilities.	JA, FS, BLM, BIA, Staff	$0[ff]	$69,290[ff]	$69,290
79. Conduct recreational use surveys every 6 years during the peak recreational season (May through September).	FS, BLM	$0[c]	$2,500[c, gg]	$2,500

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annnalized Cost (2002$)
80. Conduct recreational use surveys every 5 years during the peak recreational season (May through September).	BIA	$0[c]	$3,180[c, hh]	$3,180
81. Enter into a cost share agreement with FS to provide 20 percent of the annual O&M for FS facilities at Haystack reservoir.	JA, FS	$4,700[ii]	$0	$700
82. Enter into a cost share agreement with BLM to maintain, upgrade, or construct recreational facilities on the lower Deschutes River.	JA, BLM	$41,800[jj]	$0	$6,240
Land and aesthetic resonrce measures				
83. Develop and implement project-related road maintenance (Dizney and Pelton Dam Roads; Jordan Road; and FS Roads 11 and 1170).	JA, Staff	$125,280[a]	$70,660[a]	$89,360

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Environmental Measures	Entity	Capital and One-Time Costs (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annualized Cost (2002$)
84. Increase funding for road reconstruction and maintenance of FS Roads 11 and 1170 to 11 percent and 95 percent, respectively.	FS	$45,880[ii]	$4,370[kk]	$11,220
85. Provide funding to Jefferson County for road maintenance.	JA, Jefferson County, Staff	$0[a]	$76,320[a]	$76,320
86. Develop and implement reservoir shoreline erosion control plans.	JA, FS, ODEQ, BIA, Staff	$50,110[a]	$6,210[a]	$13,690
87. Develop and implement a management program for private shoreline development.	JA, Staff	$0[a]	$25,880[a]	$25,880
88. Develop and implement a landscape management plan for project facilities.	FS, Staff	$0[c]	2,390[c,ll]	$2,390
89. Implement aesthetic improvements at project facilities.	JA, Staff	$120,000[c]	$0	$17,910

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Environmental Measures	Entity	Capital and One-Time Cost (2002$)	Annual Costs, Including O&M and Energy Costs (2002$)	Total Annnalized Cost (2002$)
90. Prepare a travel and access management section for the transmission line ROW management plan.	BLM	$5,000[c]	$2,150[c, mm]	$2,900
Cultural resource measures				
91. Develop and implement measures to protect archaeological sites.	JA, FS, BLM, Staff	$70,890[a]	$5,780[a]	$16,360
92. Develop and implement measures to protect hydroelectric facilities.	JA, FS, BLM, Staff	$13,400[a]	$0[a]	$2,000
93. Develop and implement measures to protect traditional cultural properties.	JA, FS, BLM, Staff	$10,180[a]	$6,210[a]	$7,730
94. Develop and implement cultural resource management procedures.	JA, FS, BLM, Staff	$46,210[a]	$20,710[a]	$27,610

Notes: AR – American Rivers, BIA – Bureau of Indian Affairs, BLM – Bureau of Land Management, FS – U.S. Forest Service, JA – Joint Applicants, ODEQ – Oregon Division of Environmental Quality, ODFW – Oregon Department of Fish and Wildlife, Tribes' BNR – Branch of Natural Resources, Tribes' WCB – Water Control Board, WW – Waterwatch of Oregon

[a] Joint Applicants' costs taken from Final Joint Amendment Application or the updated proposed preferred alternative filed on April 27, 2004. Capital costs incurred before 2003 associated with protection and enhancement measures were applied to the 2002 net investment value of the No-action Alternative.

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[b] The energy estimate from the Joint Applicants for their latest proposal corresponds to a loss of 630,000 kWh at a cost of $32,340.

[c] Cost estimated by staff.

[d] Energy estimate taken from CWTS (1999a), which corresponds to a gain of 242,000 kWh for a decrease in costs of $11,580.

[e] Energy estimate based on results of Interior model, which corresponds to a loss of 1,133,000 kWh at a cost of $53,270.

[f] Very low frequency of flows less than 3,000 cfs; 30 days in 77 years; negligible energy gain, based on 6.7 percent increase in output at the three developments at a flow of 3,000 cfs during average of 9 hours per year.

[g] Because of the extremely low frequency of flows less than 3,000 cfs, the effect on average annual energy would be negligible.

[h] The expected potential energy loss of this measure is negligible relative to the flow regime proposed by the Joint Applicants and recommended by ODEQ, FWS, ODFW, the Tribes' WCB and staff, and it would be impossible to estimate frequency.

[i] Due to the vague criteria, it would be impossible to estimate the effect of this exception on the proposed flow regimes.

[j] Due to the extremely low frequency of occurrence, it would not be possible to estimate the effect on energy, but the losses would be nominal.

[k] Based on analysis of inflows and average operating head at Lake Billy Chinook from figures 5-4 and 5-5 of the Final Joint Amendment Application, a 1.4 percent average minimum increase in generation flows and 13-foot decrease in average operating head at Lake Billy Chinook produces a net loss of 17,500,000 kWh at a cost of $837,550.

[l] We assume that the cost would be similar to the BIA's recommended flow regime in item no. 3.

[m] The cost of this measures includes American Rivers' recommended flow regime, which is the same as the Joint Applicants, plus the estimated loss of energy, which we assume to be the same as item 10 ($55,760).

[n] Long-term ramping rates only smooth the hydrograph; they do not change available volume of water; energy change would be insignificant.

[o] Average annual cost based on transferring wood after major flood events every 5 years on average.

[p] Annual cost based on 3 sites x 500 yards x $483 per yard, which includes material and placement by helicopter.

[q] Cost is dependent on need for augmentation.

[r] Based on graphs of predicted levels for 30 years; Joint Applicants' modified proposal never results in more than a 10-foot drawdown.

[s] This measure is part of the Draft Project Operating Plan.

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[t] If implemented this measure would reduce energy loss and increase revenue (based on 8 years at 3 foot higher head at Lake Billy Chinook for 2.5 months, producing a gain of 1,800,000 kWh for an increase in revenues of $86,150); however, we do not include a cost because the criteria for implementation of this measure is too vague.

[u] If implemented this measure would reduce energy loss and increase revenue (based on 8 years at 1.5 feet higher head at Lake Billy Chinook for 1.5 months, producing a gain of 500,000 kWh for an increase in revenues of $23,930); however we do not include a cost because we cannot determine the frequency of when the condition would apply.

[v] PGE provided an estimate of approximately 17,903,000 kWh per year to operate the Round Butte downstream fish passage facilities and the SWW system.

[w] Although we present the cost of this measure separately, we assumed that the cost is included as part of the cost of implementing the Current Fish Passage Plan.

[x] Cost estimate reflects only the additional annual reporting recommended by FWS. The cost of the periodic revisions are included in the cost of the flsh passage plan proposed by the Joint Applicant and recommended by the agencies, in item 28.

[y] Cost assumes $100,000 per year for 3 years.

[z] Cost based on estimates provided by BIA.

[aa] We have no basis to assign a value to this measure.

[bb] Cost based on Joint Applicants' costs for similar measures.

[cc] ODFW's recommendation calls for retrofitting structures, caves, and tunnels, but provides insufficient detail to develop a cost estimate for this measure.

[dd] Staff prorated the cost provided by PGE for the Pelton Round Butte and Bethel-Round Butte transmission lines to determine a cost for only the 7.9-mile-long Pelton-Round Butte transmission line.

[ee] Cost not to exceed $1.6 million over 30 years (assumed license term).

[ff] Base cost by the Joint Applicants was modified by Staff.

[gg] Cost assumes $20,000 every 6 years.

[hh] Cost assumes $20,000 every 5 years.

[ii] Cost provided by Joint Applicants in their December 29, 2003, filing. This includes $10,000 in year 5 and $15,000 in year 20. The proposed $15,000 expenditure in year 40 is outside of the analysis period.

[jj] Cost provided by Joint Applicants in their December 29, 2003, filing. This includes $86,000 in year 5 and $49,500 in year 7. .

[kk] Increased funding estimate based on Joint Applicants' estimates for 10 percent and 66 percent, respectively.

[ll] Cost assumes $15,000 every 5 years.

[mm] Cost assumes $10,000 every 4 years.

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5.0 STAFF'S CONCLUSIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a proposed project, we equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Accordingly, any license issued would be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

This section presents our rationale in balancing the developmental and nondevelopmental values and our recommendations for the plan best adapted to comprehensive development. Our balancing analysis considers the comparative environmental effects of the alternatives (section 3.0, *Environmental Consequences*), their economic viability (section 4.0, *Developmental Analysis*), and their consistency with relevant agency recommendations, comprehensive plans, laws and policies (sections 5.3, 5.4, and 5.5 in *Staff's Conclusions*).

Based on our independent review and analysis of the project, the measures proposed by the Joint Applicants, and the additional measures recommended by agencies and other stakeholders, we recommend relicensing the project as proposed with our additional staff-recommended environmental measures (Staff Alternative) as discussed below.

We chose the Staff Alternative as the preferred alternative because: (1) the project would provide a significant (1.6 million MWh) and dependable source of electrical energy for the region; (2) the project would avoid the need for an equivalent amount of fossil-fuel-fired, electric generation and capacity, thereby continuing to help conserve these nonrenewable energy resources and reduce atmospheric pollution; and (3) the environmental measures proposed by the Joint Applicants, combined with the additional environmental measures recommended by staff, would improve water quality, protect and enhance fish and terrestrial resources, improve the public use of recreational facilities, and maintain and protect historic and archaeological resources within the area affected by the operations of the project. The overall benefits of this alternative would be worth the cost of proposed environmental measures and would outweigh the consequences of the other alternative environmental measures or license denial.

We recommend including the following environmental measures proposed by the Joint Applicants in any license issued for this project:

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- Maintain the current summer operating policy for Lake Billy Chinook, which allows for 6-foot maximum daily reservoir fluctuations (from elevation 1,944 to 1,945 feet msl) between May 15[67] and September 15 of each year.

- Restrict seasonal drawdown of Lake Billy Chinook to a maximum of 20 feet (elevation 1,925 feet msl) during normal winter operations, except during specific extraordinary circumstances, including (1) flood events during which drawdown is needed for safe passage of flood flows to minimize damage to life and property; (2) unforeseen occurrences during drawdowns necessary to complete emergency repairs on project facilities; (3) periodic scheduled maintenance activities that require drawdown to complete normal repairs on project facilities (including spillway gates, the intake structure, or dam structures); and (4) regional power system emergencies.

- Maintain the current operating policy for Lake Simtustus with a maximum drawdown limit of elevation 1,576 feet msl between June 1 and August 31, and elevation 1,573 feet msl between September 1 and May 31.

- Institute a new maximum daily drawdown limit of 21 feet to elevation 1,414 feet msl for the Reregulating reservoir.

- Maintain average minimum flows equal to monthly target flows, as measured at the Madras USGS gage (no. 14092500), of 4,500 cfs in December through February; 4,571 cfs in March; 4,170 cfs in April; 4,000 cfs in May through July; 3,500 cfs in August; 3,800 cfs in September through October; and 4,049 cfs in November, or inflow to Lake Billy Chinook, whichever is less,[68] with a

[67] For years in which the spring inflow falls below 3,500 cfs, the refill date is June 15.

[68] The minimum flow targets proposed by the Joint Applicants equal or exceed the following: (1) monthly target flows specified in the Oregon State Water Right Certificate for the lower Deschutes River, dated October 21, 1996; (2) monthly flows stipulated in the state of Oregon water quality certificate; and (3) monthly flows stipulated by the Tribes' Water Quality Certificate. When the lowest daily inflow during the previous 7 days is below the target flow, the allowed minimum flow would be equal to the lowest daily inflow recorded during the last 7 days.

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100- to 150-cfs allowance for refilling Lake Billy Chinook[69] to meet the summer operating policy of maintaining the reservoir within the top 1 foot of the operating range between June 15 and September 15.

- Adjust minimum outflows from the Reregulating dam on a daily basis, rather than a weekly basis.

- Develop and implement a chart to instruct operators on measures to refill Lake Billy Chinook and Lake Simtustus.

- Use water stored in Lake Billy Chinook to augment outflows from the project to maintain an instantaneous release of 3,000 cfs downstream of the Reregulating dam from September 16 to November 15. Augmentation of outflows would be subject to a maximum release of 200 cfs and a maximum drawdown of Lake Billy Chinook of 4 feet.

- Limit changes to lower river stage (immediately downstream of the Reregulating dam[70]) to 0.05 feet per hour and 0.2 feet per day from May 15 through October 15 and to 0.1 feet per hour and 0.4 feet per day from October 16 through May 14, except during specific extraordinary circumstances.

- Hold river flows downstream of the Reregulating development to within +/–10 percent of the average daily inflow to Lake Billy Chinook measured over the preceding day under most conditions.

- Improve the accuracy of the Madras USGS gage in coordination with the USGS.

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[69] When inflows are equal to or greater than 3,650 cfs, the project operators would be allowed to reduce outflows to 150 cfs less than the monthly target flow (or inflows) between November 15 and May 15 to ensure that Lake Billy Chinook is filled to its summer operating level by May 15. In this event, the *allowed minimum flow* would be 150 cfs less than the minimum flow defined by the monthly target flow or the "or inflow" provision, except as noted below. From March through June, if *daily inflows* are less than 3,650 cfs and greater than 3,500 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,500 cfs. If *daily inflows* are 3,500 cfs or less, the *refill allowance* would be 0. From November through February, if *daily inflows* are less than 3,150 cfs and greater than 3,000 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,000 cfs. If daily inflows are 3,000 cfs or less, the refill allowance would be 0.

[70] Because natural oscillations in river stage at the USGS Madras gage can result in river-level fluctuations of up to 0.15 feet, the Joint Applicants propose to record the time and control signal value for all stage change instructions at the Reregulating development and report any signal changes that exceed the proposed hourly rate of change. In addition, the Joint Applicants propose to provide written documentation of all measured stage changes at the USGS Madras gage that deviate more than 0.15 feet from the control set-point value.

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- Document compliance with the minimum flow requirements by calculating project inflows through a combination of operating records and gage readings.

- Install new real-time gages upstream of the Round Butte dam to improve the accuracy of the measurements of inflow to Lake Billy Chinook.

- Track indicators of predicted long-term low-flow conditions in the lower Deschutes River throughout the license period to anticipate long-term low-flow conditions (lower than what has historically been observed at the Madras gage).[71]

- Implement SWW from Lake Billy Chinook to improve downstream water quality and fish passage as part of a fish passage plan, including constructing a new SWW facility, redirecting currents in the lake to attract and collect downstream migrant fish, and managing downstream water quality and water temperatures by mixing deep and shallow intake water at the Round Butte dam.[72]

- Establish and contribute $21.5 million to a Pelton Round Butte Fund,[73] as described in the Draft Pelton Round Butte Fund Implementation Plan, filed on December 29, 2003, and updated on April 27, 2004, for anadromous fish reintroduction and a sustainable and harvestable fishery in the Deschutes River limited to land acquisition; water rights acquisition; water conservation projects; conservation easements; construction of fish passage facilities and removal of fish passage barriers at projects not licensed by the Commission; instream habitat improvements; riparian and wetland protection and enhancement; protection and restoration of riparian corridors, wetlands, and spawning and rearing habitats adversely affected by and off-site project recreation.

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[71] If such a condition (a long-term flow trigger) is reached, the Joint Applicants would consult with the Fish Committee, ODEQ, and the Tribes' WCB to identify any negative effects on aquatic resources and federal Wild and Scenic recreational outstandingly remarkable values, identify potential mitigation measures, and determine if changes in project operations should be implemented.

[72] If the Commission includes the Joint Applicants' proposal for SWW in any license issued for the project and if the Joint Applicants determine that the SWW is ineffective or causes unacceptable impacts on downstream water quality, then the Joint Applicants would file an application to amend the license to permit the implementation of alternative measures.

[73] The Pelton Round Butte Fund includes two components: $10 million reserved for a Water Rights Fund and $11.5 million reserved for a General Fund. An additional $1 million would be deposited into the Water Rights Fund if a water acquisition project planned for 2004 is not completed.

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- Develop and implement a long-term, adaptive monitoring program to evaluate the effectiveness of new protection and enhancement measures and to determine if there are continuing project effects on water quality.[74]

Fisheries and Aquatic Resources

- Implement an adaptive fish passage plan, as described in the Current Fish Passage Plan, in cooperation with the Fish Committee. Goals of the plan include developing self-sustaining populations of anadromous spring-run Chinook salmon, summer-run steelhead, and sockeye salmon upstream of Round Butte dam, and to allow access to and through project waters for summer-run/fall-run Chinook, Pacific lamprey, bull trout, rainbow (redband) trout, and other native species. Key components of the plan would include: (1) the baseline phase during which current conditions in the project area are assessed and a draft fish passage plan is developed; (2) the experimental passage phase during which first-phase assumptions are tested with some changes in project operations to improve downstream and upstream fish passage; (3) the interim passage phase during which successful elements of the experimental phase are institutionalized in the project operations through engineering and constructing passage infrastructure improvements; and (4) the final passage phase, which includes final construction and implementation of volitional upstream passage facilities and annual biological monitoring of fish passage success.[75]

- Implement and fund specific habitat enhancements, as described in the Draft Lower River Implementation Plan, filed on December 29, 2003, and updated on April 27, 2004, in the Deschutes River and Trout Creek downstream of the project, including higher minimum flows and more restrictive ramping regimes, improved monitoring of project inflows and outflows, a plan for larger woody debris in Lake Billy Chinook for downstream fish habitat enhancements, and the experimental placement and effectiveness evaluation of spawning gravels, including both geomorphic and biological monitoring, riparian fencing, and restoration measures.

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[74] The Joint Applicants' plan for monitoring project operations is included as section 7 of the draft WQMMP filed with WQC applications. The final WQMMP would be incorporated as part of the WQCs upon approval by the Tribes' WCB and ODEQ.

[75] If the Fish Committee determines and recommends that the re-establishment of fish passage is no longer prudent and the fisheries managing agencies of the federal, state, and Tribal governments accept this recommendation, the Joint Applicants could seek Commission approval through a license amendment for alternative protection and enhancement measures, including additional habitat acquisition efforts.

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- Fund enhancements for resident fish resources in Lake Simtustus and Lake Billy Chinook, including continuing the steelhead post-smolt liberation; funding annual monitoring of the bull trout fishery in Lake Billy Chinook; and participating with the FWS in the drafting of a bull trout recovery plan for the Deschutes River basin.

- Implement improvements to the Round Butte hatchery facilities and spawning program, and continue steelhead and Chinook smolt production.

- Develop and implement a long-term, adaptive monitoring program to evaluate the effectiveness of protection and enhancement measures and to determine if there are continuing project effects on aquatic resources.

Terrestrial Resources

- Modify the existing project boundary to include 10,797 acres of Joint Applicant lands located in the Metolius Mule Deer Winter Range (7,700 acres), Trout Creek subbasin (3,000 acres), and Campbell Creek subbasin (97 acres).

- Develop and implement a Terrestrial Resources Management Plan on lands owned or administered by the Joint Applicants, FS, BLM, State of Oregon, and other private landowners to minimize and mitigate project-related impacts on terrestrial wildlife and vegetation.

- Implement habitat management measures to maintain and enhance upland, wetland, and riparian habitats and other unique habitats in the project vicinity as part of the Terrestrial Resources Management Plan. Activities would include implementing an exotic and invasive vegetation management program; improving winter range for mule deer; planting native species to enhance wetland and riparian/riverine habitat; installing water guzzlers; improving opportunities for animal movement and reducing the risk of entrapment/mortality at the Pelton fish ladder; managing roads and recreational areas to minimize wildlife disturbance; implementing future habitat improvements; supporting law enforcement in the protection of wildlife habitats and species; preparing annual work plans and 5-year progress reports, implementing an Endangered Species Alert Program, and providing support for a GIS database.

- In coordination with the development of a proposed shoreline management plan to address erosion related to private in-water development and high-priority recreational sites, implement vegetative and land use measures as part of the Terrestrial Resources Management Plan to reduce shoreline erosion.

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Activities would include conducting a feasibility analysis; planting native trees and shrubs in selected locations; constructing riparian protection fences; and implementing best management practices for riparian habitats.

- Implement measures to limit the effects of project operations on wildlife species, as part of the Terrestrial Resources Management Plan, including funding and implementing a bald eagle comprehensive management strategy for project lands; monitoring nesting productivity for golden eagles, prairie falcons, osprey, and waterfowl; monitoring winter waterfowl use of reservoirs; installing nesting platforms and bird boxes; conducting annual breeding bird surveys; funding mule deer trend counts and radio telemetry studies; supporting measures for protecting threatened and endangered species, including bat populations; and a plan for raptor-proofing distribution lines as needed.

- Develop and implement a transmission line ROW management plan for the project's 7.9-mile-long primary transmission line that would consider vegetation, soils, hydrology, threatened and endangered species, exotic and invasive species, visual screening and blending of the ROW with surrounding landscapes, and recreational access to the ROW.

Recreational Resources

- Develop and implement the Recreation Resources Implementation Plan, as described in the Summary of Recreation, Land Use, and Aesthetic Measures, filed on December 29, 2003, to implement the proposed recreation protection and enhancement measures listed below.

- Improve recreational resources at the following existing recreational sites, located within the project boundary: Cove Palisades State Park (Crooked River day-use area, Cove Marina and cabins, and Lower and Upper Deschutes River day-use areas), Perry South Campground, Street Creek boat launch, Chinook Island day-use area, Indian Park, Pelton Park, Round Butte Overlook Park, Pelton wildlife overlook, and BLM Beach east of Three Rivers recreation area; and the following existing recreational sites located outside of the project boundary, but within the project vicinity: Monty Campground, Balancing Rocks, Cove Palisades State Park (Crooked River and Deschutes River campgrounds), and existing trails near Madras. The scope of the proposed improvements would be site-specific, but cumulatively would include improved road and parking delineations; improved and resurfaced roads; replaced docks and ancillary structures; repaired and repaved boat launch ramps; improved picnic areas; improved camp site areas; consideration of the physically disabled in the design and construction of recreation facilities and

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access; improved signage and interpretive facilities; improved and formalized existing trails and development of new trails; new boat moorages and designated swimming areas; improved visual characteristics through screening and site changes; and improved viewing platforms.

- Partially fund annual O&M costs at the Cove Palisades State Park and fund one-third of the annual O&M costs at Monty Campground, and fully fund O&M at Perry South Campground and day-use areas, Street Creek boat launch, Chinook Island day-use area, Indian Park, Pelton Park, and Pelton wildlife overlook.

- Evaluate whether navigational hazards on Lake Billy Chinook should be marked or removed.

- Study the need for, and fund improvements to, the emergency communications network in the project area to ensure that emergency response personnel at the project and associated recreation sites can communicate with each other and contact external emergency services.

- Fund a feasibility study to evaluate an off-shore moorage program, and if feasible, fund up to 50 moorages on Lake Billy Chinook.

- Improve and fund annual maintenance at four dispersed shoreline campsites on Lake Billy Chinook (BLM Beach, cove area near Cove Marina, west shore area of Crooked River arm, and west shore area of the Deschutes River arm). Fund the appropriate land management agencies for closures and rehabilitation of other dispersed campsites if the respective agency formally commits to close the site and enforce the closure.

- Provide one additional year-round land-based patrol for the project area and two additional part-time water-based patrols for the reservoir to be used during peak times.

Land Use and Aesthetic Resources

- Fund project-related road maintenance, including funds for annual maintenance for Dizney Lane and Pelton Dam Road and funds for Jefferson County's annual maintenance costs through the Jordan Road slide area, as described in the Road Maintenance Agreement with Jefferson County (filed on April 27, 2004).

- Enter into an agreement with the FS for road reconstruction and maintenance on FS Roads 11 (10 percent of costs) and 1170 (66 percent of costs), as

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described in the Summary of Recreation, Land Use, and Aesthetic Measures (filed on December 29, 2003).

- Fund and implement a shoreline erosion plan for project reservoirs to assess 31 identified erosion sites and to implement erosion control measures at priority sites and to manage private in-water developments within the project boundary.

- Implement aesthetic improvements to the project facilities, as specified in the Summary of Recreation, Land Use, and Aesthetic Measures (filed on December 29, 2003).

Cultural Resources

- Adopt and implement the Cultural Resource Management Plan (CRMP) developed by the Joint Applicants that includes cultural resource monitoring and testing, general cultural resource management policies, management procedures for maintaining and protecting the historical resources in the project area, an I&E provision, and site-specific management procedures and mitigation measures at sensitive cultural sites.

Certain provisions of the Joint Applicants' proposed measures that are recommended by staff specify or contemplate actions, such as protection, mitigation, enhancement, and monitoring, that the Joint Applicants would undertake on lands outside of the current project boundary. We note that the Commission may require in any license issued for the project that the Joint Applicants include those lands within the project boundary.

Additional Measures Recommended by Staff

In addition to the Joint Applicants' proposed environmental measures, we recommend that the following additional staff-recommended environmental measures be included in any license issued for this project:

- conduct recreational use surveys every 6 years during the peak recreational season (May through September) and file the results with the Commission; and

- develop and implement a landscape management plan for future improvement and maintenance of project facilities.

The cost of some of these measures would reduce the net benefits of the project. We discuss these measures in the following text. We also discuss measures not included in our recommended alternative.

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Minimum Flows

The Pelton Round Butte Project operates as a modified run-of-river project where inflow above the Round Butte dam equals outflow downstream of the Reregulating dam under most conditions. The Joint Applicants propose to maintain minimum flows downstream of the Reregulating development equal to or greater than the state-established target flows and flows identified in the state and Tribal water quality certificates, or inflows, whichever are less, except that outflows could be reduced to 100 to 150 cfs less than inflow when needed to refill Lake Billy Chinook for the summer recreational season. The Joint Applicants also have proposed to maintain outflows within 10 percent of inflows, with limited exceptions. Outflows would be monitored at the USGS Madras gage located downstream of the Reregulating dam.[76] The ODEQ, FS, and BLM propose minimum flows that approximate those proposed by the Joint Applicants, and ODFW and NOAA Fisheries have filed revised 10(j) recommendations that are fully consistent with Joint Applicants' proposed flow regime. BIA preliminary 4(e) condition no. 4 proposes higher minimum flows from mid-March through November, but would also allow outflows to be reduced to match inflows when inflows are lower than the target flows. We conclude in section 3.6.2.1, *Minimum Flows,* in *Aquatic Resources*, that the primary effect of implementing BIA's higher target flows would be elimination of the Joint Applicants' ability to adjust outflows at times when inflows exceed the target flows. However, under most conditions, the variation in outflows would be constrained by the Joint Applicants proposed +/–10 percent restriction, and we conclude that these limited variations in discharge would have little effect on the depth or velocity of the lower Deschutes River. As a result, the higher flow recommended by BIA would not provide substantial improvement to fisheries habitat over existing conditions. We estimate that the annual cost of the minimum flows proposed by the Joint Applicants would be $32,540. The minimum flows recommended by the BIA would cost an additional $20,730 but would not provide any appreciable improvement in fisheries habitat and, in combination with reflll allowances and long-term ramping rates (discussed below) would result in lower lake levels in Lake Billy Chinook during the recreational season in dry water years. We find that the minimum flows proposed by the Joint Applicants and recommended by NOAA Fisheries and ODFW would provide adequate protection for downstream fisheries at substantially less cost without affecting lake levels in Lake Billy Chinook.

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[76] The Joint Applicants request an allowance to accommodate flow disturbances and flow changes. The proposed allowance states that the instantaneous flow at the Madras gage would not be more than 260 cfs less than the target daily flow for any two consecutive 30-minute readings at the USGS Madras gage. As proposed by the Joint Applicants, a target flow would be established for each day that meets all of the proposed operating restrictions relating to project inflows, project outflows, and reservoir levels.

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Refill Allowance at Lake Billy Chinook

Maintaining minimum flows at the target levels proposed by the Joint Applicants would result in failure to refill Lake Billy Chinook to agreed upon levels for summer recreation. To address this problem the Joint Applicants propose an allowance to reduce the target daily flow by up to 150 cfs below inflow[77] if needed to refill Lake Billy Chinook to within 1 foot of full pool by June 15. The ODEQ, ODFW, NOAA Fisheries, FS, and BLM allow for a similar reduction in the minimum flow to meet the seasonal objectives to refill Lake Billy Chinook. The BIA in preliminary 4(e) condition no. 4 specifies an allowance of 100 cfs in January and February, and 200 cfs in March and April with the provision that deviation may occur if necessary to refill Lake Billy Chinook by May 1. We conclude in section 3.4.2.1, *Minimum Flows*, in *Water Quantity*, based on modeling by the BIA, that the earlier refill period (by May 1) and the allowance of 100 cfs in January and February proposed by the BIA would not allow the Joint Applicants to refill Lake Billy Chinook to full pool by June 15 about 6 percent of the time (2 summers out of 30 summers). While the BIA recommendation would not affect project economics, it would affect the ability of the Joint Applicants to refill Lake Billy Chinook by June 15 as required by ODEQ and the Tribes' WCB's WQCs conditions. Therefore, we do not recommend adopting the BIA's refill allowances.

Ramping Rates

Rapid changes in river stage could affect the spawning and incubation period of fisheries in the lower Deschutes River. The Joint Applicants propose to limit stage changes downstream of the Reregulating development to 0.05 feet per hour and 0.2 feet per day from May 15 through October 15 and to 0.1 feet per hour and 0.4 feet per day from October 16 through May 14, except during specific extraordinary circumstances. BLM, FWS, NOAA Fisheries, ODEQ, ODFW, the Tribes' WCB, and FS would require or recommend the same limitations to river stage below the Reregulating development. The BIA, in preliminary 4(e) condition no. 5, specifies a further limitation on changes to river stage from April 1 through July 31, to 500 cfs over any moving 60-day period and to 800 cfs over any moving 30-day period from October 1 through February 28 when minimum flows are 4,500 cfs or less as measured at the Madras USGS gage. The

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[77] When inflows are equal to or greater than 3,650 cfs, the project operators would be allowed to reduce outflows to 150 cfs less than the monthly target flow (or inflows) between November 15 and May 15 to ensure that Lake Billy Chinook is filled to its summer operating level by May 15. In this event, the *allowed minimum flow* would be 150 cfs less than the minimum flow defined by the monthly target flow or the "or inflow" provision, except as noted below. From March through June, if *daily inflows* are less than 3,650 cfs and greater than 3,500 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,500 cfs. If *daily inflows* are 3,500 cfs or less, the *refill allowance* would be 0. From November through February, if *daily inflows* are less than 3,150 cfs and greater than 3,000 cfs, the *refill allowance* would be the difference between the *daily inflow* and 3,000 cfs. If daily inflows are 3,000 cfs or less, the refill allowance would be 0.

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objective of BIA's proposed long-term ramping rates would be to prevent flows from receding to a level that would adversely affect steelhead and fall Chinook during their spawning and incubation periods. We conclude in section 3.6.2.2, *Ramping Rates and Reservoir Levels*, in *Aquatic Resources* that the ramping rates and provision for maintaining outflows within 10 percent of inflows under most conditions, as proposed by the Joint Applicants, would adequately protect and enhance spawning and incubating steelhead and fall Chinook. The long-term ramping rates proposed by BIA would provide little, if any, additional enhancement. Successful reproduction of trout and steelhead under existing conditions is evident from the abundance of trout fry that were observed along the river shoreline in the early summer during the Joint Applicants' studies, and spawning and incubation conditions are likely to improve due to the Joint Applicants-proposed measures that would stabilize flows, improve water quality conditions (by implementing SWW), and increase spawning habitat through experimental gravel augmentation. We also conclude that long-term ramping rates are not needed to protect the incubation environment for fall Chinook, because both river flows and ambient DO concentrations generally increase during the fall and winter months when incubation occurs for this species. The long-term ramping rates, in combination with BIA's higher minimum flows and refill allowances (discussed above) would result in lower lake levels in Lake Billy Chinook during the late spring and early summer with the potential to affect the ESA-listed bull trout, cultural resources and recreation in Lake Billy Chinook. Because of the adverse environmental effects of reservoir drawdowns and the minimum benefits that would be provided to aquatic resources in the lower Deschutes River, we conclude that BIA's proposed long-term ramping rates would not be worth it, whatever the cost, and do not recommend that they be adopted.

Measuring Minimum Flows and Reservoir Levels

Accurately documenting minimum flows and reservoir levels is necessary to monitor compliance with license requirements. In the Draft Project Operating Plan, the Joint Applicants propose to document compliance of minimum flow and reservoir level requirements through a combination of operations records and gage readings, and they propose an allowance of 260 cfs to accommodate flow measurement inaccuracies and control system variations, and the inability of the turbine and spillway gates to exactly produce set point flows. The Joint Applicants indicate in the Draft Project Operating Plan that documenting compliance would include improvements to the Madras gage and a new reservoir-level monitoring station on Lake Billy Chinook. The BIA preliminary 4(e) condition no. 4 specifies that additional reservoir-level monitoring stations be installed at all three project reservoirs to account for wind effects and varying atmospheric pressure and would not provide an allowance of 260 cfs for measurement error. We conclude in section 3.4.2.3, *Flow Monitoring and Operational Compliance*, in *Water Quantity*, that the proposed improvements to the USGS gage at Madras would improve the documentation of outflows from the project below the Reregulating dam. We also conclude that a new reservoir-level monitoring station in Lake Billy Chinook

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would enable accurate and reliable estimates of inflows through the application of a mass balance equation. We do not agree with BIA that installation of additional reservoir-level monitoring stations in Lake Simtustus and the Reregulating reservoir would enable more accurate or reliable inflow estimates, and we conclude that the 260-cfs allowance would still be needed to account for measurement errors. We estimate that the annual cost for the installation of additional reservoir-level monitoring systems on Lake Simtustus and the Regulating reservoir would be $10,450, and because this measure would not improve the accuracy of flow measurements, we conclude that it would not be worth the extra cost and do not recommend it.

Fish Passage

The original license issued for the Pelton Round Butte Project envisioned the installation of effective fish passage. Early fish passage facilities failed, and, subsequently, hatchery operations have been used to maintain runs of summer steelhead and spring Chinook in the lower Deschutes River. In response to widespread interest among the Tribes, agencies and NGOs, the Joint Applicants initiated numerous studies to evaluate the feasibility of restoring fish passage at the project. Incorporating and building upon the studies conducted to date, the Joint Applicants propose a four-phase adaptive fish passage plan to include developing self-sustaining populations of anadromous spring-run Chinook salmon, summer-run steelhead, and sockeye salmon upstream of Round Butte dam, and to allow access to and through project waters for summer-run/fall-run Chinook, Pacific lamprey, bull trout, rainbow (redband) trout, and other native species. The four phases of the proposed plan include: (1) the baseline phase during which current conditions in the project area are assessed and a draft fish passage plan is developed; (2) the experimental passage phase during which first-phase assumptions are tested with some changes in project operations to improve downstream and upstream fish passage; (3) the interim passage phase during which successful elements of the experimental phase are institutionalized in the project operations through engineering and constructing passage infrastructure improvements; and (4) the final passage phase, which includes final construction and implementation of volitional upstream passage facilities and annual biological monitoring of fish passage success. The FWS and NOAA Fisheries would require fishway facilities and the BIA, BLM, FS, ODEQ and the Tribes' WCB recommend various measures pertaining to fish passage which are generally consistent with the objectives of the Joint Applicants' Current Fish Passage Plan. In addition, ODFW filed a revised 10(j) recommendation that is fully consistent with the Joint Applicants' Current Fish Passage Plan. We conclude in section 3.6.2.3, *Fish Passage Plan*, in *Aquatic Resources*, that the fish passage plan proposed by the Joint Applicants would provide substantial benefits to the aquatic resources in the project area and therefore recommend its implementation.

Implementation of the fish passage plan is currently in the experimental phase, and the Joint Applicants have identified a number of pre-requisites that would need to be

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fulfilled before the program transitions into the interim passage phase.[78] One of these pre-requisites is the issuance of any license for the project, which the Joint Applicants have assumed would occur by May 2004. The FWS and NOAA Fisheries preliminary prescriptions include schedules that may not allow sufficient time to review designs, that would require the development of facility monitoring and operations plans far in advance of their construction, would require permanent screening facilities at the Round Butte dam prior to determining the effectiveness of the SWW, and would require the construction of volitional upstream passage facilities within 24 years of issuance of any new license. We conclude in section 3.6.2.3, *Fish Passage Plan*, that these schedules would be burdensome and inconsistent with an efficient and coordinated effort to restore volitional fish passage to the upper Deschutes River. Therefore, we encourage both FWS and NOAA Fisheries to review the time frames specified in their preliminary fishway prescriptions to ensure that they are workable and realistic. Likewise, we encourage FWS and NOAA Fisheries to ensure that any schedules that are included in the final fishway prescriptions for attaining recommended milestones and any performance criteria allow sufficient time for evaluation of the results of monitoring studies and implementation of any refinements of facility operations that may be required.

The Joint Applicants disagree with several technical aspects of the FWS and NOAA Fisheries preliminary fishway prescriptions, including: (1) monitoring hydraulic conditions in the Round Butte tailrace and constructing a physical model of the Round Butte forebay; (2) meeting NOAA Fisheries smolt criteria for sweeping velocities at the deep water intake; and (3) evaluating the mortality at the Round Butte dam and operating the turbines at the most effective efficiency for fish passage. We conclude in section 3.6.2.3, *Fish Passage Plan*, that these measures would have minimal benefits, because no downstream fish passage facilities would be constructed in or around the tailrace, because it would be impossible to meet NOAA Fisheries smolt criteria for sweeping velocities at the deep water exclusion screen, and because the intakes at Round Butte would be fully screened. Furthermore, the Joint Applicants have committed to take any feasible measures or implement modifications that are under their control that are needed to achieve fishway performance goals. We estimate that evaluating hydraulic conditions in the Round Butte forebay and tailrace would cost $100,000 and that evaluating mortality at Round Butte dam would cost $200,000. Designing the deep-water screen to meet NOAA Fisheries smolt criteria for sweeping velocities would require a substantial re-design of the facility to include a fish bypass, which we estimate would add at least $1,000,000 to the cost of constructing the facility, as well as substantial losses in project generation that would be caused by increases in bypass flow requirements. We do not have enough information about the manner in which turbines might be operated to provide the most effective fish passage, so we cannot estimate the value of lost peak

[78] The interim phase would require a substantial capital investment in passage facilities and in the construction of a new intake tower to implement SWW, which would allow the depth at which water is withdrawn from Lake Billy Chinook to be controlled.

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power production that would occur if the project turbines were required to be operated over a restricted range. However, constraining the turbine operating range at the Round Butte and Pelton developments would curtail the project's ability to meet peaks in electrical demand. Because outflows from the project are smoothed out downstream of the Reregulating dam, the project is able to provide peaking capacity without adversely affecting flows downstream of the project. Therefore, we conclude that the benefits that would be provided by these measures do not justify their costs, and request that the FWS and NOAA Fisheries revisit the need for them in their final fishway prescriptions.

Genetic Studies

Steelhead spawn in a number of tributaries to the lower Deschutes River and it is likely that populations that spawn in different tributaries may be subject to different levels of introgression with hatchery stocks, especially in comparison with fish that spawn in the mainstem Deschutes River. The FWS recommends that the Joint Applicants conduct genetic studies on wild and hatchery steelhead in the basin to assist in stock assessment for the reintroduction of steelhead. The Joint Applicants disagree with FWS' recommendation that they should conduct genetic studies on wild and hatchery steelhead in the basin to assist with stock assessment for the reintroduction of steelhead. Although we conclude that there may be value in undertaking the genetic studies recommended by FWS to determine the extent of hatchery introgression in each spawning area and to assist with identifying appropriate stocks for use in re-introduction, it is ultimately the responsibility of the fisheries agencies to gather the information that agencies need to make basin-wide decisions, including determining which steelhead stocks to reintroduce upstream of the project. Therefore, we do not include this measure in our recommended alternative.

Funding for Aquatic Habitat Improvements

We currently have before us six alternative proposals for enhancing aquatic and riparian habitats. These are: (1) a $1.75 million plan for riparian corridor improvements that was originally proposed by the Joint Applicants in the Final Joint Application Amendment and that would be required by the Tribes' WCB; (2) a habitat fund designed to compensate for 227 acres of inundated federally managed lands that is recommended by FS, BLM, and FWS; (3) a habitat fund to compensate for 691 acres of inundated lands that is recommended by the Conservation Groups; (4) the BIA Fisheries Habitat Compensation Plan that would provide $750,000 annually for habitat restoration projects; (5) the Pelton Round Butte Fund as proposed by the Joint Applicants and updated on April 27, 2004, to include a Water Rights Fund and a General Fund; and (6) the Lower River Implementation Plan as proposed by the Joint Applicants and updated on April 27, 2004.

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In section 3.6.2.4, we conclude that implementing habitat enhancement measures in the Deschutes River basin would benefit recreational and Tribal fisheries. We also note that the Pelton Round Butte Fund and Lower River Implementation Plan, which we recommend, would provide for the funding or implementation of various enhancement measures, including land acquisition, water rights acquisition, water conservation projects, conservation easements, construction of fish passage facilities and removal of fish passage barriers (except at FERC-licensed projects), instream habitat improvements, and riparian and wetland protection and enhancement. In light of the fact that both the Pelton Round Butte Fund and Lower River Implementation Plan were developed by the Joint Applicants in consultation with the parties to the proceeding, including all federal, state, and Tribal fish and wildlife agencies, we conclude that the Pelton Round Butte Fund and Lower River Implementation Plan together are consistent with the intent of the agency preliminary terms and conditions and recommendations for various aquatic habitat funds and compensation plans.

Funding for Terrestrial Habitat Acquisitions

FS, BLM, BIA, and the Tribes' BNR filed preliminary terms and conditions or recommendations specifying that the Joint Applicants provide compensation for terrestrial habitat inundated by the project, at ratios ranging from 1:1 to 5:1. The ratio would depend on agency or Tribal policies regarding mitigation, and/or the quality of habitat acquired as compensation in relation to the quality of habitat inundated. In section 3.7.2.1, *Habitat Acquisition and Proposed Terrestrial Resources Management Plan*, we concluded that the jointly owned lands, which we recommend be included in the project boundary, would provide almost 10,800 acres of habitat in addition to areas that would be enhanced and improved within the existing project boundary. We found that the specific measures that we recommend, integrated within a comprehensive plan for terrestrial resource management, would benefit many of the same wildlife species affected by the project (e.g., mule deer, beaver, black-tailed jackrabbit, bushy-tailed woodrat, American kestrel, mourning dove, California quail, Bullock's oriole, chipping sparrow, northern side-blotched lizard, gopher snake, and Pacific chorus frog). Actions that would be undertaken as part of the Lower River Implementation Plan would provide further protection and improvement of terrestrial resources through extensive riparian habitat restoration. Our recommended measures would substantially benefit wildlife at a reasonable cost ($310,470 in total annualized costs for the Terrestrial Resources Management Plan and $70,140 in total annualized costs for the Lower River Implementation Plan). We also note that measures that would be funded through the Pelton Round Butte Fund could still result in more benefits to terrestrial resources, including riparian habitats.

In light of the fact that the Joint Applicants' proposals for the Lower River Implementation Plan, Terrestrial Resources Management Plan, and Pelton Round Butte Fund were made in consultation with the parties to the proceeding, including all federal,

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state, and Tribal fish and wildlife agencies, we conclude that these measures are consistent with the intent of the agency preliminary terms and conditions and recommendations for various terrestrial habitat compensation plans.

Large Woody Debris Plan

The project impedes the movement of large woody debris into the lower Deschutes River. Large woody debris that collects in Lake Billy Chinook is typically collected to remove boating hazards or cabled to the shoreline to improve fish habitat. The Joint Applicants propose to develop and implement a Large Wood Management Plan in consultation with the Tribes' DNR. The purpose of the plan is to provide for the management of floating wood (greater than 7.9 inches by 6.6 feet [20 centimeters by 2 meters]) that enters Lake Billy Chinook and the placement of large wood along the project reservoir shorelines for the protection of riparian plantings and to improve habitat conditions for juvenile salmonids, and in the Lower Deschutes River to benefit fish habitat. BLM and FS recommend that the Joint Applicants develop and implement a large wood debris management plan. BIA also recommends that a plan be developed, but would have the plan encompass all three project reservoirs. ODFW and NOAA Fisheries filed revised 10(j) recommendations that are more detailed than, but are consistent with, the plan that is described by the Joint Applicants in the Draft Lower River Implementation Plan. We conclude in section 3.6.2.5, *Woody Debris Management*, in *Aquatic Resources*, that the amount of large woody debris that is delivered into Lake Billy Chinook in most years is quite limited, even as a result of major flood events. However, we also conclude that a plan for managing large woody debris that accumulates in Lake Billy Chinook and anchoring it along the reservoir shoreline or placing it in the lower Deschutes River in locations that have been selected to maximize habitat benefits would be reasonable. Because it is not possible to predict the quantity, size, and timing that large woody debris would become available, the plan should allow for specific placement locations to be determined after a specified number of pieces of large woody debris have accumulated in one or more of the project reservoirs. Fisheries in Lake Billy Chinook and in the lower Deschutes River would benefit from the strategic placement and well-planned use of any large woody debris that could be available. We estimate that our recommended large woody debris plan would cost $11,490. We assume that the amount of woody debris entering Lake Simtustus and the Reregulating reservoir would be small relative to Lake Billy Chinook and that the plan could encompass the reservoir at little additional cost. The cost of developing and implementing a plan would be justified by the benefit that would result to the fisheries in Lake Billy Chinook and in the lower Deschutes River and thus we recommend that the plan be developed.

Plan for Spawning Gravel Mouitoring

The quality and quantity of spawning habitat downstream of the project could be affected by the availability of spawning gravels. The Joint Applicants conclude that

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while the reservoirs do trap gravel delivered from upstream tributaries, the project has had limited effect on the amount and quality of spawning gravels available to trout and salmon. However, the agencies question the validity of the sediment transport model that provided the basis for this conclusion. To address the potential effects of project operations on downstream spawning habitat, the Joint Applicants propose, the ODEQ, the Tribes' WCB, BLM, FS and FWS recommend several measures, including the verification of sediment transport models designed to determine effects of sediment transport on downstream spawning habitat, and the completion of a study to determine if gravel augmentation is desirable or necessary. BIA preliminary 4(e) condition no. 7 specifies an extensive gravel monitoring and augmentation program, including initial placement of 250 to 1,000 cubic yards of gravel at each of three initial gravel augmentation sites. Revised 10(j) recommendations filed by ODFW and NOAA Fisheries include the implementation of a more limited, experimental gravel augmentation program, involving the placement of a total of 300 cubic yards of gravel, which the Joint Applicants incorporated in the Draft Lower River Implementation Plan and updated with a revised Lower River Gravel Assessment. We conclude in section 3.6.2.6, *Spawning Gravel Monitoring and Augmentation*, in *Aquatic Resources*, that the field measurements to verify the sediment transport model and the limited gravel augmentation experiments proposed by the Joint Applicants would provide an effective method to directly evaluate the potential benefits of gravel augmentation while reducing the potential for adverse impacts that could be associated with a larger-scale program. We estimate the annual cost of the Joint Applicants' proposal would be $51,130.

The BIA recommends a gravel monitoring and augmentation program that would include the initial placement of 250 to 1,000 cubic yards of gravel at each of three initial sites. We estimate that the annual cost of BIA's recommended measures would be $739,930. We conclude in section 3.6.2.6, *Spawning Gravel Monitoring and Augmentation*, that heavy use of the river by spawning rainbow trout indicates that high-quality spawning gravel is still reasonably abundant in the lower Deschutes River and suggests that placement of additional gravels may provide only minimal additional benefits. Undertaking a gravel augmentation program of the scale envisioned by BIA would not only be significantly more costly, but could also involve extensive disturbance of the streambank at the proposed gravel augmentation sites. Placement of gravel via helicopter to avoid disturbance of the streambank, which we assumed in our estimate of the cost of BIA's proposed program, adds to the cost of the program. Therefore, we conclude that the benefits of BIA's specified gravel monitoring and augmentation program do not justify the costs.

Avian Protection Plan

The Joint Applicants propose to develop and implement a transmission line ROW management plan for the 7.9-mile-long transmission line corridor that remains within the project boundary. The BIA and the FWS recommend that the transmission line

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management plan include measures to prevent avian collisions and electrocution. We conclude in section 3.7.2.7, *Transmission Line Management*, in *Terrestrial Resources*, that the likelihood of collision or electrocution caused by the 7.9-mile-long transmission line would be slight. However, we agree with the agencies that a plan to assess and monitor the existing line for compliance with standards set by the APLIC would be beneficial for any avian species, but for raptors in particular. We recommend that this plan be developed as part of the Joint Applicants' proposed transmission ROW management plan. We estimate that the annual cost for a plan to prevent avian collisions and electrocution would cost $8,460 and would be justified by the potential benefit to avian species.

Recreation Resources Implementation Plan

Recreational use at the project has increased significantly and problems with on-water congestion results in user conflicts. The Joint Applicants propose to develop and implement a Recreation Resources Implementation Plan that would address improvement to the developed recreational facilities, navigational hazards, trails, telecommunications, off-shore boat moorage, dispersed recreational areas, and law enforcement, and would provide for road closures and interpretation and education programs. The plan would include staffing management and coordination, funding schedules for a 10-year implementation period, priorities, and monitoring and evaluation. The ODFW, FS, BLM, and BIA generally agree with the measures proposed by the Joint Applicants, except that the FS specifies implementation of the plan within 3 years. We conclude in section 3.9.2.1, *Recreational Use and Resources*, in *Recreational Resources*, that the proposed recreational enhancement measures would be beneficial because they would address a back-log of maintenance needs and the plan would provide a framework to ensurc that project facilities meet future needs and to resolve confiicts among recreational uses as public use of the project's recreational facilities increases over time. We conclude that the estimated annual costs for implementing the plan with all of the components as proposed by the Joint Applicants would be about $775,000 and would be worth the potential benefit to recreational use and enjoyment in the project area. Three years is a reasonable time to begin implementation of the approved plan.

In addition to the Joint Applicants' proposed measures, the BIA preliminary 4(e) condition no. 15 calls for funding of a full-time Tribal offieer, FS preliminary 4(e) condition no. 12 specifies that the Joint Applicants cost share with the FS to fund 20 percent of annual O&M costs at the FS recreational facilities at Haystack reservoir, and the BLM recommends that the Joint Applicants participate in a cost share agreement with the BLM to maintain, upgrade, or construct recreational facilities on the lower Deschutes Wild and Scenic River segment downstream of the project. We estimate that the annual cost of these measures would be $50,000, $12,000, and $105,000, respectively. We conclude in section 3.9.2.2., *Carrying Capacity and User Conflicts*, that the benefit of the full-time Tribal Offieer would be minimal because it is not clear how an additional full-

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time Tribal officer would improve recreational experiences at Indian Park and Chinook Island, and we do not recommend adopting this measure. We also found that recreational use at the Haystack reservoir and along the segment of the lower Deschutes Wild and Scenic River is not affected by the project; however, the recreation improvements at the Haystack and Wild and Scenic River sites would contribute to a beneficial effect on the recreation resource and associated public use within the river basin.

Recreational Use Surveys

The Joint Applicants propose to monitor recreational use at the project consistent with the Commission's Form 80 requirements. The BLM's preliminary Section 4(e) condition specifies that the Joint Applicants should conduct recreational use surveys at BLM-managed dispersed recreational sites every 6 years and consult with the resource agencies to determine management changes if the use exceeds 90 percent of the dispersed site capacity. FS also recommends recreational use monitoring every 6 years with the 90 percent capacity criteria, and the BIA specifies recreational use monitoring every 5 years. BIA provides no justification for conducting surveys every 5 years. We conclude in section 3.9.2.2, *Carrying Capacity and User Conflicts*, in *Recreational Resources,* that recreational use surveys every 6 years would comport with the Commission's required filing of a FERC Form-80. The surveys would provide accurate estimates of total recreational use, recreational use by activity, and assessments of recreational issues. Implementation of recreational use surveys would enable the Joint Applicants to determine future needs and would benefit recreational use and opportunities in the project area over the term of any new license issued for the project. We conclude that the potential benefit of implementing recreational use surveys as part of the recreational resources implementation plan would be worth the estimated annual cost of $2,500, and we recommend implementation of recreational use surveys.

Erosion Control

Shoreline erosion resulting from project operations and recreational use at shoreline locations can affect water quality, riparian habitat, cultural resources, and aesthetic resources associated with the project. The Joint Applicants propose, as described in the Summary of Recreation, Land Use, and Aesthetic Measures, to develop and implement a shoreline management plan that would encompass a shoreline erosion plan for the assessment, treatment and monitoring of known erosion sites, high-use recreational sites, and private-in-water development in private areas along the shoreline. The Joint Applicants also propose to include site-specific erosion control measures associated with implementation of wildlife and recreation enhancement in the terrestrial resources management plan and in the recreation resources implementation plan. FS, BLM, FWS, and ODFW recommend the development of a shoreline management plan. BIA preliminary Section 4(e) condition nos. 14 and 25 are consistent with the Joint Applicants' proposal for addressing erosion and sedimentation. We conclude in section

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3.10.2.3 *Shoreline Management Plan*, in *Land Use and Aesthetic Resources*, that implementation of the Joint Applicants plan to determine the cause and to remediate and monitor erosion at known sites would be adequate for determining the extent of project-related erosion and the effectiveness of shoreline erosion control measures. We also conclude that a permit program and guidelines for private-in-water uses would benefit aesthetic values and recreational use. Implementation of the shoreline erosion plan would cost about $25,800. We conclude that the cost would be worth the benefit to water quality, cultural resources, and aesthetics.

Landscape Management Plan

The Joint Applicants state that they would design the proposed enhancements to the recreational facilities they operate to be more compatible with the surrounding landscape. However, the Joint Applicants do not propose to develop and implement a landscape management plan for project facilities, roads, and other land form alternations as specified by FS preliminary 4(e) condition no. 13. We conclude in section 3.10.2.1, *Compatibility of Project Features with the Visual Setting*, in *Land Use and Aesthetics*, that the existing project facilities, with the exception of the Round Butte dam, do not dominate the landscape and that all of the facilities generally blend with the surrounding landscape. We conclude that the visual enhancements detailed in FS preliminary 4(e) condition no. 13, particularly those measures that require staining, painting or planting on and around the existing dams, roads and talus slopes would provide little benefit for visual resources and may be in conflict with other objectives for project facilities, such as maintaining temperatures in buildings. We do agree that future improvement and maintenance at the project facilities could benefit from aesthetic guidelines developed in consultation with the FS as part of a landscape management plan. We estimate that the annual cost of developing and implementing a landscape management plan would be $2,390. We conclude that the benefits of implementing this plan would be worth the cost.

5.2 CUMULATIVE EFFECTS SUMMARY

We identified water quality, anadromous fish, and recreation as resources that may be affected in a cumulative manner by the proposed relicensing of the Pelton Round Butte Project. The project is located in a system that has been intensively developed for flood control, agriculture, and hydropower, with numerous irrigation diversion dams and seven hydroelectric dams on the mainstem or tributaries upstream of the project. Each of these developments has contributed to cumulative changes in geomorphology, hydrology, aquatic macrophyte abundance, and fish species diversity. Many of these changes have negatively affected natural riverine processes that support riparian and wetland habitats, and which, in turn support unique plant and wildlife communities. Below we summarize our detailed cumulative effects analysis found at the end of each resource section in section 3.0.

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Water Quality

Implementing the SWW is expected to improve seasonal water temperatures and DO concentrations in the project reservoirs and in the Deschutes River downstream of the Rcregulating dam. Therefore, cumulative effects would be beneficial.

Anadromous Fish

Implementing the measures proposed by the Joint Applicants would benefit anadromous fish by (1) restoring access to historic spawning and rearing habitats upstream of the project through implementation of the proposed fish passage plan; (2) improving water quality in the project reservoirs and in the lower Deschutes River through implementing SWW; (3) protecting and restoring aquatic habitats through near-term riparian corridor improvements and the movement of large woody debris from Lake Billy Chinook into the lower river; and (4) enhancing the stability of habitat downstream of the project by implementing greater restrictions on project operations. As a result, cumulative effects on anadromous fish would be positive.

Recreation

The recreational measures proposed by the Joint Applicants, as well as those recreational measures specified by resource agencies and recommended by staff, would enhance recreational resources associated with the project. A primary goal of the proposed and recommended measures is to improve the recreational experience and management of recreational resources without significantly increasing the number of recreational facilities or the number of recreationists. The proposed improvements to facilities and the proposed management measures would achieve these goals by reducing user conflicts, distributing recreationists more evenly throughout the recreational season, and implementing permitting programs if needed. Site stabilization measures and closures of dispersed recreational areas could reduce erosion and improve aquatic resources. Overall, the cumulative effects of the improvements to recreational opportunities in the project area would be beneficial, with negligible effects on regional recreational opportunities.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection of, mitigation of damage to, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and requirements

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of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

The FWS filed 24 recommendations and the ODFW filed 33 recommendations under Section 10(j) on November 12, 2002. NOAA Fisheries adopted all of the FWS recommendations pertaining to Chinook and sockeye salmon and steelhead as its Section 10(j) recommendations on November 12, 2002. ODFW and NOAA Fisheries filed revised Section 10(j) recommendations on December 29, 2003, and December 31, 2003, respectively, in response to the analysis and information contained in the draft EIS. ODFW stated that should a settlement agreement not be reached, its revised recommendations would no longer apply, and it would revert to its original 24 recommendations.

Table 35 lists the current federal and state recommendations subject to Section 10(j), as revised, and whether these are recommended under the staff alternative. Recommendations that we consider outside of the scope of Section 10(j) have been considered under Section 10(a) of the FPA and are addressed in the specific resources section of this document. We include in our recommended alternative all current recommendations that we found to be within the scope of Section 10(j).

In the draft EIS, we recommended adopting each of FWS and NOAA Fisheries fish and wildlife recommendations that we found to be within the scope of Section 10(j) of the FPA; however, we made a preliminary determination that six of 24 recommendations made by the ODFW may be inconsistent with the purpose and requirements of the FPA or other applicable law. These recommendations included: (1) provide effective upstream and downstream passage for Pacific lamprey; (2) monitor fish entrainment via sonar acoustics at Round Butte dam; (3) include off-site habitat acquisition and enhancement in the terrestrial resources management plan; (4) monitor the effectiveness of the wildlife crossing at the Pelton fish ladder; (5) implement a habitat program to restore riparian and riverine aquatic habitat for terrestrial species consistent with, but not in addition to, a fish habitat protection, mitigation, and enhancement plan; and (6) support threatened and endangered species by developing opportunities for bat habitat improvements. We sent a letter to ODFW on November 19, 2003, informing them of the inconsistencies. By letter filed December 29, 2003, ODFW filed revised Section 10(j) recommendations, such that the recommendations no longer include item 2 and the recommendations now encompass item 1 as an assessment under the Current Fish Passage Plan, items 3 and 5 as eligible activities under the General Fund of the Pelton Round Butte Fund, and items 4 and 6 under the Terrestrial Resources Management Plan; consequently, no inconsistencies remain.

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Table 35. Federal and state fish and wildlife agency recommendations. (Source: Staff)

	Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
1.	Maintain minimum flows or inflow, whichever is less, as measured at the Madras gage (no. 14092500) of 4,500 cfs from December through March, 4,000 cfs from April through July, 3,500 cfs in August and 3,800 from September through November. When inflows are less than the target flows, FWS recommends adjusting inflows on a daily basis using the average inflow during the past 7 days.	FWS	Yes	$32,540 $1,247,420 (loss in energy)	Yes, our recommended target minimum flows would be higher than as those proposed by FWS.[a]
2.	Maintain average minimum flows equal to monthly target flows, as measured at the Madras USGS gage (no. 14092500), of 4,500 cfs in December through February; 4,571 cfs in March; 4,170 cfs in April; 4,000 cfs in May through July; 3,500 cfs in August; 3,800 cfs in September through October; and 4,049 cfs in November, or inflow to Lake Billy Chinook, whichever is less, with a 100 to150-cfs allowance for refilling Lake Billy Chinook[b] by May 15.	ODFW, NOAA Fisheries	Yes	$32,540 (loss in energy)	Yes

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	Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
3.	Supplement inflows from September 16 to November 15, to ensure a minimum flow release to the lower river of at least 3,000 cfs subject to a maximum supplement of 200 cfs and maximum drawdown of Lake Billy Chinook equal to 4 feet.	ODFW, NOAA Fisheries	Yes	Negligible	Yes
4.	Within 1 year, improve the existing USGS gages on the Crooked (no. 14087400), Deschutes (no. 14076500), and Metolius rivers (no. 14091500) upstream of the project.	FWS, NOAA Fisheries, ODFW	Yes	$20,640 (included in WQMMP)	Yes
5.	For flows under 6,000 cfs, hold river flows below the Rcregulating development to within ±10 percent of the measured project inflow.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to item no. 1	Yes
6.	Opcrate the project with ramping rates of 0.1 feet per hour and 0.4 feet per day from October 16 to May 14 and with 0.05 feet per hour and 0.2 feet per day from May 15 to October 15.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to WQMMP	Yes

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	Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
7.	Operate Lake Billy Chinook between elevation 1,944 and 1,945 feet msl from June 15 to September 15.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to WQMMP	Yes
8.	Restrict the drawdown of Lake Billy Chinook to a maximum of 20 feet (elevation 1,925 feet msl) during normal winter operations.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to the WQMMP	Yes
9.	Reduce minimum flow up to 150 cfs, if necessary, to ensure the refilling of Lake Billy Chinook to reach its normal minimum summer operational level of elevation 1,944 feet msl.	FWS	Yes	No additional cost to item no. 1	Yes
10.	Develop and implement a chart that clearly instructs project operators on measures to refill Lake Billy Chinook or Lake Simtustus from a range of drawdown elevations based on the stipulation that 150 cfs is held back to refill the reservoir.	FWS, NOAA Fisheries, ODFW	Yes	$750	Yes, the Joint Applicants' Draft Project Operating Plan includes a refill curve for Lake Billy Chinook.

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
11. Operate Lake Simtustus to a maximum drawdown elevation of 1,576 feet msl from June 1 to August 31 and elevation 1,573 feet msl from September 1 to May 31.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to the WQMMP	Yes
12. Operate the Reregulating reservoir to restrict drawdown to 21 feet (1,414 feet msl year-round).	FWS, NOAA Fisheries, ODFW	Yes	No additional cost, included in WQMMP	Yes
13. Monitor water quality with permanent stations below the Reregulating dam for DO, water temperature, and pH in accordance with the WQCs and the WQMMP.	FWS, NOAA Fisheries	Yes	No additional cost to the WQMMP	Yes
14. Develop and implement a fish passage program with the Fish Committee that provides a sequential, step-by-step program with clear targets, accomplishments and prerequisites; and prepare and implement annual work plans and evaluation plans to determine the effectiveness of all upstream and downstream passage facilities. Implement a long-term program to	ODFW	Yes	$3,031,980	Yes

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	Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
	establish sustainable fish runs of Chinook salmon, steelhead, and sockeye salmon, with target population sizes to be developed with the Fish Committee, while minimizing the risks of fish pathogen introduction.				
15.	Conduct an assessment of Pacific lamprey habitat, implement a 3-year Pacific lamprey passage feasibility study if sufficient habitat is found, implement a plan for the experimental reintroduction of Pacific lamprey into identified habitats upstream of the project if passage is found to be feasible, or develop of an alternative enhancement plan if passage is infeasible.	ODFW	No, the study could have been conducted prior to licensing.	$27,780	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
16. Within 1 year, develop and implement a fish habitat protection and enhancement plan for habitat located upstream and downstream of the project; connectivity and quality; fund throughout term of any license issued for the project by priority for projects within first 15 years.	FWS, NOAA Fisheries, ODFW	No, dollars to fund plan are not 10(j), because it is not a specific measure to protect fish and wildlife. Also, the plan is largely designed to enhance off-site tributary habitats that are not affected by the project.	$147,130	No, inconsistent with 10(a) and 4(e); near-term habitat enhancement measures, the fish passage plan, and the SWW are expected to mitigate for most project impacts and would provide for substantial enhancement of habitat conditions for Chinook salmon, steelhead, and sockeye salmon. Minimal additional benefit from fish habitat protection and enhancement plan.

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
17. Develop a fish passage unavoidable loss mitigation plan to mitigate for unavoidable and ongoing effects on outmigrating anadromous and resident fish in Lake Billy Chinook and implement after 16 years of issuance of any new license.	FWS, NOAA Fisheries, ODFW	No, not a specific measure to protect fish and wildlife (the plan is vague and does not identify types of measures to implement).	Unable to Determine	No, other measures would provide sufficient enhancement to these resources.
18. Establish a Pelton Round Butte Fund for implementing enhancements related to increasing the success of anadromous fish reintroduction at the project and the sustainable and harvestable fishery in the Deschutes River.	ODFW	No, not a specific measure to protect fish and wildlife	$361,850 (General Fund) $512,060 (Water Rights Fund)	Yes
19. Implement additional habitat enhancement measures in the lower Deschutes River, Trout Creek and small tributaries as defined in the Draft Lower River Implementation Plan.	ODFW	Yes	$84,690	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
20. Within 2 years, develop and complete production capacity estimates for spring Chinook, summer steelhead, and sockeye and evaluate models annually for the first 10 years and every 5 years thereafter; conduct fish habitat surveys every 10 years to update models, monitor habitat effectiveness and quality.	FWS, NOAA Fisheries	Yes	No additional cost to item no. 14	Yes
21. Cooperatively develop and conduct habitat surveys for monitoring habitat effectiveness on 5- to 10-year interval (about 10 miles per year).	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to item no. 14	Yes
22. Develop and implement fish health monitoring of upstream and downstream Deschutes River fish populations.	ODFW	Yes	No additional cost to item no. 14	Yes
23. Develop, implement, and monitor fish populations to evaluate risk of transmitting fish pathogens above the project. Implement fish health management measures to effectively manage fish diseases under fish passage program.	FWS, NOAA Fisheries,	Yes	No additional cost to item no. 14	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
24. Within 2 years, fund and implement an evaluation of anadromous and resident fish populations to pass for reintroduction. Review stock performance at least every 5 years.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to item no. 14	Yes
25. Conduct genetic studies on wild and hatchery steelhead in the basin to assist in a stock assessment for the reintroduction of steelhead.	FWS, NOAA Fisheries,	No, studies could have been done before licensing	$14,930	No, but we recommend cooperating with agencies in the collection of fish needed for such studies
26. Develop and implement a study of fish predators in the project reservoirs over a 3-year period once smolt migration >10,000 smolts.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to item no. 14	Yes
27. Develop and implement a large wood management plan for using large wood collected in Lake Billy Chinook to benefit fish and riparian habitats.	FWS, NOAA Fisheries, ODFW	Yes	$11,490	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
28. Develop a detailed monitoring plan consistent with the Joint Applicants' response to AIR no. 13 to verify sediment transport model, measure bedload transport and re-measure particle size distributions if significant transport occurs at lower flows, study the quality of gravel habitat, and initiate a gravel augmentation program if gravel transport occurs at lower flows and it is recommended by the Fish Committee.	FWS, NOAA Fisheries, ODFW	Yes	$14,930	Yes
29. Develop and implement an experimental gravel augmentation program to include placement of a total of 300 cubic yards of gravel distributed among at least three sites between the Reregulating dam and Shitike Creek.	ODFW, NOAA Fisheries	Yes	$34,380	Yes
30. Operate Round Butte hatchery to meet the current goals for returning 1,800 adult summer steelhead and 1,200 spring Chinook salmon.	FWS, NOAA Fisheries, ODFW	Yes	$414,110	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
31. Implement facility upgrades at Round Butte hatchery.	ODFW	Yes	No additional cost to item no. 30	Yes
32. Develop a plan to address project effects on Pacific lamprey if lamprey cannot be successfully reintroduced upstream of the project.	FWS	No, measure would accord FWS with reserved authority	No additional cost to item no. 15	Yes, as part of a feasibility study for the reintroduction of Pacific lamprey. However, this feasibility does not give FWS reserved authority.
33. Monitor and evaluate effects of reintroducing anadromous fish on resident fish populations including abundance, distribution, and density.	FWS, NOAA Fisheries, ODFW	Yes	No additional cost to item no. 14	Yes
34. Develop, fund, and implement a comprehensive terrestrial resources management plan in consultation with a Terrestrial Resources Work Group within 2 years of issuance of any new license and update every 5 years.	ODFW	Yes	$310,470	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
35. Develop, fund, and implement the comprehensive terrestrial resources management plan (item 29) within 1 year of issuance of any new license and update every 5 years.	FWS	Yes	$310,470	Yes, except that we recommend the ODFW time frame of 2 years to develop and file the plan for approval.
36. Fund and conduct a mule deer winter range telemetry study ($50,000).	ODFW	Yes	$2,800 (part of item no. 34)	Yes
37. Monitor annual deer trend counts and sightability studies annually including 4 hours of helicopter time annually ($1,600 in Trout Creek and $3,000 in Deschutes Unit)	ODFW	Yes	$5,900 (part of item no. 34)	Yes
38. Within 3 years, implement Pelton fish ladder measures to protect wildlife species including wildlife crossings and an exclusion device.	FWS ODFW	Yes	$790 (part of item no. 34)	Yes
39. Monitor the effectiveness of wildlife crossings.	ODFW, FWS	Yes	$5,750	Yes, for new small animal passage structures.

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
40. Develop, fund, and implement a shoreline management plan over the term of any license issued that is tiered to the proposed recreational resources implementation plan and the terrestrial resources management plan to avoid conflicts between recreation, shoreline development, and protection of wildlife habitat.	FWS, NOAA Fisheries, ODFW	Yes	$39,570	Yes, where tied to terrestrial resources management.
41. Establish a Shoreline Work Group within 6 months of licensing to help develop, fund, and implement the shoreline management plan.	ODFW	No, not a specific measure to protect fish and wildlife	$0	No, consultation with the agencies, the Terrestrial Resources Work Group, and the other plans would be sufficient.
42. Fund and implement proposed habitat improvement measures identified in the Final Joint Application Amendment.	FWS ODFW	Yes	$0 (part of item no. 34)	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
43. Within 5 years, fund and implement the Final Joint Application Amendment wetland habitat improvement projects at Fly Lake, Potter Springs, and Burnt Snag Pond.	ODFW	Yes	$330 (part of item no. 34)	Yes
44. Within 2 years fund and implement an exotic and invasive vegetation management program for the prevention, suppression, and containment of noxious weed plants.	ODFW	Yes	$52,930 (part of item no. 34)	Yes, as part of the terrestrial resources management plan.
45. Implement, maintain and monitor habitat connectivity, lynx prey habitat patches, native early seral conditions, and survey and manage species for the purpose of reducing transmission line ROW effects on terrestrial resources.	FWS	No, not project related	NA	No, applies to non-project facilities.
46. Within 2 years, fund, develop, and implement a transmission line ROW restoration and enhancement management plan.	ODFW	No, not project related	NA	No, applies to non-project facilities.

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
47. Within 1 year, develop a plan to minimize adverse interactions between project transmission and distribution lines and birds.	FWS	Yes	$8,460	Yes, as part of ROW management plan for the 7.9-mile-long line within the project boundary as proposed by the Joint Applicants.
48. Support threatened and endangered species and special habitats by identification and protection and additional measures for research, protection and habitat enhancement if new species are listed.	FWS, NOAA Fisheries, ODFW	Yes	$200	Yes, as part of the terrestrial resources management plan.
49. Support threatened and endangered species by developing opportunities for bat habitat improvements at project facilities.	ODFW	Yes	$12,990	Yes.
50. Support threatened and endangered species by developing opportunities for off-site bat habitat improvements	ODFW	No, bat populations that would benefit are located in areas not affected by the project	Undetermined	No, no nexus to the project.

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
51. Develop, fund, and implement a Comprehensive Bald Eagle Management Strategy, including effectiveness monitoring.	FWS, ODFW	Yes	$4,770 (part of item no. 34)	Yes
52. Fund and conduct annual monitoring of bald and golden eagles, prairie falcons; monitor osprey in 2 of every 5 years.	FWS, ODFW	Yes	$7,140 (part of item no. 34)	Yes
53. Develop, fund, and implement management plans and provide funding for 8 bald eagle nest sites and 3 bald eagle winter roost sites.	ODFW	Yes	No additional cost to item no. 34	Yes
54. Fund and develop a raptor protection study to ensure that project facilities, operations, and related activities do not adversely affect bald eagle, golden eagle, or prairie falcon nest site behavior or foraging habitat.	FWS	No, study could have been done prior to licensing	$7,570 (part of item no. 34)	Yes

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Recommendation	Agency	Within Scope of Section 10(j)	Total Annualized Cost (2002$)	Recommend Adopting?
55. Implement measures to avoid disturbing and harassing spotted owls, peregrine falcons, goshawks, great gray owls, lynx, and wolverine during transmission line ROW maintenance activities.	FWS	No, not project related	NA	No, applies to non-project facilities.
56. Fund additional year-round and seasonal patrols of the project areas and road closure areas.	ODFW	No, not a specific measure to protect fish and wildlife	$103,530 (part of recreational resources management plan)	Yes
57. Operator would obtain appropriate permits before repairing or modifying the project and would notify agencies if at any time fish or wildlife are being killed, harmed or endangered as a result of project operation.	ODFW	No, not a specific measure to protect fish and wildlife	Nominal	No, but licensees are expected to obtain permits required by law and licensees would be required to notify agencies as appropriate.
58. Upon project abandonment, the owner/operator would remove or modify project facilities and restore pre-project conditions in a manner to maintain fish and wildlife production in the project affected area.	ODFW	No, not a specific measure to protect fish and wildlife	$0 (unknown)	No, we would determine appropriate measures at the time of license surrender.

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Recommendation	Agency	Within Scope of Section 18(j)	Total Annualized Cost (2002$)	Recommend Adopting?
59. Fund one full-time NRS 2 for pre-license period and 15 years of any license issued and 10 percent of fish passage engineer position with ODFW.	ODFW	No, not a specific measure to protect fish and wildlife	$71,430 (part of item no. 14)	Yes, as part of the Current Fish Passage Plan (item 14) under Section 10(a), but only for the term of any license issued for the project.
60. Limit any new license issued to 30 years or 40 years if licensee commits to negotiated settlement agreement of a substantive habitat restoration program or fund for restoring anadromous fish populations.	ODFW	No, not a specific measure to protect fish and wildlife	$0	The Commission will specify the license term in any order issuing a license.

Note: NA – Not available

[a] When inflows are less than the target flows, we agree with the Joint Applicants' proposal to maintain outflows equal to or greater than the lowest daily inflow during the previous 7 days, and not the average flow as recommended by FWS. However, since inflows are very stable during low-flow conditions, we do not consider this difference to rise to the level of an inconsistency.

[b] When inflows are equal to or greater than 3,500 cfs, the project operators would be allowed to reduce outflows to 150 cfs less than the monthly target flow (or inflows) between November 15 and May 15 to ensure that Lake Billy Chinook is filled to its summer operating level by May 15. If daily inflows are less than 3,500 cfs but more than 3,100 cfs, the refill allowance would be reduced to 100 cfs and the refill season extended to June 15. When inflows are between 3,100 cfs and 3,000 cfs, the refill allowance would be the difference between daily inflow and 3,000 cfs.

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5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, (16 U.S.C. § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. Consistency with comprehensive plans is one of several factors considered by the Commission in its licensing decision. Under Section 10 (a)(2), federal and state agencies have filed 137 qualifying comprehensive plans, of which we identified 61 Oregon and 4 federal plans to be potentially applicable (appendix D). We did not find any conflicts.

5.5 RELATIONSHIP OF LICENSE PROCESS TO LAWS AND POLICIES

5.5.1 Water Quality Certification

On June 25, 2001, and June 26, 2001, the Joint Applicants applied to the WCB of the Tribes and the ODEQ, respectively, for WQC as required under section 401(a)(1) of the Federal Water Pollution Control Act (Clean Water Act). The Tribes and the ODEQ issued WQCs on June 24, 2002.

5.5.2 Coastal Zone Consistency Certification

Section 307(c)(3) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456 (c)(3)(A), requires that all federally licensed and permitted activities be consistent with approved state coastal zone management programs. If a project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of the designated coastal zone, the Joint Applicants must certify that the project is consistent with the state's coastal zone management program.

The Oregon Department of Land Conservation Development (DLCD) manages the Coastal Management Program, which was created by the state and approved by the National Oceanic and Atmospheric Administration in the early 1970's, pursuant to the CZMA. Oregon's coastal zone boundary generally starts at the Coast Range divide and extends from the shoreline three miles to the outer limit of the state's territorial jurisdiction. Lands in the coastal zone include 33 coastal cities, 7 coastal counties, and parts of 5 inland counties (DLCD, 2001). Only those federal actions that affect any land or water use or natural resource in Oregon's coastal zone are subject to federal consistency review.

The Pelton Round Butte Project is located on the Deschutes River approximately 100 miles upstream of the confluence with the Columbia River, and approximately 200 miles upstream of the Columbia's confluence with the Pacific Ocean in Astoria, Oregon. For the purpose of federal consistency, the coastal zone area along the Columbia River ends at the eastern boundary of Clatsop County, approximately 10 miles upstream of

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Astoria, approximately 190 miles downstream of the Pelton Round Butte Project. We conclude that no coastal zone consistency is needed for this project.

5.3 Wild and Scenic River Designation

The Wild and Scenic River Act (P.L. 90-542) and its amendments protect in their free-flowing conditions designated rivers and their immediate environments that possess outstanding remarkable values (ORVs). ORVs include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Section 7(a) of the act states that FERC shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the FPA on or directly affecting any river designated as a Wild and Scenic River. The Wild and Scenic Rivers Act specifically does not preclude licensing of developments below or above designated wild, scenic, or recreational rivers if the development does not invade the area or unreasonably diminish the scenic, recreational and fish and wildlife values present in the designated reach.

Four river segments adjacent to the project are designated by Congress as Wild and Scenic Rivers, including the Crooked River upstream of the project, the Metolius River upstream of the project, and two sections of the Deschutes River, one upstream and one downstream. A 9.8-mile segment of the Crooked River extending from Ogden State Wayside downstream through a narrow and deep basalt canyon to Opal Springs is designated as a scenic river. Designation of the Metolius River includes 28.7 miles from its headwater springs to the backwaters of Lake Billy Chinook on the Metolius arm. The upper 10 miles is designated as a recreational river and the lower 18.7 miles is designated as a scenic river. Immediately upstream of the project, designation of the Deschutes River includes a 20-mile section from Odin Falls to the gaging stations just upstream of the project. This reach is classified as a scenic river. Downstream of the project, designation of the Deschutes includes 100 miles of free-flowing river, from the Reregulating dam to the confluence with the Columbia River. This stretch is classified as a recreational river, partly because of historical use and partly because of the train tracks and roads that parallel much of the reach.

Fisheries resources are identified as an ORV in the sections of the lower Deschutes River, middle Deschutes River, and Metolius River that are protected under the Wild and Scenic Rivers Act. Based on the potential for long-term restoration of fish habitats and populations, the BLM concludes that the fisheries of the lower Crooked River could also be determined to be outstandingly remarkable in the future. The Metolius River is the only section in which water quality has been designated as an ORV.

Several measures included in the staff alternative would benefit fisheries in the lower Deschutes River, including improvement of water quality through implementing SWW, more restrictive ramping rates, and restricting outflows to within 10 percent of

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inflows under most conditions. Although BLM has expressed concern that an absolute minimum flow of 9,000 cfs may be necessary to protect ORVs in the lower Deschutes River, this is based on concern for future increases in consumptive uses in the basin.

Implementing the measures proposed under the staff alternative would provide several benefits to fisheries and water quality in the Wild and Scenic River segments located upstream of Lake Billy Chinook, which include portions of the middle Deschutes River, the lower Crooked River, and the Metolius River. Implementation of the fish passage plan, if it is successful, would restore runs of anadromous fish to much of their historical range, as well as the delivery of marine-derived nutrients, which would increase productivity for both resident and anadromous fish. There is some risk of fish diseases being transferred upstream of the project, but disease risks would be monitored and controlled by implementing the Joint Applicants' proposed fish health management program. Implementing habitat enhancement measures as proposed by the Joint Applicants and several agencies would provide further benefits to water quality and fisheries in these segments, but we conclude in section 3.6, *Aquatic Resources*, that we do not have enough information to determine how much habitat enhancement would be needed to restore runs of anadromous fish.

Implementing the measures proposed under the staff alternative would have negligible effects on recreational resources in the designated wild and scenic reaches. The staff-recommended recreational measures primarily address recreational needs within the project boundary and would neither attract additional recreationists to the designated reaches nor affect scenic values or wildlife values of these reaches, except for the proposed improvements to the FS-managed Monty Campground. The campground is located outside of the project boundary and adjacent to the downstream end of the Metolius reach designated for its scenic values. Improvements to this site would improve the recreational experience by providing a more comfortable, clean, and attractive recreational site. These improvements could attract additional recreational users to the lower Metolius River. Although improvements to the site would improve the aesthetic characteristics of the campground, the ongoing effects of additional recreational users could result in minor shoreline impacts as anglers and others access the unique fishing opportunities associated with the lower Metolius River.

Other staff-recommended measures associated with flows and water quality downstream of the Reregulating dam could improve recreational fishery resources in the lower Deschutes River. Over time, improvements to the fishery could attract additional recreational users to the reach. The staff believes that any increased recreational use associated with the improved fishery would be marginal and could not be distinguished from general increases in demand for boating and fishing in this section of the Deschutes River.

Based on our analysis, we conclude that relicensing of the Pelton Round Butte Project with the staff-recommended measures would not affect the scenic or recreational

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attributes of the wild and scenic sections of the Crooked River, the upper Deschutes River, or the upper and middle sections of the Metolius River.

5.5.4 Section 18 Fishway Prescription

Section 18 of the FPA, 16 U.S.C. 811, states that the Commission shall require a licensee to construct, operate, and maintain such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce, as appropriate. Under Section 18, Interior and Commerce filed with the Commission, by letters dated November 12, 2002, preliminary fishway prescriptions. These preliminary prescriptions are described in section 3.6.2.3, *Fish Passage Plan*, in *Aquatic Resources*.

5.5.5 Essential Fish Habitat Assessment

Public law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (MSA)[79] to establish new requirements for essential fish habitat (EFH) in federal fishery management plans and actions and to require agencies to consult with NOAA Fisheries on activities that may affect EFH. The MSA defined EFH as those waters and substrate necessary for fish use in spawning, breeding, feeding or growth to maturity. The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific Salmon fishery that includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery.

EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to coho and Chinook salmon in Oregon, Washington, Idaho, and California, except above the impassable barriers identified by the PFMC. EFH excludes areas above natural barriers, such as waterfalls. Proposed actions on the Deschutes River include measures to: (1) continue a fish passage program aimed at determining the feasibility of reintroducing anadromous species above the project and reconnecting resident fish populations, and implementing appropriate passage measures; (2) continue Round Butte hatchery operations in a manner that complements the fish passage program in protecting and fostering wild fish populations while providing harvest opportunities for Tribal and sports fishing; (3) manage project operations according to strict limits to mimic the natural flow regime and minimize the potential adverse effects of the project on downstream river resources; (4) protect and improve aquatic and associated riparian and upland habitat to increase the probability of success of the anadromous fish reintroduction and reconnection of resident fish populations; and (5) increase resident fish populations in Lake Billy Chinook and Lake Simtustus, with a focus on riparian habitat enhancement and fish passage. In the long term, the Joint

[79] *Joint Applicants submittal included both a biological evaluation and EFH Assessment.*

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Applicants expect the effects of the proposed action to be beneficial for EFH. In summary, effects of the proposed actions would not result in adverse effects on EFH.

5.5.5 Columbia River Fish and Wildlife Program

Under Section 4(h) of the Pacific Northwest Power Planning and Conservation Act, the Northwest Power and Conservation Council (NPCC) developed the Columbia River Basin Fish and Wildlife Program (Program) to protect, mitigate, and enhance the fish and wildlife resources associated with development and operation of hydroelectric projects within the Columbia River basin. Section 4(h) states that responsible federal and state agencies should provide equitable treatment for fish and wildlife resources, in addition to other purposes for which hydropower is developed, and that these agencies should take the Program into account, to the fullest extent possible.

The Program directs agencies to consult with fish and wildlife managers and the NPCC during the study, design, construction and operation of any hydroelectric development in the basin (Sections 12.1A.1 and 12.1A.2). The Commission's regulations require the Joint Applicants to initiate prefiling consultation with the appropriate federal and state fish and wildlife agencies and Indian Tribes and to provide these groups with post-filing opportunities to review and to comment on the application. This consultation has occurred.

The Program states that authorization for new hydroelectric projects should include conditions to mitigate the effects of the project on fish and wildlife resources (Sections 12.1A.1 and 12.1a.2). The specific provisions of Sections 12.1A.1 and 12.1A.2 that apply to the project calls for: (1) consultation with fish and wildlife managers and the NPCC throughout the study, design, construction, and operation of the project; (2) the best available means for aiding downstream and upstream passage of anadromous and resident fish; (3) flows of specific quantity to protect spawning, incubation, rearing, and migration; (4) full compensation for unavoidable fish losses or fish habitat losses consistent with the provisions of this program; (5) the collection of data needed to monitor and evaluate the results of fish protection efforts; (6) assurance that the project would not degrade water quality beyond the point necessary to sustain sensitive fish species (as designated in consultation with the fish managers); (7) providing artificial nest structures when appropriate; (8) creating sub-reservoirs by diking backwater slough areas, creating islands, and creating nesting areas; (9) avoiding critical riparian habitat (as designated in consultation with the wildlife managers) when clearing, riprapping, dredging, disposing of spoils and wastes, constructing diversions, and relocating structures and facilities; and (10) collecting data needed to monitor and evaluate the results of the wildlife protection efforts.

Our recommended alternative includes measures that are consistent with the applicable provisions of the program listed above.

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5.5.7 Endangered Species Act

Section 7 of the ESA, 16 U.S.C. § 1536(a), requires that federal agencies consult with the FWS and NOAA Fisheries when a proposed action may adversely affect federally listed or endangered species. Three federally listed species are known to occur in the project vicinity: bald eagle (threatened), Columbia River DPS for bull trout (threatened), and Middle Columbia River ESU of steelhead (threatened). There is also proposed critical habitat for bull trout in the project area. Our analysis of project effects on threatened and endangered species can be found in section 3.8 and our recommendations in section 5.0.

We conclude that the measures proposed by the Joint Applicants would benefit the middle Columbia River steelhead ESU compared with baseline conditions by providing upstream passage to spawning and rearing habitat above the project, downstream passage for juvenile fish, improvements in water quality, and other habitat enhancement measures. We also believe that the gravel augmentation program specified by BIA in its preliminary 4(e) conditions would most likely increase the availability of spawning habitat for steelhead, but we conclude that there is the potential for adverse effects on water quality and damage to aquatic or riparian habitats when the gravel is placed in the river and that the gravel could fill in pool areas that provide holding habitat for summer steelhead. Because of the smaller amount of gravel that would be used, we have less concern regarding the potential adverse effects associated with the gravel augmentation program proposed by the Joint Applicants. However, because we cannot rule out the potential for some adverse effects, we conclude that the project is likely to adversely affect the middle Columbia River steelhead ESU.

We conclude that the measures proposed by the Joint Applicants would benefit the Columbia River DPS and proposed critical habitat for bull trout compared with baseline conditions by implementing: (1) the design and construction of the SWW facility that would improve water quality conditions in the Deschutes River downstream of the project and in the project reservoirs, (2) the development and construction of fish passage facilities at the project that would provide upstream and downstream passage at the project and restore population connectivity, and (3) habitat restoration efforts upstream of the project that would improve habitat and water quality conditions. Potential adverse effects on this DPS and its proposed critical habitat are associated with re-establishment of access upstream of the project for anadromous salmonids, including the potential for introducing diseases, the potential for competition for prey and habitat, and injury or mortality caused during fish tagging or tracking activities or associated with fish passage facilities. Because we cannot rule out the potential for some adverse effects, we conclude that the proposed project with our recommendations is likely to adversely affect the Columbia River DPS for bull trout. We also conclude that the proposed project with our recommendations may affect, but is not likely to adversely modify or destroy, proposed critical habitat for the Columbia River bull trout DPS.

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We conclude that the proposed project with our recommendations may affect, but would not be likely to adversely affect, the federally listed bald eagle.

We initiated formal consultation with NOAA Fisheries and FWS on September 24, 2003. By letters filed November 5, 2003, and November 6, 2003, NOAA Fisheries and FWS indicated that they require more information before formal consultation can proceed. We will send additional information to NOAA Fisheries and FWS so that consultation can continue.

5.5.8 National Historical Preservation Act

Relicensing is considered an undertaking within Section 106 of the National Historical Preservation Act of 1966, as amended (P.L.89-665, 16 U.S.C.470). Section 106 requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, TCPs, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register. As the lead federal agency for issuing a license, the Commission is responsible for ensuring that the licensee takes all necessary steps to "evaluate alternatives or modifications" that "would avoid, minimize, or mitigate any adverse effects on historic properties" for the term of any license issued involving the project. The lead agency must also consult with the SHPO(s), as well as with other land management agencies where the undertaking may have an effect, and with Indian Tribes who may have cultural affiliations with affected properties involving the undertaking. The overall review process involving Section 106 is administered by the Advisory Council, an independent federal agency.

To meet the requirements of Section 106, the Commission will execute a programmatic agreement for the protection of historic properties from the effects of the continued operation of the Pelton Round Butte Project. The PA would be among the consulting parties: FERC, FS, BLM, SHPO, CTWS, PGE, and the Advisory Council. The terms of the PA would ensure that the Joint Applicants would address and treat all historic properties identified within the project area through a CRMP. The CRMP entails ongoing consultation involving historic properties for the term of any license issued.

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APPENDIX A

FIGURES

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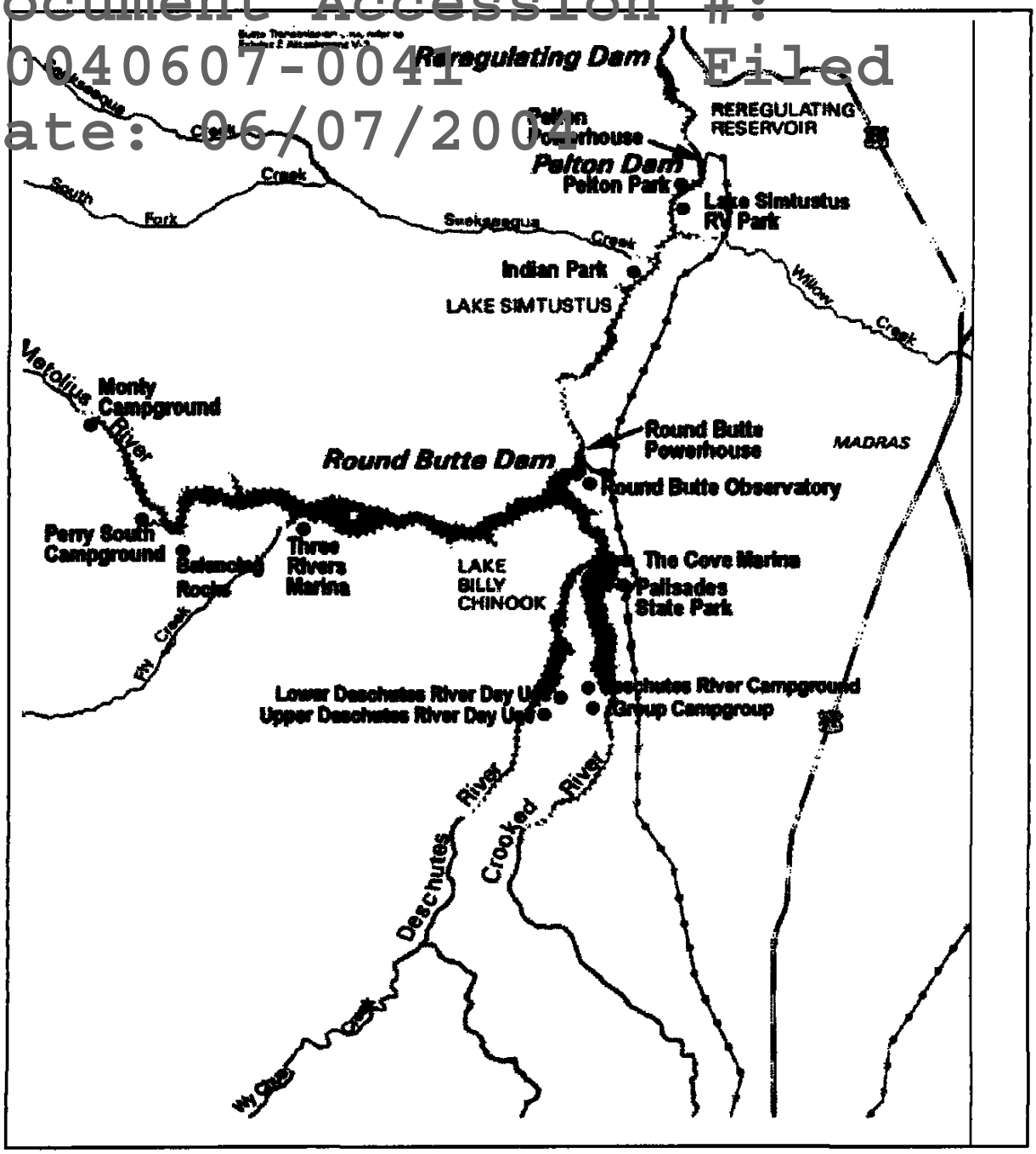

Figure A-1. Project area with powerhouses and recreational sites. (Source: PGE, 1999, as modified by staff)

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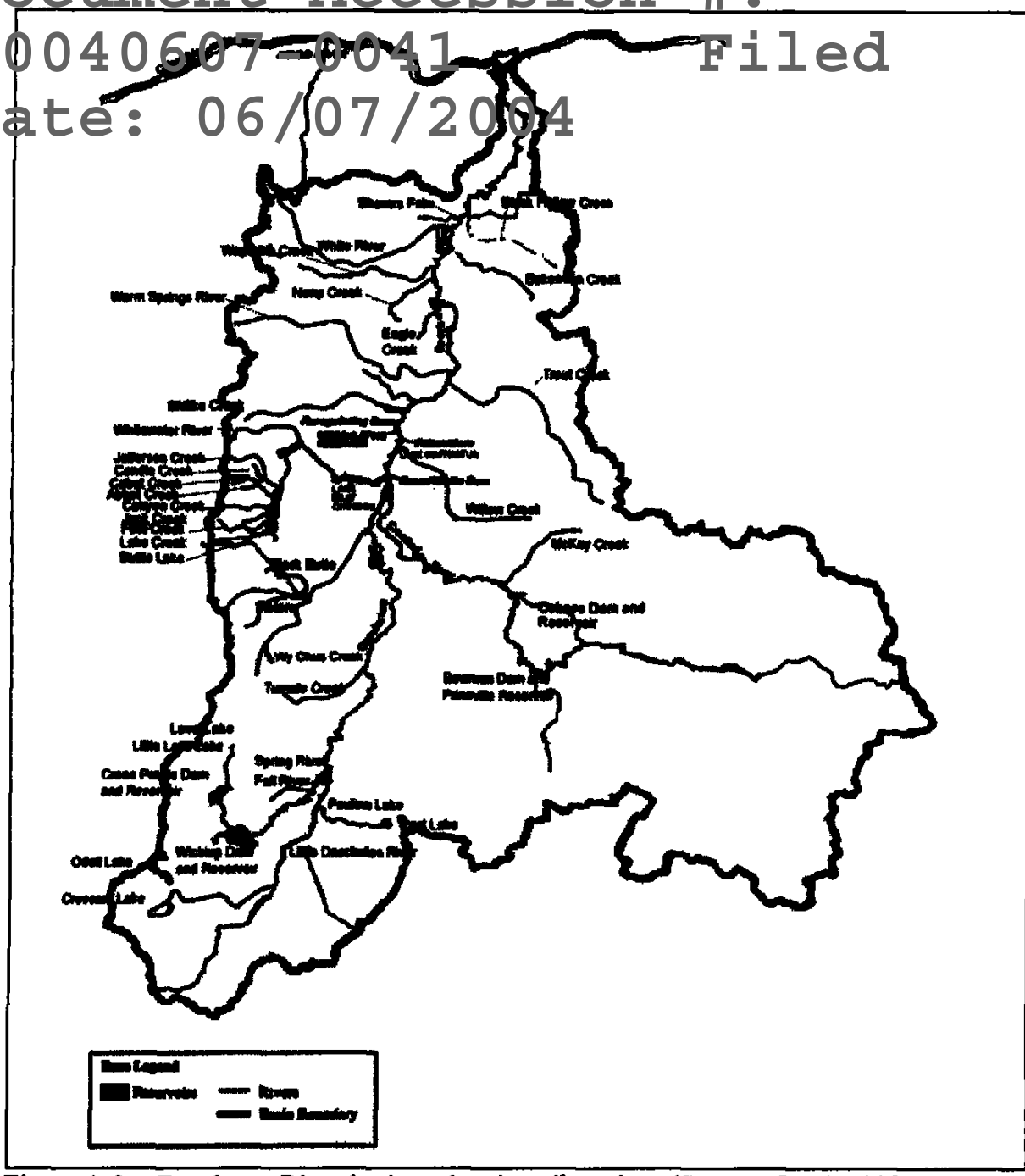

Figure A-2. Deschutes River basin and major tributaries. (Source: PGE, 1999, as modified by staff)

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APPENDIX B

SPECIAL STATUS WILDLIFE SPECIES

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Table B-1. Special status wildlife species that could occur or are known to occur in the project area. (Source: PGE, 1999; Csuti et al., 1997)

Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Amphibians		
Western toad (*Bufo boreas*)	FSS; ODFW SV; ONHP 3	Documented in mixed conifer, Metolius arm. May be found in a variety of habitats from sea level to near timberline. Breeds in ponds, irrigation canals, lakes, or rivers in deserts, shrubland, grassland, woodland, and forest.
Tailed frog (*Ascaphus truei*)	SoC; FSS; BLMS; ODFW SV; ONHP 3	Documented in open water, Metolius arm. Occurs only in cold, high-gradient, perennial streams, usually in forested areas. Sightings in Metolius arm likely originated in tributaries.
Columbia spotted frog (*Rana luteiventris*)	C; FSS; ODFW SU; ONHP 3	Highly aquatic, living in or near permanent water. Most often found in non-woody wetland plant communities, from about 1,500 feet to about 3,000 feet.
Reptiles		
Northern sagebrush lizard (*Sceloporus graciosus graciosus*)	SoC; BLMS; ODFW SV; ONHP 4	Primarily in sagebrush, but occasionally in juniper woodlands and conifer forest.
Birds		
Common loon(*Gavia immer*)	FSS; BLMS; ONHP 2	Documented in open water. Nests in isolated mountain lakes, winters along coast.
Horned grebe (*Podiceps auritus*)	ODFW SP; ONHP 4	Documented in open water. Nests on lakes, ponds, and marshes with abundant emergent vegetation; winters along coast.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Rednecked grebe(*Podiceps grisegna*)	FSS; ODFW SC; ONHP 2	Documented in open water. Nests on lakes and ponds in forested areas, often associated with hardstem bulrush marshes; sometimes nests colonially; winters along coast.
Ameriean white pelican (*Pelecanus erythrorhynchos*)	FSS; ODFW SV; ONHP 2	Nests colonially on inland lakes and marshes, usually on islands, where fish are abundant. May winter on inland waters also, or along coast.
Barrow's goldeneye(*Bucephala islandica*)	ODFW SU; ONHP 2	Documented in open water. Usually nests in cavities of trees near high mountain lakes, usually with dense emergent vegetation; winters along coast and sometimes along Columbia and Snake rivers.
Buffiehead (*Bucephala albeola*)	FSS; BLMS; ODFW SU; ONHP 2	Documented in open water and wetlands. Usually nests in cavities of trees near high mountain lakes, usually with dense emergent vegetation; winters on open inland waters and along coast.
Great egret (*Ardea alba*)	ONHP 3	Documented in wetlands. Nests colonially in trees in riparian forest or shrub, often associated with cattail and bulrush marshes, riparian habitats, wet meadows, and pastures. Winters along coast.
Sandhill crane(*Grus canadensis*)	FSS; ODFW SV; ONHP 4	Nests in marshes, wet meadows, pastures, and hay fields. A few winter on islands in the Columbia River, but most migrate to California.
Franklin's gull(*Larus pipixan*)	BLMS; ODFW SP; ONHP 2	Documented in open water. Nests colonially in or near alkaline marshes, forages in meadows, irrigated pasture, and croplands.
Forster's tern (*Sterna forsteri*)	ONHP 3	Documented in open water. Nests colonially in lakes, marshes, mudflats, and sandflats.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Black tern(*Chlidonias niger*)	SoC; BLMS; ONHP 3	Nests colonially in or near alkaline lakes and freshwater marshes, rivers, and ponds. Forages in water, wet meadows, pastures, and croplands.
Northern goshawk(*Accipiter gentilis*)	SoC; FSS; ODFW SC; ONHP 3	Documented in manzanita on Metolius Mule Deer Winter Range. Usually nests in mature conifer forests, often on north-facing slopes near water.
Swainson's hawk(*Buteo swainsoni*)	ODFW SV; ONHP 3	Documented in grasslands. Nests in trees in open grasslands, sagebrush, juniper woodlands; winters in South America.
Ferruginous hawk(*Buteo regalis*)	SoC; FSS; BLMS; ODFW SC ONHP 3	Usually nests in isolated trees, riparian woodlands, or cliffs; forages over grasslands, sagebrush, and juniper woodlands.
Merlin (*Falco columbarius*)	FSS; BLMS; ONHP 2	Documented in mixed shrub. Usually nests in conifer forest edges near lakes, rivers, often in abandoned crows' or ravens' nests. May winter as far south as Peru.
Peregrine falcon(*Falco peregrinus*)	FSS; ODFW E ONHP 1	Nests in cliffs overlooking open areas with abundant avian prey (e.g., waterfowl).
Great gray owl(*Strix nebulosa*)	BLMS; ODFW SV; ONHP 4	Nests in mature or older mixed conifer, ponderosa pine, or lodgepole pine forests; forages over meadows or clearcuts.
Flammulated owl(*Otus flammeolus*)	BLMS; ODFW SC ONHP 4	Usually nests in open ponderosa pine forest; forages in grasslands and meadows.
Boreal owl (*Aegolius funereus*)	ODFW SU; ONHP 3	Usually nests in spruce or subalpine fir forests at elevations over 5,000 feet; forages over open meadows at forest edges.
Western burrowing owl (*Athene cunicularia hypugea*)	SoC; BLMS; ODFW SC; ONHP 3	Usually nests colonially in ground squirrel or badger burrows, in open deserts, grasslands, and pastures; forages in same.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Mountain quail(*Oreortyx pictus*)	ODFW SU; ONHP 4	Documented in mixed conifer and ponderosa pine forests. Usually nests at high elevations in open forests and woodlands with dense underbrush or in riparian woodlands or meadow edges; forms coveys in fall and winters at lower elevations.
Pileated woodpecker (*Dryocopus pileatus*)	BLMS; ODFW SV; ONHP 4	Most common in old-growth ponderosa pine or mixed conifer in eastern Oregon. Nests and forages in large trees and snags.
Lewis' woodpecker(*Melanerpes lewis*)	BLMS; ODFW SV; ONHP 3	Documented in ponderosa pine, bitterbrush, manzanita, mixed shrub and grasslands. Usually nests in oak, ponderosa, mixed oak-pine woodlands, or cottonwoods along river valleys.
Williamson's sapsucker (*Sphyrapicus thyroideus*)	ODFW SU; ONHP 3	Documented in ponderosa pine. Nests and forages in mature, high-elevation conifer forest; may also breed in riparian thickets within conifer forest.
White-headed woodpecker (*Picoides albolarvatus*)	BLMS; ODFW SC; ONHP 4	Documented in mixed conifer. Nests in large snags, forages in large trees, in ponderosa pine, or ponderosa-mixed conifer forest.
Black-backed woodpecker (*Picoides articus*)	BLMS; ODFW SC; ONHP 4	Nests in stands dominated by lodgepole pine, ponderosa pine, or western larch at low elevations. Forages in mature lodgepole stands with abundant dead or dying trees.
Olive-sided flycatcher (*Contopus cooperi*)	SoC; ODFW SV; ONHP 2	Documented in ponderosa pine near Lake Billy Chinook and in bitterbrush, and manzanita on Metolius Mule Deer Winter Range. Nests in uneven-age conifer forests with abundant snags.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Little willow flycatcher (*Empidonax traillii brewsterii*)	SoC; ODFW SV/SU; ONHP 3/4	Documented in mixed shrub and riparian near Lake Simtustus. Nests in willows along streams in meadows, marshes, or forest edges. Winters in Mexico and Central America.
Bank swallow(*Riparia riparia*)	ODFW SU; ONHP 4	Nests colonially in burrows in cliffs or embankments soft enough to excavate, near open water, grassland, or pasture. Winters in Panama and South America.
Pygmy nuthatch(*Sitta pygmaea*)	ODFW SV; ONHP 4	Documented in ponderosa pine and bitterbrush. Nests in open mature ponderosa pine woodlands. May use large roost cavities during the winter.
Green-tailed towhee (*Pipilo chlorurus*)	FSS	Documented in ponderosa pine, bitterbrush, rabbitbrush, manzanita and mixed shrub. Nests in ponderosa pine or juniper woodlands.
Sage sparrow(*Amphispiza belli*)	FSS; ONHP 4	Documented in juniper, sagebrush, and mixed shrub. Nests in shrubs in sagebrush, rarely in grassland. Winters in California and southwest deserts.
Sage thrasher(*Oreoscoptes montanus*)	FSS	Documented in mixed shrub. Nests in sagebrush or other dry shrub types but typically avoids areas where junipers dominate.
Loggerhead shrike(*Lanius ludovicianus*)	FSS; ODFW SV; ONHP 4	Documented in rabbitbrush, sagebrush, mixed shrub, and grassland. Nests in sagebrush, bitterbrush, juniper woodlands, open pine or oak, mountain shrub with tall trees or shrubs for perching or nesting.

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Common Name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Tri-colored blackbird (*Agelaius tricolor*)	SoC; BLMS; ODFW SP; ONHP 2	Documented near open water at Pelton waterfowl pond. Nests colonially in freshwater marshes with dense cattails, willow thickets or other shrubs, or Himalayan blackberry, often mixed with red-winged blackbirds. Winters in California.
Mammals		
Mountain sheep(*Ovis canadensis*)	SoC; BLMS; ONHP 4	Steep rocky mountains, canyons and high mountain meadows in summer; migrate to lower elevations in winter.
White-tailed jackrabbit (*Lepus townsendii*)	ODFW SU; ONHP 3	Found in a variety of habitats, from open sagebrush and grasslands to openings in conifer forest and alpine meadows.
Pygmy rabbit(*Brachylagus idahoensis*)	SoC; FSS; BLMS; ONHP SV; ONHP 2	Requires deep, friable soil for digging. Strongly associated with Great Basin sagebrush, but also known from areas dominated by greasewood.
Western gray squirrel (*Sciurus griseus*)	FSS; ODFW SU; ONHP 3	Documented in mixed conifer. Strongly associated with oak woodlands, sometimes mixed with pine, but also present in riparian areas and mixed conifer forest.
Preble's shrew(*Sorex preblei*)	SoC; BLMS; ONHP 3	Usually near streams in shrublands or grasslands, or in dense, high-elevation conifer forest.
Yuma myotis (*Myotis yumanensis*)	SoC; ONHP 4	Documented in riparian habitat and over open water on Metolius Mule Deer Winter Range and Round Butte dam. Found in a variety of habitats, including riparian, desert scrub, moist woodlands and open forests; forages low above open water. Establishes large colonies in buildings, mines, caves, under bridges.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Long-eared myotis(*Myotis evotis*)	SoC; ODFW SU; ONHP 4	Documented in ponderosa pine and over open water on Metolius Mule Deer Winter Range. Found in a variety of habitats; forages on foliage surfaces. May winter outside Oregon, but has been documented in caves in western Oregon.
Long-legged myotis(*Myotis volans*)	SoC; ODFW SU; ONHP 3	Documented in riparian habitat and over open water on Metolius Mule Deer Winter Range. Usually in conifer forest, oak woodlands, and riparian forests. Roosts in crevices of cliffs, abandoned buildings, caves, and mines. May winter in Oregon.
Western small-footed myotis (*Myotis ciliolabrum*)	SoC; ODFW SU; ONHP 3	Documented in cliffs, mixed shrub, riparian habitat, and over open water on Metolius Mule Deer Winter Range. Associated with cliffs and rocky canyons in dry grasslands and desert scrub, ponderosa pine, mixed conifer. Roosts in rock crevices, under boulders or bark; hibernates in caves and mines. Forages over rocks, rather than open water.
Silver-haired bat(*Lasionycteris noctivagans*)	ODFW SU; ONHP 3	Documented in riparian habitat and over open water. Most abundant in older Douglas fir/western hemlock forests, but also occurs in ponderosa pine forest; forages over ponds and streams; roosts under bark.
Pacific western big-eared bat(*Corynorhinus townsendii townsendii*)	SoC; FSS; BLMS; ODFW SC; ONHP 3	Documented in cliff habitat. Found in a variety of habitats; roosts in buildings, caves, mines and under bridges; hibernates in cold areas of caves and mines.

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Common name (scientific Name)	Status	Habitat requirements and likelihood of occurrence
Pallid bat (*Antrozous pallidus*)	BLMS; ODFW SV; ONHP 3	Documented in cliff habitat. Open forests and shrublands; roosts in cliff faces, caves, mines, or buildings. Forages on the ground.

C	–	Candidate for listing
SoC	–	Federal species of concern
FSS	–	FS sensitive species
BLMS	–	BLM Special Status Species
ODFW E	–	state endangered
ODFW SV	–	Sensitive vulnerable; listing as threatened or endangered is not imminent and can be avoided through protective measures
ODFW SP	–	Sensitive peripheral; species on the edge of their range in state
ODFW SU	–	Sensitive undetermined; status is unclear
ODFW SC	–	Sensitive critical; listing as threatened or endangered is pending or warranted if immediate conservation measures are not taken
ONHP 1	–	threatened with extinction or presumed to be extinct throughout their entire range
ONHP 2	–	threatened with extirpation or presumed to be extirpated from the state
ONHP 3	–	more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout their range
ONHP 4	–	of conservation concern, but not currently threatened or endangered

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APPENDIX C

Public Comments on the Draft EIS for the Pelton Round Butte Project and Staff Responses

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ACRONYMS AND ABBREVIATIONS

APE	Area of Potential Effect
BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BNR	Branch of Natural Resources
BOR	U.S. Bureau of Reclamation
°C	degrees Celsius
cfs	cubic feet per second
COC	cost of capital
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
CTWS	Confederated Tribes of the Warm Springs Reservation of Oregon
DO	dissolved oxygen
EIS	environmental impact statement
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FS	U.S. Forest Service
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
Interior	U.S. Department of the Interior
NEPA	National Environmental Policy Act
ODEQ	Oregon Division of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
O&M	operations and maintenance
ORV	outstanding remarkable value
PGE	Portland General Electric Company
SWW	selective water withdrawal
Tribes	Confederated Tribes of the Warm Springs Reservation of Oregon
WCB	Tribes' Water Control Board
WQC	401 Water Quality Certification

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STAFF RESPONSES TO COMMENTS ON THE PELTON ROUND BUTTE DRAFT EIS

The EPA's notice of availability of the draft EIS was issued on August 29, 2003. Comments on the draft environmental impact statement (EIS) were due on December 31, 2003. The following entities filed comments pertaining to the draft EIS.

Commenting Entity	Filing Date
Waterwatch of Oregon	December 23, 2003
Oregon Water Resources Department[a]	December 29, 2003
Portland General Electric Company and Confederated Tribes of the Warm Springs Reservation	January 12, 2004
U.S. Forest Service, Ochoco/Deschutes National Forest	December 29, 2003
Confederated Tribes of the Warms Springs Reservation Natural Resources Departments	December 30, 2003
U.S. Department of the Interior	December 30, 2003
U.S. Environmental Protection Agency	December 31, 2003
National Marine Fisheries Service	December 31, 2003
Jefferson County	December 31, 2003

[a] Filed on behalf of the Oregon Department of Fish and Wildlife.

In this appendix, we summarize the comments received, provide responses to those comments, and indicate, where appropriate, how we have modified the text of the final EIS. The comments are grouped by topic for convenience.

PROCEDURAL AND GENERAL

Comment: The Forest Service (FS) and the U.S. Department of the Interior (Interior) comment that the Staff Alternative is not consistent with Section 4(e) of the Federal Power Act (FPA) because it does not include all of the mandatory conditions from FS and Interior for fish habitat protection and enhancement and off-site riparian habitat mitigation. FS contends that the Federal Energy Regulatory Commission (Commission or FERC) must give equal consideration to the purposes of power generation, protection of and mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat) and that the Commission fails to meet the intent of the FPA by not including all of its mandatory Section 4(e) conditions in the Staff Alternative. Interior contends the statement that the Commission "may" include these prescriptions is incorrect and that the Commission must include the agencies mandatory conditions filed pursuant to Sections 4(e) and 18 of the FPA. The Conservation Groups also contend that by failing to include an alternative that includes all the terms, conditions, and recommendations of the various agencies, the Commission staff has failed to comply with the equal consideration requirements of the FPA.

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NOAA Fisheries indicates that the draft EIS inappropriately disregarded several of its preliminary prescriptions filed under Section 18 of the FPA. Interior, likewise, indicates that the range of alternatives presented in the draft EIS is insufficient because it does not present an alternative incorporating Interior's mandatory conditions submitted pursuant to Sections 4(e) and 18 of the FPA.

The Oregon Department of Fish and Wildlife (ODFW) indicates that the draft EIS did not analyze an alternative that included all of its recommendations filed under Section 10(j) of the FPA. ODFW's filing includes Section 10(j) recommendations that are consistent with the Joint Applicants' modified proposal and recommends that the final EIS analyze the modified proposal. The Conservation Groups also comment that the draft EIS fails to consider an alternative that includes all the mandatory conditions and recommendations made by the agencies, as well as a comprehensive alternative that includes all of the recommendations made by them, in particular with relation to flow regimes in the lower river. FS also indicates that the draft EIS did not analyze an alternative that included the conditioning agencies' mandatory conditions and recommendations or even address them as an alternative eliminated from further detailed study.

Response 1: Although a Commission license must include valid terms and conditions submitted pursuant to Sections 4(e) and 18 of the FPA, Commission staff still has the responsibility in its environmental documents to make recommendations to the Commission that in its view would "be best adapted to a comprehensive plan for improving or developing a waterway or waterways" as provided for by Section 10(a)(1) of the FPA. Our recommendations reflect this consideration. All of Interior's terms and conditions, as well as the terms and conditions made by other entities, are referenced in sections 2.2.3, 2.2.4, and 2.2.5 and are fully described and analyzed in section 3 of the draft EIS.

The terms, conditions, and recommendations filed by the agencies and other entities did not suggest a clear alternative to the Joint Applicants' proposed action. Instead, they included a variety of environmental enhancement and protection measures that reflected the individual concerns and interests of the agencies. In the absence of a clear alternative, we included the preliminary terms and conditions filed under Section 401 of the CWA and Sections 4(e) and 18 of the FPA in the proposed action. We compared and analyzed the relative effects of all of the preliminary terms, conditions, and recommendations in section 3 of the draft EIS. We feel we have described and evaluated a reasonable range of alternatives.

Comment: The Conservation Groups comment that the Executive Summary of the draft EIS inaccurately states that the Staff Alternative consists of agency terms, conditions, and recommendations, when, in fact, the Staff Alternative rejects a number of the recommended measures.

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Response 2: We respectfully disagree. The Executive Summary states that the Staff Alternative includes the proposed action with additional environmental measures that include agency recommendations, and terms and conditions that would be necessary or appropriate with continued operation of the project. We then detail the specific agency recommendations, terms, and conditions that are not included in the Staff Alternative in the following paragraphs under the Staff Alternative. Staff considers all of the agencies' preliminary terms, conditions, and recommendations in the draft EIS.

Comment: Interior comments that the draft EIS neither makes mention of the environmental consequences of the proposed action or its alternatives to Indian trust resources nor provides any indication as to how the Commission intends to consult with the Tribe on a government-to-government basis. The Bureau of Indian Affairs (BIA) offers to assist the Commission in the government-to-government consultation. Further, Interior comments that the draft EIS should consider the cumulative effects of the project on the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes') exercise of its treaty rights and associated trust resources.

Response 3: On March 17, 2004, Commission staff declined the Tribes' January 28, 2004, request to consult on a government-to-government basis, because staff felt it would not be appropriate to consult so late in the process. The exercise of treaty rights is a legal issue that we do not address in our environmental documents. The EIS does analyze the effects of the project on trust resources.

1.0 PURPOSE OF ACTION AND NEED FOR POWER

Comment: The Conservation Groups comment that the draft EIS should include an analysis of how potential new energy sources, including wind, solar, geothermal, and fuel cell, relate to the assertion in section 1.2 that the project only displaces non-renewable energy sources.

Response 4: Our determination that combustion turbines fueled by natural gas would be the most likely resource to replace the project power is based on the probability that the project would be used to displace fossil-fuel generation. Combustion turbines are the most rapidly growing form of fossil-fuel generation. We believe that it is unlikely that renewable generation resources would replace hydropower as long as there are fossil-fuel generators available to off load.

Comment: The Conservation Groups request that the list of intervenors in section 1.3 include American Rivers, Oregon Trout, and the Native Fish Society as part of the Trout Unlimited filing.

Response 5: We have revised section 1.3 to include American Rivers, Native Fish Society, and Oregon Trout as part of the Trout Unlimited filing.

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2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 PROJECT DESCRIPTION

Comment: Interior comments that section 2.1.2 of the draft EIS does not accurately describe the project and its operations. For instance, the statement in the draft EIS that Lake Billy Chinook is lowered in the winter for fiood control is too limited and should also state that the lake is primarily lowered for power production purposes. Interior states that the project has no formal agreement with the U.S. Army Corps of Engineers that requires drawdown and the project's use for flood control.

Response 6: We agree that the statement should be revised because the capture of spring runoff has historically been primarily for hydroelectric purposes. Under the Draft Project Operating Plan, filed on December 29, 2003, the reservoir level restrictions may require a draw down for flood control purposes under extraordinary conditions. We have revised the text accordingly.

Comment: Interior and the Conservation Groups comment that the statement made on pages 7 and 8 of the draft EIS that the average daily discharge from the Reregulating development is about equal to the average daily inflow to the Round Butte development is incorrect and fails to capture the conditions when the reservoir is being filled or drawn down. Since both circumstances have a direct effect on the flow levels below the project they should be accurately identified in terms of frequency and magnitude in the final EIS.

Response 7: We acknowledge that differences may occur during storage or storage release periods. We have revised section 3.4.1.5 of the final EIS to include an analysis of the percentage of time that the outflow from the Reregulating dam differs from the inflow to the project.

2.2 PROPOSED ACTION AND ALTERNATIVES

Comment: The Joint Applicants filed with their comments on the draft EIS, a *Description of Proposed Preferred Alternative* (proposed preferred alternative) that reflects the terms of a pending settlement. The Joint Applicants request that Commission staff incorporate these terms as the Joint Applicants' modified proposal in the final EIS and in its consultation with the Fish and Wildlife Service(FWS) and NOAA Fisheries pursuant to Section 7 of the Endangered Species Act (ESA). The Joint Applicants also request that the Commission staff recommend their modified proposal as the preferred alternative in the final EIS. ODFW also requests that the final EIS include and analyze the proposed preferred alternative. FS indicates that the agreement in principle currently under review meets its resource objectives requests that the Commission allow sufficient time for the consideration, presentation, analysis, and public review of an alternative based on a settlement agreement in the final EIS. Interior states that the pending settlement represents only tentative views of parties, may change as negotiations

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progress, and is covered by a confidentiality agreement that protects settlement discussion. Interior requests that the Commission allow sufficient time for the parties involved in the settlement negotiations to resolve remaining issues so that any settlement agreement can be included in the final EIS. ODFW and NOAA Fisheries filed revised recommendations pursuant to Section 10(j), and the Bureau of Land Management (BLM) and FS filed revised recommendations under Section 10(a) consistent with the modified proposal.

Response 8: We have revised section 2.2 of the final EIS to include the Joint Applicants' modified proposals, including the Updated Description of Preferred Alternative, filed on April 27, 2004, that reflect the terms of the pending settlement as requested by the Joint Applicants and several of the agencies. However, because the modifications do not constitute a final settlement agreement and because Interior and FS have not filed revised terms, conditions, and recommendations, we retain the descriptions and analysis of FS and Interior's preliminary terms, conditions, and recommendations filed in November 2002 in response the to REA notice and indicate any agency recommendations that have been revised to be consistent with the terms of the pending settlement. We explain the approach to our analysis at the beginning of section 3.0 of the final EIS.

Comment: The Conservation Groups state that the Commissions staff should consider a true "no-action" alternative that considers no-project conditions to fully assess the impacts of issuing any license for the Pelton Round Butte Project. FS also indicates that the draft EIS contains an inadequate analysis of the no-action or "baseline" alternative.

Response 9: The Commission has established that the baseline for our environmental analysis is the project as it exists today, not without the project. We use historical information, where available, to inform this analysis.

Comment: The Conservation Groups indicate that the description of the various alternatives in the draft EIS is unclear relative to what is actually being considered within each alternative and points out that the discussion of the Joint Applicants' proposal in section 2.2 also contains descriptions of the mandatory conditions, making it more broad than just the Joint Applicants' proposal.

Response 10: We respectfully disagree. The proposed action described in section 2.2 in the final EIS consists of the Joint Applicants' proposed environmental and operational measures as well as the conditions filed under Section 401 of the CWA and the preliminary terms and conditions filed under Sections 4(e) and 18 of the FPA.

Comment: FS and Interior indicate that the draft EIS does not present an adequate analysis of environmental effects. Instead, the draft EIS provides a comparison of proposed and alternative actions without any rigorous consideration of the effects of

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those actions on the environment. Interior attributes this problem partially to the use of baseline environmental information and a poorly developed No-action Alternative.

Response 11: We respectfully disagree with FS and Interior's comments concerning the adequacy of our analysis. The information in the EIS about the environmental effects of actions and action alternatives is sufficient for the Commission to render a licensing decision. We agree that there are information gaps relative to the physical environment as it might have existed prior to the construction of the project; however, the baseline for our analysis is the project as it exists today. We use historical information, where available, to inform our analysis.

PROPOSED ENVIRONMENTAL MEASURES

Comment: The Conservation Groups comment that the draft EIS in section 2.2.2 should clarify that when inflow provisions apply, the Joint Applicants are not allowed to deviate as much as +/–10 percent, but are held to tighter parameters as is discussed in more detail in section 3.6.2.1.

Response 12: We understand the concern and have revised the bullet in section 2.2.2 of the final EIS to be consistent with the referenced text in section 3.6.2.1.

Comment: The Conservation Groups strongly support many of the components contained in the Draft Project Operating Plan (as part of the Description of Proposed Preferred Alternative filed by the Joint Applicants) and urge Commission staff to consider and evaluate these proposals in the final EIS, particularly the new proposals for gravel studies, fish passage plan, and habitat restoration. The Conservation Groups provide additional recommendations for instream flows and the hatchery program, which we discuss below under *Water Quantity* and *Aquatic Resources*.

Response 13: We have revised section 2.2 of the final EIS to include the Joint Applicants' Draft Project Operating Plan, as updated on April 27, 2004, to reflect the terms of the pending settlement. However, because these measures are not a final settlement agreement, and because Interior and FS have not filed revised terms, conditions, and recommendations, we retain the descriptions and analysis of Interior's and FS's preliminary recommendations filed in November 2002 in response the to REA notice. We also indicate those agencies' recommendations that have been revised to be consistent with the terms of the pending settlement.

Comment: FS comments that the draft EIS on page 17 incorrectly states that the Joint Applicants propose to fully fund annual operations and maintenance (O&M) for Monty Campground. The draft EIS should be revised to state that the Joint Applicants propose

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to fund one-third of the annual O&M for Monty Campground, consistent with the FS Section 4(e) condition and the estimated share of use that is project-related.

Response 14: We have revised the description of the proposed action in section 2.2 accordingly.

2.3 MODIFICATIONS TO THE PROPOSED ACTION

Comment: FS indicates that the Staff Alternative does not make clear why the proposed measure to develop and implement a plan for removing any large woody debris that accumulates in Lake Billy Chinook is different or better than the mandatory conditions and recommendations for large woody debris management made by FS.

Response 15: We consider the woody debris plan that we recommend in the draft EIS to be consistent with the FS Section 4(e) condition on large woody debris management. We have revised the text in the draft EIS to include a description of Section 10(j) recommendations relating to woody debris plans filed by ODFW and NOAA Fisheries, which we find to be consistent with both the FS Section 4(e) condition and the Draft Lower River Implementation Plan filed on December 29, 2003.

Comment: The Joint Applicants disagree with the need for new reservoir-level monitors in Lake Simtustus and the Reregulating reservoir as recommended in the draft EIS. The Joint Applicants state that installation of new reservoir-level monitors in the two lower reservoirs would provide no increase in accuracy and could decrease the accuracy of measurements. These two small reservoirs have significant backwater effects, ranging from 1 foot in Lake Simtustus to 9 feet in the Reregulating reservoir, which effectively eliminate any values from new reservoir-level monitoring stations at the upper end of either reservoir. The Joint Applicants request any recommendation to install new reservoir-level monitoring stations in either Lake Simtustus or the Reregulating reservoir be deleted.

Response 16: We acknowledge the problems identified by the Joint Applicants associated with the use of reservoir-level monitoring stations in Lake Simtustus and the Reregulating reservoir to monitor compliance. We agree that the Joint Applicants' proposal to install two or more new lake-level monitoring stations in Lake Billy Chinook would reduce measurement errors caused by wind and enable accurate estimates of project inflows by using a combination of the "Storage Change" and "Average Ungaged Inflow" methods. We have reviewed the Draft Project Operating Plan and conclude that implementation of the plan would be adequate to ensure compliance with license condition based on the Draft Project Operating Plan. We have revised our analysis in section 3.4.2.2 and our recommendations in section 5.1 of the final EIS accordingly.

Comment: The Conservation Groups support those modifications to the Joint Applicants' Draft Project Operating Plan that would lead to more accurate flow and

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reservoir measurements and tighter operating restrictions, provide flows in the lower river between September 16 and November 15 to protect fall Chinook, and provide for the development large woody debris and gravel augmentation plans.

Response 17: We appreciate the support and note that the Draft Project Operating Plan includes our recommendations for augmenting flows in the lower Deschutes River and developing large woody debris and gravel augmentation plans. Based on new information included in the Joint Applicants' plan, we have reconsidered our recommendations for new reservoir-level monitoring stations and conclude that the methods for providing and monitoring compliance with minimum flow and reservoir levels described in the Draft Project Operating Plan would be adequate.

Comment: The Conservation Groups comment that the evaluation of project retirement set forth in the draft EIS fails to provide sufficient information to the public or decision makers to make an informed decision on the long-term measures to be included in any license issued. They contend that the final EIS should more appropriately evaluate current generation that would be foregone against existing environmental measures rather than against proposed environmental measures.

Response 18: As we note above, the baseline for our evaluation of effects and costs is the project as it exists today, without any new environmental or operational measures.

3.0 ENVIRONMENTAL CONSEQUENCES

3.1 GENERAL LOCALE

Comment: Interior comments that the draft EIS does not provide an assessment of past and present impacts (ongoing impacts) of the project and does not make use of existing information in the public record in the environmental analysis.

Response 19: We respectfully disagree. The EIS does consider ongoing impacts and does make use of the information in the public record.

3.2 CUMULATIVE EFFECTS

Comment: ODFW concurs with the geographic and temporal scope of the cumulative effects analysis in section 3.2.1 of the draft EIS. ODFW disagrees with the draft EIS conclusion that the cumulative effects of the preferred alternative on water quality, anadromous fish, and recreation would be positive, given the negative effects on other types of resources at the project.

Response 20: As noted above, the evaluation of cumulative effects is based on the baseline that is defined as the existing project. Therefore, we consider that the additional environmental measures in the Staff Alternative would be beneficial as compared to

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existing conditions. We would expect that the project, if licensed consistent with the Staff Alternative described in the Final EIS, would improve water quality, provide better fish passage, and enhance recreational facilities over the existing conditions.

Comment: Interior comments that the draft EIS cumulative impacts analysis is wholly inadequate and confused. Interior contends that the geographic scope is too limited for some of the resources affected by the project. For instance, the downstream geographic range for anadromous fish resources to the confluence with the Columbia River neither reflects the biological needs of anadromous fish nor all of the impacts on these resources. Further, the cumulative affects analysis does not address the Tribes treaty rights and trust resources. The Conservation Groups comment that the final EIS should more fully evaluate the cumulative effects of the flow-related measures on aquatic resources, recreation, and aesthetic values of the lower river.

Response 21: We respectfully disagree. The EIS scope of analysis of cumulative effects is consistent with the scoping documents for this project and consistent with the extent of influence of the project to the lower Deschutes River.

3.3 GEOLOGY AND SOILS

Comment: The BNR comments that Chinook Island needs stabilization of the north and west banks much more than maintenance of a log boom as stated in the draft EIS on page 234.

Response 22: The significant erosion on Chinook Island is noted on page 234 of the draft EIS, and Chinook Island is identified as an erosion site in table 2 on page 33. The order of items listed on page 234 does not imply a priority.

Comment: Jefferson County disagrees with the draft EIS conclusion that the Jordon Road slide does not constitute a threat to public safety and that Joint Applicants' proposed action is adequate. Given that the county spent over $210,000 in repairs after the 1989 slide, the County requests that the Joint Applicants be required to keep all project roads open and be responsible for the reconstruction and maintenance of any future slides along project roads, including but not limited to the area of the Jordan Road slide.

Response 23: Staff agrees that the statement regarding risk to public safety may be misleading. We have revised the text to indicate that there is a negligible risk to public safety due to the very slow, but continuing, movement of the slide. Movement of the Jordan River slide shows a relationship with the reservoir level, making the connection between the slide and project operations obvious. The Joint Applicants' proposed measures would ensure maintenance of safe access along Jordan Road and other roads adjacent to the project reservoirs as defined in the Road Maintenance Agreement with Jefferson County if slides occur.

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Comment: Interior, ODFW, FS, and Interior disagree with the draft EIS characterization of the reduction of sediment supply as having "little effect" on sediment transport. They contend that whether these are relatively small or large amounts of sediments, the project has eliminated sediment delivery to the lower Deschutes River. They request that the final EIS support its conclusions about sediment numbers and their importance with an environmental (ecological or biological) analysis.

Response 24: Staff agrees that the description of fluvial geomorphology and sediment transport on page 30 of the draft EIS should be clearer about the effect of the project. We have revised the text to state that "[t]he project captures and retains all coarse sediment from upstream."

Comment: NOAA Fisheries, ODFW, FS, and Interior disagree with our conclusion that the riverbed sediments downstream of the projcct are stable at all but extreme flows. They point out that the Fassnacht (1997) study has not been field verified as recommended by Emmett (1999) and that the results of other relicensing studies (McClure, 1998; Huntington, 1985; and Grant et al., 1999) all show some trends in armoring of the river downstream of the Reregulating dam. NOAA Fisheries indicates that it would continue to work with the Joint Applicants to develop a channel bedload monitoring program and mitigation measures as they are warranted. Interior suggests that rather than reaching vague conclusions, the draft EIS would provide better information if Commission staff quantified the rate of pre-dam gravel supply and post-dam gravel deficit, and analyzed the frequency of bed mobilization using actual field data.

Response 25: The measures proposed by the Joint Applicants include an assessment of the appropriateness of the model developed by Fassnacht (1997), by revising the flow rate for which monitoring is performed, depending upon initial monitoring results. The Joint Applicants propose to measure bedload transport at the Warm Springs Bridge, which would provide the data for analysis of bed mobilization as recommended by Interior.

Comment: Interior finds the analysis of sediment transport and spawning gravel augmentation to be lacking quantitative information and requests that actual data regarding the extent of gravel mobility be provided in the final EIS. Interior provides a new report documenting tracer gravel observations during the past few years for this purpose.

Response 26: There are differences of opinion as to the frequency and magnitude of sediment transport in the lower Deschutes River. However, the Joint Applicants' Draft Lower River Implementation Plan includes an assessment of gravel mobility and tracer gravel studies with a provision to re-visit river sections if transport is found to occur at

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flows lower than the predicted flows. In view of the proposed studies and the lack of tracer studies, except for the report provided by Interior at the end of the draft EIS review period, there does not appear to be a benefit in summarizing analyses and data that are not necessarily accepted by the various interested parties. The new report provided by Interior dated December 2003 provides information that will be useful in planning the future studies. The requested analysis of spawning gravel augmentation would require completion of the studies on bed transport and tracer movement that are proposed by the Joint Applicants Draft Lower River Implementation Plan.

Comment: ODFW and Interior state that the draft EIS conclusions in section 3.3.3 that there are no unavoidable adverse effects of the project contradicts the findings on page 166 of the draft EIS that the unavoidable adverse effects of the project include the interruption of the sediment transport process.

Response 27: We agree and have revised the conclusion in section 3.3.3 to indicate that the project interrupts the sediment transport process.

3.4 WATER QUANTITY

Comment: Interior notes that the description of various reservoirs in sections 3.2.1 and 3.4.1.1 of the draft EIS are incorrect. The Ochoco dam is owned and operated by the Ochoco Irrigation District, and its reservoir has a surface area of 1,100 acres and a maximum storage of 48,020 acre-feet. The Prineville reservoir has a surface area of 3,030 acres and a maximum storage of 154,700 acre-feet. The Wickiup and Crane Prairie reservoirs are owned by Interior through the BOR and operated under contracts by local irrigation districts. The surface area of Wickiup reservoir is 11,170 acres and the maximum storage is 200,000 acre-feet.

Response 28: The source of information about various reservoirs in the draft EIS was National Inventory of Dams, which provides characteristics (including ownership, reservoir area, and storage) for approximately 76,000 U.S. dams. However, because these projects are owned by Interior through the BOR, it is likely that information provided by the Interior is more accurate. We have revised sections 3.2.1 and 3.4.1.1 of the draft EIS based on information provided by Interior.

Comment: FS and Interior comment that the draft EIS is inaccurate in its statement that Opal Springs regenerates the Crooked River by contributing 1,236 cfs. Although the stream gage below Opal Springs may show annual flows to be 1,236 cfs, the value is not derived entirely from Opal Springs. Recently, it has been documented that the Wild and Scenic River segment upstream of Opal Springs contributes spring flow of about 900 cfs (FS, unpublished data, 2002). Opal Springs has been documented to flow 108,000 gpm or 240 cfs. Thus, the Crooked River is regenerated over about 10 miles of stream length and not just at Opal Springs. Table 3 on page 40 of the draft EIS indicates that the

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average annual flow at the Opal Springs gage is 1,570 cfs, not 1,236 as indicated on page 39 of the draft EIS.

Response 29: The flows presented on pages 39 and 40 are consistent. Mean annual flow at the Crooked River below Opal Springs gage is 1,570 cfs. Flow of 1,236 cfs is the difference between mean flows at the Crooked River below Opal Springs gage and the next upstream gage (Crooked River near Terrebonne). Therefore, 1,236 cfs represents contribution of the small catchment area between the two stations, which includes Opal Springs. We have revised section 3.4.1.1 to indicate that the Crooked River is regenerated along about 10 miles of stream, including Opal Springs, a spring complex.

Comment: The Joint Applicants note that the draft EIS on pages 56 and 322 states that the +/–260 cfs error allowance for flows at the Madras gage is not needed if new reservoir-level monitoring equipment is installed, but makes no statement on either page regarding what would happen when inflows are less than the monthly target flows and the measured outflow is less than the calculated inflow. The Joint Applicants contend that some allowance for deviations between the flow setpoint at the Reregulating dam and the actual measured flow is necessary, regardless of the improvements to gaging equipment at the Madras gage. The Joint Applicants request that a carefully developed proposed method for monitoring flow and defining compliance with the required minimum flow as described in Draft Project Operating Plan be adopted in the final EIS.

Response 30: Although we continue to conclude that with accurate and modern equipment an allowance for error should not be needed, we do not see any significant negative effect resulting from an allowance provision. The proposed allowance would be limited to a 30-minute interval and the Joint Applicants would prepare incident reports for exceedances of the allowance that last for more than 30 minutes. Therefore, we have revised our analysis section 3.4.2.2 and our recommendations in section 5.1 of the final EIS to include this provision consistent with the Draft Project Operating Plan.

Comment: The draft EIS analysis on page 109 states that when the project inflows are below the target flows, the flow releases should be changed daily so that the daily setpoint would be equal to the 7-day running average of inflow. The Joint Applicants agree that daily adjustment of the outflow, when passing inflow, is an acceptable operating method and have included this provision in the Draft Project Operating Plan. However, the Joint Applicants state that using a 7-day running average for defining inflow would result in summer reservoir drawdowns of Lake Billy Chinook in violation of the 401 Water Quality Certifications (WQCs) issued by the Oregon Department of Environmental Quality (ODEQ) and the Tribes' Water Control Board (WCB). To avoid this condition, the Joint Applicants suggest that the inflow be defined as the lowest daily flow during the previous 7 days to prevent drawdown of Lake Billy Chinook. They state that this measurement method would be consistent with the requirements of the WQCs.

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Response 31: We agree that this provision in the Draft Project Operating Plan would offer improvements in adjustment of flows and would prevent forced withdrawal of Lake Billy Chinook.

Comment: The Joint Applicants comment that on page 109 Commission staff states that the two WQCs include conditions that would allow deviations of project outflows from the +/–10 percent of inflow provision only when flows are greater than 6,000 cfs and if an emergency or failure occurs. The Joint Applicants find that such a restriction is unduly restrictive because a requirement that the deviation from +/–10 percent of inflow be allowed only for flows greater than 6,000 cfs would defeat most normal practices of reservoir operation for flood management and preclude many normal maintenance activities. The Joint Applicants request that in order to address safety concerns and to allow normal maintenance activities, the deviations from the +/–10 percent of inflow also be allowed when flows are less than 6,000 cfs.

Response 32: We believe that the condition that would allow deviations of project outflows from the +/–10 percent of the inflow provision only when flows are greater than 6,000 cfs and if an emergency or failure occurs is too restrictive, and we agree with the need for a revised list of situations when +/–10 percent rule would not be followed, as presented in the Draft Project Operating Plan. We have revised our analysis in section 3.6.2.1 and our recommendations in section 5.1 to include conditions that would allow deviation of the +/–10 percent rule to occur when flows are less than 6,000 cfs.

Comment: Waterwatch notes that the draft EIS on page 9 states that the current license requires Portland General Electric (PGE) to maintain a full reservoir to the highest practicable level. Waterwatch comments that this current condition allows for flexibility in reservoir management and recommends that the Commission continue this condition in any new license issued.

However, the Conservation Groups comment that the draft EIS should provide a more detailed discussion of past and future refill scenarios that would identify, based on the past flow and refill data, the likely frequency of use of the refill allowance, the impacts on the lower river flow amounts, and the resulting long-term effects on lower river aquatic resources. They contend that the Staff Alternative under all scenarios would require refill of the reservoir at the expense of the lower river. Waterwatch strongly disagrees with the draft EIS conclusion on page 111 that the potential for affecting "life stages is limited by the small amount of the allowance (150 cfs) in relationship to the overall stream flows during the refill period." Without an absolute minimum flow, Waterwatch strongly opposes a 150-cfs refill allowance as it would only make conditions worse in the lower river during dry years.

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Response 33: We believe that Joint Applicants' Draft Project Operating Plan offers a good balance between needs of the lower river and requirements to refill Lake Billy Chinook and maintain it at the highest practicable level.

Comment: The Conservation Groups state that section 3.4.2.1 of the draft EIS fails to adequately analyze the effects of the various flow proposals on the lower river flows and the beneficial uses they support. Further, the draft EIS fails to analyze the FS and BLM's recommended 3,000-cfs minimum flow on the ability to refill the reservoir. They further suggest that section 3.4.2.1 should include the same discussion in section 3.6.2.1 to clarify the relationship between the proposal that downstream flows would be held to within +/–10 percent of the measured inflow and the requirement to pass inflow.

Response 34: We respectfully disagree. In the draft EIS, we provided an analysis of the effects of the absolute minimum flow on reservoir refill. To address concerns about sufficient flows to the lower Deschutes River, the Draft Project Operating Plan includes a provision to release up to 200 cfs from Lake Billy Chinook up to a limited drawdown of 4 feet during the period from September 16–November 15 to maintain a daily release of 3,000 cfs to benefit fall Chinook spawning.

Comment: The Conservation Groups strongly disagree with the conclusion in the draft EIS regarding the effects of various flow proposals, including the FS and BLM's absolute minimum flow of 3,000 cfs. They indicate that there are no data to support the assertion on page 110 of the draft EIS that the absolute minimum flow of 3,000 cfs could potentially result in substantial and prolonged drawdowns of Lake Billy Chinook. The cited data in the record show that flows below 3,000 cfs have occurred only once and for a limited duration. The final EIS should provide data to support this conclusion as well as information regarding the adverse effects that would result from such a drawdown. They suggest a slight variation to the Draft Project Operating Plan that would not allow, under any circumstances, the flows released to fall below 3,000 cfs. Waterwatch also recommends a year-round absolute minimum flow of 3,000 cfs and suggests that the WQC could be reopened to address the rare instances when inflow falls below 3,000 cfs.

Response 35: We agree that our analysis concludes that inflows of less than 3,000 cfs are infrequent, and data collected during the period of record (1965–2001) show the lowest average daily flows of 2,770 cfs on February 21, 1969, and 2,950 cfs on February 20, 1969, and December 20, 1969. However, the potential for inflows of less than 3,000 cfs exists in very dry water years and could increase with additional consumptive water uses upstream of the project. Both ODFW and the Tribes' WQCs provide an "or inflow" provision in recognition of this possibility and the desire to maintain water-level elevations in Lake Billy Chinook.

Comment: The Conservation Groups support the Joint Applicants' emergency provisions as described on page 13 of the draft EIS, but assert that the Joint Applicants

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fail to take into account the devastating effects that droughts can have on aquatic resources and to provide flexibility to address drought conditions. The emergency provisions should allow deviations from the minimum flow and reservoir refill rule to enhance lower river water quality during emergency drought conditions. The Joint Applicants should be allowed to use storage capacity, in consultation with the Fish Committee, during drought emergencies.

Response 36: Deviation from the "or inflow" minimum flow provision or from the current selective water withdrawal (SWW) flow-blending scheme would be allowed under the fish emergency clause included in the Draft Project Operating Plan and in the Draft Lower River Implementation Plan. Under this clause, the Joint Applicants would be required to consult with an interagency Fish Committee to consider whether such deviations are needed to avoid harming native species in years in which inflow is expected to be below 3,000 cfs or flow conditions may result in in-river conditions that are judged by the Fish Committee to be unacceptably poor. We conclude in our analysis in section 3.6.2.1 that this clause would be beneficial in protecting aquatic resources during low-flow events and recommend in section 5.1 its adoption as part of the project operating plan. However, the Commission would need to retain final authority for any change in project operations.

Comment: ODFW states that the draft EIS is consistent with its minimum flow recommendations, but ODFW and Interior disagree with the conclusion in section 3.4.3 that the proposed project operations would have no unavoidable adverse effect on water quantity. As discussed on page 51 of the draft EIS, ODFW notes that flows are higher in the fall and lower in the spring than they would be without the project.

Response 37: Our baseline for determining unavoidable adverse effects is the project as it exists today. Our recommended minimum flows and ramping rates would increase flows in the lower Deschutes River and would not result in an unavoidable adverse effect over existing conditions.

Comment: The Conservation Groups contend that the draft EIS fails to adequately analyze the water rights issue as it pertains to effects on flows in the lower river. They contend that merely asserting that water rights are under the purview of the state and ignoring the potential impacts of the subordination clause on the environmental measures included in any license issued fails to meet the requirement of the National Environmental Policy Act. The subordination clause undermines the probability that the lower river would be protected for the duration of any new license issued and calls into question the adequacy of the long-term and comprehensive mitigation package described in the Final Joint Application Amendment. The Conservation Groups and FS point out that the final EIS should clarify that the OWRD has jurisdiction of the subordination issue and not the WDEQ.

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Response 38: We analyze the cumulative effects of water use by the project in section 3.4 of the final EIS. We have revised the EIS to state that the administration of water rights in the state of Oregon is the responsibility of the OWRD, not the ODEQ.

Comment: NOAA Fisheries, ODFW, FS, and Interior disagree with statements in the draft EIS that the Joint Applicants' proposed $1.475 million, 5-year habitat restoration plan would reduce water temperatures, increase flows and DO, and reduce nutrient levels, because the proposed program is too limited to achieve these wide-reaching results. NOAA Fisheries and ODFW recommend that the Joint Applicants perform additional habitat restoration in the project tributaries to address continued unavoidable losses associated with any fish passage program. ODFW notes that the Joint Applicants' proposed Pelton Round Butte Fund and its Section 10(j) recommendations would include a much larger commitment to habitat restoration.

Response 39: Although we agree that the scale of the original $1.475 million habitat restoration plan would have provided only limited benefit to water quality, we feel that our statement in the draft EIS that these measures "could benefit water quality conditions" was appropriate. We have revised the text in section 3.5.2.5 to acknowledge the greater commitment to habitat enhancement measures that the Joint Applicants now propose as part of the Pelton Round Butte Fund and Draft Lower River Implementation Plan, which are likely to provide greater benefit to water quality. These measures are consistent with ODFW's Section 10(j) recommendations relating to fish habitat enhancement, which ODFW intends to offset unavoidable losses of outmigrating fish.

Comment: The BNR states that any license issued for the project should include the conditions of the Tribes' and state of Oregon's 401 WQCs. The BNR points out where Interior's preliminary Section 4(e) conditions for minimum flows, refill provisions, and rampings are inconsistent with the WQCs and provides additional analysis in support of the Tribes' conditions.

Response 40: We find Joint Applicants' Draft Project Operating Plan, which we recommend, would be consistent or even more restrictive (e.g., target flows) than the WQCs.

3.5 WATER QUALITY

Comment: The Joint Applicants disagree with the draft EIS recommendation, consistent with the Water Quality Management and Monitoring Plan, that they be required to notify ODEQ and the Tribes' WCB when the mix of surface and bottom discharges changes. A requirement to provide notification each time a blend is changed would be highly impractical, because the adjustment of the mix of surface and bottom water passing through the SWW may be made frequently in response to weather patterns and incoming water temperatures. The Joint Applicants propose instead that periodically they provide agencies with a historical record of changes in the surface/bottom mix,

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along with the corresponding measured temperature of the water released from the project.

Response 41: We are persuaded that the recommendation to report each time that the blend is changed would be impractical and agree that the change in reporting requirements recommended by the Joint Applicants would be more practical. We have modified the text in section 3.5.2.6 accordingly.

Comment: Interior contends that the draft EIS conclusion that the cumulative effects on water quality would be positive is inadequate and does not include past, present, and future effects, or effects from other reasonably foreseeable actions.

Response 42: Interior refers to section 5.2 of the draft EIS, which is only a brief summary of the cumulative effects analysis. A more detailed assessment of cumulative effects on water quality is integrated into the analysis in sections 3.2, 3.5, and 3.6 of the final EIS.

3.6 AQUATIC RESOURCES

Comment: The draft EIS notes in section 3.6.1.1 that winter minimum flows downstream of Bowman dam were increased from 10 cfs to 30 cfs to 75 cfs. Interior clarifies that the legislation authorizing Bowman dam and the Crooked River Project requires a minimum release of 10 cfs for the benefit of downstream fishlife. Discretionary releases at higher rates, as those cited in the draft EIS, are normally achieved except during periods of severe drought.

Response 43: We appreciate the additional information. Our description of the flow regime downstream of Bowman dam is based on the information that was provided in PGE's 1999 final license application. We have revised the text in section 3.6.1.1 of the final EIS to clarify that a release of 10 cfs is required to benefit downstream fishery resources and that higher releases are discretionary.

Comment: FS and Interior note that Wy Chus is more properly spelled Why-chus (FS, 1998) and comments that even though a name change for this tributary has been proposed, the final EIS should reflect the current name of the tributary.

Response 44: We apologize for the misspelling. The Tribe asked us to use the name Why-chus instead of Squaw Creek as the latter term was seen as derogatory by the Tribe. Since the name change has not formally occurred, we have revised the text in the final EIS to indicate that this tributary is also known as Squaw Creek.

Comment: FS notes, in regard to the discussion on page 92 of the draft EIS, that instream water rights have been acquired to maintain flows in the reach of Squaw Creek near Sisters for minimal fish passage in the summer.

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Response 45: We appreciate this information and have revised the draft EIS text in section 3.6.1.1 accordingly.

Comment: Interior questions why the spawning and run size information for the Deschutes River spring and fall Chinook salmon described in sections 3.6.1.2 of the draft EIS does not include the most recent 5 years of run size data. These more recent data show an 8- and 10-fold increase from the numbers posted for these species in the late 1990's. Interior also notes that the draft EIS neither provides any trend analysis for the data presented nor examines notable discrepancies in Deschutes River trends to that in other basins and explores the reasons for the substantial differences.

Response 46: In our description of the affected environment, we rely primarily on the information that is provided by the licensees in their application and the information that is filed into the record by agencies and other stakeholders. During scoping, the Commission staff made a specific request to the agencies, Tribes, and NGOs to provide any information that would assist us with conducting an accurate and thorough analysis of the site-specific and cumulative effects of the licensing action. No party provided any additional information on recent adult returns or indicated any reason why this information should be considered in our analysis. Although we are aware that favorable conditions for ocean survival have resulted in increased returns of salmon and steelhead in recent years, we understand that this is a cyclical phenomenon, and that these conditions are not likely to be sustained over the long term. We believe that the information that we summarized on run sizes that occurred between 1980 and 1998 provided an adequate basis for our analysis of project effects and of potential enhancement measures.

Comment: Interior comments that the draft EIS analysis of its recommended minimum flow of 3,000 cfs does not consider the effects of flows of less than 3,000 cfs on the Lower Deschutes Wild and Scenic River outstanding remarkable values (ORVs), particularly recreation and fisheries. Instead the draft EIS attempts to dismiss Interior's minimum flow and a number of other flow proposals as "not proposed with any specified limitations" and based on concerns for increased consumptive use in the upper basin, which is a policy decision under the jurisdiction of OWRS. Interior agrees that issues of state water law are not before the Commission, but a number of the flow proposals dismissed by the draft EIS could be accomplished with water stored by the project.

Response 47: In section 5.5.3 of the draft EIS, we discussed the effects of the Staff Alternative on the recreational fisheries in the lower Deschutes River and conclude that our recommended measures would improve recreational fisheries. We indicate that any increased use of the improved fisheries would be marginal. Our conclusions are consistent with the preliminary Section 7(a) findings filed by FS and Interior.

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Comment: Interior contends that the draft EIS misreads the flexibility that is built into Interior's preliminary Section 4(e) condition no. 4 for minimum target flows. Interior's minimum target flow condition provides that when inflow is less than the target flow, the minimum flow is inflow less 100–200 cfs during specified months. This flexibility to hold back 100–200 cfs is similar to the Joint Applicants' proposed 150-cfs allowance although Interior does not limit the use of this "hold back" provision to refill concerns. Contrary to the explanation in the draft EIS, Interior's preliminary condition does not specify that the Joint Applicants must submit a request to BIA and the Tribes' BNR for permission to invoke this allowance.

Response 48: We have modified the text in section 3.6.2.1 accordingly.

Comment: Interior questions the use of the Joint Applicants' wetted perimeter analysis as the basis for concluding in section 3.6.2.1 of the draft EIS that Interior's recommended target flows for the protection and utilization of the Warm Springs Reservation would not substantially improve the condition of aquatic species over that proposed by the Joint Applicants.

Response 49: In the draft EIS, we used the Joint Applicants' wetted perimeter analysis to evaluate the effects of flow variations that would be allowed under the +/–10 percent rule proposed by the Joint Applicants. The five transects that were used in this analysis were selected because they included documented spawning areas, and we maintain that the results of this analysis support our conclusion that this level of flow variation is unlikely to cause any notable adverse effects on aquatic resources. The minimum flows and ramping rates that are proposed by the Joint Applicants were developed in close consultation with the stakeholders in this proceeding. Unlike the minimum flows and ramping rates specified in BIA's preliminary Section 4(e) conditions, those proposed by the Joint Applicants are consistent with the flow-related provisions in the state and Tribal Section 401 certifications, as well as the Section 10(j) recommendations filed by ODFW and NOAA Fisheries. In their comments on the draft EIS, the Tribes' BNR voiced a number of serious concerns regarding the minimum flows and ramping rates that were specified in BIA's preliminary Section 4(e) conditions, including the adequacy of its scientific foundation and numerous concerns regarding the use of storage in Lake Billy Chinook to meet BIA's minimum flows and long-term ramping rates. We share these concerns, which include the potential for causing accelerated bank erosion on Tribal property and potential effects on cultural and archaeological sites, wetlands, rearing habitat for early lifestages of fish, water quality, recreational use, operability of the proposed SWW and fish passage facilities, ESA-listed species, aesthetics, and power generation. The Tribes conclude by stating that "in order to meet a 'run of river' mandate and the WCB philosophy to make the project as 'invisible' as possible in its environmental effects, the Tribes will not support changes in operation, which would result in drafting the reservoirs specifically to meet the minimum flow scenario recommended by Interior."

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Comment: Interior contends that the information in Aney et al. (1967) supports its recommended long-term ramping rates. Interior notes that Aney et al. concluded that the most important factors determining the DO content of intragravel water was the surface water DO content, the rate of interchange between surface and intragravel water, gravel permeability, intergravel biological and chemical oxygen demands, water temperature, and stream discharge.

Response 50: We do not disagree with these conclusions from the Aney et al. (1967) report. However, we maintain that there is no indication that incubation conditions are adversely affecting fish populations in the lower Deschutes River, that the measures proposed by the Joint Applicants would not adequately protect and enhance incubation conditions, or that the benefit of implementing BIA's long-term ramping rates would justify the adverse effects of using storage from Lake Billy Chinook (see previous response). We note that implementation of SWW is predicted to improve DO conditions throughout the spawning and incubation season for rainbow and steelhead trout and that the minimum flows and ramping rates that are proposed by the Joint Applicants would provide very stable flows with the exception of certain narrowly defined, unusual conditions. We also note that the Joint Applicants' Draft Lower River Implementation Plan, as updated on April 27, 2004, includes experimental gravel augmentation, which should serve to increase the availability of high-quality spawning and incubation habitat in the 3-mile-long segment between the Reregulating dam and Shitike Creek.

Comment: The Conservation Groups point out that in addition to the effects of reduced flows in the lower river on steelhead and redband trout, as reported on page 111 of the draft EIS, they had also expressed concerns about maintaining and recovering aquatic and riparian species, including spring Chinook salmon, fall Chinook salmon, and rainbow trout. Since the Joint Applicants propose to use the refill allowance throughout the fall, winter, and spring, the effects would extend beyond steelhead and rainbow trout. The final EIS should more accurately identify the potential effects of the refill allowance, in particular during low-flow years when it is most likely to be used. The analysis in the draft EIS appears limited to average-flow years, while ignoring drier years when the lower river is most urgently in need of protection.

Response 51: We have revised the text in section 3.6.2.1 to include the Conservation Groups' concern about affecting other species. Our analysis in the draft EIS described the magnitude of flow changes that the refill provision would cause during average years, but it also described the maximum impact that would occur during the lowest flows that have been observed in the recent period of record (1965 to 2001). The lowest average daily flow that occurred at the Madras gage during March, April, May, and June during this 37-year period are 3,070 cfs (March 9, 1969), 3,450 cfs (April 1–3, 1966, and April 4, 28, and 30, 1967), 3,460 cfs (May 12–13, 1996), and 3,570 cfs (June 12–13, 1968, and June 1, 1977), respectively. Minimum daily flows that have occurred during these and

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other months of the year were presented in table 10 of the draft EIS. The lowest daily average flow that occurred on any day between 1965 and 2001 was 2,176 cfs, which occurred on February 21, 1969, and the second lowest flow was 2,950 cfs, which occurred on February 20, 1969, and December 26, 1969.

Comment: NOAA Fisheries, Interior, and ODFW note that the draft EIS, while supporting the majority of its preliminary prescriptions filed under Section 18, found several to be inconsistent with the Joint Applicants' proposed fish passage plan and preliminary conditions filed by other agencies. The inconsistencies pertain to scheduling, consultation requirements, and technical issues. On page 132, the draft EIS recommends that NOAA Fisheries and FWS not define a fixed schedule for the Joint Applicants to construct volitional upstream passage facilities because there is no guarantee that all of the prerequisites for the transition to volitional passage will have been met. NOAA Fisheries and Interior indicate that their preliminary prescriptions already take this approach. ODFW states that based on the pending settlement, ODFW also would recommend two-stage construction of downstream passage facilities in its recommendations, relying on the designs developed by the Joint Applicants in consultation with the federal fish and wildlife agencies and other members of the Fish Committee. Interior indicates that it intends to prescribe two-stage construction of downstream passage facilities in its modified Section 18 prescription, also relying on the designs developed by the Joint Applicants in consultation with Interior and other agencies.

Response 52: Both Interior's and NOAA Fisheries' preliminary prescriptions specify that volitional fishways would be installed and operational within 24 years after issuance of any new license. The Current Fish Passage Plan filed on December 29, 2003, identifies five prerequisites that need to be fulfilled before volitional upstream passage facilities would be installed. The fish passage plan provides a schedule for addressing these prerequisites, and we maintain that specifying a fixed schedule for the construction of volitional passage facilities is not realistic. Regarding downstream passage, we understand that agreement has been achieved on the two-phased construction approach, and we have modified the text in section 3.6.2.3 accordingly.

Comment: On page 132, the draft EIS recommends that NOAA Fisheries consult with the Fisheries Technical Subcommittee (FTS) regarding the review of preliminary and final fishway designs, operations, and maintenance plans, and monitoring and effectiveness plans. NOAA Fisheries and Interior indicate that they would continue to consult with the FTS, but both assert that final approval of these plans rests with NOAA Fisheries and the FWS. ODFW indicates that the parties to the pending settlement have resolved disputes with the technical issues and recommends that we recommend adopting the ODFW Section 10(j) recommendation no. 1 for fish passage implementation and monitoring.

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Response 53: We acknowledge the preliminary Section 18 conditions of NOAA Fisheries and FWS for providing final approval of fishway designs, O&M plans, and monitoring plans. We have reviewed ODFW Section 10(j) recommendation no. 1, have found it to be consistent with the Joint Applicants' Current Fish Passage Plan, filed on December 29, 2003, and recommend that it be adopted in any license issued for this project. We note that the Current Fish Passage Plan refers to the interagency committee that would guide implementation of the plan as the Fish Committee.

Comment: ODFW and Interior disagree with the draft EIS conclusion that a plan to compensate for outmigrant losses in the project reservoirs and from fish passage operations is not needed because Interior's and ODFW's monitoring and performance criteria would ensure that any necessary and appropriate measures are taken if the facilities do not meet the criteria. ODFW and Interior point out that their monitoring and performance criteria are intended to assess progress in accomplishing successful fish passage and would not ensure that necessary and appropriate measures are taken to compensate for unavoidable losses during passage. ODFW also points out that even though the draft EIS concluded that it would be impossible to account for fish losses in the reservoir, the Joint Applicants now propose to do exactly what the draft EIS states is extremely difficult and includes test and verification studies to assess predation, competition, and harvest in the Current Fish Passage Plan.

Response 54: We recommend the Current Fish Passage Plan because we conclude that its benefits would be worth the cost. Although we understand that the Joint Applicants have proposed to conduct studies to assess losses from predation, competition, and harvest, we maintain that it would be difficult to use the results of these studies to determine the amount of habitat enhancement that would be needed to offset these losses. Factors that would complicate this process include difficulties in accurately quantifying outmigration losses, accounting for benefits that occur from fish rearing in Lake Billy Chinook during their outmigration, and quantifying the level of benefit that would accrue from implementing specific habitat enhancement measures.

Comment: The draft EIS recommends that major revisions of the fish passage plan occur in 2004, 2011, and 2022 rather than annually as recommended by the FWS. NOAA Fisheries, Interior, and ODFW believe that this frequency of revision is insufficient to address this difficult and complex process, which would generate pertinent new information annually that must be reflected in the plan. They contend that annual review and revision are consistent with the adaptive management approach envisioned in the fish passage plan.

Response 55: We agree that annual review and revision of the fish passage plan would facilitate adaptive management and have modified the text in section 3.6.2.3 accordingly. We note that the Current Fish Passage Plan (included in the Joint Applicants' filing of

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December 29, 2003) does not specify a schedule for plan reviews, although it does specify that annual work plans would be developed.

Comment: NOAA Fisheries and ODFW note that the draft EIS on page 135 agrees with the Joint Applicants' contention that the proposed deep exclusion screen for the SWW deep intake cannot meet NOAA Fisheries' criteria for sweeping velocity. NOAA Fisheries and Interior indicate that they would continue to work with the Joint Applicants and others to refine and further develop the Round Butte dam downstream passage facility and that the revised design should adequately address the technical issues and concerns regarding its preliminary prescriptions. As noted above, ODFW indicates that the parties to the pending settlement have resolved disputes with the technical issues and recommends that we recommend adopting the ODFW Section 10(j) recommendation no. 1 for fish passage implementation and monitoring.

Response 56: We understand that these issues have been resolved and have modified the text in section 3.6.2.3 accordingly.

Comment: Interior comments that the draft EIS misinterprets Interior's preliminary Section 18 prescription regarding turbine efficiency. The proposed fish passage facilities at the project would be physically connected to the project's power generation facilities. Interior's preliminary prescription was expressed in terms of overall facility operations. Accordingly, the draft EIS focuses more narrowly on limiting turbine operations and entrainment, and ignores any consideration of the potential benefits to downstream fish passage that might be achieved through modifications to project operations. This relationship should be analyzed. Interior indicated that it would clarify its position on this matter in its modified conditions and prescriptions.

Response 57: We appreciate the clarification. We have expanded our analysis in section 3.6.2.3 to include consideration of the effects of project operations on the effectiveness of fish passage facilities at Round Butte dam. We conclude that the Joint Applicants' plan to install pumps to provide up to 3,000 cfs of attraction flow, if needed, provides a reasonable contingency plan for improving the attraction of smolts to the collection facility. Further, we note that under the terms of the Current Fish Passage Plan, the Joint Applicants would identify and implement any feasible measures that may be required to achieve downstream passage survival standards or to reduce any impingement that is observed on the deepwater exclusion screen.

Comment: NOAA Fisheries and Interior disagree with the draft EIS statement on page 137 that performance criteria for upstream and downstream fish passage survival be identified as targets and not as mandatory objectives. NOAA Fisheries believes that, at a minimum, mandatory performance criteria are appropriate for mortality and injury directly associated with the operation of the downstream and upstream fish passage facilities. NOAA Fisheries indicates that it would continue to discuss factors that affect

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attainment of performance standards with the Joint Applicants and would review and further consider these issues in formulating its final prescription. ODFW indicates that its recommended survival standards are consistent with conditions included in the North Umpqua Project (FERC No. 1927). However, ODFW states it now supports the set of goals and performance criteria in the Current Fish Passage Plan and as stated in its Section 10(j) recommendation no. 1.

Response 58: We appreciate being notified of your concerns. We stand by our conclusion, however, that establishing mandatory objectives for survival rates at passage facilities is not warranted. Due to the unique design of the downstream passage facility at Round Butte dam, we do not believe that it is possible to predict with a high degree of certainty what survival rates can be achieved at this facility.

Comment: BNR supports the SWW alternative but states that if further modeling shows that the SWW alternative is not feasible, then further alternatives need to be developed. Failure of the SWW does not mean failure of the fish passage program. The Fisheries Technical Subcommittee developed alternative fish passage options that need to be prioritized and included in the Fish Passage Plan.

Response 59: In the final EIS, we recommend adopting the Current Fish Passage Plan as proposed by the Joint Applicants. The Fish Passage Plan specifies that the Joint Applicants would develop an alternative fish passage plan, if it is recommended by the Fish Committee.

Comment: Interior and the BNR indicate that the fish passage plan should include Pacific lamprey. BNR states that the expectation that lamprey would not return in great numbers and that successful reintroduction would be hindered by predation and downstream dam are issues for all target species and should not be reasons for dismissing the potential for this culturally significant species. Interior states that to not address project impacts on Pacific lamprey in any new license issued is not consistent with federal obligations to tribal trust resources.

Response 60: Both the Current Fish Passage Plan and ODFW's Section 10(j) recommendations include measures to assess Pacific lamprey habitat, to conduct a passage feasibility study if sufficient habitats are found upstream of the project, and to implement a plan for the experimental reintroduction of Pacific lamprey into identified habitats upstream of the project. If passage is determined to be infeasible, the Joint Applicants would develop and implement an alternative Pacific lamprey mitigation and enhancement plan. Although there would be a low potential for successful reintroduction of Pacific lamprey into the Deschutes River, we conclude the ODFW's phased approach to determining the feasibility of reintroducing the species would be reasonable. We have revised the text in section 3.6 and 5.3 of the EIS and now recommend adopting this measure.

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Comment: Interior indicates that as part of the fish passage plan, the Joint Applicants need to resolve which of the target species would be introduced first, whether to use hatchery or wild stock for introduction, and what life stages should be used for reintroduction and future augmentation efforts. The Conservation Groups recommend that hatchery smolt production be phased out to achieve the overall objective of natural production. They also recommend that the Joint Applicants fund an evaluation of the Round Butte hatchery program every 5 years, which should consider current policies and plans, relevant best practices, and existing information regarding recent scientific advances and should include recommendations for ongoing management of the hatchery program.

Response 61: We agree with Interior that these issues need to be resolved. In its rationale for its Section 10(j) recommendation on hatchery operations, ODFW indicates that it would develop an annual operating plan for the hatchery that would guide brood selection for the production and conservation programs. It indicates that the parties to the pending settlement have concluded that no license condition regarding stock selection would be necessary. Further, ODFW indicates that the Joint Applicants would conduct an evaluation of the Round Butte hatchery program every 5 years, to include all of the elements identified by the Conservation Groups. In the Current Fish Passage Plan, the Joint Applicants state that "ODFW and the Tribes may reduce hatchery production levels if necessary to meet fishery management objectives, including, but not limited to, allowing for natural selection and adaptation of naturally spawning salmonids."

Comment: FS comments that our assessment of the need for fish habitat enhancement in section 3.6.2.4 did not address the lack of production in Lake Simtustus and the Reregulating reservoir, account for the fact that the public has no access to the Reregulating reservoir, or account for the effect on habitat for Chinook salmon, steelhead, and redband trout from project reservoirs and the limited capacity of the project reservoir to produce anadromous smolts above Round Butte dam. Further, FS states that increased production of kokanee salmon is not consistent with federal land management goals for restoring native fish populations and does not mitigate for the restricted capacity and other effects on native fish that result for this recommitment of federal lands to the project under any license issued.

Response 62: Our analysis of the rationale for fish habitat enhancement measures did describe the areas that were inundated by the project reservoirs and the larger parts of the watershed that became inaccessible to anadromous fish after fish passage was abandoned. This is part of our cumulative effects analysis on fisheries. The issue of public access to the Reregulating reservoir was not addressed in this section of the draft EIS because it is not relevant to the consideration of fish habitat enhancement measures, but we note here that construction of the project has generally improved public access and increased usage of the project area. Finally, we believe that our description of the kokanee fishery that

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now exists in Lake Billy Chinook and the potential for development of a substantial run of sockeye salmon in the future is relevant to a full and fair consideration of the benefits of the project as it currently exists and of the measures that are proposed by the Joint Applicants. We must consider effects on all resources not just those associated with federal land management goals.

Comment: NOAA Fisheries, ODFW, FS, and Interior disagree with the draft EIS conclusion that there is not enough information to determine how much habitat restoration is needed to achieve a given size run of anadromous fish. They point to several studies that evaluate the relationships among fish passage performance, habitat capacity, juvenile production, and adult returns and that fully support its recommendations for additional habitat restoration. FS points out that the draft EIS presents model data in table 27 yet states that there is not sufficient data to determine the need for habitat enhancement. NOAA Fisheries and ODFW indicate that additional habitat restoration is needed to mitigate for the unavoidable adverse effects described on page 166 of the draft EIS, including losses of outmigrants during reservoir passage and effects on aquatic resources, such as interruptions to the sediment transport process. ODFW points out that proposed preferred alternative includes a much larger habitat fund than is included in its Section 10(j) recommendation no. 14.

Response 63: We maintain that there is a high level of uncertainty regarding what level of habitat enhancement that would result in the establishment of self-sustaining runs of anadromous fish to areas upstream of the project. The Joint Applicants had proposed substantive measures in the Final Joint Application Amendment that addressed the primary effects of the project on aquatic resources, and we concluded that these measures provide adequate enhancement for aquatic resources in the context of the comprehensive development of the river.

Comment: FS recommends that Commission staff adopt and analyze mandatory conditions for woody debris submitted by FS and BLM. Interior indicates that as the primary land managers for the lands where woody debris would be collected and relocated, BLM should be included among the parties consulted in the development of a woody debris plan that is consistent with agency conditions.

Response 64: We consider the woody debris plan that we recommend in the draft EIS to be consistent with the FS and BLM Section 4(e) conditions on large woody debris management. We have revised the text in section 3.6.2.5. of the final EIS to include a description of Section 10(j) measures relating to woody debris plans filed by ODFW and NOAA Fisheries, which we find to be consistent with the FS and BLM Section 4(e) condition as well as the Joint Applicants' Draft Lower River Implementation Plan. We agree that BLM should be included in the list of agencies to be consulted in developing the plan and have modified the text accordingly.

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Comment: The monitoring schedule described on page 176 of the draft EIS indicates that bedload transport monitoring would be conducted if the first three measurables (i.e., movement of tracer particles, buried columns of rock, and cross-section measurements) indicate that transport and channel change occur at flows lower than predicted by the sediment transport model. Interior and FS indicate that only movement of tracer particles lower than predicated is required to initiate bedload measurements as indicated in the Joint Applicants' additional information request response for no. 13 (July 2002) and that documentation of channel change is not required to initiate bedload measurements.

Response 65: In the Long-Term Monitoring Program Description, filed on December 29, 2003, the Joint Applicants have revised their gravel monitoring proposals to include bedload monitoring at flows exceeding 5,500 cfs. This schedule is consistent with the description of sediment transport monitoring activities provided in the Description of Preferred Alternative, as updated on April 27, 2004. We have revised table 33 accordingly.

Comment: ODFW recommends that the Joint Applicants conduct habitat surveys in anadromous-fish producing tributaries and develop a GIS database that would be used for developing, prioritizing, and implementing fish habitat mitigation projects and evaluating the success of fish passage efforts. ODFW also recommends that the Joint Applicants monitor populations of anadromous fish, bull trout, redband trout, and kokanee/sockeye salmon to determine the effects of reintroduction and that they implement several specific measures associated with fish health monitoring of upstream and downstream Deschutes River fish populations. The purpose of the monitoring would be to evaluate the risk of transmitting fish pathogens above the project associated with fish passage.

Response 66: In the final EIS, we recommend that the Joint Applicants monitor the effectiveness of the specific fisheries enhancement measures that would be implemented under any new license issued, including fish passage facilities, SWW, and experimental gravel augmentation. ODFW's recommendations, in part, appear to be related to the overall, long-term management and administration of the fishery in areas outside of the project boundary, which is outside of the Commission's jurisdiction. We note that our recommendations in the final EIS take into consideration the upper basin fishery management goals of the fish and wildlife agencies.

Comment: The Conservation Groups contend that the draft EIS fails to adequately identify or analyze the ongoing unavoidable adverse effects of the project, particularly the inundation of the reservoirs.

Response 67: The Commission staff uses the existing project as the baseline for determining the unavoidable adverse effects of the continued operation of the project. As such, the presence of the reservoirs is not an effect but an existing, baseline condition.

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3.7 TERRESTRIAL RESOURCES

Comment: ODFW points out that on page 180 in section 3.7 the location of the Pelton waterfowl pond is on the east side of the Reregulating reservoir and is not part of the large wetland on the Tribal (west) side of the reservoir.

Response 68: We appreciate the correction and have clarified the location of the Pelton waterfowl pond.

Comment: ODWF indicates that contrary to the statement on page 189 of the draft EIS, pronghorns have occupied the grasslands for many decades and have long since been established.

Response 69: We have modified the text to clarify that pronghorns are well established in the Crooked River National Grasslands.

Comment: Interior and ODFW state that implementation of off-site improvements to habitat, as recommended in the draft EIS (on pages 195–199) may not fully mitigate for lost riparian and rivcrine habitat and connectivity of those habitats above and below the project. Interior further contends that the draft EIS analysis of the acquisition of riparian and wetland areas overlooks the value of replacement land to the beneficiaries of the trust and does not assess the ecological values of the replacement lands. Further, Interior and FS indicate that the Joint Applicants' contribution to the protection of riparian habitat in the basin has already been taken into account in the development of the additional request for mitigation of riparian habitats. The additional 145-acre requirement for riparian mitigation could be met by the agency-recommended fish habitat mitigation and enhancement fund. The assumption in the draft EIS that this mitigation has already been accomplished is incorrect. Further, Interior and FS do not agree with the draft EIS that the Joint Applicants established 180 acres of riparian and wetland habitats near reservoirs as these acres neither mimic nor provide structural components and complexity to mitigate for riparian habitat fragmentation and the loss of connectivity over the term of any license issued (see Tressler et al., 1996, 1998).

Response 70: Establishment of the Pelton Round Butte Fund would provide an effective mechanism for acquiring and enhancing riparian, riverine, and wetland habitats.

Comment: ODFW notes that the draft EIS does not recommend enhancement measures for bats even though they are included in the Joint Applicants' Final Annoted Outline for the Terrestrial Resources Management Plan.

Response 71: We do not recommend the enhancement measures for the bats, even though the measures are proposed by the Joint Applicants, because we identify no nexus between the project and the bats at Opal Springs and Willowdale.

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Comment: ODFW points out that there are only four large animal crossings at the Pelton fish ladder, not six as stated in the draft EIS. ODFW disagrees with the conclusion of the draft EIS that monitoring the effective of the small animal crossings is not warranted. ODFW states that the Joint Applicants have only monitored large animal crossings and has agreed in principle to install and monitor the effectiveness of the five low-technology overhead-type crossings to assist dispersal and movement of small wildlife species.

Response 72: We have revised the text to clarify that there are now four bridges (including two vehicle access bridges) over the Pelton fish ladder that provide opportunities for wildlife to cross the ladder.

Comment: FS and Interior contend that the Bethel-Round Butte transmission line remains a part of the project until the Joint Applicants receive all necessary permits and approvals from the FS or BLM.

Response 73: We see no practical reason for both evaluating the environmental effects of and making associated recommendations related to a transmission line that the Commission has already determined is not part of the project.

3.8 THREATENED AND ENDANGERED SPECIES

Comment: Interior indicates that the draft EIS and the biological assessment do not adequately address federally listed threatened and endangered species in accordance with the ESA because the Commission's request for consultation did not include a complete description of the proposed action; the action's effects on listed species, including direct, interrelated/interdependent, and cumulative effects; measures intended to reduce adverse effects on listed species; and effects on proposed critical habitat for the bull trout. FWS expects to initiate formal ESA consultation once FWS' informational requirements are satisfied and such consultation is requested.

Response 74: In the final EIS, we provide all the information that we have available related to federally listed species in the project area, and we use this information in our assessment of project effects on the listed species. We have clearly identified the staff alternative in section 5.1 of this final EIS.

Comment: Interior comments that the draft EIS does not adequately address the project's effects on the lower Deschutes River population of bull trout. The final EIS should assess existing environmental conditions regarding these effects (e.g., temperature, DO exceedance, reservoir habitat).

Response 75: We respectfully disagree with Interior's assessment. The draft EIS and the biological assessment included analysis of the effects of project construction and

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operation on bull trout habitat, including blocked passage and the transformation of riverine into reservoir habitat. The draft EIS and the biological assessment also evaluated the effects of proposed measures, including the implementation of fish passage, SWW (and associated effects on water temperatures and DO), and fish habitat enhancement measures.

Comment: The draft EIS notes (on page 93) that the project likely inundated steelhead spawning habitat in the mainstem Deschutes River. The draft EIS finds on page 94 that cooler temperatures in the spring, as a result of project operations, may delay the spawning of summer steelhead in the mainstem Deschutes River but concludes on page 118 that that the Joint Applicants have developed a set of proposed measures and modifications to provide for conservation of steelhead. Waterwatch strong disagrees with the draft EIS conclusion that the proposed measures and modifications would protect steelhead. Waterwateh contends that although the Joint Applicants are providing for fish passage, they are not ensuring adequate flows for downstream steelhead spawning and other life cycle needs. Because the steelhead is a federally listed threatened species, the Commission should require the Joint Applicants to pass adequate flows for the protection of steelhead trout.

Response 76: The minimum flows and ramping rates that are proposed by the Joint Applicants were developed in close consultation with the stakeholders in this proceeding and are consistent with the flow-related provisions that are specified in the state and Tribal Section 401 certifications, as well as the Section 10(j) recommendations filed by ODFW and NOAA Fisheries. We find no reason to conclude that the flows recommended by these entities would not afford an adequate level of protection and, in fact, would likely enhance conditions for steelhead in the lower Deschutes River. Furthermore, implementation of SWW is predicted to improve DO conditions throughout the spawning and incubation season for rainbow and steelhead trout, and the Joint Applicants' proposed experimental gravel augmentation program should serve to increase the availability of high-quality spawning and incubation habitat that is available for steelhead. We also note that the Tribes' BNR has voiced a number of serious concerns regarding proposals that would use storage from Lake Billy Chinook to augment minimum flows. We share these concerns, which include the potential for causing accelerated bank erosion on Tribal property and potential effects on cultural and archaeological sites, environmental resources, and power generation.

Comment: ODFW notes that the state record bull trout from Lake Billy Chinook is 23 pounds, 2 ounces and that the claim of evidence that some of the bull trout passed upstream shortly after construction of the project weighed over 40 pounds is unsupported.

Response 77: We have modified the text in section 3.8.2.2 accordingly.

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3.9 RECREATION

Comment: The Tribes' BNR points out several misstatements and ambiguities in the recreation resources discussion in the draft EIS as they pertain to tribal use. The BNR indicates that the Reregulating reservoir is not a primary recreational resources site as noted on page 231 of the draft EIS as it is closed to the public using the eastern shore and is rarely used by Tribal members on the western shore, a portion of which is closed due to hazardous conditions. Also, the Tribes' BNR notes that Indian Park on Lake Simtustus is not primarily used by Tribal members as stated on page 234 of the draft EIS. Further, the Tribes' BNR comments that the car-top boat access should not be included in the description of Monty Campground resources on page 233 of the draft EIS as the Metolius River below the campground is hazardous to boating and has been closed to boating by the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS).

Response 78: Recreational resources exist at the Reregulating reservoir and recreational use occurs on the eastern side of the reservoir. Angling occurs in the vicinity of the dam and wildlife viewing, picnicking and resting occurs at the overlook. In addition, the Joint Applicants propose numerous recreational and visual enhancements to the recreational sites associated with the reservoir. For these reasons, we maintain that the Reregulating reservoir is one of the primary recreational resources in the project. Our understanding is that FS discourages, but has not officially closed the Metolius River for boating. The Metolius is known for 30 miles of class III whitewater, with Monty Campground as a primary take-out (Willamette Kayak and Canoe Club, "Soggy Sneekers: A Guide to Oregon Rivers" The Mountaineers, Seattle WA, 4th printing 2001). We have left the reference to a car-top boat access in the final EIS.

Comment: The BNR indicates that the text on page 232 should be revised to state that the Oregon State Marine Board sets the laws and limits on the reservoir and Jefferson County enforces the limits. BNR suggests that the text on page 234 be revised to include the town of Madras because visitors driving to the area from the north would save time and fuel to access the reservoir through Madras rather than Redmond and that the text on page 244 be revised to clarify that the self-contained restroom and the floating restroom are the same restroom.

Response 79: We have revised the text accordingly.

Comment: The BNR requests clarification of the text on page 244 as to whether the Joint Applicants propose to fund O&M at any other sites than the three FS sites and whether there is agreement for recreatioual interpretation, education, and resource protection for Lake Simtustus as well as Chinook Island.

Response 80: In section 3.9.2.1 of the final EIS, we describe the Joint Applicants' proposed measure that includes contributing funding for operational and maintenance

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costs at federal, tribal and state recreation sites. In this section, we state that the Joint Applicants propose to partially fund annual O&M costs at the Cove Palisades State Park, fund one-third of the O&M costs at Monty Campground, and fully fund Perry South Campground and Day-use Area, Street Creek Boat Launch, Chinook Island Day-Use Area, Indian Park, Pelton Park, Round Butte Overlook Park, and Pelton Wildlife Overlook.

Comment: The BNR comments that Chinook Island needs stabilization of the north and west banks much more than maintenance of a log boom as stated in the draft EIS on page 234.

Response 81: The significant erosion on Chinook Island is noted on page 234 of the draft EIS, and Chinook Island is identified as an erosion site in table 2 on page 33. The order of items listed on page 234 does not imply a priority.

Comment: FS indicates that it has dropped its recommendation regarding implementation of the Comprehensive Plan discussed on page 245 because many of the elements of the plan are outside the authority or responsibility of the Joint Applicants.

Response 82: We have removed this text from section 3.9.2.1 of the final EIS.

Comment: Jefferson County disagrees with the statement on page 251 of the draft EIS that the county might not be able to enforce habitat improvement, closure of federally managed lands, and wildlife and protection enhancement measures. To the contrary the county cites an excellent history of providing contract patrol and law enforcement services for several agencies. Jefferson County supports and urges the Commission to adopt the measures in the Summary of Recreation, Land Use, and Aesthetic Measures, filed on December 29, 2003, for law enforcement, which include funding for one full-time land based sheriff's deputy and two seasonal marine-based sheriff's deputies.

Response 83: We recognize that Jefferson County may have experience managing lands for other local, state and federal agencies. Nonetheless, our concerns stated on page 251 of the draft EIS reflect the fact that FERC has no jurisdiction over the county. While we trust that an effective arrangement between the Joint Applicants and the county could be developed, we maintain that responsibility for ensuring that visitors to the project would not damage environmental resources should rest with the Joint Applicants as a condition of any new license issued for the project.

Comment: Jefferson County supports the Joint Applicants' Summary of Recreation, Land Use, and Aesthetic Measures, which includes a provision for a communications study plan and funding for certain measures related to communications and recommends that the final EIS be revised to include a description of these provisions.

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Response 84: We updated the Joint Applicants' proposed action to be consistent with the summary of recreation, land use and aesthetic measures for the Pelton Round Butte Project as prepared by the Pelton Round Butte Settlement Working Group and filed by the Joint Applicants on December 29, 2003, and updated on April 27, 2004.

Comment: FS disagrees with the draft EIS conclusion on page 253 that there is no nexus between Haystack reservoir and the project. FS has assessed the available information and concluded that a portion of the use at Haystack reservoir occurs, because of social, if not physical crowding (perceived or real), at Lake Billy Chinook. Further, the draft EIS mischaracterizes the recreational experience at Haystack reservoir. Current uses at Haystack reservoir, including waterskiing, powerboat racing, and a warmwater and coldwater fishery, are very similar to those provided at Lake Billy Chinook, albeit at a smaller scale.

Response 85: No new information was filed as to project effects on the recreational use at Haystack reservoir, and we maintain that Haystack reservoir is not project related. However, the Joint Applicants propose to provide partial funding for dispersed recreation at Haystack reservoir as part of the pending settlement. We conclude in section 5, *Comprehensive Development*, that it would be in the public interest to recommend adopting the settlement, including funding for sites at Haystack reservoir.

Comment: Waterwatch states that if the reservoir level were to drop as a result of implementing their recommended absolute minimum flow of 3,000 cfs, then the Joint Applicants could partially or totally close Lake Billy Chinook to recreation at times lake levels would need to be lowered to augment flows. They state that recreation on Lake Billy Chinook is not a protected beneficial use under Oregon State Water Law, whereas recreation on the lower river is a protected beneficial use via the 1989 instream water right and state and federal wild and scenic river acts.

Response 86: We did not consider closing Lake Billy Chinook to recreational use in our environmental review because our assessment of minimum flows indicates that the proposed target flows or inflow would provide adequate resource protection downstream of the project without affecting lake levels in Lake Billy Chinook.

Comment: Waterwatch states that it could find no analysis in the draft EIS of recreational interests on the lower Deschutes River despite the fact that the lower Deschutes River is both a state scenic waterway and a federal Wild and Scenic River and has state instream water rights to protection recreation.

Response 87: In section 3.9.2.3, we describe the Joint Applicants' Summary of Recreation, Land Use, and Aesthetic Measures developed as part of settlement negotiations. The pending settlement includes funding for recreational measures downstream of the project. However, we conclude that recreational use on the lower

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Deschutes River is not project related. As such, we do not conduct a detailed assessment of recreational use and needs downstream of the project. However, the Joint Applicants propose to provide partial funding for dispersed recreation at Haystack reservoir as part of the pending settlement. We conclude in section 5, *Comprehensive Development*, that it would be in the public interest to recommend adopting the settlement, including funding for sites at Haystack reservoir.

Comment: FS and Interior disagree with the draft EIS conclusion that continued operation of the project would have no adverse effects on recreation. FS indicates that the project would continue to occupy 41 miles of riverine habitat that would otherwise be available for river-related recreational activities such as whitewater boating and these lost opportunities are not replaced by flatwater recreation. Further, the Reregulating reservoir is not available for non-tribal public recreation for safety and access is denied to 123 acres of BLM lands adjacent to the reservoir because of safety and security reasons. FS states that these effects are not unavoidable and are not mitigated by any actions within the project area.

Response 88: The Commission uses existing conditions at the time of the environmental review as our baseline conditions for considering project effects on recreational resources. Therefore, we define the 41 miles of river to which FS refers as presently flatwater not riverine. As such, there would be no loss of whitewater boating opportunities in the 41 miles of river during the term of any license, because no whitewater boating activities currently exist in the 41 miles of river. The Joint Applicants propose extensive improvements at Lake Billy Chinook and the Reregulating reservoir. Our assessment indicates that recreational resources would be improved relative to existing conditions by the Joint Applicants' proposed and staff-recommended measures. In section 3.9.1.2, we state that the east side of the reservoir shoreline is off limits to recreational use because of reservoir water-level fluctuations of 20 feet per day.

Comment: Interior indicates that the cumulative effects analysis for recreational resources is inadequate for the same reasons cited for other resource areas.

Response 89: Our cumulative effects analysis uses the best information that we currently have available to us.

3.10 LAND USE AND AESTHETICS

Comment: Jefferson County states that the draft EIS is deficient because it does not fully consider which roads are used by the public to access the project or address the Joint Applicants' obligation to assist in the improvement and maintenance of all roads used to access the project, including existing and planned recreation areas. Jefferson County requests that the Joint Applicants be required to comply with the recommendations set forth in the Pelton Round Butte Comprehensive Management Plan for Recreation, Land Use, and Aesthetics (CTWS, 1999b).

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Response 90: In section 3.10.1, we discuss roads used by the public to access the project, including Jordan Road, which is owned and maintained by Jefferson County. In section 3.10.2.1, we discuss the Joint Applicants' proposed measures for road maintenance and upkeep on 5 roads within the project area. The Joint Applicants' proposed measures include performing an analysis of the Jordan Road slide area and assisting with annual maintenance costs through the slide. We conclude that these measures would improve public access to the Deschutes and Metolius arms of Lake Billy Chinook.

The Joint Applicants propose to develop a recreational resource implementation plan, as identified in its Final Joint Application Amendment.

Comment: Jefferson County states that Jordan Road is the primary road used to access project waters and disagrees with the draft EIS conclusion that the Jordon Road slide does not constitute a threat to public safety and that Joint Applicants' proposed action is adequate. Given that the county spent over $210,000 in repairs after the 1989 slide, the County requests that section 3.10.2.2 of the draft EIS be revised to require the Joint Applicants to keep all project roads open and be responsible for the reconstruction and maintenance of any future slides along project roads, including but not limited to the area of the Jordan Road slide. The County requests that the Joint Applicants prepare a Transportation Management Plan within 1 year of issuance of any new license as the mechanism for ensuring the ongoing maintenance and repair of project roads.

Response 91: Staff agrees that the statement regarding risk to public safety may be misleading. We have revised the text to state that "investigations and ongoing monitoring of the Jordan Road slide show that there is a negligible risk to public safety due to the very slow, but continuing, movements of the slide" in accordance with the findings of Landslide Technology, September 1999. Movements of the Jordan River slide show a relationship with the reservoir level, making the connection between the slide and project operations obvious. The Joint Applicants' proposed measures would ensure maintenance of safe access along Jordan Road and other roads adjacent to the project reservoirs as defined in the Road Maintenance Agreement with Jefferson County if slides occur.

On page 263 in the draft EIS, we stated that the Joint Applicants proposed conducting an engineering analysis and providing funds for Jefferson County's annual maintenance costs through the Jordan Road slide area. On page 318 of the draft EIS, we recommended that this proposal be included in any new license for the Pelton Round Butte Project. The Joint Applincants filed a Road Maintenance Agreement with Jeffeerson County on April 27, 2004, that addresses the future maintenance or repair of the Jordan Road slide area. We understand that the nature and extent of the Joint

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Applicants' funding for the Jordan Road slide area is the subject on ongoing settlement negotiations.

3.11 CULTURAL RESOURCES

Comment: The BNR points out that it is not clear if the lands discussed on page 276 are all lands or only federal lands administered by the BLM and FS. BNR indicates that the draft EIS should recognize that on Warm Springs Reservation lands, the BIA generally defers to the Tribes' management plan for cultural sites and resources.

Response 92: The lands discussed in the context of the Cultural Resources Management Plan (CRMP) include all lands that fall within the area of potential effect (APE) as defined on page 270 of the draft EIS. The CRMP was prepared jointly by the Tribes and PGE and addresses the management of cultural sites and resources on the Warm Springs Reservation. We would expect that the CRMP would be consistent with the Tribes' management objectives for cultural sites and resources on its reservation.

Comment: Interior and FS note that the draft EIS states that the final CRMP be implemented in coordination with the recreation resources implementation plan which would not be completed until 1 year after issuance of any new license. FS states that implementation of the CRMP a year after issuance of any new license is unacceptable and that it was both BLM's and FS' understanding that the CRMP would be implemented immediately upon issuance of any new license.

Response 93: The CRMP would be in place prior to the development of the proposed recreation resources implementation plan.

4.0 DEVELOPMENTAL ANALYSIS

Comment: Interior indicates that some of the assumptions in table 41 of the draft EIS are in error or potentially in error and that some of the numbers cannot be verified based on the limited and vague information provided. For instance, (1) the source of the weighted bond rate is not explained and cannot be duplicated using the cited sources, (2) the cost of capital (COC) cannot be duplicated based on vague and insufficient information provided and a potential error in footnote "f," (3) the value of the discount rate or its source as provided in note "g" is in error, and (4) whatever discount rate is used, it should be a "real" (inflation adjusted) discount rate. Interior indicates that each of these values is important in the overall calculations.

Response 94: The information used to derive the cost of capital, stock return rate, weighted bond rate, bond/debt ratio, and discount rate was obtained from PGE's 2001 Form 10-K annual report. We have reviewed the information from the 10-K report, our calculations, and the information and values provided in the draft EIS, and provide the following clarifications, explanations, and corrections.

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1. We have reviewed the data and methods used to compute the weighted bond rate, the value stated in the draft EIS, and the corresponding footnote citation. Based on that review, we feel that the methodology is acceptable, but we need to provide some additional explanation regarding values we used:

   - WBR = (interest charges on long term debt for 2001) / (average long term debt for 2001 and 2000)
   - Interest on long term debt = $68 million (see 10-K report, page 56)
   - Long term debt for 2001 (including debt due within 1 year) = $942 million (see 10-K report, page 75)
   - Long term debt for 2000 (including debt due within 1 year) = $850 million (see 10-K report, page 75)
   - Average long term debt 2001/2000 = $896 million

   Note: The average debt was used since the debt values reflect the debt owed at the beginning and end of the year, while the interest value reflects the interest paid during the year on that debt. Since we do not know exactly what the debt level was at all points during the year, we estimate that the average debt was simply the average of the beginning and end points.

   - WBR = $68 million / $896 million = 7.59 percent

   We have revised footnote "d" for table 41 to reflect the additional explanation.

2. Interior was correct that footnote "f" should not have referred to the cost of money (which should have been called "cost of capital" for consistency with table 41), but should have referred to the stock return. Although the footnote was in error, the computed value was correct. The COC was computed using the following formula:

   - COC = stock return + [(bond/debt ratio + weighted bond rate) / (1– bond/debt ratio)]
   - Stock return = 10.5 percent (see 10-K report, page 7)
   - Bond/debt ratio = 0.407 (see 10-K report, page 58, $768 million / $1,888 million)
   - Weighted bond rate = 7.59 percent (see item (a) above)
   - COC = 0.105 + [(0.407 + 0.0759) / (1 – 0.407)] = 0.09305 (9.305 percent)

   We have corrected footnote "f" accordingly.

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3. Interior was correct that the value for the discount rate was not based on the weighted bond rate, but was, in fact, assumed to be the same as the cost of capital (9.305 percent). The correct value was used in the analysis, but footnote "g" was incorrect. We have corrected footnote "g" accordingly.

4. Interior is concerned that the discount rate selected for use in the economic analysis is not a "real" (inflation adjusted) discount rate. Interior acknowledges that the methodology used by FERC staff to perform the economic analysis intentionally does not consider potential future inflation, escalation, or deflation beyond the date of any license issued. Although we do not include inflation, the tax value used is a "true" value in that the model shows what the actual payment would be (thus, inflation is implicitly included in the model results). The model therefore includes a mix of non-escalated and implicitly escalated values. We feel that the use of a nominal (inflation-inclusive) discount rate is appropriate. We feel the discount rate used represents the nominal discount rate.

Comment: Interior notes that in sections 4.1 and 4.2, the draft EIS does not explain how the itemized costs in table 43 related to the two alternatives summarized in these sections.

Response 95: The approach we used in the draft EIS was to identify measures that were proposed by the Joint Applicants with a "JA" reference under the "Entity" column of table 43, and a "Staff" reference for all measures that Staff recommends. The total of all of the cost for measures attributed to Joint Applicants should approximate the cost of the Joint Applicants' proposal. The total is presented as the "Joint Applicants' proposed action" in table 42 and the costs are discussed in section 4.1. For this project, Staff recommended all of the Joint Applicants' proposed measures, but also recommended additional measures. The total of the Joint Applicants' proposed measures and those additional measures recommended by Staff reflect the totals discussed in section 4.2 and presented as being the "Joint Applicants' proposed action with additional staff-recommended measures" in table 42.

Comment: The Joint Applicants note that on page 285, the use of the median year generation to calculate the average project generation is not correct because the 1971 median year generation was somewhat higher than the historic project average.

Response 96: We have reviewed the energy estimates provided by the Joint Applicants in their comments on the draft EIS. We have incorporated the new estimates into the revised developmental analysis for the final EIS.

Comment: The Conservation Groups comments that the Developmental Analysis in the draft EIS completely ignores all economic benefits associated with the various

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protection and enhancement measures and, for example, does not discuss the economic benefits from an improved lower river fishery.

Response 97: We have included in our economic analysis only those costs associated with the construction, maintenance and operation of new facilities, ongoing maintenance and operation of existing facilities, and implementation of various plans and measures to protect and enhance project environmental resources.

We have not attempted to place a value on other costs, such as benefits to the local economy as a result of potential improvements to river fisheries, and other such measures. We recognize that benefits may include increased tourism and associated additional business for support service industries, such as sales of bait, food, gasoline, etc. Nor have we attempted to place an economic value on personal experiences, such as the value of a day spent fishing or partaking of other recreational opportunities in areas affected by the project or enhanced as a result of the relicensing process.

We acknowledge that environmental enhancements, such as improving fisheries and increasing access to such fisheries, can have a positive influence on the local economy, efforts to quantify such benefits are expensive and the result are often controversial, and highly speculative. We determined early in the scoping process that the costs of collecting this data exceeded the benefits that it would accrue to our analysis.

Although we agree that economic benefits are likely at this project, we do not endeavor to assign a dollar value to those benefits. We are not required by the FPA to place a dollar value on nonpower benefits when balancing those benefits against economic costs.

Comment: The Conservation Groups note that the draft EIS asserts that higher flows would produce an overall decrease in project generation due to reductions in hydraulic head. They state that the discussion on page 283 of the draft EIS should more adequately explain how the higher flows under the Joint Applicants' proposed action would result in generation lost since, as noted in the draft EIS, the flow would be passed through the project turbines.

Response 98: As stated above, we are revising our energy estimates in accordance with energy estimates provided by the Joint Applicants in their comments on the draft EIS. As such, the estimated losses attributed to increased minimum flows are projected to be much less. Our comment that the higher flow requirements would result in energy losses despite the passage of the flows through the turbines was qualified by saying that the loss was due to a reduction in hydraulic head resulting from reservoir level restrictions. That qualification is still valid. The new energy estimates show that the losses are not significant, but some losses are expected to occur.

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Comment: The Joint Applicants disagree with the statement on page 283 of the draft EIS that the provision of minimum flows that are higher than are currently provided at the three developments would produce an overall decrease in project generation. In response to the draft EIS statements, the Joint Applicants provided a detailed estimate of the changes in average project generation caused by the Round Butte equipment upgrades and the proposed changes in operation and request that Commission staff use the estimated average annual energy values listed in table 2 of the new analysis in the final EIS.

Response 99: We have reviewed the energy estimates provided by the Joint Applicants in their comments on the draft EIS. We have incorporated the new estimates into the revised developmental analysis for the FEIS.

5.0 STAFF'S CONCLUSIONS

Comment: ODFW states that the draft EIS incorrectly concludes that certain of its recommendations are beyond the scope of Section 10(j).

Response 100: We respectfully disagree. Recommendations made pursuant to Section 10(j) of the FPA must be specific measures for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. We found 10 of your recommendations to be outside that the scope of Section 10(j) because they were not specific measures to protect or enhance fish and wildlife. In the final EIS, we make recommendations that are consistent with all of ODFW's recommendations that we found to be within the scope of Section 10(j).

Comment: The Joint Applicants note that the draft EIS recommends on page 313 that the Joint Applicants maintain average minimum flows equal to monthly target flows as measured at the Madras gage, but does not provide a precise definition. The Joint Applicants are unclear as to how the Commission would define "average" flow release. The Joint Applicants recommend that Commission staff modify the wording to reflect that the plant operator would maintain a flow setpoint equal to or greater than the "allowed minimum flow" as defined in the project operating plan. The allowed minimum flow on any given day would be defined using a computational process that considers the monthly target flow, the measured flow, and any reservoir refill allowance that applies. Also, the Joint Applicants note that the actual measurement at the Madras gage is the river stage (in feet), not discharge (in cfs) as implied in the draft EIS.

Response 101: We conclude in section 3.4.2.2 of the final EIS that the methods for providing and monitoring compliance with minimum flow and reservoir levels described in the Draft Project Operating Plan, including the definition of allowed minimum flow would be adequate. We recommend adoption of the Draft Project Operating Plan in section 5.1.

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5.2 CONSISTENCY WITH COMPREHENSIVE PLAN

Comment: FS provides a list of nine documents submitted to the Commission that should be added to the list of comprehensive plans and considered in the final EIS. Interior also notes that 4 of the FS plans should be included in this section.

Response 102: Of the plans listed by FS and Interior, four are included in the Commission's list of comprehensive plans dated February 2004. We have included these four in appendix D to the final EIS.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Comment: Both ODFW and Interior take exception to the determination in section 5.3 that some of their Section 10(j) recommendation are outside the scope of Section 10(j). Both agencies indicate that the Commission does not have authority to make this determination. They both indicate that because of this discrepancy, the Commission should reissue its Section 10(j) inconsistency letter and that time period to resolve any inconsistencies should not begin until the Commission issues new letters. Both agencies would request a meeting to discuss the Commission actions regarding the agencies' recommendations.

Response 103: We respectfully disagree. We clearly state in section 5.3 of the draft EIS that we recommend adopting all of fish and wildlife recommendations filed by FWS and NOAA Fisheries that we found to be within the scope of Section 10(j). Hence, we had no need to inform either FWS or NOAA Fisheries of any inconsistencies with Section 10(j). We did find 6 inconsistencies among the recommendations made by ODFW that we found to be within the scope of Section 10(j) and notified ODFW by letter of these inconsistencies. We find no discrepancy between the findings in the draft EIS and the letter that we sent to ODFW.

5.5 WILD AND SCENIC RIVER DESIGNATION

Comment: Interior and FS comment that that absolute minimum flow value to protect recreation and fisheries in the Wild and Scenic River segment of the lower Deschutes River is considered to be 3,000 cfs. Staff assessment of impacts to the Wild and Scenic River segment of the lower Deschutes needs to include the BLM Section 7 determination of the proposed experiments of gravel augmentation below the Reregulating dam. Also, the draft EIS needs to address the effects of streamflows on the ORVs of the lower Deschutes River.

Response 104: In numerous places in the draft EIS, including sections 3.4, *Water Quality*, 3.5, *Water Quantity*, and 3.6, *Aquatic Resources*, we discuss the recommended minimum release of target flows or inflow, which generally exceed 3,000 cfs. On page 320 of the draft EIS, we conclude that the proposed minimum flow, in combination with other proposed and recommended measures, would provide adequate protection to

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aquatic resources downstream of the project. In section 5.5.3, we discuss Wild and Scenic River Designation and describe how proposed and recommended measures would improve the quality of the fishery and would not adversely affect recreational resources. The Interior and FS comments are not clear on how the gravel augmentation plan would adversely affect the fishery or how streamflows would affect off-road vehicle use. No new information was provided that would change our assessment made, or conclusions reached, in section 5.5.3, *Wild and Scenic River Designation*.

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APPENDIX D

STATE AND FEDERAL COMPREHENSIVE PLANS

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The following comprehensive plans are relevant to the Pelton Round Butte Project.

- Bureau of Land Management. 1985. A five-year comprehensive anadromous fish habitat enhancement plan for Oregon coastal rivers. Department of the Interior, Portland, Oregon. May 1985. 20 pp.

- Bureau of Land Management. 1986. Two Rivers resource area management plan. Department of the Interior, Prineville, Oregon. June 1986. 61 pp.

- Bureau of Land Management. 1990. Issues and alternatives for management of the lower Deschutes River. Department of the Interior, Prineville, Oregon. January 1990. 72 pp. and appendices.

- Bureau of Land Management. 1992. Three Rivers resource management plan. Department of the Interior, Hines, Oregon. September. 232 pp. and appendices.

- Bureau of Land Management. Bureau of Reclamation. 1992. Lower Crooked wild and scenic river (Chimney Rock segment). Department of the Interior, Prineville, Oregon. October 1992. 60 pp.

- Bureau of Land Management. Forest service. 1993. Oregon State Parks and Recreation. 1992. Middle Deschutes/Lower Crooked River wild and scenic rivers management plan. Department of the Interior, Prineville, Oregon. Department of Agriculture, Ochoco National Forest. December 1992. 99 pp.

- Bureau of Land Management. 1993. Lower Deschutes River management plan and environmental impact statement. Department of the Interior, Prineville, Oregon. Two volumes and record of decision.

- Bureau of Land Management. 1993. North Fork Crooked River management plan. Department of the Interior, Prineville, Oregon. Department of Agriculture, Ochoco National Forest. April 1993. 30 pp. and appendices.

- Forest Service. 1989. Ochoco National Forest and Crooked River National Grassland plan. Department of Agriculture, Bend, OR, October 1989.

- Forest Service. 1990. Deschutes National Forest land and resource management plan. Department of Agriculture, Bend, OR. August 1990.

- Forest Service. 1990. Mt. Hood National Forest land and resource management plan. Department of Agriculture, Gresham, OR. October. 460 pp. and appendices.

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- Forest Service. 1990. Willamette National Forest land and resource management plan. Department of Agriculture, Eugene, OR. July. 382 pp. and appendices.
- Forest Service. 1995. Deschutes National Forest metolius watershed analysis. Department of Agriculture, Bend, OR. August 1995.
- Governor's Hydroelectric Planning Group. 1985. Preliminary site resource inventory: Report to the 63rd legislative assembly. Salem, OR. March. 146 pp.
- Hydro Task Force. Strategic Water Management Group. 1988. Oregon comprehensive waterway management plan. Salem, OR. 112 pp. and appendices.
- National Marine Fisheries Service, Seattle, Washington. Pacific Fishery Management Council, Portland, Oregon. 1978. Final environmental impact statement and fishery management plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California commencing in 1978. Department of Commerce. March 1978. 157 pp.
- Northwest Power Planning Council. 1984. Columbia River basin fish and wildlife program. Portland, OR. October 1984. 138 pp. and maps and appendices.
- Northwest Power Planning Council. 1986. Northwest conservation and electric power plan. Portland, OR. Two volumes.
- Northwest Power Planning Council. 1987. Columbia River basin fish and wildlife program. Portland, OR. February 1987. 246 pp.
- Northwest Power Planning Council. 1988. Protected areas amendments and response to comments. Document 88-22. Portland, OR. September 14. 21 pp.
- Northwest Power Planning Council. 1994. Columbia River basin fish and wildlife program. Portland, OR. December 14, 1994. 409 pp. and appendices.
- Oregon Department of Energy. 1987. Oregon final summary report for the Pacific Northwest rivers study. Salem, OR. November 1987. 89 pp.
- Oregon Department of Environmental Quality. 1976. Proposed water quality management plan. Salem, OR. Nineteen volumes.

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- Oregon Department of Environmental Quality. 1978. Statewide water quality management plan. November 1978. Seven volumes.

- Oregon Department of Fish and Wildlife. 1982. Comprehensive plan for production and management of Oregon's anadromous salmon and trout: Part I. General considerations. Portland, OR. June 1, 1982. 33 pp.

- Oregon Department of Fish and Wildlife. 1982. Comprehensive plan for production and management of Oregon's anadromous salmon and trout: Part II. Coho salmon plan. Portland, OR. June 1, 1982. 118 pp. and appendices.

- Oregon Department of Fish and Wildlife. 1986. Oregon Bighorn sheep management plan. Portland, OR. November 1986. 17 pp.

- Oregon Department of Fish and Wildlife. 1987. Warmwater game fish management plan. Portland, OR. August 1987. 60 pp.

- Oregon Department of Fish and Wildlife. 1987. The statewide trout management plan. Portland, OR. November 1987. 77 pp.

- Oregon Department of Fish and Wildlife. 1987. Trout mini-management plans. Portland, OR. December 1987. 58 pp.

- Oregon Department of Fish and Wildlife. 1991. Comprehensive plan for production and management of Oregon's anadromous salmon and trout: Coastal Chinook salmon plan. Portland, OR. December 18, 1991. 62 pp.

- Oregon Department of Fish and Wildlife. 1992. Oregon elk management plan. Portland, OR. July 1992. 63 pp. and appendix.

- Oregon Department of Fish and Wildlife. 1993. Oregon black bear management plan, 1993-1998. Portland, OR. 33 pp. and appendices.

- Oregon Department of Fish and Wildlife. 1993. Oregon wildlife diversity plan. Portland, OR. November 1993. 512 pp.

- Oregon Department of Fish and Wildlife. 1993. Oregon cougar management plan, 1993-1998. Portland, OR. 31 pp. and appendices.

- Oregon Department of Fish and Wildlife. 1993. Oregon wildlife and commercial fishing codes. Portland, OR. 146 pp. and index.

- Oregon Department of Fish and Wildlife. 1995. Comprehensive plan for production and management of Oregon's anadromous salmon and trout: Part III. Steelhead plan. Portland, OR. April 26, 1995. 118 pp. and appendices.

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- Oregon Department of Fish and Wildlife. 1995. Biennial report on the status of wild fish in Oregon. Portland, OR. December 1995. 217 pp. and appendix.

- Oregon Department of Fish and Wildlife. 1996. Crooked River Fish Management Plan. Prineville, OR. April 24, 1996.

- Oregon Department of Fish and Wildlife. 1996. Wildlife Diversity Program. Species at risk: Sensitive, threatened, and endangered vertebrates of Oregon. Portland, OR. June 1996.

- Oregon Department of Fish and Wildlife. 1997. Lower Deschutes River subasin management plan. Prineville, OR. July 1997.

- Oregon Department of Fish and Wildlife. March 1997. Oregon Coastal Salmon Restoration Initiative (Oregon Plan). Roseburg, OR. 5 Volumes.

- Oregon Department of Fish and Wildlife. December 1997. OR Plan for Salmon and Watersheds, Supplement 1 Steelhead. Roseburg, OR. 4 Volumes.

- Oregon Department of Transportation. State Parks and Recreation Division. 1987. Upper Deschutes River scenic waterway study. Salem, OR. January 1987. 44 pp. and appendices.

- Oregon Department of Transportation. State Parks and Recreation Division. 1987. Recreational values on Oregon rivers. Salem, OR. April 1987. 71 pp.

- Oregon Land Conservation and Development Commission. 1984. Oregon coastal management program. Salem, OR. 63 pp.

- Oregon State Board of Forestry. 1982. Forestry program for Oregon: An action program for the eighties. Salem, Oregon. May 1982. 57 pp.

- Oregon State Game Commission. 1963–1975. Fish and wildlife resources - 18 basins. Portland, OR. 21 reports.

- Oregon State Parks and Recreation Department. 2003. Oregon Outdoor Recreation Plan 2003-2007 (SCORP). Salem, OR. January 2003.

- Oregon State Parks and Recreation Division. 1987. Social and ecological impacts of recreation use on the Deschutes River Scenic Waterway. Salem, OR. February 1987. 295 pp.

- Oregon State Parks and Recreation Division. Undated. The Oregon scenic waterways program. Salem, OR. 75 pp.

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- Oregon State Water Resources Board. 1973. Surface area of lakes and reservoirs. Salem, OR. 43 pp.

- Oregon Water Resources Commission. 1985. Oregon water use programs. Salem, OR.

- Oregon Water Resources Commission. 1987. Oregon water use programs. Salem, OR. 295 pp.

- Oregon Water Resources Department. 1985. Biennial report, 1985-1987. Salem, OR. January 1985. 58 pp.

- Oregon Water Resources Department. 1988. Oregon water laws. Salem, OR. 240 pp.

- Pacific Fishery Management Council. 1988. Eighth amendment to the fishery management plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California commencing in 1978. Portland, OR. January 1988.

- Pacific Fishery Management Council. 1999. Appendix A - Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon: Amendment 14 to the Pacific Coast Salmon Plan. Portland, OR. August 1999. 146 pages.

- Pacific Fishery Management Council. 2000. Appendix B - Description of the Ocean Salmon Fishery and its Social and Economic Characteristics: Amendment 14 to the Pacific Coast Salmon Plan. Portland, Oregon. August 1999. 109 pages. Pacific Fishery Management Council. Amendment 14 to the Pacific Coast Salmon Plan (1997). Portland, OR. May 2000.

- Portland District Corps of Engineers. 1993. Water resources development in Oregon. Portland, OR. 78 pp.

- State of Oregon. State of Washington. State of Idaho. Confederated Tribes of the Warm Springs Reservation of Oregon. Confederated Tribes of the Umatilla Indian Reservation. Nez Perce Tribe. Confederated Tribes and Bands of the Yakima Indian Nation. 1987. Settlement agreement pursuant to the September 1, 1983,Order of the U.S. District Court for the District of Oregon in Case No. 68-5113. Columbia River fish management plan. Portland, OR. November. 61 pp. and tables.

- Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. May 1986. 19 pp.

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- Fish and Wildlife Service. Undated. Fisheries USA: The recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp.
- Forest Service. Bureau of Land Management. 1994. Standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Department of Agriculture, Washington, D.C. April 13, 1994. 144 pp.
- National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, D.C. January 1982. 432 pp.

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