Final Environmental Assessment

U.S. Fish and Wildlife Service's Authorization For Incidental Take and Implementation Of PacifiCorp's Klamath Hydroelectric Project Interim Operations Habitat Conservation Plan For the Endangered Lost River and Shortnose Suckers

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Acronyms and Abbreviations

BiOp	Biological Opinion
CDFG	California Department Fish and Game (Now CDFW)
CDFW	California Department Fish and Wildlife
CEQ	Council on Environmental Quality
cfs	cubic feet per second
DO	dissolved oxygen
DOI	U.S. Department of Interior
DPS	Distinct Population Segment
DRE	Dam Removal Entity
EA	Environmental Assessment
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission (or "Commission")
HCP	Habitat Conservation Plan
IA	Implementing Agreement
ITP	Incidental Take Permit
KHSA	Klamath Hydroelectric Settlement Agreement
NCWCB	North Coast Regional Water Quality Control Board
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
RM	river mile
SONCC	Southern Oregon and Northern California Coast (coho salmon)
USBR	U.S. Bureau of Reclamation
Reclamation	U.S. Bureau of Reclamation
Program	Klamath Basin Sucker Recovery Program
Service	U.S. Fish and Wildlife Service

SECTION 1
Introduction

In accordance with the National Environmental Policy Act (NEPA), the U.S. Fish and Wildlife Service (Service) has developed this environmental assessment (EA) to evaluate the effects of issuing an incidental take permit (ITP) under Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended, to PacifiCorp Energy (PacifiCorp or the Applicant) related to interim operation of the Klamath Hydroelectric Project (Project). The Klamath Hydroelectric Settlement Agreement (KHSA[1]) anticipates that four dams within PacifiCorp's Project on the Klamath River in southern Oregon and northern California would be removed in 2020 and that hydroelectric generating facilities owned by PacifiCorp associated with the U.S. Bureau of Reclamation's (Reclamation) Link River Dam would be decommissioned. PacifiCorp has separately applied to the Service and the National Marine Fisheries Service (NMFS) for ITPs to address the interim period prior to potential dam removal and Project decommissioning, or restoration of volitional fish passage through the Federal Energy Regulatory Commission (FERC) licensing process. PacifiCorp is applying to the Service for an ITP for a 10-year period authorizing the incidental take of Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*), which are listed as endangered under the ESA (53 FR 27130).

The Service's issuance and continuation of the ITP would be contingent on the implementation of a Habitat Conservation Plan (HCP) developed, in coordination with the Service, by the Applicant (PacifiCorp 2013). The HCP includes conservation measures to avoid, minimize, and mitigate the effects of operation of the Project on the take of listed Lost River and shortnose suckers during the interim period until dam removal or the resolution of PacifiCorp's FERC relicensing application for continued operation of the Project.

This EA analyzes the effects of the Service's proposed action of issuance of an ITP as provided under NEPA and implementing regulations and policy (40 CFR §§ 1500-1508). The scope of this NEPA analysis covers the direct, indirect, and cumulative effects of the proposed incidental take, and the avoidance, mitigation and minimization measures proposed in the HCP (USFWS and NMFS 1996).

Subject to certain conditions and pending an affirmative determination by the Secretary of the Interior, the KHSA anticipates that four Project dams (Iron Gate, Copco No.1, Copco No. 2, and J.C. Boyle) on the Klamath River will be removed in 2020 to accomplish volitional fish passage for listed coho salmon (*Oncorhynchus kisutch*) and other anadromous fishes (USDOI and CDFW 2013). The removal of the dams as provided in the KHSA modifies an earlier proposal by PacifiCorp to the FERC to relicense and continue to operate the Project for 50 years. The KHSA provides that operations of the Project, including the dams proposed for removal, will continue over the interim period until the dams are removed or, should dam removal not precede until the FERC issues a decision on PacifiCorp's application to relicense the Project. The HCP that PacifiCorp included with its application for an ITP includes conservation measures to avoid, minimize, and mitigate the effects of operation of the Project on incidental take of endangered Lost River and shortnose suckers during the interim period until dam removal or the FERC's issuance of a decision regarding the relicensing application for future operation of the Project.

The conservation or mitigation measures and their effects, summarized below, are derived from, among other things, ESA Section 7 biological opinions (BiOp) developed by the Service and NMFS in accordance with the ESA, and in conjunction with a Final Environmental Impact Statement (FEIS) developed by the FERC for issuing a new Federal license to operate the Project, without dam removal for a 50-year period (FERC 2007), and updated studies and analyses described in the HCP (PacifiCorp 2013). This EA assesses impacts of issuing the proposed ITP and these conservation or mitigation measures, taking into account differences between the original 50-year FERC relicensing proposal and the current 10-year interim operation period.

The conservation or mitigation measures incorporated into the HCP include the following:

- Substantially reducing operations at the East Side and West Side developments within 30 days of issuance of the ITP to eliminate turbine mortality of listed suckers at these facilities. These facilities would remain substantially shut down until eventual decommissioning of the facilities.
- Supporting activities to enhance the survival and recovery of Lost River and shortnose suckers by funding additional recovery initiatives during the period extending from reduced operations of the East Side and West Side developments until the end of the permit term.
- Developing and implementing a flow-monitoring program to evaluate take of suckers at Project facilities.

Implementation of the HCP would result in a 90 percent reduction in the lethal take suckers resulting from operation of Project facilities. Implementation of the HCP also would contribute to improved habitat that would benefit the recovery of Lost River and shortnose suckers.

1.1 Chronological Background

In 2004, PacifiCorp filed an application with the FERC for a new license to operate the Project. The alternatives, environmental impacts and mitigation measures for the continued operation of the Project were considered in the FERC's relicensing process, as documented in the FEIS prepared by the FERC (FERC 2007). In December 2007, the NMFS and Service issued BiOps on FERC's proposed relicensing action (NMFS 2007, USFWS 2007). NMFS' BiOp analyzed the effects on listed coho salmon of FERC's proposed relicensing action, which for purposes of the BiOp included mandatory requirements to construct fishways for volitional passage of anadromous fish around the Project dams, but did not include removal of the Project dams (NMFS 2007). The Service analyzed the effects of FERC's proposed relicensing action on endangered Lost River suckers and shortnose suckers in the 2007 BiOp (USFWS 2007) and included incidental take statements that described the incidental take of those listed species expected as a result from Project operations, reasonable and prudent measures necessary to minimize the impact of that incidental take, and terms and conditions to implement those reasonable and prudent measures (USFWS 2007).

To address the concerns of the Service and NMFS regarding the effects of Project operations identified in the BiOps and during the interim period (i.e., prior to dam removal under the KHSA or continuation by PacifiCorp of the FERC relicensing process for the Project), the Applicant submitted an interim conservation plan (PacifiCorp 2008) to the Service and NMFS identifying

mitigation and minimization measures that PacifiCorp would implement until a decision regarding dam removal or relicensing has been made.

As described previously, several Indian tribes, governmental agencies, and organizations entered into the KHSA on February 18, 2010. The KHSA recognized the intention of the parties to the agreement that the Clean Water Act, Section 401 process for the FERC relicensing of the Project be held in abeyance pending the outcome of the Secretary of the Interior's determination regarding dam removal. If dam removal does not proceed, or the KHSA terminates for other reasons, the FERC relicensing process for the Project would resume. The Department of the Interior released the final environmental impact statement/environmental impact report on the Secretary of the Interior's determination regarding dam removal pursuant to the KHSA on April 4, 2013 (USDOI and CDFW 2013).

The Applicant developed an HCP, with technical assistance from the Service, and included it with an application for an ITP under Section 10(a)(1)(B) of the ESA for an interim 10-year period until dam removal under the KHSA or relicensing of the Project by the FERC (PacifiCorp 2013).

1.2 Purpose and Need

The Service's need for the Federal action is to respond to PacifiCorp's application for a ESA Section 10(a)(1)(B) incidental take permit in a way that ensures the protection and conservation of the Lost River sucker and the shortnose sucker during the interim operations of PacifiCorp's Project.

1.3 Public Involvement

The Service published a Notice of Availability of the HCP, Draft EA, and receipt of an application for the ITP by the Applicant for the proposed action in the *Federal Register* on January 28, 2013 (78 FR 5830-5832). Publication of the notice initiated a 60-day comment period that ended on March 29, 2013. An informational meeting to inform the public of the draft HCP and draft EA and to answer questions was held at the Service's office in Klamath Falls on February 20, 2013. As a result of the request for comments, the Service received hard copy and electronic comments from the public, as well as from several State and Federal agencies. Copies of the comments are filed at the Service's office in Klamath Falls.

SECTION 2
Proposed Action and Alternatives

2.1 Introduction

The proposed action, issuance of an ITP, would authorize incidental take of federally-endangered Lost River sucker and shortnose sucker during the proposed 10-year term of the ITP. Issuance and continuation of the ITP would be contingent on the implementation of the HCP developed by the Applicant that includes conservation or mitigation measures related to the interim operation of the Project.

The NMFS separately processed an ITP application from PacifiCorp that authorizes incidental take of listed coho salmon (77 FR 14734). NMFS issued the ITP to PacifiCorp on February 24, 2012. Some of the conservation measures in the separate HCPs that PacifiCorp included with separate applications for ITPs from the Service and NMFS will assist more than one affected species. The Service and NMFS coordinated their processes for review of the applications as much as possible. However, each agency is processing its ITP reviews and NEPA analyses separately.

2.2 No-Action Alternative

Under the no-action alternative, the Service would not issue an ITP to PacifiCorp, and as a result PacifiCorp would not have incidental take authorization for Lost River and shortnose sucker during the 10-year interim period prior to Project removal or the issuance of a new FERC license for the Project. The no-action alterative would also mean deferring or not implementing the additional conservation or mitigation measures outlined in the HCP. The Project would continue to operate under the terms and conditions of the existing FERC license in a manner consistent with current operations, which does not include all of the avoidance, minimization, mitigation, and conservation measures based on Project impacts identified by the Service in the 2007 FERC BiOp (USFWS 2007) or identified in PacifiCorp's HCP (PacifiCorp 2013).

2.3 Proposed Action

The proposed action is the issuance of an ITP by the Service for take of Lost River and shortnose suckers by the Klamath Hydroelectric Project and the associated implementation of avoidance, minimization, and mitigation measures by the Applicant that would be implemented under an approved HCP. The proposed avoidance, minimization, and mitigation measures are based on analyses contained in the Service's 2007 FERC BiOp (USFWS 2007), the 2007 FERC Final Environmental Impact Statement (FERC 2007), and the Applicant's HCP (PacifiCorp 2013); they are intended to avoid, minimize, and mitigate the impacts of incidental take of Lost River and shortnose suckers resulting from interim operation of the Project to the maximum extent practicable pursuant to Section 10(a)(1)(B) of the ESA. The term of the proposed ITP is 10 years. A summarized comparison of the basic differences in implementation and operation between the No-action and Proposed Action alternatives is found below in Table 1.

The specific impacts associated with the no-action and proposed action is presented in greater detail in Section 4 (*Environmental Consequences*).

Table 1. Comparison of Effects on Resources Associated with the Proposed Action and No-action Alternatives

Resource	No-action	Proposed Action
Water Resources • Hydrology • Water Quality	**Hydrology:** Current conditions in the Upper Klamath Basin reaches, downstream reservoirs, and Klamath River would continue as managed under biological opinions from the NMFS and Service (NMFS and USFWS 2013). **Water Quality:** Poor water quality conditions would continue without any mitigating actions unless directed by other regulatory mechanisms (e.g. total maximum daily load [TMDL]).	**Hydrology**: Same as no-action, but slightly higher for 1-mile reach between Link River Dam and East Side and West Side powerhouse tailraces due to reduced diversions by PacifiCorp for hydroelectric purposes. **Water Quality**: Same or better than the no-action.
Biological Resources • Upper Klamath River System • Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs • Klamath River Downstream of Iron Gate	**Upper Klamath River System:** No change from effects of current conditions **Reservoirs:** No change from effects of current conditions **Klamath River Downstream of Iron Gate:** No change from current conditions.	**Upper Klamath River System:** Benefits to Lost River sucker and shortnose sucker by reducing mortality impacts (e.g., entrainment, ramping) and other impacts (e.g., false attraction to tailraces) at East Side and West Side developments by 90 percent. Additional benefits to habitat conditions, such as improved nursery habitat, resulting from sucker recovery initiatives. **Reservoirs:** Same as no-action. **Klamath River Downstream of Iron Gate:** Same as no-action.
Socioeconomics and Environmental Justice	Direct and indirect effects from employment would continue similar to current conditions.	Minor gains in employment due to direct and indirect economic benefits from sucker recovery activities funded by the Applicant as part of the HCP.
Cultural Resources	No change from current conditions.	Same as no-action.

2.3.1 Covered Activities

Activities covered under the ITP ("covered activities") include those activities that are necessary to operate and maintain Project facilities during the permit term as well as specific mitigation and conservation measures identified in the HCP. Hydroelectric generation is the primary activity conducted at Project facilities, with the exception of the Keno development, which does not include turbines and generators. Many of these activities are governed by the existing FERC

license or agreements with other entities (e.g., with U.S. Bureau of Reclamation [Reclamation]) or through voluntary commitments made by the Applicant. The majority of these activities were considered in the Service's 2007 BiOp; therefore, the terms and conditions of the 2007 BiOp served as the basis for developing the avoidance, minimization, and mitigation measures contained in the HCP (PacifiCorp 2013). Detailed descriptions of Project facilities and their operations are provided in Chapter IV (*Current Conditions*) of the HCP. Detailed information on HCP Covered Activities can be found in Chapter 2 of the Applicant's HCP (PacifiCorp 2013).

As described in the HCP, the covered activities necessary to operate and maintain Project facilities include the following:

- Operate and maintain the spill gates at Link River Dam for regulation and releases of flows to maintain flow to the East Side and West Side water conveyance features.
- Operate and maintain Link River Dam pursuant to PacifiCorp's agreements with Reclamation to provide instream flow and ramp-rate releases from Link River Dam, including: (1) flows and ramp rates in accordance with Reclamation's operational directives to PacifiCorp; and (2) flows and ramp rates to meet Project minimum flow and ramp rate requirements in accordance with PacifiCorp's FERC license and to facilitate Project operation and maintenance.
- Operate and maintain the East Side and West Side canals and flow lines following shutdown of the East Side and West Side powerhouse facilities.
- Operate and maintain Keno Dam, spill gates, and fish ladder.
- Regulate the water level upstream of Keno Dam in accordance with the agreement with Reclamation (per PacifiCorp's existing FERC license) and for irrigation withdrawal activities.
- Operate and maintain J.C. Boyle Dam, fish bypass system, water conveyance system, turbines, and powerhouse facilities.
- Maintain an instream flow release from the J.C. Boyle Dam to the Klamath River of not less than 100 cubic feet per second (cfs) (per PacifiCorp's existing FERC license).
- Regulate flows from J.C. Boyle Dam and powerhouse during normal operations such that ramping rates of flow in the Klamath River do not exceed 9 inches per hour (as measured at the U. S. Geological Survey [USGS] gage located 0.5 mile downstream of the J.C. Boyle powerhouse) per PacifiCorp's existing FERC license.
- Operate and maintain Copco No. 1 and Copco No. 2 Dams, water conveyance systems, turbines, and powerhouse facilities.
- Operate and maintain Iron Gate Dam (and associated appurtenances), penstocks, turbines, and powerhouse facilities.
- Regulate releases from Iron Gate Dam in accordance with instream flow and ramping rate requirements (as measured at the USGS gage located 0.5 mile downstream of Iron Gate dam) established in the current Operations Plan for Reclamation's Klamath Project and per PacifiCorp's existing FERC license.

- Regulate water levels in Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs.

The avoidance, minimization, mitigation and conservation measures comprising the Sucker Conservation Strategy in the HCP also are covered activities. The Sucker Conservation Strategy derives from portions of the Service's 2007 FERC BiOp (USFWS 2007) that identified reasonable and prudent measures to minimize incidental take of listed suckers associated with the Project. To reduce take of listed suckers from the interim operations, the Applicant has identified several interim conservation measures. These selected measures include:

- Substantially reducing operations at the East Side and West Side powerhouses within 30 days of issuance of the ITP to avoid and minimize entrainment of listed suckers at these generating facilities. These facilities would remain substantially shut down until eventual decommissioning of the facilities.
- Supporting activities to enhance the survival and recovery of listed sucker species by funding additional sucker recovery initiatives during the period extending from shut down of the East Side and West Side developments until the end of the permit.
- Developing and implementing a flow-monitoring program to evaluate impacts to suckers at Project facilities.

Detailed descriptions of the avoidance, minimization, mitigation and conservation measures in the categories listed above are provided in Chapter VI (*Conservation Program*) of the HCP (PacifiCorp 2013).

2.3.2 Covered Lands

Covered Lands include existing Project facilities, adjacent water and land areas, and riparian zones potentially influenced by Project maintenance and operations, including the Link River and mainstem Klamath River, and Project reservoirs from the outlet of Upper Klamath Lake (River Mile [RM] 255) downstream to Iron Gate Fish Hatchery below Iron Gate Dam (River Mile 189.3; Figure 1). Project facilities and their operations are described in Chapter 4 (*Current Conditions*) of the HCP (PacifiCorp 2013).

The Applicant operates the Project located in southern Oregon and northern California (Figures 1 and 2) under a license issued by the FERC (FERC Project No. 2082). The Project consists of eight developments. Seven of the developments are located on the Klamath River between RM 190.1 and 254.3, including (in order moving upstream) Iron Gate (RM 190.1 to 196.9); Copco No. 2 (RM 198.3 to 198.6); Copco No. 1 (RM 198.6 to 203.1); J.C. Boyle (RM 220.4 to 228.3); Keno (RM 233 to 253.1); and East Side and West Side (both in the Link River at RM 253.1 to 254.3). The eighth development is on Fall Creek, a Klamath River tributary located at RM 196.3. The Fall Creek facility is not included in the HCP because it does not affect the endangered suckers, and therefore is not included in the HCP, and consequently will not be further mentioned in this EA.

The East Side and West Side developments are located near Klamath Falls, Oregon, just downstream of Link River Dam at the outlet of Upper Klamath Lake at RM 254.3. Link River Dam is owned by Reclamation, but the Applicant operates the dam at Reclamation's direction. Reclamation's operations at the Link River Dam includes specified flow releases to comply with the recent joint BiOp relating to the effects to the two listed sucker species in Upper Klamath

Lake and coho salmon in the Klamath River below Iron Gate Dam (NMFS and USFWS 2013). PacifiCorp generates electricity at the East Side and West Side facilities using water diverted at the Link River Dam.

The East Side facilities consist of: (1) 670 feet of mortar and stone canal; (2) an intake structure; (3) 1,729 feet of 12-foot-diameter, wood-stave flow line; (4) 1,362 feet of 12-foot-diameter, steel flow line; (5) a surge tank; and (6) a powerhouse. Maximum diversion capacity for the East Side powerhouse is 1,200 cfs.

The West Side development facilities consist of: (1) a 5,575-foot-long concrete-lined and unlined canal; (2) a spillway and discharge structure; (3) an intake; (4) 140 feet of 7-foot-diameter steel penstock; and (5) a powerhouse. The maximum diversion capacity of the West Side powerhouse is 250 cfs. Water at Link River Dam either flows over the dam or is diverted to East Side or West Side developments, after which it enters the Link River and flows to Keno Reservoir.

Maintenance of the two facilities consists of gate repairs, flow line, and powerhouse maintenance, and vegetation control in and around the dam and flow lines, and dam structural repairs. The frequency of such maintenance is dependent upon the maintenance schedule for each piece of equipment and maintenance associated with equipment repairs. Maintenance also occurs to address conditions identified by the FERC in their annual facility inspections.

2.3.3 Permit Term

The term of the proposed ITP (referred to herein as "permit term" or "term of the ITP") is 10 years. The ITP would authorize the incidental take of covered species that may occur as a result of operating the Project and implementing related conservation measures.

The transfer of the Project to a Dam Removal Entity (DRE) for Project decommissioning is contemplated by the KHSA to occur on or before December 31, 2020, if various contingencies are met. While the Service and the Applicant anticipate and intend that Project decommissioning will occur consistent with the terms of the KHSA, circumstances may arise resulting in the termination of the KHSA. In the event of such a termination, the ITP would remain in effect for a term of 10 years, during which time the FERC relicensing process would resume, and incidental take associated with Project operations may be authorized by the Service under Section 7 of the ESA.

2.3.4 Conservation Strategy

The Sucker Conservation Strategy identifies take minimization and mitigation measures that respond directly to the sources of take that may occur as a result of the Applicant's covered activities during interim operations. The approach of the strategy focuses on two substantive conservation components for listed sucker species. First, the Applicant will avoid or minimize take associated with its covered activities by substantially reducing operations at its East Side and West Side hydroelectric facilities within 30 days after issuance of the ITP. Further operation of the turbines, if any, at the East Side and West Side facilities prior to decommissioning of these facilities will occur only during times when take of listed suckers is unlikely to occur; however, a flow of approximately 80 cfs will be maintained in the East Side wood-stave flow line to maintain its structural integrity prior to decommissioning. Second, the Applicant will improve habitat conditions for listed suckers by facilitating the implementation of specific habitat enhancement projects consistent with the Service's revised recovery plan (USFWS 2013a) and

supporting the Williamson River Delta Restoration Project managed by The Nature Conservancy (TNC).

The overarching biological goals of the HCP are to mitigate impacts of the taking resulting from the operations of the Project and contribute to the recovery of the Lost River sucker and shortnose sucker in the permit area during the interim period by reducing threats and restoring habitat. These goals would be achieved through implementation of measures that avoid or minimize the direct effects of PacifiCorp's Project operations (i.e., turbine mortality at the East Side and West Side facilities) on individual suckers and by funding enhancement efforts that translate into benefits for listed suckers. Specific goals and objectives of the conservation strategy are described in the HCP (PacifiCorp 2013).

The conservation or mitigation measures incorporated into the HCP include the following:

- Substantially reducing operations at the East Side and West Side developments within 30 days of issuance of the ITP to eliminate turbine mortality of listed suckers at these facilities. These facilities would remain substantially shut down until eventual decommissioning of the facilities.

- Supporting activities to enhance the survival and recovery of listed sucker species by funding additional sucker recovery initiatives during the period extending from reduced operations of the East Side and West Side developments until the end of the permit term.

- Developing and implementing a flow-monitoring program to evaluate take of suckers at Project facilities.

Implementation of the HCP would result in an estimated 90 percent reduction in the lethal take of listed suckers by the Project (USFWS 2013b). Implementation of the HCP also would contribute to improved habitat that would benefit the recovery of Lost River and shortnose suckers.

The overarching biological goals of the HCP are to avoid, minimize, and mitigate impacts of the taking resulting from the operations of the Project and contribute to the recovery of the Lost River sucker and shortnose sucker in the permit area during the interim period by reducing threats and restoring habitat. These goals would be achieved through implementation of measures that avoid or minimize the direct effects of PacifiCorp's Project operations (e.g., entrainment) on individual suckers and by funding enhancement efforts that translate into benefits for listed suckers. Specific goals and objectives of the conservation strategy are described below.

Measures Undertaken to Achieve Conservation Objectives

The first objective of the conservation strategy is to avoid turbine mortality of listed suckers at the East Side and West Side hydroelectric facilities. To address this objective, the Applicant would substantially reduce operations at the East Side and West Side facilities within 30 days of the date of issuance of the ITP by the Service. The majority of estimated take of listed suckers associated with Project operations is from entrainment through the turbines at the East Side and West Side facilities (USFWS 2007, 2013b). With shutdown of the turbines at the East Side and West Side facilities during the period when suckers are present, Project impacts on listed suckers at these facilities would be avoided, and the residual sources of take would mostly be restricted

to the downstream reservoirs where suckers contribute less to the overall population viability due to their inability to return upstream. A small amount of take is anticipated to be associated with suckers moving through the East Side flow line, but this take will be substantially less than take from historic turbine entrainment.

Under the HCP, the operation of the East Side and West Side turbines would cease; however, the facilities themselves would remain in place until they are decommissioned through the FERC licensing process. Decommissioning is not a covered activity under this HCP. PacifiCorp will continue to maintain the facilities such that limited operations for testing or maintenance purposes are possible prior to decommissioning of the facilities. As discussed in Chapter VI of the HCP, further turbine operations of these facilities prior to decommissioning, if any, would occur only for brief periods for testing and maintenance purposes. Such operations, if done, would occur when take of listed suckers is unlikely to occur, such as during times of low species presence (i.e., outside the May-October period of concern for entrainment). As noted in the HCP, PacifiCorp will contact the Service no later than 30 days before any such operations for testing and maintenance purposes to provide information on the planned operations and allow the Service to recommend possible modifications of the planned operations to avoid take of listed suckers.

The second conservation objective under the HCP is to increase or enhance sucker habitat. To address this objective, the Applicant will facilitate activities that improve sucker habitat or otherwise promote the survival and recovery of listed sucker species. The Applicant will accomplish this by establishing a "Sucker Conservation Fund," to support sucker recovery actions and providing continued support of the Williamson River Delta Restoration Project for the duration of the permit term.

The Applicant will provide funding for these enhancement projects, but third parties undertaking habitat projects and research studies must obtain all necessary State and Federal permits and authorizations prior to conducting such activities. Thus, the environmental analysis for these conservation measures contained in the HCP and EA is general in nature, but it should help expedite future permitting processes and any related environmental analyses required for specific projects.

Sucker Recovery Initiatives

Within 90 days following issuance of the ITP, PacifiCorp will make an initial contribution of $40,000 to the Sucker Conservation Fund to support initiatives that promote sucker recovery. PacifiCorp will also support recovery initiatives by contributing an additional $30,000 to the fund on the fourth anniversary of the ITP and another $30,000 on the seventh anniversary (PacifiCorp 2013). The total fund contribution over the permit term will be $100,000. The amount allocated for habitat improvement is intended to mitigate population-level impacts of the estimated take.

Recommendations for projects to be funded by the Sucker Conservation Fund will be provided by the Klamath Basin Sucker Recovery Implementation Program (Program). The revised recovery plan for the Lost River sucker and shortnose sucker (USFWS 2013a) calls for the establishment of the Program which will consist of several teams to coordinate public outreach, develop scientific collaboration, and assess recovery program direction, including genetics management, spawning and rearing enhancements, recovery management plans, and to

periodically review progress. The Program will consist of knowledgeable biologists, limnologists, resource managers, and others from Federal and State agencies, nongovernmental organizations, Tribal partners, and private stakeholders.

Because the Program will be comprised of experts in the fields relevant to sucker recovery and is generally responsible for the implementation of the revised recovery plan including prioritization and coordination of activities, the Program will be in a position to provide informed recommendations to PacifiCorp concerning utilization of the Sucker Conservation Fund for projects and actions that will best support recovery efforts. PacifiCorp will verify project selections to ensure they are consistent with HCP goals, HCP objectives, and ITP requirements.

The Sucker Conservation Fund will be administered by the National Fish and Wildlife Foundation (NFWF)[1]. If, for any reason, a different third-party administrator is required during the permit term, PacifiCorp and the Service will select a new third-party administrator with demonstrated capability to successfully carryout the administration of the fund. The NFWF will administer the fund upon receiving a list of sucker enhancement projects specified by PacifiCorp based on recommendations from the Program as described above. Thereafter, NFWF will be responsible for overseeing contracting with parties for the projects with funds provided from the Sucker Conservation Fund. Certain projects funded by this account may qualify for matching grants or money from NFWF or other parties.

In evaluating proposed sucker recovery initiatives for selection and implementation, the following guidelines will be considered:

1. Whether the proposed project substantially reduces the threats to suckers, and how the project reduces these threats;
2. The recovery objectives of the proposed project and the anticipated dates for achieving them;
3. The estimated costs to complete the proposed project, along with a description of construction and permitting requirements, and the ability of the party undertaking the project to successfully and safely complete the project;
4. Whether the proposed project incorporates quantifiable, scientifically-valid standards that will demonstrate achievement of recovery objectives;
5. Whether the proposed project includes provisions for monitoring and reporting progress on project implementation and effectiveness; and
6. The extent to which the proposed project is consistent with the revised recovery plan or other pertinent scientific literature.

[1] NFWF is a 501(c)(3) non-profit organization created by Congress in 1984. NFWF directs public conservation dollars to projects and activities that preserve and restore native wildlife species and habitats, and matches those investments with private funds. NFWF works with a variety of individuals, foundations, government agencies, nonprofits, and corporations to identify and fund important conservation projects and activities throughout the U.S.

Williamson River Delta Restoration Project

As described above, PacifiCorp, in partnership with TNC, will continue contributing to the restoration of riparian and wetland habitats in the Williamson River Delta on Upper Klamath Lake to assist in the recovery of listed suckers over the permit term (PacifiCorp 2013). Currently the Applicant leases 1,100 acres of farmland ("Tulana Farms") from TNC and uses its share of the income from the property to contribute to funding restoration actions at TNC's Williamson River Delta Preserve. In October 2007, approximately 600 acres of this farmland was returned to wetlands, and the current farm operation is approximately 500 acres in size (Erdman and Hendrixson 2010, 2011).

In 2006, after several successful pilot projects and the completion of environmental planning documents, TNC and Federal partners, including the Service, implemented a $9 million effort to restore 5,500 acres of wetlands at the Williamson River Delta by removing approximately 2 million cubic yards of material from 22 miles of levees (Erdman and Hendrixson 2010, 2011). In support of this project, PacifiCorp contributed $1.6 million towards the purchase of the Williamson River Delta property in 1996, provided $750,000 in funding towards the restoration effort, and voluntarily dedicated $100,000 from its share of the 2006 and 2007 farm lease income. This $100,000 contribution also fulfilled the requirement of a private match that helped TNC successfully compete for a $1 million grant from the North American Wetlands Conservation Council for this restoration work. This phase of the restoration project, one of the most significant projects initiated to restore habitat and advance the recovery of the endangered Lost River and shortnose suckers, was completed in October of 2008 (Erdman and Hendrixson , 2010, 2011). Subsequently, PacifiCorp also contributed an additional $67,000 from its share of farm revenue in 2007, 2008, and 2009 that was used to further extend and deepen the breaches along the lake and the river, work that was supported and guided by staff from both TNC and the Service.

Throughout the permit term, PacifiCorp will continue to gift all net revenue from its share of the annual farm revenue (about $20,000 annually depending on farm revenue) resulting in total contributions of approximately $200,000 to support restoration and recovery efforts for listed suckers for the duration of the permit term. From these contributions, an average of $4,000 per year ($40,000 over the permit term) will be used directly to implement additional projects to increase sucker habitat through riparian and wetland plantings along the Williamson River and the shoreline of UKL, and other sucker habitat enhancement projects at the Williamson River Delta Restoration project. The remainder of funds will be used for supporting ongoing sucker recovery and land management actions by TNC at the restoration project.

These contributions will provide the support needed to continue to realize the conservation benefits of this important sucker recovery and habitat restoration action, for which PacifiCorp has already provided significant funding as mitigation for Project operations. This ongoing funding will provide continuing benefits to listed suckers and contribute to meeting the goals and objectives defined in Service's revised sucker recovery plan (USFWS 2013a).

2.3.4.1 Monitoring Program

Project Facilities

Upon shutdown, incidental take monitoring activities at the East Side and West Side facilities will be unnecessary because the Applicant will no longer be diverting water through the turbines and discharging water at the tailraces. All take owing to turbine entrainment will be eliminated. However, the Applicant will monitor flows at these facilities if any generation occurs, and provide that information to the Service in the annual monitoring report. Monitoring at the downstream facilities will be conducted using flow through the turbines as a surrogate as described in the HCP in Section VIII, *Compliance with Authorized Level of Take*.

Sucker Recovery Initiatives

Projects selected for implementation using the Sucker Conservation Fund will incorporate effectiveness monitoring as a part of the project design. Information obtained from effectiveness monitoring will be provided to NFWF, which will in turn produce an annual report summarizing project implementation and effectiveness. Information obtained from this annual report will be provided to the Service and the Applicant for review and discussion. Based upon information obtained from monitoring results, measures implemented under the fund may be augmented, modified or discontinued.

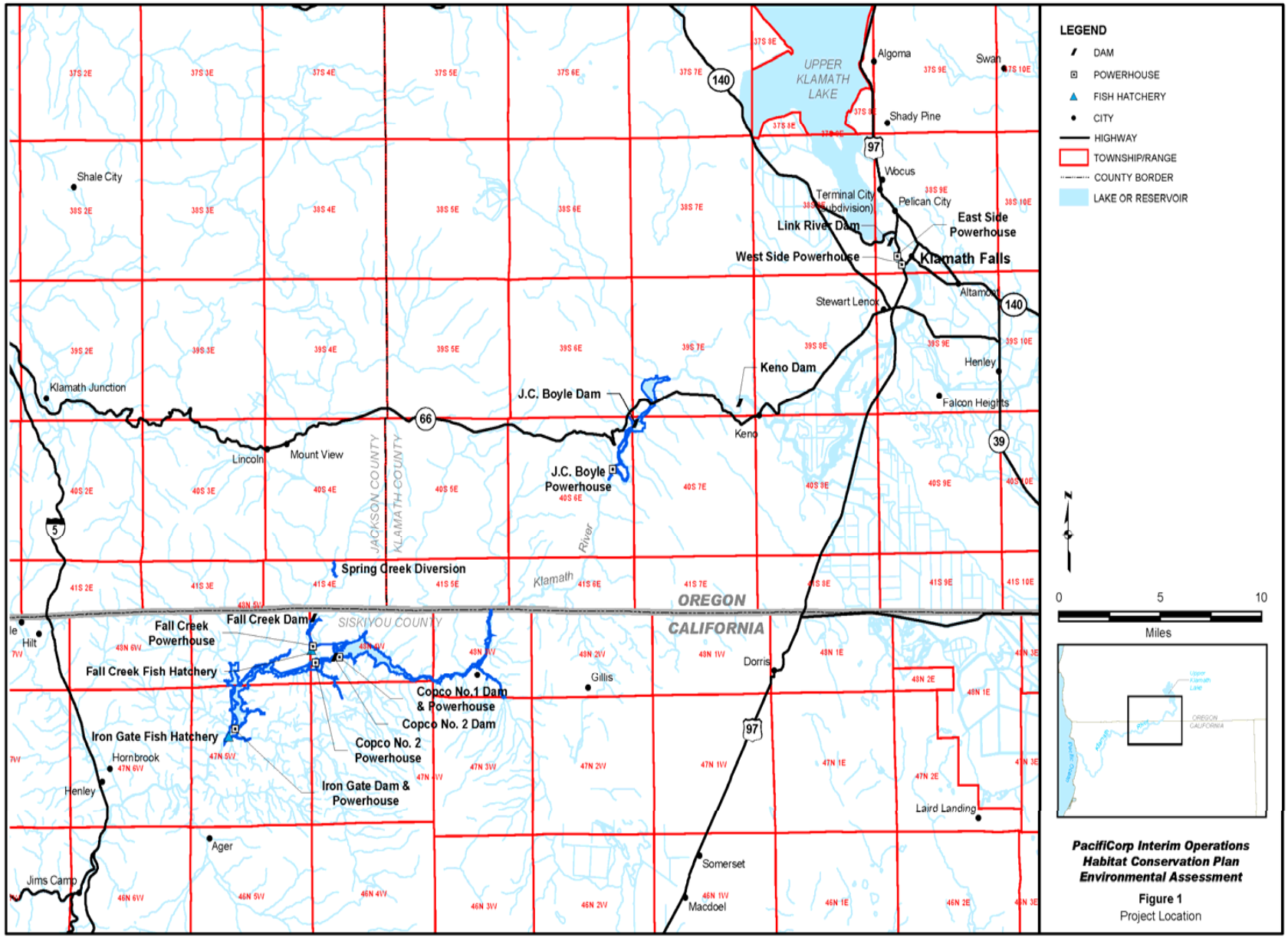
Williamson River Delta Restoration Project

The restoration progress and project details related to PacifiCorp's ongoing support of TNC's Williamson River Delta Restoration Project will be monitored as part of TNC's overall monitoring for the program. PacifiCorp will provide the Service with an annual report that documents program progress, accomplishments of the prior year, and future restoration plans and schedule. The annual report also will document the contribution of the Applicant's entire share of the proceeds from farming operations to support the Williamson River Delta Restoration Project.

2.4 Alternatives Considered but Dismissed from Further Analysis

2.4.1 Conservation Actions without an Incidental Take Permit

As is described above, the Applicant has been implementing certain interim conservation measures described in its Interim Conservation Plan and plans to implement additional conservation measures consistent with the HCP, and the KHSA provides that PacifiCorp will implement certain interim conservation measures according to specific deadlines for each measure, unless the KHSA is terminated. As is described in the HCP Chapter XI, through discussions during the development of the HCP, the Service considered whether the Applicant would continue to implement these conservation measures in the absence of an ITP from the Service authorizing take associated with such measures. Failing to obtain an ITP may prevent the Applicant's full implementation of certain conservation measures that would benefit Lost River sucker and shortnose suckers. Furthermore, the Applicant has justified expenditures associated with the interim conservation measures on the basis that it would obtain an ITP from the Service in a timely manner that provides additional regulatory certainty. Consequently, it is uncertain whether PacifiCorp would continue expenditures on conservation measures without issuance of an ITP by the Service. Thus, due to this level of uncertainty, the Service will not further analyze the effects of this alternative in the remainder of this document.



PacifiCorp Interim Operations Habitat Conservation Plan Environmental Assessment

Figure 1
Project Location

SECTION 3
Affected Environment

Information for this affected environment section has been generated from several source documents that contain descriptions of the resources potentially affected by the actions considered in this EA. In an effort to incorporate efficiencies and utilize relevant information from other documents, the Service has adopted parts of these source documents and incorporated by reference pertinent information in this chapter. Readers of this EA are encouraged to review these source documents for more detailed information than that which is summarized in this EA.

These source documents are:

- FERC (2007) Final Environmental Impact Statement for Relicensing of the Klamath Hydroelectric Project No. 2082-027.
- National Marine Fisheries Service [NMFS] and U.S. Fish and Wildlife Service [USFWS]. 2013. Biological Opinions on the Effects of Proposed Klamath Project Operations from May 31, 2013, through March 31, 2023, on Five Federally Listed Threatened and Endangered Species.
- PacifiCorp (2013) Klamath Hydroelectric Project Interim Operations Habitat Conservation Plan for Lost River and Shortnose Suckers.
- U.S. Department of Interior and California Department of Fish and Wildlife [USDOI and CDFW]. 2013. Klamath Facilities Removal Public Final Environmental Impact Statement/Environmental Impact Report.
- U.S. Fish and Wildlife Service [USFWS]. 2007. Formal Consultation on the Proposed Relicensing of the Klamath Hydroelectric Project, FERC Project No. 2082, Klamath River, Klamath County, Oregon, and Siskiyou County, California. Prepared by United States Department of the Interior, Fish and Wildlife Service, Yreka Fish and Wildlife Office, Yreka, California.
- U.S. Fish and Wildlife Service [USFWS]. 2013a. Revised Recovery Plan for the Lost River Sucker (*Deltistes luxatus*) and Shortnose Sucker (*Chasmistes brevirostris*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.
- U.S. Fish and Wildlife Service [USFWS]. 2013b. Formal Intra-Service Section 7 Consultation for the Issuance of an Endangered Species Act, Section 10(a)(1)(B) Incidental Take Permit for PacifiCorp's Klamath Hydroelectric Project Interim Operations Habitat Conservation Plan for Lost River and Shortnose Suckers, California and Oregon. Klamath Falls Fish and Wildlife Office.

3.1 Water Resources

3.1.1 Climate, Hydrology, and Water Management

The permit area lies in the 15,000 square-mile upper Klamath River Basin which ranges in elevation from 2,000 to 9,000 feet above sea level (NRC 2004, FERC 2007, Gannett et al. 2007). Precipitation occurs mostly during the late fall, winter, and spring and is mostly in the form of snow above elevations of 5,000 feet. Average yearly precipitation varies greatly with elevation and location and ranges from about 10 to more than 50 inches. Annual precipitation at Klamath Falls at the upper end of the Klamath River is 13.3 inches, downstream at Copco No. 1 Reservoir

it is 18.2 inches, and it is over 100 inches in some parts of the lower watershed. Precipitation occurs primarily as rain or snow, mostly during the fall and winter, with occasional afternoon thunderstorms occurring in the summer. Snow fall often occurs during winter, particularly in the higher elevations above 5,000 feet.

Stream flows in the basin normally peak during the late spring and/or early summer from snowmelt runoff. Low flows within this watershed typically occur during the late summer or early fall, after the snowmelt and before the runoff from the fall storms moving inward from the Pacific Ocean.

Upper Klamath Lake is the dominant hydrologic feature of the upper part of the Klamath River Basin. Upper Klamath Lake receives most of its water from the Williamson and Wood Rivers (NRC 2004, Gannett et al. 2007). The Williamson River watershed consists of two sub-basins drained by the Williamson and Sprague Rivers, which together comprise about 75 percent of the drainage area of Upper Klamath Lake and about 50 percent of the inflow. The Wood River drains an area northwest of Upper Klamath Lake extending from the southern base of the eastern slopes of the Cascade Mountains near Crater Lake to its confluence with the northern arm of Upper Klamath Lake, which is often referred to as Agency Lake. The balance of the water reaching Upper Klamath Lake is derived from direct precipitation and groundwater that flows from springs, small streams, irrigation canals, and agricultural returns (Gannett et al. 2007).

Alterations to the basin's natural hydrologic character began in the late 1800s, accelerating in the early 1900s, including construction and operation of Reclamation's Klamath Project (NRC 2004). The Klamath Project includes facilities to divert, store, and distribute water for irrigation, National Wildlife Refuges, and control of floods in the basin. The Klamath Project's diversion of stored water occurs year-round, but primarily is from early April through mid-October. Water is diverted from Upper Klamath Lake near Link River Dam through the A Canal, and also is diverted from the upper part of the Klamath River known as Lake Ewauna/Keno Reservoir. The largest of these diversions is the Lost River Diversion Channel. A portion of the water diverted to the Klamath Project is returned to the Klamath River through Reclamation's Lost River Diversion Channel and the Klamath Straits Drain.

Reclamation is responsible for management of flow volumes out of Link River Dam at RM 254 and coordinates with PacifiCorp on releases from Iron Gate Dam at RM 190.1 for ESA compliance purposes. The area between Link River Dam and Iron Gate Dam is occupied by PacifiCorp's Project developments, which includes five dams on the mainstem Klamath River. Reclamation also manages Upper Klamath Lake elevations to meet ESA requirements and contractual irrigation demands of Reclamation's Klamath Project. PacifiCorp's reservoirs on the mainstem of the Klamath River provide about 13 percent of the total water storage of the Klamath River, and about 2 percent of active (usable) storage.

Between Link River and Iron Gate Dams, surface-water volumes are largely controlled by Reclamation's management of Upper Klamath Lake elevations and resultant flow releases from Link River Dam. However, within PacifiCorp's project area, short-term (i.e., hourly to daily) reservoir elevations and flow variability are affected by hydropower operations for power production. Flows below Link River Dam into the Link River are passed through the spill gates and/or PacifiCorp's East Side and West Side facilities depending on a variety of factors including: (1) flow requirements under the joint NMFS and Service BiOp for Reclamation's operation of its Klamath Project (NMFS and USFWS 2013); (2) water-surface elevation of

Upper Klamath Lake; (3) seasonal shut down of PacifiCorp's facilities for maintenance; and (4) inflow into Upper Klamath Lake.

Keno Reservoir is located downstream of the Link River. It is shallow (average depth of 7.5 feet) and long (22.5 miles), and receives most of its water from Upper Klamath Lake via Link River. There are approximately 60 irrigation diversions within the reservoir including Reclamation's Lost River Diversion Channel (USBR 2001). The 1968 contract between PacifiCorp and Reclamation for the operation of Keno Reservoir generally requires that the water-surface elevations be maintained between 4085.0 and 4086.5 feet (USBR datum) to allow for agricultural diversions. The minimum flow requirement below Keno Dam is 200 cfs per a cooperative agreement with the Oregon Department of Fish and Wildlife (ODFW).

Downstream of Keno Dam there is a short, high gradient river-reach upstream of J.C. Boyle reservoir, which is a relatively small mainstem reservoir. Under typical peaking operations, the J.C. Boyle Reservoir fluctuates about 3.5 feet, while average daily fluctuations are approximately 1 to 2 feet (FERC 2007). The flows that are released to the Klamath River from J.C. Boyle powerhouse during peaking operations are ramped up to either one turbine operation (up to 1,500 cfs) or two turbines operation (up to 3,000 cfs). When generation is not occurring at the J.C. Boyle powerhouse (and J.C. Boyle Dam is not spilling), typical non-generation base flows in the J.C. Boyle peaking reach (i.e., the reach of the Klamath River between J.C. Boyle powerhouse and Copco Reservoir) are about 320 to 350 cfs, consisting of the 100 cfs minimum flow release from J.C. Boyle Dam and the accretion of 220 to 250 cfs of groundwater flow into the upstream J.C. Boyle bypass reach (FERC 2007).

Copco No. 1 Reservoir (or simply "Copco Reservoir") is located below J.C. Boyle Dam. Water levels in Copco No. 1 Reservoir are normally maintained within 6.5 feet of full pool (elevation 2,607.5 feet) and daily fluctuations in reservoir water levels of about 0.5 foot are due to peaking operation of the Copco No. 1 powerhouse and variance in the inflow from the J.C. Boyle peaking reach (PacifiCorp 2004, FERC 2006). Copco No. 2 Reservoir, because of its small size, has virtually no storage, and the water level within the reservoir rarely fluctuates more than several inches.[2] There is no minimum flow requirement below Copco No. 2 Dam, but PacifiCorp maintains a release of 5 cfs in this short reach (approximately 1 mile) between Copco No. 2 Dam and Iron Gate Reservoir. Because Reclamation is required to meet specific flow release requirements at Iron Gate Dam, accretions from tributaries and naturally-occurring springs upstream of Iron Gate are generally managed and included within Reclamation's minimum flow requirements at Iron Gate. Operation of PacifiCorp's Project facilities therefore does not generally affect flow volumes in the Klamath River, but can affect rates of change in flows on a short-term basis (i.e., hourly and daily) due to flow ramping during powerhouse start-up or shut-off and seasonal spillway use.

Reclamation's management of flows in the upper Klamath River is based on operational requirements resulting from ESA consultations with the Service and NMFS to protect the federally-listed Lost River sucker, shortnose sucker, and Southern Oregon and Northern California Coast (SONCC) coho salmon, and their designated critical habitats. Lake levels and

[2] Because Copco No. 2 reservoir is so small, the much larger Copco No. 1 reservoir is typically called "Copco Reservoir."

river flows were consulted on under Section 7of the ESA, most recently in a joint NMFS and Service BiOp dated May 2013 (NMFS and USFWS 2013).

Water Quality

Water quality in the Klamath River Basin varies greatly along the approximately 250 river miles from Upper Klamath Lake to the estuary at the Pacific Ocean (NRC 2004, FERC 2007, USDOI and CDFW 2013). A wide range of natural and anthropogenic influences affect water quality throughout the system. Inflows to the system at Link River Dam originate from the nutrient-rich Upper Klamath Lake (ODEQ 2002, NRC 2004). Diversions and return flows for agriculture, as well as municipal and industrial use, occur in the reach between Link River Dam and Keno Dam and these also affect water quality (ODEQ 2010).

The Klamath River receives considerable inflow from tributaries between Iron Gate Dam and the estuary, including Shasta, Scott, Salmon, and Trinity Rivers (NRC 2004). Due to an increasing stream gradient and inputs from tributaries with water that is both cooler and generally lower in nutrient concentrations, the Klamath River is generally less nutrient-rich as the river approaches the Pacific Ocean. However, despite this unique attribute, the large current loading of nutrients and organic matter released at Link River Dam from Upper Klamath Lake play a dominant role in downstream water quality conditions and overwhelm the natural nutrient processing capabilities of the Klamath River, leading to its impaired status and listing under the Clean Water Act for exceedances (ODEQ 2010, NCWCB 2010a). Both point and nonpoint sources of pollution also contribute to the water quality impairments in the Klamath River. Two waste-water treatment facilities degrade water quality in the Keno Reservoir (ODEQ 2010). Land use pollutant source categories impacting Klamath River water quality are identified as wetland conversion, grazing, irrigated agriculture, timber harvest, urban runoff, and roads (ODEQ 2002, 2010; NCWCB 2010a).

The Klamath River has a relatively low alkalinity (less than 100 mg/L). The low alkalinity provides for a weak buffering capacity of Klamath River water. Photosynthesis removes carbon dioxide in the water (in the form of carbonic acid), which increases the pH. Natural alkalinity serves as a buffer to minimize the increase in pH caused by photosynthesis. In low alkalinity waters such as the Klamath River, this buffering capacity is frequently exceeded, and high pH values are observed during daytime hours when photosynthesis is occurring. The large daily variation of pH observed in the Klamath River is caused by photosynthesis in the low alkalinity water with pH exceeding 8.5 routinely at water quality stations located below Iron Gate Dam (NCWCB 2010a). Measurements of pH above 8.5 commonly occurred more than 25 percent of the time at many stations within the Klamath mainstem, with some stations exceeding a pH of 8.5 more than 40 percent of the time (NCWCB 2010a). The North Coast Regional Water Quality Control Board (NCWCB) sets the water quality objective for pH in the Klamath River at a maximum of 8.5 and a minimum of 7.0 (NCWCB 2010a).

Further exacerbating the effect of the naturally productive and weakly buffered system is the presence of regionally-high ambient summer air temperatures, and the resulting high heat load to the shallow and predominantly un-shaded Upper Klamath Lake. These naturally warm waters are the source of the Klamath River. Additionally, the east-west aspect of much of the Klamath River below Keno also makes it prone to heating, even within the steep gorges of some reaches of the river. In June, water temperatures at locations between Iron Gate Dam and above the confluence with the Scott River range from about 16 to 22° C, while in July, temperatures range

from 16 to 26° C (NCWCB 2010a). In August, the minimum temperatures are higher but the maximum temperatures are lower than in July.

The Klamath River mainstem is listed as impaired for organic enrichment/low dissolved oxygen (DO) from Iron Gate Reservoir to the Scott River, and for nutrient and temperature impairment in the remainder of the basin pursuant to Section 303(d) of the Clean Water Act (NCWCB 2010a). The Klamath River mainstem is listed for organic enrichment/low DO in the reaches upstream of Iron Gate Reservoir and downstream of the Scott River (NCWCB 2010a). Iron Gate and Copco Reservoirs and the intervening reach of the Klamath River were listed for the blue-green-algae toxin microcystin impairment produced by *Microcystis aeruginosa*; NCWCB 2010a). The 303(d) listings were confirmed in the Klamath River total maximum daily load (TMDL) analysis (NCWCB 2010a). The State Water Resources Control Board of California adopted a resolution on September 7, 2010, that approved the establishment of the following: (1) site specific DO objectives for the Klamath River; (2) an action plan for the Klamath River Total Maximum Daily Loads addressing temperature, DO, nutrients, and microcystin impairments in the Klamath River; and (3) a TMDL implementation plan for the Klamath and Lost River Basins (NCWCB 2010b). The TMDLs, implementation plan, and new DO objectives are currently in effect.

In summary, the solar exposure and seasonally high ambient air temperatures, coupled with the high levels of biological productivity and respiration that are enhanced by the high levels of bio-stimulatory nutrients, yield large volumes of organic matter, seasonally high water temperatures, daily low DO, and high pH levels in the Klamath River. These conditions have resulted in seasonally-degraded water quality that do not meet applicable water quality objectives and that impair designated beneficial uses. These natural background heat, nutrient, and organic matter loads to the Klamath River underscore the very limited capacity of the river to assimilate anthropogenic pollutants, and the necessity for establishing load allocations that would result in attainment of water quality standards.

Additional information on water quality, water quality objectives, and beneficial uses within the basin and the role the Project reservoirs play in the water quality problems of the basin see the 2007 FERC FEIS; the 2002 TMDL for Upper Klamath Lake; the 2010 TMDLs for the California and Oregon reaches of the Klamath River (ODEQ 2010, NCWCB 2010a, b); and the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

3.2 Biological Resources

3.2.1 Upper Klamath River System

3.2.1.1 Lost River Sucker and Shortnose Sucker

Lost River suckers and shortnose suckers were listed as endangered species on July 18, 1988 (53 FR 27130). Critical habitat for the Lost River sucker and the shortnose sucker was proposed in 1994, but was not finalized (59 FR 61744). However, critical habitat for the species was recently re-proposed and was finally designated in December 2012 (77 FR 73740). Designated critical habitat in the project area includes Upper Klamath Lake and the Keno Reservoir upstream of the Keno Dam. No reaches of the Klamath River, including the hydropower reservoirs downstream from Keno Dam, were included in the critical habitat designation. A recovery plan for the listed

suckers was issued in 1993 (USFWS 1993) and was recently revised (USFWS 2013a). Five-year status reviews for the two fishes were also recently completed (USFWS 2013 c, d).

Lost River sucker and shortnose sucker are part of a group of suckers that are large, long-lived, late-maturing, and live in lakes and reservoirs but primarily spawn in rivers and streams; although, Lost River suckers also spawn in springs in Upper Klamath Lake (USFWS 2012). Collectively, they are commonly referred to as lake suckers (NRC 2004; USFWS 2008, 2013a). The species grow rapidly in their first 5 to 6 years, reaching sexual maturity sometime between years 4 and 6 for shortnose suckers and 4 and 9 for Lost River suckers (Perkins et al. 2000). Both are very long-lived fish species, and have been aged to 55 years (Lost River sucker) and 33 years (shortnose sucker). Both species spawn in spring or riverine habitat from late February through May. They do not die after spawning and can spawn many times during their lifetime. Most of the suitable spawning habitat occurs upstream of Keno Reservoir in the lakes of the Upper Klamath basin. Soon after hatching from river gravels, sucker larvae drift downstream to the lakes. Once in the lake, larval suckers disperse to near-shore areas (Cooperman 2004, Cooperman and Markle 2004). Larval habitat is generally along the shoreline, in water 10 to 50 cm deep and associated with emergent aquatic vegetation, such as bulrush (Buettner and Scoppettone 1990, Cooperman and Markle 2004). Emergent vegetation likely provides cover from predators, protection from currents and turbulence, and abundant prey (including zooplankton, macroinvertebrates, and periphyton), but could also be a source of predators and parasites. As they grow during the summer many move offshore. Adult suckers generally use water depths 6 feet or deeper (Peck 2000, Banish et al. 2009).

At the time of listing, the Lost River sucker population in Upper Klamath Lake was estimated to be approximately 11,000 to 23,000 individuals (53 FR 27130). This early estimate was probably inaccurate, because statistical assumptions necessary for modeling population size were likely not met. Nevertheless, after review of available data, a special committee of the National Research Council concluded that: "For purposes of [Endangered Species Act] actions, the critical facts, which are known with a high degree of certainty, are that the fish are much less abundant than they originally were and that they are not showing an increase in overall abundance" (NRC 2004).

Because of the generally dispersed distribution of Lost River sucker and extensive habitat, accurate estimates of population size are extremely difficult to obtain (USFWS 2013c). Additionally, most populations have not been monitored sufficiently to produce adequate data to even attempt a reasonable estimate of population size. In 2011, Upper Klamath Lake monitoring detected or captured approximately 25,000 tagged Lost River suckers participating in the annual spawning congregations and runs (Brian Hayes, USGS, pers. comm. 2011). Estimates of what proportion of the total population is tagged are unavailable, but these data suggest that Lost River suckers likely number between 50,000 and 100,000 in Upper Klamath Lake (USFWS 2013c).

Long-term monitoring of Lost River sucker spawning populations in Upper Klamath Lake has revealed several trends in abundance and demography, including consistent annual declines in the number of individuals participating in the runs and an increasing trend in the average size (and therefore age) of spawning adults. Since the year 2002, Lost River sucker spawning congregations in Upper Klamath Lake have declined by approximately 45 percent across both the shoreline spring-spawning and the river-spawning subpopulations (Hewitt et al. 2011, Hewitt et al. 2012). Over this same period, the Upper Klamath Lake river-spawning population has

exhibited an increasing trend in length, presumably because recruitment to the adult population is minimal and the monitoring is tracking the same individuals year after year as they age.

Data on other Lost River sucker populations are extremely limited, but the minimal monitoring efforts completed for these populations imply very low numbers of individuals (USFWS 2013c). Although, mark-recapture monitoring has occurred on the Clear Lake Reservoir population for several years (Barry et al. 2007), capture rates of Lost River suckers overall are low. Slightly less than 500 tagged Lost River suckers were detected during the 2011 spawning run up Willow Creek from Clear Lake Reservoir. In 2007, approximately 35 percent of all individuals captured in Clear Lake Reservoir were less than 400 mm, a size indicative of relatively young adults, indicating that recruitment to the adult population was occurring or about to occur. However, as of 2011, only 25 percent of this group was still being detected in the spawning runs suggesting mortality rates for this young adult group of nearly 75 percent. The data now indicate that the adult population continues to age with few new individuals surviving to reproductive age to offset natural mortality. For this species, annual adult mortality rates greater than 15 – 20 percent can significantly decrease population stability and viability (USFWS 2013c).

Long-term monitoring of shortnose sucker spawning populations in Upper Klamath Lake has revealed several trends in abundance and demography, including consistent annual declines in the size of spawning runs and an increasing trend in the average size (and therefore age) of spawning adults, similar to those seen in Lost River suckers but more severe. Since the year 2001, the numbers of both males and females in shortnose sucker spawning congregations in Upper Klamath Lake have declined by approximately 60 percent for the river-spawning subpopulation (Hewitt et al. 2011). Over this same period, the Upper Klamath Lake spawning populations have exhibited an increasing trend in length (Hewitt et al. 2011). In 2011, Upper Klamath Lake monitoring detected or captured approximately 6,000 tagged shortnose suckers participating in the annual spawning congregations and runs (Brian Hayes, USGS, pers. comm. 2011). Estimates of what proportion of the total shortnose sucker population in Upper Klamath Lake is tagged are unavailable, but data suggest that it is less than 25,000 (USFWS 2013d).

Data on other shortnose sucker populations are extremely limited, but the minimal monitoring efforts completed for these populations imply very low numbers of individuals, mark-recapture monitoring has occurred on the Clear Lake Reservoir population for several years, capture rates are relatively low when compared to Upper Klamath Lake (USFWS 2013d).

All life stages of listed suckers have been found in the Link River in recent years, based on monitoring below Upper Klamath Lake and the Link River Dam. This habitat is primarily a migration corridor for large numbers of larval and juvenile suckers dispersing downstream from Upper Klamath Lake to Keno Reservoir (Gutermuth et al. 2000, USBR 2006). While juvenile suckers occupy habitat throughout the Link River in low numbers, the lower Link River is an important water quality refuge area for juvenile and adult suckers during periods of low DO in Keno Reservoir (USFWS 2007).

In Keno Reservoir between 2008 and 2011 approximately 200 Lost River suckers and 700 shortnose suckers were detected (Kyger and Wilkens 2010). Similarly, sampling within the reservoirs on the Klamath River downstream of Keno between 1997 and 1999 yielded

approximately 200 adult shortnose suckers and only three adult Lost River suckers (Desjardins and Markle 2000).

For additional information on the status and biology of the suckers, see the revised recovery plan for the suckers (USFWS 2013a), the joint BiOp (NMFS and USFWS 2013), the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013), and the 5-year status reviews for the listed suckers (USFWS 2013 c, d).

3.2.1.2 Other Fish Species

A wide variety of other native fishes are present in the upper basin, including four species of lamprey, three minnows, four suckers, four salmonids, and three sculpins, and of these the tui and blue chubs (*Siphateles bicolor* and *Gilia coerulea*, respectively) are the most numerous (Moyle 2002, NRC 2004). Non-native or introduced fish species in the upper basin consist of three minnows, two catfishes, four salmonids, one perch, and seven sunfish and bass species, and of these the fathead minnow (*Pimephales promelas*) is the most numerous (Moyle 2002, NRC 2004). Introduced fishes are considered by the Service as important threats to the survival of the endangered suckers (USFWS 2013a). For additional information, see the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

Upper Klamath Lake supports a trophy-sized fishery of trout, which appear adapted to the harsh water quality conditions and resistant to the myxosporidian parasite *Ceratomyxa shasta* (ODFW 2005, Buchanan et al. 2011). Behnke (1992) considers the strains of rainbow trout that predominate inland of the Cascade Range to be a separate subspecies from the coastal form. In the Klamath River Basin, he identifies the inland form as the Upper Klamath redband trout, *Oncorhynchus mykiss newberri*, while he considers steelhead and resident rainbow trout downstream of Upper Klamath Lake to be primarily coastal rainbow trout, *Oncorhynchus mykiss irideus*. He indicates that there may be two distinct groups of redband trout in the upper basin, one that is adapted to lakes and another that is adapted to streams. Classification of resident rainbow trout populations in the lower part of the basin appears to be less distinct, as Behnke (1992) reports that trout in some of the small tributaries downstream of Upper Klamath Lake have characteristics that are typical of inland redband trout.

3.2.2 Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs

3.2.2.1 Lost River Sucker and Shortnose Sucker

As outlined above, the Service has designated critical habitat above Keno Dam (USFWS 2012); areas below Keno Dam were excluded from designation of critical habitat because they do not presently contain habitat essential for the recovery of the listed suckers.

Adult Lost River sucker and shortnose sucker, numbering several thousand individuals, are in Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs. The number of endangered suckers found in Project reservoirs are highest in Keno Reservoir and diminishes downstream; there is no evidence that self-sustaining populations exist in any of the reservoirs (USFWS 2007). Although previous efforts have been made to survey suckers in the Klamath River reservoirs (Coots 1965, Beak Consultants 1987, Buettner and Scoppettone 1991, PacifiCorp 2004, and others cited in

USFWS 2007), the most intensive survey for suckers was performed in 1998 and 1999 by Oregon State University biologists (Desjardins and Markle 2000).

The shortnose sucker is the only lake sucker that occurs commonly in the reservoirs below Keno Dam (Buettner et al. 2006, Desjardins and Markle 2000). Although shortnose sucker adults are more abundant in Copco No.1 Reservoir, both Copco No.1 and Iron Gate Reservoirs contain primarily larger individuals than J.C. Boyle Reservoir which contains a wide range of size classes including juveniles (Buettner et al. 2006). These fish are probably expatriated from Upper Klamath Lake (Desjardins and Markle 2000). Unidentified sucker larvae have been caught in all three reservoirs, and shortnose suckers are known to spawn in the Klamath River above Copco No.1 Reservoir; although, there is no evidence that larvae and juveniles consistently survive in the reservoir because of a lack of suitable habitats, poor water quality, and predation by non-native fishes (Beak Consultants 1987, Buettner and Scoppettone 1991, Desjardins and Markle 2000l, NRC 2004, USFWS 2007).

The National Research Council (NRC 2004) concluded that sucker populations in Klamath River reservoirs below Keno Reservoir do not have a high priority for recovery because they are not part of the original habitat complex of the suckers and probably are inherently unsuitable for completion of life cycles of suckers. However, individuals within this management unit are not genetically distinct from other management units that are outside the action area (Dowling 2005). The Klamath River Management Unit possesses some conservation value because suckers in the reservoirs provide redundancy until the species can be recovered in other units and therefore, should be conserved. In other words, individual fish in these reservoirs provide some insurance against loss of other populations (NRC 2004) and could serve as "backup" to facilitate replacement of fish lost in other population if a catastrophic event happened. However, this value is limited because: (1) the listed suckers in the reservoirs are not self-sustaining, (2) there are relatively low numbers of individuals, (3) it will likely be difficult to capture suckers within the reservoirs, and (4) there is not adequate fish passage for listed suckers to return to Upper Klamath Lake where suitable spawning habitat exists, so these fish do not contribute to reproducing populations.

Iron Gate Reservoir was formed when Iron Gate Dam was constructed at RM 190.1 in 1962. The dam is 173 feet high and does not include any fish passage facilities. Water levels in the reservoir are normally maintained within 4 feet of full pool, and daily fluctuations due to peaking operation of the upstream J.C. Boyle and Copco developments are typically about 0.5 foot. Large areas of thick aquatic vegetation are common in shallow areas. Nearshore riparian habitat is generally lacking, except at the mouths of Jenny and Camp Creeks, where well developed riparian habitat occurs. Due to the cliff-like nature of shorelines, only very small isolated pockets of shallow water habitat for young suckers exist around the perimeter of the reservoir.

Listed suckers are known to occur infrequently in Iron Gate Reservoir (Desjardins and Markle 2000, USFWS 2007). The shortnose sucker made up only 1 percent of the total catch of adult fish, and no Lost River suckers were collected in Iron Gate Reservoir. Although over 1,000 sucker larvae were collected in the reservoir, no juvenile suckers were collected, which may reflect predation by non-native species such as yellow perch, largemouth bass, and crappie (Desjardins and Markle 2000). It is believed that sucker larvae and occasional adult suckers found in Iron Gate Reservoir had been washed downstream from Upper Klamath Lake, but are considered lost to the population as there is little in the way of suitable habitat in the reservoir to

complete their life-cycle (USFWS 2007). Predation rates on small suckers are probably also high in Copco Reservoir, where only three juvenile suckers were collected (USFWS 2007).

Water quality in the reservoirs during the summer is generally poor (FREC 2007, USDOI and CDFW 2013). In Copco and Iron Gate Reservoirs, large blooms of blue-green algae, such as *Aphanizomenon flos-aquae* and *Microcystis aeruginosa*, occur annually as a result of the effects of impoundment coupled with the large loads of nutrients and organic matter from upstream (FERC 2007, USDOI and CDFW 2013). The surface water temperatures of the reservoirs during summer also are warm. For additional information on the fishes in this area see the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

3.2.2.2 Other Fish Species

Fish collected in Iron Gate Reservoir during Oregon State University's 1998 and 1999 surveys were dominated by golden shiners (*Notemigonus chrysoleucas*), tui chub, pumpkinseed (*Lepomis gibbosus*), unidentified chubs (*Siphateles* or *Gilia*), yellow perch (*Perca flavescens*), unidentified larval suckers, and largemouth bass (*Micropterus salmoides*), which collectively comprised 95 percent of all fish collected. Netting efforts conducted in 2004 in Iron Gate Reservoir caught three species of fish, i.e., yellow perch, black crappie (*Pomoxis nigromaculatus*), and golden shiner with yellow perch consistently being the most abundant species caught (PacifiCorp 2004). Redband/rainbow trout also occur in Iron Gate Reservoir (FERC 2007).

The dominant fish species found in Project reservoirs are nonnative, warm water species that include yellow perch, various species of centrarchids (sunfish and bass), fathead minnows, chub species, bullheads (*Ameiurus* spp.), and golden shiners. Fish species found in the Klamath River reaches above Iron Gate Reservoir also include redband/rainbow trout, speckled dace (*Rhinichthys osculus*), Klamath smallscale sucker (*Catostomus rimiculus*), and marbled sculpins (*Cottus klamathensis*; ODFW 2005). With regard to redband/rainbow trout, see the discussion of Behnke (1992) above. The free-flowing reach of the Klamath River downstream of Keno Reservoir supports a trout fishery; although, the fishing season is closed during the summer because high water temperatures cause excessive mortality in a catch-and-release fishery (ODFW 2005, Buchanan et al. 2011). The J.C. Boyle bypass and peaking reaches also support good fisheries for redband/rainbow trout (ODFW 2005, Buchanan et al. 2011). For additional information on fish in these reservoirs see the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

3.2.3 Fishes of the Klamath River Downstream of Iron Gate Dam

The Klamath River downstream of Iron Gate Dam supports a variety of species of anadromous fish including fall-run and spring-run Chinook salmon (*Oncorhynchus tshawytcha*), coho salmon, steelhead (*Oncorhynchus mykiss*), green sturgeon (*Acipenser medirostris*), and Pacific lamprey (*Lampetra tridentata*; Moyle 2002, NRC 2004). Klamath River fall-run Chinook salmon contributes to important commercial, recreational, and tribal fisheries; steelhead supports a popular recreational fishery, and green sturgeon supports a small tribal fishery (NRC 2004, FERC 2007). Coho salmon that occur in the basin are part of the Southern Oregon/Northern

California Coast (SONCC) Evolutionarily Significant Unit (ESU)[3], which is federally-listed as threatened. Information on the abundance and distribution of anadromous fish, and the condition of aquatic habitat in the Klamath River and its tributaries is summarized below. In May 1997, NMFS listed SONCC coho salmon as threatened due to significant declines in population abundance and spatial distribution since the 1940's (62 FR 24588). NMFS designated critical habitat for SONCC coho downstream of Iron Gate Dam in May, 1999 (64 FR 24049).

In 1998, NMFS completed a status review for the Upper Klamath and Trinity Rivers Chinook salmon ESU (NMFS 1998). Based on the health of the fall-run populations within the ESU, NMFS concluded that the ESU was not at significant risk of extinction, nor was it likely to become endangered in the foreseeable future, and therefore, did not warrant listing under the ESA (63 FR 11482, 11493). In January, 2011, NMFS received a petition to list Chinook salmon in the Upper Klamath Basin under the ESA. NMFS found that the petition presented substantial scientific information indicating that the petitioned action may be warranted; therefore, NMFS convened a biological review team to assess the current status of the ESU (76 FR 20302). On March 27, 2012, NMFS issued a 12-month finding indicating that after a status review the petitioned action of listing Klamath River Chinook salmon was not warranted (77 FR 19597).

The NMFS considers all steelhead in the Klamath River Basin to be part of the Klamath Mountains Province ESU. Moyle (2002) describes two life history forms within this ESU, a summer run and a winter run. However, Hopelain (1998) concluded that there are three distinct runs of steelhead in the Klamath River Basin: (1) a winter run that enters the river from November through March; (2) a spring run that enters the river from March through June; and (3) a fall run that enters the river from July through October. Other reports appear to consider the fall run described by Hopelain (1998) to be a component of the winter run, based on a run timing of August through February given for winter-run steelhead by Barnhart (1994; as cited by NRC 2004).

The green sturgeon is an anadromous species that is known to range in nearshore marine waters and in estuaries from Mexico to the Bering Sea (Moyle 2002). NMFS has identified two distinct population segments (DPS)[4]: (1) a northern coastal segment consisting of populations spawning in coastal watersheds northward of and including the Eel River; and (2) a southern segment consisting of coastal or Central Valley populations spawning in watersheds south of the Eel River. The Klamath River Basin supports the largest spawning population of the species, which is included in the northern DPS and also includes green sturgeon populations spawning in the Umpqua, Rogue, and Eel Rivers. The NMFS published a final rule listing the southern DPS as threatened (71 FR 17757). The southern DPS green sturgeon includes populations south of the Eel River in Humboldt County. NMFS considers the northern DPS, which includes the Klamath River population, a "species of concern."

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[3] An ESU is a Pacific salmon population listed under the ESA that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species.

[4] A DPS is a vertebrate population (other than Pacific salmon) listed under the ESA that is discrete from other populations of the species and significant in relation to the entire species. The ESA provides for listing species, subspecies, or distinct population segments of vertebrate species.

Pacific lamprey are eel-like anadromous nest building fishes that, like salmon, die shortly after spawning and are found in Pacific coast streams extending from Alaska to Baja California (Moyle 2002). They currently occur throughout the mainstem Klamath River and its major tributaries downstream of Iron Gate Dam (Moyle 2002, Hamilton et al. 2005). The extent of their historical upstream distribution in the upper parts of the basin is uncertain, but Hamilton et al. (2005) noted that Pacific lamprey are capable of migrating long distances, and generally shows a spawning distribution similar to anadromous salmon and steelhead.

For additional information on fishes in the Klamath River below Iron Gate Dam, see the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

3.3 Socioeconomics and Environmental Justice

The FERC FEIS (2007) considered a six-county study area for PacifiCorp's socioeconomic analysis including Klamath, Jackson, and Curry Counties in Oregon, and Siskiyou, Humboldt, and Del Norte Counties in California. The FEIS included detailed information regarding demographic characteristics (population, race, ethnicity, employment, and income) and Project-related economic sectors (project employment, payroll, taxes, recreation, commercial fishing, tribal fishery, and irrigated agriculture). A detailed description of these resources is addressed in Section 3 of the FEIS. That information is incorporated herein by reference.

For purposes of the ITP issuance considered within this EA, evaluation of socioeconomic resources is linked to the HCP and the conservation or mitigation measures incorporated therein. Issuance of the ITP is contingent upon the HCP. The HCP measures include substantially reducing operations at the East Side and West Side developments. The other HCP measures are wide-ranging and include supporting activities to enhance the survival and recovery of listed sucker species by funding additional sucker recovery initiatives. These include: (1) supporting the Sucker Conservation Fund, and (2) extending funding support for the Williamson River Delta Restoration Project. In consideration of impacts from the proposed action, the Service assumes that local economies, services, and human resources could be affected by implementation of the HCP, most importantly, the Sucker Conservation Fund, and these impacts are discussed in Section 4 below. The Service assumes that most of these restoration projects would occur at Upper Klamath Lake and its major tributaries where suckers spawn, especially the Sprague and Williamson Rivers. These areas are part of designated Critical Habitat Unit 1 (USFWS 2012).

3.3.1 Population, Race, and Ethnicity

The U.S. Census data was queried to identify different race and ethnic distribution and is shown in Table 3-1. The total population within the six-county area was over 500,000.

Table 3-1. Race and Ethnic Distribution by County within the Permit Area based on the 2010 census.

County	Total Population	Percent White (alone)	Percent Racial Minority[a]	Percent Hispanic[b]
Curry County, OR	22,364	92.0	8.0	5.4
Klamath County, OR	66,380	85.9	14.1	10.4

Table 3-1. Race and Ethnic Distribution by County within the Permit Area based on the 2010 census.

County	Total Population	Percent White (alone)	Percent Racial Minority[a]	Percent Hispanic[b]
Jackson County, OR	203,206	88.7	11.3	10.7
Del Norte County, CA	28,610	64.7	35.3	17.8
Humboldt County, CA	134,623	77.2	22.8	9.8
Siskiyou County, CA	44,900	79.5	20.5	10.3

Source: U.S. Census Bureau, 2010

[a] Racial minority includes all individuals who report a race other than White Non-Hispanic.
[b] Hispanics may be of any race.

3.3.1.1 Employment

The U.S. Bureau of Labor Statistics (BLS) database was queried to determine the average unemployment rate in the six counties between January 2010 and January 2011 (December 2010 and January 2011 data is preliminary). Unemployment averages for the six counties during this time period are Del Norte 13.7 percent; Humboldt 11.9 percent; Siskiyou 19 percent; Curry 19 percent; Jackson 12.6 percent; and Klamath 13.9 percent (BLS 2011).

In its comments on the draft FERC EIS, the Yurok Tribe cites Bureau of Indian Affairs data indicating the unemployment rate was as high as 75 percent for Yurok and 40 percent for Hoopa Valley tribal members in 2001. It is estimated these high rates of unemployment persist to this day.

3.3.1.2 Indian Tribes

No federally-recognized Indian tribes are present within the permit area. However, there are five federally-recognized Indian tribes located downstream of Iron Gate Dam: the Quartz Valley Indian Community; the Karuk Tribe; the Yurok Indian Reservation; the Hoopa Valley Indian Reservation; and the Resighini Rancheria (San Diego State University, 2011). In addition, the federally-recognized Klamath Tribes are located upstream of the permit area near Upper Klamath Lake.

3.3.2 Recreation

3.3.2.1 Link River to J.C. Boyle Reservoir

The Link River segment of the Klamath River, an approximately 1-mile stretch downstream from Link River Dam, has only one developed recreational facility, the Link River Nature Trail. This 1.4-mile trail is for pedestrian use only and follows a gated access road on the west side of the Link River bypassed reach. The Link River Nature Trail is popular for sightseeing, hiking, walking, jogging, trout fishing, and bird watching (FERC 2007).

Lake Ewauna/Keno Reservoir area provides various recreational opportunities, including fishing, picnicking, boating (including competitive crew), sightseeing, and wildlife viewing. In the fall,

waterfowl hunting is a popular activity at the ODFW's, Klamath Wildlife Area, located at Miller Island. Although most of the land adjacent to the reservoir is privately owned, Keno Reservoir has several public access points, including: the City of Klamath Falls Veterans' Memorial Park/Boat Launch, Miller Island Boat Launch, and the Keno Recreation Area and Campground (PacifiCorp 2004).

The Klamath River downstream of Keno Dam provides about 5 miles of river suitable for whitewater boating; although, not much boating use is reported for this reach, which may be due to its limited access and short run length. The reach is rated class III difficulty, and flows acceptable for whitewater boating opportunities range from 1,000 to 4,000 cfs.

Redband trout fishing is allowed on the Klamath River downstream of Link River Dam between September 30 and June 16. The highest use in this area occurs from late winter through spring; this area is mainly used by residents of Klamath Falls. Catch records indicate that although angler success is consistently low, there is a greater percentage of larger-sized trout being caught in this reach than between J.C. Boyle Dam and the state line.

3.3.2.2 J.C. Boyle Reservoir to Iron Gate Dam

J.C. Boyle Reservoir has three public- recreational facilities at the reservoir including Pioneer Park, Sportsman's Park, and Topsy Campground. The J.C. Boyle reach of the Klamath River from J.C. Boyle Reservoir to Copco Reservoir extends about 16.4 river miles. Several campgrounds, public fishing, and boat access areas exist along this reach.

Copco No. 1 Reservoir has two publicly- available facilities: Mallard Cove and Copco Cove. These facilities provide day use access, and although they are not official campgrounds, camping occasionally occurs at both locations. The impoundment behind Copco No. 2 Dam is so small that it has no developed recreation facilities and no public access.

Iron Gate Reservoir has the highest concentration of recreation sites of all the developments associated with the PacifiCorp facilities. The developed facilities at Iron Gate Reservoir include a trail (Fall Creek Trail), five combination day use and campground areas (Jenny Creek, Camp Creek, Juniper Point, Mirror Cove, and Long Gulch), three day-use areas (Fall Creek, Overlook Point, and Wanaka Springs). Recreational opportunities include sightseeing, swimming, fishing, boating, and day and overnight use. Summer and weekend use is quite high at the reservoir, due to the popularity of bass tournaments, waterskiing, and camping and proximity to the Interstate 5 corridor.

3.3.2.3 Downstream of Iron Gate Dam

The Iron Gate Fish Hatchery, operated by CDFW with funding provided by PacifiCorp, is located just downstream of Iron Gate Dam and provides a day-use area adjacent to the hatchery with tables, an interpretive kiosk, restrooms, parking area, and an Americans with Disabilities-accessible trail to the river/fish return area. There is public access for launching small boats on the northwest side of the river via a graveled road accessed from Copco Road.

The main stem of the Klamath River 3,500 feet downstream of Iron Gate Dam is open to fishing year round. This reach attracts and supports several fishing outfitter services that focus on salmon, steelhead, and trout fisheries. The number of businesses that offer angling guide services can change from year to year, depending mainly on the annual status of the fall-run

Chinook salmon run in the lower Klamath River (FERC 2007). In addition, extensive whitewater boating and other standard boating activities occur in the Klamath River downstream of Iron Gate Dam to its confluence with the Salmon River (FERC 2007).

3.3.2.4 Wild and Scenic River Designation

Two components of the Klamath River are designated as Wild and Scenic Rivers (WSR), one in Oregon and the other in California (USDOI and CDFW 2013). The component in Oregon, between the J.C. Boyle powerhouse and the Oregon-California state line was designated a WSR in 1994. In California, the entire river downstream of the Iron Gate Dam was designated a WSR in 1981, because of the outstandingly remarkable anadromous fisheries, including that of salmon and steelhead (USDOI and CDFW 2013).

3.3.3 Cultural Resources

Cultural resources include historic properties listed or eligible for listing in the National Register of Historic Places (National Register). Historic properties include archaeological sites, districts (a term that includes historical and cultural landscapes), buildings, structures, or objects of archaeological or historical significance. Historic properties also may be resources of traditional religious and cultural importance to Native American tribes that meet the National Register criteria, known as Traditional Cultural Properties (TCPs). Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires Federal agencies to consider the effects of their activities on historic properties.

Cultural resources along the entire 260-mile length of the Klamath River from Upper Klamath Lake to the Pacific Ocean are described in FERC (2007) and USDOI and CDFW (2013). Sixty-eight sites in the area are recommended eligible for inclusion on the National Register (USDOI and CDFW 2013). The majority of these are prehistoric sites associated with Indian occupation and use of the area. These sites include small lithic scatters, traditional fishing sites, ceremonial sites, and larger village sites. The known historic sites within the project area are mostly related to the development of agriculture and hydroelectric power. Project dams and other associated facilities, because of their age, are also recommended eligible for inclusion on the National Register as a historic district (Kramer 2003, FERC 2007). Additional descriptions of ethnography and TCPs in the Klamath Basin are available in FERC (2007) and USDOI and CDFW (2013).

SECTION 4
Environmental Consequences

4.1 Effects from the No-Action Alternative

4.1.1 Water Resources

Under the no-action alternative, hydrologic conditions in the Klamath River Basin would remain similar to current conditions. Reclamation would continue to manage Upper Klamath Lake elevations to meet ESA requirements and contractual irrigation demands of Reclamation's Klamath Project. Downstream of Link River Dam, surface-water volumes would continue to be controlled by Reclamation's operations, and flows would continue to be passed through the spill gates and/or PacifiCorp's East Side and West Side facilities. Flow releases would continue to be regulated by existing operational plans, developed in consultation with the Service and NMFS, to protect the ESA-listed Lost River and shortnose suckers, coho salmon, and their designated critical habitats, and would be consistent with the current joint BiOp (NMFS and USFWS 2013).

Hydrologic conditions from Keno Reservoir downstream through Iron Gate Dam would remain similar to current conditions, governed by existing ESA requirements and agreements between PacifiCorp, Reclamation, ODFW, NMFS, and the Service:

- The contract between PacifiCorp and Reclamation that provides for Keno Reservoir water surface elevations would continue to remain in effect.
- The minimum flow requirement below Keno Dam would continue to be 200 cfs per a cooperative agreement with ODFW.
- Fluctuations at J.C. Boyle Reservoir would continue to be 3.5 feet under typical operations, with average daily fluctuations of approximately 1 to 2 feet.
- Releases from J.C. Boyle powerhouse during peaking operations would continue to be ramped up to either one turbine operation (up to 1,500 cfs) or two turbines operation (up to 3,000 cfs). Non-generation base flows in the J.C. Boyle peaking reach would continue to be about 320 to 350 cfs.
- Water levels in Copco Reservoir would continue to be maintained within 6.5 feet of full pool (elevation 2,607.5 feet) and daily fluctuations in reservoir water levels of about 0.5 foot would continue to occur due to peaking operation of the Copco No. 1 powerhouse and variance in the inflow from the J.C. Boyle peaking reach.
- PacifiCorp would continue to maintain a minimum flow release of 5 cfs between Copco No. 2 Dam and Iron Gate Reservoir.
- Minimum flow releases from Iron Gate Dam would continue to occur consistent with the joint BiOp (NMFS and USFWS 2013) on Reclamation's operation of the Klamath Project.

Water-quality conditions would continue to be similar to current conditions, including the inflow of nutrient-enriched water from Upper Klamath Lake and agricultural return flows between Link

River Dam and Keno Dam. Activities such as grazing, irrigated agriculture, timber harvest, roads and urban runoff , and point-source discharges would continue to affect Klamath River water quality. The levels and trends in water quality constituents (e.g., pH, Klamath River Basin, and water temperature) would be similar to current conditions; however, some improvements are anticipated as a result of implementation of actions to comply with Oregon's Department of Environmental Quality TMDLs for the Oregon portion of the basin (ODEQ 2002, 2010) and the recently approved TMDLs for the California portion of the Klamath River (NCWCB 2010a, b).

Renewable Energy

Under the no-action alternative, impacts on renewable energy generation would be unchanged. The combined hydroelectric capacity of the East Side and West Side facilities is only 3.8 megawatts (MW), while that of the entire Klamath Hydroelectric Project is 169 MW (FERC 2007). The Applicant already undertakes seasonal shutdown of the East Side and West Side hydroelectric developments from July 15 to November 15 to reduce impacts to listed suckers (PacifiCorp 2013). The Service assumes this shutdown period, which already reduces renewable energy production from the East Side and West Side developments, would continue under the no-action alternative.

4.1.2 Biological Resources

4.1.2.1 Upper Klamath River System

Entrainment at the East Side and West Side Facilities

Under the no-action alternative, entrainment of listed suckers at the East Side and West Side facilities would continue to occur from their downstream movement into Project diversions or spillways by drift, dispersion, and volitional movement. Effects to fish associated with entrainment may include harassment, injury and mortality as fish pass through turbines or over spillways. Turbine mortality would take place as a result of pressure changes, shear stress, cavitation, turbulence, strike, and grinding (Cada 2001). Spillway mortality of entrained fish can occur from strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water (Clay 1995). Operational water releases at Link River Dam also would continue to result in take of listed suckers; however, those effects would be the responsibility of Reclamation and are covered by the 2013 joint BiOp (NMFS and USFWS 2013).

The Service's HCP BiOp (USFWS 2013b) contains a detailed description of methods used to estimate entrainment at the East Side and West Side developments, and in the Applicant's downstream facilities. Based on those calculations, the Service estimates that approximately 730,000 larvae, over 60 juveniles, and less than 5 adult suckers annually die from entrainment by turbines, flow lines, and spillways associated with the East Side and West Side developments (USFWS 2013b, Table 4.1). These mortality rates are anticipated to continue under the no-action alternative.

Currently, the number of larval suckers that are estimated to be killed through entrainment represents a small proportion of the potential fecundity of the breeding population in Upper Klamath Lake. Each female shortnose sucker and Lost River sucker can produce up to 72,000 and 200,000 eggs per year, respectively (Perkins et al. 2000), and there are thousands of spawning females in the population (Janney et al. 2008). Based on the monitoring

Table 4.1. Estimates of sucker mortality from operations at the PacifiCorp's seven Project facilities under current conditions (with East Side and West Side facilities operational) and with the implementation of the proposed HCP (i.e., without operating turbines at the East Side and West Side facilities, but maintaining 80 cfs flow through the East Side flow line). Source: USFWS (2013b).

Sucker Life Stage and Facility	Estimated Mortality without the HCP			Estimated Mortality with the HCP		
	Turbine	Spillway and Flow Line	Reservoir Fluctuations & Stranding	Turbine	Spillway and Flow line	Reservoir Fluctuations & Stranding
Eggs						
J.C. Boyle Dam	0	0	10,000	0	0	10,000
Larvae						
East Side/West Side	731,161	0	0	0	16,573	0
Keno Dam	0	8,208	400	0	9,554	456
J.C. Boyle Dam	9,452	48	3,000	11,001	56	3,492
Copco No. 1 Dam	13,268	0	200	13,394	0	233
Copco No. 2 Dam	9,951	0	20	10,045	0	20
Iron Gate Dam	731	1	100	738	1	101
Total	764,563	8,257	3,720	35,178	26,184	4,302
Juveniles						
East Side/West Side	0	66	0	0	66	0
Keno Dam	0	65	20	0	65	20
J.C. Boyle Dam	77	0	205	77	0	205
Copco No. 1 Dam	6	0	50	6	0	50
Copco No. 2 Dam	5	0	0	5	0	0
Iron Gate Dam	1	0	0	1	0	0
Total	89	131	275	89	131	275
Adults						
East Side/West Side	4	0	0	0	0	0
Keno Dam and downstream	0	0	0	0	0	0
Total	*4*	*1*	*0*	*0*	*1*	*0*
Grand Total	764,656	8,388	13,995	35,267	26,315	14,577

done in Upper Klamath Lake by the USGS, it is likely that adult sucker populations number less than 25,000 to greater than 50,000, depending on the species (NMFS and USFWS 2013). The effect of this loss is uncertain, but it is likely that its impact on the population as a whole is low because mostly larvae are affected and they are produced annually in large numbers.

False Attraction at Project Tailraces

Project facilities do not presently possess tailrace barriers to prevent suckers from being falsely attracted to tailrace discharges. Due to the relatively low numbers of listed suckers in the lower reservoirs, along with lack of spawning habitat, the Service considers the effects of false attraction flows to be an issue only for listed suckers moving out of Keno Reservoir into the Link River as a result of flows at the East Side and West Side powerhouses. Under the no-action alternative, false attraction flows could continue to cause an upstream migration delay of listed suckers that may prevent or delay fish from reaching suitable spawning habitat when they are ready to spawn or when conditions are optimal for survival. This reduced productivity likely would have little impact on the population because of the high reproductive output of the spawning population and the small number of individuals that would not contribute.

Ramp Rate Effects

Hydroelectric facilities typically cause variations in flow rates and water levels (called changes in stage) downstream over times as short as minutes to hours. The rate at which these changes occur is called the "ramp rate" or "ramping." The ramping rate is the allowable rate of change in stage or flow between regulated flow levels. The faster the down-ramping rate, the more likely fish become stranded along the shore. In most cases, up-ramping of flows typically is not an issue regarding fish stranding (FERC 2007). Under current operations, PacifiCorp follows established ramping rates (as described above) to control the rate of change or fluctuation in river flow levels downstream of Project facilities.

Most of the research and evaluation regarding the effects of flow fluctuations on fish has involved effects to salmon and steelhead (FERC 2007). No stranding vulnerability information is available specifically for suckers; however, the Service (USFWS 2007) indicated that rapid flow reductions can adversely affect fish populations, including sucker, by dewatering spawning, rearing, or foraging habitat and may strand fish. Smaller larvae and juvenile fish (less than about 50 mm long) are considered most vulnerable to stranding due to weak swimming ability and their habitat preference for shallower, near-shore habitats.

The population-level effects to suckers as a result of stranding are unknown, but are likely low because of the small number of individuals affected relative to the total population. The Service also concluded that ramping effects associated with PacifiCorp's Project facilities have minimal impacts on Lost River and shortnose suckers within the context of their overall population size and geographic range (USFWS 2007). This conclusion was based on the assumption that the river and reservoir reaches occupied by these species, particularly downstream of Keno Dam, are not part of the original habitat complex of these sucker species and probably is inherently unsuitable for completion of their life cycles because of habitat conditions and abundance of predators, as discussed above.

Migration Barriers

Within the distribution of the listed suckers in the Klamath River, there are three fish ladders – one on the Reclamation-owned Link River Dam, and one each on PacifiCorp's Keno and J.C.

Boyle Dams. In 2005, Reclamation completed construction a new fishway at the Link River Dam that meets recommended design criteria and guidelines for upstream fish passage of ESA-listed suckers (USFWS 2005, ODFW 2006). However, the design of the fishways on Keno and J.C. Boyle Dams does not accommodate upstream passage of listed suckers because they were built for passage of trout that have higher burst swimming speeds, can leap, and likely have greater stamina than suckers.

Since 2008, Reclamation has conducted sampling in Lake Ewauna each spring in an attempt to quantify the relative abundance and distribution of suckers and evaluate sucker use of the Link River Dam fish ladder (Kyger and Wilkens 2010). Captured suckers have been implanted with passive integrated transponder (PIT) tags that can be used to identify individual fish. Kyger and Wilkens (2010) indicated that most of the PIT-tagged sucker detections in the fish ladder (a total of 26 suckers) occurred in late May during 2009 and early June during 2010. They suggest that these peaks in sucker movement through the ladder in late spring coincided with increases in temperature (approaching 18º C) and decreases in water quality that typically occur in Lake Ewauna at that time of year. Nearly all detections of PIT-tagged suckers in the fish ladder occurred at night or early morning or late evening, suggesting the preference of suckers to move during the night or in low-light conditions. Kyger and Wilkens (2010) indicated that there were no relationships between discharge from Link River Dam or discharge trend and sucker use of the fish ladder.

To address fish passage conditions in the Link River below the dam, Reclamation conducted a hydraulic modeling study (USBR 2005). The Service (USFWS 2007) indicated that current operation of the East Side and West Side power diversion at Link River Dam likely restricts adult sucker migration at flows less than about 300 cfs in the Link River bypass reach because of the location of the turbine outlets and at flows greater than 3,000 cfs because of the flow hydraulics in the cascade reach.

Under the no-action alternative, the remaining migration barriers described above would be unchanged.

Degradation and Loss of Habitat

Instream Flows

The ecological structure and functioning of aquatic, wetland, and riparian ecosystems depends on the hydrologic regime, or pattern and quantity of water flowing through the system. Intra-annual variation in hydrologic conditions plays an essential role in the dynamics among species within such communities through influences on reproductive success, natural disturbance, and biotic interactions (Poff and Ward 1989). Modifications of hydrologic regimes can adversely affect the composition, structure, and functioning of aquatic systems (Bunn and Arthington 2002).

The 1.2-mile long Link River is primarily used as a migration corridor for suckers moving between Keno Reservoir and Upper Klamath Lake (USBR 1996, USFWS 2007). Juvenile suckers have been sampled in Link River throughout the year, suggesting that this area may provide some rearing habitat (USBR 1996, 2000). The minimum flow requirements below Link River Dam of 250 cfs, which would continue under the no-action alternative, likely avoids significant losses of habitat that would result at lower flows (USFWS 2007).

Other Fish Species

Upper Klamath Lake supports a trophy-sized trout fishery and a small fishery for yellow perch. Under the no-action alternative, the Service anticipates these fisheries would be similar to current conditions.

4.1.2.2 Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs

Entrainment

There are currently no downstream fishways (screen and bypass facilities) to prevent entrainment of suckers and other fishes at the Copco No. 1, Copco No. 2, and Iron Gate Dam developments. However, the J.C. Boyle development does have screen and bypass facilities, but how well they function is unknown. Turbine entrainment studies were completed at the East Side and West Side developments from 1997 to 1999 (Gutermuth et al. 2000), but entrainment data are lacking at the other facilities. The Service used literature reviews and extrapolations from other entrainment studies to estimate the expected turbine and spillway entrainment at the Klamath facilities, as well as the expected mortality of suckers due to this entrainment. The HCP BiOp (USFWS 2013b) contains a detailed description of methods and calculations used by the Service to estimate entrainment. Estimated annual entrainment mortality of Lost River and shortnose suckers, including spillway and flow lines, at Keno, J.C. Boyle, Copco 1 and Copco 2, and Iron Gate Dams equals approximately 42,000, most of which are predicted to be larvae. We expect that this estimated level of entrainment would continue to occur under the no-action alternative. Because the abundance of the suckers in PacifiCorp's reservoirs progressively decreases downstream (Desjardins and Markle 2000), we therefore assumed the numbers of suckers entrained at Project facilities also decreases (USFWS 2007, 2013b).

Ramp Rates Effects

The Service (USFWS 2007) indicated that current operation of Keno Dam with existing ramping rates may strand an unknown number of sucker larvae dispersing downstream during the spring and summer, and juveniles dispersing downstream throughout the year. PacifiCorp (2004) concluded that fish stranding and mortality due to ramping are unlikely in the 4.3-mile long J.C. Boyle bypass reach due to the relatively constant flow conditions in the bypass reach. However, the Service (USFWS 2007) indicated that there could be ramping-related impacts on shortnose suckers in the 17-mile long J.C. Boyle peaking reach (downstream of the J.C. Boyle powerhouse). In the peaking reach, flow fluctuations from peaking operations can occur daily when flow in the Klamath River entering J.C. Boyle Reservoir is less than about 3,000 cfs (PacifiCorp 2004).

The Service (USFWS 2013b) estimates a stranding-related loss of up to 10,000 sucker eggs and 1,000 sucker larvae per year as a result of shortnose suckers that ascend from Copco Reservoir to spawn in the lower portion of the peaking reach that is affected by flows from J.C. Boyle Dam. Because water levels between Copco No. 1 Dam and Copco No. 2 Dam rarely fluctuate more than a few inches per day, stranding below Copco No. 1 Dam is minimal. Ramping of flows in the bypass reach between Copco No. 2 Dam and powerhouse is infrequent and occurs only when maintenance requires spill at the dam, during a forced outage, or when inflows are greater than the hydraulic capacity of the powerhouse. However, the Service (USFWS 2007) suggested that some downstream dispersal and stranding is possible below Copco No. 2 Dam in the bypass reach. We expect that this reported level of stranding would continue to occur under the no-action alternative. Ramp-rate effects on listed suckers below Iron Gate Dam are unknown but

likely negligible, since listed suckers have not been observed in the Klamath River below the dam.

Reservoir Fluctuation Effects

Fluctuating reservoir levels can adversely affect fish directly if stranding occurs along the shoreline, and indirectly if a "dewatered zone" occurs around the edges of the reservoir decreases habitat availability. The occurrence and severity of these depends on the magnitude and timing of the reservoir fluctuations and the life-stage involved (USFWS 2007). The Service estimates of the number of listed suckers that could be stranded at Project facilities due to fluctuating reservoir elevations at approximately 2,500 per year, most of which are larvae (USFWS 2013b). These losses would likely continue to occur under the no-action alternative.

Because the effects of reservoir fluctuations are less than the ramping effects associated with Project facilities, it is assumed that the adverse effects associated with reservoir fluctuations on Lost River sucker and shortnose sucker would be minimal when considered within the context of their overall population size and geographic range. This is based on the Service's assumption that the reservoir reaches in the Klamath River occupied by these species, particularly downstream of Keno Dam, is not part of the original habitat complex of these sucker species and probably is inherently unsuitable for completion of their life cycles (USFWS 2007).

Migration Barriers

The current fish ladders at Keno and J.C. Boyle Dams likely prevent or impede the upstream migration of suckers in the system because they were designed for trout; however, the need for a new ladder at Keno Dam is unknown (USFWS 2007). This is because of a lack of information or observations on suckers downstream of Keno Dam or migrating upstream through the Keno ladder (USFWS 2007). We also concluded that operation of the J.C. Boyle fish ladder has no documented adverse impact to adult Lost River and shortnose suckers because none appear to attempt upstream migration to the dam to spawn or return to upstream rearing areas (USFWS 2007). One reason for this is the fact that the river between Keno Dam and J.C. Boyle Reservoir consists of a steep gradient reach were water velocities are high and suckers are therefore likely to have difficulties migrating upstream during the spring spawning season when flow velocities are still relatively high.

There are no upstream fishways at Copco No. 1, Copco No. 2, and Iron Gate Dams; however, the Service concluded that there are currently no documented effects on upstream sucker spawning migrations at these facilities because listed adult suckers are rare or absent in Copco No. 2, uncommon in Iron Gate Reservoir, and absent in the Klamath River below Iron Gate Dam (USFWS 2007).

Because the river and reservoir reaches occupied by these species, particularly downstream of Keno Dam, are not part of the original habitat complex of these sucker species and probably are inherently unsuitable for completion of their life cycles, it is assumed that the impacts caused by migration barriers under the no-action alternative would be minimal when considered within the context of their overall population size and geographic range. This is consistent with the conclusions reached by the Service in the 2007 FERC BiOp (USFWS (2007).

Degradation and Loss of Habitat

The ecological structure and functioning of aquatic, wetland, and riparian ecosystems depends on the hydrologic regime, or pattern and quantity of water flowing through the system. Intra-annual

variation in hydrologic conditions plays an essential role in the dynamics among species within such communities through influences on reproductive success, natural disturbance, and biotic interactions (Poff and Ward 1989), and modifications of hydrologic regimes can adversely affect the composition, structure, and functioning of these systems (Bunn and Arthington 2002).

Under the no-action alternative, adverse impacts on listed suckers from degradation and loss of habitat due to low instream flows are likely low. This is consistent with our conclusions contained in the Service's 2007 FERC BiOp (USFWS 2007) indicating that while current operation of Project developments and associated minimum instream flow requirements below Keno, J.C. Boyle, and Copco No. 2 Dams may affect individual suckers in the Project area, these effects are considered minimal within the context of the overall population size and geographic range of the Lost River and shortnose sucker because these reaches are not part of the original habitat complex of the listed suckers and are inherently unsuitable for completion of life cycles of these suckers (USFWS 2007).

Effects to Other Fish Species

Under the no-action alternative, threats to other fish species will likely be unchanged. Entrainment of fishes and resultant turbine and other forms of mortality will continue to occur at all Project facilities. Entrainment studies by Gutermuth et al. (2000) showed that minnows (primarily blue chubs and fathead minnows) were the most numerous species entrained at the East Side and West Side facilities. Entrainment of fishes at other Project facilities is unstudied, but would likely include crappie and yellow perch, which are common in Copco and Iron Gate Reservoirs. Project operations will also continue to adversely affect redband trout upstream of Iron Gate Dam as a result of entrainment, by blocking migrations, reducing the amount of available habitat, degrading water quality, as well as other effects (FERC 2007, USDOI and CDFW 2013).

4.1.2.3 Klamath River Downstream of Iron Gate Dam

Listed suckers have not been observed below Iron Gate Dam. This area is outside the geographic range of the Lost River and shortnose sucker and is not part of the original habitat complex of the listed suckers for completion of life cycles (USFWS 2007).

Other Fish Species

Operations of PacifiCorp's facilities have limited effects on the availability of flows released from Iron Gate Dam. Under the no-action alternative, it is expected that releases of instream flows and ramping rates from Iron Gate Dam will adhere to flow management commitments contained in the current NMFS BiOp for operation of Reclamation's Klamath Project (NMFS and USFWS 2013). Therefore, under the no-action alternative, flows resulting from these measures are expected to maintain the hydraulic conditions needed to support coho salmon.

Under the no-action alternative, water-temperature patterns below Iron Gate Dam would be similar to current conditions. The presence of Project reservoirs will continue to cause a "thermal lag" of water temperatures released from Iron Gate Dam compared to the same location under a hypothetical "without-dam" (i.e., river-only) scenario. The natural seasonal trend of warming temperatures in the spring and cooling temperatures in the fall are expected to be "lagged" about 2 to 4 weeks with the existence of the reservoirs compared to a hypothetical "without-dam" scenario (FERC 2007). This thermal lag will continue to affect the timing (or periodicity) of anadromous salmonid life stages below Iron Gate Dam, or affect anadromous

salmonid egg pre-spawn viability and juvenile growth (bioenergetics), foraging, and fitness (FERC 2007, USDOI and CDFW 2013). Other temperature-sensitive fish species would experience similar effects.

Under current conditions, DO levels in the Klamath River periodically drop below 85 percent saturation for approximately 6 miles downstream of Iron Gate Dam during summer and early fall (FERC 2007). NMFS (2007) stated that these low DO conditions limit the period (mainly at night) during which anadromous salmonid juvenile fish leave refuge habitat to forage within the mainstem Klamath River. PacifiCorp is in the process of implementing turbine venting (per Interim Measure 3 of the KHSA) to improve DO conditions in waters released from the Iron Gate powerhouse to the Klamath River downstream. Under the no-action alternative, it is assumed that this turbine venting would be continued and will improve DO conditions in the 6 miles downstream of Iron Gate Dam that support anadromous salmonids and other sensitive native fishes.

Additional information on anadromous fishes and other fish species downstream of Iron Gate Reservoir can be found in the 2007 FERC FEIS, the 2013 joint NMFS and USFWS BiOp, and the final EIS/EIR developed for evaluating the impacts of removal of the four hydropower dams on the Klamath River (USDOI and CDFW 2013).

4.1.3 Socioeconomics and Environmental Justice

4.1.3.1 Employment

We anticipate that the no-action alternative would continue to influence social and economic conditions in the six-county study area in the same manner as current conditions. Employment conditions would remain the same, which indicates that other demographic characteristics (e.g., population, race and ethnicity, and income) are unlikely to change. This includes both direct (Project) employment conditions (e.g., worker salaries and taxes) and the regional economic conditions (e.g., service-sector employment) associated with these Project jobs.

4.1.3.2 Recreation

The current levels of recreation use (e.g., sport fishing, whitewater boating) and commercial fishing or tribal fishing within the area analyzed are not expected to change under the no-action alternative. As a result, there would be no changes under the no-action alternative to associated social and economic conditions related to recreational and fishing activities.

4.1.3.3 Environmental Justice

The Service anticipates that current conditions affecting minority or low income populations would not change as a result of the no-action alternative. The no-action alternative would not involve activities resulting in changes to existing conditions affecting the standard of living for current or future minority and low-income residents in the area. As such, we do not expect that minority and low income populations to be disproportionally adversely affected by the no-action alternative. Therefore, there would be no environmental- justice impacts under the no-action alternative.

4.1.3.4 Cultural Resources

The Service believes the no-action alternative would not change factors affecting cultural or historic resources, including sites, districts, structures, or objects listed in or eligible for listing in the National Historic Registry. Under the no-action alternative, threats to historic or cultural

properties would be unchanged and existing threats to these resources from current operation of the Project, including operation of the East Side and West Side developments, would continue. These threats relate to the potential for modification or disturbance to historic or cultural resources. Future actions unrelated to ITP issuance may occur that could affect cultural and historic resources (e.g. Project decommissioning and removal), but these effects, which would be assessed consistent with the requirements of Section 106 of the National Historic Preservation Act under a FERC decommissioning process, would not be more likely to occur under no-action.

4.2 Effects from the Proposed Action

4.2.1 Water Resources

Shutdown of East Side and West Side Developments

Covered Activities under the proposed action include ceasing power generation at PacifiCorp's East Side and West Side developments. As a result of substantially reducing operations at these facilities, water not diverted into the East Side and West Side water conveyances for hydroelectric generation would instead be released at the Link River Dam. Therefore, water flowing between Link River Dam and the powerhouse tailraces, a distance of about 1 mile, would increase, and turbulence at the East Side and West Side powerhouse tailrace outfalls would be substantially reduced.

All flow releases would continue to be regulated by existing operational plans, developed in consultation with the Service and NMFS, to protect the ESA-listed Lost River sucker, shortnose sucker, coho salmon, and their designated critical habitats. Reclamation would continue to manage Upper Klamath Lake elevations to meet ESA requirements, tribal trust responsibilities, and contractual irrigation demands of the Klamath Project and PacifiCorp would continue to operate Link River Dam based upon operational directives from Reclamation. Downstream of Link River Dam, surface water volumes would continue to be controlled by Reclamation operations, but under the proposed action flows would be passed through the Link River Dam spillway gates rather than through hydroelectric turbines at the East Side and West Side facilities. These flow releases would be implemented by Reclamation's actions at the Link River Dam and not by PacifiCorp's operation of the East Side and West Side developments. Although curtailed operations at East Side and West Side would increase spillway mortality of suckers at Link River Dam, the net result is an overall substantial reduction (approximately 87 percent) in the mortality of listed suckers entering Lake Ewauna.

Hydrologic conditions from Keno Reservoir downstream through Iron Gate Dam would remain similar to current conditions, governed by existing ESA requirements and agreements between PacifiCorp and Reclamation, ODFW, NMFS, and the Service. Substantially reducing operations of the East Side and West Side developments and using the Link River Dam exclusively to manage flows in the Link River would not measurably affect hydrology in the Keno Reservoir or downstream in the Klamath River.

Water quality conditions under the proposed action would be similar to the no-action alternative. Curtailing operations of the East Side and West Side facilities would result in greater discharge of Upper Klamath Lake water into the 1-mile portion of Link River between the Link River Dam and the East Side and West Side powerhouse tailraces, which could have some beneficial effects, e.g., increased flow and DO levels in this reach and at the mouth of the Link River. Water quality conditions would be unchanged; however, in all other downstream areas.

Renewable Energy

The Service does not anticipate that the proposed action would substantially affect the Applicant's ability to meet the region's electric power needs over the next 10 years. The combined hydroelectric capacity of the East Side and West Side facilities is only 3.8 megawatts (MW), while that of the entire Klamath Hydroelectric Project is 169 MW (FERC 2007). Thus, this shutdown only represents a 2 percent loss of power production. Additionally, the Applicant already undertakes seasonal shutdown of the East Side and West Side hydroelectric developments from July 15 to November 15 to reduce impacts to listed suckers (PacifiCorp 2013), which reduces renewable energy generation from the Project. Additionally, the Applicant has made substantial increases in its generation capacity through the purchase of contracted and company-built wind-powered energy amounting to 1,400 MW since 2006 (PacifiCorp 2011). Based on this, the Service does not anticipate that the loss of 3.8 MW of capacity will have a significant adverse effect on the region's power supplies over the term of this ITP. The Service also assumes that under the proposed action, shutdown of the East Side and West Side developments would have negligible effects on overall renewable energy generation because of the small amount of electricity produced by these facilities and the Applicant's on-going investments in wind power. However, the FERC (2007) stated that if any portion of the Project was decommissioned, the energy and capacity would need to be replaced to meet future energy needs.

Sucker Recovery Initiatives

Implementation of the sucker recovery initiatives as part of the HCP could cause temporary and localized water-quality degradation from restoration activities (e.g., increased turbidity), but overall these initiatives would either not influence water-quality conditions in the Upper Klamath Basin. For example, a potential recovery project funded under the HCP might consist of adding gravel to increase spawning habitat at one or more of the shoreline areas of Upper Klamath Lake where the suckers now spawn. Such a project might temporarily increase suspended sediment, but would not affect lake-wide water quality.

4.2.2 Biological Resources

4.2.2.1 Upper Klamath River System

Shutdown of East Side and West Side Developments

Adverse impacts to suckers and other fishes associated with operation of the East Side and West Side facilities would be substantially reduced upon shutdown within 30 days of ITP issuance. This would benefit these species by reducing mortality at these facilities by as much as 90 percent. False attraction flows at the tailrace discharges would also be substantially reduced. Mortality of listed suckers could still occur, as a result of flow releases over the spillway at Link River Dam, which is the responsibility of Reclamation (USFWS 2007).

The near complete shutdown of the East Side and West Side facilities under the proposed action would reduce annual mortality of suckers of all life stages by the Project by 90 percent, from approximately 787,000, estimated current total mortality, vs. 76,000 mortality anticipated to occur under the proposed action (Table 4.1). Most of this reduction is due to fewer larvae being entrained by the turbines at the East Side and West Side facilities.

The Service has determined (USFWS 2013b) that the adverse effects associated with Project operations under the proposed action are unlikely to have a substantial adverse effect on the survival and recovery ability of the Lost River and shortnose suckers because: (1) the amount of

take under the proposed HCP is reduced by 90 percent from historic levels; (2) most of the authorized take is of sucker eggs and larvae that are produced in large numbers annually; (3) sucker populations in the hydropower reservoirs are not self-supporting and are likely dependent on upstream source populations to maintain themselves; (4) were it not for the reservoirs that are part of the Project, habitat for the Lost River and shortnose suckers would not exist below Keno Dam; 5) none of the Lost River and shortnose suckers that occur in the reservoirs below Keno Dam have adequate upstream access, and therefore they do not contribute to reproducing populations upstream that are essential for recovery; and (6) adverse effects to designated critical habitat by the Project are confined to Keno Reservoir, which represents only about one percent of the total amount of designated critical habitat for the two species.

Sucker Recovery Initiatives

The actions undertaken through the Sucker Conservation Fund would mitigate the impacts of the taking caused by entrainment at Project dams downstream of Link River Dam that cannot be avoided. These actions also would contribute to meeting the biological goals and objectives of the revised sucker recovery plan (USFWS 2013a) by mitigating the impacts of take associated with false attraction, instream flows and habitat availability, stranding (reservoir fluctuations), and migration barriers. As previously described, the effect of the take of suckers reasonably attributable to Project operations is low because few fish, relative to the population as a whole, would be taken. In addition, most of the take by the Project would occur downstream of Keno Dam and where individual suckers do not contribute to the current self-sustaining populations of listed sucker species.

Actions undertaken through the Sucker Conservation Fund would be directed by the Service to support the conservation goals and objectives in the revised sucker recovery plan (USFWS 2013a). Decisions on specific projects to be implemented under the Sucker Conservation Fund have not yet been made. However, the likely projects will be prioritized and selected based on actions recommended in the revised recovery plan (USFWS 2013a), and as otherwise recommended by the Klamath Sucker Recovery Implementation Program. For example, projects being considered for funding include enhancement of spawning areas along the east side of Upper Klamath Lake and improvement of juvenile rearing areas that could provide substantial conservation benefits. Also, these funds may leverage and be combined with funds from other sources to implement larger projects with even greater benefits.

The Sucker Conservation Fund provides the flexibility to focus the mitigation on actions that create the greatest benefit for suckers, regardless of the proximal cause. Therefore, this measure is expected to mitigate the impact of take by making habitat improvements or otherwise increasing survival and recruitment to the adult population (e.g., trapping and transporting adults from reservoirs downstream of Keno Dam to the Upper Klamath Lake where they can contribute to the spawning population).

Continued funding of The Nature Conservancy's Williamson River Delta Restoration Project would also further mitigate the impacts associated with the operation of downstream facilities by contributing to the restoration of the historic form and function of the riparian corridor in the Williamson River Delta and improving habitat complexity by increasing the variety and amount of the riparian vegetation. Native riparian vegetation provides a productive medium for zooplankton on which larval suckers feed. These areas not only provide physical protection from predators, but also rich feeding grounds for young fish. Actions to increase wetland areas

could contribute to reducing nutrients in the lake. Relatively high quality water from the interior western wetlands could provide refuge to larval suckers in the fringe wetland habitats which are, in their current condition, seasonally inundated with poor Upper Klamath Lake water (low DO, high pH, high unionized ammonia) along the southern perimeter of the Williamson River property. Investment in improvements in the Williamson River Delta addresses habitat limitations in an important part of the suckers' range (USFWS 2012, 2013a).

As part of implementing PacifiCorp's HCP and the terms and conditions of the ITP, the Service and PacifiCorp will ensure that the conservation benefits of actions undertaken through the Sucker Conservation Fund will be maximized. Given the minimal residual impacts following reduction of take at East Side and West Side facilities, the amount of funding allocated for habitat improvement should be sufficient to mitigate the population-level impact of the estimated take. This conclusion is based on the low level of take associated with operation during the permit term and the fact that the fish taken at Keno Dam and the downstream facilities are part of a sink population that does not contribute to the sucker population. Therefore, any increased survival and recruitment to the adult population in Upper Klamath Lake and its tributaries achieved by the actions funded by Sucker Conservation Fund will represent a positive contribution to the population and mitigation of all take anticipated during the permit term.

Other Fish Species

Under the proposed action, the Service anticipates there would be no additional adverse effects to other fish species (e.g., redband trout) in the Upper Klamath Basin. Conditions in the Upper Klamath River system would remain similar to current conditions. Upper Klamath Lake supports a trophy-sized trout fishery and a small fishery for yellow perch, and the Service anticipates these fisheries would continue unaffected by the proposed action.

4.2.2.2 Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs

Shutdown of East Side and West Side Developments

Downstream of Link River Dam, surface water volumes would continue to be largely controlled by Reclamation operations and flow releases at Link River Dam. All flow releases would still continue to be regulated by existing operational plans, developed in consultation with the Service and NMFS, to protect the ESA-listed Lost River sucker, shortnose sucker, coho salmon, and their designated critical habitats. For this reason, the effects to Lost River sucker and shortnose sucker in Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs, and in related stream reaches, would be similar to the no-action alternative. Entrainment and stranding of suckers by the Project at Keno Dam and downstream would continue to occur similar to under the no-action alternative. Similarly, impacts to other fish species in Project reservoirs would be the same as under the no-action alternative.

Sucker Recovery Initiatives

The Sucker Conservation Fund is not expected to increase threats to listed suckers, relative to the no-action alternative, in Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs. Projects implemented under the Sucker Conservation Fund would occur upstream of these reservoirs in Upper Klamath Lake and its tributaries where the more important sucker habitats occur. Therefore, the proposed action would not change any of the existing environmental factors making Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs unsuitable for sucker viability.

Continued funding of TNC's Williamson River Delta Restoration Project is not expected to result in any change in threat severity, relative to the no-action alternative, for Lost River sucker and shortnose sucker, and other fish species in Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs. However, as described above, the sucker recovery initiatives under the HCP will provide benefits to listed suckers that would mitigate the impacts of Project-related take at these downstream facilities.

Other Fish Species

Under the proposed action, adverse effects to other fish species will be unchanged relative to the no-action alternative. Entrainment of fishes at the Keno, J.C. Boyle, Copco, and Iron Gate facilities under the proposed action will not change the conditions that might lead to or cause entrainment at these facilities. The proposed action also will not change conditions affecting redband trout and other fish species upstream of Iron Gate Dam, including Project-related impacts on flow fluctuations, water quality, the amount of available habitat, and the ability of fish to migrate (FERC 2007, USDOI and CDFW2013).

4.2.2.3 Klamath River Downstream of Iron Gate Dam

Listed suckers have not been observed below Iron Gate Dam, so we do not anticipate affects to them below Iron Gate Dam as a result of the proposed action. This area is outside the geographic range of the Lost River and shortnose sucker and is not part of the original habitat complex of the listed suckers for completion of life cycles (USFWS 2007).

Shutdown of East Side and West Side Developments

Under the proposed action, Reclamation would continue to manage Upper Klamath Lake elevations to meet ESA BiOp requirements and contractual irrigation demands of Reclamation's Klamath Project. Downstream of Iron Gate Dam, surface water volumes would continue to be primarily influenced by Reclamation operations and flow releases at Link River Dam. All flow releases at Iron Gate Dam would continue to be regulated by existing operational plans, developed in consultation with the NMFS, to protect the coho salmon and its designated critical habitats. For this reason, effects to coho salmon, Chinook salmon, steelhead, and other fishes (e.g., Pacific lamprey and green sturgeon) in the Klamath River downstream of Iron Gate Dam would be similar to those under the no-action alternative. The hydropower dams would continue to alter natural hydrology and other riverine processes, as well as create adverse water quality conditions in the reservoirs similar to those under the no-action alternative. Similarly, threats to other fish species would be the same as under the no-action alternative.

Sucker Recovery Initiatives

The Sucker Conservation Fund is not expected to result in any noticeable changes in effects, relative to the no-action alternative, downstream of Iron Gate Dam. The proposed action would not change any of the existing factors that impair salmonid habitat conditions downstream of Iron Gate Dam. Similarly, no changes in impact severity (relative to the no-action alternative) are expected to other fish species downstream of Iron Gate Dam under the proposed action.

Continued funding of TNC's Williamson River Delta Restoration Project is not expected to result in any change in impact severity, relative to the no-action alternative, for salmonids and other anadromous fish downstream of Iron Gate Dam.

4.2.3 Socioeconomics and Environmental Justice

It is not anticipated that issuance of a 10-year ITP for the Project will negatively affect any of the socioeconomic resources in and around the permit area or downstream of Iron Gate Dam. The Service anticipates that the action alternative would continue to influence social and economic conditions in the six-county study area in a manner similar to the no-action alternative. Changes in employment are not expected given the continuing need for a maintenance crew to work at the East Side and West Side facilities prior to any future decommissioning and the fact that these employees will continue to operate and maintain other remaining Project facilities. There would continue to be direct and indirect benefits associated with employment. In addition, the proposed action would add new funds to the local economy for the purpose of habitat restoration. The Sucker Enhancement Fund and the Applicant's contribution to the Williamson River Delta Restoration Program would have direct benefits associated with employment and purchase of goods and equipment rentals, as well as indirect regional benefits (e.g., service sector employment).

The Service does not anticipate that the proposed action would adversely affect recreation opportunities. Reducing operations of the East Side and West Side developments would result in flow increases in the 1-mile reach downstream of Link River Dam; however, this is not anticipated to affect recreational use of the Link River corridor. As described above, the action alternative is not expected to change existing conditions for coho salmon, Chinook salmon, or steelhead populations downstream of Iron Gate Dam, and therefore we do not anticipate any project-related impacts to sport-fishing, commercial fishing, or tribal fishing.

Because there would be no project-related adverse impacts on social and economic conditions or recreational and commercial fishing activities, including tribal fisheries, minority and low income populations would not be disproportionally adversely affected by the proposed action. Therefore, we do not anticipate there would be affects to environmental justice under this alternative.

Minority or low income populations will not be disproportionally adversely impacted by the action alternative. A potential beneficial impact is anticipated for tribes in the area from reduction in take of suckers, which have cultural and historical significance to the tribes. Habitat protection and improvement projects considered in the HCP (under the Sucker Enhancement Fund) could provide jobs to tribal and non-tribal members involved in restoration projects.

4.2.4 Cultural Resources

The action alternative would not affect cultural or historic resources, including sites, districts, structures, or objects listed in or eligible for listing in the National Register. Because the Project affects the Klamath River mainstem, and most of the conservation measures proposed in the HCP are likely to occur within active river and stream channels, or within existing Project facilities, the Service believes no historic or cultural properties are at risk from the proposed action. Additionally, future HCP-funded habitat enhancement projects will be required to undergo their own permitting actions, including a review of affects to cultural or historic resources that may occur within the project area. At this time, the action alternative considers conservation measure projects funded through the Sucker Conservation Fund in the HCP in a general sense, but specific project planning and detailed site plans will need to be developed before these funds will be used to implement projects. When this occurs, a review of historic and cultural resources within the affected area will be needed depending on the circumstances. Although the action alternative would result in shutdown of the East Side and West Side developments, future decommissioning of these developments would be considered through a FERC decommissioning process, which would be conducted consistent with the requirements of Section 106 of the National Historic Preservation Act.

SECTION 5
Cumulative Effects

According to the Council of Environmental Quality's regulations for implementing NEPA (50 35 CFR §1508.7), an action may cause cumulative effects on the environment if its effects overlap with those of other past, present, and reasonably foreseeable future actions. This chapter describes what the Service believes are cumulative impacts occurring in the area of the Proposed Action. The Service has not included future dam removal, decommissioning of Project facilities, or the establishment of volitional fish passage above Iron Gate Dam as cumulative effects consideration as such actions are not reasonably certain to occur within the 10-year permit term this EA analyzes.

5.1 Water Quantity and Quality

Other past, present, and reasonably foreseeable future actions that overlap with the proposed action have affected and will continue to affect water quantity and quality conditions in the proposed action area. The Service believes that the proposed action would not cause an increase in adverse cumulative effects on these conditions. To the contrary, we believe the proposed action, if anything, would reduce cumulative effects on these conditions for listed species because the Applicant would cease diversions into the East Side and West Side powerhouses that are adversely impacting the endangered Lost River sucker and shortnose sucker.

Most of the water available to the Project comes from Upper Klamath Lake, part of Reclamation's Klamath Project. The Klamath Project, which has been in existence since 1905, uses water from the Klamath and Lost Rivers to supply agricultural water users in southern Oregon and northern California. A portion of the water diverted from Upper Klamath Lake and the Klamath River for irrigation purposes returns to the Klamath River, along with agricultural return flows from the Lost River Diversion Channel and the Straits Drain into the Keno Reservoir.

Since about 1992, Reclamation has modified Link River Dam operations to benefit the shortnose and Lost River suckers. In 1999, in response to ESA listing of coho salmon, NMFS provided a BiOp and an associated incidental take statement to Reclamation containing terms and conditions that require Reclamation to provide for specific instream flows at Iron Gate Dam and PacifiCorp to operate the dam to release those specified instream flows and implement identified ramping rates. Additional BiOps on the effects of Reclamation's Klamath Project on listed species were developed by NMFS, with the most recent being released in 2013 (NMFS and USFWS 2013).

Into the foreseeable future, Reclamation will be required to maintain Upper Klamath Lake elevations and Klamath River flows below Iron Gate Dam for listed species through implementation of Section 7 BiOps issued by the Service and NMFS. Inflows to the Project are largely the result of releases from the Link River Dam and withdrawals or return flows from Reclamation's Klamath Project. The relatively small active storage of the Project reservoirs (compared to available storage in Upper Klamath Lake) will continue to limit the effects of PacifiCorp's operations on flow conditions in the Klamath River, particularly during flooding events or extremely dry periods that are largely beyond PacifiCorp's control.

Water quality in Upper Klamath Lake and in releases from the lake at Link River Dam is seasonally impaired, due to warm water temperatures and nutrient enrichment, as discussed above. Implementation of the TMDL for Upper Klamath Lake (ODEQ 2002) and upstream improvements in riparian condition and the subsequent reduction in phosphorous loading to the lake should, over time, improve water quality within the lake and in releases from Link River Dam. Implementation of the TMDLs for the Klamath River (ODEQ 2010, NCWCB 2010a) would build on the existing TMDL for Upper Klamath Lake (ODEQ 2002) and allocate nutrient loads to the Klamath River from point and non-point sources throughout the Upper Klamath Basin. Once loads have been established, NPDES permit holders and agricultural land owners would become eligible to apply for funding to implement measures to reduce the nutrient loads leaving their properties and entering the Klamath River. If implemented successfully, this program would benefit water quality throughout the Klamath River. The Service anticipates the TMDL program would lead to some water-quality improvements during the permit term.

Construction of the Project dams resulted in areas of the river where the physical processes that control water quality have experienced a shift, as the processes in the reservoirs are different relative to the river environment. Although at times water quality meets applicable state water quality criteria (typically during the winter, high-flow months), the water quality within most of the Project reservoirs (i.e., Keno, Copco, and Iron Gate Reservoirs) are lake-like, and thus have long residence times, within which high inflowing loads of nutrients and organic matter cause algal blooms and depression of DO to levels that adversely affect fish and other aquatic biota (ODEQ 2010, NCWCB 2010a, USDOI and CDFW 2013). These conditions are further degraded by solar heating enhanced by the large surface areas of the reservoirs.

5.2 Biological Resources

5.2.1 Lost River Sucker and Shortnose Sucker

Other actions that overlap with the proposed action have affected and will likely continue to affect habitat conditions for the Lost River and shortnose suckers in the action area. The Service believes that the proposed action would not cause an increase in adverse cumulative effects on these conditions. To the contrary, we believe the proposed action, if anything, would reduce cumulative effects on these conditions for listed species because the Applicant would cease diversions into the East Side and West Side powerhouses that are adversely impacting the endangered suckers, and would be taking other actions to improve habitat conditions for these species over the next 10 years.

Habitat conditions for the two ESA-listed sucker species have been degraded over the past 150 years by agriculture, grazing, forestry, and to a smaller degree, by urbanization (NRC 2004; FERC 2007; USFWS 2012, 2013a). Nearly all streams and rivers in the Klamath Basin have been degraded, some seriously, by the loss of riparian vegetation, geomorphic changes, introduction of return flows from agricultural drainage ditches and water pumped from drained wetlands, stream channelization, dams, and flow reductions from agricultural and hydroelectric diversions (ODEQ 2002, 2010; NRC 2004; FERC 2007; NCWCB 2010a). Wetland losses have been especially harmful for sucker populations, because wetlands provide habitat for larval and juvenile suckers and have important water quality functions. Along the perimeter of Upper Klamath Lake, about 40,000 acres of wetlands have been diked and drained for agriculture, and extensive amounts of wetland have been drained elsewhere in the upper basin (ODEQ 2002).

In the 2007 FERC BiOp, the Service indicated that the loss of approximately 85,000 acres of historical wetlands that connected with the Klamath River above the present location of Keno Dam has reduced the historically available habitat for sucker larvae and juveniles (USFWS 2007). In that BiOp, we concluded that construction of Keno Reservoir contributed to the losses of these wetland values, including an unknown amount of wetlands loss from assumed facilitation of agricultural conversion of lands by Keno Reservoir, an unknown amount of wetlands loss due to maintenance dredging of Keno Reservoir, about 230 acres of wetlands loss or degradation due to reduced water surface elevation fluctuations at Keno Reservoir, and degradation of approximately 1,600 acres of existing emergent wetlands along the east side of Keno Reservoir near the Klamath Straits Drain (USFWS 2007).

Collectively, the effect of the historical loss of habitat, including wetlands in Upper Klamath Lake and Keno Reservoir, on the listed sucker population is likely significant (USFWS 2012, 2013a, c, d). Continued operations under the no-action alternative would continue to prevent the re-establishment of former wetland habitat because operations would moderate water level fluctuations in Keno Reservoir that support and maintain habitat. Given that PacifiCorp does not control Upper Klamath Lake levels, continued operations under the no-action alternative would not affect habitat losses upstream of Link River Dam. However, the extent of these impacts and allocation of the responsibility for these is uncertain, as is the increment of effect contributed by PacifiCorp's continued operations over the interim period. PacifiCorp operates Keno Dam pursuant to a 1968 contract with Reclamation that requires Keno Reservoir elevations be generally maintained at water surface elevations between 4085.0 and 4086.5 feet. PacifiCorp historically has maintained the elevation at about 4085.5 feet to help stabilize flows entering diversion canals to Reclamation's Klamath Project. In consideration of PacifiCorp's limited discretionary ability to control lake levels in Keno Reservoir and the short duration of interim operations, the impacts associated with habitat loss due to operations under the no-action alternative is likely low.

The Project has likely caused mortality to suckers entrained through turbines at the mainstem developments downstream from Link River Dam (FERC 2007; USFWS 2007, 2013b). Upstream migration of suckers is blocked by the Copco Dams, which do not have fish ladders, and the ladders at J.C. Boyle and Keno Dams do not meet criteria for sucker passage (FERC 2007, USFWS 2007). As mentioned earlier in this EA, the few suckers that have been found in Copco and Iron Gate Reservoirs are thought to be individuals washed down from suitable upstream habitats and are essentially considered "lost" to the self-reproducing sucker populations in Upper Klamath Lake. Prior to the construction of the Project, the Klamath River downstream of Keno did not include any lake or reservoir habitat suitable to support rearing of these species. Based on their limited swimming ability compared to salmon, steelhead, and trout, it is likely that most suckers that moved downstream past the high gradient rapids in the Keno and J.C. Boyle peaking reaches would be unable to return upstream to suitable rearing habitat, and they too were probably lost from the spawning population (FERC 2007, USFWS 2007, USDOI and CDFW 2013).

5.2.2 Anadromous Fishes

Other actions that overlap with the proposed action have affected and will continue to affect habitat conditions for anadromous fishes in the action area and in the Klamath River downstream. The Service believes that the proposed action would not cause a change in

cumulative effects on these conditions. The proposed action would not alter current conditions in the Klamath River downstream of Iron Gate Dam, where anadromous fishes occur. The main activities under the proposed action related to improving conditions for the sucker species will occur well upstream of Iron Gate Dam, and are therefore not expected to have an affect downstream of Iron Gate Dam.

Further, the Service notes that NMFS has issued an incidental take permit to PacifiCorp that authorizes taking of listed coho salmon downstream of Iron Gate Dam resulting from PacifiCorp's Project operations (77 FR 14734). Issuance of the ITP requires implementation of PacifiCorp's Coho Conservation Strategy, which is described in the Interim Operations HCP for Coho Salmon (PacifiCorp 2013). The coho salmon HCP includes conservation measures that avoid, minimize, or mitigate for take of listed coho salmon from PacifiCorp's operations. In the separate EA for the coho salmon HCP (NMFS 2011), NMFS concludes that issuing the ITP would result in beneficial effects to coho salmon, as well as to Chinook salmon, steelhead, and other fishes, downstream of Iron Gate Dam. Issuing the ITP would not significantly adversely affect Lost River and shortnose suckers or other aquatic species occurring in the Klamath River above Iron Gate Dam.

The settlement and development of the Klamath River Basin has caused substantial adverse cumulative effects on the habitat and population size of coho salmon (FERC 2007, NMFS 2010). Chinook and steelhead have also suffered declines (NRC 2004, FERC 2007). In addition to the gold mining, timber harvest and grazing impacts, the construction and operation of facilities associated with Reclamation's Klamath Project resulted in extensive draining of wetlands, and increased agricultural diversions (NRC 2004, FERC 2007). In the 1920s, the water resources in the Shasta and Scott Rivers were developed to support irrigated agriculture, and the construction of Dwinnell Dam blocked access for salmonids to the southern headwaters (NRC 2004, FERC 2007). Agricultural diversions in these tributaries and in the tributaries to Upper Klamath Lake have reduced flows, increased water temperatures, and increased nutrient inputs. Construction of Copco No. 1 Dam in 1918 blocked Chinook salmon from historic habitat upstream, including habitat above Upper Klamath Lake (NRC 2004, FERC 2007, Hamilton et al. 2005). In addition, diversion of up to 80 percent of the flow from the Trinity River basin to support agriculture in the Sacramento River Basin started in 1964 with the completion of Trinity and Lewiston Dams (FERC 2007).

Overfishing has also contributed to the decline of coho salmon in the basin, although NMFS (2002) believes that fishing mortality has been reduced substantially since the retention of naturally produced coho salmon south of Cape Falcon, Oregon, was prohibited in 1994. Competition with Chinook and coho salmon produced at Iron Gate and the Trinity River hatcheries has also likely adversely affected wild runs of coho salmon and possibly Chinook. NMFS (2002) reports that approximately 95 percent of the coho salmon run in the Trinity River above Willow Creek and about 65 percent of the coho salmon run in the Klamath River above Weitchipec consist of hatchery fish. Prior to the construction of Iron Gate Dam in 1962, peaking operations at the Copco developments adversely affected anadromous fish by causing large daily fluctuations in flow, which likely resulted in extensive fish stranding.

Periodic changes in Pacific currents, winds, and upwelling regimes have substantial effects on the primary and secondary productivity of the northeast Pacific Ocean (Brown et al. 1994, Mantua et al. 1997). These oceanic events, described as El Niño/Southern Oscillation (ENSO)

and Pacific decadal oscillation (PDO) are associated with declines and increases in ocean survival and decreases and increases in size of coho and Chinook salmon (Spence et al. 1996, Tschaplinski 1999, Cole 2000, Ryding and Skalski 1999, and Koslow et al. 2002). Substantial changes in salmon ocean survival associated with these cyclical oceanic oscillations can make it difficult to isolate and determine the effects of both long- and short-term changes in the condition of freshwater spawning and rearing habitats, and of conditions in the migration corridor downstream of Iron Gate Dam. Despite the role ocean conditions play in returns of adult salmonids to the Klamath River, NMFS considers poor freshwater survival a significant threat to the long-term conservation of naturally produced salmonids in the basin.

The overall distribution and abundance of Pacific lamprey on the Pacific Coast has been severely reduced due to effects associated with hydropower development (FERC 2007). The construction of numerous mainstem and tributary dams has reduced the amount of habitat that is accessible for freshwater spawning and rearing of this species over most of its range (FERC 2007). Although a substantial amount of habitat suitable for lampreys remains accessible in the Klamath River Basin, accounts given by tribal elders indicate that the number of lampreys in the river has declined precipitously from historic levels (Larson and Belchik 1998).

5.3 Socioeconomics and Environmental Justice

The proposed action would not contribute significantly to any socioeconomic or environmental justice concerns related to past, present, or reasonably foreseeable future actions in and around the Project Area. The issuance of a 10-year ITP for the Project and associated HCP conservation mitigation measures would not adversely affect use and value of surrounding lands for agriculture, recreational and fishing activities, and other components of the regional economy. The issuance of a 10-year ITP for the Project and associated HCP conservation mitigation measures would support regional employment and income as a result of habitat restoration activities leading to projects that would utilize local resources (e.g., contractors and suppliers). Because there would be no Project-related adverse impacts on social and economic conditions or recreational and commercial fishing activities, including tribal fisheries, minority and low income populations would not be disproportionally adversely affected by the proposed action.

5.4 Land Use and Development

The proposed action would not contribute significantly to any land use and development impacts related to past, present, or reasonably foreseeable future actions in and around the Project Area. European settlement of the basin since the mid-1800's has significantly altered the natural landscape and developed native habitats into land uses such as irrigated agriculture, mining areas, timber production zones, and residential and commercial development (NRC 2004). This human development has significantly altered the natural environment in the Upper Klamath Basin.

The Service anticipates land use in the Project area will not change significantly during the permit term; however expansion of commercial and residential uses and developments is likely to occur, especially in the Klamath Falls area. Once development and associated infrastructure (roads, drainage, water development, etc.) are established, any associated impacts to aquatic species are expected to be permanent. Impacts on water quality and other habitat conditions that may be related to infrastructure development would be expected to be regulated under applicable laws and regulations.

The Service also anticipates that agricultural activities will not change significantly during the permit term. Agricultural activities in the permit area include grazing, dairy farming, and the cultivation of crops. Threats to water quality and other habitat conditions that are related to agricultural activities would be expected to be regulated under applicable State and Federal laws such as the Clean Water Act.

5.5 Cultural Resources

The proposed action would not contribute significantly to any cultural resources effects related to past, present, or reasonably foreseeable future actions in and around the Project Area. The issuance of a 10-year ITP for the Project and associated HCP conservation mitigation measures would not adversely affect cultural resources (see Section 4.2.4). The Service anticipates land use conditions will not change significantly during the permit term; however some land disturbance from expansion of commercial and residential uses and developments is likely to occur. Impacts on cultural resources conditions that may be related to such land disturbance activities would be expected to be regulated under applicable laws protecting cultural resources.

5.6 Climate Change

Climate change likely poses a high threat to fish and other aquatic species within the permit area, particularly salmonids because of their dependence on cool water (Mote et al. 2003, Barr et al. 2010). The effects of climate change in this region would have the greatest impact on salmonid juveniles, smolts, and adults. Suckers would also be affected but to a lesser degree (USFWS 2012, 2013a-d). The current climate in the permit area is generally warm, and long-term modeled regional average temperatures shows a large temperature increase; with average ambient temperatures increasing by as much as 3^{o} C in the summer and by 1^{o} C in the winter, while annual precipitation in this area is predicted to trend downward over the next century (Barr et al. 2010). Average water temperatures in the Klamath River are already increasing by about 0.5^{o} C /decade (Bartholow 2005). Additionally it is predicted that snowpack in upper elevations of the Klamath basin would decrease with changes in response to changes in temperature and precipitation (California Natural Resources Agency 2009, Barr et al. 2010, USBR 2011). Decreases in stream flows during the summer, especially in sub-basins dominated by groundwater input, have occurred in the Klamath Basin (Mayer and Naman 2011). It is possible that during the proposed action permit term (10 years) the Klamath River Basin would experience some degree of rising temperatures due to climate change (probably less than 1^{o} C), even though climate models are generally run over long time series such as 50 or 100 years.

Climate change could affect habitat conditions for suckers by degrading water quality, reducing snow-pack, and increasing agricultural water demand (USFWS 2013a-d). Higher temperatures could exacerbate current poor water quality conditions by increasing the episodes of peak summer temperatures when die-offs are most likely to occur. Higher temperatures could also increase water use by agriculture because evapotranspiration would be increase and the water needs of crops would be greater. Climate change will likely have gradual adverse effects on suckers and other fish and aquatic organisms; however, these effects will occur over a long time period (i.e., decades). Recovery efforts that restore habitat, such as will occur with issuance of a 10-year ITP for the Project and associated HCP conservation mitigation measures, will likely occur more rapidly.

SECTION 6
Summary of Effects

Table 6-1 summarizes the Service's analysis of effects from the proposed action (issuance of an ITP and implementation of the PacifiCorp HCP) and no-action (i.e., no issuance of an ITP and no implementation of the PacifiCorp HCP). In summary, the proposed action is likely to result in beneficial effects, including improvements to Lost River and shortnose sucker populations and their habitat in the basin. The no-action alternative would be a continuation of current conditions, including degraded conditions that would occur in the absence of mitigating actions taken under the proposed action.

Table 6-1. Comparison of Effects on Resources Associated with the proposed action and No-action

Resource	No-action	Proposed Action
Water Resources • Hydrology • Water Quality	**Hydrology:** Current conditions in the Upper Klamath basin reaches, downstream reservoirs, and Klamath River would continue as managed under biological opinions from the Service (NMFS and USFWS 2013). **Water Quality:** Poor water quality conditions would continue without any mitigating actions unless directed by other regulatory mechanisms (e.g. TMDL).	**Hydrology**: Same as no-action, but slightly higher for 1-mile reach between Link River Dam and East Side and West Side powerhouse tailraces due to reduced diversions by PacifiCorp for hydroelectric purposes. **Water Quality**: Same as no-action.
Biological Resources • Upper Klamath River System • Keno, J.C. Boyle, Copco, and Iron Gate Reservoirs • Klamath River Downstream of Iron Gate	**Upper Klamath River System:** No change from effects of current conditions **Reservoirs:** No change from effects of current conditions **Klamath River Downstream of Iron Gate:** No change from current conditions.	**Upper Klamath River System:** Benefits to Lost River sucker and shortnose sucker by reducing mortality impacts (e.g., entrainment, ramping) and other impacts (e.g., false attraction to tailraces) at East Side and West Side developments by 90 percent. Additional benefits to habitat conditions, such as improved nursery habitat, resulting from sucker recovery initiatives. **Reservoirs:** Same as no-action. **Klamath River Downstream of Iron Gate:** Same as no-action.
Socioeconomics and	Direct and indirect effects from employment would continue similar to	Minor gains in employment due to direct and indirect economic benefits from

Environmental Justice	current conditions.	sucker recovery activities.
Cultural Resources	No change from current conditions.	Same as no-action.

SECTION 7
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