

# RECLAMATION

*Managing Water in the West*

## Long-Term Plan to Protect Adult Salmon in the Lower Klamath River

Humboldt County, California

### Final Environmental Impact Statement



## **Mission Statements**

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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## Abbreviations and Acronyms

°F	degrees Fahrenheit
AUM	Animal Unit Month
BLM	U.S. Department of the Interior, Bureau of Land Management
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DO	dissolved oxygen
DOI	Department of the Interior
Draft LTP	<i>Draft Long-Term Plan for Protecting Late Summer Adult Salmon in the Lower Klamath River</i>
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EIS/R	Environmental Impact Statement/Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gas
GUI	Graphical User Interface
Ich	<i>Ichthyophthirius multifiliis</i>
IFIM	Instream Flow Incremental Methodology
IOS	Interactive Object-Oriented Salmon Simulation
KFHAT	Klamath Fish Health Assessment Team
KRRC	Klamath River Renewal Corporation
LCSD	Lewiston Community Services District
LTP	Long-Term Plan to Protect Adult Salmon in the Lower Klamath River
LVWC	Lewiston Valley Water Company
MT CO <sub>2</sub> e/year	metric tons of carbon dioxide equivalents per year
NCRWQCB	North Coast Regional Water Quality Control Board
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRC	National Research Council
PL	Public Law

Reclamation	U.S. Department of the Interior, Bureau of Reclamation
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
RPS	renewable portfolio standard
SB	Senate Bill
SL&DMWA	San Luis & Delta-Mendota Water Authority
SRWQM	Sacramento River Water Quality Model
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TCD	Temperature Control Device
TMDL	total maximum daily load
TRD	Trinity River Division
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
WUA	weighted usable area

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# Chapter 1

## Introduction

In conformance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508), and Department of the Interior (DOI) Regulations (43 CFR Part 46), the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), as the lead agency, prepared this Final Environmental Impact Statement (EIS) in response to comments received on the Draft EIS. Rather than reproduce the entire EIS, Reclamation prepared the Final EIS to provide responses to comments, including an errata where Draft EIS text has been revised or replaced.

### Public Review Process

The public comment period for the Draft EIS began on October 21, 2016, with the publication of a Notice of Availability by the Environmental Protection Agency in the Federal Register (81 FR 72830). The Draft EIS was made available online at [http://www.usbr.gov/mp/nepa/nepa\\_projdetails.cfm?Project\\_ID=22021](http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=22021), and hard copies were provided for review at Reclamation's offices in Shasta Lake, Weaverville, and Sacramento, California, and at libraries in Humboldt, Merced, Shasta, and Trinity Counties in California and Klamath County, Oregon. Over 2,800 individuals, agencies, and organizations were informed by e-mail or mail of the availability of the Draft EIS. A public hearing was held on November 9, 2016, at the Holiday Inn in Redding, California, to receive oral and written comments on the Draft EIS. When preparing the Final EIS, Reclamation considered comments received at the public hearing, from cooperating agencies, and in 30 comment letters received during the public comment period.

### Preferred Alternative

After considering comments received on the Draft EIS, and in consultation with the cooperating agencies, Reclamation is identifying the Proposed Action – Alternative 1, as the Preferred Alternative. Alternative 1 addresses the need for action, it can be implemented by August 2017, and it is within Reclamation's authority to implement without requiring additional authority or changes to the current decision-making structure for the Trinity River Restoration Program.

**Chapter 1**  
**Introduction**

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## Chapter 2

# Master Responses

U.S. Department of the Interior, Bureau of Reclamation (Reclamation) received 30 letters commenting on the Draft Environmental Impact Statement (EIS), containing more than 400 individual comments. Some comments on the Draft EIS were made frequently, and Master Responses were prepared to address these similar comments. In some cases, an individual comment may be addressed by one or more of the Master Responses.

This chapter presents seven Master Responses, as follows:

- Master Response “General Comment”
- Master Response “Best Available Information”
- Master Response “Scientific Support for Flow Augmentation”
- Master Response “Range of Alternatives”
- Master Response “Removal of PacifiCorp Dams on the Klamath River”
- Master Response “Reclamation Authority to Release Flows”
- Master Response “Rules and Regulations for Water Operations for Alternatives”

### Master Response “General Comment”

Many comment authors expressed personal opinions, histories or experiences. However, a response to these types of comments are not required under National Environmental Policy Act (NEPA) because they do not raise a significant environmental issue. These comments will be included as part of the record and made available to decision makers prior to a final decision on the proposed project.

Reclamation acknowledges that there are many people who support late-summer flow augmentation actions and there are many who oppose late-summer flow augmentation actions. A reasonable range of alternatives are presented in this EIS, including three which are examined in detail using the best available scientific and technical information. There are positive and negative aspects for each of these alternatives. The potential effect of the alternatives are discussed in the EIS and will be fully considered by Reclamation, along with public input, before making a final decision.

## Master Response “Best Available Information”

During the scoping process, and in discussions with agencies and stakeholders, Reclamation collected information (including current available data) to document resource conditions, and to evaluate the potential impacts of the alternatives. Methodologies used for the effects analysis are documented in each resource chapter of the Draft EIS (Chapters 4 through 14) under *Potential Mechanisms for Change and Analytical Methods* or similarly-titled sections. Additional details of the analytical tools used to evaluate the alternatives are located in the Analytical Tools Technical Appendix, where there are descriptions of the tools, assumptions and uncertainties, and how they are used to support the analyses within the EIS. Primary models or tools used in the evaluation of alternatives are shown in Table 2-1.

### Quality Control Reviews for EIS

Reclamation and its consultant’s resource-area experts conducted technical reviews of documentation and related evaluations throughout the development of the EIS. Similar technical reviews were also conducted for appropriate resource areas by cooperating agencies. During these reviews, documentation and related evaluations were reviewed for:

- Compliance with established laws, policies, regulations, and other appropriate guidance
- Adequacy of the scope of the document
- Appropriateness of all planning, engineering, and environmental assumptions and methods
- Appropriateness of data used, including the level of detail
- Appropriateness of alternatives evaluated
- Accuracy
- Comprehensiveness
- Reasonableness of results

In addition, routine technical reviews were conducted by subject-matter experts during preparation of the EIS, which included: (1) review of tool selection, (2) review of tool assumptions and inputs, (3) review of tool outputs, and (4) review of modeling results and interpretation. The EIS was then independently reviewed by subject-matter experts to confirm agreement with scope, appropriateness of assumptions and methodology, accuracy of data and findings, interpretation of findings, and to ensure that conclusions were supported by the information presented.

Table 2-1. Primary Models Used in the Analysis of the Effects of Alternatives

<b>Analysis Area</b>	<b>Model</b>	<b>Primary Description in Draft EIS</b>	<b>Appendix</b>
Reservoir Levels, River Flows and Water Supply Operations	CalSim II	Chapter 4, "Surface Water Supply and Management"	Analytical Tools Technical Appendix Chapter 2, "Water Operations Modeling"
Water Quality – Reservoir and Sacramento River Temperature	Sacramento River Water Quality Model (SRWQM)	Chapter 5, "Surface Water Quality"	Analytical Tools Technical Appendix Chapter 3, "Reservoir and River Temperature Modeling"
Water Quality – Trinity and Klamath River Temperature	River Basin Model-10 (RBM10)	Chapter 5, "Surface Water Quality"	Analytical Tools Technical Appendix Chapter 3, "Reservoir and River Temperature Modeling"
Water Quality – Delta Water Quality	Delta Simulation Model 2 (DSM2)	Chapter 5, "Surface Water Quality"	Analytical Tools Technical Appendix Chapter 6, "Delta Hydrodynamics and Salinity Modeling"
Fisheries – Sacramento River Anadromous Fish Production	Anadromous Fish Production Simulation (SALMOD)	Chapter 11, "Fisheries and Aquatic Resources"	Analytical Tools Technical Appendix Chapter 4, " Fisheries Modeling"
Fisheries – Sacramento River Winter-Run Chinook Salmon Lifecycle	Winter-Run Chinook Salmon Interactive Object-Oriented Simulation Model (IOS)	Chapter 7, "Biological Resources – Fisheries"	Analytical Tools Technical Appendix Chapter 4, "Fisheries Modeling"
Power – Hydropower Generation and Consumption (CVP)	Long-Term Generation (LTGen)	Chapter 9, "Hydropower Generation"	Analytical Tools Technical Appendix Chapter 5, "Hydropower Modeling"
Power – Hydropower Generation and Consumption (SWP)	State Water Project Power (SWP_Power)	Chapter 9, "Hydropower Generation"	Analytical Tools Technical Appendix Chapter 5, "Hydropower Modeling"
Economics – Regional Agricultural Production and Economic Optimization	Statewide Agricultural Production Model (SWAP)	Chapter 11, "Agricultural Resources"	Analytical Tools Technical Appendix Chapter 7, "Economics Modeling"
Economics – Regional Economics	Impact Analysis for PLANning Model (IMPLAN)	Chapter 16, "Socioeconomics, Population and Housing"	Analytical Tools Technical Appendix Chapter 7, "Economics Modeling"

Key:  
CVP = Central Valley Project  
EIS = Environmental Impact Statement  
SWP = State Water Project

## Master Response “Scientific Support for Flow Augmentation”

The scientific understanding of infection dynamics and outbreaks of *Ichthyophthirius multifiliis* (Ich) in adult salmon returning to the Klamath River continues to evolve based on ongoing monitoring and research. The section *Current Understanding of Fish Disease Processes in the Lower Klamath River* of Chapter 7, “Biological Resources – Fisheries” of the Draft EIS, describes, based on best available science, the primary factors contributing to an Ich outbreak. The following factors contribute to the fish’s susceptibility to infection that may lead to mortality:

- A background presence of Ich
- Large run size or high localized concentration of fall-run Chinook Salmon in the Klamath River system can result in favorable conditions for transmission and infectivity of the Ich parasite
- High water temperatures in the lower Klamath River, greater than about 73.4 degrees Fahrenheit, during late summer into early fall that can result in thermal barriers that slow or delay migration of adult salmon
- Low-flow conditions, often associated with high water temperatures, limiting areas of holding habitat and slowed migration for adult salmon, resulting in higher fish densities

Increasing flows in the lower Klamath River during the return migration provides the following benefits:

- The transmission of the free-swimming Ich life stage that propagates infectivity among fish can be physically hindered by increased flow rates and velocities
- Increased flows from the Trinity River Basin often reduce lower Klamath River temperatures in the late summer, which can reduce stress and offer migration opportunity for migrating adult fish, while also slowing the development of Ich and other pathogens
- Additional flows can increase the wetted cross-sectional area and pool depth along the river bed, decreasing fish densities
- Fish are sometimes cued by flow changes and reduced water temperatures to continue their migration upstream to suitable areas of both river systems

With reduced density of fish and higher water velocities encountered in the main channel and upriver, the probability of Ich reinfesting the original host, or infecting other fish, is greatly reduced. This appears to have occurred in 2014 during flow augmentation, when an Ich epizootic was detected but no resulting fish mortality occurred.

Flows and water temperatures have been monitored in the lower Klamath River for many decades while fish density has been monitored for over two decades. Fish health (i.e., Ich infection levels) has been monitored in the lower Klamath River since 2002 when the first major fish die-off occurred. This information is now used by Reclamation, the resource agencies, and

tribes to determine what actions may be necessary to prevent or reduce a future fish die-off; continued monitoring and synthesis of this data will increase knowledge and understanding of what may trigger an epizootic that could lead to a fish die-off.

Reclamation has, since the 2002 fish die-off, worked in close collaboration with Federal and State resource agencies and tribes to develop the flow augmentation criteria for the action alternatives (see the *Flow Augmentation Components* section in Chapter 2, “Description of Alternatives” of the Draft EIS). Additionally, recommendations provided in reports by National Marine Fisheries Service, U.S. Fish and Wildlife Service, and tribes—based on observed fish conditions since 2002, including Ich outbreaks—were used to develop and refine the flow augmentation criteria. Through time, and as additional information is obtained from the ongoing monitoring programs as well as from observations of the fish responses (behavioral and physiological) to management activities, the flow augmentation trigger criteria have been modified. Reclamation acknowledges that while data on the Ich infection dynamics related to flow augmentation actions are still limited, contemporary scientific information on Ich disease and treatments indicate that increasing the rate and volume of water increases the water exchange in relation to the location of the fish; this may reduce the density of Ich in the vicinity of the fish, lowering the risk of disease transmission (Chapter 7, “Biological Resources – Fisheries” of the Draft EIS, and Chapter 4, “Errata” of the Final EIS).

The *Background and History* section of Chapter 1, “Introduction” of the Draft EIS includes data during years when flow augmentation actions were taken, to provide a comparison against conditions in 2002, when a fish die-off occurred. This is not meant to imply that these were the only conditions that may contribute to preventing a fish die-off. However, as no fish die-offs have occurred since 2002, it is reasonable to assume the flow augmentation actions have reduced the risk of a fish die-off.

In 2016, Reclamation funded an Independent Scientific Peer Review to evaluate the scientific validity of the flow augmentation criteria that were developed based on an understanding of the causative factors of an Ich epizootic. Overall, reviewers felt that the flow augmentation program was reasonable given the local circumstances in the lower Klamath River, even if not fully supported by science (Reclamation 2016). All reviewers agreed that the preventive base flow augmentation criterion regarding thermal conditions inhibiting upstream migration, and the criterion to initiate preventive flow augmentation releases by August 22, were supported by science or were reasonable, even if they questioned the exact mechanism of effect. All reviewers agreed that temperature was probably the most important environmental variable in Ich epizootic outbreaks, and that lowering temperatures could have multiple benefits. However, there was disagreement on scientific support for all other augmentation flow criteria. In most cases, the reviewers that felt the criteria were not supported by science thought that additional information was needed to strengthen the validity of the criteria. All reviewers recommended continued monitoring and application of an adaptive management approach, especially in light of the small number of years since 2002 where flow augmentation has been used, noting that additional data collection would allow for refinement of criteria. Results of the peer review can be found on Reclamation’s Quality of Information webpage at <https://www.usbr.gov/main/qoi/peeragenda.html>.

## Chapter 2 Master Responses

Based on the current understanding of the causative factors of Ich infection, and in collaboration with Federal and State resource agencies, tribes and other entities, Reclamation developed trigger criteria for the flow augmentation components that were incorporated into both action alternatives. The action alternatives were formulated specifically to meet the Purpose and Need, which is to reduce the likelihood, and potentially reduce the severity, of an Ich epizootic event that could lead to an associated fish die-off. Based on the best available information, the action alternatives meet the Purpose and Need.

As described in Chapter 2, “Description of Alternatives” of the Draft EIS, both action alternatives include monitoring and research actions to address uncertainties and to further scientific understanding of causative factors of Ich infection and outbreak in the lower Klamath River. The action alternatives include an adaptive management approach that provides for the refinement of the flow augmentation criteria. Therefore, management actions are anticipated to be modified or adapted based on the monitoring results through the process defined in the Draft EIS Chapter 2, “Description of Alternatives” on pages 2-5 through 2-10.

## Master Response “Range of Alternatives”

### NEPA Requirements for Alternatives Development

NEPA requires that the lead agency rigorously explore and objectively evaluate all reasonable alternatives to recommended courses of action in any proposal (42 U.S. Code (USC) Sec. 4332(2)(E)). Under NEPA, *reasonable alternatives* are alternatives that are technically and economically practical or feasible and meet the purpose and need of the proposed action (43 CFR 46.420). The Council on Environmental Quality’s “Forty Most Asked Questions” adds that “Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the [agency].”

### Alternatives Development Process

Chapter 2, “Description of Alternatives” of the Draft EIS describes the alternatives development and screening process. The alternatives formulation process and the development of a range of alternatives started with the development of the Purpose and Need. Based on the Purpose and Need, Reclamation then developed and applied four criteria to screen potential alternatives:

- **Effective** – Addresses more than one of the significant contributing factors to Ich epizootic events: (1) crowded holding conditions for pre-spawn adults, (2) warm water temperatures, and (3) presence of disease pathogens
- **Substantial Risk Reduction** – Capability of meaningfully and substantially reducing the likelihood, and potentially reducing the severity, of any Ich epizootic event that could lead to an associated fish die-off
- **Immediate Implementability** – Actions may be needed as early as August 2017, therefore alternatives need to be able to be implemented immediately



- **Consistent with Laws and Regulations** – Consistent with Federal Reclamation law; other Federal laws, and the State of California

Input received during preparation of the *Draft Long-Term Plan for Protecting Late Summer Adult Salmon in the Lower Klamath River* (Draft LTP) (Reclamation 2015a) and during the public scoping process (Reclamation 2015b), along with environmental effects of potential alternatives, were also considered in the development and screening of alternatives.

In addition to the No Action Alternative, the Proposed Action (Alternative 1) and Trinity River Record of Decision Flow Rescheduling Alternative (Alternative 2) were evaluated in the Draft EIS, while other alternatives were considered but rejected. Alternatives that did not meet one or more of the screening criteria included structural flow augmentation measures (e.g., constructing new or expanded storage facilities), non-structural flow augmentation alternatives (e.g., reoperating existing facilities or modifying regulatory requirements in the Klamath River Basin) and non-flow related alternatives (e.g., fisheries management activities, improvement in water quality or temperature, and other measures). See section *Alternatives Eliminated from Detailed Evaluation* in Chapter 2 of the Draft EIS.

## **Master Response “Removal of PacifiCorp Dams on the Klamath River”**

Removal of PacifiCorp Dams on the Klamath River is not included as a project under the No Action Alternative for this EIS. It is uncertain whether the dam removals would occur during the time period between 2017 to 2030, that is covered by this analysis. As described in Chapter 2, “Description of Alternatives” of the Draft EIS, the Klamath Facilities Removal Final EIS/Environmental Impact Report was completed in 2012 (DOI and DFG 2012); however, a ROD for the dams’ removal was not issued. On June 16, 2016, the Federal Energy Regulatory Commission (FERC) approved a temporary suspension of the hydropower relicensing process in order for PacifiCorp and the Klamath River Renewal Corporation (KRRC) to develop two additional applications for FERC review, including an application to transfer the four dams and facilities to the KRRC, and an application by the KRRC to surrender and remove the four dams. These applications were submitted to FERC in September 2016, however, FERC has not approved the removal of the four dams. For the purposes of this EIS, the No Action Alternative includes PacifiCorp operating under the current annual license with the dams remaining in place.

The removal of PacifiCorp Dams on the Klamath River is reasonably foreseeable and is considered qualitatively in the assessment of cumulative effects of the alternatives.

The LTP EIS is a separate and independent project from the proposed removal of the PacifiCorp Dams on the Klamath River. Implementation of the preferred alternative (Proposed Action - Alternative 1) is not dependent on the removal of the PacifiCorp Dams in order to meet the Purpose and Need. The decision whether to approve the removal of the PacifiCorp Dams on the Klamath River will be made by FERC. Comments received expressing support or opposition to the proposed removal of the PacifiCorp Dams are not relevant to this EIS.

## Master Response “Reclamation Authority to Release Flows”

Reclamation has the authority to release flows on the Trinity River for both fisheries and consumptive-use purposes. As described in the *Statutory Authority* section of Chapter 1, “Introduction” and the Statutory Authority Appendix of the Draft EIS, the Trinity River Division Central Valley Project Act of 1955 (Public Law (PL) 84-386) provides the principal authorization for implementing the action alternatives. The Draft EIS also identified the following additional authorities: Trinity River Basin Fish & Wildlife Management Act of 1984 (Act of October 24, 1984 (PL 98-541); as amended by the Act of October 2, 1992 (PL 102-377); Act of November 13, 1995 (PL 104-46); Act of May 15, 1996 (PL 104-143)) (that directs the Secretary to restore the fish populations impacted by the TRD facilities); the Fish and Wildlife Coordination Act (16 USC 661) and section 3406(b)(1) of the Central Valley Project Improvement Act (CVPIA).

Reclamation acknowledges that previous years’ flow augmentation actions are currently in litigation. However, litigation on flow augmentation actions in previous years are specific to the year and the environmental conditions of that year. Further, Reclamation notes that the court rejected the requests for injunctive relief in previous years and allowed the actions to go forward.

## Master Response “Rules and Regulations for Water Operations for Alternatives”

As described in Chapter 4, “Surface Water Supply and Management,” Trinity Dam and Reservoir are an integral component of the Central Valley Project (CVP). Trinity Dam and Reservoir are operated in conjunction with other CVP facilities and State Water Project (SWP) facilities to manage storage of surplus winter runoff for irrigation and municipal and industrial use, protection and conservation of fish, and other beneficial uses in both the Klamath (including Trinity Subbasin) and Sacramento River Basins. The action alternatives would not supersede existing laws or regulations and would not exempt any actions from compliance with applicable laws, including NEPA or the Federal Endangered Species Act. The Federal, State, and local regulatory framework for water operations is described in the *Regulatory Environment and Compliance Requirements* section of Chapter 4, “Surface Water Supply and Management” of the Draft EIS. In addition, the *Affected Environment* section of Chapter 4, “Surface Water Supply and Management,” and Chapter 2, “Water Operations Modeling” of the Analytical Tools Technical Appendix of the Draft EIS, provide additional details on water operations for the No Action Alternative and action alternatives. Analysis of water operations of Trinity Dam and Reservoir and other CVP and SWP facilities are consistent with the *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project and State Water Project* (USFWS 2008) and the 2009 *Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project* (NMFS 2009). Operations of Trinity Dam and Reservoir under the LTP EIS action alternatives are described in Chapter 2, “Description of Alternatives.”

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**Chapter 2**  
**Master Responses**

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