KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project
Tributary - Mainstem Connectivity Plan

TMCP Fish Passage Monitoring Areas

November 2022

N

0 60 120 180 240 300 Feet
(At original document size of 11x17)
1:2,400

- River Milepost
- Access Road
- 1 ft Contour
- 5 ft Index Contour
- Klamath River
- Tributary Stream
- TMCP Klamath River Monitoring and Confluence Monitoring at*:
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  - Bogus Creek RM 192.6
  - Dry Creek RM 191.9
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Definitions:
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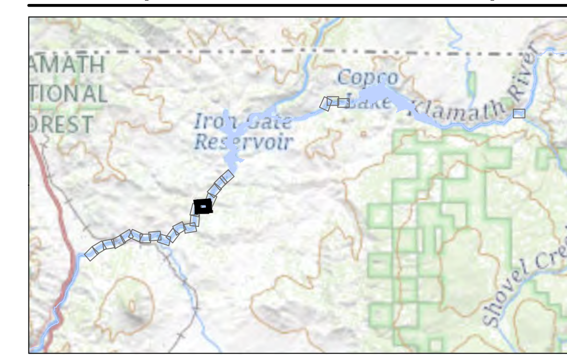

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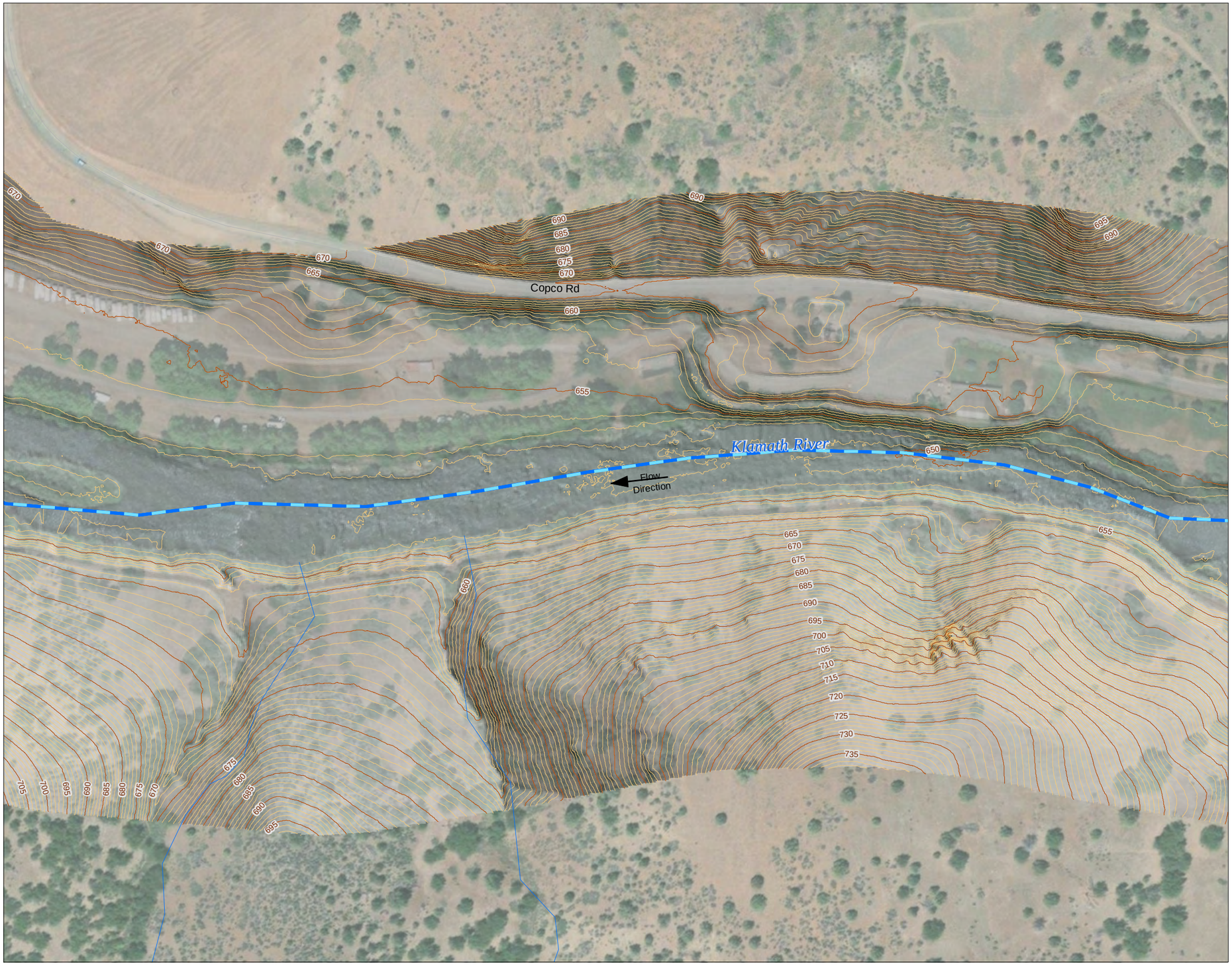

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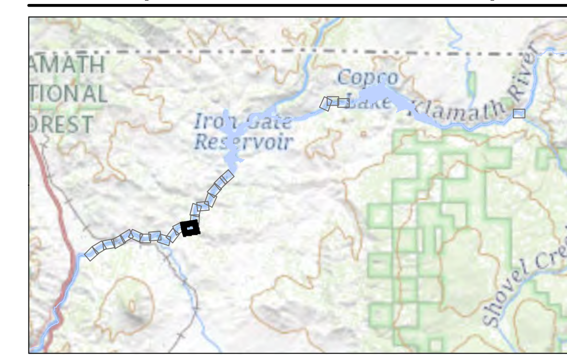

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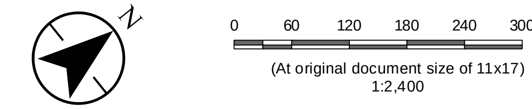

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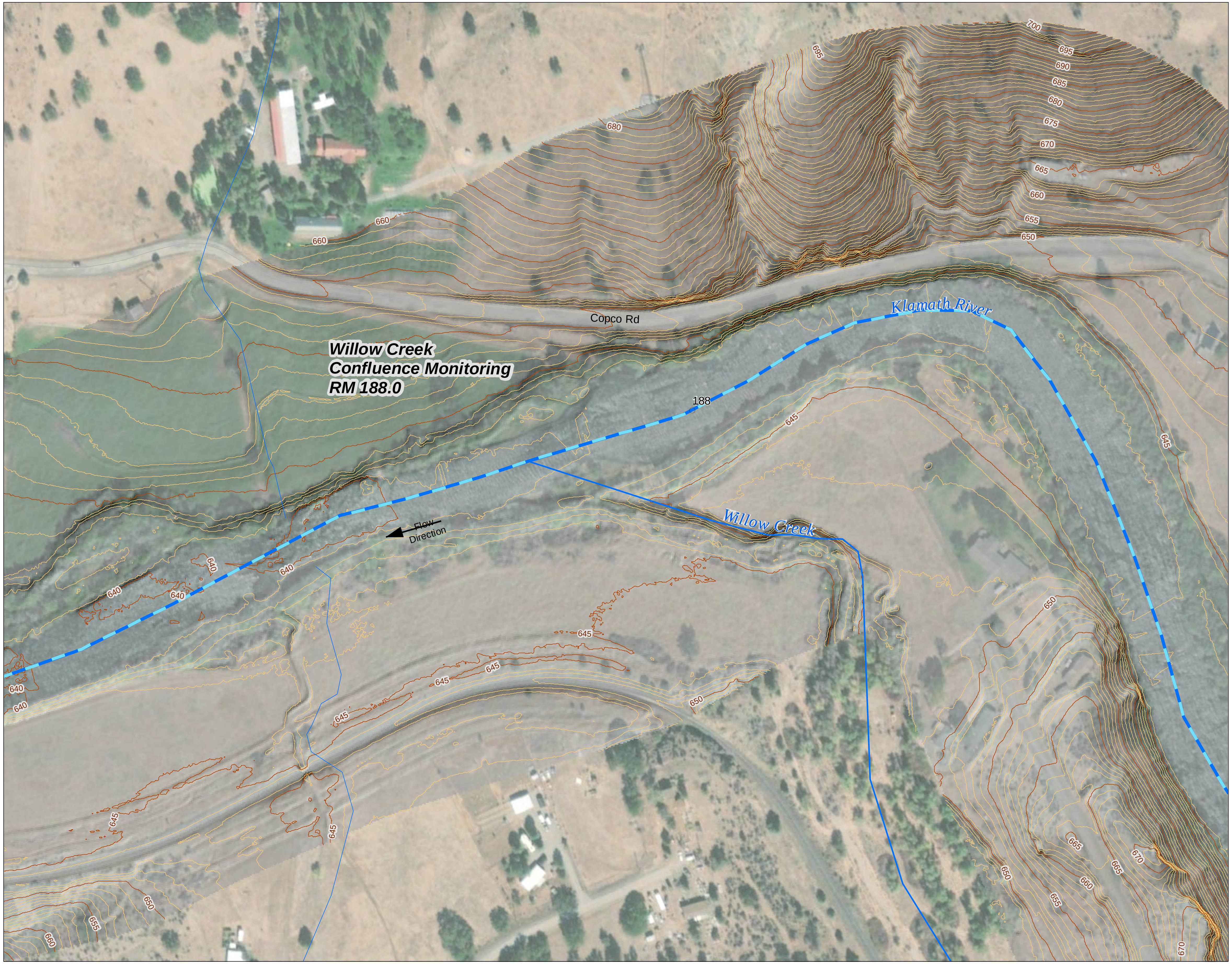

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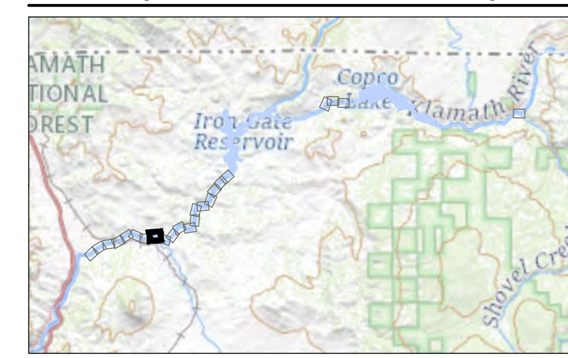

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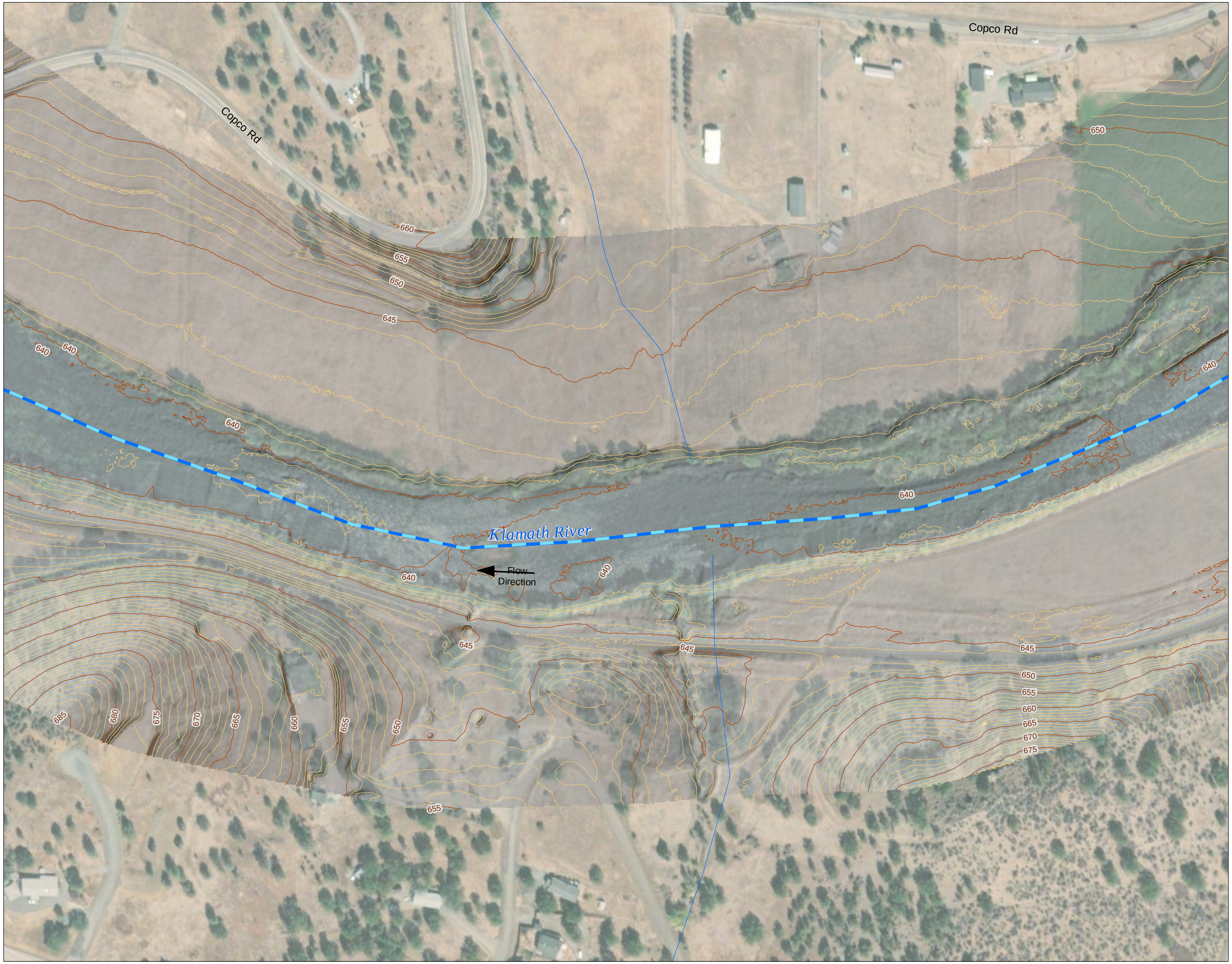

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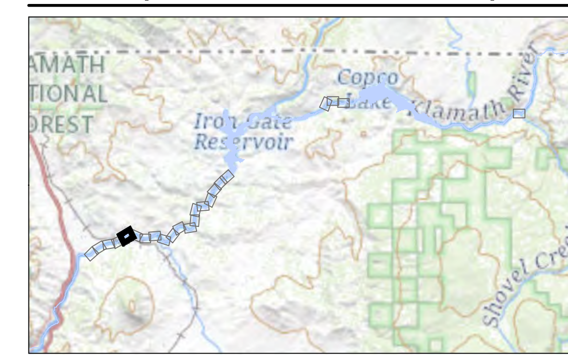

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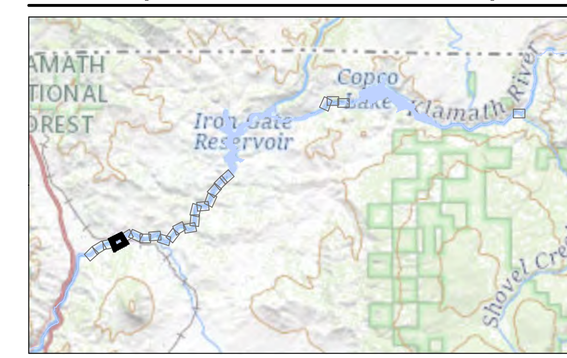

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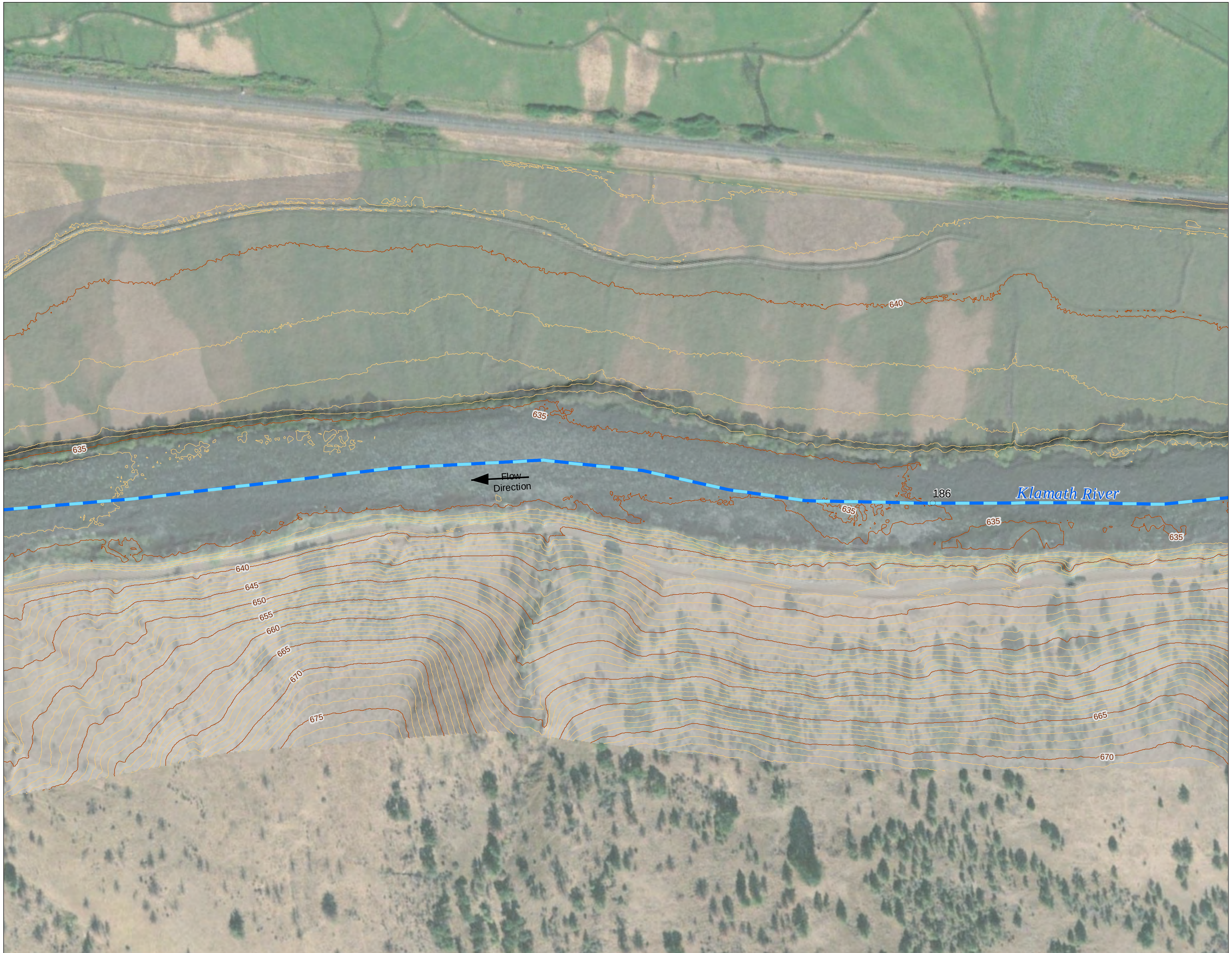

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2. Data Sources: Klamath River Hydrology: Developed by AECOM with https://nhd.usgs.gov/NHD_High_Resolution.html National Hydrography Dataset; Special Species Plants: CDM Hill surveys April and July 2019; BLM surveys. Eagle data: RES; All other nest data: CDM Hill 2018 and 2019 surveys; Restoration Zones: AECOM 2017.
3. Background: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2022.
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project
Tributary - Mainstem Connectivity Plan

TMCP Fish Passage Monitoring Areas

November 2022

N

0 60 120 180 240 300 Feet

(At original document size of 11x17)
1:2,400

- River Milepost
- Access Road
- 1 ft Contour
- 5 ft Index Contour
- Klamath River
- Tributary Stream
- TMCP Klamath River Monitoring and Confluence Monitoring at*:
  - Shovel Creek RM 209.0
  - Bogus Creek RM 192.6
  - Dry Creek RM 191.9
  - Little Bogus Creek RM 189.0
  - Willow Creek RM 188.0
  - Cottonwood Creek RM 185.1

Definitions:
TMCP - Tributary-Mainstem Connectivity Plan
* Monitoring extends 150 feet upstream in the tributary from the confluence.

PRELIMINARY DESIGN
(NOT FOR CONSTRUCTION)

Notes
1. Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US
2. Data Sources: Klamath River Hydrology: Developed by AECOM with https://nhd.usgs.gov/NHD_High_Resolution.html National Hydrography Dataset; Special Species Plants: CDM Hill surveys April and July 2019; BLM surveys. Eagle data: RES; All other nest data: CDM Hill 2018 and 2019 surveys; Restoration Zones: AECOM 2017.
3. Background: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2022.
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Appendix B

ODFW Fish Passage Permit

Oregon
Kate Brown, Governor

Department of Fish and Wildlife
Fish Division
4034 Fairview Industrial Drive SE
Salem, OR 97302
(503) 947-6201
FAX (503) 947-6202
www.dfw.state.or.us/

September 30, 2022

Mark Bransom
Chief Executive Officer
Klamath River Renewal Corporation
2001 Addison Street, Suite 317
Berkeley, CA 94704

RE: ODFW Fish Passage Authorization PA-14-0038 --- JC Boyle Dam Removal Project
Klamath River --Lower Klamath Project (FERC Project No. 14803)

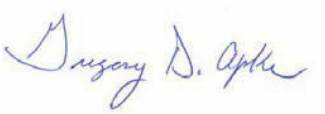
Mr. Bransom,

The Oregon Department of Fish and Wildlife (ODFW) Statewide Fish Passage Program in coordination with the ODFW East Region Hydropower Program has reviewed the Klamath River Renewal Corporation's (Renewal Corporation's) plans to permanently decommission and remove the Lower Klamath Project (LKP) (Federal Energy Regulatory Commission (FERC) Project Number 14803) to achieve a free-flowing river condition and to restore volitional passage of native migratory fish. With respect to those specific elements of the LKP located in Oregon, ODFW has actively engaged in discussions with the Renewal Corporation and its consultants over the course of the past decade regarding the proposed removal of J.C. Boyle Dam, river restoration, project planning, project implementation, and monitoring.

The proposed action (PA) to remove J. C. Boyle Dam and associated facilities located in Oregon has triggered the State of Oregon's fish passage statutes and regulations as set forth in Oregon Revised Statutes (ORS) 509.585 and Oregon Administrative Rule (OAR) chapter 635, division 412. The Renewal Corporation submitted a formal Oregon Fish Passage Permit Application (FPPA) and supporting documents to ODFW on April 29th, 2022. ODFW has reviewed the submitted FPPA materials, including designs, analyses, and monitoring plans, and ODFW has determined the PA is consistent with applicable fish passage design criteria, as defined in OAR 635-412-0035(1), (2), (8) and (10); and therefore, approves the PA, as conditioned by this approval and in accordance with Oregon fish passage law (ORS 509.585). This fish passage authorization (FPA) provides the state's fish passage approval for the PA. This fish passage authorization is based on the information provided to ODFW and subsequent discussions between ODFW and Renewal Corporation staff and consultants.

Please continue to coordinate with Ted Wise (ODFW East Region Hydropower Coordinator) at Ted.G.WISE@odfw.oregon.gov, as the project advances towards implementation. The Renewal Corporation may similarly contact me at 503-947-6228 or by email at greg.d.apke@odfw.oregon.gov with questions regarding the content or the provisions of this fish passage authorization.

Sincerely,



Greg Apke
ODFW - Statewide Fish Passage Program Coordinator

Enclosure Cc:
Ted Wise, ODFW East Region Hydropower Coordinator
Anika Marriott, Oregon Department of Justice
Chandra Ferrari, ODFW Water Program Manager & Deputy Habitat Division Administrator
Alan Ritchey, ODFW Fish Screening and Passage Program Manager
Debbie Colbert, ODFW Deputy Director for Fish and Wildlife
Curt Melcher, ODFW Director
ODFW Fish Passage Project Files (#FPA-14-0038)

ODFW Fish Passage Authorization PA-14-0038 --- JC Boyle Dam Removal Project Klamath River

Decommissioning and Removal of the Lower Klamath Hydroelectric Project No. 14803-001, Klamath County, Oregon and Siskiyou County, California

1.0 BACKGROUND

The LKP consists of four hydroelectric developments on the Klamath River: J.C. Boyle, located in Oregon; Copco No. 1, Copco No. 2, and Iron Gate located in the state of California. In September of 2016, the Renewal Corporation filed an Application for Surrender of License for Major Project and Removal of Project Works, FERC Project Nos. 2082-063 & 14803-001 (License Surrender). The Renewal Corporation filed the License Surrender Application as the dam removal entity for the purpose of implementing the 2010 Klamath River Hydroelectric Settlement Agreement as amended in 2016. In November of 2020, the Renewal Corporation filed its Definite Decommissioning Plan (DDP) to its Amended License Surrender Application. The DDP is the Renewal Corporation's comprehensive plan to physically remove the LKP, achieve a free-flowing run of river condition, restore volitional fish passage, implement site remediation and restoration, and avoid adverse downstream impacts.

On August 26, 2022, FERC issued its final environmental impact statement (FEIS) for the proposed surrender and decommissioning of the LKP. The FERC staff found that any short- and long-term, adverse environmental effects and the loss of power generation resulting from the proposed action would be outweighed by the substantial long-term environmental benefits gained from project decommissioning and removal. Based on this finding, the FEIS recommended approval of the proposed license surrender, decommissioning, and removal of the project with staff additional recommendations and mandatory conditions.

The initial removal of all LKP facilities is projected to span an approximate 20-month period with longer term monitoring and restoration phase extending another five years beyond dam removals. The fish passage monitoring phase is the period during which upstream and downstream passage will occur through the free-flowing river. The river channel during this phase will likely regrade during high water events, and the goal of monitoring during this phase is to assess and ensure compliant fish passage conditions for a period of at least five years during the time of river channel reformation and stabilization and after dam removal.

The PA as defined and covered by this ODFW FPA, includes the J.C. Boyle Dam, Powerhouse, and associated features which generally include the powerhouse intake structures, embankments and side walls, penstocks and supports, decks, piers, gatehouses, fish ladder and holding facilities, pipes and pipe cradles, spillway gates and structures, diversion control structures, aprons, sills, tailrace channels, footbridges, powerhouse equipment, distribution lines, transmission lines, switchyards, and original cofferdams.

The FPPA contains a narrative description of the proposed process for the removal of J.C. Boyle Dam. Per information provided by the Renewal Corporation*, "no in-channel work will be conducted for dam removal in Oregon downstream of the J.C. Boyle Dam, other than the removal of boulders at the sidecast slide location and the filling of the J.C. Boyle Powerhouse*

tailrace." In addition, the FPPA states, *"that the majority of dam removal will occur in the dry by leaving the upstream portion of the dam embankment and the historic cofferdam in place. The cofferdam will direct the Klamath River through two existing diversion culverts, allowing the deconstruction crew to safely access the dam site. Dam removal is anticipated to begin during the July following the commencement of drawdown, though may be delayed in the case of extreme wet conditions (i.e., high inflow rates). Depending on the river hydrologic conditions and flows of the drawdown water year, the target is to achieve free-flowing river conditions by early October, with the facility removal completed by December 31. The earth fill dam embankment and concrete structures will be removed in a top- down sequence that ensures structural stability criteria are met throughout the entire removal process. Dam removal methods may include mechanical demolition, drilling, and, in limited situations, controlled blasting. Embankment removal…will occur over multiple phases… Removal of concrete structures such as the power intake, cut-off wall, and fish ladder may occur in conjunction with the dam embankment removal… The historic cofferdam is anticipated to be breached in September of the drawdown year. Channel restoration will be conducted at the dam footprint prior to the historic cofferdam breach…In addition, erosion protection will be installed, and a visual inspection of the historic cofferdam and remaining sediment is to be completed prior to the cofferdam breach. The breach will be completed by cutting the cofferdam embankment back towards the right bank."*

The Renewal Corporation expects to initiate reservoir drawdown on January 1, 2024, with upland preparatory work occurring in the year prior to drawdown. Restoration activities will begin following completion of reservoir drawdown. Table 1 identifies the anticipated phases and approximate date ranges of project activities.

Table 1.

Project Phase	**Date Range**	**Principle Activities**
Pre-Construction	Before March 1, 2023	Project planning
Pre-drawdown	March 1 to Dec. 31, 2023	Upland construction, site preparation
Drawdown	Jan. 1 to June. 30, 2024 June 30 to Oct. 15, 2024 June 30 to Dec. 31, 2024	Reservoir drawdown Dam deconstruction Initial restoration
Restoration Construction	Jan. 1 to Dec. 31, 2025	Reservoir area restoration, tributary enhancement
Monitoring	Jan. 1, 2026, to license surrender	Monitoring and adaptive management

The project monitoring areas and duration of the monitoring activities are described in the FPPA submitted to ODFW in April 2022, and the Reservoir Area Management Plan (RAMP) submitted to ODFW on FERC submittal in December 2021. The monitoring areas include:

- Areas within the former J.C. Boyle Reservoir area;
- Areas at and immediately downstream of the former J.C. Boyle Dam footprint;

- Areas within the approximately 2.5-mile reach between the former J.C. Boyle Dam footprint and the former J.C. Boyle scour hole[1];
- Areas at the former J.C. Boyle Powerhouse; and
- The lower reach of Spencer Creek approximately 0.20-mile near the confluence with the Klamath River.

The physical extent of the PA includes the geographic areas that encompass dam removal and the restoration related activities associated with the PA and may extend beyond the Federal Energy Regulatory Commission boundary associated with the LKP, as noted in the FPPA application submittal.

The RAMP prescribes fish passage monitoring that the Renewal Corporation will conduct on sections of the mainstem Klamath River in Oregon as well as a section of Spencer Creek near the confluence with the Klamath River. In addition to the fish passage monitoring areas covered in the RAMP, additional sections of the Klamath River downstream from J.C. Boyle Dam to the Oregon State Line will be surveyed as described in the FPPA and in accordance with the ODFW's FPA conditions set forth below.

2.0 APPROVAL TERMS AND CONDITIONS

ODFW has determined the PA is consistent with the state's fish passage design criteria, as defined in Oregon Administrative Rule (OAR) 635-412-0035(1), (2), (8) and (10) and therefore approves the PA, as conditioned by this approval and in accordance with Oregon fish passage law (ORS 509.585). This fish passage authorization provides the State of Oregon's fish passage approval for the PA in waters of this state and is subject to the following terms and conditions:

1. The Renewal Corporation is the responsible party to ensure the work of its contractors, subcontractors or other entities is consistent with the terms and conditions of this FPA.

2. The ODFW Klamath Watershed District Fish Biologist and the ODFW East Region Hydropower Coordinator shall be contacted four weeks prior to the start of the PA pre-drawdown activities and again 48 hours in advance of the beginning of J.C. Boyle Reservoir drawdown

3. All in-water work, defined as work at or below the ordinary high water mark elevation of the project area(s), shall be completed during the appropriate ODFW in-water work period from July 1 to September 30, as specified in the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources unless otherwise modified by ODFW. Per this FPA, ODFW provides an extension of the recommended in-water work for PA activities occurring during January 1, 2024 through December 31, 2024.

4. Downstream passage of native migratory fish shall be maintained during deconstruction activities associated with the PA by maintaining flow through the J.C. Boyle Dam diversion culverts and/or dam footprint, or as otherwise approved by ODFW. The Renewal

[1] Includes area where Sidecast Slide occurs.

Corporation will implement the fish passage related measures set forth in the RAMP and FPPA to facilitate fish passage (as defined in OAR 635-412-0005(18)) at all artificial obstructions caused by the PA that prevent or impair the migration of native migratory fish for the five-year period following removal of the J.C. Boyle Dam.

5. Implementation of the fish passage monitoring, adaptive management elements for the mainstem Klamath River waters in Oregon and Spencer Creek, as described in the FPPA, including, but not limited to, the implementation of the monitoring and remedy actions established in the RAMP. The Renewal Corporation will apply the in-water work best management practices (BMPs) set forth in the RAMP to work related to reservoir restoration activities. These BMPs are specific to the restoration activities conducted during the Construction Period and Maintenance and Monitoring Period of the project. These BMPs for in-water work are part of the overall adaptive management approach that includes proactive monitoring and surveys for fish passage and tributary connectivity blockages, as described in the RAMP and the Aquatic Resources Management Plan (Appendix D of FERC 2021a).

6. Implementation of fish passage measures prescribed in Section 4 of the Oregon Department of Environmental Quality 401 Water Quality Certification for the LKP dated September18, 2018[2].

7. During the monitoring period set forth and in accordance with the adaptive management framework described in the RAMP and FPPA, the Renewal Corporation will identify, monitor, evaluate, and remove or modify all fish passage barriers caused by the PA, such as sediment barriers and erosional head cuts, that are visible within channel beds and cause greater than a six-inch discontinuity in water surface elevation.

8. Prior to the J. C. Boyle reservoir drawdown and dam removal, the Renewal Corporation will undertake the fish salvage and translocation measures described in the Oregon AR-6 Adaptive Management Plan-Suckers (Appendix F of the ARMP as filed with FERC in December 2021).

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[2] This section of the certification provides as follows:

> The Licensee shall provide or maintain fish passage at all artificial obstructions created or affected by the Proposed Action that prevent or delay the migration of native migratory fish; The Licensee shall, in consultation with ODFW and subject to approval by DEQ, remove or modify artificial fish barriers created or affected by the Proposed Action until the effective date of license surrender at all locations where native migratory fish are currently or have historically been present. Until the effective date of license surrender the Licensee shall reduce or eliminate project-related obstructions such as sediment barriers and erosional head cuts resulting in a vertical step higher than six inches; Potential artificial barrier locations may include but are not limited to the following: A. Topsy Grade Road culverts; B. Unnamed tributary north of Keno Access Road; C. Spencer Creek.

Oregon Department of Environmental Quality, Section 401 Certification, Lower Klamath Project, at Section 4, *available at* https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf.

9. Prior to J.C. Boyle reservoir drawdown, the Renewal Corporation and its contractors and agents will conduct fish salvage operations in the J.C. Boyle fish ladder. This will involve permanently shutting down the fish ladder operation followed by the use of a collection method (i.e., dip nets) to capture and relocate stranded fish in the fish ladder. Electrofishing should be used if dip netting becomes ineffective at capturing fish. The procedure will be repeated until there is reasonable confidence that all fish have been removed from the fish ladder.

10. Following J.C. Boyle reservoir drawdown, all work area isolation measures related to in-water restoration activities, including fish salvage and relocation, shall be implemented in accordance with the BMPs set forth in the RAMP and the terms of the NMFS Biological Opinion. The BMPs set forth in the RAMP require the following:

    a. A fisheries biologist to evaluate the in-water habitat to determine if salmonids or protected fish occur in the limits of work.

    b. If salmonids or other protected fish are or are assumed to be present in the in-water work area, fish rescue, relocation and exclusion will occur under the direction of a qualified fisheries biologist.

    c. General conditions for fish capture and relocation activities include:

        i. Exclusion will include the use of block nets, or similar, to isolate the work area from fish access.
        ii. The fisheries biologist will evaluate the upstream and downstream extent of the fish exclusion and relocation efforts, which will be based on the minimal amount of wetted channel where salmonids may experience potential injury or mortality from the in-water activity.
        iii. Fish relocation will be performed using seine nets, dip nets, and/or electrofishing as determined appropriate and effective by the fisheries biologist.
        iv. The duration and extent of fish relocation actions will be determined by the fisheries biologist.
        v. Once the work area is determined to be cleared of salmonids, in-water work activities will be cleared to begin.
        vi. All electrofishing will be conducted in accordance with the NMFS Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act (NMFS 2000).

    d. Salmonid Handling and Relocation: NOAA Restoration Center's Programmatic Approach to ESA/EFH Consultation Streamlining for Fisheries Habitat Restoration Projects (NMFS 2017b), Section 2.4.1.E – Guidelines for Relocation of Salmonids, will guide relocation work.

e. If no salmonids or protected fish occur in the work area, a biologist will monitor the in-water work actions to ensure that there is no change in conditions that would require fish exclusion or relocation.

f. Photographs of the in-water work locations and a written summary of the actions within these locations will be provided to the Aquatic Resources Group (of which ODFW is a member) within one (1) week of the completion of in-water work. These photographs and written summaries must include any fish salvage and relocation activities.

11. Prior to conducting fish salvage in Oregon, the Renewal Corporation will obtain the authorizations required from NMFS or USFWS if work is in ESA waters. In addition, the Renewal Corporation will obtain the additional permits or authorizations required under Oregon law.

12. Materials from dam demolition activities used to fill waters of this state shall be clean, non-hazardous, and non-toxic.

13. In project areas where fish may be exposed to materials necessary to construct or deconstruct the project (concrete, steel, etc.), all potential sharp or abrasive edges and surfaces shall be made smooth as to preclude harm or physical injury to native migratory fish.

14. All stream grading, stream bank shaping, or bank stabilization within waters of this state shall be sloped towards the thalweg of the Klamath River, or other confluent tributaries where appropriate, as to not entrain or strand native migratory fish.

15. Rockfall or fill materials associated with and located at site of the scour hole downstream of the J.C. Boyle Dam shall not further constrict the river channel or prevent or delay fish passage.

16. Fish passage monitoring of the mainstem Klamath River and Spencer Creek tributary during the J.C. Boyle reservoir drawdown will be conducted in accordance with the FPPA and RAMP.

17. Fish passage monitoring shall be led by a qualified biologist to determine whether the project functions as it was designed to function for fish passage. Such monitoring will include both the desktop monitoring methods and field monitoring methods described in the FPPA and the RAMP. The project areas of high risk for fish passage should be specifically emphasized during monitoring and reporting. These areas of high risk for fish passage include but are not limited to the areas within the footprint of the J.C. Boyle Dam, the Scour Hole below the Dam, the narrows situated downstream of the dam, and Spencer Creek.

18. The Renewal Corporation shall provide ODFW with all fish passage monitoring reports required under the FPPA and the RAMP. The reports shall be submitted to the ODFW Fish Passage Program Coordinator, ODFW East Region Hydropower Coordinator and the

ODFW Klamath Watershed District Fish Biologist for a period of 5 years – post the year of J. C. Boyle hydroelectric dam and associated facilities removal, in accordance with the schedule and timeline set forth in the FPPA and RAMP. Annual reporting shall include the extent to which performance criteria (as defined in the RAMP) for evaluating restoration are being meet with respect to unobstructed stream continuity and volitional passage of native migratory fish. Monitoring reports shall be submitted to:

Oregon Department of Fish and Wildlife
East Region Hydropower Program Coordinator
61374 Parrell Road,
Bend, Oregon 97702

Oregon Department of Fish and Wildlife
Fish Division Statewide Fish Passage Program Leader
4034 Fairview Industrial Drive SE
Salem, Oregon 97302

19. If monitoring, by the Renewal Corporation, your designee, or the ODFW indicates that volitional fish passage is questionable or not provided within the RAMP or the Oregon Fish Passage Monitoring Areas (as defined in the FPPA) due to fish passage barriers caused by dam removal activities, the Renewal Corporation in consultation with the ODFW shall identify, evaluate, and, during a work period approved by the ODFW remove the fish passage barrier(s) in accordance with the adaptive management framework described in the RAMP and FPPA.

20. The ODFW shall be allowed to inspect the project at reasonable times for the duration of this approval. Unless prompted by emergency or other exigent circumstances, inspection shall be limited to regular and usual business hours, including weekends.

3.0 FINAL NOTES

Please retain this fish passage authorization for your records, as this documents ODFW's fish passage approval of the LKP J.C. Boyle - Klamath River Dam Removal restoration project as required by ORS 509.585. Failure to comply with this ODFW fish passage approval shall constitute a violation of this approval and applicable fish passage laws (ORS 509.585 and 509.610).

This approval is solely for the purpose of fulfilling Oregon fish passage statutory requirements and responsibilities administered by the Oregon Fish and Wildlife Commission or the ODFW and does not satisfy any other federal, state, or local laws, rules, or regulations, including but not limited to State or Federal Endangered Species Acts, any applicable water rights, approvals, or other certificates administered by regulatory authorities. It is the Renewal Corporation’s responsibility to comply with all necessary and required local, county, state, and federal approvals and permits. This approval in no way purports or authorizes take of a state or federally-listed species.

4.0 REFERENCES

Federal Energy Regulatory Commission (FERC). 2021f. Klamath River Renewal Corporation, PacifiCorp. Project Nos. 14803-001; 2082-063. Amended Application for Surrender of License for Major Project and Removal of Project Works. Exhibit A. Aquatic Resources Management Plan. (Amended December 15, 2021)

Oregon Department of Environmental Quality (ODEQ). 2019. Clean Water Act Section 401 Certification for the Klamath River Renewal Corporation Lower Klamath Project License Surrender (FERC No. 14803), Klamath County, Oregon. September 7, 2018. Available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf

Appendix E

Juvenile Salmonid and Pacific Lamprey Rescue and Relocation Plan

KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project
FERC Project No. 14803

Juvenile Salmonid and Pacific Lamprey Rescue and Relocation Plan

Klamath River Renewal Corporation
2001 Addison Street, Suite 317
Berkeley, CA 94704

Prepared by:
RES
2125 19th Street, Suite 200
Sacramento, CA 95818

December 2022

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Table of Contents

List of Tables

List of Figures

Appendices

1.0 Introduction

This Juvenile Salmonid and Pacific Lamprey Rescue and Relocation Plan (Juvenile Salmonid Plan) is a sub-plan of the Aquatic Resources Management Plan that will be implemented as part of the Proposed Action (Proposed Action) for the Lower Klamath Project.

For purposes of the Juvenile Salmonid Plan, Year 1 refers to the year before drawdown and Year 2 refers to the drawdown year.

1.1 Purpose of Juvenile Salmonid Plan

Juvenile salmonids use the mainstem Klamath River and its tributaries as migration corridors to redistribute in the spring and early summer (USFWS, 2018a; Soto *et al.*, 2016), when Suspended Sediment Concentrations will likely be highest in the mainstem as a result of the Proposed Action (Renewal Corporation, 2021).

The purpose of the Juvenile Salmonid Plan is to describe (1) the water quality monitoring that the Renewal Corporation will undertake, (2) the framework the Renewal Corporation will use to determine when to relocate juvenile salmonids based on the monitoring criteria, (3) the methods the Renewal Corporation will use to relocate juvenile salmonids, and (4) the reporting requirements applicable to the Renewal Corporation under the Juvenile Salmonid Plan. The actions described in the Juvenile Salmonid Plan will occur between January 1 and December 31 of Year 2.

Pacific lamprey (*Entosphenus tridentatus*), an anadromous fish species, co-occurs with juvenile salmonids in the Klamath River and its tributaries (Goodman and Reid, 2012). Following consultation, the Aquatic Technical Work Group (ATWG) recommended that Pacific lamprey not be relocated. Therefore, Pacific lamprey will not be relocated by the Renewal Corporation under the Juvenile Salmonid Plan. Any incidental catch of Pacific lamprey by the Renewal Corporation will be left at the site of capture to continue volitional outmigration. See Section 3.0 of the Aquatic Resources Management Plan for additional details regarding the ATWG.

1.2 Relationship to Other Management Plans

The Juvenile Salmonid Plan is supported by elements of the California Water Quality Monitoring Plan for effective implementation. So as not to duplicate information, elements from the California Water Quality Monitoring Plan are not repeated herein but are, where appropriate, referenced in the Juvenile Salmonid Plan.

1.3 Juvenile Salmonid Plan Activities

The remainder of the Juvenile Salmonid Plan describes the actions that the Renewal Corporation will take in connection with the Juvenile Salmonid Plan, and is divided into the following sections:

- Section 2.0 provides an overview of the Renewal Corporation's monitoring efforts, including the time period during which monitoring will occur, the areas that the Renewal Corporation will monitor, and the criteria that will be used during monitoring.
- Section 3.0 provides an overview of the Renewal Corporation's capture and relocation efforts, including a list of the target species, a description of the equipment and methods that the Renewal Corporation will use, detailed information regarding site-specific approaches to capture, and a summary of the different relocation sites and relocation logistics.
- Section 4.0 provides a description of the report that the Renewal Corporation will prepare following implementation of the Juvenile Salmonid Plan.

2.0 Juvenile Salmonid Plan Monitoring

2.1 Monitoring Plan Overview

High water temperatures can increase the risk of juvenile salmonid mortality. Juvenile salmonids will therefore typically attempt to redistribute to cooler water as a natal tributary begins to warm (USFWS, 2018a). Juveniles redistributing into the Klamath River mainstem during certain portions of Year 2 may experience elevated levels of Suspended Sediment Concentrations due to the Proposed Action. Elevated Suspended Sediment Concentrations can also cause juvenile salmonid mortality to increase. To minimize juvenile salmonid mortality during Year 2, the Renewal Corporation will monitor water temperature and Suspended Sediment Concentrations as described below to determine whether juvenile salmonids need to be relocated during Year 2.

The Renewal Corporation will monitor (1) Suspended Sediment Concentrations of the mainstem Klamath River using three U.S. Geological Survey (USGS) water quality monitoring gages and (2) water temperature at the 13 tributary confluences listed in Section 2.3 using underwater temperature data loggers. The locations of the 13 tributary confluences are set forth in the figures included in Appendix A. Grab samples will also be collected every two weeks on the mainstem Klamath River as part of the California Water Quality Monitoring Plan. Additionally, during site visits when water temperature loggers are being offloaded, the Renewal Corporation will monitor dissolved oxygen and record visual observations of fish in the tributary and the thermal mixing zone where the mainstem and tributary waters mix (i.e., Thermal Refugia). The observations will include estimated fish densities and fish behavior, including lethargy, increased agonistic behavior, excessive gill flaring (Nielsen *et al.*, 1994), unusual swimming patterns (Logue *et al.*, 1995), and visible signs of disease, injury, or mortality. During these sites visits, the Renewal Corporation will record water temperature, turbidity, dissolved oxygen levels, and fish behavior observations on electronic tablets or paper data sheets (Appendix B).

Based on the criteria set forth in Section 2.5, the Renewal Corporation will determine, in consultation with Aquatic Resources Group (ARG), if capture and relocation efforts are required. See Section 3.0 of the Aquatic Resources Management Plan for additional details regarding the ARG.

If a decision is made to capture and relocate juvenile salmonids, the Renewal Corporation will relocate collected juvenile salmonids to suitable relocation sites based on the species, life stage, and location of collection. Each monitored tributary has primary and secondary relocation sites (Relocation Sites), which are set forth in Section 3.3.3 and were selected in consultation with the ATWG. Prior to capture and relocation, the Renewal Corporation will perform a reconnaissance survey of the relevant Relocation Site(s) to ensure habitat conditions and capacity are suitable for the anticipated number of relocated fish. If the Renewal Corporation determines based on reconnaissance surveys that neither the primary nor secondary Relocation Sites for the relevant monitored tributary are suitable, it will identify, in consultation with the ARG, alternative relocation sites with suitable water quality conditions and holding capacity based on the criteria used to identify the Relocation Sites.

2.2 Monitoring Timeline

The Renewal Corporation will conduct monitoring from March 1 to July 1 during Year 2. This timeline, developed in consultation with the ATWG, is based on the timing of juvenile salmonid outmigration, water temperature suitability, and anticipated Suspended Sediment Concentration modeling for the Klamath River during drawdown (Renewal Corporation, 2018; Renewal Corporation, 2021).

2.3 Areas to be Monitored

The Renewal Corporation will monitor (1) water temperatures at the confluences of 13 tributaries (Monitored Tributaries) between Iron Gate Dam and Seiad Creek (Appendix A, Figure 1) and (2) Suspended Sediment Concentrations at three locations on the mainstem Klamath River.

The Monitored Tributaries (from downstream to upstream) are:

- Seiad Creek (RM 131.9)
- Grider Creek (RM 132.1)
- Walker Creek (RM 135.2)
- O'Neil Creek (RM 139.1)
- Tom Martin Creek (RM 144.6)
- Scott River (RM 145.1)
- Horse Creek (RM 149.5)
- Beaver Creek (RM 163.3)[1]
- Humbug Creek (RM 173.9)
- Shasta River (RM 179.3)
- Cottonwood Creek (RM 185.1)

[1] The Beaver Creek referenced in this Juvenile Salmonid Plan is not the same as the priority tributary at Copco No. 1 Reservoir named Beaver Creek that is referenced in the Reservoir Area Management Plan and the Fish Presence Monitoring Plan.

- Dry Creek (RM 190.9)
- Bogus Creek (RM 192.6)

The Renewal Corporation selected the areas to be monitored under the Juvenile Salmonid Plan in consultation with the ATWG based on their importance as natal streams for salmonid spawning or as key Thermal Refugia for juvenile salmonids.

2.4 Monitoring Criteria

2.4.1 Water Quality Triggers

The Renewal Corporation determined the water quality triggers for mainstem Suspended Sediment Concentration and tributary confluence temperatures in consultation with the ATWG (Renewal Corporation, 2018). The Suspended Sediment Concentration trigger (Suspended Sediment Concentration Trigger) is a Suspended Sediment Concentration[2] greater than 1,000 mg/L. Because measuring Suspended Sediment Concentration requires lengthy laboratory procedures that do not permit real-time decision making, water turbidity will be used as a proxy for Suspended Sediment Concentration. As set forth below, water turbidity will primarily be measured in 15 or 30-minute continuous intervals at three USGS water quality monitoring gages.

The Renewal Corporation will also conduct baseline water quality monitoring on the mainstem Klamath River as part of the California Water Quality Monitoring Plan, including monitoring Suspended Sediment Concentration levels through collections of grab samples every two weeks and continuous monitoring of turbidity starting January 1 of Year 1 and extending into the post-drawdown period. See the California Water Quality Monitoring Plan for additional information. Data collected by the Renewal Corporation during Suspended Sediment Concentration and turbidity monitoring will be fit to a regression developed to better define the local relationship between these two variables. An initial regression analysis for each of the three USGS water quality monitoring gage locations will be completed prior to June 1 of Year 2. Once completed, they will be provided to the ARG and used by the Renewal Corporation to set a continuously-monitored turbidity level for each location. Each location's turbidity level will be used as the surrogate for the Suspended Sediment Concentration Trigger. The regression analysis for each location will be regularly updated throughout the drawdown and monitoring phases as new data is collected and becomes available.

The Renewal Corporation will monitor water temperatures at the Monitored Tributaries and has, in consultation with the ATWG, established both early-warning and trigger temperatures based on a 7-day average of the daily maximum values (7DADM). A 17°C 7DADM will be used as an early indication of warming temperatures. A 19°C 7DADM will be used as the water temperature trigger (Water Temperature Trigger).

[2] Suspended sediment refers to settleable suspended material in the water column (FERC, 2022).

2.4.2 Mainstem Klamath Suspended Sediment Monitoring

The Renewal Corporation will use the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) and the USGS Klamath River Near Seiad Valley CA gage (No. 11520500) to monitor Suspended Sediment Concentration in the mainstem Klamath River (Appendix A, Figure 1). In addition, the Renewal Corporation will also monitor Suspended Sediment Concentration at the USGS Klamath River At Orleans CA gage (No. 11523000), which is approximately 73 river miles downstream of the Seiad Valley CA gage.

The USGS stations provide continuous turbidity monitoring data and will serve as proxies for evaluating if the mainstem Suspended Sediment Concentration Trigger is exceeded, as described in more detail above. In addition, when the water temperature at a Monitored Tributary either exceeds or is anticipated to exceed the Water Temperature Trigger, the Renewal Corporation will take supplemental point samples of turbidity in the mainstem Klamath River near the Monitored Tributary using a handheld water quality meter.

2.4.3 Tributary Confluence Water Temperature Monitoring

Given the differences between the Monitored Tributaries, the spatial extent of monitoring at each confluence will vary (Appendix A, Figures 2-14). Generally, the confluence is the point where the tributary meets the mainstem Klamath River. The areas monitored by the Renewal Corporation (Tributary Confluence Monitoring Areas) are described in more detail in Section 3.2 below. If the Renewal Corporation needs to modify a monitored area due to landowner and/or access issues that are currently unknown, it will do so in consultation with the ARG. The Renewal Corporation's primary goal at each Monitored Tributary is to identify a location to monitor water temperatures that is representative of where juvenile salmonids may congregate. Given that the spatial extent of the thermal mixing zones shift daily and throughout the season (Brewitt and Danner, 2014), the Renewal Corporation will install a water temperature logger within each Tributary Confluence Monitoring Area in an accessible location that is representative of the Thermal Refugia for that tributary confluence. Loggers will collect water temperature at 30-minute intervals. During Year 2, the Renewal Corporation will offload water temperature loggers every other week between March 1 – April 30 and weekly from May 1 – July 1. If, based on the hydrologic and meteorological forecasts, temperatures are anticipated to approach or exceed the Water Temperature Trigger at a Monitored Tributary, the Renewal Corporation will determine, in consultation with the ARG, whether it is necessary to temporarily offload the water temperature loggers at the Monitored Tributary more frequently.

2.4.4 Site Visit Monitoring

During site visits when water temperature loggers are being offloaded, the Renewal Corporation will take point measurements of dissolved oxygen within the Tributary Confluence Monitoring Area using a handheld YSI meter (or equivalent). The dissolved oxygen level will be recorded on electronic tablets or paper data sheets (Appendix B). In addition, the Renewal Corporation will record visual estimates of juvenile fish density and observations of fish behavior. With respect to fish behavior, the Renewal Corporation will note lethargy, increased agonistic behavior, excessive gill flaring (Nielsen *et al.*, 1994), unusual swimming patterns (Logue *et al.*, 1995), and visible signs of disease, injury, or mortality. The Renewal Corporation will

photograph noteworthy habitat changes that may adversely impair habitat quality. While visual observations will be made primarily from shore, the Renewal Corporation may undertake in-water fish observations (i.e., snorkel surveys) as temperatures approach the Water Temperature Trigger depending on the Renewal Corporation's ability to obtain visual observations of the fish. The length of the observation period will be dependent on water temperature, turbidity and fish behavior and will be recorded on electronic tablets or paper data sheets (Appendix B).

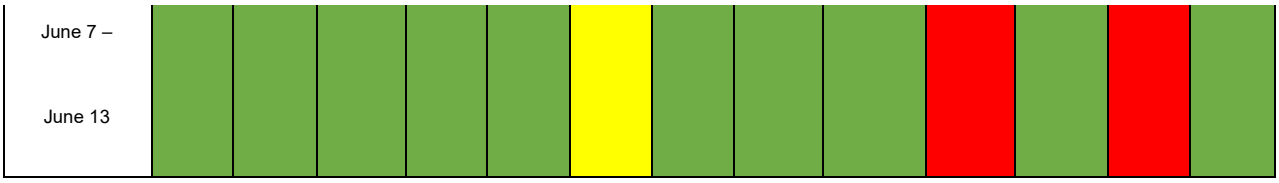
2.5 Aquatic Technical Working Group Coordination; Capture and Relocation Criteria

The Renewal Corporation will schedule standing calls with the ARG to review water quality data, fish observations, and invasive species updates (if any). Call frequency will be bi-monthly (i.e., twice per month) between March 1 and April 30 of Year 2 and weekly between May 1 and July 1 of Year 2 unless a less frequent call schedule is agreed to by the ARG. In addition to the water quality data, monitoring observations and invasive species updates, the Renewal Corporation will provide the ARG with hydrologic and meteorological forecasts for the upcoming monitoring period. If the meteorological data forecasts unseasonably high temperatures, the Renewal Corporation will consult with the ARG to determine whether it is necessary to schedule additional calls with the ARG. In addition, as described above in Section 2.4.3, if temperatures are anticipated to approach or exceed the Water Temperature Trigger at a Monitored Tributary based on the hydrologic and meteorological forecasts, the Renewal Corporation will consult with the ARG to determine whether it is necessary to temporarily offload the water temperature loggers at the Monitored Tributary more frequently.

Before each call, the Renewal Corporation will prepare a weekly/bi-weekly monitoring report for rapid tracking of tributary conditions relative to water quality triggers. Each tributary will be color coded to indicate whether no water quality trigger has been exceeded (Green), one water quality trigger has been exceeded (Yellow), or both water quality triggers have been exceeded (Red). An example of a monitoring report is presented in Figure 2-1.

Figure 2-1. Example monitoring report.

Monitoring Period	Tributary Confluence Monitoring Area												
	Seiad Creek	Grider Creek	Walker Creek	O'Neil Creek	Tom Martin Creek	Scott River	Horse Creek	Beaver Creek	Humbug Creek	Shasta River	Cotton-wood Creek	Dry Creek	Bogus Creek
May 24 - May 30													
May 31 - June 6													



When reviewing water quality data, the Renewal Corporation will determine whether any of the three mainstem Klamath River monitoring sites referenced in Section 2.4.2 have exceeded the Suspended Sediment Concentration Trigger. If the Suspended Sediment Concentration Trigger has not been exceeded, no capture and relocation efforts will be implemented unless the Renewal Corporation determines, in consultation with the ARG, that capture and relocation is warranted based on dissolved oxygen levels and unusual fish behavior.

If the Suspended Sediment Concentration Trigger has been exceeded, the Renewal Corporation will determine, in consultation with the ARG, whether any Tributary Confluence Monitoring Areas have exceeded the early warning temperature of 17°C 7DADM. If both the Suspended Sediment Concentration Trigger and early warning temperature have been exceeded, the Renewal Corporation will determine, in consultation with the ARG, whether capture and relocation is warranted based on (1) dissolved oxygen levels, (2) observations of fish behavior and (3) upcoming hydrologic and meteorological data. If capture and relocation is warranted, the Renewal Corporation will consult with the ARG regarding logistics for the capture and relocation effort.

If both the Suspended Sediment Concentration Trigger has been exceeded and the Water Temperature Trigger of a Tributary Confluence Monitoring Area has been exceeded, the Renewal Corporation will, following consultation with the ARG, proceed with capture and relocation efforts in the manner described in Section 3.0 below.

3.0 Juvenile Fish Capture Methods and Relocation Sites

3.1 Capture and Relocation Overview

If the Renewal Corporation determines, in consultation with the ARG, that fish relocation is necessary at a Monitored Tributary, the Renewal Corporation will promptly commence capture and relocation, typically within 48 hours. The number of crew members required will depend on the level of effort needed at that tributary and on the capture equipment that will be used. The level of effort required will be determined by the Renewal Corporation following consultation with the ARG.

3.1.1 Target Species

Target species for capture and relocation include coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*O. tshawytscha*), and steelhead trout (anadromous form of rainbow trout; *O. mykiss*). The target life stage for these salmonids during capture and relocation is the juvenile life stage, which includes fry and parr (collectively young-of-the-year or YOY) and smolts.

3.1.2 Equipment and Methods

The Renewal Corporation will use seines and fyke nets as its primary fish capture equipment. The equipment used to capture fish at a given tributary confluence will depend on several factors, including habitat type (e.g., shallow eddy vs. deep pool), habitat complexity (e.g., sandy vs. rocky bottom), the total number of fish expected to be captured, and whether fish will be actively out-migrating during the capture period. For example, in a shallow, sandy eddy, a seine may be the best option. Alternatively, trapping with fyke nets may be the best capture option from a deep pool with a rocky bottom in a tributary from which juveniles are actively out-migrating.

Electrofishing, if used, will be performed by a qualified individual and conducted according to the National Marine Fisheries Service (NMFS) *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act* (NMFS, 2000). The Renewal Corporation will submit staff qualifications to NMFS for approval prior to conducting electrofishing. Due to both the variation in water quality that may occur as a result of reservoir drawdown conditions and the variation in species composition and size encountered during capture activities, electrofishing will only be conducted by the Renewal Corporation in the event that seining is considered an ineffective measure for safely collecting and relocating fish from the Tributary Confluence Monitoring Area.

The Renewal Corporation may, in coordination with the California Department of Fish and Wildlife (CDFW), use rotary screw traps and existing outmigration monitoring locations in implementing the Juvenile Salmonid Plan. In addition, baited minnow traps may be used by the Renewal Corporation to supplement the fish capture methods described above.

While the following sections describe the anticipated equipment and capture methods to be used at each Monitored Tributary, the final determination of what methods to use will be site-specific and made by the Renewal Corporation close in time to capture and relocation based on the specific characteristics of the Tributary Confluence Monitoring Area. If required, the Renewal Corporation will use a small boat or cataraft to safely relocate captured fish to transport vehicles.

3.2 Site-Specific Approaches to Juvenile Salmonid Capture

This section of the Juvenile Salmonid Plan addresses the following with respect to the Monitored Tributaries:

- The area that will be monitored for each Monitored Tributary. The areas to be monitored were determined in consultation with the Karuk Tribe on a tributary-by-tributary basis based on the Tribe's local knowledge and experience with the Monitored Tributaries.
- The species that are expected to be most abundant in the Tributary Confluence Monitoring Area during the monitoring period.
- With respect to certain Monitored Tributaries, if volitional fish passage is expected to be available from the Tributary Confluence Monitoring Area to cooler reaches upstream.

- With respect to certain Monitored Tributaries, if and when the Renewal Corporation expects the Water Temperature Trigger to be exceeded.
- With respect to certain Monitored Tributaries, other factors (if any) that the Renewal Corporation will consider in determining if capture is warranted.
- The equipment and methods that the Renewal Corporation anticipates using for fish capture and relocation.

Details for Monitored Tributaries are provided in the following subsections, and tributaries are listed from downstream to upstream. Figures referenced in the sections below delineate the Tributary Confluence Monitoring Area where the Renewal Corporation will install water temperature logger(s) and, if needed, where fish collection activities will take place (Appendix A).

3.2.1 Seiad Creek

The Renewal Corporation will monitor the lower approximately 1,500 ft (0.29 miles) of Seiad Creek (Appendix A, Figure 2). This tributary is anticipated to be heavily used by juvenile coho salmon, especially non-natal individuals (Witmore, 2014). The lower reach and confluence of Seiad Creek may exceed the Water Temperature Trigger around late July to mid-August, which is outside of the monitoring period. Additionally, there is a cold-water refuge near the Highway 96 bridge, about 0.5 miles upstream of the confluence. Since there are no known fish passage barriers between the tributary confluence and the upstream cold-water refuge, fish are expected to be capable of volitionally moving to cooler habitat as needed. Therefore, the Renewal Corporation does not expect that capture and relocation of out-migrating juvenile salmonids will be needed at Seiad Creek.

While the Water Temperature Trigger is not anticipated to be exceeded during the monitoring period, Seiad Creek may experience an increase in use by non-natal salmon, potentially resulting in overcrowding in the Thermal Refugia. If the Renewal Corporation observes overcrowding and negative fish behavior, the Renewal Corporation may engage in capture if the Suspended Sediment Concentration Trigger is exceeded. If the Renewal Corporation engages in capture, a seine is likely to be used, with capture and relocation likely requiring a crew of three persons working over a one or two-day period.

3.2.2 Grider Creek

The Renewal Corporation will monitor approximately 500 ft (0.10 miles) of Grider Creek (Appendix A, Figure 3). The Renewal Corporation does not expect that Grider Creek will exceed the Water Temperature Trigger. Sediment deposition at the confluence is relatively dynamic and typically does not result in deep pools that are utilized by juvenile coho salmon (T. Soto, pers. comm., 2020). In addition, there has not been a significant amount of juvenile habitat identified in the Tributary Confluence Monitoring Area. The Renewal Corporation anticipates using a seine if the Renewal Corporation determines that juvenile fish need to be relocated from this Tributary Confluence Monitoring Area. This capture effort will likely be done by a crew of three persons working over a one to two-day period. If seining is an issue due to substrate and habitat complexity, the Renewal Corporation may use backpack electrofishing instead.

3.2.3 Walker Creek

The Renewal Corporation will monitor the lower approximately 700 ft (0.14 miles) of Walker Creek (Appendix A, Figure 4). The Renewal Corporation does not expect that Walker Creek will exceed the Water Temperature Trigger. Walker Creek does not support a large population of spawning salmonids, though non-natal salmonids are occasionally observed in the Tributary Confluence Monitoring Area (T. Soto, pers. comm., 2020). The confluence of Walker Creek is dynamic, and its structure can shift annually based on flows and sediment deposition. The Renewal Corporation anticipates using a seine if the Renewal Corporation determines that juvenile fish need to be relocated from this Tributary Confluence Monitoring Area. This capture effort will likely be done by a crew of three persons working over a one to two-day period. If seining is an issue due to substrate and habitat complexity, the Renewal Corporation may use backpack electrofishing instead.

3.2.4 O'Neil Creek

The Renewal Corporation will monitor the lower approximately 800 ft (0.15 miles) of O'Neil Creek (Appendix A, Figure 5). The Renewal Corporation has not identified any significant Thermal Refugia in O'Neil Creek upstream of the tributary confluence, though there is a Thermal Refugia for juvenile salmonids at the tributary confluence, which is included in the Tributary Confluence Monitoring Area. This Thermal Refugia typically provides habitat for a large number of non-natal fish, especially Scott River juvenile salmonids (Gorman, 2016). The Renewal Corporation anticipates using a seine, fyke net traps, or backpack electrofishing if the Renewal Corporation determines that juvenile fish need to be relocated from this Tributary Confluence Monitoring Area. Due to the relatively high habitat complexity, the Renewal Corporation will determine the specific equipment type based on site conditions and the anticipated number of fish to be encountered. This capture effort will likely be done by a crew of up to five persons working over a one to four-day period.

3.2.5 Tom Martin Creek

The Renewal Corporation will monitor the lower approximately 350 ft (0.07 miles) of Tom Martin Creek and approximately 580 ft (0.11 miles) of Klamath River side channel habitat (Appendix A, Figure 6). Due to a fish passage barrier just upstream of the mouth, Tom Martin Creek does not have an adult spawning population of anadromous salmonids. However, it is a significant Thermal Refugia for non-natal salmonids (Soto *et al.*, 2016; Witmore, 2014). Importantly, Tom Martin Creek is the first cold water tributary downstream of the Scott River, offering Thermal Refugia for redistributing YOY salmonids (Gorman, 2016).

The Renewal Corporation anticipates that Tom Martin Creek will remain a source of cold-water refuge. Due to its location, the Tributary Confluence Monitoring Area will likely be impacted by increased Suspended Sediment Concentrations in the mainstem Klamath. Therefore, salmonids in this Tributary Confluence Monitoring Area may require capture and relocation if behavioral and habitat observations indicate actions should be taken. The Renewal Corporation anticipates using a seine if the Renewal Corporation determines that juvenile fish need to be relocated from this Tributary Confluence Monitoring Area. If seining is an issue due to substrate and habitat

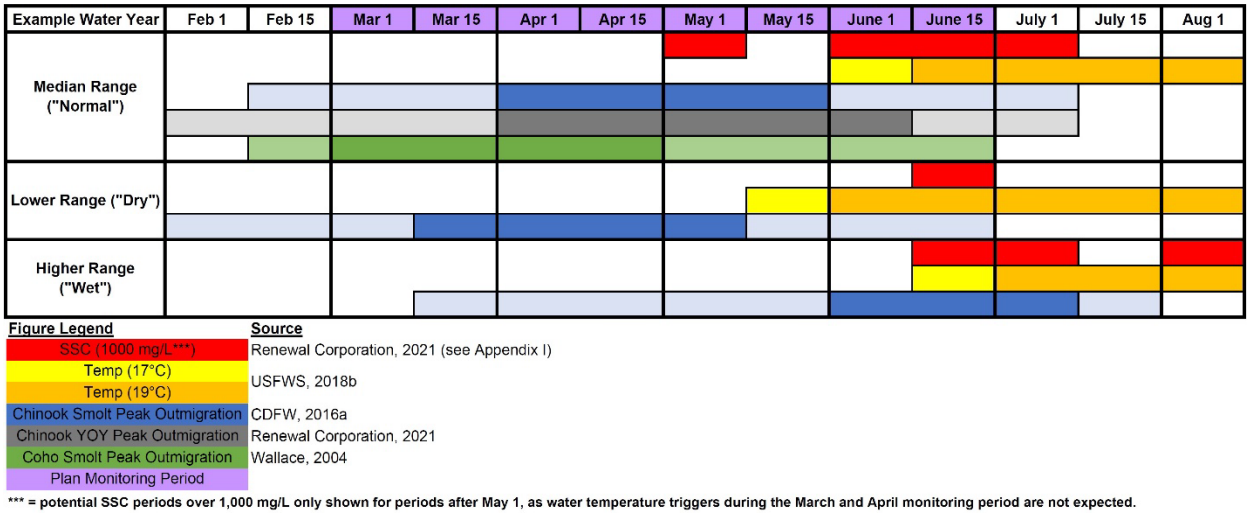
complexity, the Renewal Corporation may use backpack electrofishing instead. This capture effort will likely be done by a crew of up to five persons working over a one to four-day period.

3.2.6 Scott River

The Renewal Corporation will monitor the lower approximately 1,200 ft (0.23 miles) of the Scott River (Appendix A, Figure 7). In typical years, the Scott River begins to warm in late spring, potentially exceeding the Water Temperature Trigger by late May to mid-June (Figure 3-1). This period is anticipated to overlap with elevated Suspended Sediment Concentration levels in the mainstem Klamath River. Therefore, the Renewal Corporation anticipates that both water quality triggers may be exceeded during a 2-4 week period in June of a typical water year.

The Scott River is a significant salmon producing tributary, with large populations of coho salmon, Chinook salmon, and steelhead trout. The timing of peak juvenile salmonid outmigration is variable based on water year type. Dry water years typically see peak salmon outmigration in late March to early April, with 90 percent of the juveniles having out-migrated by the end of May (CDFW, 2016a). Other water year types have more variable outmigration timing, sometimes extending into June.

Figure 3-1. Scott River potential overlap of water quality triggers and juvenile salmonid outmigration



With the potential overlap of outmigration periods with exceeded water quality triggers, juvenile salmonid outmigrant trapping may be required in this Tributary Confluence Monitoring Area (Figure 3-1). If trapping is required, the Renewal Corporation anticipates deploying two to three fyke net traps to span the majority of the river channel. The Renewal Corporation will check fyke net traps daily, when operating, to process collected fish and clear debris. This capture effort will likely be done by a crew of two to three persons working for the duration of time that the fyke nets are operating. The Renewal Corporation anticipates the fyke nets operating for two to four-weeks, depending on water quality conditions. To the extent necessary, the Renewal Corporation anticipates using seining to capture fish in areas downstream of the deployed fyke

nets. If seining is an issue due to substrate and habitat complexity, the Renewal Corporation may instead use backpack electrofishing in the areas that will not have an electric field containing the fyke net live cars (i.e., where captured fish consolidate in the trap).

Of the Monitored Tributaries, the greatest number of out-migrating juvenile salmonids are likely to be encountered during fish collection activities at Scott River. Therefore, the Renewal Corporation will coordinate any outmigrant trapping in this Tributary Confluence Monitoring Area with CDFW. This may include support and/or coordination on capture activities at existing out-migrating trap monitoring locations in the Scott River. The Renewal Corporation will use fish capture in association with these outmigrant trap locations to support capture efforts during the monitoring period if water quality triggers are exceeded and fish relocation is needed.

3.2.7 Horse Creek

The Renewal Corporation will monitor approximately 650 ft (0.12 miles) of Horse Creek (Appendix A, Figure 8). Horse Creek is a significant producer of coho salmon within the Upper Klamath diversity strata[3]. Previous habitat restoration in the Horse Creek watershed by the Karuk Tribal Fisheries Program and the Mid Klamath Watershed Council has included placement of large woody elements and the construction of several off-channel ponds, providing juvenile salmon in the watershed access to Thermal Refugia. While this creek is not expected to warm in the upper reaches, the lower reaches may warm due to agricultural diversions. The Renewal Corporation anticipates that volitional passage upstream to cooler water will be available. However, if the Renewal Corporation determines that it is necessary to capture and relocate fish from the lower reaches, the Renewal Corporation anticipates using a fyke net trap for out-migrating juvenile salmonids. If necessary, the Renewal Corporation anticipates deploying a single fyke net trap in a location to span the majority of the creek channel. The Renewal Corporation will check the fyke net trap daily, when operating, to process collected fish and clear debris. This capture effort will likely be done by a crew of two to three persons working for the duration of time that the fyke net is operating.

If the Renewal Corporation determines that an alternative method of fish capture should be used, the Renewal Corporation anticipates using a seine net to capture fish within the Tributary Confluence Monitoring Area. This capture effort will likely be done by a crew of three persons working over a one to two-day period.

3.2.8 Beaver Creek

The Renewal Corporation will monitor the lower approximately 500 ft (0.10 miles) of Beaver Creek and approximately 630 ft (0.12 miles) of Klamath River (Appendix A, Figure 9). Beaver Creek is a significant coho salmon producing tributary and a critical site for non-natal rearing. Immediately downstream of the confluence in the mainstem of the Klamath River is a spring-fed

[3] Horse Creek is part of the Upper Klamath population unit of the Southern Oregon/Northern California Coast coho salmon Evolutionary Significant Unity. The Upper Klamath population unit boundaries are Portuguese Creek (non-inclusive) upstream to Spencer Creek (inclusive) (NMFS, 2006).

Thermal Refugia, which is considered part of the Tributary Confluence Monitoring Area. This pool is heavily utilized by non-natal juvenile salmonids, as it stays cool throughout the summer months.

The Renewal Corporation does not anticipate any fish passage issues in lower Beaver Creek that would impede access of juvenile salmonids to suitable habitat upstream of the Tributary Confluence Monitoring Area. The mainstem Beaver Creek typically does not exceed the Water Temperature Trigger during the monitoring period. Therefore, the Renewal Corporation does not expect that capture and relocation will be needed within the mainstem Beaver Creek.

The portion of the Tributary Confluence Monitoring Area that is in the mainstem Klamath River will likely see increased Suspended Sediment Concentration during the reservoir drawdown. While the Renewal Corporation does not expect the Water Temperature Trigger to be exceeded, salmonids in this refuge may still require capture and relocation if behavioral and habitat observations indicate that actions should be taken. The Renewal Corporation anticipates using a seine if the Renewal Corporation determines that fish need to be relocated from this Tributary Confluence Monitoring Area. If seining is an issue due to substrate and habitat complexity, the Renewal Corporation may use backpack electrofishing instead. This capture effort will likely be done by a crew of up to five persons working over a one to four-day period.

3.2.9 Humbug Creek

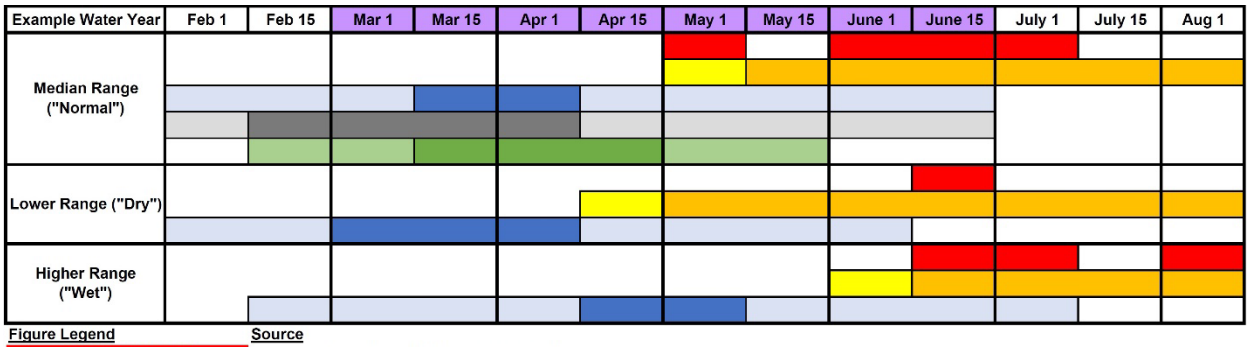
The Renewal Corporation will monitor the lower approximately 950 ft (0.18 miles) of Humbug Creek (Appendix A, Figure 10). There are no known documented Thermal Refugia found near the confluence of Humbug Creek or within the Tributary Confluence Monitoring Area. The lower reaches of Humbug Creek typically begin to dewater in early summer and completely disconnect from the Klamath by July or August. The upper reaches of Humbug Creek experience relatively stable flows and temperatures through the summer months (T. Soto, pers. comm., 2020). Since there are no known fish passage issues, fish can volitionally move throughout Humbug Creek and gain access to the cooler upper reaches. In addition, Humbug Creek is not a significant producer of coho salmon. Therefore, the Renewal Corporation does not expect that capture and relocation that capture and relocation will be needed in the Tributary Confluence Monitoring Area at Humbug Creek. If the Renewal Corporation determines that juvenile fish need to be relocated from stranded pools, the Renewal Corporation anticipates using a seine. This capture effort will likely be done by a crew of three persons working over a one to two-day period.

3.2.10 Shasta River

The Renewal Corporation will monitor the lower approximately 700 ft (0.13 miles) of the Shasta River (Appendix A, Figure 11), which covers an area from the confluence upstream to the CDFW rotary screw trap. The Shasta River is among the most significant salmon-producing tributaries of the Klamath River, containing its own evolutionarily significant population of coho salmon (NMFS, 2006). In addition, it warms relatively early, forcing rearing juveniles into the mainstem Klamath. Irrigation diversions typically begin on April 1, sometimes reducing Shasta River average monthly flows by half or more (CDFW, 2016b). In a dry water year, these

diversions may result in the Water Temperature Trigger being exceeded as early as mid-April or early May. Juvenile salmonid outmigration begins relatively early on the Shasta River. Peak outmigration is expected to occur throughout March, with 90 percent of the juveniles having out-migrated by mid-April (CDFW, 2016b).

Figure 3-2. Shasta River potential overlap of water quality triggers and juvenile salmonid outmigration



*** = potential SSC periods over 1,000 mg/L only shown for periods after May 1, as water temperature triggers during the March and April monitoring period are not expected.

With the potential overlap of outmigration periods with exceeded water quality triggers, the Renewal Corporation anticipates the need for juvenile salmonid outmigrant trapping in the Tributary Confluence Monitoring Area (Figure 3-2). Depending on the type of water year, the Renewal Corporation may initiate outmigrant trapping as early as May though it is most likely to be needed in June. Similar to the Scott River, the Renewal Corporation will coordinate this effort with CDFW due to the large number of fish that may be encountered. CDFW operates a rotary screw trap (RST) about 0.15 miles upstream of the confluence. In the event that fish capture actions are necessary, the Renewal Corporation anticipates working with CDFW to capture fish using this RST since it will provide an efficient and effective capture method. Even if the RST is used, the Renewal Corporation expects that some number of juvenile salmon will be found in the reach downstream of the RST. If both water quality triggers are exceeded and the Renewal Corporation determines that juvenile salmonids in this lower reach need to be relocated, the Renewal Corporation anticipates using a seine.

In the event RST collection is not possible, or capture actions are needed to supplement the RST, the Renewal Corporation anticipates using two to three fyke net traps deployed in locations that span the majority of the river channel. The Renewal Corporation will check the fyke net traps daily, when operating, to process collected fish and clear debris. This capture effort will likely be done by a crew of two to three persons working for the duration of time that the fyke nets are operating. The Renewal Corporation anticipates the fyke nets operating for two to four-weeks, depending on water quality conditions. To the extent necessary, the Renewal Corporation anticipates using seining to capture fish in areas downstream of the deployed fyke nets. If seining is an issue due to substrate and habitat complexity, the Renewal

Corporation may instead use backpack electrofishing in the areas that will not have an electric field containing the fyke net live cars (i.e., where captured fish consolidate in the trap).

3.2.11 Cottonwood Creek

The Renewal Corporation will monitor the lower approximately 950 ft (0.18 miles) of Cottonwood Creek (Appendix A, Figure 12). There are no known documented Thermal Refugia found near the confluence of Cottonwood Creek or within the Tributary Confluence Monitoring Area. In the event that the Tributary Confluence Monitoring Area is not directly accessible, the Renewal Corporation will install a temperature logger at the Copco Road crossing.

Cottonwood Creek contains several agricultural diversions, which typically results in the dewatering and pooling of the lower reach during the irrigation season. Juvenile salmonids will not typically congregate near the tributary confluence. However, if the lower reach does dewater during a period when the mainstem Suspended Sediment Concentration Trigger is exceeded, the Renewal Corporation anticipates using a seine to capture and relocate juvenile salmonids that may become stranded in pools in the lower reach. This capture effort will likely be done by a crew of two to four persons working over a one to two-day period.

3.2.12 Dry Creek

The Renewal Corporation will monitor the lower approximately 250 ft (0.05 miles) of Dry Creek (Appendix A, Figure 13). Dry Creek is a relatively small tributary that tends to dewater by summer. This creek is not thought to provide important rearing habitat for juvenile salmonids and does not have great access for juvenile fish to the upper reaches due to its relatively high gradient. It is not expected that juvenile salmonids will be using habitat in the Tributary Confluence Monitoring Area throughout the summer.

Capture and relocation efforts are therefore not expected to be needed in Dry Creek. However, if the Renewal Corporation determines that it is necessary to capture and relocate fish from the Tributary Confluence Monitoring Area, the Renewal Corporation anticipates using a seine. This capture effort will likely be done by a crew of three persons working over a one-day period.

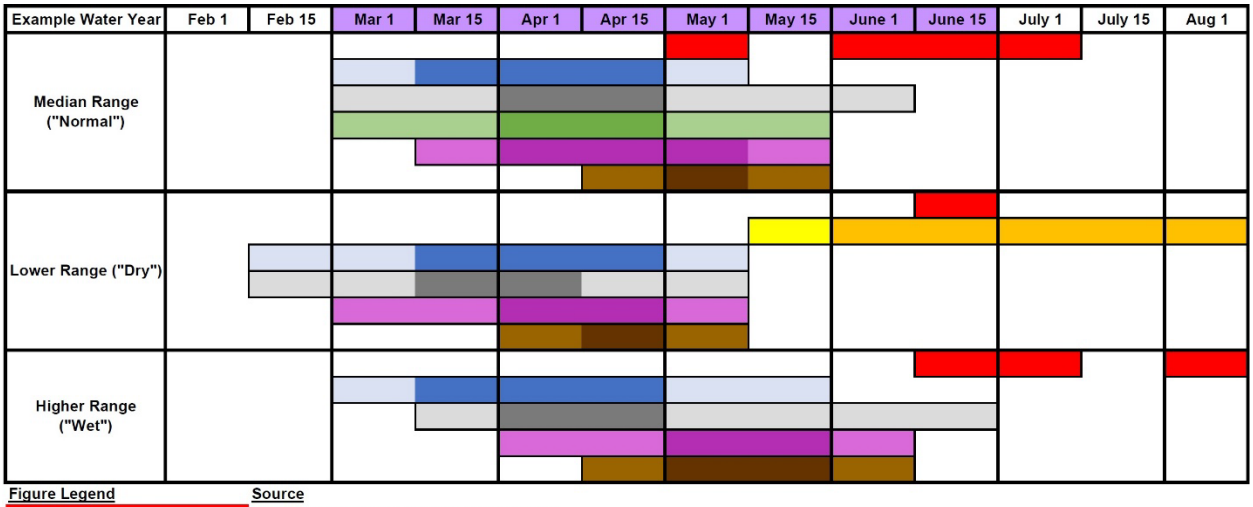
3.2.13 Bogus Creek

The Renewal Corporation will monitor the lower approximately 500 ft (0.1 miles) of Bogus Creek (Appendix A, Figure 14). Bogus Creek is a relatively cool, spring-fed creek. It is anticipated that during normal or wet water year types that Bogus Creek will not exceed the Water Temperature Trigger within the monitoring period. However, in a dry year, Bogus Creek may exceed the Water Temperature Trigger by mid-May or early June.

Bogus Creek is a significant salmonid-producing tributary, especially for Chinook salmon. The CDFW monitors outmigration of juvenile salmonids from Bogus Creek using a fyke net trap to collect demographic data on juvenile run-timing, weekly abundance estimates, size, and future smolt-to-adult survival rates (CDFW 2015, CDFW 2021). In addition, the USFWS operates an RST in the mainstem Klamath River, about one mile downstream of Bogus Creek (USFWS,

2015). Based on data from these stations, peak outmigration is expected to occur from mid-March to late April, with 90 percent of the juveniles having out-migrated by the end of April. Therefore, the Renewal Corporation anticipates that a significant portion of juvenile outmigrants will have already passed through the Tributary Confluence Monitoring Area prior to the period during which the Water Temperature Trigger may be exceeded (Figure 3-3).

Figure 3-3. Bogus Creek potential overlap of water quality triggers and juvenile salmonid outmigration.



If dry conditions occur during the monitoring period and water quality triggers are exceeded, then outmigrant trapping may be necessary for a portion of June. If this occurs, the Renewal Corporation anticipates using one to two fyke net traps deployed in locations that span the majority of the creek channel. The Renewal Corporation will check fyke net traps daily, when operating, to process collected fish and clear debris. This capture effort will likely be done by a crew of two to three persons working for the duration of time that the fyke nets are operating. The Renewal Corporation anticipates the fyke nets operating for two to four-weeks, depending on water quality conditions. The Renewal Corporation will coordinate any outmigrant trapping in this Tributary Confluence Monitoring Area with CDFW. To the extent necessary, the Renewal Corporation anticipates using seining to capture fish in areas downstream of the deployed fyke nets. If seining is an issue due to substrate and habitat complexity, the Renewal Corporation may instead use backpack electrofishing in the areas that will not have an electric field containing the fyke net live cars (i.e., where captured fish consolidate in the trap).

3.3 Juvenile Fish Relocation Sites

3.3.1 Relocation Site Selection

The Juvenile Salmonid Plan identifies relocation sites (Relocation Sites) for each Tributary Confluence Monitoring Area. The Renewal Corporation selected the Relocation Sites based on information from the Karuk Tribal Fisheries Program and consultation with the ATWG (Renewal Corporation, 2018; Aquatic Technical Working Group, 2020). To the extent possible, in-watershed Relocation Sites were prioritized.

The Renewal Corporation will relocate YOY (i.e., fry and parr) coho salmon and *O. mykiss* to tributary channels or off-channel ponds (Table 3-1). For the purposes of the Juvenile Salmonid Plan, fry is defined as the life stage immediately after the yolk sac has been absorbed. This life stage is typically under 55 mm in length (CDFW, 2016b). Parr is the life stage immediately following fry, when parr marks are visible and smoltification has not yet begun. Fish will be relocated to the primary Relocation Site listed on Table 3-1 if it is deemed suitable for relocation based on the habitat assessment described in Section 3.3.2. If the primary Relocation Site is not suitable for relocation, the fish will be relocated to the secondary Relocation Site listed on Table 3-1. If neither the primary nor secondary Relocation Sites are suitable for relocation, an alternative relocation site will be identified in consultation with the ARG. Primary tributary Relocation Sites include Beaver Creek (RM 163.3), Horse Creek (RM 149.5), and Seiad Creek (RM 131.9). These three tributaries each have long upper reaches of cool water with suitable habitat for juvenile salmonids, including several constructed off-channel ponds. For the Scott River and Shasta River, the Renewal Corporation will also consider upstream locations that provide suitable Thermal Refugia for YOY rearing. Details for relocation to these key tributaries are outlined in Section 3.3.3.1.

Table 3-1. Primary and secondary Relocation Sites for YOY juvenile salmonids for the 13 Tributary Confluence Monitoring Areas

TRIBUTARY CONFLUENCE MONITORING AREA	PRIMARY RELOCATION SITE	SECONDARY RELOCATION SITE
Seiad Creek	Upstream Seiad Creek	Seiad Creek off-channel ponds
Grider Creek	Upstream Grider Creek	Seiad Creek off-channel ponds
Walker Creek	Upstream Walker Creek	Seiad Creek off-channel ponds
O'Neil Creek	Upstream O'Neil Creek	Seiad Creek off-channel ponds
Tom Martin Creek	Seiad Creek off-channel ponds	Horse Creek off-channel ponds
Scott River	Scott River Watershed	Seiad Creek off-channel ponds
Horse Creek	Upstream Horse Creek	Horse Creek off-channel ponds
Beaver Creek	Upstream Beaver Creek	Horse Creek off-channel ponds
Humbug Creek	Beaver Creek	Horse Creek off-channel ponds
Shasta River	Shasta River Watershed	Beaver Creek
Cottonwood Creek	Beaver Creek	Horse Creek off-channel ponds
Dry Creek	Beaver Creek	Horse Creek off-channel ponds
Bogus Creek	Upstream Bogus Creek	Beaver Creek

The Renewal Corporation anticipates relocating coho salmon smolts, steelhead smolts, and all Chinook juvenile life stages directly into the mainstem Klamath River. Smolts are identified by having lost their parr marks, are silvery in color with scales that are beginning to set and have an expected size range of 80-150 mm (Moyle, 2002). The primary reason for relocating these fish to the mainstem is to allow them to continue volitional downstream outmigration. These relocation areas are divided into two reaches: Happy Camp to the Salmon River and Salmon River to the Trinity River. The Renewal Corporation's release locations for each reach are located within two miles (upstream) of a perennial cold-water tributary. The Renewal Corporation identified these reaches due to the relatively high number of tributary inputs that are expected to increasingly dilute the elevated Suspended Sediment Concentrations from the reservoir drawdown. In general, the Renewal Corporation anticipates relocating these fish to the nearest Klamath River reach listed above, assuming the existence of suitable Suspended Sediment Concentration conditions. Specific relocation areas for these two groups are discussed below in Section 3.3.3.2.

3.3.2 Fish Occupancy and Water Quality at Relocation Sites

To determine if a Relocation Site is suitable for relocation of YOY coho salmon and *O. mykiss,* the Renewal Corporation will conduct a reconnaissance survey in the spring of Year 2 to assess habitat conditions and holding capacity, especially with respect to any off-channel pond site.

The Renewal Corporation will conduct habitat assessments of Relocation Sites to ensure habitat conditions remain supportive of juvenile salmon. The assessment will evaluate (among other things) the suitability of cover, hydrologic connection, depths, and water temperature. As part of the assessment, the Renewal Corporation will use biologists experienced with salmonid habitats and relocation efforts to conduct a visual assessment of habitat conditions at selected Relocation Sites.

In addition to habitat conditions, fish occupancy and holding capacity are critical to understand prior to relocation, as high fish densities may lead to density-dependent food limitation (Brewitt *et al.*, 2017). Holding capacities for several of the constructed off-channel ponds are understood, although capacities may change over time. The Renewal Corporation will qualitatively assess holding capacity and fish occupancy as part of the reconnaissance surveys conducted at Relocation Sites in the spring of Year 2. When available, the Renewal Corporation will use information from independent spawning season surveys to assess anticipated holding capacity and fish occupancy for a Relocation Site.

Based on the results of the reconnaissance surveys, the Renewal Corporation will determine the suitability of each surveyed Relocation Site to support relocated fish. If the Renewal Corporation determines that it is necessary, a follow-up reconnaissance survey of the Relocation Site will be performed up to 48 hours before fish relocation will occur. The Renewal Corporation will consult with the ARG concerning any restrictions or limitations to be placed on the use of a Relocation Site.

3.3.3 Relocation Sites

3.3.3.1 Tributary Relocation Sites

The Renewal Corporation's prioritization of Tributary Confluence Monitoring Area Relocation Sites for YOY coho salmon and *O. mykiss* is set forth above (Table 3-1).

3.3.3.1.1 Seiad Creek Off-Channel Ponds

Seiad Creek contains a complex of six constructed off-channel ponds that are suitable Relocation Sites (Appendix A, Figure 15). These ponds are suitable for winter habitats and are suitable during summer months. Three of these ponds (May Pond, Alexander Pond, and Durazo Pond) have a strong groundwater influence that provides favorable conditions for relocation during summer months. During the summer months, these ponds display relatively low densities of juvenile salmonids compared to similar ponds in the Klamath River Basin (Witmore, 2014).

Seiad Creek's off-channel ponds typically hold 1,000-1,500 juvenile salmon each (Soto *et al.*, 2018). Seiad Creek and its complex of ponds have good vehicle and crew access and are relatively easy to sample if needed. The Karuk Tribal Fisheries Program is anticipated to continue sampling and monitoring work at these locations, including off-channel pond holding capacity surveys and the planned installation of a passive integrated transponder (PIT) tag array on lower Seiad Creek. Data collected from this work will provide additional information on pond

utilization that the Renewal Corporation can factor into its decision to utilize these locations during the monitoring period.

Table 3-1 identifies Tributary Confluence Monitoring Areas being considered by the Renewal Corporation for YOY salmonid relocation to Seiad Creek off-channel ponds. Seiad Creek's off-channel ponds have been identified as the primary Relocation Site for YOY coho salmon and *O. mykiss* from Tom Martin Creek. Seiad Creek's off-channel ponds have also been identified as the secondary Relocation Site from the following creeks and rivers, if needed: Grider Creek, Walker Creek, O'Neil Creek, and Scott River. If YOY salmonids from Scott River are not relocated within the Scott River Watershed, then Seiad Creek off-channel ponds will be a suitable location, as PIT tagged Scott River fish have been documented using Seiad Creek off-channel ponds to rear (Gorman, 2016). YOY coho salmon and *O. mykiss* relocated from the Seiad Creek Tributary Confluence Monitoring Area will remain in the Seiad Creek watershed.

3.3.3.1.2 Beaver Creek

Beaver Creek contains several miles of cold-water habitat suitable for rearing juvenile salmonids (USFWS, 2018b). In addition, future restoration activities on lower Beaver Creek[4] are expected to provide enhanced reaches with large wood placement and the construction of off-channel ponds. The Renewal Corporation anticipates that this work will be completed prior to the commencement of the monitoring period. The prevalence of cold-water rearing habitat allows YOY fish to volitionally distribute throughout the over 5-mile relocation reach identified below the West Fork of Beaver Creek (Appendix A, Figure 15). Since YOY fish relocated by the Renewal Corporation will have the ability to redistribute to suitable habitat within this reach, issues related to overcrowding and capacity limitations will be minimized. The Renewal Corporation has identified a number of potential Relocation Sites along Beaver Creek, from the confluence with West Fork Beaver Creek down to the confluence with the mainstem Klamath River. These Relocation Sites have good vehicle and crew access from Beaver Creek Road (Forest Road 48N01).

Table 3-1 identifies Tributary Confluence Monitoring Areas being considered by the Renewal Corporation for YOY salmonid relocation to Beaver Creek. Beaver Creek has been identified as the primary Relocation Site for YOY coho salmon and *O. mykiss* from lower Beaver Creek, Humbug Creek, Cottonwood Creek, and Dry Creek. Beaver Creek has also been identified as the secondary Relocation Site from the following creeks, if needed: Bogus Creek and Shasta River. Depending on the water year, Shasta River may require a relatively large relocation effort, and Beaver Creek is the closest downstream tributary with suitable habitat. If the Renewal Corporation is not able to relocate YOY salmonids from the Shasta River within the Shasta River Watershed, then Beaver Creek is next closest suitable location.

[4] As noted above, the Beaver Creek referenced in this Juvenile Salmonid Plan is not the same as the priority tributary at Copco No. 1 Reservoir named Beaver Creek that is referenced in the Reservoir Area Management Plan and Fish Presence Monitoring Plan.

3.3.3.1.3 Horse Creek

The upper reaches of Horse Creek provide several miles of cold-water habitat that is suitable for rearing juvenile salmonids (T. Soto, pers. comm., 2020). Previous habitat enhancement work in Horse Creek included large wood placement as well as multiple off-channel ponds to enhance rearing habitat availability. Approximately 2.75 miles of upper Horse Creek, along with a complex of eight off-channel ponds in upper Horse Creek and two off-channel ponds in Middle Creek (tributary to Horse Creek), provide suitable relocation options (Appendix A, Figure 15).

Table 3-1 identifies Tributary Confluence Monitoring Areas being considered by the Renewal Corporation for YOY salmonid relocation to Horse Creek. Horse Creek's off-channel ponds have been identified as the secondary Relocation Site for YOY coho salmon and *O. mykiss* from the following creeks, if needed: Tom Martin Creek, Beaver Creek, Humbug Creek, Cottonwood Creek, and Dry Creek. YOY coho salmon and *O. mykiss* relocated from the Horse Creek Tributary Confluence Monitoring Area will remain in the Horse Creek watershed.

Depending on the annual adult coho salmon return, Horse Creek typically supports a relatively large population of spawning adult coho salmon. The Renewal Corporation will consider distribution, capacity, and habitat utilization by YOY fish at Horse Creek prior to any decision to relocate captured YOY to the off-channel ponds at Horse Creek. The Renewal's Corporation decision will be informed by the reconnaissance survey(s) conducted at the Relocation Site(s) in the spring of Year 2.

3.3.3.1.4 Scott River

Coho salmon in the Scott River watershed are a distinct population within the Interior Klamath River Diversity Stratum (NMFS, 2016). Therefore, whenever possible, the Renewal Corporation prefers relocating these fish within the same watershed. The upper reaches of the Scott River and its tributaries are therefore the Renewal Corporation's primary Relocation Sites for YOY coho salmon and *O. mykiss* captured in the lower reaches of the Scott River. Relocation Sites in the Scott River watershed include French Creek and Sugar Creek. Both of these tributaries have off-channel ponds that have previously served as Relocation Sites for Scott River juvenile salmonids (Bull *et al.*, 2015). The Renewal Corporation may consider using other Scott River watershed locations, including Shackleford Creek and the South Fork Scott River. The Renewal Corporation will capture and relocate YOY salmonids within the Scott River watershed in coordination with CDFW.

3.3.3.1.5 Shasta River

Coho salmon in the Shasta River watershed are a distinct population within the Interior Klamath River Diversity Stratum (NMFS, 2016). Therefore, whenever possible, the Renewal Corporation will relocate these fish within the same watershed. The upper reaches of the Shasta River and its tributaries are the Renewal Corporation's primary Relocation Sites for YOY coho salmon and *O. mykiss* captured in the lower reaches of the Shasta River. Potential Relocation Sites in the Shasta River watershed are on CDFW's Shasta Big Springs Ranch, which contains 2.2 miles of Big Springs Creek and all of Little Springs Creek. Recent management practices made in the

Big Springs Creek complex have enhanced juvenile coho salmon rearing habitat (Adams, 2013; CDFW, 2012), restoring a critical component of the watershed. The Renewal Corporation will coordinate the capture and relocation of YOY salmonids within the Shasta River with CDFW. The Renewal Corporation's selection of final Relocation Sites will be informed by reconnaissance survey(s) of the potential Relocation Sites.

3.3.3.2 Mainstem Klamath River Relocation Sites

The Renewal Corporation will relocate captured coho salmon smolts, steelhead smolts, and Chinook salmon juveniles to the mainstem Klamath River. As these species/life stages will be out-migrating from their natal tributaries during the monitoring period, the Renewal Corporation will relocate these species/life stages into the mainstem Klamath River at downstream locations to facilitate continued outmigration.

The Happy Camp (RM 108.4) to Salmon River (RM 66.4) and Salmon River to Trinity River (RM 43.4) mainstem release reaches are described below. The Renewal Corporation selected up to four release sites for each reach based on (1) their upstream proximity to a tributary with known suitable water quality conditions and (2) accessibility for transport vehicles. Each subsequent downstream release site in a reach has increasing tributary accretion flows, diluting Suspended Sediment Concentrations in the river and affording relocated fish the option to seek refuge if mainstem conditions worsen.

The Renewal Corporation will give preference to the most upstream release site considered appropriate given the anticipated mainstem Suspended Sediment Concentrations at the time of relocation. For example, if water quality triggers are exceeded and capture activities are required following a short duration sediment spike, the Renewal Corporation will select the most upstream release site. If capture activities are required during the upward peak of a large suspended sediment spike, then release locations further downstream may be used since downstream locations are expected to have lower Suspended Sediment Concentrations due to the dilution effects of incoming tributaries. The Renewal Corporation's final decision regarding the release site will be based on anticipated conditions during release, which will be informed by information from the USGS water quality stations, information collected as part of the California Water Quality Monitoring Plan, and by drawdown and dam removal activities.

3.3.3.2.1 Happy Camp to Salmon River

If water quality conditions are suitable, the Renewal Corporation will relocate coho salmon smolts, steelhead smolts, and Chinook salmon juveniles to the mainstem Klamath River reach between Happy Camp, CA and the Salmon River. The Renewal Corporation has identified river access points in this reach to strategically relocate fish within two miles upstream of a tributary with suitable water quality conditions (Appendix A, Figure 16). The tributaries are Elk Creek, Clear Creek, and Ti Creek. This will allow released fish to volitionally relocate to tributary accretion flows as necessary to refuge from mainstem conditions during their continued outmigration. The Renewal Corporation will determine final Relocation Sites prior to juvenile salmonid relocation using the metrics and objectives described in the Juvenile Salmonid Plan. This reach of the Klamath River is the closest reach to the Tributary Confluence Monitoring

Areas. Therefore, if water quality conditions permit, it will serve as the Renewal Corporation's primary Relocation Site for coho salmon smolts, steelhead smolts, and Chinook salmon juveniles.

3.3.3.2.2 Salmon River to Trinity River

The Renewal Corporation has identified four Relocation Sites between Salmon River and Trinity River for the relocation of coho salmon smolts, steelhead smolts, and Chinook salmon juveniles. The Renewal Corporation expects these Relocation Sites to be used only if water quality conditions require release below Salmon River. The Renewal Corporation has identified river access points in this reach to strategically relocate fish within two miles upstream of a tributary with suitable water quality conditions (Appendix A, Figure 16). The tributaries are Camp Creek, Bluff Creek, and the Trinity River. This will allow released fish to volitionally relocate to tributary accretion flows as necessary to refuge from mainstem conditions during their continued outmigration. The Renewal Corporation does not anticipate relocating any coho salmon smolts, steelhead smolts, and Chinook salmon juveniles to relocation sites below the confluence with the Trinity River because accretion flows in this reach are expected to adequately reduce the elevated Suspended Sediment Concentration from the reservoir drawdown.

3.3.4 Relocation Effort and Logistics

The Renewal Corporation will adjust equipment, capture method and logistics for a specific Tributary Confluence Monitoring Area (Section 3.2) as needed given the type of water year, site access, expected duration of capture activities and the estimated number and species/life stage of the fish. The Renewal Corporation's methods used for capture and handling fish are adapted from *Standard Methods for Sampling North American Freshwater Fishes* (Bonar *et al.*, 2009) and will be supplemented and/or modified based on regulatory requirements. To minimize potential transport of aquatic invasive species, staff will implement the relevant BMPs set forth in Appendix C (Best Management Practices) of the Reservoir Area Management Plan during monitoring, capture, and relocation. The Renewal Corporation will use the Nonindigenous Aquatic Species (NAS) database maintained by the United States Geological Survey (https://nas.er.usgs.gov/) to determine, in consultation with the ARG, the need to use species-specific BMPs to avoid the transfer of invasive species from infected waters to other locations.

Upon capture, the Renewal Corporation will transfer juvenile salmonids to insulated coolers (i.e., holding coolers), filled with water from the tributary to at least 75% capacity and equipped with battery operated aerators. The Renewal Corporation will handle Endangered Species Act-listed fish with extreme care and fish will be kept in water to the maximum extent possible during capture and relocation activities. The Renewal Corporation will keep all captured fish in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding and will minimize fish handling to the greatest extent possible. For the purposes of the Juvenile Salmonid Plan, whether overcrowding exists will be determined by the Renewal Corporation in its professional judgment based on several factors, including quality and quantity of habitat, the observed number of fish, and the life stages of the observed fish. Holding coolers will have water temperature and dissolved oxygen levels periodically checked by a handheld YSI meter (or equivalent) to monitor the suitability of water quality. Water will be deemed suitable if its

temperature remains no more than 1° Celsius above the initial ambient water temperature and its dissolved oxygen level remains at or above 6.0 milligrams per liter (Carter, 2008). If necessary, the Renewal Corporation will refresh water in the holding coolers to ensure temperature and dissolved oxygen levels remain suitable for juvenile salmonids.

The Renewal Corporation will mark holding coolers to indicate tributary or mainstem Klamath River Relocation Site destination. The Renewal Corporation will then move the coolers to a truck or sport utility vehicle and secure them to prevent sliding or overturning. The Renewal Corporation will transport fish to Relocation Sites on the same day of capture, so no overnight holding will occur. One transport vehicle will be used to relocate YOY fish to the tributary Relocation Site and a second vehicle will be used to transport smolts and Chinook juveniles to the mainstem Klamath River Relocation Site. Depending on the number and species/life stage anticipated to be encountered during the fish capture activity, the Renewal Corporation may use multiple transport vehicles for a specific Tributary Confluence Monitoring Area.

The Renewal Corporation will measure water temperature in the holding cooler(s) and at the Relocation Site prior to release. If the difference between the two exceeds 1.5°C, then the Renewal Corporation will make partial water transfers in the holding coolers to adjust and acclimate fish to the temperature of the Relocation Site. The Renewal Corporation will then release the fish directly into the Relocation Site. The length of the acclimation period will be dependent on water temperature and fish behavior and will be recorded on electronic tablets or paper data sheets (Appendix B).

Data collected by the Renewal Corporation at each Relocation Site will include the release location, start and end time, counts from each species and life stage, and any mortality during transport. The Renewal Corporation will also record air temperature, water temperature, and dissolved oxygen at the time of release. The Renewal Corporation will record data collected during fish relocation on electronic tablets or paper data sheets (Appendix B). The Renewal Corporation will take photographs of each release site.

4.0 Reporting

The Renewal Corporation will prepare and submit a report within six months following implementation of the Juvenile Salmonid Plan. The report will be submitted to the Federal Energy Regulatory Commission, State Water Resources Control Board, and Oregon Department of Environmental Quality, and copied to the ARG. The report will include the following information:

1. A summary of applicable water quality data collected;
2. Rescue and relocation actions implemented, including the number and age class of juvenile salmonids rescued;
3. Release location; and
4. Results of relocation.

5.0 References

Adams. C.C. 2013. Survival and Movement of Juvenile Coho Salmon (*Oncorhynchus kisutch*) in the Shasta River, California. Humboldt State University Master's Thesis.

Aquatic Technical Work Group (Aquatic Technical Working Group). 2020. Aquatics Technical Work Group Meeting – Juvenile Salmonid Plan. August 27, 2020.

Bonar, S.A., W.A. Hubert, and D.W. Willis. 2009. Standard Methods for Sampling North American Freshwater Fishes. American Fisheries Society. Bethesda, MD.

Brewitt, K.S., and E.M. Danner. 2014. Spatio-temporal temperature variation influences juvenile steelhead (Oncorhynchus mykiss) use of thermal refuges. Ecosphere. 5(7): 1–26. doi:10.1890/es14-00036.1

Brewitt, K.S., E.M. Danner, and J.W. Moore. 2017. Hot eats and cool creeks: Juvenile Pacific salmonids use mainstem prey while in thermal refuges. Canadian Journal of Fisheries & Aquatic Sciences 74:1588–1602

Bull, J., D. Flickinger, P. Harris, L. Magranet, B. Miller, and S. Sommarstrom. 2015. Cooperative Report of the Scott River Coho Salmon Rescue and Relocation Effort: 2014 Drought Emergency. Prepared by California Dept. of Fish & Wildlife, NOAA-Fisheries, Scott River Water Trust, Siskiyou Resource Conservation District, U.S. Forest Service – Klamath National Forest. August 2015. Available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3850544.pdf

California Department of Fish and Wildlife (CDFW). 2012. Water Temperature Thresholds for Coho Salmon in a Spring-Fed River, Siskiyou County, California. Prepared by Stenhouse, S.A., C.E., Bean, W.R., Chesney, and M.S., Pisano. California Fish and Game 98(1): 19-37. Available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/marblemountain/exhibits/cdfw_exhibits/cdfw_4.pdf

Carter, K. 2008. Effects of temperature, dissolved oxygen/total dissolved gas, ammonia, and pH on salmonids. Appendix 4 in Final staff report for the Klamath River total Maximum daily loads (TMDLs) addressing temperature, dissolved oxygen, nutrient, and microcystin impairments in California, the proposed site-specific dissolved oxygen objectives for the Klamath River in California, and the Klamath River and Lost River implementation plans. North Coast Regional Water Quality Control Board, Santa Rosa, California, USA.

CDFW. 2015. Report of Out-migrant trapping effort on Bogus Creek, 2015. Technical Memorandum. CDFW Klamath River Project.

CDFW. 2016a. Scott and Shasta River Juvenile Chinook Salmon Out-Migrant Study Multi-Year Report, 2000-2015. Prepared by Stenhouse, S.A., Debrick, A.J., and W.R. Chesney. Anadromous Fisheries Resource Assessment and Monitoring Program, 1625 South Main Street, Yreka, CA. Available online at: https://kbifrm.psmfc.org/wp-content/uploads/2017/01/Stenhouse-et-al_2016_0158_Scott-and-Shasta-River-Juvenile-Chinook-Salmon-Out-mig.pdf

CDFW. 2016b. Shasta and Scott River Outmigration Study, 2016 Report. Prepared by C.N. Jetter and W.R. Chesney. Anadromous Fisheries Resource Assessment and Monitoring Program. August 2016. Available online at: https://kbifrm.psmfc.org/wp-content/uploads/2017/01/Jetter-et-al_2016_0156_Shasta-and-Scott-River-Juvenile-Salmonid.pdf

CDFW. 2020. California 2020-2021 freshwater sport fishing regulations. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=177572&inline

CDFW. 2021. Report of Out-migrant trapping effort on Bogus Creek, 2021. Technical Memorandum. CDFW Klamath River Project.

Federal Energy Regulatory Commission (FERC). 2022. Final Environmental Impact Statement for Hydropower License Surrender and Decommissioning Lower Klamath Project – FERC Project No. 14903-001, Klamath Hydroelectric Project – FERC Project No. 2082-063, Oregon and California. Office of Energy Projects, Washington, DC, USA.

Goodman, D.H. and S.B. Reid. 2012. Pacific Lamprey (*Entosphenus tridentatus*) Assessment and Template for Conservation Measures in California. U.S. Fish and Wildlife Service, Arcata, California. 117 pp.

Gorman, M.P. 2016. Juvenile Survival and Adult Return as a Function of Freshwater Rearing Life History for Coho Salmon in the Klamath River Basin. Humboldt State University.

Klamath River Renewal Corporation (Renewal Corporation). 2018. Definite Plan for the Lower Klamath Project. June 2018. Available online at: http://www.klamathrenewal.org/definite-plan/

Klamath River Renewal Corporation (Renewal Corporation). 2021. Lower Klamath Project Biological Assessment. Berkeley, California.

Logue, J., P. Tiku, and A.R. Cossins. 1995. Heat Injury and Resistance Adaptation in Fish. J. Therm. Biol. 20 (1-2), 191–197.

Moyle, P.B. 2002. Inland fishes of California. University of California Press, Berkeley.

National Marine Fisheries Service (NMFS). 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. June 2000.

NMFS. 2006. Historical Population Structure of Coho Salmon in The Southern Oregon/Northern California Coasts Evolutionarily Significant Unit. Prepared by T.H. Williams, E.P. Bjorkstedt, W.G. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, M. Rode, G. Szerlong, R.S. Schick, M.N. Goslin, and A. Agrawal. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-390. Available online at: https://repository.library.noaa.gov/view/noaa/17026

National Marine Fisheries Service (NMFS). 2016. 5-Year Review: Summary & Evaluation of Southern Oregon/Northern California Coast Coho Salmon. National Marine Fisheries Service, West Coast Region, Arcata, California. Available online at: https://repository.library.noaa.gov/view/noaa/17026

Nielsen, J.L., T.E. Lisle, and V. Ozaki. 1994. Thermally Stratified Pools and Their Use by Steelhead in Northern California Streams. Trans. Am. Fisher. Soc. 123 (4), 613–626.

Soto, T. 2020. Fisheries Program, Department of Natural Resources, Karuk Tribe. Personal communication with Dan Chase, Resource Environmental Solutions, August 19, 2020.

Soto, T., D. Hillemeier, S. Silloway, A. Corum, A. Antonetti, M. Kleeman, and L. Lestelle. 2016. The Role of the Klamath River Mainstem Corridor in the Life History and Performance of Juvenile Coho Salmon (*Oncorhynchus kisutch*). Period Covered: May 2007–August 2011. Prepared by the Karuk Tribe Department of Natural Resources, Yurok Fisheries Program, and Biostream Environmental for the U.S. Bureau of Reclamation, Mid-Pacific Region, Klamath Area Office, Klamath Falls. Updated April 2016. Available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/marblemountain/exhibits/karut_tribe_exhibits/kt_9.pdf

Soto, T., J. Peterson, S. Price, C. Wickman, and W. Harling. 2018. Using Science to Guide Coho Restoration in the Mid Klamath: If You Would Build it They Will Come. Presented at the 36th Annual Salmonid Restoration Conference, Fortuna, CA. April 2018. Available online at: https://www.calsalmon.org/sites/default/files/2018_SRF_3_Effectiveness_Monitoring.pdf

USFWS. 2015. Summary of Abundance and Biological Data Collected During Juvenile Salmonid Monitoring in the Mainstem Klamath River Below Iron Gate Dam, California, 2000-2013. Prepared by S.A. Gough, A.T. David, and W.D. Pinnix. Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2015-43, Arcata, CA. Available online at: https://www.fws.gov/arcata/fisheries/reports/dataSeries/KlamathOutmigrantReport2000-13_final.pdf

USFWS. 2018a. Estimating Freshwater Productivity, Overwinter Survival, and Migration Patterns of Klamath River Coho Salmon. Prepared by C.V. Manhard, N.A. Som, R.W. Perry, J.R. Faukner, and T. Soto. Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR 2018-33, Arcata, CA. Available online at: https://www.fws.gov/arcata/fisheries/reports/technical/2018/EstimatingFreshwaterProductivityOverwinterSurvivalandMigrationPatternsofKlamathRiverCohoSalmon.pdf

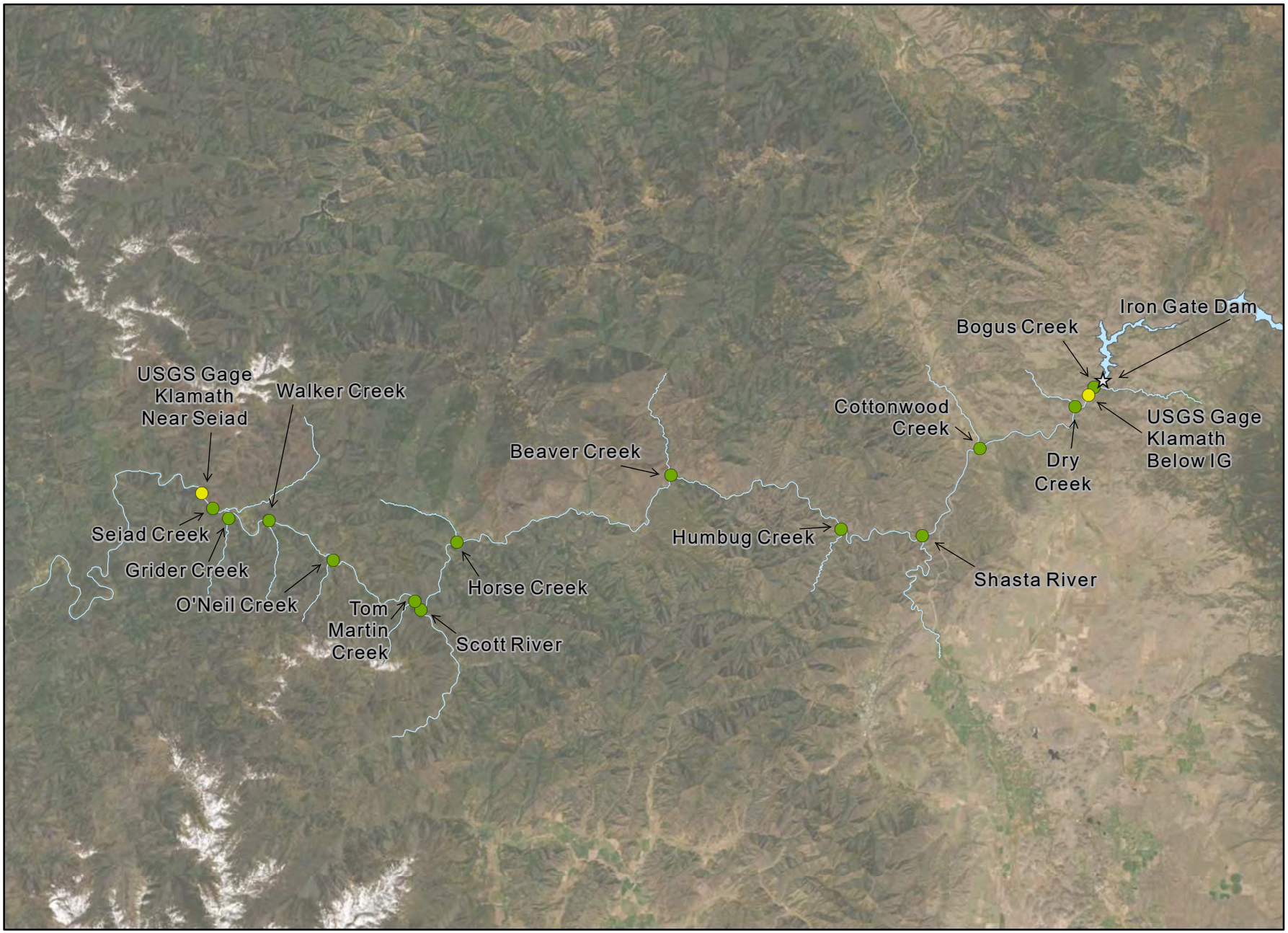
USFWS. 2018b. Estimation of Stream Conditions in Tributaries of the Klamath River, Northern California. Prepared by C.V. Manhard, N.A. Som, E.C. Jones, and R.W. Perry. Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR 2018-32, Arcata, CA. Available online at: https://www.fws.gov/Arcata/fisheries/reports/technical/2018/EstimationofStreamConditionsinTributariesoftheKlamathRiverNorthernCalifornia.pdf

Wallace, M. 2004. Natural vs. Hatchery Proportions of Juvenile Salmonids Migrating Through the Klamath River Estuary and Monitor Natural and Hatchery Juvenile Salmonid Emigration from the Klamath River Basin. July 1, 1998 through June 30, 2003. Final Performance Report. Federal Aid in Sport Fish Restoration Act. Project no. F-51-R-6. Arcata, California.

Witmore, S.K. 2014. Seasonal Growth, Retention, and Movement of Juvenile Coho Salmon in Natural and Constructed Habitats of the Mid-Klamath River. M.Sc. thesis. Humboldt State University, Arcata, California. Fisheries Service, Southwest Fisheries Science Center.

Appendix A

Detailed Map Books



KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 1. Mainstem and Tributary Monitoring Sites

November 11, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

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Legend

- Tributary Monitoring Sites
- Mainstem Monitoring Sites
- Iron Gate Dam
- Klamath River and Tributaries
- Reservoir Boundaries

N

0 6 12 Miles

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Monitoring Sites: RES; Klamath River: RES; Res. Bdry.: National Hydrography Dataset USGS*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 2. Tributary Confluence Monitoring Area

Seiad Creek Monitoring Area

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

0 190 380 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 3. Tributary Confluence Monitoring Area

Grider Creek Monitoring Area

November 12, 2020

0 340 680 Feet

N

Legend

- Monitored Tributary
- Primary Monitoring Area
- Secondary Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 4. Tributary Confluence Monitoring Area

Walker Creek Monitoring Area

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 5. Tributary Confluence Monitoring Area

O'Neil Creek Monitoring Area

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 6. Tributary Confluence Monitoring Area

Tom Martin Creek Monitoring Area

November 12, 2020

0 110 220 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 7. Tributary Confluence Monitoring Area

Scott River Monitoring Area

November 12, 2020

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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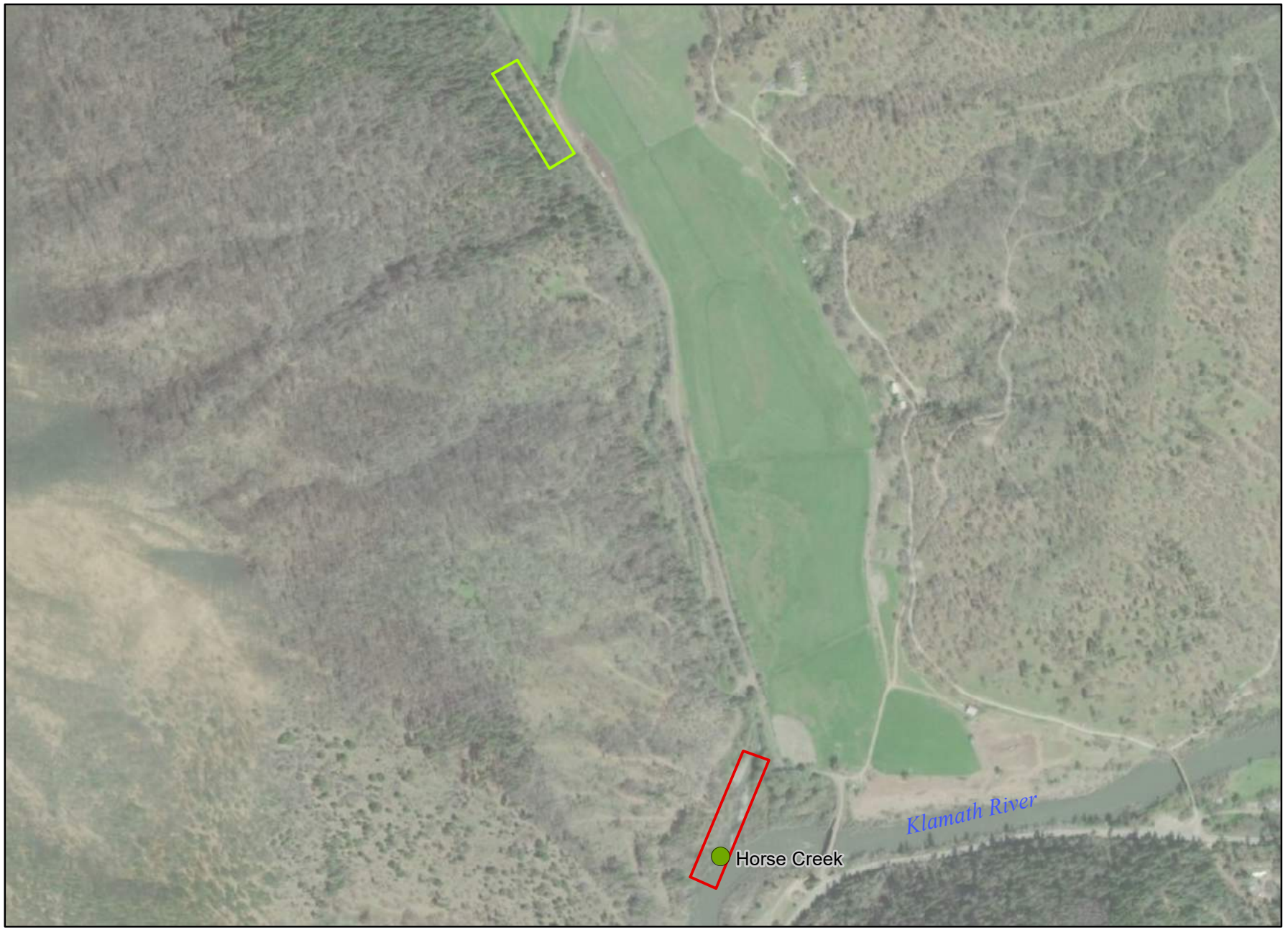

KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 8. Tributary Confluence Monitoring Area

Horse Creek Monitoring Area

November 12, 2020

0 675 1,350 Feet

N

Legend

- Monitored Tributary
- Primary Monitoring Area
- Secondary Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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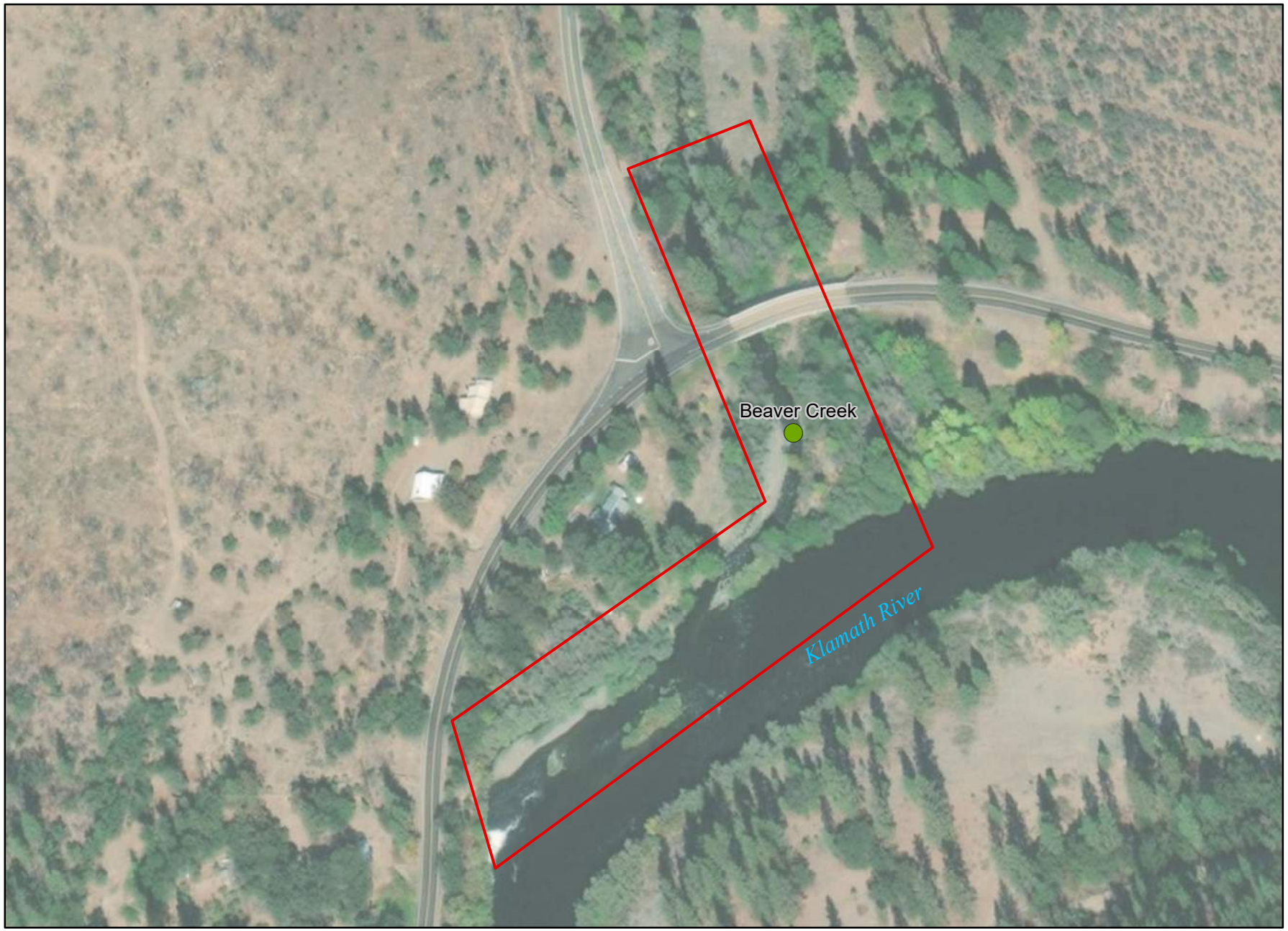

KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 9. Tributary Confluence Monitoring Area

Beaver Creek Monitoring Area

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 10. Tributary Confluence Monitoring Area

Humbug Creek Monitoring Area

November 12, 2020

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 11. Tributary Confluence Monitoring Area

Shasta River Monitoring Area

November 12, 2020

0 110 220 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 12. Tributary Confluence Monitoring Area

Cottonwood Creek Monitoring Area

November 12, 2020

0 160 320 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 13. Tributary Confluence Monitoring Area

Dry Creek Monitoring Area

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

0 50 100 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 14. Tributary Confluence Monitoring Area

Bogus Creek Monitoring Area

November 12, 2020

0 110 220 Feet

N

Legend

- Monitored Tributary
- Monitoring Area

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmomoid monitoring areas: RES;*

3. *Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS*

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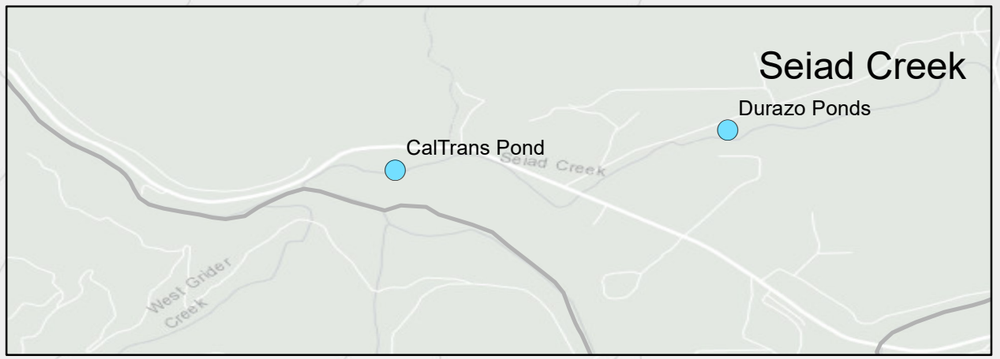
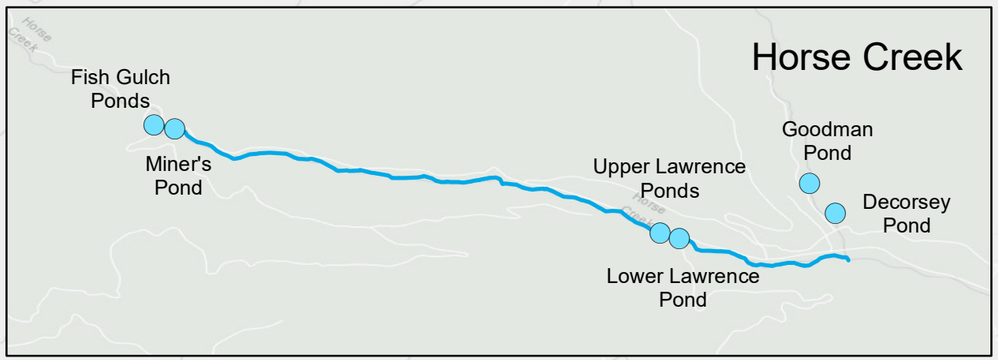
Beaver Creek
Seiad Creek
West Grider Creek
Horse Creek
Shasta River
Cade Creek
Elk Creek
Tom Martin Creek
Scott River
Sandy Bar Creek
Stanshaw Creek
Camp Creek





KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmonid Plan

Figure 15. Coho and* O. mykiss *Young-of-the-Year Relocation Sites

November 12, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

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N

0 4 8 12 Miles

Legend

- Primary Relocation Tributaries
- Alternative Relocation Tributaries
- Tributary Relocation Sites
- Klamath River
- Tributary Relocation Reaches

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmon relocation sites: RES; Klamath River: National Hydrography Dataset USGS*

3. *Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community*

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Happy Camp, CA
Elk Creek
Indian Creek River Access
Wingate Bar River Access
Clear Creek
Ti Bar River Access
Ti Creek
Salmon River Access
Somes Bar, CA
Orleans, CA
Camp Creek
Orleans Bar River Access
Big Bar River Access
Bluff Creek
Trinity River

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KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project

Juvenile Salmon Plan

Figure 16. Coho Smolt and Chinook Mainstem Relocation Sites

December 8, 2020

PRELIMINARY DESIGN (NOT FOR CONSTRUCTION)

Legend

☆ Reference Points

Tributaries

- Happy Camp to Salmon River
- Salmon River to Trinity River

Relocation Sites

- Happy Camp to Salmon River
- Salmon River to Trinity River

Reaches

- Happy Camp to Salmon River
- Salmon River to Trinity River

N

0 3 6 Miles

Notes

1. *Coordinate System: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US*

2. *Data Sources: Salmon relocation areas: RES; Klamath R. Reaches: RES*

3. *Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community*

Appendix B

Monitoring Data Sheets

Lower Klamath Project

Juvenile Salmonid Plan – Water Quality Monitoring Data Sheet

Date: _____

Tributary Confluence Monitoring Area: _____

Weather: _____

Air Temp. (°C): _____

Logger Offloaded: ☐

Water Temp. (°C): _____

DO (mg/L): _____

Turbidity (NTU): _____

Length of observation period: _____

Notes and field observations, including juvenile salmonid behavior:

Date: _____

Tributary Confluence Monitoring Area: _____

Weather: _____

Air Temp. (°C): _____

Logger Offloaded: ☐

Water Temp. (°C): _____

DO (mg/L): _____

Turbidity (NTU): _____

Length of observation period: _____

Notes and field observations, including juvenile salmonid behavior:

Date: _____

Tributary Confluence Monitoring Area: _____

Weather: _____

Air Temp. (°C): _____

Logger Offloaded: ☐

Water Temp. (°C): _____

DO (mg/L): _____

Turbidity (NTU): _____

Length of observation period: _____

Notes and field observations, including juvenile salmonid behavior:

Lower Klamath Project

Juvenile Salmonid Plan – Capture Data Sheet

Capture Tributary:	_____	Habitat Type:	_____
Capture Date:	_____	Weather:	_____
Crew:	_____	Air Temp. (°C):	_____
Start Time:	_____	Water Temp. (°C):	_____
End Time:	_____	DO (mg/L):	_____
Gear(s) Used:	_____	Turbidity (NTU):	_____

Captured Fish				
Relocation Sites	**Life Stage**	**Species**	**Number Caught**	**Number of Mortalities**
Tributaries	YOY (fry and parr)	Coho salmon		
		O. mykiss		
Mainstem Klamath	YOY	Chinook salmon		
	Smolt	Coho salmon		
		O. mykiss		
		Chinook salmon		
Released On-Site	Ammocoete	Pacific lamprey		
	Transformer			
	Adult			

Notes and field observations:

Lower Klamath Project

Juvenile Salmonid Plan – Relocation Data Sheet

Capture Tributary: _____

Species & Life Stage: _____

Number of Coolers: _____

Prim. Relocation Site: _____

Sec. Relocation Site: _____

Crew: _____

_____

Release Date: _____

Release Time: _____

Air Temp. (°C): _____

Site Water Temp. (°C): _____

Cooler Water Temp. (°C): _____

Site DO (mg/L): _____

Site Turbidity (NTU): _____

Relocated Fish			
Life Stage	**Species**	**Number Released**	**Number of Mortalities**
	Coho salmon		
	O. mykiss		
	Chinook salmon		

Final relocation site: _____

Photo captured of relocations site: ☐

Difference between site and cooler temp: _____

Was an acclimation period needed? _____

If so, how long? _____

Temp. difference at time of release: _____

Notes and field observations:

Appendix F

Oregon AR-6 Adaptive Management Plan-Suckers

KLAMATH RIVER RENEWAL CORPORATION

Lower Klamath Project
FERC Project No. 14803

Oregon AR-6 Adaptive Management Plan - Suckers

Klamath River Renewal Corporation
2001 Addison Street, Suite 317
Berkeley, CA 94704

Prepared By:
RES
2125 19th Street, Suite 200
Sacramento, CA 95818

River Design Group, Inc.
311 SW Jefferson Avenue
Corvallis, OR 97333

December 2022

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

This Oregon AR-6[1] Adaptive Management Plan - Suckers (OR Suckers Plan) is a subplan of the Aquatic Resources Management Plan that will be implemented as part of the Proposed Action for the Lower Klamath Project (Project).

1.1 Purpose

This OR Suckers Plan describes the measures the Renewal Corporation has completed to better understand Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) (listed suckers) populations in J.C. Boyle Reservoir and to plan the salvage and translocation of the listed suckers from the reservoir prior to reservoir drawdown and dam removal. The sampling plan described herein furthered understanding of sucker demographics and genetics, population sizes, habitat use, and successful gear types and fishing methods. Informed by sampling plan results, the Renewal Corporation will conduct sucker salvage and translocation efforts to remove Lost River and shortnose suckers from the Project reservoirs prior to reservoir drawdown and dam removal.

2.0 Overview

The OR Suckers Plan entails two actions as part of the Proposed Action: Action 1: Reservoir and River Sampling, and Action 2: Sucker Salvage and Translocation, both of which are summarized below. The Renewal Corporation has completed Action 1 activities as detailed in *Section 3.0 Action 1: Sampling Plan Methods and Results*. The Action 2 activities outlined in *Section 4.0 Action 2: Salvage and Translocation Plan* will be completed prior to reservoir drawdown. A similar plan for Copco No. 1 Reservoir and Iron Gate Reservoir is included in the California AR-6 Adaptive Management Plan - Suckers (CA Suckers Plan).

2.1 Action 1: Reservoir and River Sampling

The Renewal Corporation coordinated a sucker sampling program with U.S. Fish and Wildlife Service (USFWS), Oregon Department of Fish and Wildlife (ODFW), and the U.S. Geological Survey (USGS) from 2018 through 2020. The Renewal Corporation completed sampling in J.C. Boyle Reservoir and at the upstream end of the reservoir where the Klamath River enters the reservoir. Sampling took place over four periods between fall 2018 and spring 2020 (Renewal Corporation 2020). Sampling included placing trammel nets in the reservoir and electrofishing, which was used in the Klamath River reach entering the reservoir and to augment trammel net

[1] AR-6 is an acronym for Aquatic Resources Measure 6. This terminology was used in the 2018 Definite Plan to identify and describe the measures the Renewal Corporation would implement under the Aquatic Resources Management Plan to protect aquatic resources. Since the 2020 Definite Decommissioning Plan has superseded the Definite Plan, the “AR-6” terminology is no longer relevant. Regardless, the Renewal Corporation has retained the original name of this subplan to avoid confusion and ensure continuity during the consultation process.

sampling. Captured Lost River and shortnose suckers were identified by species and sex, marked with a PIT tag (Burdick 2013), fin clipped for genetic material, measured, and released. Klamath smallscale suckers (*Catostomus rimiculus*) were also processed in 2020 to collect genetic material for USFWS. It is the Renewal Corporation's understanding that USFWS will use the genetic material to develop genetic assays. Recaptured fish were used to estimate sucker abundance, and fin clips were provided to USFWS for genetic testing at the discretion of USFWS. Sampling was typically completed over three nights. The Renewal Corporation completed annual summary reports following each sampling effort and reports were submitted to ODFW and USFWS. The Renewal Corporation also presented sampling results to the Aquatic Technical Work Group (ATWG), a working group assembled to consult with the Renewal Corporation with respect to the development of the Aquatic Resources Management Plan. See Section 3.0 of the Aquatic Resources Management Plan for additional details regarding the ATWG. The sampling performed under Action 1 was completed in 2020.

2.2 Action 2: Sucker Salvage and Translocation

The Renewal Corporation will capture adult listed suckers in J.C. Boyle Reservoir using similar methods as those employed for the Action 1 sampling effort. In the spring or fall prior to reservoir drawdown, the Renewal Corporation will translocate captured suckers to the Klamath Falls National Fish Hatchery and/or the Klamath Tribes sucker rearing facility. Other translocation sites may be used following consultation with the Aquatic Resources Group (ARG) and agreement between the Renewal Corporation, USFWS, CDFW and ODFW. If agreement is reached to use other translocation sites, the Renewal Corporation will file a report with the Federal Energy Regulatory Commission (Commission) within 14 calendar days that includes the location of the additional translocation site, the reasons for the additional translocation site, and documentation of consultation with USFWS, CDFW and ODFW. See Section 3.0 of the Aquatic Resources Management Plan for additional details regarding the ARG. The Renewal Corporation anticipates salvaging approximately 300 listed suckers from J.C. Boyle Reservoir over 7 days based on sampling catch efficiencies. The 300 listed suckers equate to between 11 and 35 percent of the mean population estimates calculated for J.C. Boyle Reservoir. A similar effort will be completed on Copco No. 1 Reservoir and Iron Gate Reservoir in California (see CA Suckers Plan). During the salvage action, the Renewal Corporation does not anticipate salvaging and translocating the entire populations of Lost River and shortnose suckers residing in J.C. Boyle Reservoir.

3.0 Action 1: Sampling Plan Methods and Results

3.1 Purpose

The Renewal Corporation coordinated a sucker sampling program with USFWS, ODFW, and the USGS from 2018 through 2020. Sampling was completed in fall 2018, spring and fall 2019, and spring 2020. Collected data were used to develop a better understanding of sucker demographics and genetics, population sizes, habitat use, and successful gear types and fishing methods for catching Lost River and shortnose suckers. The sampling performed under Action 1 was completed in 2020, and the sampling results directly informed the salvage and translocation efforts described in *Section 4.0 Action 2: Salvage and Translocation Plan*.

3.2 Previous Efforts

The Renewal Corporation reviewed previous sampling studies completed on Upper Klamath Lake, J.C. Boyle Reservoir, Copco No. 1 Reservoir (California), and Iron Gate Reservoir (California) as part of pre-sampling planning. The literature review focused on studies that evaluated Lost River and shortnose sucker habitat use and demographics in Copco No. 1 Reservoir and Iron Gate Reservoir. Studies of interest included Coots (1965), California Department of Fish and Game (CDFG) (1980), Beak Consultants (1987), Buettner and Scoppettone (1991), and Desjardins and Markle (2000). These studies documented shortnose suckers in Copco No. 1 Reservoir and Iron Gate Reservoir. Beak Consultants (1987) and Desjardins and Markle (2000) each captured one Lost River sucker in Copco No. 1 Reservoir. Buettner and Scoppettone (1991) referenced the decline of Lost River suckers from Copco No. 1 Reservoir since the 1950s as documented by previous CDFW studies (Coots 1965; CDFG 1980). Buettner and Scoppettone (1991) also noted there was no prior evidence of Lost River or shortnose suckers inhabiting Iron Gate Reservoir, although Desjardins and Markle (2000) subsequently captured shortnose suckers in Iron Gate Reservoir. Sucker spawning habitat upstream from Copco No. 1 Reservoir and Iron Gate Reservoir is limited due to short riverine reaches, coarse bed material, and fluctuating river levels (Buettner and Scoppettone 1991; Desjardins and Markle 2000). Limited juvenile rearing habitat and predation by non-native fish species also likely limit the reproductive potential of Lost River and shortnose suckers in the reservoirs (Desjardins and Markle 2000). Beak Consultants documented shortnose sucker spawning in the Klamath River in the 1-mile reach of the Klamath River upstream from Copco No. 1 Reservoir (1987), but they found few larval shortnose suckers in Copco No. 1 Reservoir (1988). Identified sucker larvae were believed to be Klamath smallscale suckers or shortnose sucker-Klamath smallscale sucker hybrids (Beak Consultants 1988).

J.C. Boyle Dam and Keno Dam have fish ladders that do not meet current sucker passage criteria (ODFW OAR 412; FishPro 2000) and potentially impede the upstream migration of Lost River and shortnose suckers from the Lower Klamath Project reach to Upper Klamath Lake (PacifiCorp 2013). Desjardins and Markle (2000) noted that J.C. Boyle Reservoir tended to have smaller adult shortnose suckers and more sucker size classes than the downstream reservoirs. Desjardins and Markle (2000) suggested that fewer non-native predatory fish species and more littoral habitat could have accounted for better juvenile recruitment compared to Copco No. 1 Reservoir and Iron Gate Reservoir.

3.3 Sampling Periods and Locations

The Renewal Corporation field crews completed sampling in J.C. Boyle Reservoir over four sampling periods (Renewal Corporation 2020). Spring sampling was completed in late March and mid-May, and fall sampling was completed in early November. Sampling typically began before dusk and ended after midnight. Sampling effort focused on habitats less than 20 ft deep as adult Lost River and shortnose suckers in Upper Klamath Lake preferentially selected habitats up to 15 ft deep (Reiser et al. 2001; Banish et al. 2009). In addition to target depth, field crews also prioritized habitats with similar depths over distances of at least 300 ft to accommodate the dimension of the deployed trammel nets. Nets were often placed to fish transitional features such as from the shallow shoreline into a submerged historical channel of a

tributary or the Klamath River. Sampling locations were generally in coves and tributary confluence areas that met the sampling habitat criteria defined by water depths less than 20 ft deep and habitats with consistent elevations over a 300 ft distance. Habitats that were successfully sampled during previous efforts, and over the course of the Renewal Corporation's work, were repeatedly sampled.

3.4 Sampling Methods

The Renewal Corporation field crews deployed sampling boats[2] with a captain and two crew members on each boat. The captain was responsible for driving the boat and assisting with data recording during fish processing. Crew members were responsible for deploying and retrieving fishing gear, and processing captured fish. Crew members used trammel nets and boat electrofishing to sample suckers. Trammel nets were most frequently used and accounted for nearly all the sampled suckers. A boat electrofisher was used in flowing portions of the Klamath River at the head end of J.C. Boyle Reservoir and in shallow reservoir margins. Table 3-1 summarizes the sampling gear employed.

Table 3-1. Gear for sampling listed suckers in J.C. Boyle Reservoir

SAMPLING EQUIPMENT ITEM	NUMBER	SPECIFICATIONS
Sampling Boat	1 or 2	18 ft and 19 ft sampling boats with necessary safety and anti-pollution equipment
Trammel Net	6	USGS specifications - 300 feet long, 6 feet high; two 12-inch mesh outer panels; one 1.5-inch mesh (3-inch stretch) inner panel; foam-core float line; lead-core bottom line
Electrofishing Equipment	1	3250 watt generator operated boat-mounted Smith-Root Model 1.5 KVA Electrofisher

3.4.1 Trammel Nets

Netting of suckers was predominantly completed at night by one or two boats. Each boat set between two and six nets during each net set. Each trammel net included two 12-inch mesh outer panels and one 1.5-inch mesh inner panel sandwiched between the outer 12-inch mesh panels. A foam-core float line and lead-core bottom line maintained net position. Nets were clipped to an end poly rope with a mushroom or pyramid anchor secured at the bottom of the poly rope and a buoy secured to the top of the poly rope. The distance between the top of the clipped net and the buoy was based on water depth such that nets were fished on the bottom. Nets were paid out from either the bow or the side of the boat depending on the boat. A second anchor and buoy were attached to the poly rope at the end of the trammel net. Each net set

[2] Two crews conducted sampling in fall 2018, and spring and fall 2019. One crew conducted sampling in spring 2020. Sampling level of effort was comparable across the four sampling efforts.

location was documented with either a handheld or on-board GPS. During spring 2020, one sampling boat was used to deploy six trammel nets.

Nets were generally set perpendicular to the shoreline in water depths ranging from 3 ft to 50 ft, but nets were most commonly set in 20 ft or less of water. Nets were typically fished for approximately 2 hours, but up to 6 hours during the spring 2020 sampling. At the end of each net soak, the nets were retrieved, and captured fish were removed from the nets and placed in live wells for processing. Non-target species were identified, enumerated, and released.

3.4.2 Tangle Nets

The Renewal Corporation field crew deployed two tangle nets in the transitional reach at the upstream end of J.C. Boyle Reservoir. The nets included one net measuring 100 feet long by 6 feet deep with 3-inch stretch mesh size and one net measuring 50 feet by 8 feet with 3-inch stretch mesh size. Both nets were fitted with a foam core float line and lead core bottom line. Tangle nets were fished through a lower velocity reach where water depths ranged from 6 feet to 8 feet. Tangle nets were not fished upstream from Copco Reservoir or Iron Gate Reservoir due to coarse bed material or low sucker presence determined while boat electrofishing. One Klamath smallscale sucker was caught using the tangle nets.

3.4.3 Boat Electrofishing

Boat electrofishing was an added gear type for fall 2019 and spring 2020 sampling. The electrofishing equipment included dual bow-mounted anode/cathode arrays (each with a terminal 4 wire umbrella). Dual cathode arrays were hung from each side of the boat, each with 14 terminal wires. The electrofisher components were mounted on a 17-foot jet boat. The anode/cathode arrays were operated by a Smith-Root electrofisher control module (Model 1.5 KVA) with electricity provided by a gas-powered generator (Generac GP 3250) with a maximum output of 3,250 running watts. The Smith-Root 1.5 KVA electrofisher has a maximum output power of 1,700 watts and can be set to pulsed AC or DC current that draws between 0 and 10 amps. The AC mode produces 60 Hz alternating current between the anode and cathode wires. The DC position produces direct current, pulsing at 120 pulses per second. There is no wattage adjustment on the Smith-Root 1.5 KVA electrofisher.

Per the USFWS Incidental Take Permit for listed suckers, only the DC setting was used. Following the user manual, the Smith-Root 1.5 KVA electrofisher controller was set to DC current and the voltage was set to the lowest setting. The electrofisher was then activated to determine the amount of current (amperage) drawn at the lowest voltage setting. Test electrofishing was conducted and the voltage was increased in a stepwise manner until the desired level of electrotaxis to facilitate capture was exhibited by the target species, while also minimizing injury and mortality of target and non-target species. The effective DC voltage for the Klamath Reservoir surveys was approximately 150 volts, which drew about 5 amps. During electrofishing, two fish netters stationed in the bow controlled the electrofisher via a foot switch.

Sampling focused on shallow water areas less than 6 ft deep in coves and tributary confluences to ensure electrofisher effectiveness and to minimize injury to listed suckers. Sampling areas

mirrored net set locations from previous sampling, as well as flowing reaches of the Klamath River upstream of J.C. Boyle Reservoir. Field crews recorded boat electrofishing level of effort by recording the time the electrofishing unit was engaged by the field crew.

3.4.4 Sucker Processing Procedures

Crew members processed captured listed suckers on the boat of capture. Fish processing involved the following observations and other measurements of each captured listed sucker.

- Identified the fish species and sex, noting the presence of tubercles and anal fin shape as sex characteristics.
- Identified any external abnormalities including parasites, lamprey marks, and fin and scale anomalies.
- Measured fork length to the nearest millimeter using a wetted PVC measuring board.
- Collected a fin clip to serve as a genetic material sample.
- Confirmed absence of existing PIT tag, then inserted a PIT tag into the ventral musculature anterior to the pelvic girdle using pre-loaded single use 12-gauge hypodermic needles (HPT12 PLT) fitted onto an implant device (MK-25). Existing or inserted PIT tag numbers were recorded.
- Collected photographs of each sucker's mouth, lateral body view, and features of concern such as lesions or parasites.

Measurement data were recorded on field sheets and photographs and GPS data were transferred from field equipment to laptop computers following sampling. Processed fish were returned to the reservoir away from the immediate sampling area to minimize repeat capture. All efforts were made to minimally handle suckers and release fish in good condition.

3.4.5 Sucker Genetics

In 2020, the USFWS-Abernathy Lab compiled genetic libraries for the four Klamath sucker species including Lost River suckers, shortnose suckers, Klamath largescale suckers (*Catostomus snyderi*), and Klamath smallscale suckers (Smith et al. 2020). Genetic results suggested genetic variation within each of the four sucker species was primarily partitioned among subbasins (Smith et al. 2020). Smith et al. (2020) also determined there are potentially thousands of genetic markers for species and population differentiation that will be useful in the recovery of Lost River and shortnose suckers. It is the Renewal Corporation's understanding that USFWS will use the genetic results to develop assays that will likely allow fisheries managers to distinguish among the four Klamath Basin sucker species, providing an important tool for species conservation (Smith et al. 2020). The fin clips collected by the Renewal Corporation in the Lower Klamath Project reservoirs have been provided to the USFWS. USFWS will be responsible for determining whether assays are applied to the fin clips to determine sucker genetics.

3.5 Sampling Results

Results for the four sampling efforts completed between 2018 and 2020 on J.C. Boyle Reservoir are provided below. Results for Copco No. 1 Reservoir and Iron Gate Reservoir are provided in the CA Suckers Plan.

3.5.1 Level of Effort

Table 3-2 and Table 3-3 include the level of effort for the trammel net sets and boat electrofishing, respectively.

Table 3-2. Level of effort for trammel net sets

METRIC	SAMPLING EVENT	NET SET VALUES
Total Net Sets (#)	Spring 2020	7
	Fall 2019	19
	Spring 2019	40
	Fall 2018	30
	Total	**96**
Total Net Soak Time (hours)	Spring 2020	49.7
	Fall 2019	36.0
	Spring 2019	55.1
	Fall 2018	57.9
	Total	**198.8**
Average Net Soak Time (hours)	Spring 2020	7.1
	Fall 2019	1.9
	Spring 2019	1.4
	Fall 2018	1.9
	Average	**3.1**

Table 3-3. Boat electrofishing level of effort for J.C. Boyle Reservoir from fall 2019 and spring 2020 sampling

SAMPLING EVENT	BOAT ELECTROFISHING EFFORT (SECONDS)
Spring 2020	2792
Fall 2019	2999
Total	**5791**

3.5.2 Catch Composition

3.5.2.1 Trammel Nets

The Renewal Corporation field crews caught 3,645 fish during the four sampling periods using trammel nets. Fish counts and native and non-native species composition are included in Table 3-4 and Table 3-5, respectively.

Table 3-4. Total trammel net catch for J.C. Boyle Reservoir

SAMPLING EVENT	TOTAL FISH CAUGHT
Spring 2020	1184
Fall 2019	716
Spring 2019	829
Fall 2018	916
Total	**3645**

Table 3-5. The most common native and non-native fish species caught using trammel nets in J.C. Boyle Reservoir

NATIVE/NON-NATIVE SPECIES	SPECIES NAME	TOTAL FISH CAUGHT
Native Species	Tui Chub (*Siphatales bicolor bicolor*)	1464
	Blue Chub (*Gila coerulea*)	451
	Smallscale Sucker (*Catostomus rimiculus*)	131
	Rainbow Trout (*Oncorhynchus mykiss*)	80
	Shortnose Sucker (*Chasmistes brevirostris*)	64
	Lost River Sucker (*Deltistes luxatus*)	26
Non-native Species	Crappie (*Pomoxis* spp.)	386
	Brown Bullhead (*Ameiurus nebulosus*)	384
	Goldfish (*Carassius* spp.)	338
	Yellow Perch (*Perca flavescens*)	245

NATIVE/NON-NATIVE SPECIES	SPECIES NAME	TOTAL FISH CAUGHT
	Redear Sunfish (*Lepomis microlophus*)	23

3.5.2.2 Boat Electrofishing

The Renewal Corporation field crews caught 289 fish during fall 2019 and spring 2020 boat electrofishing. Fish counts and native and non-native species composition are included in Table 3-6 and Table 3-7, respectively.

Table 3-6. Total boat electrofishing catch for J.C. Boyle Reservoir

SAMPLING EVENT	TOTAL FISH CAUGHT
Spring 2020	215
Fall 2019	74
Total	**289**

Table 3-7. The most common native and non-native fish species caught using boat electrofishing in J.C. Boyle Reservoir in 2019 and 2020 sampling

NATIVE/NON-NATIVE SPECIES	SPECIES NAME	TOTAL FISH CAUGHT
Native Species	Chubb sp. (*Siphatales bicolor bicolor* and *Gila coerulea)*	218
	Rainbow Trout (*Oncorhynchus mykiss*)	14
	Smallscale Sucker (*Catostomus rimiculus*)	2
	Shortnose Sucker (*Chasmistes brevirostris*)	2
Non-native Species	Goldfish (*Carassius* spp.)	44
	Largemouth Bass (*Micropterus* sp.)	6
	Brown Bullhead (*Ameiurus nebulosus*)	3

3.5.3 Trammel Net and Boat Electrofishing Summary

Table 3-8 includes the total catch for the four sampling periods in J.C. Boyle Reservoir. Table 3-9 includes the most common native and non-native fish species caught in J.C. Boyle Reservoir using trammel nets and boat electrofishing.

Table 3-8. Total trammel net catch and boat electrofishing catch for J.C. Boyle Reservoir

SAMPLING EVENT	TOTAL FISH CAUGHT
Spring 2020	1399
Fall 2019	790
Spring 2019	1109
Fall 2018	274
Total	**4548**

Table 3-9. The most common native and non-native fish species caught using trammel nets and boat electrofishing in J.C. Boyle Reservoir

NATIVE/ NON-NATIVE SPECIES	SPECIES NAME	TOTAL FISH CAUGHT
Native Species	Tui Chub (*Siphatales bicolor bicolor*)	1464
	Blue Chub (*Gila coerulea*)	451
	Chubb sp. (*Siphatales bicolor bicolor* and *Gila coerulea)*	218
	Smallscale Sucker (*Catostomus rimiculus*)	133
	Rainbow Trout (*Oncorhynchus mykiss*)	94
	Shortnose Sucker (*Chasmistes brevirostris*)	66
	Lost River Sucker (*Deltistes luxatus*)	26
Non-native Species	Brown Bullhead (*Ameiurus nebulosus*)	387
	Crappie (*Pomoxis* spp.)	386
	Goldfish (*Carassius* spp.)	338
	Yellow Perch (*Perca flavescens*)	245
	Redear Sunfish (*Lepomis microlophus*)	23

3.5.4 Sucker Catch, Size, and Condition

The Renewal Corporation caught Lost River suckers, shortnose suckers, and potential shortnose sucker hybrids in J.C. Boyle Reservoir (Table 3-10) over the four sampling periods. Potential hybrid suckers were individuals that had intermediate characteristics suggesting hybridization with other sucker species. As noted above, the Renewal Corporation provided all fin clip samples to USFWS for genetic testing at the discretion of USFWS.

Table 3-10. Listed suckers and potential hybrid suckers caught using trammel nets and boat electrofishing J.C. Boyle Reservoir

SPECIES[1]	SAMPLING EVENT	TOTAL SUCKERS CAUGHT
Lost River Suckers	Spring 2020	9
	Fall 2019	4
	Spring 2019	10
	Fall 2018	3
	Total	**26**
Shortnose Suckers	Spring 2020	15
	Fall 2019	9
	Spring 2019	19
	Fall 2018	21
	Total	**64**
Potential Hybrid Suckers	Spring 2020	0
	Fall 2019	1
	Spring 2019	1
	Fall 2018	3
	Total	**5**
Total Suckers	Spring 2020	24
	Fall 2019	14
	Spring 2019	30
	Fall 2018	27
	Total	**95**

[1]: Only includes maiden captures (i.e., first capture), does not include recaptured fish.

Lost River sucker and shortnose sucker length statistics recorded over the four sampling periods are provided in Table 3-11.

Table 3-11. Lost River and shortnose sucker length statistics for suckers caught using trammel nets and boat electrofishing in J.C. Boyle Reservoir over the four sampling periods

SPECIES	STATISTIC	VALUE
Lost River Suckers	Count	26
	Maximum (mm)	765.0
	Median (mm)	534.5
	Mean (mm)	534.1
	Minimum (mm)	375.0
	1 SD (mm)	90.8
Shortnose Suckers	Count	64
	Maximum (mm)	520.0
	Median (mm)	428.0
	Mean (mm)	427.9
	Minimum (mm)	313.0
	1 SD (mm)	35.2

Based on length-age relationships for shortnose suckers in Upper Klamath Lake, shortnose suckers sampled in J.C. Boyle Reservoir are likely older fish. Prior to the Renewal Corporation's sampling, sucker populations downstream of Keno Reservoir had not been sampled since the late 1990s (Desjardins and Markle 2000) and early 2000s (Desjardins and Markle, unpublished data). In four sampling years, Desjardins and Markle (2000; unpublished data) caught 4 adult Lost River suckers and 61 adult shortnose suckers in J.C. Boyle Reservoir. A comparison of shortnose sucker lengths from sampling in 1998-1999 (Desjardins and Markle 2000) and 2000-2001 (Desjardins and Markle, unpublished data), and the Renewal Corporation's sampling (2018-2020) is shown in Figure 3-1.

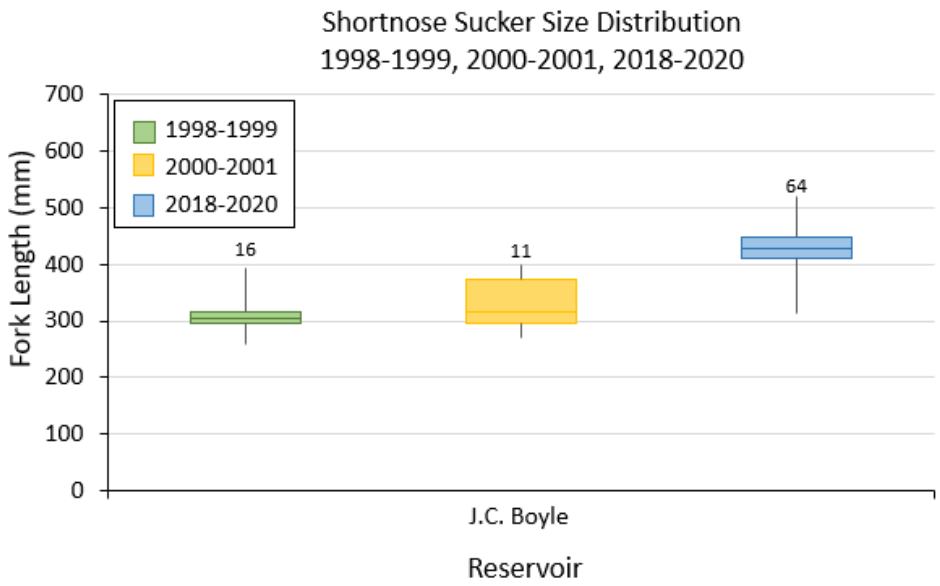

Figure 3-1. Comparison of shortnose sucker fork lengths for fish sampled by Desjardins and Markle (1998-1999 and 2000-2001) and the Renewal Corporation (2018-2020) in J.C. Boyle Reservoir[3]

Renewal Corporation field crews noted the occurrence of wounds, deformities, and growths/tumors on listed suckers in the reservoirs. Common afflictions included worn fins, caudal fin deformities, parasites, wounds from lamprey attachment, and growths/tumors (Figure 3-2). Between 11% and 33% of suckers had afflictions across the four sampling periods. Due to small sample sizes, affliction patterns across the sampling periods were not apparent. Sucker afflictions in J.C. Boyle Reservoir included wounds, deformities, tumors, and parasites. No direct sucker mortality was observed during sampling in J.C. Boyle Reservoir.

[3] Sample sizes are posted above each box plot in Figure 3-1.

Figure 3-2. Example Lost River sucker (upper left) and shortnose sucker (upper right) sampled in spring 2020. Example of tumors and growths (lower left) and deformities (lower right) afflicting suckers in the Lower Klamath Project reservoirs

3.5.5 Sucker Catch Per Unit Effort

Table 3-12 includes a comparison of catch per unit effort (CPUE) for maiden (i.e., first capture) shortnose suckers over the four sampling events, and the previous sampling completed by Desjardin and Markle in 1998 and 1999 (Desjardins and Markle 2000). Including both Lost River suckers and shortnose suckers, the CPUE in J.C. Boyle Reservoir over the four sampling periods is 0.44 fish/net-hour. The CPUE for Lost River suckers and shortnose suckers individually, was 0.13 and 0.31 fish/net-hour, respectively.

Table 3-12. Shortnose sucker catch per unit effort for the Renewal Corporation sampling and the Desjardins and Markle sampling (2000) in J.C. Boyle Reservoir

SAMPLING EFFORT[1]	CPUE (FISH/NET-HOUR)
Desjardins and Markle – 1998 and 1999[2]	0.06
Renewal Corporation – Spring 2020	0.26
Renewal Corporation – Fall 2019	0.25
Renewal Corporation – Spring 2019	0.34
Renewal Corporation – Fall 2018	0.36
Renewal Corporation - All Events Combined	0.31

[1]: Catch per unit effort does not include recaptured fish.
[2]: Desjardins and Markle 2000

3.5.6 Sucker Population Estimates

The Renewal Corporation used recaptured suckers (trammel net data only) to develop population estimates for the three reservoirs, as well as a total population estimate across the three reservoirs. Three different methods were used to develop population estimates, all yielding comparable results.

3.5.6.1 Methods

The Renewal Corporation used the PIT tag mark-recapture data to produce abundance estimates for listed suckers inhabiting each reservoir, and for the three reservoirs combined. Due to the relatively low recapture rates, mark-recapture data for shortnose, Lost River, and potential hybrid suckers were combined. All listed sucker mark-recapture data were aggregated to determine total population estimates. Any listed sucker recaptured at least one day (or longer) after initial capture, tagging, and release was considered a recapture for the determination of the population estimates. Population estimates were then calculated using the following methods.

The Chapman Method (Chapman 1951; Johnson et al. 2007) reduces small sample size bias and estimates the total population as:

$$\hat{N} = \frac{(M)(n+1)}{(m+1)}$$

Where:

$\hat{N}$ = Estimated size of the population

n = Number of fish initially marked and released

M = Number of unmarked fish captured during subsequent survey

m = Number of recaptured fish that were marked

Meridian Environmental, Inc. (Renewal Corporation subcontractor) also used a nonparametric bootstrap method (Efron and Tibshirani 1986; Manly 2007) to calculate mean population estimates and estimate variance to produce 95 percent confidence intervals. The bootstrap was run 10 times for each estimate, with 1,000 iterations per run. Population and variance estimates represent the mean of each 10-run set. The Renewal Corporation calculated the 95 percent confidence interval as the square root of the mean bootstrap variance multiplied by 1.96.

Total population estimates were also calculated using the super-population parameterization (Schwarz and Arnason 1996) of the Jolly-Seber model to estimate listed sucker abundance while accounting for subsampling for marking. Abundance is quantified by Schwarz and Arnason (1996) as the total number of gross “births” in the area of interest, which includes listed suckers present at the beginning of the study, those that move into the study area during the monitoring period, and those that do not survive to the end of the monitoring period. The super-population parameterization (Schwarz and Arnason 1996) of the Jolly-Seber model (POPAN model) was applied with the RMark package (Laake 2013) to the capture histories of each

individual PIT-tagged sucker with at least one resighting (recapture) opportunity. Intercept-only models were used for capture and survival probabilities due to the low number of recaptured individuals. Because survey occasions were distributed across a period of 18 months, the estimated abundance represents a mean for that time period. Bootstrapping was initially applied to obtain reasonable (i.e., non-negative and finite) confidence interval limits. However, bootstrapped confidence intervals resulted in unrealistically large upper bounds, so confidence intervals based on asymptotic normality were constructed.

The mark-recapture estimates include the following assumptions: 100 percent PIT tag retention (i.e., no tag loss); mortality of tagged target suckers is the same as untagged target suckers; no emigration of tagged target suckers occurs from the reservoirs between the first and last survey; and trammel net set locations are representative of habitats used by suckers in the three reservoirs. Combining shortnose sucker, Lost River sucker, and potential hybrid sucker mark-recapture data also assumes that the trammel net catchability of these three categories of fish is the same.

An additional assumption is that each sucker species identification is correct. The field teams have collected genetic samples from all shortnose sucker, Lost River sucker, and potential hybrid suckers captured during the three survey efforts, and all target suckers were PIT-tagged. As noted above, once genetic assays are available, USFWS will decide whether the genetic samples provided by the Renewal Corporation will be used to confirm sucker genetics. If they are, reservoir mark-recapture population estimates could be further refined based on species genetic assignment of each fish in the dataset.

3.5.6.2 Results

The Renewal Corporation's population estimates suggest that the total number of adult listed suckers is highest in Copco No. 1 Reservoir, slightly less in J.C. Boyle Reservoir, and lowest in Iron Gate Reservoir (Table 3-13). The 95 percent confidence intervals suggest that there are several thousand adult suckers in Copco No. 1 Reservoir and J.C. Boyle Reservoir, and several hundred adult suckers in Iron Gate Reservoir. Based on sampling results, shortnose suckers are more abundant than Lost River suckers in J.C. Boyle Reservoir, and Lost River suckers are at low population levels in Copco No. 1 Reservoir and potentially absent from Iron Gate Reservoir. Due to the low number of recaptured suckers over the sampling effort, the 95 percent confidence intervals for the population estimates are large compared to the magnitude of the population estimate (i.e., confidence interval widths greater than ±100 percent of the population estimate for Copco No. 1 Reservoir and J.C. Boyle Reservoir).

Using the Chapman Method, the Renewal Corporation estimated 4,509 listed suckers in all three reservoirs. The bootstrap method yielded a mean estimate of 5,540 listed suckers and a 95% confidence maximum estimate of 11,531 listed suckers across the three reservoirs. The Jolly-Seber model estimated 2,201 listed suckers and a 95% confidence maximum estimate of 4,615 listed suckers across the three reservoirs.

Table 3-13. Population estimate attributes and estimates for listed and potential hybrid suckers in the Lower Klamath Project reservoirs

POPULATION ESTIMATE ATTRIBUTES	RESERVOIRS			
	J.C. BOYLE	COPCO NO. 1	IRON GATE	RESERVOIRS COMBINED
Total Maiden Suckers Captured (Fall 2018 through Spring 2020)	95	98	29	222
Total Target Suckers PIT-tagged and Available for Recapture (Fall 2018, Spring 2019, Fall 2019, Spring 2020)[1]	71	83	27	181
Total Tagged Suckers Recaptured (Fall 2018 through Spring 2020)	3	3	2	8
Recapture Efficiency (# Recaptured / # Tagged)	4.2%	3.6%	7.4%	4.4%
Chapman Method - Population Estimate	1,727	2,078	279	4,509
Bootstrap Method - Mean Population Estimate	2,766	3,371	399	5,540
Bootstrap Method - 95% Confidence Interval	±3,730	±4,508	±544	±5,991
Jolly-Seber Model - Mean Population Estimate	864	1,235	102	2,201
Jolly-Seber Model - 95% Confidence Interval	±951	±1,374	±89	±2,414

[1]: Although all target suckers captured on the final night of sampling at each reservoir were PIT-tagged, they were not available for subsequent recapture, and therefore, they were excluded from the total number of target suckers PIT-tagged and released for the mark-recapture estimate.

4.0 Action 2: Salvage and Translocation Plan

4.1 Purpose

The Renewal Corporation will undertake salvage and translocation measures to remove adult listed suckers from J.C. Boyle Reservoir prior to reservoir drawdown and dam removal to reduce Project effects on listed suckers residing in the reservoir.

During the development of the sampling and salvage plan, the Renewal Corporation coordinated with the ATWG to develop aquatic resource plan components. The Renewal Corporation initially proposed salvaging 100 Lost River and 100 shortnose suckers from each of the three reservoirs for a total of 600 suckers (Renewal Corporation 2017). Based on the sampling results presented in *Section 3 Action 1: Sampling Plan Methods and Results,* the original proposal was not feasible, especially with respect to Lost River suckers, which are at low numbers in Copco No. 1 Reservoir and potentially absent from Iron Gate Reservoir.

Under this OR Suckers Plan, the Renewal Corporation will salvage suckers over a 14-day period including a total of 5 days on Copco No. 1 Reservoir, 2 days on Iron Gate Reservoir, and 7 days on J.C. Boyle Reservoir. Based on catch efficiencies from the sampling effort, the Renewal Corporation anticipates catching a combined total of approximately 300 listed suckers from Copco No. 1 Reservoir and Iron Gate Reservoir and approximately 300 listed suckers from J.C. Boyle Reservoir. The 300 listed suckers equate to between 11 percent and 35 percent of the sucker mean population estimates calculated for J.C. Boyle Reservoir (see *Section 3.5.7 Sucker Population Estimate*). Salvage will continue for 7 days at J.C. Boyle Reservoir even if the 300-sucker estimate is exceeded. Salvaged suckers caught in J.C. Boyle Reservoir will be translocated to the Klamath Falls National Fish Hatchery and/or the Klamath Tribes' sucker rearing facility. Other translocation sites may be used following consultation with the ARG and agreement between the Renewal Corporation, USFWS, CDFW and ODFW. If agreement is reached to use other translocation sites, the Renewal Corporation will file a report with the Commission within 14 calendar days that includes the location of the additional translocation site, the reasons for the additional translocation site, and documentation of consultation with USFWS, CDFW and ODFW.

The salvage and translocation efforts will be led by experienced staff with prior experience salvaging or sampling suckers using trammel nets, tangle nets and/or electrofishing equipment. At least one month prior to salvage, the Renewal Corporation will provide Field Supervisors at both the Klamath Falls and Yreka Fish and Wildlife Field Offices with a list of experienced staff that will be leading the effort along with a summary of their qualifications. Volunteers (if any) that participate in the salvage and/or translocation effort will receive training from experienced staff regarding, among other things, capture and handling techniques. All volunteers will also be monitored by experienced staff throughout the effort.

During the salvage and translocation effort, the Renewal Corporation will, to the extent practicable, adhere to the "Klamath Basin Sucker Rearing Program Fish Handling Guidelines" (USFWS, 2008) when capturing, handling and transporting suckers.

4.2 Regulatory Compliance

This OR Suckers Plan supports compliance with the federal Endangered Species Act of 1973 and the Oregon Department of Environmental Quality 401 Water Quality Certification pertaining to the Lost River and shortnose suckers.

4.3 Salvage Period

The Renewal Corporation will perform sucker salvage and translocation in the spring or fall prior to reservoir drawdown. At least three months prior to salvage, the Renewal Corporation will send an email to the Klamath Tribes and the Klamath Falls National Fish Hatchery notifying them of the proposed dates for both salvage and translocation at J.C. Boyle Reservoir. Each will be promptly notified if the dates for salvage and/or translocation change to ensure that staff from the Klamath Falls National Fish Hatchery and the Klamath Tribes' sucker rearing facility have the option of being onsite during salvage and translocation efforts and that the translocation sites are prepared to receive the salvaged suckers. In addition, at least three

weeks prior to salvage, the Renewal Corporation will send an email to the Klamath Tribes and the Field Supervisor of the Klamath Falls USFWS Field Office confirming the dates for both salvage and translocation at J.C. Boyle Reservoir.

During the spring, Lost River and shortnose suckers congregate in shallower habitats in advance of and during the spring spawning period. Initiation of the Lost River and shortnose sucker spawning runs in Upper Klamath Lake coincides with water temperatures approaching or exceeding 10 °C and 12 °C, respectively, in the Williamson River (Hewitt et al. 2017). A similar temperature-related spawning migration pattern was documented by Beak Consultants (1987) for shortnose suckers in Copco No. 1 Reservoir. In the Beak Consultants study, shortnose suckers began spawning when average water temperatures exceeded 12 °C on April 15, 1987. Spawning peaked between April 22 and April 30 and spawning ended approximately May 15, 1987 (Beak Consultants 1987). Therefore, a spring salvage period would be completed between mid-April and early May. The Renewal Corporation previously sampled J.C. Boyle Reservoir in late March 2019, and mid-May 2020 and captured the target species. These previous efforts likely bracketed the primary listed suckers spawning periods.

If sucker salvage and translocation cannot be performed in the spring for any reason, the Renewal Corporation will perform this measure in the fall prior to reservoir drawdown. A fall salvage period is less dependent on water temperature-related sucker behavior and habitat use, although suckers inhabited deeper habitats in a study conducted on Upper Klamath Lake (Reiser et al. 2001). A fall salvage period would take place after water temperatures decrease to less than 16 °C and reservoir microsystin levels decline to concentrations below human health advisory levels. A fall salvage period would occur between late October and early November.

4.4 Salvage Locations

J.C. Boyle Reservoir salvage locations will correspond to the previous sampling locations and include shallower habitats associated with reservoir margins and deeper habitats associated with the historical Klamath River channel. During a spring salvage, field crews would target the upper 0.25 miles of the J.C. Boyle Reservoir where the Klamath River joins the reservoir. Similar reservoir locations would be targeted in a fall salvage period.

4.5 Salvage Methods

The Renewal Corporation will employ similar methods for processing salvaged suckers as were used during the sucker sampling effort. The Renewal Corporation will use trammel nets and boat electrofishing. The Renewal Corporation will not use backpack electrofishing in connection with the salvage of suckers. While the Renewal Corporation expects to fish primarily at night, it may also use boat electrofishing during the day if the Renewal Corporation thinks that day fishing will be effective based on its professional judgment and expertise. Two boats will each deploy four trammel nets in J.C. Boyle Reservoir. Fewer nets will be deployed in J.C. Boyle Reservoir compared to Copco No. 1 Reservoir and Iron Gate Reservoir due to the abundant bycatch in J.C. Boyle Reservoir. Additional trammel nets with larger mesh openings will also be used to reduce bycatch and make fishing for the listed suckers more efficient.

The Renewal Corporation will set trammel nets sequentially and fish the nets for 2-3 hours in previously sampled reservoir habitats. Four net sets will be completed per night depending on catch efficiency and bycatch. Boat electrofishing will focus on shallow reservoir areas and the upstream end of J.C. Boyle Reservoir. Tangle nets may also be used in riverine reaches if congregations of shortnose suckers are encountered during boat electrofishing. Captured Lost River and shortnose suckers will be weighed, identified to species and sex, measured, fin clipped, photographed, and PIT tagged using a new or pre-sterilized needle for each individual injection. Each sucker will also be scanned to detect existing PIT tags. Salvaged suckers will be held in aerated live wells and periodically transferred to net pens near boat access sites where suckers will be held until transport. If a captured sucker is identified as a hybrid based on a visual inspection of its physical characteristics, it will be released back into the salvage reservoir.

When boat electrofishing, the Renewal Corporation will select settings to minimize potential injury or mortality to suckers, use only direct current or pulsed direct current, and avoid egg deposition areas. As in the sucker sampling effort, the Renewal Corporation will set the Smith-Root 1.5 KVA electrofisher (or equivalent) to DC current and set the voltage to the lowest setting. The electrofisher will then be activated to determine the amount of current (amperage) drawn at the lowest voltage setting. Test electrofishing will then be conducted, and the voltage will be increased in a stepwise manner until the desired level of electrotaxis to facilitate capture is exhibited by the target suckers, while also minimizing injury and mortality of target and non-target species. During boat electrofishing, two people will be stationed in the boat's bow to control the electrofisher via a foot switch.

The Renewal Corporation may also use tangle nets or a resistance board weir to salvage suckers from the upstream extent of J.C. Boyle Reservoir, or in flowing portions of the Klamath River at the head end of J.C. Boyle Reservoir.

The Renewal Corporation will acquire current information on water quality to better anticipate water quality conditions in J.C. Boyle Reservoir, the Klamath Falls National Fish Hatchery, the Klamath Tribes' sucker rearing facility, other translocation sites (if any), and Upper Klamath Lake (as needed). The information will be used to understand water quality conditions in the salvage and translocation sites. Water quality constituents of interest include water temperature, dissolved oxygen, salinity concentrations, and pH levels. Acquiring this information in advance of the salvage will be necessary to condition the water in the transport live well and to plan the acclimation period at the release locations.

4.6 Transport and Translocation Methods

The Renewal Corporation will remove suckers after the third day, fifth day, and seventh day of salvage and transport them to the translocation sites. At the time of transport, the Renewal Corporation field crews will remove suckers from net pens and scan them for PIT tag identification prior to loading fish into aerated live wells (approximately 200-300 gallons) for transport. The Renewal Corporation will coordinate with USFWS, CDFW, ODFW, U.S. Bureau of Reclamation, the Klamath Tribes, and the Yurok Tribe to access transport vehicles. Large live

wells will be fiberglass, steel, or polyethylene and will be sized to fit in the open bed of a standard pickup truck or on a trailer. Live wells will be baffled to limit sloshing during transport. The live well will be filled to 75% capacity (about 150 gallons) with J.C. Boyle Reservoir water in the vicinity of the net pens. Transported fish will be large (>300 mm) and care will be required to minimize overstocking the live well. Densities should be the equivalent of approximately 1 lb. of fish per gallon of water. While the transport density will be adjusted based on sucker size, sucker species, conditions, and sucker response, in no event will more than 165 pounds of suckers be transported at any one time in a 160-gallon live well. The following methods will be used to prepare the transport tanks (USBR 2008; USFWS 2008).

- Live wells are to be disinfected using a Virkon (1.3 oz/gallon) solution or other approved disinfectant. Live wells are to be disinfected daily and thoroughly rinsed following disinfection.
- Water will be pumped from J.C. Boyle Reservoir into the live well using a portable pump. A handheld YSI meter will be used to measure water quality constituents including water temperature, dissolved oxygen, salinity, and pH prior to adding suckers to the live well. The live well will be refilled at J.C. Boyle Reservoir prior to each transport.
- Water temperature will be monitored in the live well during each day's initial transport runs. Water temperature will be monitored during subsequent transport runs as necessary. Water temperature in the live well should remain within 4 °C of the initial ambient water temperature during the transport. Water temperature will be modified by chillers or heaters.
- Dissolved oxygen concentrations will be monitored in the live well during each day's initial transport runs. Dissolved oxygen levels will be monitored during subsequent transport runs as necessary. Dissolved oxygen levels should be maintained at approximately 100 percent saturation. If needed, a portable aeration system will be installed to maintain dissolved oxygen levels at approximately 100 percent saturation.
- Salinity levels should be approximately 0.5%. Coarse ground sodium chloride will be added in small increments to the live well until a 0.5% salinity level is achieved.
- The Renewal Corporation field crews transporting the listed suckers will be attentive to the condition of the equipment throughout the transport process.
- To acclimate suckers at the receiving waterbody, reservoir water in the live well will be replaced with recipient waterbody water over the course of at least an hour. Approximately a quarter to a half of the reservoir water will be drained from the live well and replaced with recipient waterbody water that will be pumped into the live well. Tempering the live well will be important for acclimating the suckers to the recipient waterbody's water quality constituents. Live well water will be drained away from translocation sites to avoid discharging salvage reservoir water directly to these sites. Additional live well discharge strategies (if any) will be coordinated with USFWS. Water quality constituents should be consistently measured during the tempering process. USFWS suggests the target suckers can tolerate a 0.5 °C temperature change every 15 minutes when tempering and, to the extent practicable, overall tempering should not exceed a greater than 4 °C change.

4.6.1 Translocation Sites

The Klamath Falls National Fish Hatchery and the Klamath Tribes sucker rearing ponds are expected to be the primary translocation sites for suckers salvaged from J.C. Boyle Reservoir. Other translocation sites may be used following consultation with the ARG and agreement between the Renewal Corporation, USFWS, CDFW and ODFW. If agreement is reached to use other translocation sites, the Renewal Corporation will file a report with the Commission within 14 calendar days that includes the location of the additional translocation site, the reasons for the additional translocation site, and documentation of consultation with USFWS, CDFW and ODFW.

Salvaged suckers will first be taken to the Klamath Falls National Fish Hatchery where they will be isolated and receive an external parasite treatment before they are integrated into hatchery groups. USFWS has requested a ratio between 60:40 and 70:30 shortnose suckers to Lost River suckers be provided to the hatchery, of which, half of the salvaged shortnose suckers originate in J.C. Boyle Reservoir and half originate in Copco No. 1 Reservoir and/or Iron Gate Reservoir. All Lost River suckers are anticipated to come from J.C. Boyle Reservoir as the species is in low numbers in Copco No. 1 and Iron Gate reservoirs.

The Renewal Corporation will translocate salvaged Lost River and shortnose suckers exceeding the Klamath Falls National Fish Hatchery's capacity to the Klamath Tribes' sucker rearing facility east of Chiloquin, Oregon. The Klamath Tribes' rearing facility currently includes two ponds and several more ponds are expected to be completed prior to the salvage and translocation of listed suckers under this OR Suckers Plan. The capacity for adult salvaged suckers is unknown at this time, but the Klamath Tribes could provide capacity for up to 2,000 adult suckers. Suckers delivered to the Klamath Tribes' ponds will be placed in separate ponds including one pond for Lost River suckers, one pond for shortnose suckers, and one pond for suckers that are not easily identifiable. Translocated suckers will be genetically tested and fish health investigations may be conducted by the Klamath Tribes, ODFW, or USFWS before fish are released in the future. Rearing pond effluent will be discharged to a dry basin so that no pond effluent will discharge to the Sprague River. Delivered suckers will also receive an external parasite treatment before release into the rearing ponds. The Klamath Tribes anticipate holding translocated suckers for up to three to five years before suckers are released either into Upper Klamath Lake or another location to be determined in the future.

If salvaged suckers are transported to California, the Renewal Corporation will obtain and comply with the permits (if any) required to transport the salvaged suckers across the state line between California and Oregon.

4.6.2 Transport Route

Travel from J.C. Boyle Reservoir to the Klamath Falls National Fish Hatchery is approximately 22 miles. Directions include traveling east on Highway 166 to Keno (6 miles), turning south on the Keno-Worden Road (7 miles), turning east on Township Road (8 miles), then traveling north on Lower Klamath Lake Road to Klamath Falls National Fish Hatchery (1 mile).

Travel from J.C. Boyle Reservoir to the Klamath Tribes sucker rearing facility is approximately 50 miles. Directions include traveling east on Highway 66 to Highway 97 (15 miles), turning north on Highway 97 and continuing to Chiloquin (28.3 miles), continue east on the Sprague River Highway to the Klamath Tribes' sucker rearing facility (5.1 miles).

4.7 Reporting

The Renewal Corporation will process sucker salvage data including information on the salvaged and transported suckers and water quality constituents. Collected fin clips (i.e., sucker genetic material) will be linked to the individual sampled via unique PIT tag identification numbers. The Renewal Corporation will provide the USGS and the ARG with an electronic copy of the Microsoft Excel data workbook and photographs. The genetic material will be provided to USFWS.

Summary reports will be submitted to the Commission, the California State Water Resources Control Board and the Oregon Department of Environmental Quality, and copied to USGS and the ARG, within three months of completing the salvage. The summary report will contain, at a minimum, the following information:

1. Data for any suckers that die during the capture and translocation effort. This includes information on when an individual died (e.g., during capture, holding, or transport), and the species, sex, measurements, and photographs;
2. The date, time, and location data for each translocation, including water temperature data at the translocation site and time of translocation (e.g., dusk);
3. The stocking densities of the live wells (e.g. number of fish per lb. of water) when the fish are transported;
4. The sex ratio of the salvaged suckers;
5. The results of disease and pathogen screening (if any) conducted by ODFW and USFWS; and
6. All fin clip data with the associated passive integrated transponder (PIT) tag codes.

The Renewal Corporation's sucker salvage responsibilities end once suckers are released at the prescribed translocation sites. USFWS and ODFW will maintain management responsibilities for Lost River and shortnose suckers through and after the salvage effort.

4.8 Salvage Plan Summary

The Renewal Corporation completed four sampling efforts to gain a better understanding of current sucker demographics and population sizes in the project reservoirs.

The Renewal Corporation will conduct 7 days of salvage and translocation of listed suckers from J.C. Boyle Reservoir. Based on catch efficiencies from the sampling effort, the Renewal Corporation anticipates relocating approximately 300 listed suckers from J.C. Boyle Reservoir. The Renewal Corporation will continue to coordinate sucker salvage planning, including the estimated dates for capture and translocation, with USFWS, ODFW, and the Klamath Tribes.

5.0 References

Banish, N. P., B. J. Adams, R. S. Shively, M. M. Mazur, D. A. Beauchamp, and T. M. Wood. 2009. Distribution and habitat associations of radio-tagged adult Lost River and shortnose suckers in Upper Klamath Lake, Oregon. Transactions of the American Fisheries Society 138:153-168.

Beak Consultants Incorporated. 1987. Shortnose and Lost River sucker studies: Copco Reservoir and the Klamath River. Unpublished manuscript. Project No. D3060.01. Portland, Oregon, 37 pp. and appendix.

Beak Consultants Incorporated. 1988. Shortnose and Lost River sucker studies: Larval Sucker Study between Copco Reservoir and the Proposed Salt Caves Diversion Pool. A Response to a FERC Request for Additional Information. Project No. 73060.03. Portland, Oregon, 36 pp.

Buettner, M.E., and G.G Scoppettone. 1991. Distribution and information on the taxonomic status of the shortnose sucker (Chasmistes brevirostris) and Lost River sucker (Deltistes luxatus) in the Klamath River Basin, California. Completion Report. Study conducted for the California Department of Fish and Game under Contract FG-8304. 110 pp.

Burdick, S.M. 2013. Assessing movement and sources of mortality of juvenile catostomids using passive integrated transponder tags, Upper Klamath Lake, Oregon—Summary of 2012 effort: U.S. Geological Survey Open-File Report 2013-1062, 12 p.

California Department of Fish and Game (CDFG). 1980. Copco Lake, Siskiyou County, Fish Sampling Spring 1980. Unpublished report.

Chapman, D.G. 1951. Some properties of the hypergeometric distribution with applications to zoological censuses. University of California Publications on Statistics 1:131–160.

Coots, M. 1965. Occurrences of the Lost River sucker, Deltistes luxatus (Cope), and shortnose sucker, Chasmistes brevirostris Cope, in Northern California, California Fish and Game 51:68-73.

Desjardins, M., and D.F. Markle. 2000. Distribution and Biology of Suckers in the Lower Klamath Reservoirs, 1999. Final Report. Prepared for PacifiCorp, Portland, OR, by Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Desjardins, M., and D.F. Markle. Unpublished sucker sampling results for Copco No. 1 Reservoir and Iron Gate Reservoir for 2000-2001.

Efron, B., and R. Tibshirani. 1986. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. Statistical Science, Vol. 1, No. 1, 54 77.Federal Energy Regulatory Commission (FERC). 2018. Order Amending License and Deferring Consideration of Transfer Application FERC Project Nos. 2082-062 and 14803-000. 162 FERC ¶ 61,236. Washington, DC, Federal Energy Regulatory Commission, Office of Energy Projects, Division of Hydropower Licensing.

FishPro. 2000. Fish Passage Conditions on the Upper Klamath River. Submitted to The Karuk Tribe and PacifiCorp. 132 p.

Hewitt, D.A., Janney, E.C., Hayes, B.S., and Harris, A.C. 2017. Status and trends of adult Lost River (Deltistes luxatus) and shortnose (Chasmistes brevirostris) sucker populations in Upper Klamath Lake, Oregon, 2015: U.S. Geological Survey Open-File Report 2017–1059, 38 pp., https://doi.org/10.3133/ofr20171059.

Johnson, D.H., B.M. Shrier, J.S. O'Neal, J.A. Knutzen, X. Augerot, T.A. O'Neil and T.N. Pearsons. 2007. Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations. American Fisheries Society, Bethesda, Maryland.

Klamath River Renewal Corporation (Renewal Corporation). 2017. Klamath River Renewal Project – California Environmental Quality Act (CEQA) and California and Oregon 401 Water Quality Certifications Technical Support Document. 994 p.

Laake, J.L. 2013. RMark: An R Interface for Analysis of Capture-Recapture Data with MARK. AFSC Processed Rep 2013-01, 25p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Manly, B. 2007. Randomization, Bootstrap, and Monte Carlo Methods in Biology, 3rd edition. Chapman and Hall, Boca Raton, Florida.

Oregon Department of Fish and Wildlife (ODFW). State of Oregon Administrative Rules Chapter 635 – Division 412 Fish Passage. Website https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=173471

PacifiCorp. 2013. PacifiCorp Klamath Hydroelectric Project Interim Operations Habitat Conservation Plan for Lost River and Shortnose Suckers. Prepared by PacifiCorp Energy, Inc., Portland, OR. Submitted to the U.S. Fish and Wildlife Service, Klamath Falls Fish and Wildlife Office, Klamath Falls, OR.

Reiser, D.W., M. Loftus, D. Chaplin, E. Jeanes, and K. Oliver. 2001. Effects of Water Quality and Lake Level on the Biology and Habitat of Selected Fish Species in Upper Klamath Lake. Prepared for Bureau of Indian Affairs, Portland, Oregon. 147 p.

Renewal Corporation. 2020. Lower Klamath Project Annual Monitoring Report. 39 p.

Schwarz, C.J., and A.N. Arnason. 1996. A general method for analysis of capture-recapture experiments in open populations. Biometrics 52:860-873.

Smith, M., J. Von Bargen, C. Smith, M. Miller, J. Rasmussen, and D.A. Hewitt. 2020. Characterization of the genetic structure of four sucker species in the Klamath River. Final Report. U.S. Fish and Wildlife Service. 34 p.

U.S. Bureau of Reclamation (USBR). 2008. Handling Guidelines for Klamath Basin Suckers. 20 pp.

U.S. Fish and Wildlife Service (USFWS). 2008. Klamath Basin Sucker Rearing Program Fish Handling Guidelines. Unpublished report. 18 p.

Appendix G

Consultation Record

Consultation Record

Aquatic Resources Management Plan			
Sub-Plan	**Agency**	**Date of Agency Plan Submittal**	**Agency Comments Received Date**
Spawning Habitat Availability Report and Plan	National Marine Fisheries Service	January 22, 2021 August 13, 2021	No Comments Received September 1, 2021
	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	February 5, 2021 September 8, 2021
	California Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 3, 2021/ April 23, 2021 September 8, 2021
	California Department of Water Resources	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	California State Water Resources Control Board	January 22, 2021 August 13, 2021 August 11, 2022	April 23, 2021 September 8, 2021 No Comments Received
	Oregon Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 6, 2021 September 8, 2021
	Oregon Department of Environmental Quality	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Yurok Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Karuk Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Klamath Tribe	August 13, 2021	No Comments Received
California AR-6 Adaptive Management Plan (Suckers)[1]	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	February 5, 2021 No Comments Received
	California State Water Resources Control Board	January 22, 2021 August 13, 2021 August 11, 2022	April 23, 2021 August 30, 2021 No Comments Received
	California North Coast Regional Water Quality Control Board	January 22, 2021 August 13, 2021	No Comments Received No Comments Received

Aquatic Resources Management Plan			
Sub-Plan	**Agency**	**Date of Agency Plan Submittal**	**Agency Comments Received Date**
	California Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 5, 2021/ April 15, 2021 No Comments Received
	California Department of Water Resources	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
Oregon AR-6 Adaptive Management Plan (Suckers)[1]	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Oregon Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 6, 2021 No Comments Received
	Oregon Department of Environmental Quality	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Bureau of Land Management – Klamath Falls	February 12, 2021 August 13, 2021	April 15, 2021 No Comments Received
	Klamath Tribe	August 13, 2021	No Comments Received
Tributary-Mainstem Connectivity Plan	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	February 5, 2021 August 28, 2021
	National Marine Fisheries Service	January 22, 2021 August 13, 2021	February 4, 2021 No Comments Received
	California State Water Resources Control Board	January 22, 2021 August 13, 2021 August 11, 2022	No Comments Received August 30, 2021 September 20, 2022
	Bureau of Land Management – Klamath Falls	February 12, 2021 August 13, 2021	April 15, 2021 No Comments Received
	California Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 5, 2021 August 30, 2021
	California North Coast Regional Water Quality Control Board	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	California Department of Water Resources	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Oregon Department of Fish and Wildlife	August 13, 2021	No Comments Received

Aquatic Resources Management Plan			
Sub-Plan	**Agency**	**Date of Agency Plan Submittal**	**Agency Comments Received Date**
	Oregon Department of Environmental Quality	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Yurok Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Karuk Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Klamath Tribe	August 13, 2021	No Comments Received
Fish Presence Monitoring Plan	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	February 5, 2021 August 28, 2021
	National Marine Fisheries Service	January 22, 2021 August 13, 2021	February 11, 2021 August 25, 2021
	Bureau of Land Management – Klamath Falls	February 12, 2021 August 13, 2021	April 15, 2021 No Comments Received
	California State Water Resources Control Board	January 22, 2021 August 13, 2021 August 11, 2022	April 23, 2021 August 31, 2021 September 20, 2022
	California Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 5, 2021 April 15, 2021 August 30, 2021
	California Department of Water Resources	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	California North Coast Regional Water Quality Control Board	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Yurok Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Karuk Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Klamath Tribe	August 13, 2021	No Comments Received
Juvenile Salmonids and Pacific	United States Fish and Wildlife Service	January 22, 2021 August 13, 2021	February 5, 2021 August 28, 2021

Aquatic Resources Management Plan			
Sub-Plan	**Agency**	**Date of Agency Plan Submittal**	**Agency Comments Received Date**
Lamprey Rescue and Relocation Plan	National Marine Fisheries Service	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	California State Water Resources Control Board	January 22, 2021 August 13, 2021 August 11, 2022	April 23, 2021 August 30, 2021 September 20, 2022
	California Department of Fish and Wildlife	January 22, 2021 August 13, 2021	February 5, 2021/ April 15, 2021 August 30, 2021
	California North Coast Regional Water Quality Control Board	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	California Department of Water Resources	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Yurok Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Karuk Tribe	January 22, 2021 August 13, 2021	No Comments Received No Comments Received
	Klamath Tribe	August 13, 2021 August 13, 2021	No Comments Received

[1] The California and Oregon AR-6 Adaptive Management Plans – Suckers underwent a process of consultation with the United States Fish and Wildlife Service, California Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, and the Klamath Tribes through a series of informal meetings during the development of the 2021 Biological Assessment from January through March 2021. Further consultation records for these documents can be found in the Biological Assessment (Renewal Corporation 2021).

Renewal Corporation. 2021. Lower Klamath Project Biological Assessment. March 2021. *Adopted by the Federal Energy Regulatory Commission August 2021.* https://elibrary.ferc.gov/eLibrary/filelist?document_id=14938394&accessionnumber=20210322-5335