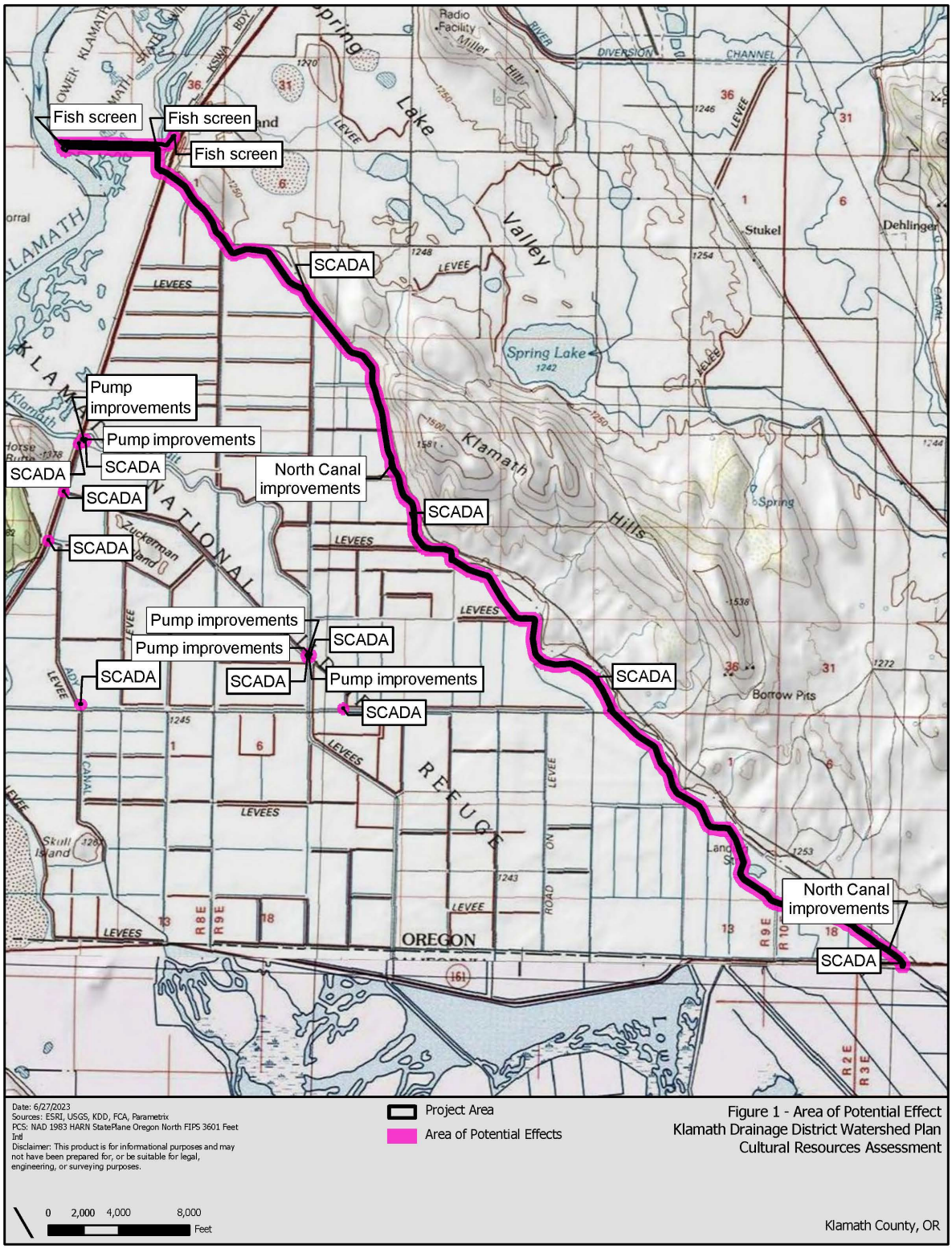
anticipated to occur outside of the APE established for direct effects. The APE is shown in the enclosed figure.
Cultural resources studies of the APE will be performed and shared with consulting parties. If the Karuk Tribe is interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to the Karuk Tribe. If you have any questions or concerns about the project, please contact Rachel Gebauer, NRCS Oregon Acting State Archaeologist at rachel.gebauer@usda.gov or 541.887.3511.

Sincerely,

Rachel LS Gebauer

Rachel Gebauer
Acting State Cultural Resources Specialist
USDA NRCS
541.887.3511
rachel.gebauer@usda.gov

cc:
Gary Diridoni, NRCS Oregon State Watershed Planner
Melina Pastos, NRCS Oregon State Tribal Liaison
Enclosure: Area of Potential Effect Figure


Fish screen
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Lake
Valley
Spring Lake
Klamath
Hills
Stukel
Dehlinger
Borrow Pits
LEVEES
REFUGE
OREGON
Project Area
Area of Potential Effects
Date: 6/27/2023
Sources: ESRI, USGS, KDD, FCA, Parametrix
PCS: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.
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Figure 1 - Area of Potential Effect
Klamath Drainage District Watershed Plan
Cultural Resources Assessment
Klamath County, OR

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Rachel Gebauer, State Archaeologist
1945 Main St., Suite 200
Klamath Falls, Oregon 97601

Alex Watts-Tobin, THPO, Karuk Tribe
P.O. Box 1016
Happy Camp, CA 96039

January 27, 2025

Subject: Cultural Resources Assessment for the Klamath Drainage District, Klamath County, Oregon

Dear Alex Watts-Tobin,

NRCS Oregon proposes to provide federal funding to the Klamath Drainage District in Klamath County, Oregon, for infrastructure modernization to increase operational and water delivery efficiency. The project is being performed through the NRCS' Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). This undertaking is subject to the Section 106 of the National Historic Preservation Act (NHPA), as amended, and its implementing regulations (36CFR Part 800) and also subject to Section 110(f) of the NHPA (36 CFR 800.10). NRCS is serving as the lead federal agency for the project. This letter is a follow up to our Initial Consultation request on January 6, 2025 and provides documentation of a survey for cultural resources within the Area of Potential Effect.

Proposed Undertaking

The project proposes to make the following improvements to the Klamath Drainage District (KDD): •Screen the North Canal Diversion on the Klamath River and improve access to the potential fish screen site. •Improve the North Canal by extending it 0.47 miles (~2,500 feet) from Fugate Road to California State Highway 161, connecting the North Canal to the P-1 Lateral, adding a point of delivery to the Lower Klamath NWR. This project action would also include the modification of five road crossings along the North Canal to accommodate an additional flow of 100 cubic feet per second (cfs). •Upgrade the Reclamation F&FF and E&EE pump stations along the KSD to a more common voltage and with variable frequency drives (VFD). •Install a recirculation pipeline going from the outlet of the western-most pump in the E Pump Station to the Center Canal. •Install 14 SCADA12 systems, four of which include automated gates, at 12 locations distributed across the District.

The enclosed report includes the identification of archaeological and built environment resources located in the project area, evaluation of these resources for listing in the National Register of Historic Places (NRHP), and an assessment of effects to these resources from the proposed project. Parametrix conducted

archaeological and built environment survey of the project area to identify and document cultural resources present within the project area. Archaeological survey identified two archaeological sites – Temporary Site # KL-1 and KL-2 – and one precontact isolate – Temporary # KLISO-1. None of the archaeological sites or isolates are located in areas where project-related ground disturbance is proposed. Built environment survey identified 22 components of the Klamath Drainage District, including nine specific linear resources, five specific structures, and eight feature categories.1 The 22 components of the Klamath Drainage District irrigation infrastructure were evaluated collectively as a potential sub-historic district, the Klamath Drainage District Irrigation System Historic District, within the Klamath Project, an NRHP-eligible historic
district.

Determinations of Eligibility and Effects

The Klamath Drainage District Irrigation System Historic District is **recommended eligible for listing in the NRHP as contributor to the Klamath Project**. Fifteen of the Klamath Drainage District's **components are recommended NRHP eligible as contributing resources** to the Klamath Drainage District Irrigation System Historic District and the Klamath Project and seven are recommended as non-contributing resources to the Klamath Drainage District Irrigation System Historic District or the Klamath Project. The project area additionally overlaps with the boundaries of the Lower Klamath National Wildlife Refuge, which is designated as a National Historic Landmark (NHL) and listed in the NRHP. The project is recommended as **not resulting in an adverse effect** to either the Klamath Drainage District Irrigation System Historic District or Lower Klamath National Wildlife Refuge NHL.

Attached you will find materials to support our present consultation effort, including:

- A full archaeological report (Cultural Resources Assessment for the Klamath Drainage District, Klamath County, Oregon)

If you have any questions, please let me know and I will be happy to address them.

Sincerely,

Rachel LS Gebauer

Rachel Smith Gebauer, M.A., RPA,
NRCS Oregon State Cultural Resources Specialist

cc. Gary Diridoni, NRCS Oregon State Watersheds Planner

United States Department of Agriculture

Natural Resources Conservation Service

1201 NE Lloyd Blvd.
Suite 900
Portland, OR 97232
503-414-3200

October 11, 2024

Louisa McCovey
Yurok Tribe
190 Klamath Blvd.
Klamath, CA 95548

Subject: Klamath Drainage District Infrastructure Modernization Project Draft Watershed Plan-Environmental Assessment Notice of Availability

Dear Louisa McCovey,

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), in cooperation with Klamath Drainage District (KDD or District) as the project sponsor and U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service as cooperating agencies is proposing to partially fund the Klamath Drainage District Infrastructure Modernization Project (Project) through the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566). The Project is in Klamath County, Oregon, and Siskiyou County, California.

The purpose of the proposed Project is to reduce District operational efficiencies affecting water quality and water quantity and improve the ability of the District to deliver the amount of water patrons need at the time they need it. Water shortages due to drought and operational inefficiencies have resulted in farmers being forced to fallow thousands of acres of high-value farmland. The unscreened diversions from the Klamath River risk entraining anadromous fish species which will be present in these reaches with the removal of the four Klamath River dams. The Klamath Straits Drain, the main discharge from the U.S. Bureau of Reclamation Klamath Project to the Klamath River, has been identified as a non-point source of pollution. Modernizing strategic sections of the KDD system would reduce potential entrainment of fish, improve water quality, address water shortages by recirculating irrigation water, and address delivery and operational efficiencies by more efficiently managing resources throughout the District.

A Draft Watershed Plan-Environmental Assessment (Draft Plan-EA) has been prepared for the Project and is now available for public review and comment. The Draft Plan-EA was prepared under the authority of PL 83-566 and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1989 (PL 91-190).

We are requesting your review of the Draft Plan-EA and invite you to attend an **in-person public meeting**. Please visit watershedplans.org/Klamath-dd for the date, time, and location of the meeting and to review and download the Plan-EA.

Comments on the Draft Plan-EA may be submitted any time during the public comment period starting **October 11, 2024** and ending on **November 15, 2024**. Comments may be emailed to klamathdd.comments@gmail.com; submitted online at watershedplans.org/Klamath-dd; left as a voice message at the Farmers Conservation

Alliance office at (541) 716-6085; or mailed to: Farmers Conservation Alliance, Attn: KDD Plan, 102 State Street, Hood River, OR, 97031.

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Water Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, Oregon, 97232; by phone at (503) 414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

Greg Becker
State Conservationist

Enclosure:

Notice of Availability of Draft Watershed Plan-Environmental Assessment and Public Meeting for Klamath Drainage District Infrastructure Modernization Project.

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oregon State Office
1201 NE Lloyd Blvd. Suite 900
Portland, OR 97232

6 January 2025

Chairman Joe James
Yurok Tribe
190 Klamath Blvd., P.O. Box 1027
Klamath, CA 95548

Re: Invitation to Participate in Section 106 Consultation for the Klamath Drainage District Modernization Project, Klamath County, Oregon

Dear Chairman James,

The Farmers Conservation Alliance (FCA) is proposing the Klamath Drainage District Modernization Project (the project) in Klamath County, Oregon. The project is being performed through the Natural Resources Conservation Service's (NRCS) Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). As a result, the project is considered a federal undertaking and is subject to Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800. NRCS is serving as the lead federal agency for the project. In this letter, NRCS initiates Section 106 consultation and requests feedback on the project's Area of Potential Effects.

Project Description

The project will make the following improvements to the Klamath Drainage District (KDD):

- Screen the North Canal Diversion on the Klamath River and improve access to the potential fish screen site.
- Improve the North Canal by extending it 0.47 miles (~2,500 feet) from Fugate Road to California State Highway 161, connecting the North Canal to the P-1 Lateral, adding a point of delivery to the LKNWR. This project action would also include the modification of five road crossings along the North Canal to accommodate an additional flow of 100 cubic feet per second (cfs).
- Upgrade the Reclamation F&FF and E&EE pump stations along the KSD to a more common voltage and with variable frequency drives (VFD).
- Install a recirculation pipeline going from the outlet of the western-most pump in the E Pump Station to the Center Canal.
- Install 14 SCADA12 systems, four of which include automated gates, at 12 locations distributed across the District.

Area of Potential Effects

A project's APE is defined as the geographic area(s) in which an undertaking may directly or indirectly effect the character or use of historic properties (36 CFR 800.16.c). Effects may be direct or indirect, with the former including any type of effect (i.e., physical, visual, auditory, etc.) resulting from an undertaking and the latter including any type of reasonably foreseeable effect caused by the undertaking after its completion or farther in distance. In determining the Project's APE, the APE for direct effects was delineated primarily to account for physical and visual effects, as well as construction-related effects such as vibration, noise, and fugitive dust. The Project's physical APE will be limited to the vertical and horizonal footprint of the areas and/or structures where the proposed project activities will occur. The project's visual APE includes a 100-foot radial buffer around the physical APE to account for effects on the viewsheds of historic properties resulting from alterations to select components of the Klamath Drainage District. The APE for indirect effects is the same as the APE for direct effects as reasonably foreseeable indirect effects are not

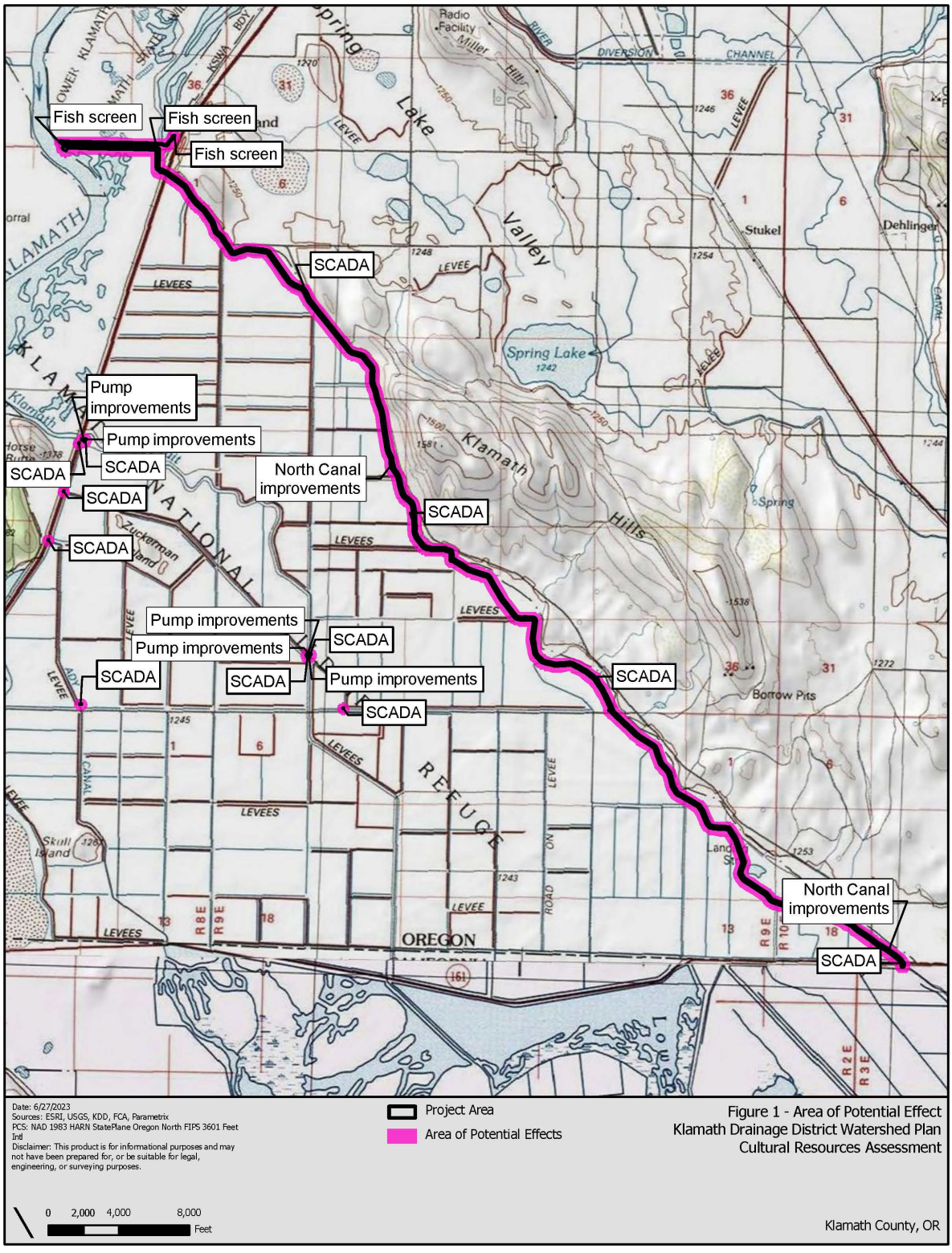
anticipated to occur outside of the APE established for direct effects. The APE is shown in the enclosed figure.
Cultural resources studies of the APE will be performed and shared with consulting parties. If the Yurok Tribe is interested in becoming a consulting party for the project, please provide a response within 30-days of receipt of this letter with confirmation of your interest and any key contacts to be included in future correspondence. NRCS is also interested in input regarding the identification of any historic properties that may exist within the project's APE that may have religious and cultural significance to the Yurok Tribe. If you have any questions or concerns about the project, please contact Rachel Gebauer, NRCS Oregon Acting State Archaeologist at rachel.gebauer@usda.gov or 541.887.3511.

Sincerely,

Rachel LS Gebauer

Rachel Gebauer
Acting State Cultural Resources Specialist
USDA NRCS
541.887.3511
rachel.gebauer@usda.gov

cc:
Gary Diridoni, NRCS Oregon State Watershed Planner
Melina Pastos, NRCS Oregon State Tribal Liaison
Enclosure: Area of Potential Effect Figure


Fish screen
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Spring Lake
Klamath
Hills
Stukel
Dehlinger
Borrow Pits
Skull Island
OREGON
LEVEES
Project Area
Area of Potential Effects
Date: 6/27/2023
Sources: ESRI, USGS, KDD, FCA, Parametrix
PCS: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.
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Figure 1 - Area of Potential Effect
Klamath Drainage District Watershed Plan
Cultural Resources Assessment
Klamath County, OR

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Rachel Gebauer, State Archaeologist
1945 Main St., Suite 200
Klamath Falls, Oregon 97601

Rosie Clayburn, THPO, Yurok Tribe
190 Klamath Blvd., P.O. Box 1027
Klamath, CA 95548

January 27, 2025

Subject: Cultural Resources Assessment for the Klamath Drainage District, Klamath County, Oregon

Dear Rosie Clayburn,

NRCS Oregon proposes to provide federal funding to the Klamath Drainage District in Klamath County, Oregon, for infrastructure modernization to increase operational and water delivery efficiency. The project is being performed through the NRCS' Watershed Protection and Flood Prevention Program, Public Law 83-566 (PL 83-566). This undertaking is subject to the Section 106 of the National Historic Preservation Act (NHPA), as amended, and its implementing regulations (36CFR Part 800) and also subject to Section 110(f) of the NHPA (36 CFR 800.10). NRCS is serving as the lead federal agency for the project. This letter is a follow up to our Initial Consultation request on January 6, 2025 and provides documentation of a survey for cultural resources within the Area of Potential Effect.

Proposed Undertaking

The project proposes to make the following improvements to the Klamath Drainage District (KDD): •Screen the North Canal Diversion on the Klamath River and improve access to the potential fish screen site. •Improve the North Canal by extending it 0.47 miles (~2,500 feet) from Fugate Road to California State Highway 161, connecting the North Canal to the P-1 Lateral, adding a point of delivery to the Lower Klamath NWR. This project action would also include the modification of five road crossings along the North Canal to accommodate an additional flow of 100 cubic feet per second (cfs). •Upgrade the Reclamation F&FF and E&EE pump stations along the KSD to a more common voltage and with variable frequency drives (VFD). •Install a recirculation pipeline going from the outlet of the western-most pump in the E Pump Station to the Center Canal. •Install 14 SCADA12 systems, four of which include automated gates, at 12 locations distributed across the District.

The enclosed report includes the identification of archaeological and built environment resources located in the project area, evaluation of these resources for listing in the National Register of Historic Places (NRHP), and an assessment of effects to these resources from the proposed project. Parametrix conducted

archaeological and built environment survey of the project area to identify and document cultural resources present within the project area. Archaeological survey identified two archaeological sites – Temporary Site # KL-1 and KL-2 – and one precontact isolate – Temporary # KLISO-1. None of the archaeological sites or isolates are located in areas where project-related ground disturbance is proposed. Built environment survey identified 22 components of the Klamath Drainage District, including nine specific linear resources, five specific structures, and eight feature categories.1 The 22 components of the Klamath Drainage District irrigation infrastructure were evaluated collectively as a potential sub-historic district, the Klamath Drainage District Irrigation System Historic District, within the Klamath Project, an NRHP-eligible historic
district.

Determinations of Eligibility and Effects

The Klamath Drainage District Irrigation System Historic District is **recommended eligible for listing in the NRHP as contributor to the Klamath Project**. Fifteen of the Klamath Drainage District's **components are recommended NRHP eligible as contributing resources** to the Klamath Drainage District Irrigation System Historic District and the Klamath Project and seven are recommended as non-contributing resources to the Klamath Drainage District Irrigation System Historic District or the Klamath Project. The project area additionally overlaps with the boundaries of the Lower Klamath National Wildlife Refuge, which is designated as a National Historic Landmark (NHL) and listed in the NRHP. The project is recommended as **not resulting in an adverse effect** to either the Klamath Drainage District Irrigation System Historic District or Lower Klamath National Wildlife Refuge NHL.

Attached you will find materials to support our present consultation effort, including:

- A full archaeological report (Cultural Resources Assessment for the Klamath Drainage District, Klamath County, Oregon)

If you have any questions, please let me know and I will be happy to address them.

Sincerely,

Rachel LS Gebauer

Rachel Smith Gebauer, M.A., RPA,
NRCS Oregon State Cultural Resources Specialist

cc. Gary Diridoni, NRCS Oregon State Watersheds Planner

United States Department of Agriculture

Natural Resources Conservation Service

1201 NE Lloyd Blvd.
Suite 900
Portland, OR 97232
503-414-3200

October 11, 2024

Chairman William E. Ray Jr.
Klamath Tribes
P.O. Box 436
501 Chiloquin Blvd.
Chiloquin, OR 97624

Subject: Klamath Drainage District Infrastructure Modernization Project Draft Watershed Plan-Environmental Assessment Notice of Availability

Dear Chairman Ray,

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), in cooperation with Klamath Drainage District (KDD or District) as the project sponsor and U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service as cooperating agencies is proposing to partially fund the Klamath Drainage District Infrastructure Modernization Project (Project) through the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566). The Project is in Klamath County, Oregon, and Siskiyou County, California.

The purpose of the proposed Project is to reduce District operational efficiencies affecting water quality and water quantity and improve the ability of the District to deliver the amount of water patrons need at the time they need it. Water shortages due to drought and operational inefficiencies have resulted in farmers being forced to fallow thousands of acres of high-value farmland. The unscreened diversions from the Klamath River risk entraining anadromous fish species which will be present in these reaches with the removal of the four Klamath River dams. The Klamath Straits Drain, the main discharge from the U.S. Bureau of Reclamation Klamath Project to the Klamath River, has been identified as a non-point source of pollution. Modernizing strategic sections of the KDD system would reduce potential entrainment of fish, improve water quality, address water shortages by recirculating irrigation water, and address delivery and operational efficiencies by more efficiently managing resources throughout the District.

A Draft Watershed Plan-Environmental Assessment (Draft Plan-EA) has been prepared for the Project and is now available for public review and comment. The Draft Plan-EA was prepared under the authority of PL 83-566 and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1989 (PL 91-190).

We are requesting your review of the Draft Plan-EA and invite you to attend an **in-person public meeting**. Please visit watershedplans.org/Klamath-dd for the date, time, and location of the meeting and to review and download the Plan-EA.

Comments on the Draft Plan-EA may be submitted any time during the public comment period starting **October 11, 2024** and ending on **November 15, 2024**. Comments may be emailed to klamathdd.comments@gmail.com; submitted online at watershedplans.org/Klamath-dd; left as a voice message at the Farmers Conservation

Alliance office at (541) 716-6085; or mailed to: Farmers Conservation Alliance, Attn: KDD Plan, 102 State Street, Hood River, OR, 97031.

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Water Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, Oregon, 97232; by phone at (503) 414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

Greg Becker
State Conservationist

Enclosure:

Notice of Availability of Draft Watershed Plan-Environmental Assessment and Public Meeting for Klamath Drainage District Infrastructure Modernization Project.

State of California • Natural Resources Agency — Gavin Newsom, *Governor*
DEPARTMENT OF PARKS AND RECREATION — Armando Quintero, *Director*
OFFICE OF HISTORIC PRESERVATION
Julianne Polanco, State Historic Preservation Officer
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
Telephone: (916) 445-7000 FAX: (916) 445-7053
calshpo.ohp@parks.ca.gov www.ohp.parks.ca.gov

February 27, 2025

VIA EMAIL — In reply refer to: NRCS_2024_0725_001

Rachel Smith Gebauer, M.A., RPA
Acting State Cultural Resources Specialist
Natural Resources Conservation Service
1945 Main Street, Suite 200
Klamath Falls, OR 97601

Subject: Section 106 Consultation for the Klamath Drainage District Modernization Project, Oregon and California

Dear Ms. Gebauer:

The State Historic Preservation Officer (SHPO) is in receipt of a consultation letter received on January 29, 2025, from the Natural Resources Conservation Service (NRCS), Klamath Drainage District (KDD) for the above referenced undertaking. The NRCS is continuing consultation with the SHPO to comply with Section 106 of the National Historic Preservation Act of 1966 (as amended) and its implementing regulation at 36 CFR 800. The NRCS is presenting a finding of *no adverse effect* to historic properties pursuant to 36 CFR § 800.5(b).

The NRCS initiated consultation with the SHPO for this undertaking on July 24, 2024. In that letter, the NRCS provided a project description for the undertaking and determined the Area of Potential Effects (APE). The majority of the project lies within the state of Oregon, and the project APE crosses into California for approximately 100 feet. The SHPO responded on August 23, 2024, with no objection to the APE as defined.

Along with their letter, the NRCS provided a copy of the following report for SHPO review: *Cultural Resources Assessment for the Klamath Drainage District, Klamath County, Oregon* prepared by Parametrix for the Farmers Conservation Alliance, dated January 2025.

Efforts to identify historic properties included background research through review of online resources and Oregon Heritage (Oregon SHPO) and NPS cultural resource databases, an intensive archaeological pedestrian survey of the APE, the excavation of shovel probes at locations where project-related ground disturbance is anticipated to result, a reconnaissance-level built environment survey, and Native American consultation.

The NRCS provided copies of the archaeological and historic resource report to the following consulting parties: the Klamath Tribes, Modoc Nation, Burns Paiute Tribe, Confederated Tribes of the Cow Creek Band of Umpqua Indians, Confederated Tribes of the Warm Springs Reservation of Oregon, Fort Bidwell Indian Community, Karuk Tribe, and Yurok Tribe.

As a result of their identification efforts, the NRCS identified two archaeological sites – Temporary Site # KL-1 and KL-2 – and one precontact isolate – Temporary # KLISO-1 within the APE. None of the archaeological sites or isolates are located in areas where project-related ground disturbance is proposed. All of the identified archaeological resources were located within the Oregon portion of the APE.

The NRCS also identified 22 components of the Klamath Drainage District. The 22 components of the Klamath Drainage District irrigation infrastructure were evaluated collectively as a potential district, the Klamath Drainage District Irrigation System Historic District. This proposed district is located entirely within the Oregon portion of the APE.

The NRCS has determined that the Klamath Drainage District Irrigation System Historic District is eligible for listing in the National Register of Historic Places (NRHP) as a contributor to the Klamath Project. The project area additionally overlaps with the boundaries of the Lower Klamath National Wildlife Refuge, which is designated as a National Historic Landmark (NHL) and listed in the NRHP. The NRCS has applied the criteria of adverse effect and reached a finding of *no adverse effect* to historic properties.

Following review of the submittal, I offer the following comments:

- Given that all of the historic properties identified within the APE are located within Oregon, I defer to the Oregon SHPO regarding the determinations of eligibility made as part of this undertaking.
- Pursuant to 36 CFR § 800.5(b), **I do not object** to a finding of *no adverse effect* to historic properties. However, I request to be kept informed should any other consulting parties object to the NRCS's finding of effect.

Be advised that under certain circumstances, such as an unexpected discovery or a change in project description, the NRCS may have additional future responsibilities for this undertaking under 36 CFR 800. If you require further information, please contact Robert Fitzgerald, Associate State Archaeologist, at Robert.Fitzgerald@parks.ca.gov.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chairman Russell Attebery
PO Box 1016
Happy Camp, CA 96039

Subject: Klamath Drainage District Infrastructure Modernization Project Final Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chairman Attebery,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Drainage District (KDD or District) as the project sponsor and U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service as cooperating agencies is proposing to partially fund the Klamath Drainage District Infrastructure Modernization Project (Project) through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566). The Project is in Klamath County, Oregon and Siskiyou County, California.

The purpose of the proposed Project is to reduce District operational efficiencies affecting water quality and water quantity and improve the ability of the District to deliver the amount of water patrons need at the time they need it. Water shortages due to drought and operational inefficiencies have resulted in farmers being forced to fallow thousands of acres of high-value farmland. The unscreened diversions from the Klamath River risk entraining anadromous fish species which will be present in these reaches with the removal of the four Klamath River dams. The Klamath Straits Drain, the main discharge from the U.S. Bureau of Reclamation Klamath Project to the Klamath River, has been identified as a non-point source of pollution. Modernizing strategic sections of the KDD system would reduce potential entrainment of fish, improve water quality, address water shortages by recirculating irrigation water, and address delivery and operational efficiencies by more efficiently managing resources throughout the District

A Final Draft Watershed Plan-Environmental Assessment (Final Draft Plan-EA) is being prepared for the Project. The Final Draft Plan-EA is being prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566) and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1969 (Public Law 91-190). Public comments on the Draft Plan-EA were accepted from October 11 through November 15, 2024, and were incorporated into the Final Draft Plan-EA. The Draft Plan-EA was accessible during the public comment period at https://watershedplans.org/klamath-dd

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Watershed Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, Oregon, 97232; by phone at 503-414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

GREGGORY BECKER Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:46:49 -07'00'

GREG BECKER
State Conservationist

Cc: Bill Tripp, Natural Resources Director Karuk Tribe

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chief Robert Burkybile III
22 N. 8 Tribes Trl.
Miami, OK 74354

Subject: Klamath Drainage District Infrastructure Modernization Project Final Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chief Burkybile,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Drainage District (KDD or District) as the project sponsor and U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service as cooperating agencies is proposing to partially fund the Klamath Drainage District Infrastructure Modernization Project (Project) through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566). The Project is in Klamath County, Oregon and Siskiyou County, California.

The purpose of the proposed Project is to reduce District operational efficiencies affecting water quality and water quantity and improve the ability of the District to deliver the amount of water patrons need at the time they need it. Water shortages due to drought and operational inefficiencies have resulted in farmers being forced to fallow thousands of acres of high-value farmland. The unscreened diversions from the Klamath River risk entraining anadromous fish species which will be present in these reaches with the removal of the four Klamath River dams. The Klamath Straits Drain, the main discharge from the U.S. Bureau of Reclamation Klamath Project to the Klamath River, has been identified as a non-point source of pollution. Modernizing strategic sections of the KDD system would reduce potential entrainment of fish, improve water quality, address water shortages by recirculating irrigation water, and address delivery and operational efficiencies by more efficiently managing resources throughout the District

A Final Draft Watershed Plan-Environmental Assessment (Final Draft Plan-EA) is being prepared for the Project. The Final Draft Plan-EA is being prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566) and in accordance with section 102(2)(c) of the National Environmental Policy Act of 1969 (Public Law 91-190). Public comments on the Draft Plan-EA were accepted from October 11 through November 15, 2024, and were incorporated into the Final Draft Plan-EA. The Draft Plan-EA was accessible during the public comment period at https://watershedplans.org/klamath-dd

For additional information regarding the proposed Project, please contact Gary Diridoni, Assistant State Conservationist for Watershed Resources at USDA, NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, Oregon, 97232; by phone at 503-414-3092; or email at gary.diridoni@usda.gov.

Sincerely,

GREGGORY BECKER Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:47:32 -07'00'

GREG BECKER
State Conservationist

Cc: Ken Sandusky, Modoc Nation Homelands Director
Audrey McGaughey, Tribal Historic Preservation Officer

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

OR State Office 1201
NE Lloyd Blvd. Suite 900
Portland, OR 97232

April 25, 2025

Chairman Joe James
PO Box 1027
Klamath, CA 95548

Subject: Klamath Drainage District Infrastructure Modernization Project Final Draft Watershed Plan–Environmental Assessment Notice of Availability

Dear Chairman James,

The United States Department of Agriculture Natural Resources Conservation Service (NRCS), in cooperation with Klamath Drainage District (KDD or District) as the project sponsor and U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service as cooperating agencies is proposing to partially fund the Klamath Drainage District Infrastructure Modernization Project (Project) through the Watershed Protection and Flood Prevention Act of 1954 (PL83-566). The Project is in Klamath County, Oregon and Siskiyou County, California.

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Sincerely,

GREGGORY BECKER Digitally signed by GREGGORY BECKER
Date: 2025.04.25 14:48:39 -07'00'

GREG BECKER
State Conservationist

Cc: Tim Hayden, Natural Resources Director Yurok Tribe

Oregon
Tina Kotek, Governor

Parks and Recreation Department
Oregon Heritage/
State Historic Preservation Office
725 Summer St. NE, Suite C
Salem, OR 97301-1266
(503) 986-0690
Fax (503) 986-0793
oregonheritage.org

April 21, 2025

Ms. Rachel Gebauer
USDA-NRCS
1945 Main St. Ste 200
Klamath Falls, OR 97601

RE: SHPO Case No. 23-1790
USDA-NRCS Klamath Drainage District Modernization Project
Piping and improvements to infrastructure
Multiple legals, Midland, Klamath County

Dear Rachel Gebauer:

Thank you for submitting information for the undertaking referenced above and providing our office with the additional information we requested to complete our review. We concur that there will be no adverse effect to the Klamath Drainage District Irrigation System Historic District or the Lower Klamath National Wildlife Refuge NHL for this undertaking.

This concludes consultation with our office under Section 106 of the National Historic Preservation Act (per 36 CFR Part 800) and/or Oregon Revised State (ORS) 358.653. If you have not already done so, be sure to consult with all appropriate Native American tribes and interested parties regarding the proposed undertaking.

If the undertaking design or effect changes or if additional historic properties are identified, further consultation with our office will be necessary before proceeding with the proposed undertaking. Additional consultation regarding this case must be sent through Go Digital. In order to help us track the undertaking accurately, reference the SHPO case number above in all correspondence.

Sincerely,

Robert T. Olguin

Robert Olguin
Review and Compliance, Historian
(503) 602-2468
Robert.Olguin@oprd.oregon.gov

cc: Tate Elder, Parametrix

E.3 Supporting Information for Land Use

No additional information.

E.4 Supporting Information for Socioeconomic Resources

Environmental Justice Communities

Areas with over 50 percent or "meaningfully greater" representation of minority or low-income communities are considered environmental justice communities (CEQ 1997), and their propensity to experience disproportionally adverse effects from a given action must be analyzed within NEPA documents per E.O. 12898. For this analysis, low-income is defined as those whose income is less than two times the federal poverty level. Minority is defined as those identifying as a race other than white alone and/or list their ethnicity as Hispanic or Latino. This methodology is consistent with that used in EPA's EJScreen tool.

Race and Ethnicity in Klamath County, Siskiyou County, Oregon, and California are summarized in Table E-2. Approximately 25 percent of the population of Klamath County identifies as a minority, less than that of the State of Oregon, where approximately 28 percent of the population identifies as a minority. Approximately 27 percent of the population of Siskiyou County identifies as a minority, less than that of the State of California, where approximately 65 percent of the population identifies as a minority.

Table E-2. Race and Ethnicity.

Indicator	Klamath County	Siskiyou County	Oregon	California
Total Population in 2020	69,413	44,076	4,237,256	39,538,223
Two or More Races	6.5%	7%	6.1%	4.1%
White alone	74.8%	72.7%	71.7%	34.7%
Black or African American alone	0.7%	1.1%	1.9%	5.4%
American Indian and Alaska Native alone	3.6%	4%	1%	0.4%
Asian alone	1.1%	2%	4.5%	15.1%
Native Hawaiian and Other Pacific Islander alone	0.1%	0.1%	0.4%	0.3%
Hispanic or Latino (of any race)	12.6%	12.5%	13.9%	39.4%
Not Hispanic or Latino	87.4%	87.5%	86.1%	60.6%

Source: U.S. Census Bureau (2020).

Low-income populations in Klamath County, Siskiyou County, Oregon, and California are summarized in Table E-3. Both Klamath and Siskiyou counties have a higher percentage of low-income populations than their respective states.

Table E-3. Low Income Populations.

Indicator	Klamath County	Siskiyou County	Oregon	California
Low Income (household income less than or equal to twice the poverty level)	43%	40%	29%	29%

Source: EPA (2020).

E.5 Supporting Information for Soil Resources

No additional information.

E.6 Supporting Information for Vegetation Resources

Table E-4. Plant Species that Occur Within Planning Area.

Plant Species	Scientific Name
Antelope bitterbrush	*Purshia tridentata*
Biennial wormwood	*Artemisia biennis*
Big sagebrush	*Artemisia tridentata*
Black cottonwood	*Populus balsamifera*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Broadleaf cattail	*Typha latifolia*
Bulrush	*Scirpus spp.*
California poppy	*Eschscholzia californica*
Canada thistle	*Cirsium arvense*
Carelessweed	*Cyclachaena xanthiifolia*
Catnip	*Nepeta cataria*
Cheatgrass	*Bromus tectorum*
Poison hemlock	*Conium maculatum*

Plant Species	Scientific Name
Climbing nightshade	*Solanum dulcamara*
Common duckmeat	*Spirodela polyrrhiza*
Common duckweed	*Lemna minor*
Common kochia	*Kochia scoparia*
Common lambsquarters	*Chenopodium album*
Common yarrow	*Achillea millefolium*
Coon's tail	*Ceratophyllum demersum*
Desert sweet	*Chamaebatiaria millefolium*
Dwarf mallow	*Malva neglecta*
Greasewood	*Sarcobatus vermiculatus*
Hastate orache	*Atriplex prostrata*
Herb sophia	*Descurainia sophia*
Hoe nightshade	*Solanum sarrachoides*
Hollyhok	*Alcea rosea*
Idaho fescue	*Festuca idahoensis*
Jointed goatgrass	*Aegilops cylindrica*
Low goosefoot	*Chenopodium chenopodioides*
Low sagebrush	*Artemisia arbuscula*
Mapleleaf goosefoot	*Chenopodium simplex*
Mountain rush	*Juncus balticus*
Mouse barley	*Hordeum murinum*
Narrowleaf dock	*Rumex stenophyllus*
Nodding thelypody	*Thelypodium flexuosum*

Plant Species	Scientific Name
Nuttall alkaligras	*Puccinellia nuttalliana*
Paiuteweed	*Suaeda calceoliformis*
Perennial pepperweed	*Lepidium latifolium*
Povertyweed	*Iva axillaris*
Prickly lettuce	*Lactuca serriola*
Prostrate pigweed	*Amaranthus blitoides*
Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Elymus repens*
Red goosefoot	*Chenopodium rubrum*
Redscale saltbush	*Atriplex rosea*
Reed canary grass	*Phalaris arundinacea*
Rough cocklebur	*Xanthium strumarium*
Rubber rabbitbrush	*Ericameria nauseosa*
Russian olive	*Elaeagnus angustifolia*
Russian thistle	*Salsola tragus*
Rye brome	*Bromus secalinus*
Saltgrass	*Distichlis stricta*
Sandberg bluegrass	*Poa sandbergii*
Shortpod thelypody	*Thelypodium brachycarpum*
Short-rayed alkali aster	*Symphyotrichum frondosum*
Silvery lupine	*Lupinus argenteus*
Small-flower fiddleneck	*Amsinckia menziesii*
Smartweed	*Persicaria sp.*
Spiny hopsage	*Grayia spinosa*

Plant Species	Scientific Name
Squirreltail	*Elymus elymoides*
Stinging nettle	*Urtica dioica ssp. holosericea*
Tall annual willowherb	*Epilobium brachycarpum*
Tall hedge-mustard	*Sisymbrium altissimum*
Teasel	*Dipsacus sp.*
Tufted hairgrass	*Deschampsia cespitosa*
Two-scale saltbush	*Atriplex micrantha*
Western juniper	*Juniperus occidentalis*
Western needlegrass	*Achnatherum occidentale*
Wild mint	*Mentha arvensis*
Wyoming Indian paintbrush	*Castilleja linariifolia*
Yellow flag iris	*Iris pseudacorus*
Yellow pondlily	*Nuphar lutea*
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*

Sources: (KDD 2022) and (USFWS 2016)

Noxious Weeds

The Klamath County Weed Control program defines noxious weeds as terrestrial, aquatic or marine plants that represent the greatest public menace and as a top priority for action by weed control programs; and identify three weed categories. "A" designated weeds are weeds of known economic importance which are known to occur in the county in small enough infestations that make eradication or containment possible, or are not known to occur in the county, but their presence in neighboring counties makes future occurrence in a county seems immminent. "B" designated weeds are weeds of known economic importance which in some parts of the county are abundant, but may have limited distribution in other parts of the county. Where implementation of a fully-integrated countywide management plan is infeasible, biological control shall be the main control approach when applicable. "C" designated weeds are weeds which are abundant in most of the county. While not subject to enforcement regulations, these species can cause similar economic and ecological impacts as other noxious weeds. Education and control recommendations will be the main approach.

Table E-5. Noxious Weeds Known to Occur Within the Planning Area With Their State and County Designations.

Common Name	Scientific Name	Oregon State Designation	Klamath County Designation	California State Designation	California Invasive Plant Council
Bermudagrass	*Cynodon dactylon*	-	-	D	Moderate
Bull thistle	*Cirsium vulgare*	List B	-	C	Moderate
Canada thistle	*Cirsium arvense*	List B	List B	B	Moderate
Common St. John's wort	*Hypericum perforatum*	List B	List B	C	Moderate
Creeping bentgrass	*Agrostis stolonifera*	-	-	-	Limited
Cutleaf teasel	*Dipsacus laciniatus*	List B	List A	-	
Dalmatian toadflax	*Linaria dalmatica ssp. dalmatica (= Linaria genistifolia ssp. dalmatica)*	List B	List B	A	Moderate
Diffuse knapweed	*Centaurea diffusa*	List B	List A	A	Moderate
Cheatgrass	*Bromus tectorum*	-	-	C	High
Dyer's woad	*Isatis tinctoria*	List B	List A	B	Moderate
English ivy and Algerian ivy	*Hedera helix and H. canariensis*	List B	-	D	High
Eurasian watermilfoil	*Myriophyllum spicatum*	-	-	C	High
French broom	*Genista monspessulana*	List B	-	C	High
Hairy whitetop	*Lepidium appelianum (= Cardaria pubescens)*	List B	-	B	Limited
Himalayan blackberry	*Rubus armeniacus (= Rubus discolor)*	-	-	-	High
Houndstongue	*Cynoglossum officinale*	List B	List A	-	Moderate
Kochia	*Kochia scoparia*	List B	-	-	Moderate

Common Name	Scientific Name	Oregon State Designation	Klamath County Designation	California State Designation	California Invasive Plant Council
Leafy spurge	*Euphorbia virgata (= Euphorbia esula)*	List B (T)	List B	A	High
Lepidium chalepensis and L. draba	*Lepidium chalepense (= Cardaria chalepensis and C. draba)*	List B	-	B	Moderate
Mediterranean sage	*Salvia aethiopis*	List B	-	B	Limited
Medusahead	*Elymus caput-medusae (= Taeniatherum caput-medusae)*	List B	-	C	High
Musk thistle	*Carduus nutans*	List B	List B	A	Moderate
Myrtle spurge	*Euphorbia myrsinites*	List B	List B	-	
Pampas grass	*Cortaderia selloana*	List B	-	-	High
Perennial pepperweed	*Lepidium latifolium*	List B	List B	B	High
Poison-hemlock	*Conium maculatum*	List B	List B	-	Moderate
Puncture vine	*Tribulus terrestris*	List B	List B	C	Limited
Purple loosestrife	*Lythrum salicaria*	List B	List A	B	High
Purple starthistle	*Centaurea calcitrapa*	List A (T)		B	Moderate
Rush skeletonweed	*Chondrilla juncea*	List B (T)	List A	A	Moderate
Russian knapweed	*Acroptilon repens*	List B	List A	B	Moderate
Russian thistle	*Salsola tragus*	-	-	C	Limited
Scotch broom	*Cytisus scoparius*	List B	List A	C	High
Scotch thistle	*Onopordum acanthium*	List B	List B	A	High
Smallflower tamarisk	*Tamarix parviflora*	-	-	B	High
Spanish broom	*Spartium junceum*	List B	-	C	High

Common Name	Scientific Name	Oregon State Designation	Klamath County Designation	California State Designation	California Invasive Plant Council
Spiny cocklebur	*Xanthium spinosum*	-	List A	-	-
Spotted knapweed	*Centaurea stoebe ssp. micranthos (= Centaurea maculosa)*	List B	List B	A	High
Squarrose knapweed	*Centaurea virgata ssp. squarrosa*	List A (T)	List A	A	Moderate
Tree-of-heaven	*Ailanthus altissima*	List B	-	C	Moderate
Whitetop (hoary cress)	*Lepidium draba (= Cardaria draba)*	List B	List B	-	-
Yellow starthistle	*Centaurea solstitialis*	List B	List B	C	High
Yellowflag iris	*Iris pseudacorus*	List B	List B	B	Limited

Source: iMapInvasives (2022), CalIPC (2022), Site observation, Taya MacLean, Senior Scientist, Parametrix, May 3, 2022.

Planning Area Vegetation

Figure E-1. Representative view of irrigated pasture vegetation and weedy edges of field (May 3, 2022; T. MacLean).

Figure E-2. Representative view of canals (North Canal), wetland fringe vegetation, and upland vegetation along the berms (May 3, 2022; T. MacLean).

Figure E-3. View of Klamath River at the channel mouth for the North Canal point of diversion (May 3, 2022; T. MacLean).

Figure E-4. View of marsh habitat at North Canal Diversion (May 3, 2022; T. MacLean).

Figure E-5. Lower Klamath National Wildlife Refuge (May 3, 2022; T. MacLean).

E.7 Supporting Information for Water Resources

Water Rights KDD History

The agricultural history of the KDD began in the late 1800s when the District's natural grasslands were used for grazing cattle. Since then, development progressed within the basin and on District lands, including urban and agricultural land development, road construction, water diversion, water delivery and drainage infrastructure construction, and other land use practices and irrigation projects. The earliest water right priority date in the District is February 1, 1883. On October 24, 1907, the United States and the two railroad companies entered into agreement acting under the provisions of the National Reclamation Act of 1902; the Act of Congress of February 9, 1905; and the Oregon and California Acts of Legislation of 1905 to develop agriculture in the Klamath River Basin. In 1911, Congress expanded the Secretary of the Interior's authority to develop reclamation projects by passing the Warren Act, which authorized the Secretary to enter into contracts with individuals, associations, and irrigation districts for the irrigation and drainage of lands not included in the scope of the 1902 legislation. Based upon the provisions of the Warren Act, KDD was formed under the laws of the State of Oregon on March 6, 1915. The District was created for the purpose of providing adequate drainage at all times for its landowners as well as for providing a cost-effective water supply to those same landowners.

Streamflow Graphs

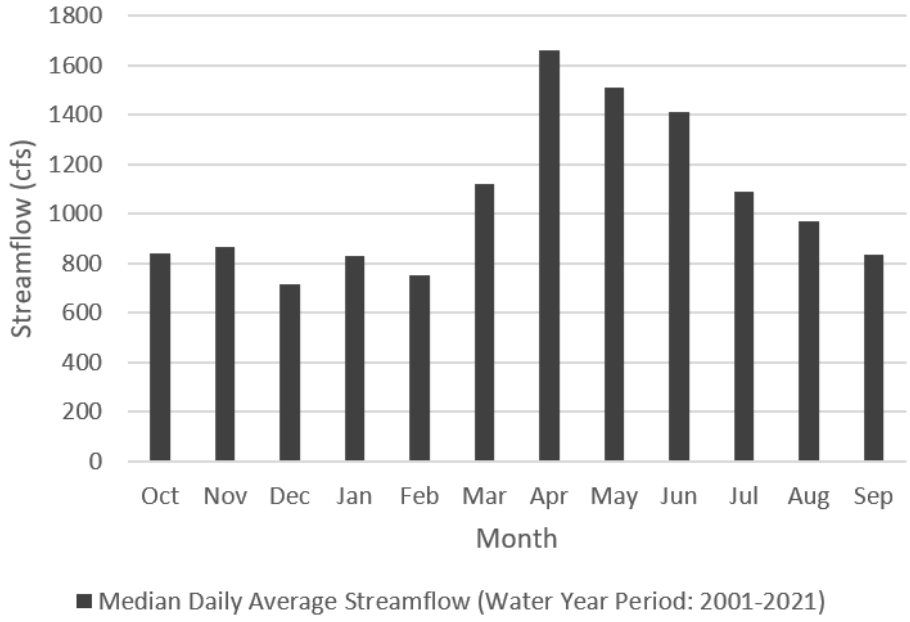

Figure E-6. Median daily average streamflow by month in the Link River at Klamath Falls, Oregon, at OWRD Gauge No. 11507500.

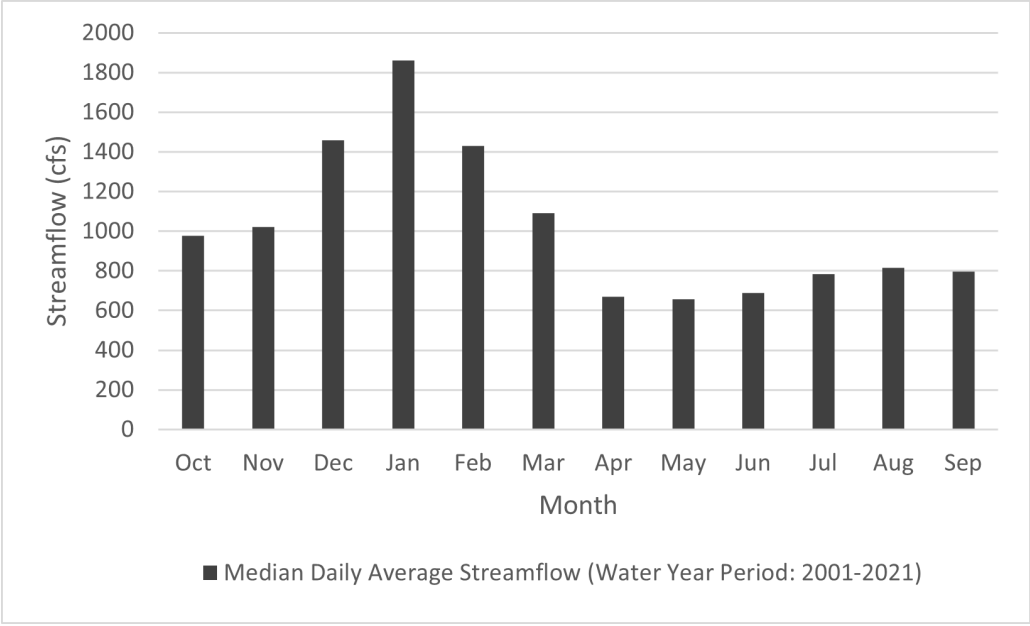

Figure E-7. Median daily average streamflow by month in the Klamath River at Keno, Oregon, at OWRD Gauge No. 11509500.

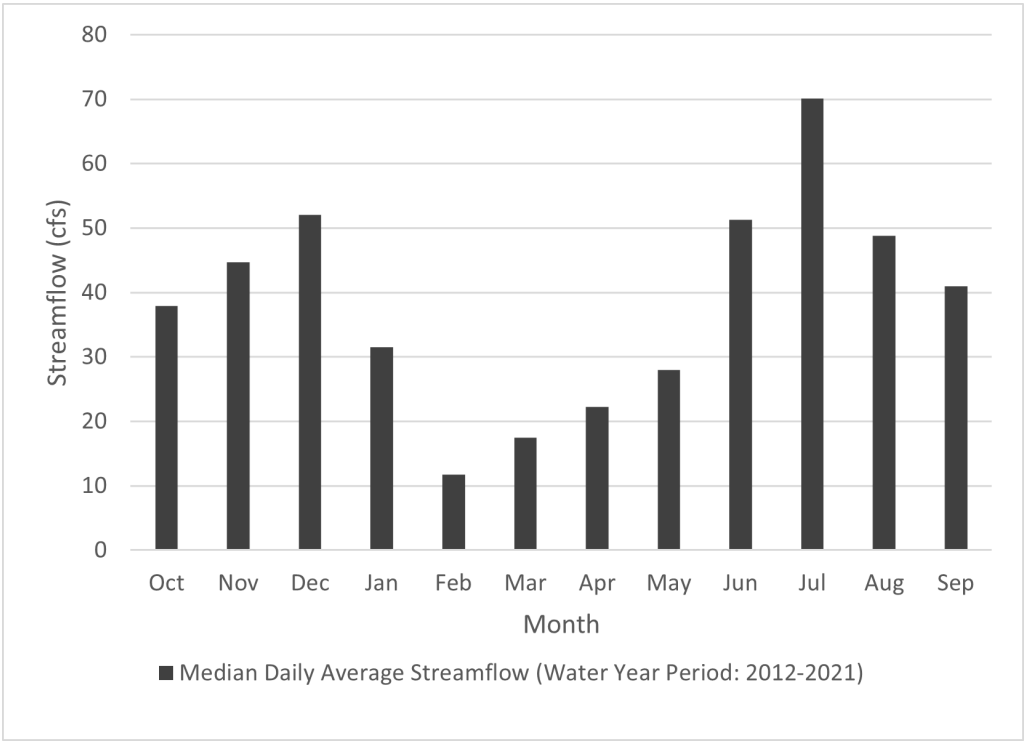

Figure E-8. Median daily average streamflow by month at the North Canal at Highway 97, near Worden, Oregon, at OWRD Gauge No. 11509105.

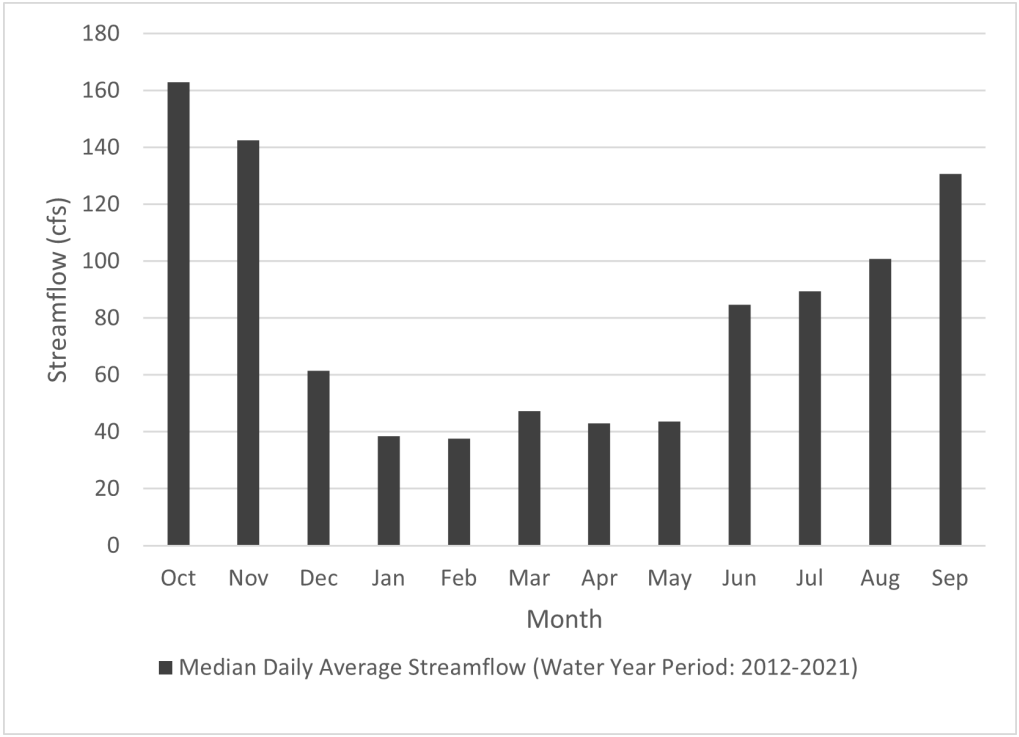

Figure E-9. Median daily average streamflow by month at the Ady Canal at Highway 97, near Worden, Oregon, at OWRD Gauge No. 11509200.

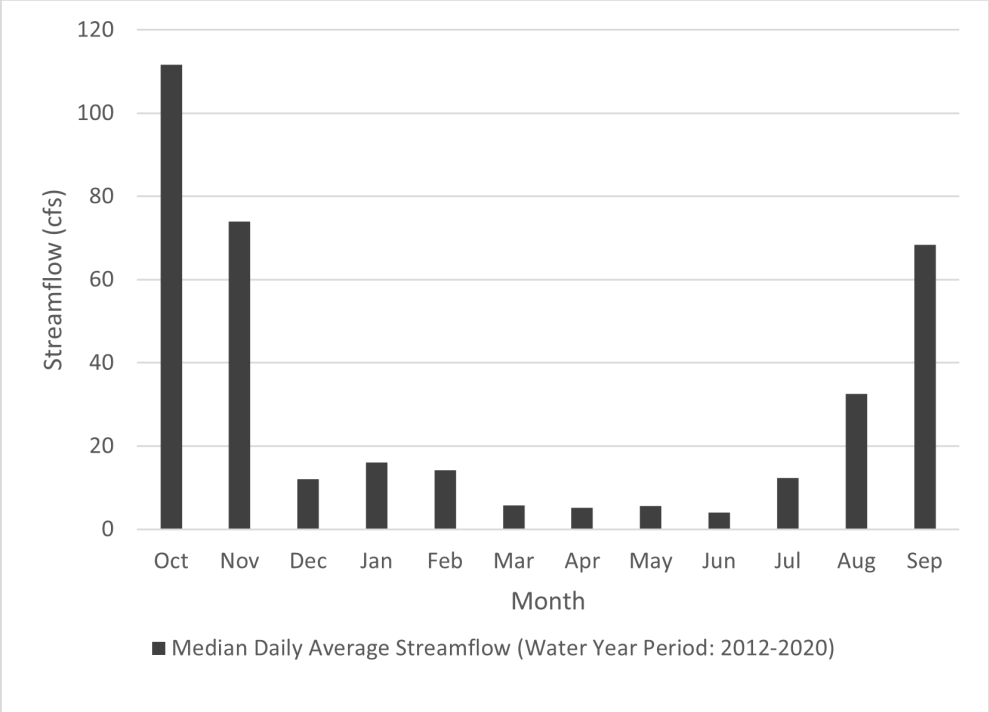

Figure E-10. Median daily average streamflow by month in the Ady Canal above Lower Klamath NWR, near Worden, Oregon, at OWRD Gauge No. 11509250.000-1.

E.8 Supporting Information for Fish and Aquatic Resources

Table E-6. Fish Species that occur within the Project Planning Area.

Fish Species	Scientific Name	Nativity
Blue chub	*Gila coerulea*	native
Black bullhead	*Ameiurus melas*	non-native
Black crappie	*Pomoxis nigromaculatus*	non-native
Bluegill	*Lepomis macrochirus*	non-native
Brook trout	*Salvelinus fontinalis*	non-native
Brown bullhead	*Ameiurus nebulosus*	non-native
Bull trout	*Salvelinus confluentus*	non-native
Channel catfish	*Ictalurus punctatus*	non-native
Chinook salmon	*Oncorhynchus tshawytscha*	native
Coho	*Oncorhynchus kisutch*	native

Fish Species	Scientific Name	Nativity
Fathead minnow	*Pimephales promelas*	non-native
Golden shiner	*Notemigonus chrysoleucas*	non-native
Goldfish	*Carassius auratus*	non-native
Green sunfish	*Lepomis cyanellus*	non-native
Klamath Lake sculpin	*Cottus princeps*	native
Klamath largescale sucker	*Catostomus snyderi*	native
Klamath River lamprey	*Lampetra similis*	native
Klamath smallscale sucker	*Catostomus rimiculus*	native
Klamath Spackled Dace	*Rhinichthys osculus klamathensis*	non-native
Klamath tui chub	*Siphatales bicolor*	native
Kokanee salmon	*Oncorhynchus nerka*	non-native
Largemouth bass	*Micropterus salmoides*	non-native
Lost River sucker	*Deltistes luxatus*	native
Miller Lake Lamprey	*Lampetra milleri*	native
Pacific lamprey	*Entosphenus tridentatus*	native
Pit-Klamath brook lamprey	*Lampetra lethophaga*	native
Pumpkinseed	*Lepomis gibbosus*	non-native
Redband trout	*Oncorhynchus mykiss gairdneri*	native
Sacramento perch	*Archoplites interruptus*	non-native
Shortnose sucker	*Chasmistes brevirostris*	native
Slender sculpin	*Cottus tenuis*	native
Steelhead trout	*Oncorhynchus mykiss*	native
Tui Chub	*Gila bicolor*	native
Upper Klamath marbled sculpin	*Cottus klamathensis*	native

Fish Species	Scientific Name	Nativity
White crappie	*Pomoxis annularis*	non-native
Yellow bullhead	*Ameiurus natalis*	non-native
Yellow perch	*Perca flavescens*	non-native

Sources: ODFW (2022), StreamNet (2023), ORBIC (2022), USFWS (2022). NOAA NMFS (2022), Carter and Kirk (2008), PacifiCorp (2021).

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

May 7, 2025 **Refer to NMFS No:** WCRO-2025-01291

Gary Diridoni
Assistant State Conservationist Watershed Resources
USDA – Natural Resources Conservation Service
Oregon State Office
1201 NE Lloyd Boulevard, Suite 900
Portland, Oregon 97232

Re: Endangered Species Act Section 7(a)(2) Concurrence Letter for the Klamath Drainage District Infrastructure Modernization Project

Dear Mr. Diridoni:

This letter responds to your May 5, 2025, request for concurrence from NOAA's National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and concurrence because it contained sufficient information on your proposed action and its potential effects to ESA-listed species.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 FR 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the ESA (84 FR 45015; 89 FR 24268. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this letter of concurrence would not have been any different under the 2019 regulations or pre-2019 regulations.

We reviewed the Natural Resources Conservation Service's (NRCS) consultation request document and related materials. Based on our knowledge, expertise, and your action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species, Southern Oregon Northern California (SONCC) (*Oncoryhncus kisutch)* coho salmon. Critical habitat for SONCC coho salmon is designated in the action area and consultation under the ESA is not required for this action.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The concurrence letter will be available through NMFS' Environmental

Consultation Organizer (https://www.fisheries.noaa.gov/resource/tool-app/environmental-consultation-organizer-eco. A complete record of this consultation is on file at the Santa Rosa office.

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. In this case, EFH is not designated within the action area, and consultation under the MSA is not required for this action.

Reinitiation of consultation is required and shall be requested by NRCS, where discretionary federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA consultation.

Please direct questions regarding this letter to Shari Anderson at shari.anderson@noaa.gov or 707-362-6906.

Sincerely,

Dan Wilson
Supervisory Fish Biologist
California Coastal Office

cc: efile FRN# 151422WCR2025AR00121

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region

Klamath Falls Fish and Wildlife Office
1936 California Avenue
Klamath Falls, Oregon 97601

In Reply Refer to:
ECOSphere Project Code #
2024-0063669

September 18, 2025
Sent Electronically

Gary Diridoni
Assistant State Conservationist Watershed Resources
Natural Resources Conservation Service
1201 NE Lloyd Blvd., Suite 900
Portland, OR 97232

Subject: Conference Concurrence and Biological Opinion for the Klamath Drainage District Infrastructure Modernization Project

Dear Mr. Diridoni:

This document transmits the U.S. Fish and Wildlife Service's (Service) conference concurrence and biological opinion based on the review of the proposed Klamath Drainage District (KDD) infrastructure modernization project (Project). On April 30, 2025, the Service received a letter via email from the Natural Resources Conservation Service (NRCS) requesting initiation of Section 7 consultation under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; hereafter referred to as the Act) and a corrected biological assessment on May 6, 2025. The Service has based this concurrence letter and biological opinion on information that accompanied the April 30, 2025, request for consultation, including the May 6, 2025, revised biological assessment, phone calls, meetings, email correspondence, information in the Service's files, and the best available science on the species and their habitats.

The Project is located within the Klamath Drainage District, in the Upper Klamath Basin on the east side of the Cascade Mountain Range, in Klamath County, Oregon. KDD operations are in the Lower Klamath Lake watershed with points of diversion and discharge located along the Klamath River which lie within the Lake Ewauna-Klamath River watershed. The project area is a small portion of the total KDD system. NRCS proposes to fund and provide technical assistance for KDD's Project which includes updating and installing irrigation infrastructure: installing a fish screen at the point of diversion at the Klamath River; extending (0.47 miles) and increasing the capacity of the North Canal, and upgrading pumps; in addition to installing a recirculation pipeline, 14 Supervisory Control and Data Acquisition (SCADA) systems, automated gates, and upgrade turnouts (Parametrix, 2025).

The biological assessment determined that the Project would have "no effect" on gray wolf (*Canis lupus*), North American wolverine (*Gulo gulo luscus*), yellow-billed cuckoo (*Coccyzus*

americanus), Suckley's cuckoo bumble bee (*Bombus suckleyi*) and California condor (*Gymnogyps californianus*), and critical habitats associated with these species. The regulations implementing section 7(a)(2) of the Act (50 Code of Federal Regulations (CFR) 402) do not require our concurrence with a "no effect" determination made by a Federal agency. Therefore, these species will not be addressed further.

The biological assessment determined the proposed project "may affect and is likely to adversely affect" the federally endangered Lost River sucker (*Deltistes luxatus*; LRS) and shortnose sucker (*Chasmistes brevirostris*; *SNS*) and their respective designated critical habitats, thus necessitating formal consultation. This document also determined that the Project "may affect, but is not likely to adversely affect" the proposed threatened northwestern pond turtle (*Actinemys marmorata; NWPT*) and monarch butterfly (*Danaus Plexippus*). This letter transmits the Service's biological opinion in consideration of the potential effects of the proposed action on the LRS, SNS, and their designated critical habitats (see enclosure). The Service's conference concurrence on the potential effects of the proposed action on northwestern pond turtle and monarch butterfly is provided below.

Effects to Northwestern Pond Turtle

The Service proposed to list NWPT as threatened under the Act on October 3, 2023 (USFWS 2023b). Critical habitat has not been proposed for the species.

NWPT were likely abundant in the region prior to the onset of agricultural development, which severely restricted habitat availability due to altered hydrologic regimes and conversion of wetlands and lakes to agricultural areas. The species is known to occur within the KDD watershed area (USFWS 2023) and based on observations in Klamath Project irrigation canals (NRCS 2025), potentially exist within the KDD conveyance system (drains, canals, and laterals). Within the action area, NWPT are known to occur in the Lower Klamath Lake National Wildlife Refuge and the Klamath River (NRCS 2025). NWPT surveys have not been completed in these areas and population estimates are not available. Densities within the conveyance system and the project area are likely low due to a lack of suitable upland habitat for overwintering and nesting, fragmentation from existing populations and ponded environments, and a high degree of anthropogenic disturbance.

Terrestrial habitats within the action area include areas adjacent to the Klamath River at the location of the proposed North Canal fish screen and adjacent to KDD conveyance infrastructure. Action area terrestrial habitats are extremely fragmented by agricultural fields and roadways and generally consist of 25- to 100-foot-wide strips of land heavily vegetated with mostly non-native grasses such as reed canary grass (*Phalaris arundinacea*) and cheatgrass (*Bromus tectorum*). The action area lacks forested and shrub scrub areas.

The North Canal fish screen habitat consists of heavily vegetated and steeply inclined levees and is not suitable for nesting or overwintering. Terrestrial habitat adjacent to the KDD conveyance system is also of low quality due to dense herbaceous vegetation, compacted soils, and regular maintenance and disturbance of the area related to operations and maintenance of pumps, vegetation clearing within and adjacent to the canals, and adjacent agricultural practices.

Given the lack of suitable upland habitat within the project area, adult NWPT overwintering in the action area would likely only occur in the bottom sediments of ponded areas. Therefore, any

turtles present within the project area will be either foraging or overwintering in aquatic habitats and will not be present in upland habitat. Therefore, NWPT nests, eggs, hatchlings, gravid females, and overwintering adults will not experience impacts within upland habitat from ground disturbing activities related to the proposed project. However, NWPT may experience construction generated behavior disturbances in aquatic habitats caused by hydroacoustic levels, work area isolation, and generation of localized turbidity.

Piling installation and removal are expected to generate hydroacoustic levels exceeding 100 dB. There are no known published studies related specifically to how hydroacoustic levels impact NWPT. However, red-eared slider (*Trachemys scripta elegans*) research suggests that levels about 100dB could cause acute impacts to NWPT hearing (Salas et al. 2023) and that over the long term can cause physiological stresses (Hur and Lee 2010). It is assumed that any individual turtles present in the North Canal work area will vacate at the onset of piling installation, avoiding long term hydroacoustic impacts. As turtles would likely vacate the construction area due to the noise, they are not expected to be in the area at the time of cofferdam sealing, preventing turtle entrapment. In the event individual turtles should become entrapped within the cofferdam during the dewatering process, they will be collected during fish salvage operations and relocated to the Klamath River.

Work area isolation during the dewatering process and following fish screen construction will remove NWPT access to 0.57 acres of instream habitat, reducing available NWPT foraging habitat during the four-month fish screen construction process. It is anticipated that fill related to fish screen, levee extension, and road widening construction will result in a permanent loss of 0.34 acres of Klamath River habitat. However, there is an abundance of suitable and readily available aquatic foraging habitat within the immediate vicinity of the fish screen construction site, reducing any potential impacts from the temporary loss of 0.57 acres and permanent loss of 0.34 acres foraging habitat to that of a non-detectable level.

NWPT foraging may also be impacted by an increase in localized turbidity, generated by construction including barge operations, which could cause a disruption of NWPT vision and a resulting decrease in foraging success. Work area isolation during fish screen construction will prevent runoff into the adjoining waters and avoidance and minimization measures including the use of silt fences and turbidity curtains during upland construction will minimize the extent of any turbidity pulses during embankment fill activities. NWPT is also accustomed to occupying habitats with high levels of turbidity and is likely tolerant to any potential vision disruption that might be brought on by temporary generations of localized turbidity.

Implementation of the proposed project will provide long term improvements to water quality, water quantity, and aquatic habitat. The proposed actions would also provide beneficial effects by increasing NWPT habitat quality and availability. However, the benefits cannot be quantified at this time as specific project details are not available. As described above, any behavioral disturbance and loss of foraging impacts to NWPT from project related activities will be short term, temporary, or of insignificant impact. Because of these reasons the proposed project is anticipated to result in insignificant effects to individual northwest pond turtles and will not jeopardize the continued existence of the species.

Effects to Monarch Butterfly

The Service proposed to list the monarch butterfly as threatened under the Act on December 12, 2024 (USFWS 2024). Critical habitat has not been proposed for the species. Monarchs are found throughout North America. The species lay their eggs, and larvae develop, on their obligate milkweed host plant (*Asclepias* spp). In temperate climates, in the fall individuals will migrate south to their overwintering areas. The project area is within the temperate zone of North America, consists of poor foraging habitat (predominately non-nectar producing non-natives), is in a region with low observations of monarchs, and has no documented occurrences of milkweed (NRCS 2025, p. 34). Due to the lack of milkweed, no larvae are anticipated to occur in the project area. To the extent feasible, vegetation clearing is anticipated to occur during monarch non-breeding season after monarchs have migrated (NRCS 2025, pp. 15 and 26). However, there is the potential that project implementation may occur prior to monarch migration and vegetation clearing would occur during the middle of the day in the warmer periods when monarchs are most active (NRCS 2025, p. 15). If adult monarchs are observed in the project area, per avoidance and minimization measures, the contractors will walk the area to be cleared, which will cause monarchs to vacate the affected area prior to vegetation removal (NRCS 2025, p. 15). Therefore, the proposed action, including avoidance and minimization measures, is anticipated to result in insignificant effects to adult monarchs and will not jeopardize the continued existence of the species.

Summary and Conclusion

Based on the Service's review of the biological assessment, the overall description of the proposed action, and the avoidance and minimization measures that will potentially minimize the impacts to listed species, the Service concurs with the determination that the proposed action may affect, but is not likely to adversely affect northwestern pond turtle and monarch butterfly.

This concludes informal consultation pursuant to section 7 of the Act for northwestern pond turtle and monarch butterfly. Reinitiation of consultation on this action may be necessary if: (1) new information reveals effects of the action that may affect species or critical habitats in a manner or to an extent not considered in the assessment; (2) the action is subsequently modified in a manner that causes an effect to species or critical habitats not considered in this analysis; or (3) a new species is listed or critical habitat designated that may be affected by the proposed action.

Thank you for your efforts to conserve federally listed species. If you have any questions about this document, please contact Margie Shaffer at margie_shaffer@fws.gov.

Sincerely,

JENNIE LAND

Digitally signed by JENNIE LAND
Date: 2025.09.18 09:34:29 -07'00'

Jennie Land
Field Supervisor

Enclosure:
Biological Opinion for the Klamath Drainage District Infrastructure Modernization Project

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Biological Opinion for the Klamath Drainage District Infrastructure Modernization Project

Ecosphere Project Code # 2024-0063669

September 18, 2025

U.S. Fish and Wildlife Service
Klamath Falls Fish and Wildlife Office
Klamath Falls, Oregon

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List of Abbreviations and Acronyms

Abbreviations	Definitions
BA	Biological Assessment
BMP	best management practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIA	contributing impervious area
dB	decibel
DSL	Department of State Lands
ESA	Endangered Species Act
ft	feet
HUC	Hydrologic Unit Code
KDD	Klamath Irrigation District
KRRC	Klamath River Renewal Corporation
KSD	Klamath Straits Drain
LKNWR	Lower Klamath National Wildlife Refuge
LRS	Lost River sucker
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
ODEQ	Oregon Department of Environmental Quality
PBF	physical or biological feature
Project	Klamath Drainage District Infrastructure Modernization Project
RM	river mile
rms	root mean square
SCADA	Supervisory Control and Data Acquisition
SNS	shortnose sucker
SR	California Sate Route
SSA	species status assessment
TMDL	total maximum daily load
USGS	U. S. Geological Service
USACE	U. S. Army Corp of Engineers
VFD	variable frequency drive

1 INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this biological opinion in response to the Natural Resources Conservation Service's (NRCS) request for consultation on the effects of funding and providing technical assistance to the Klamath Drainage District (KDD) Infrastructure Modernization Project (Project) on the federally endangered Lost River sucker (*Deltistes luxatus*; LRS), shortnose sucker (*Chasmistes brevirostris*; SNS), and their designated critical habitats. The request for consultation is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; hereafter referred to as the Act). NRCS determined that the Project "may affect and is likely to adversely affect" LRS, SNS, and their designated critical habitats. Based on the analysis presented in the biological assessment (Parametrix, 2025), calls, meetings with NRCS and their contractors, and best available information on the species and their habitats, the Service concludes that the survival and recovery of LRS and SNS is not in jeopardy as a result of implementation of the Project. Similarly, the Project will not result in destruction or adverse modification of their critical habitats. The following biological opinion provides the rationale for these conclusions.

The biological assessment also includes determinations that the proposed action "may affect, but not likely to adversely affect" the proposed threatened northwestern pond turtle (*Actinemys marmorata*) and monarch butterfly (*Danaus Plexippus*). The Service concurred with this determination in the letter that accompanies this biological opinion. Similarly, NRCS determined that the proposed action would have "no effect" on gray wolf (*Canis lupus*), North American wolverine (*Gulo gulo luscus*), yellow-billed cuckoo (*Coccyzus americanus*), Suckley's cuckoo bumble bee (*Bombus suckleyi*) and California condor (*Gymnogyps californianus*), and designated critical habitats associated with these species. The regulations implementing section 7(a)(2) of the Act (50 Code of Federal Regulations (CFR) 402) do not require the Service's concurrence with a "no effect" determination made by a Federal agency. Therefore, these species will not be addressed further.

This biological opinion pertains to implementation of the proposed action which is expected to begin fall 2025 and will continue over a period of four years, with construction completed by fall 2029 (G. Diridoni, NRCS, personal communication June 9, 2025). Given the proposed timeline, the analyses contained in this biological opinion are valid through end of the 2029, unless reinitiation of consultation is triggered (see section 14 *Reinitiation of Consultation*).

2 CONSULTATION HISTORY

The following is a summary of the history of the Project consultation which began in December 2023. Phone calls, emails, and meetings of importance are listed below.

- December 11, 2023: Project kick off meeting with contractors and National Wildlife Refuge staff to discuss proposed projects and ESA section 7 consultation process for listed and proposed species.
- March 26, 2024: Meeting to discuss conferencing on northwestern pond turtle in relation to the proposed action and the potential effects to species.
- October 22, 2024: Preliminary effects determination meeting.

- December 5, 2024: Discussion of Project plan environmental assessment and the result of the public comment period. Service assisted NRCS in answering questions pertaining to fish screens and ESA listed species.
- March 14, 2025: Draft biological assessment shared with Service; comments on the draft were provided to NRCS March 31, 2025.
- April 30, 2025: Service received request for formal consultation on LRS, SNS, and their designated critical habitat and informal conference on northwestern pond turtle and monarch butterfly.
- May 5, 2025: NRCS alerted the Service that an older version of the biological assessment was transmitted with the request for consultation. A corrected version of the biological assessment was submitted to the Service on May 6, 2025.
- June 4, 2025: the Service requested additional information and clarification on certain aspects of the biological opinion and received a response on June 9, 2025.

3 PROJECT LOCATION AND ACTION AREA

The Project is located within the Klamath Drainage District, in the Upper Klamath Basin on the east side of the Cascade Mountain Range, in Klamath County, Oregon. The project area and the waterbodies affected by KDD operations are within the Lost River subbasin. Specifically, KDD operations are in the Lower Klamath Lake watershed (Hydrologic Unit Code [HUC] 10 #1801020414) with points of diversion and discharge located along the Klamath River which lie within the Lake Ewauna-Klamath River watershed (Figure 1). The project area is a small portion of the total KDD water conveyance system, consisting of the proposed KDD infrastructure to be modernized, areas where new infrastructure will be built, and all associated right of ways and easements, where construction equipment will be staged and construction will take place (Figure 3).

Regulations implementing the Act describe the "action area" as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). Consequently, the action area for this consultation includes all areas where NRCS proposed funding and technical assistance, will result in modifications to the land, air, or water. Specifically, the action area is the area of all potential consequences of the proposed action, including the project area, the water quality and quantity zone of effects, and the behavioral disturbance zone of effects (Figure 2).

The action area encompasses the KDD infrastructure that will be upgraded and improved by the Project and the KDD operated rights-of-way and easements that will be used for construction and staging. The Project includes a waterfront staging area on developed lands that are barge accessible within 8 miles of the project area, that will be selected by the contractor (Parametrix, 2025, p. 11). Therefore, the action area includes the Keno Reservoir section of the Klamath River, which can be defined as the portion of the Klamath River upstream of the Keno dam to the terminus of the Link River (river mile (RM) 231 to 252), and approximately 300 meters (985 ft.) of upland area on both sides of the river. As the barge accessible staging area has only a general location the action area was extended north of the project area to the terminus of the Link River to include potential boat launches and potential staging areas on developed lands. The action area

in the Klamath River extends south from the project area to Keno Dam due to a yet to be identify location of the waterfront staging area and the water quality and quantity effects generated by the Project. The water quality and quantity effects will also extend south of the proposed fish screen location into the KDD water conveyance system (including canals, laterals, and drains) and the Lower Klamath National Wildlife Refuge (LKNWR) in California.

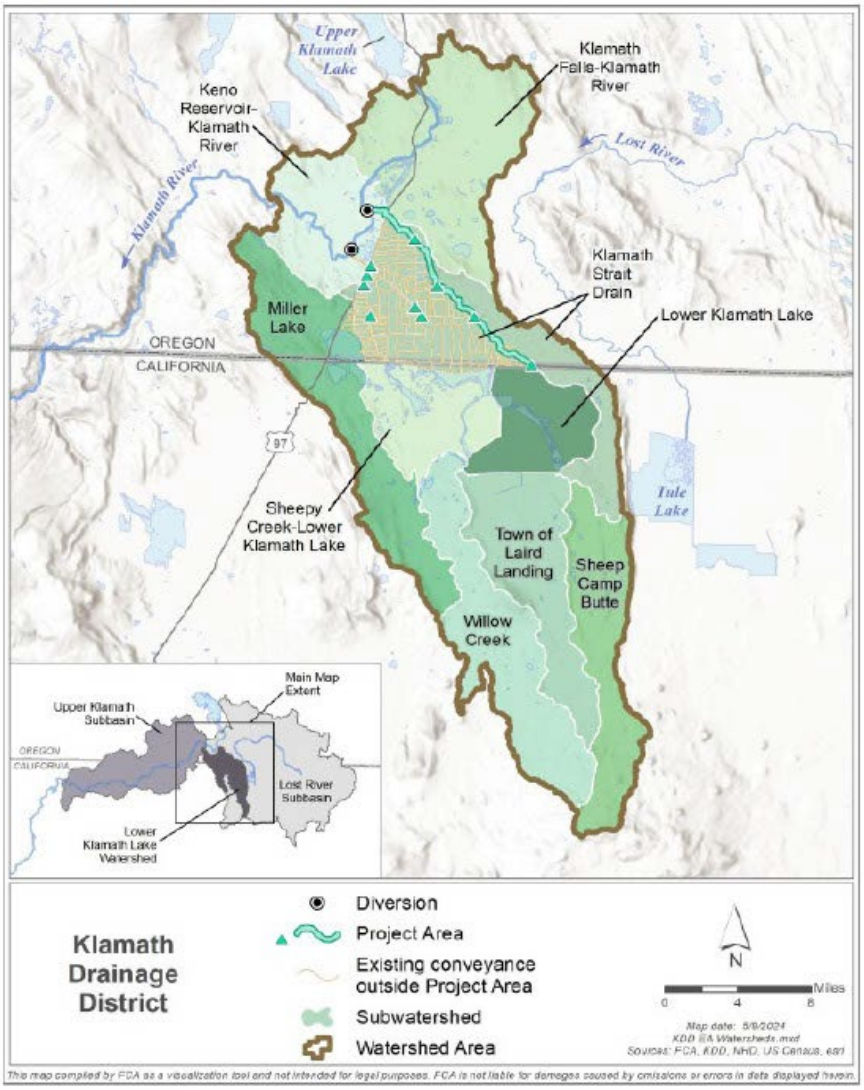

Figure 1. Project location and action area (Parametrix, 2025, p. 3).

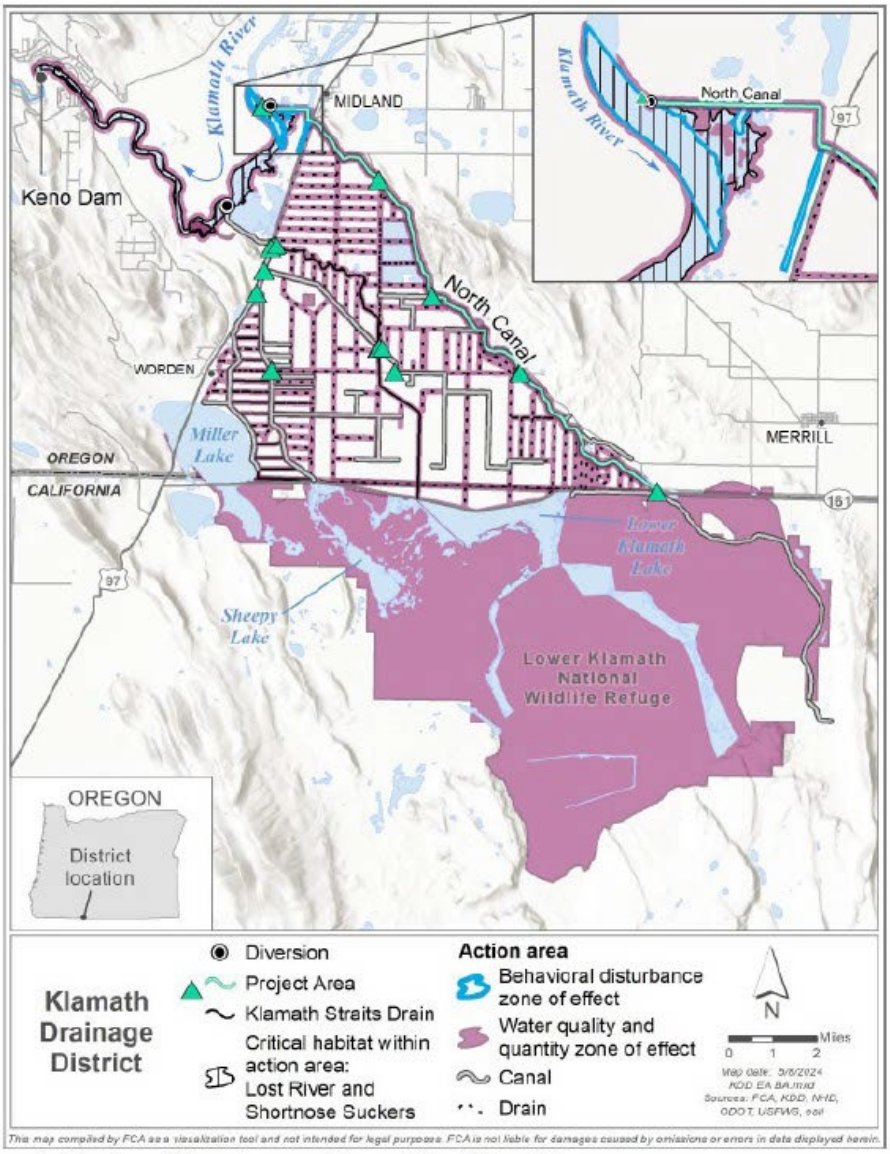

Figure 2. Overview of the action area (Parametrix, 2025, p. 20).

4 DESCRIPTION OF THE PROPOSED ACTION

The implementing regulations for section 7(a)(2) of the Act define "action as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include but are not limited to: (a) actions intended to conserve listed species or their habitat; (b) the promulgation of regulations; (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or (d) actions directly or indirectly causing modifications to the land, water, air" (50 CFR 402.02).

NRCS proposes to fund and provide technical assistance for KDD's infrastructure modernization project which includes updating and installing irrigation infrastructure including: installing a fish screen at the point of diversion at the Klamath River; extending (0.47 miles) and increasing the capacity of the North Canal, and upgrading pumps; in addition to installing a recirculation pipeline, 14 Supervisory Control and Data Acquisition (SCADA) systems, automated gates, and upgrade turnouts[1] (Parametrix, 2025).

4.1 Construction

Project construction will begin as early as October 2025 (Parametrix, 2025) during the non-irrigation season and is anticipated to take 4 years to complete (G. Diridoni, NRCS, personal communication June 9, 2025). In-water work associated with the construction of the fish screen will occur during the in-water work window between July 1 and January 31 based on Oregon guidelines for timing of in-water work. The North Canal improvements will be implemented between January and April and take approximately 12 months to complete. Upgrades to the F and E Pumping Plants will be completed within one calendar year and would occur between February and May, and August and December. Installation of the recirculation pipeline at the E Pumping Plant will begin after on-farm flooding activities between January 1 and April 1 and will take approximately 6 months to complete. Installation of SCADA and automated gates would occur during any time of the year. Upgrades to turnouts would take place from January to April. Patron deliveries will be minimally affected during construction, and KDD will work with patrons to minimize impact to water deliveries.

4.1.1 Construction Staging and Access

A construction staging area will be needed to store materials, pre-build materials, and store the construction barge, used in North Canal fish screen construction. The exact location of the construction staging area will be selected by the contractor but will be located in a developed upland area with waterfront barge access within 8 miles of the project area. A barge will be needed for the levee repairs and the installation and removal of the cofferdam, and other aspects of fish screen construction. The Barge will be loaded, unloaded, and stored (when not in use) at the staging area.

An additional staging area will be located on a portion of the levee crest in an upland area adjacent to the North Canal. This staging area will be for the heavy equipment and materials needed for construction of the levee extension, fish screen, and access to the project site and isolated work area. Approximately 1 acre of vegetation will be cleared to create the staging area.

[1] Sections 2.4.3 *Water Summary* and 2.4.4 *Project Impact Offsetting* that were included in the biological assessment's proposed action section (Section 2) are not considered in this biological opinion as part of the proposed action. However, these topics are addressed in the Service's analysis of effects of the action (section 8).

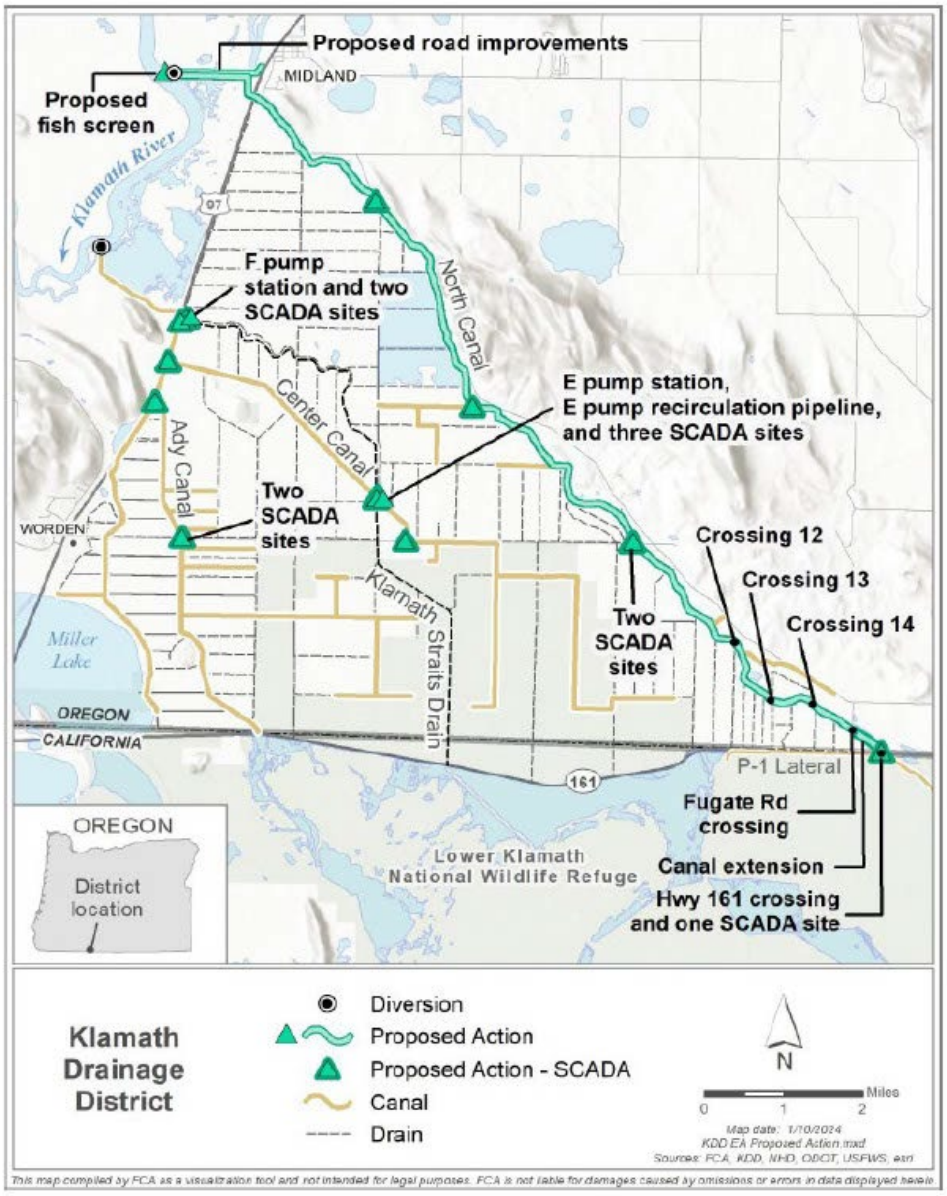

Figure 3. Overview of the proposed action and action area (Parametrix, 2025, p. 8).

4.1.2 Road, Powerline, Levee and Embankment Construction

The Project includes upgrading an existing 14-foot-wide private dirt and gravel road on the northside and running parallel with the North Canal, within an existing KDD easement. The proposed access road will be a 14-foot-wide gravel road, approximately 1.3 miles (6,900 feet) long. A portion of the gravel road (100 feet) will need to be widened to accommodate equipment access to the construction site and for operations and maintenance of the fish screen which will result in fill being placed in approximately 0.02 acres of the Klamath River and 0.02 acres of isolated wetlands and ponds. A turbidity curtain will be deployed during the gravel road widening to minimize the extent of the turbidity plumes from embankment fill activities. Vegetated stormwater filter strips will be installed to treat runoff from the gravel road before the runoff intercepts water and wetlands. An overhead power line will also need to be extended roughly 0.87 miles (4,600 feet) to power the screens. Post-project contributing impervious area (CIA) for the redevelopment and widening of North Canal gravel road is 1.9 acres.

Currently the North Canal is breached in a few locations along the sound bank. To keep fish from entering the North Canal, the south side of the North Canal levee will be repaired by sealing all areas of inflow from adjacent lands with 24-inch sheet pilings. Sheet piles associated with the repairs to the North Canal levee will be installed using a vibratory hammer to minimize hydroacoustic impacts. Approximately seven breaches in the levee will be sealed by sheet pilings varying from approximately 20 to 70 feet long. In total, approximately 135 sheet piles will be permanently installed for a total length of 265 feet to repair the levee. Installation of sheet pilings to repair the levee will be conducted within the in-water work window (July 1 to January 31) and is expected to take no longer than 20 days.

To support the width of the fish screen and to allow for sufficient sweeping velocities, the North Canal levees will be extended approximately 80 feet farther into the Klamath River. The levee crest will be 20 feet wide with a 1:2 slope descent into the Klamath River. Portions of the levee extension facing the fish screen and center of the Klamath River will be supported by approximately 120 feet of 24-inch sheet pile on each side of the levee. In total, levee extension will result in backfill being placed in approximately 0.20 acres of the Klamath River. To minimize impacts to LRS and SNS the canal extension will be constructed behind the cofferdam and after the area has been dewatered (Parametrix, 2025 p. 13). Further, the fish screen will be extended into the Klamath River and result in a loss of approximately 0.1 acres of fish-accessible habitat within the river (Parametrix, 2025, p. 9).

4.1.3 Coffer Dam Installation and Removal

Sheet pilings will be installed for the construction of a cofferdam to dewater the entirety of the work area for the fish screen. The cofferdam will not be completed until after the irrigation season (September 30) to avoid disruptions to water delivery. The cofferdam will dewater approximately 0.9 acres of the Klamath River and 0.3 acres of the North Canal to isolate the entirety of the in-water work area for the construction of the fish screen. Water will be pumped out of the cofferdam using appropriately sized fish screens and be treated and discharged into appropriate locations. The cofferdam will remain in place until construction of the fish screen is complete. Fish screen construction is anticipated to take up to 4 months and will be completed before the end of the in-water work window. The cofferdam area will be re-watered slowly to prevent loss of surface flow downstream and to prevent a sudden increase in stream turbidity. Sheet piles will be removed via vibratory extraction.

The cofferdam will be constructed by the installation of approximately 550 feet, 24-inch-wide sheet piles, 900 feet in total length. Installation of sheet pilings for the cofferdam is anticipated to take no longer than 60 days and will occur within the in-water work window. Sheet piles associated with the cofferdam will be installed using a vibratory hammer to minimize hydroacoustic impacts. Piles to support the fish screen will be installed after the cofferdam is installed and after fish savage and dewatering have occurred within the isolated work area. Piles will be installed with an impact pile driver, and installation is not anticipated to have hydroacoustic impacts due to work area isolation.

Barge use will be required for cofferdam construction and removal, fish screen construction, and repair of the North Canal levee. The barge will provide large areas to store or pre-build materials and will give the contractor the ability to move the barge in and around the work area as needed. Heavy equipment will be used within the isolated work area to reconfigure and extend levees and construct the fish screen.

Removal and fill volumes for the Proposed Action have not been calculated for the Project at this stage. Area impacts are approximations and should be considered as the maximum total impact of the Project. In total, it is anticipated that the fish screen, levee extension, and road widening will result in permanent impacts to 0.34 acres of the Klamath River. The temporary work area within the cofferdam will result in temporary loss of 0.578 acres of in-stream habitat that will not be permanently impacted. Below is a summary of sheet-pile-driving activities that will occur outside of the isolated work area (Table 1).

Table 1. Summary of pile driving activities conducted outside of the isolated work area.

Structure Type	Type/size	Total Length Sheet Pile	Number of Piles	Average Depth	Duration of Vibratory Installation per Pile	Maximum Piles per Day	Total (non-consecutive)	
							Days	Minutes
Temporary Cofferdam	Sheet Pile (24 in width)	900 feet	450	20 feet	20 minutes	20	60	9,000
North Canal Levee Repair	Sheet Pile (24 in width)	265 feet	90	20 feet	20 minutes	20	20	1,800

4.1.4 Fish Screen Installation

The fish screen will be installed at the entrance to the North Canal Diversion on the Klamath River, parallel to the flow of the Klamath River and perpendicular to the flow of the North Canal. The proposed fish screen design consists of 10 cone screens. Water will enter each screen via gravity and travel to the bottom of the cone and through the plenum into the North Canal. Each cone screen will be 14 feet in diameter with a height of 8 feet and will allow a total maximum flow of 579.2 cfs with a 0.33 feet per second approach velocity. This capacity exceeds the proposed maximum 350 cfs and will provide additional functionality during high flow conditions. Each cone screen will be mounted on a concrete foundation with four anchor bolts. Due to the deep silty soil in the area, fish screens must be set on pile foundations. Piles will be approximately 20 feet long, and a pile cap will be 180.75 feet in length and approximately 19 feet in width. In total, the fish screen will be 180.75 feet in length and 30 feet in width and will occupy 0.12 acres of the Klamath River.

4.1.5 Fish Salvage

Fish salvage operations will be conducted within the cofferdam (prior to dewatering) to remove trapped individual fish and other aquatic species before completing dewatering. Individuals will be collected using a trap, seine, or electroshocking consistent with National Marine Fisheries Service (NMFS) electrofishing guidelines (National Marine Fisheries Service, 2000). The collected individuals will be relocated to the Klamath River following NMFS and Reclamation handling guidelines (USBR, 2008).

4.1.6 North Canal Improvements

The North canal will be extended by 0.47 miles (approximately 2,500 feet) from the Fugate Road crossing to the California State Route (SR) 161 crossing. At its terminus, the North Canal will be connected to the P-1 Lateral on the Lower Klamath National Wildlife Refuge. Additionally, an inlet structure and a flow-measurement device will be installed at SR-161. The amount of increased delivery to Lower Klamath National Wildlife Refuge is not known exactly, but water savings associated with improved water management will support a greater capacity. The extension of the North Canal will be designed to have a capacity of 100 cfs.

To accommodate for water delivery to the canal extension, the North Canal's maximum flow capacity will need to be increased from 250 to 350 cfs. The North Canal may be deepened and or widened to increase its capacity, and bottlenecks at road crossings will be required to be replaced or modified. Preliminary engineering designs identified a total of five road crossings (Figure 2), two paved and three unpaved, that will be modified to increase the North Canal's maximum flow capacity from 250 to 350 cfs. Crossing 12, Fugate Road, and SR 161 would require the implementation of two additional 48-inch culverts to meet the design flow volume. Crossings 13 and 14 would require three 48-inch culverts to meet the design flow volume. Crossings 13 and 14 require three 48-inch culverts to meet the 92 cfs design flow volume. To achieve 100 cfs flow, the 4-foot by 5-foot box culverts will need to be implemented instead of the 48-inch culverts for the Fugate Road and SR 161 crossing locations. Vegetated stormwater filter strips will be installed to treat runoff from the reconfigured road crossing before interception with water and wetlands. Approximate post-project CIA from the five road crossings is 0.3 acres.

Other bottlenecks along the North Canal could be identified in more advanced engineering designs; therefore, the entire length of the North Canal was included in this assessment. All activities will occur within a 75-foot buffer extending from the center of the North Canal to each side.

The canal extension, widening, or deepening construction will remove existing material from the center alignment and construct embankments along each side of the canal. Due to the makeup of the native soil, the Project will likely require importing additional engineered embankment material. Embankment materials will be sourced from local native materials. Improvements will begin between January and April before the spring irrigation season. Should any other work occur once the spring irrigation season begins, KDD will be able to accommodate those activities without affecting water delivery to patrons. The North Canal Improvements will take approximately 12 months to complete.

The estimated total footprint that includes all construction activities is 250.5 acres, which includes approximately 150.5 acres of uplands and 100 acres of canals within 75 feet of the center line of the North Canal.

4.2 F And E Pumping Plant Upgrades

Upgrades to the F and E Pumping Plants along Klamath Straits Drain will include installing variable frequency drives (VFD), upgrading motor controls, installing panels, and upgrading transformers. Three new pumps will be installed at both the F and E Plants. Except for the transformer upgrades, which will likely occur at the location of the current transformers, all other activities will occur within the existing footprint of the pumping plants. The estimated construction footprint of the E and F Pumping Plants transformer upgrades is 2,198 and 3,512 square feet, respectively.

Upgrades to the F and E Pumping Plants will occur between February and May, and between August and December, respectively, and are expected to be completed within 1 calendar year.

While some KDD pumps will be fully replaced or upgraded, each pump will be converted to a more common voltage with VFDs; this will make pump operation more efficient. Retrofitting existing pump units with VFDs will allow pump units to operate at a range of speeds, rather than at only "on" or "off" settings. KDD will have the capacity to match water demand with pumped water supply, thereby reducing over-pumping and energy overconsumption.

4.3 Installation of Recirculation Pipeline at the E Pumping Plant

A pipeline going from the western-most pump at the E Pumping Plant to the Center Canal will be installed to recirculate water from Klamath Straits Drain to the Center Canal. This pipeline will allow for up to 100 cfs to be pumped into the Center Canal to increase the amount of water available for delivery to agricultural lands served by the Center Canal. A manifold will be installed on the north side of the pump, and the pipeline will go southwest to the Center Canal. The pipeline will be roughly 200 feet long, and construction activities will occur within 10 feet on each side. The total construction footprint is approximately 3,933 square feet.

Construction of the recirculation pipeline will begin after on-farm flooding activities between January 1 and April 1 and will take approximately 6 months to complete.

4.4 Installation of SCADA, Automated Gates, and Upgraded Turnouts

KDD will install SCADA components at selected locations in service area canals, turnouts to farm laterals, drains, and at lift pumps to improve the efficiency of irrigation water management (see **Error! Reference source not found.** for the locations of the SCADA sites). Depending on the site and KDD needs, each of the SCADA sites will require specific components and the installation of solar panels or a radio antenna. Three of the proposed sites will need electricity established at the site. Future engineering will determine site-specific electrical load requirements and whether solar power is feasible. If solar power is not feasible, power lines will be extended to power the units. A ground disturbance of approximately 313 square feet is expected at each of the SCADA sites where a single SCADA system will be installed. In the sites where two SCADA systems will be installed and paired, specifically the Township Pump Station and Ady Canal pair, and the Eastside Pump Station and the North Canal pair, the construction footprint is approximately 1,634 and 3,118 square feet, respectively. Installation of flow monitoring and automated gates will occur anytime during the year. Upgrades to turnouts will take place from January to April during the non-irrigation season when canals and laterals are

dewatered. Altogether, the 14 SCADA installation sites will require a total of approximately 0.18 acres of ground disturbance.

4.5 Avoidance and Minimization Measures

4.5.1 Construction Timing

All in-water work within the Klamath River will occur during the permitted in-water work window to minimize adverse effects to fish and to avoid fish spawning, sensitive life stages, and periods of high streamflow. Other activities associated with the Proposed Action that occur in canals and laterals will occur during the non-irrigation season when water is either absent or at its lowest. Canals and laterals are predominantly dewatered during the non-irrigation season (October 1 to February 28). Water absence during construction will prevent the presence of LRS and SNS in the project area when activities such as canal extension, canal widening, crossover reconfiguration, pump station upgrades, SCADA installation, and turnout upgrades will occur. In addition, absent or low water will minimize the potential for eroded soil to enter waterbodies during construction.

4.5.2 Erosion Control

Silt fencing, straw wattles, geotextile filters, straw bales, or other erosion control measures will be used to minimize soil erosion and prevent eroded soil from entering waterbodies during construction. Erosion control measures will be free of weeds and weed seeds. To minimize impacts during construction, vehicles will park on existing watermaster or other access roads. After construction, disturbed soils will be recontoured or regraded and replanted with a mix of native grasses and forbs to reduce the risk of post-construction erosion and spread of noxious weeds. Work area isolation during construction of the fish screen will prevent runoff into the adjoining waters. Turbidity curtains will be employed during gravel road widening to minimize the extent of turbidity plumes during the embankment fill activities.

4.5.3 Spill Prevention, Control, and Counter measures

Fuel storage areas and fueling locations will be located 150 feet from any waterbody, or in an isolated hard zone such as a paved parking lot. Spill kits will be located at fuel storage areas, and construction crews will have adequate absorbent materials and containment booms on hand to enable rapid cleanup of spills. Machinery will be inspected daily for leaks and prior to operation. Equipment and machinery will also be power washed prior to entering the water and will remain in the water for the shortest time possible. Immediately upon learning of any spills of fuel, oil, or hazardous material, or upon learning of conditions that could lead to an imminent spill, the person discovering the situation will initiate actions to contain the fluid or eliminate the source of the spill and notify the spill coordinator or crew foreman immediately. If it is determined that a spill is beyond the scope of on-site equipment and personnel, an environmental emergency response contractor will be contacted immediately to contain or clean up the spill.

4.5.4 Stormwater Runoff Treatment

Water quality treatment will be provided for 100 percent of the approximately 2.2 acres of post-project CIA. The Project will likely use either biofiltration swales or compost-amended vegetated filter strips to treat roadway stormwater before interception with the internal drainage canal network. Treatment best management practices (BMPs) will be used to treat water to the standards of the Oregon Department of Environmental Quality (DEQ) 401 Water Quality Certification. The Project's prioritizes the use of biofiltration BMPs for their effectiveness at reducing levels of 6PPD-q in stormwater runoff. Ecology (2022) determined that BMPs that

employ dispersion, infiltration, or biofiltration via soil media or compost, or other BMPs that provide sorption, provide the highest levels of reduction in 6PPD and 6PPD-q. Given proximity constraints and a high groundwater table, dispersion- and infiltration-based stormwater BMPs are unable to be used by the Project.

Traffic volume on redeveloped CIA is anticipated to be low. Proposed North Canal Road improvements and development of crossings 12, 13, and 14 (2.0 acres CIA) are anticipated to only have one to two car trips daily for operations and maintenance of the fish screen and for agricultural activities. The Fugate Road and SR 161 redeveloped crossings over the North Canal (0.2 CIA) car volume will be higher with over 20 daily car trips. Of the redeveloped and new CIA, runoff from only 0.16 acres on the North Canal Road improvements will drain directly into the Klamath River. Runoff from the remaining 2.04 acres of CIA will drain into the North Canal or adjacent wetlands and ditches. The North Canal will convey water to agricultural fields and Lower Klamath National Wildlife Refuge (LKNWR). Excess water on agricultural fields and in the LKNWR is conveyed to the Klamath River via Klamath Straits Drain. Biological sequestration of stormwater pollutants within agricultural fields and wetlands in LKNWR will further reduce contaminants from CIA before they enter into the Klamath River.

The annual volume of stormwater that will be discharged from the Project's CIA is estimated to be less than 0.00001 percent of the annual flows of the Klamath River at Keno Dam. The Klamath River is a large waterbody, and the minor volume of runoff from post-project CIA is anticipated to have an indiscernible effect on water quantity in the Klamath River and KDD conveyance infrastructure. Furthermore, the impact of pollutants and contaminants in that discharge is also small when compared to the adverse impacts of existing stormwater discharges into the Klamath River. Due to minor increases in CIA, low traffic volume, treatment BMPs, and biological sequestration of contaminants within agricultural fields in KDD and wetlands in LKNWR, stormwater runoff will have a minor incremental change in contaminant concentrations in the Klamath River; this is anticipated to have an indiscernible effect on water quality within the Klamath River.

4.5.5 Water Resources

Concurrence on jurisdictional determinations for wetlands and waters will be obtained from applicable state and federal agencies prior to construction. Before implementing site-specific actions with the potential to affect wetlands or other waters of the United States or the state of Oregon, KDD will coordinate with agencies that have regulatory authority (the U.S. Army Corps of Engineers [USACE], the Oregon Department of State Lands [DSL], Oregon Department of Environmental Quality [DEQ], the California State Water Resources Control Board, the California Department of Fish and Wildlife, and the California Environmental Protection Agency) to identify applicable regulatory requirements. KDD will obtain permits required by those agencies.

All work will be performed in compliance with BMPs, and applicable terms and conditions of permits issued by local, state, and federal agencies with permitting authority.

4.5.6 In-Water Work

All in-water work will occur during the permitted in-water work window (July 1 to January 31) or during an approved in-water work window variance to avoid fish spawning, sensitive life stages, and periods of high streamflow. All federal, state, and local permits will be secured prior to any in-water work. Water quality protection measures will be implemented, including erosion

control, sediment control, and pollution control for all in-water work and all dewatering and re-watering efforts. Equipment will be inspected, and power washed prior to entering the water. Equipment will remain in the water for the shortest time possible and not remain in the water while not working.

4.5.7 Vegetation Clearing

To the extent feasible, vegetation clearing, and removal would occur during the non-irrigation season which occurs during the non-monarch breeding season for the region (October 1 to May 30 [Xerces Society 2018b]). If vegetation clearing occurs during the monarch breeding season, activities would occur during the middle of the day as monarchs are typically most active during the warmer periods of the day and are thus better suited to vacating the area (Xerces Society 2018a). Preceding vegetation removal, the contractor will pace the extent of the area to be cleared to cause monarchs that may be present to vacate the area prior to vegetation removal. These practices will also be employed for vegetation removal that occurs within the first two weeks of October to account for monarchs that have yet to migrate out of the region.

5 ANALYTICAL FRAMEWORK FOR THE SECTION 7(A)(2) DETERMINATIONS

NRCS requested formal consultation with the Service because NRCS has determined that the activities associated with the proposed action may affect and are likely to adversely affect the endangered LRS and SNS. Formal consultation results in the Service issuing a biological opinion as to whether the proposed action is likely to jeopardize the continued existence of the species analyzed or result in the destruction or adverse modification of any designated critical habitat. A description of the formal consultation process is provided at 50 CFR 402.14. The following sections provide the analytical framework for the basis of the jeopardy and destruction or adverse modification of critical habitat determinations.

5.1 Jeopardy Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably will be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR § 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the status of the species, which describes the range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the environmental baseline, which refers to the condition of the species in the action area, without the consequences to the listed species caused by the proposed action; (3) the effects of the action, which are all consequences to listed species caused by the proposed action that are reasonably certain to occur; and (4) the cumulative effects, which evaluate the effects on the species of future State or private activities in the action area that are reasonably certain to occur.

For the section 7(a)(2) determination regarding jeopardizing the continued existence of the species, the Service begins by evaluating the effects of the proposed Federal action and the cumulative effects. The Service then examines those effects against the current status of the species to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the species in the wild.

5.2 Destruction and Adverse Modification Determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. "Destruction or adverse modification" of critical habitat means "a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR § 402.02).

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the status of critical habitat, which describes the condition of all designated critical habitat in terms of its physical and biological features, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the environmental baseline, which refers to the condition of critical habitat in the action area, without the consequences to critical habitat caused by the proposed action; (3) the effects of the action, which are all consequences to critical habitat caused by the proposed action that are reasonably certain to occur and their influence on the recovery role of the affected designated critical habitat units; and (4) cumulative effects, which evaluate the effects on critical habitat of future State and private activities in the action area that are reasonably certain to occur.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the designated critical habitat are evaluated in the context of the condition of all designated critical habitat, taking into account any cumulative effects, to determine if the consequences of the proposed action are likely to appreciably reduce the value of critical habitat as a whole for the conservation of the species.

6 STATUS OF THE LOST RIVER SUCKER AND SHORTNOSE SUCKER

LRS and the SNS were federally listed as endangered throughout their entire ranges on July 18, 1988 (USFWS, 1988). The Service recently reviewed the status of each of these species in 2024 and did not recommend changes to classification or recovery priority numbers (USFWS, 2024b, 2024a). A final revised recovery plan for these species was published in 2013 (USFWS 2013).

The Service completed the Species Status Assessment for the Endangered LRS and SNS in 2019 (SSA, (USFWS, 2019). This SSA provides a comprehensive assessment of the species' range-wide status and serves as the basis for defining the species status for consultation under section 7 of the Act (USFWS, 2019). The following section summarizes information about the LRS and SNS pertinent to their ecology, biology, and threats. For detailed information on the LRS and SNS biology, ecology, range wide status, threats, and conservation needs, please refer to the SSA (USFWS, 2019) and their recovery plan (USFWS 2013). Additional information is also available in the final rule that designated critical habitat for LRS and SNS (USFWS, 2012). The information presented below also includes current best available information to provide updated population and other information since the SSA was finalized.

The following bullets summarize the pertinent Status and ecological information for LRS and SNS from the sources listed above:

- Lakes comprise the primary habitat but spawning and some rearing occur in tributaries.
- Upper Klamath Lake (Upper Klamath Lake) historically supported the largest populations of both LRS and SNS, but recent declines in the system have made abundance more similar across all populations.

- In the Lost River sub-basin, LRS and SNS occur in Clear Lake Reservoir, Tule Lake Sump 1A, and Lower Klamath National Wildlife Refuge Unit 2, and SNS also occur in Gerber Reservoir.
- In the Lost River sub-basin, SNS exhibit regular hybridization or introgression with Klamath largescale sucker (*Catostomus snyderi*).
- Sucker populations in Lake Ewauna, the Lost River, Tule Lake, and Lower Klamath National Wildlife Refuge are relatively small and there is little or no evidence that they are self-sustaining.
- Historical threats include widespread loss and modification of primary habitats.
- Current threats to the species range wide include poor water quality, quantity, and drought, combined with predation and minimal and infrequent recruitment.

6.1 Distribution

6.1.1 Historical Distribution

LRS and SNS are endemic to the Upper Klamath Basin, including the Lost River sub-basin. Documented historical occurrences of one or both species include Upper Klamath Lake (Cope 1879 pp. 784-785) and Tule Lake (Bendire, 1889, p. 444; Eigenmann, 1891, p. 667), but the species likely occupied all of the major lakes within the upper Klamath Basin, including Lower Klamath Lake, Lake Ewauna, and Clear Lake. In addition to inhabiting the lakes throughout the upper basin, the species historically utilized all major tributaries to the lakes for spawning and rearing. Suckers were also known to spawn in great numbers at several springs and seeps along the eastern shoreline of Upper Klamath Lake, including Barkley (Bendire, 1889, p. 444) and likely spawned at other spring-dominated areas in the northwestern corner of the lake, including Harriman, Crystal, and Malone Springs.

At the time of listing (1988), LRS and SNS were known to occupy Upper Klamath Lake and its tributaries and outlet (Klamath Co., Oregon), including a "substantial population" of SNS in Copco Reservoir (Siskiyou Co., California), as well as collections of both species from Iron Gate Reservoir (Siskiyou Co., California) and J.C. Boyle Reservoir (Klamath Co., Oregon) (Figure 4). Remnants and/or highly hybridized populations were also documented to occur in the Lost River system (Klamath Co., Oregon, and Modoc and Siskiyou Co., California) including both species in Clear Lake Reservoir (Modoc Co., California), but it was apparently presumed that LRS populations in Sheepy Lake, Lower Klamath Lake, and Tule Lake (Siskiyou Co. California) had been "lost" (USFWS, 1988). Although not stated explicitly, SNS within Gerber Reservoir (Klamath Co., Oregon) were likely part of the "highly hybridized populations" in the Lost River Basin referenced in the listing.

6.1.2 Current Distribution

Upper Klamath Lake

Upper Klamath Lake is the largest remaining contiguous habitat for endangered suckers in the Upper Klamath Basin at approximately 64,000 acres (26,000 hectares). Upper Klamath Lake is a natural lake that was dammed in 1921 to allow for management of lake elevations both higher and lower to support irrigation deliveries. Approximately 70 percent of the original 50,400 acres (20,400 hectares) of wetlands surrounding the lake, including the Wood River Valley, was diked, drained, or significantly altered between 1889 and 1971 (Gearhart et al., 1995, p. 7). Spawning

aggregations at numerous locations within the Upper Klamath Lake system have disappeared, but LRS continue to use two spawning locations in relatively large numbers: the Williamson River and the eastern shoreline springs in Upper Klamath Lake, and Upper Klamath Lake contains the largest remaining population of LRS by far. SNS are only known to spawn in significant numbers in the Williamson River.

Spawning in the Williamson River and the Sprague River, its major tributary, occurs primarily in a 4.8-mile stretch continuing from the Williamson River downstream of the confluence with the Sprague to the historical Chiloquin dam site on the Sprague River. Although the Chiloquin dam was removed in 2008, only small numbers of suckers migrate beyond the historical dam site to spawn (Martin et al., 2013, p. 10).

Clear Lake Reservoir

The present-day Clear Lake Reservoir ranges from 8,400 to 26,000 acres (3,400 to 10,400 hectares), depending on lake elevation. Clear Lake is a natural lake that was greatly increased in size after damming in 1910. It is a shallow, turbid lake with little wetland vegetation. The primary inflow to Clear Lake comes from Willow Creek, which is characterized by relatively flashy hydrology. Willow Creek and its major tributary, Boles Creek, contain the only known spawning habitat available to SNS and LRS in Clear Lake. There are approximately 27 miles of stream spawning and migratory habitat utilized by LRS and 65 miles utilized by SNS in this watershed. Due to the flashy hydrology, access to the spawning habitat can be reduced in years without significant snowpack to support sustained spring run-off.

Gerber Reservoir

Gerber Reservoir is only inhabited by SNS and the non-listed KLS. The dam built on Miller Creek in 1925 created Gerber Reservoir with a maximum surface area of 3,830 acres (USBR, 2000, p. 12). There are two spawning tributaries, Barnes Valley Creek, and Ben Hall Creek, which combined have roughly 20 miles of potential habitat (spawning or migratory).

Other Bodies of Water

Both SNS and LRS are found in Lake Ewauna (Kyger & Wilkens, 2011, p. 3), Tule Lake (Hodge & Buettner, 2009, p. 4), Lower Klamath National Wildlife Refuge Unit 2, and the Lost River proper (Shively et al., 2000, pp. 82–86).

As stated above, the Keno Reservoir reach including Lake Ewauna functions as a subpopulation of Upper Klamath Lake to some degree. Successful spawning in the Link River, which is the only potential spawning habitat below Link River Dam, has not been documented, though there is an anecdotal report of spawning behaviors in the river (Smith & Tinniswood, 2007, p. 1). Small numbers of LRS and SNS reside in the Keno Reservoir (Desjardins & Markle, 2000; Korson et al., 2008; Kyger & Wilkens, 2011). Poor habitat conditions, nonnative fishes, and lack of successful reproduction are thought to be responsible for the small numbers of LRS and SNS present in the Keno Reservoir (Desjardins & Markle, 2000; Piaskowski, 2003).

Tule Lake was extensively diked, and its volume has been greatly reduced through evaporation related to retention of water above dams and irrigation as well as diversion of water to the Klamath River as well as to Lower Klamath National Wildlife Refuge through the D Pump. The remaining lake habitat, referred to as Sump 1A and Sump 1B, is approximately 9,081 acres and

3,259 acres, respectively. Hundreds of individuals of both species were captured in Tule Lake Sump 1A prior to going dry in 2020 to 2021 (Hodge & Buettner, 2009, p. 3). Spawning is not known to occur in Tule Lake; however, spawning aggregations have been observed nearby in the Lost River below Anderson Rose dam. Locations in the Lost River where historical spawning was documented, such as Olene, are inaccessible from Tule Lake due to multiple dams and inundation behind dams.

Suckers were also reintroduced into historical habitat at Lower Klamath Lake in 2023, which was disconnected from the Klamath River by railroad construction in the late 1800s and drained for agriculture in subsequent decades. Though this population is small, thanks to water deliveries to Lower Klamath National Wildlife Refuge's Unit 2 in spring 2023, there is evidence that some individuals have persisted. Suckers have also been released in other locations in the Upper Basin, such as ponds on Lakeside Farms and Westside Improvement District, both of which would have been in historical sucker habitat (Upper Klamath Lake lake-fringe wetland and Tule Lake, respectively) before diking and draining of lakes and wetlands. However, none of these populations currently contribute meaningfully to sucker persistence or recovery as there is no spawning habitat for suckers to complete their life history.

The Klamath River Renewal Corporation (KRRC) initiated decommissioning and removal of the four Lower Klamath Hydroelectric Project dams (J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate) in 2023 on the Klamath River. Copco No. 2 diversion dam was removed in the summer of 2023. Power generation at J.C. Boyle, Copco No. 1, and Iron Gate powerhouses ceased January 2024. The removal of the remaining three dams began in spring 2024 and was completed in September 2024, removing the main stem hydropower reservoirs on the Klamath River below Keno Dam. With the completion of dam removal, the Klamath River has been restored to a free-flowing condition from the prior upstream extent of J.C. Boyle Reservoir in Oregon through the location of Iron Gate Dam in California. In 2023, prior to draw down and dam removal, KRRC removed 132 adults and 137 juvenile suckers from the four hydroelectric reservoirs; these populations consisted of LRS and SNS that washed down from the Keno impoundment. These fish were relocated to the Klamath National Fish Hatchery. LRS and SNS are lake dwelling suckers and will likely not persist in the Klamath River below Keno dam after drawdown, dam removal, and restoration of the hydroelectric reach.

6.2 Reproduction

LRS and SNS are large-bodied, long-lived fishes. The oldest individuals for which age has been estimated was 57 years for LRS and 33 years for SNS (Buettner and Scoppettone 1991 p. 21; Terwilliger et al. 2010 p. 244). Juveniles grow rapidly until reaching sexual maturity sometime between four and nine years of age for LRS and between four and six years of age for SNS (Perkins, Scoppettone, et al., 2000, pp. 21–22). Upon achieving sexual maturity, LRS are expected to live on average 12.5 years based on annual survival rates (Hoenig 1983; USFWS 2013, p. 12). Similarly, SNS adults are estimated to live on average 7.4 years after having joined the adult population. Females produce a large number of eggs per year: 44,000 to 236,000 for LRS and 18,000 to 72,000 for SNS, of which only a small percentage survive to become juveniles as is typical for freshwater fish (Houde 1989, p. 479; Houde and Bartsch 2009, p. 31). LRS and SNS can generally be classified into five life stages and behaviors that occur at various times throughout the year: migration, spawning, larval, juvenile, and adult (Table 1). The timing of occurrence of each life stage is similar between the two species, with the main difference occurring during spawning and incubation.

Table 2. Life stage diagram (adapted from (Reiser et al., 2001, pp. 3–4)). LRS and SNS occur as five generic life stages: migration, spawning, larval, juvenile, and adult. Each of these may have specific ecological requirements. The table below presents the general time of year when each life stage is present within the system for each species. LRS are represented by grey and SNS are represented by orange.

Life Stages	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Dec
Adult											
Migration											
Spawning											
Larval											
Juvenile											

6.2.1 Migration

LRS and SNS require distinct growth and spawning habitats to complete their life cycle. Growth occurs in the lakes of the Upper Klamath Basin, and spawning habitat is typically found in the tributary rivers to these lakes. However, a subset of LRS use lakeshore groundwater upwelling areas (springs) as their spawning habitat in Upper Klamath Lake. Small numbers of SNS are also detected at these lakeshore sites Hewitt et al. 2017 p. 24), but the low numbers suggest that they are likely just vagrant individuals not attempting to spawn. Because most LRS and SNS individuals utilize distinct growth and spawning habitats, they must complete a spawning migration to reproduce.

Adult LRS and SNS in Upper Klamath Lake appear to strongly cue on water temperature to initiate spawning migrations in the Williamson River, which is the only tributary to Upper Klamath Lake with large spawning populations of LRS and SNS. Migration begins only after appropriate water temperatures have been achieved: 50°F for LRS and 54°F for SNS (Hewitt et al., 2017, pp. 11, 24) and decreasing temperatures can reduce numbers of individuals migrating upstream (Hewitt et al. 2014, pp. 36–37). Migration into Willow Creek, which is believed to contain the only spawning habitat available from Clear Lake Reservoir, appears to be triggered by a general rise in stream temperatures rather than exceedance of a specific temperature threshold (Hewitt & Hayes, 2013). Relatively little is known about the timing and cues for sucker spawning migrations because environmental conditions do not always allow access to the tributaries (Ben Hall Creek and Barnes Valley Creek).

Successful migrations of spawning habitats can be limited by hydrologic conditions. In Upper Klamath Lake access to the Williamson River does not appear to be affected by river flows or Lake elevations, but access to and/or suitability of the lakeshore springs habitat can be reduced by shallow depths or dewatering at springs due to low lake elevations (Burdick et al., 2015). Access to spawning habitat into Willow Creek, which is the only spawning habitat available from Clear Lake, can be limited by shallow water near the mouth or low flows within the stream (Hewitt & Hayes, 2013, p. 7). Additionally, spawning access to Ben Hall Creek and Barnes Valley Creek in Gerber Reservoir, can be limited by low flows within the streams. However, in

2022 when Gerber Reservoir surface elevations were too low and tributaries were disconnected, spawning was observed and monitored by Reclamation in the gravel below the boat ramps (USBR, 2024, 2025).

6.2.2 Spawning

Spawning occurs from February through May (Figure 4). In the Lost River drainage, the bulk of upstream migration occurs in March and April (Hewitt & Hayes, 2013, pp. 13, 15). In Upper Klamath Lake, some spawning occurs in March, but the bulk occurs in April and early May (Hewitt et al. 2014, p. 9). As suckers spawn, fertilized eggs quickly settle within the top few inches of the gravel substrate until hatching, around one week later.

Generally, individuals of both species spawn every year in Upper Klamath Lake. In Clear Lake and Gerber Reservoir, suckers skip spawning in some years due to limited access. Spawning activity is typically observed over mixed gravel or cobble substrates in depths typically less than 1.5 ft. ranging from 0.4 to 2.3 ft. in rivers and shoreline springs. Gravel is rock ranging in size from 0.8 – 2.5 in. in diameter, and cobble ranges in size from 2.5 – 10 in. in diameter.

Eggs require flowing water and relatively open substrate that permits sufficient aeration (both from ambient dissolved oxygen (DO) levels and from removal of silt and clays that can smother the eggs). These conditions are also important for the elimination of waste materials from eggs during incubation. LRS were observed to spawn at water velocities of 0.49 – 2.69 ft./sec (Coleman et al., 1988, p. iv). Eggs also require appropriate temperatures to support timely development. Coleman et al. (1988 p. iv) observed that LRS eggs hatched eight days after fertilization at 56.3°F. Eggs also need some protection, such as small spaces in gravel, against potential predators and disease, although there are no data to clarify what conditions are optimal. The small spaces between gravel pieces in the substrate help to restrict access from potential predators and limit the number of eggs that can randomly clump together, which could reduce the spread of diseases such as certain fungi that can grow on developing eggs.

6.2.3 Larvae

Larvae emerge from the gravel approximately 10 days after hatching at about 0.2 to 0.6 in. total length and are still mostly transparent with a small yolk sac (Coleman et al., 1988, p. 27). Generally, LRS and SNS larvae spend little time in rivers after swim-up, drifting downstream to the lakes at about 0.55 in. in length around 20 days after hatching (M. Cooperman & Markle, 2003, pp. 1146–1147). In the Williamson and Sprague Rivers (Upper Klamath Lake population) and Willow Creek (Clear Lake Reservoir population), larval drift downstream from the spawning grounds begins in April and is typically completed by July with the peak in mid-May (Scoppettone et al., 1995, p. 19). Most downstream movement occurs at night near the water surface (Ellsworth et al., 2010, pp. 51–53). Little is known about the drift dynamics of the larvae hatched at the shoreline springs in Upper Klamath Lake and Gerber Reservoir.

Once in the lake, larvae tend to inhabit near-shore areas (Cooperman and Markle 2004; Erdman et al. 2011, pp. 476–77). Larval density is generally higher within and adjacent to emergent vegetation than in areas devoid of vegetation (Cooperman and Markle 2004, p. 375; Crandall 2004, p. 3). Such areas may also provide refuge from wind-blown currents and turbulence, as well as areas of warmer water temperature which may promote accelerated growth (Crandall 2004, p. 5; Cooperman et al. 2010, p. 36). These areas of emergent vegetation tend to occur along the fringes of the lakes in shallower areas. However, the two species appear to have slightly different habitat usage as larvae; SNS larvae predominantly use nearshore areas adjacent

to and within emergent vegetation, but LRS larvae tend to occur more often in open water habitat than near vegetated areas (Burdick et al. 2010, p. 19).

6.2.4 Juveniles

Larvae transform into juveniles in mid-July at 0.8 – 1.2 in. in total length and transition from predominantly feeding at the surface to feeding near the lake bottom (Markle & Clauson, 2006, p. 496). In Upper Klamath Lake, some juvenile suckers continue to use relatively shallow (less than approximately 3.9 ft.) vegetated areas, but overall juveniles are found in a wide variety of habitats including deeper, un-vegetated offshore habitat (Bottcher & Burdick, 2010, pp. 12–14; Buettner & Scoppettone, 1990, pp. 32, 33, 51; Burdick et al., 2008, pp. 427–428, 2010, pp. 42, 45, 50; Hendrixson et al., 2007, pp. 15–16). One year old juveniles occupy shallow habitats during April and May but have been found in higher concentrations in deeper areas along the western shore of Upper Klamath Lake as the summer progresses until DO levels become reduced (Bottcher & Burdick, 2010, p. 17; Burdick & Vanderkooi, 2010, pp. 10, 11, 13). Once DO levels in the deeper area become suboptimal juveniles appear to move into shallower areas throughout the rest of the lake.

6.2.5 Adults

Adult LRS and SNS use the lakes of Upper Klamath Basin as their primary habitat for feeding and growing; they migrate to spawning habitats during spring as described above (Section 6.1.1). In their growth habitat, adult suckers require adequate food, water quality, and refuge from predation. Both spawning subpopulations of LRS in Upper Klamath Lake have experienced an average annual survival rate of around 90 percent between 2002 and 2019 (range: 80-96 percent across locations and sexes (Hewitt et al., 2018, pp. 12, 17; Krause et al., 2023)). SNS experienced average annual survival rates of 82 percent between 2001 to 2019 (range: 74-95 percent (Hewitt et al., 2018, p. 21; Krause et al., 2023)). However, there has been a recent downward trend in survival estimates from 2016 to 2019 for all species (Krause et al., 2023). The trend is most pronounced for LRS and has continued since 2019 (Krause & Paul-Wilson, 2024). Although adult suckers are hardier than juveniles and larvae, they are still susceptible to poor water quality, which can be associated with die-offs. Thus, adult suckers require adequate water quality, or at least refugia from poor water quality conditions, within their growth habitat. Adult LRS and SNS use the lakes of Upper Klamath Basin as their primary habitat for feeding and growing; they migrate to spawning habitats during spring as described above (Section 6.1.1). In their growth habitat, adult suckers require adequate food, water quality, and refuge from predation. Both spawning subpopulations of LRS in Upper Klamath Lake have experienced an average annual survival rate of around 90 percent between 2002 and 2019 (range: 80-96 percent across locations and sexes; (Hewitt et al., 2018, pp. 12, 17; Krause et al., 2023). SNS experienced average annual survival rates of 82 percent between 2001 to 2019 (range: 74-95 percent; Hewitt et al., 2018, p. 21; Krause et al., 2023). However, there has been a recent downward trend in survival estimates from 2016 to 2019 for all species (Krause et al., 2023). The trend is most pronounced for LRS and has continued since 2019 (Krause & Paul-Wilson, 2024). Although adult suckers are hardier than juveniles and larvae, they are still susceptible to poor water quality, which can be associated with die-offs. Thus, adult suckers require adequate water quality, or at least refugia from poor water quality conditions, within their growth habitat.

Adult LRS and SNS are distributed throughout the northern portion of Upper Klamath Lake during summer (Banish et al., 2009, p. 160), but in the spring, congregations form in the north-east quadrant of the lake prior to moving into tributaries or shoreline areas for spawning. There is

no information on their distribution in the lake during fall and winter. Less is known about populations in Gerber and Clear Lake Reservoirs because they have been studied much less (Leeseberg et al., 2007). However, Clear Lake adults appear to inhabit the western lobe of the reservoir more so than the eastern lobe (Barry et al., 2009, p. 3; Hewitt et al., 2021), which is probably due to its greater depth. Adult LRS and SNS are distributed throughout the northern portion of Upper Klamath Lake during summer (Banish et al., 2009, p. 160), but in the spring, congregations form in the north-east quadrant of the lake prior to moving into tributaries or shoreline areas for spawning. There is no information on their distribution in the lake during fall and winter. Less is known about populations in Gerber and Clear Lake Reservoirs because they have been studied much less (Leeseberg et al., 2007). However, Clear Lake adults appear to inhabit the western lobe of the reservoir more so than the eastern lobe (Barry et al., 2009, p. 3; Hewitt et al., 2021), which is probably due to its greater depth.

Based on radio-telemetry studies of suckers in Upper Klamath Lake, adults of both species tend to avoid depths of less than 6.6 ft. and most individuals are found at depths of 6.6 - 13.1 ft. (Banish et al., 2007, p. 10, 2009, pp. 151–161). An exception to these patterns occurs during poor water quality conditions when suckers tend to seek refuge from stressful conditions in the shallow habitats in and around spring-fed areas such as Pelican Bay (Banish et al., 2009, pp. 159–160). These springs dominated sites likely provide better water quality conditions because the water is typically cooler (cooler water can hold more oxygen than warmer water) and clearer because of the flowing nature of area. Selection of deeper than average habitats may reflect the distribution of their prey, or it may confer protection from avian predators, which can consume suckers as large as 28.7 in. (Evans et al. 2016, p. 1262).Based on radio-telemetry studies of suckers in Upper Klamath Lake, adults of both species tend to avoid depths of less than 6.6 ft. and most individuals are found at depths of 6.6 - 13.1 ft. (Banish et al., 2007, p. 10, 2009, pp. 151–161). An exception to these patterns occurs during poor water quality conditions when suckers tend to seek refuge from stressful conditions in the shallow habitats in and around spring-fed areas such as Pelican Bay (Banish et al., 2009, pp. 159–160). These springs dominated sites likely provide better water quality conditions because the water is typically cooler (cooler water can hold more oxygen than warmer water) and clearer because of the flowing nature of area. Selection of deeper than average habitats may reflect the distribution of their prey, or it may confer protection from avian predators, which can consume suckers as large as 28.7 in. (Evans et al., 2016, p. 1262).

In 2021, USGS began deploying Passive Integrated Transponders (PIT) tag arrays in Pelican Bay annually, to learn more about when and why LRS and SNS use this habitat. The monitoring data shows that a significant proportion of the adult population is detected in Pelican Bay after spawning but then detections seem to taper off in September, when water quality in the lake decreases (J.R. Krause, USGS, personal communication October 18, 2024). LRS and SNS from the sucker assisted rearing program have also been detected on the Pelican Bay PIT tag arrays during this time (April to October; unpublished data, FASTA slides October 3, 2024). There is still no clear indication as to why LRS and SNS leave Pelican Bay when the water quality in the lake decreases but the number of detections suggest that this is an important habitat for adult and juvenile suckers.

The limited available data on adult LRS and SNS diets, which come from Clear Lake, suggest that LRS tend to feed directly from the lake bottom whereas SNS primarily consume zooplankton from the water column (Scoppettone et al., 1995, p. 15). This diet difference aligns

with the mouth morphology of the species; SNS have terminal or subterminal (forward-facing) mouths whereas LRS have more ventral (bottom-facing) mouths (Miller & Smith, 1981, pp. 1, 7).

Figure 4. The LRS and SNS are endemic to the lakes and rivers of the Upper Klamath Basin in south, central Oregon and north, central California. Lower Klamath Lake and Sheepy Lake are depicted on the map because populations were introduced in 2023.

6.3 Numbers

Starting in the late 1800s, large areas of sucker habitat were converted to agriculture and barriers were created that isolated populations from spawning grounds. Although there are no survey records until the 1900s, it is likely that these once superabundant species began to decline in numbers around the turn of the 20th century concurrent with significant destruction and degradation of sucker habitat. Later, from the 1960s to the early 1980s, recreational harvests of suckers in Upper Klamath Lake progressively decreased (Markle & Cooperman, 2001, pp. 7–8), which reflected further declines in the LRS and SNS populations. The declines in the species' populations led to their listing under the Act in 1988. From 1995 to 1997, water quality-related die-offs killed thousands of adult suckers in Upper Klamath Lake (Perkins, Kann, et al., 2000, pp. 11–13). Over that 3-year period, more than 7,000 dead suckers were collected, and many other suckers likely died but were not detected.

The wide-ranging behavior, expansive habitat, and rarity of these species make obtaining accurate population estimates challenging. However, long-term monitoring using capture recapture methods provide accurate information on relative changes in abundance (Hewitt et al., 2018), and abundance can be roughly estimated for some populations based on the size of catches and the proportion of individuals that are tagged in annual sampling.

6.3.1 Upper Klamath Lake

Upper Klamath Lake likely contains the largest remaining populations of both LRS and SNS, though SNS population in Clear Lake may be similar in size. Although robust abundance estimates are difficult for this population due to low recapture rates of tagged fish, these recapture rates can be used to obtain rough estimates of abundance. Capture-recapture analysis results and size composition data show that the abundance of both LRS and SNS has decreased since the early 2000s, these decreasing trends are continuing in Upper Klamath Lake and have been documented previously (Hewitt, et al., 2011, 2012; Hewitt et al., 2014, 2017, 2018). The estimates from capture-recapture methods show that both species have experienced some years of relatively poor survival. Approximately a decade ago, abundance estimates were roughly 100,000 adult LRS river-spawners, 8,000 adult LRS shoreline-spring-spawner, and 19,000 SNS (Hewitt et al., 2014) However, USGS data (Krause & Paul-Wilson, 2024) were used to estimate the following abundance estimates of adult suckers participating in spawning aggregations in spring 2023: 16,000 adult LRS river-spawners, 2,400 adult LRS shoreline-spring-spawners, and 5,000 adult SNS. These estimates may not reflect the true population size due to the statistical challenges of estimating abundance from the available data. Overall, the populations in Upper Klamath Lake are characterized by high annual survival of adults (Hewitt et al. 2018 pp.12, 17, 21). These adults spawn successfully and produce larvae, but few juveniles survive their first year and captures of individuals 2-6 years old is exceedingly rare (Burdick & Martin, 2017, p. 30). Similarly, there has not been evidence of significant numbers of new individuals joining the adult spawning populations since the late 1990s (Hewitt et al., 2018, p. 24), and the lack of significant recruitment has led to sharp declines in population sizes (Hewitt et al., 2018, pp. 14, 20, 24).

Survival differences exist among the sucker populations in Upper Klamath Lake. Shortnose suckers have a more variable annual survival and lower average survival than both spawning populations of LRS (Hewitt et al., 2018; Krause et al., 2023; Krause & Paul-Wilson, 2024). Adult LRS in Upper Klamath Lake average approximately 90 percent survival annually and adult SNS is 82 percent (Krause et al., 2022, pp. 1426–1429). However, there has been a recent

downward trend in survival estimates from 2016 to 2019 for all species (Krause et al., 2022, p. 1425). The trend is most pronounced for LRS and has continued since 2019 (Figure 5) (Krause & Paul-Wilson, 2024). The most recent estimates of survival in 2022 had survival of 0.79 for LRS shoreline spring spawners and 0.83 for LRS river-spawners (Figure 5) (Krause & Paul-Wilson, 2024). The decline in survival may be attributable to senescence as fish reach their maximum known ages (Krause et al., 2022, p. 1429). Although estimates of 2023 are not available because survival and detection probability are confounded in the last year's estimates within a Cormack-Jolly Seber model, special concern is warranted for both LRS spawning populations as remote and physical detections on the spawning grounds have been more than halved between 2023 and 2024. Approximately 9,000 adult LRS river-spawners were detected in 2023 and only 4,000 in 2024 and 1,800 adult LRS adult shoreline-spring-spawners were detected in 2023 and only 800 in 2024 (Krause & Paul-Wilson, 2024).

Recent LRS and SNS size distribution trends reveal that the adult spawning populations within Upper Klamath Lake are composed of similar-sized, similar-age, relatively old individuals. Median lengths of individuals of both species in Upper Klamath Lake generally increased between the 1990s and 2010, but since about 2010 size distributions have been more or less stable among years (Hewitt et al., 2018, pp. 19, 22–23, 27, 29). This indicates that few new individuals are joining the adult populations. The fish recruited in the 1990s are now approximately 34 years old and are well beyond the average survival past maturity of 12 years for the SNS and equal to that of 20 years for the LRS.

The effects of senescence on the survival and reproduction of these two species are unknown at present, but the populations in Upper Klamath Lake are clearly aging (Hewitt et al., 2018, pp. 15, 18, 21; Krause & Paul-Wilson, 2024). The low recent survival rates could be an early signal that senescence is leading to increased mortality rates and accelerated population declines. Additional years of survival data will help to resolve whether the low survival reveals increased mortality of aging individuals or unique environmental conditions to that year.

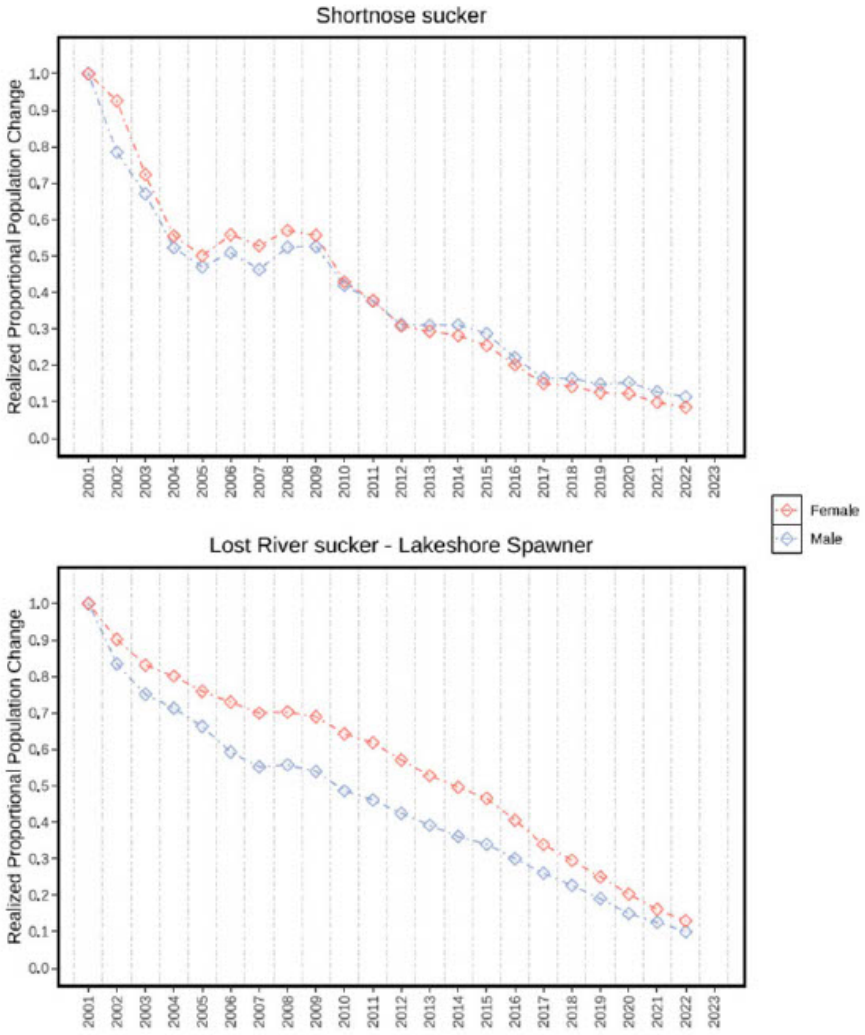

Figure 5. Annual realized proportional change in the size of the shortnose suckers and lakeshore spawning subpopulation of Lost River suckers from 2000 to 2022. Annual changes are based on λ estimates derived from separate models of annual apparent survival (Cormack-Jolly-Seber [CJS] likelihood) and seniority (reverse time CJS likelihood) probabilities, using both physical and remote encounters for survival estimates and physical captures only for seniority estimates (Krause & Paul-Wilson, 2024).

6.3.2 Clear Lake Reservoir

Data for the Clear Lake populations are very limited compared to those in Upper Klamath Lake, but generalizations have been made below based on best available information. Clear Lake currently supports the largest populations of both LRS and SNS in the Lost River drainage. SNS and LRS survival rates in Clear Lake vary considerably among years and appear to be lower than conspecifics in Upper Klamath Lake and more variable with some annual estimates as low as 47 percent (Hewitt et al., 2021), but the estimates are somewhat uncertain given the low detection probabilities. Hewitt et al. (2021, p. 20) found that LRS survival was much lower in 2009, 2013, and 2015 indicating that approximately 40 percent of the individuals larger than 300 mm fork length died in those years. Detections were particularly low in those years when flows were low in Willow Creek and in years when access to Willow Creek through the east lobe was limited by low reservoir surface elevations below 4,524 ft. (Hewitt et al., 2021, pp. 1, 11). Size distributions of LRS in Clear Lake have few year classes represented, whereas the SNS population exhibits relatively broad representation across adult sizes (Hewitt & Hayes, 2013, pp. 14, 16). The most substantial new cohort for both LRS and SNS were spawned in 2023 (first major cohort since 2016 and 2017), only 2 out of 583 samples were identified as LRS from the 2023 cohort samples (J.R. Krause, USGS, personal communication October 18, 2024) however, the SNS population in Clear Lake Reservoir is highly introgressed with KLS (Dowling et al., 2016, pp. 10–11; Tranah & May, 2006, p. 313).

Despite the inability to accurately estimate absolute abundance of the populations due to the lack of robust data, the low numbers of captures and recaptures suggests that these populations are smaller than those in Upper Klamath Lake. This is particularly true for LRS. In Clear Lake, SNS are more abundant than LRS. During the spawning run of 2019 a total of 3,901 tagged SNS were detected; slightly more than 1,104 tagged LRS that were detected during the same time period (Hewitt et al., 2021, p. 17). Although reliable estimates of total population numbers are unavailable, the data suggest it is unlikely that more than 10,000 adult SNS and 5,000 adult LRS occur in Clear Lake. Between 2004 and 2010, only 1,360 individual LRS were captured in Clear Lake Reservoir for all years combined (Hewitt and Hayes 2013a p.6)(Hewitt & Hayes, 2013, p. 6). In comparison, captures in Upper Klamath Lake of LRS averaged over 2,000 individuals annually with more than 12,000 individuals captured during this same time period (Hewitt et al., 2017). Clear Lake is sampled in the fall whereas Upper Klamath Lake is sampled in spring while the fish are congregated in preparation for spawning migrations, but the magnitude of the difference suggests that the LRS population in Clear Lake Reservoir is much smaller than the LRS population in Upper Klamath Lake. The Clear Lake LRS population also appears to be much smaller than the Clear Lake SNS population. Over the 2004 to 2010 period, 4.5 times as many individual SNS (6,240 individuals) were captured in Clear Lake Reservoir compared to LRS (Hewitt & Hayes, 2013). The average annual captures of individual SNS in Clear Lake Reservoir (1,040 per year) is comparable to Upper Klamath Lake rates (1,350 individuals), which may suggest that the population sizes are similar.

One important source of larval mortality in Clear Lake Reservoir is predation by several native or non-native aquatic species, including blue chub, fathead minnow, Sacramento perch, or bullfrog. Also, entrainment by flows through the Clear Lake dam into the Lost River appears to be a significant impact to suckers and juveniles. Although a fish screen was installed when Clear Lake dam was replaced in 2003, it is estimated around 270,000 larval and 3,600 juvenile suckers were entrained through the dam in 2013 (Sutphin and Tyler 2016). Nevertheless, when spawning

conditions are suitable for producing strong annual cohorts—estimated to be slightly less than half of the years (Hewitt & Hayes, 2013)—juveniles, particularly SNS, can survive to recruit to the adult population. Evidence for this is seen in the multiple age classes of juveniles captured during sampling (Burdick & Rasmussen, 2013), as well as the diverse size class distributions of adults (Hewitt & Hayes, 2013). LRS adults in Clear Lake Reservoir exhibit more restricted size class distributions and less consistent recruitment (Hewitt & Hayes, 2013). For example, a cohort that appeared in the trammel net sampling in 2007 was not evident in sampling in subsequent years, but the drivers of this mortality and the more tenuous status of Clear Lake LRS are unknown.

6.3.3 Gerber Reservoir

Spawning surveys of the SNS population in Gerber Reservoir in 2006 detected approximately 1,700 of the nearly 2,400 SNS that had been tagged the previous year (Barry et al., 2007, p. 7). Based on mark-recapture data from 2004 (Leeseberg et al., 2007), 2005, and 2006 (Barry et al., 2007), the population of SNS may have been as high as 42,000 individuals. In 2015 and in 2022, drought conditions reduced water levels within the reservoir to approximately one percent of the maximum storage. In both cases, water levels in the reservoir rebounded in the following year(s) with sufficient inflows from a normal snowpack. This undoubtedly reduced SNS numbers because of the limited available habitat, specific data is not available to accurately estimate the extent of this reduction, although Reclamation initiated population monitoring work in 2018. Similarly, due to a lack of robust data, the Service is not able to estimate survival rates.

In 2023, Reclamation adult sucker monitoring program set 40 nets over five days and handled 79 suckers, of which 5 were recaptures from past PIT-tagging efforts. USGS maintained and operated remote antenna arrays in Ben Hall and Barnes Valley tributaries to Gerber Reservoir and detected 1,168 PIT tagged suckers. Therefore, if the trammel netting recapture rate (6.329 percent) is representative of the total population, Reclamation estimated that 18,454 adult suckers reside in Gerber Reservoir (USBR, 2024, pp. 117, 121–122). Additional years of monitoring the adult sucker spawning population will better refine this estimate.

The outlet of Gerber Reservoir does not have a fish screen, so suckers are vulnerable to entrainment downstream into Miller Creek, which historically connected to the Lost River, but is now completely blocked and diverted for irrigation purposes. Small numbers of juvenile suckers (approximately 10s to 100s per year) have been caught in Miller Creek using nets, traps and electrofishing (Hamilton et al., 2003, pp. 3–4; Shively et al., 2000, p. 89), but the proportion of juveniles entrained, and the population impacts of entrainment are largely unknown.

6.3.4 Other Lakes and Bodies of Water

Insufficient monitoring data are available to determine trend for other LRS and SNS populations. For populations that rely on LRS and SNS populations in Upper Klamath Lake as their source, the Service expects the trends in those populations to be similar to the declining populations in Upper Klamath Lake. However, this relationship may not exist for LRS and SNS populations that have their source in other systems (i.e., the Lost River).

Data on LRS and SNS populations in Keno Reservoir, Tule Lake, Lower Klamath National Wildlife Refuge, and the Lost River are limited. Limited monitoring of these populations indicates low numbers of each species.

Lake Ewauna probably functions as a subpopulation to Upper Klamath Lake to some degree. Hundreds of listed suckers (both species) have been captured, tagged, and translocated to Upper Klamath Lake from Lake Ewauna since 2010 (Kyger & Wilkens, 2011). The Fish ladder at Link River Dam provides connectivity between Lake Ewauna and Upper Klamath Lake. However, only small numbers of individuals have been documented using it. Although water quality conditions are consistently quite poor during late summer and early fall, small numbers of endangered suckers apparently persist in Lake Ewauna, perhaps by using the Link River as a refuge from poor water quality conditions (Piaskowski, 2003, p. 9). Successful spawning in the Link River, which is the only potential spawning habitat below Link River Dam, has not been documented, though there is an anecdotal report of spawning behaviors in the river (Smith & Tinniswood, 2007, p. 1).

The Klamath Basin experienced three consecutive years (2020-2022) of drought. These hydrologic conditions observed in the Klamath Basin during 2020-2022 resulted in the reduction and loss of sucker habitat including Tule Lake Sump 1A and Sump 1B. Starting in the early spring of 2021 the water from Tule Lake Sump 1A was slowly lowered and moved into Tule Sump 1B to allow access to the sump bed so that maintenance could be performed, and because the drought was making it difficult to maintain water levels in both Tule Lake Sump 1A and Sump 1B. As water levels dropped, an effort was made to capture and translocate resident suckers to other locations, ultimately resulting in the release of these individuals into Upper Klamath Lake. The drought conditions that dried the Tule Lake sumps resulted in the loss of a LRS and SNS redundant population. In 2024, the Tule Lake sumps began refilling thanks to improved hydrologic conditions and management decisions related to the removal of Klamath River dams. Though no concerted effort was made to reestablish the Tule Lake population, suckers from the Lost River system moved volitionally into the sumps and have been observed, indicating that there is once again a population of suckers in the Tule Lake sumps. Though the size and composition of this population is unknown, monitoring work in the coming months and years may illuminate the situation.

Additionally, in 2023, a small cohort of larval and juvenile suckers were released into Unit 2 at Lower Klamath National Wildlife Refuge. This included 4,003 fish from the sucker assisted rearing program's 2022-year class and approximately 13,000 larvae collected in spring 2023 from Upper Klamath Lake. Monitoring data through the summer and fall of 2023 suggests that hundreds of these fish persisted in Unit 2, suggesting that survival and growth were possible. Provision of water for Unit 2 in 2025 has allowed habitat to persist, though it is unknown how many of the suckers released in 2023 have survived through the summer of 2025.

While there remain questions about water reliability, water management, water quality, and predation in Lake Ewauna and the refuges, it is apparent that suckers can survive in these locations. The preliminary evidence, particularly from Unit 2 at Lower Klamath National Wildlife Refuge, suggests that the factors that result in persistent mortality of juvenile suckers in Upper Klamath Lake may not be present in other locations outside of Upper Klamath Lake. Given the ongoing lack of recruitment in Upper Klamath Lake and inability to pinpoint its cause, these redundant populations in other locations have taken on increased importance for the survival of the species.

6.4 Climate Change

Climate variability, such as fluctuations between wet and dry periods, is part of natural processes; however, climatic models suggest that much of the recent trends in climate are driven by anthropogenic causes (Barnett et al., 2008, p. 1082). Annual average temperatures in the Upper Klamath Basin have already risen 1° to 2.7° F since 1895 depending on the dataset (Halofsky, 2022, p. V) and are expected to rise 2.1 to 3.6 °F from the 1960-1990 baseline by the decade of 2035-2045 due to climate change (Barr, B et al., 2010, p. 8; Risley et al., 2012a, p. 4). At present, air temperatures that primarily drive water temperature conditions lethal to suckers do not occur, but stressful water temperatures for suckers occur with regularity, particularly in late summer and early fall. Climate change may increase the frequency and duration of these stressful temperature events and is likely to make high stress events more common.

Future changes in precipitation are highly uncertain. Due to the geography of the Upper Klamath Basin, annual precipitation may increase or decrease overall under climate change (Barr, B et al., 2010, p. 8; Risley et al., 2012a, p. 4). However, climate models consistently predict that a larger proportion of annual precipitation and run-off will occur as rain events in the winter (Barr, B et al., 2010; Risley et al., 2012a). Warmer temperatures during the winter are also projected to reduce the proportion of precipitation falling as snow (McCabe et al., 2018a, p. 812).

Precipitation in the form of snow acts as a reservoir within a hydrologic system, storing water in the form of snowpack and providing more gradual and manageable input into the lakes than rain. Altered precipitation has been observed in the basin over the past several years relative to historical observations, with overall average snowpack at or below median in the last 3 out of 5 winters.

It is difficult to predict the long-term effects of precipitation changes to suckers, but it is expected that the dynamics of spring flows will be altered. Potential changes include a reduction in volume of snowmelt runoff and a shift in the start and peak timing of snowmelt runoff entering the system (Fritze et al., 2011, p. 1004). Models of the basin indicate a reduction in summer and fall flows ranging from 17 percent in the Sprague to 26 percent in the Williamson Basin (Aldous et al., 2011, p. 226). The potential changes in volume and timing of snowmelt runoff are of largest concern for suckers during the spawning season because low inflows or altered timing of inflows can impact lake elevations necessary to provide spawning and rearing habitat, alter flow timing and temperature signals for adult spawners, and/or shift water quality dynamics in Upper Klamath Lake. Shifts in both flow timing and volume may also restrict access to spawning areas in smaller watersheds, such as those entering Clear Lake and Gerber Reservoir, and reduce reproductive success.

In the near-term, the previous drought may give us some indication of how climate change may affect suckers. Limited water supply in 2020, 2021, and 2022 led to a failure to meet Upper Klamath Lake elevations necessary for spawning and rearing and resulted in decreased spawning and rearing habitat in Upper Klamath Lake. During this period, access to spawning was restricted in Clear Lake as well, due to low lake elevation and low tributary flow limiting access up and into Willow Creek. This decrease in habitat may have been associated with decreased spawning vigor in Upper Klamath Lake, but there are other factors that may also have contributed to reduced vigor (e.g., water temperature, flow conditions; (Burdick et al., 2015). Drought was also the primary factor behind the complete loss of habitat in the Tule Lake sumps from 2021 to 2024. The continued impacts to suckers under an altered climate regime are unclear, but it is worth noting these potential impacts to the species and their habitats.

6.5 Designated Critical Habitat

In 2012, two critical habitat units were designated that include approximately 123,000 acres of habitat and 208 river miles for each species, including a mix of Federal, State, and private lands. These critical habitat units include important water bodies and tributaries that support LRS and SNS life stages. Critical habitat contains those areas that are essential to the conservation of the species. The role of LRS and SNS critical habitat is to "support the life-history needs of the species and provide for the conservation of the species" (USFWS, 2012).

Critical Habitat Unit 1 is located in Klamath County, Oregon, includes Upper Klamath Lake and Agency Lake, the Link River, and Keno Reservoir to Keno Dam, as well as portions of the Williamson and Sprague Rivers, for a total of approximately 90,000 acres and 119 river miles. Unit 1 is the same for both species with the exception that, for the LRS, the unit extends up the Sprague River to the Beatty Gap east of Beatty, Oregon (approximately river mile 75), whereas for the SNS, Unit 1 extends up the Sprague River only as far as the Braymill area near river mile 8.

Critical Habitat Unit 2 (the Lost River Basin) is located in Klamath and Lake Counties, Oregon, and Modoc County, California (Figure 6). It includes Clear Lake Reservoir and its main tributary, Willow Creek as well as portions of Boles Creek, for both the LRS and the SNS. For the LRS, critical habitat includes Willow Creek to its confluence with Boles Creek and Boles Creek upstream to Avanzino Reservoir. For the SNS, critical habitat extends up Willow Creek beyond the Boles Creek confluence to include portions of the North and East Forks of Willow Creek, Fourmile Creek, and Wildhorse Creek in California. It also includes Boles Creek, Fletcher Creek, Willow Creek, and an unnamed tributary to Fletcher Creek. Gerber Reservoir and its main tributaries (Ben Hall and Barnes Valley Creeks) are also designated critical habitat in Unit 2 for SNS only. The total area for Unit 2 incorporates approximately 33,000 ac and 89 river miles of reservoir and stream habitat.

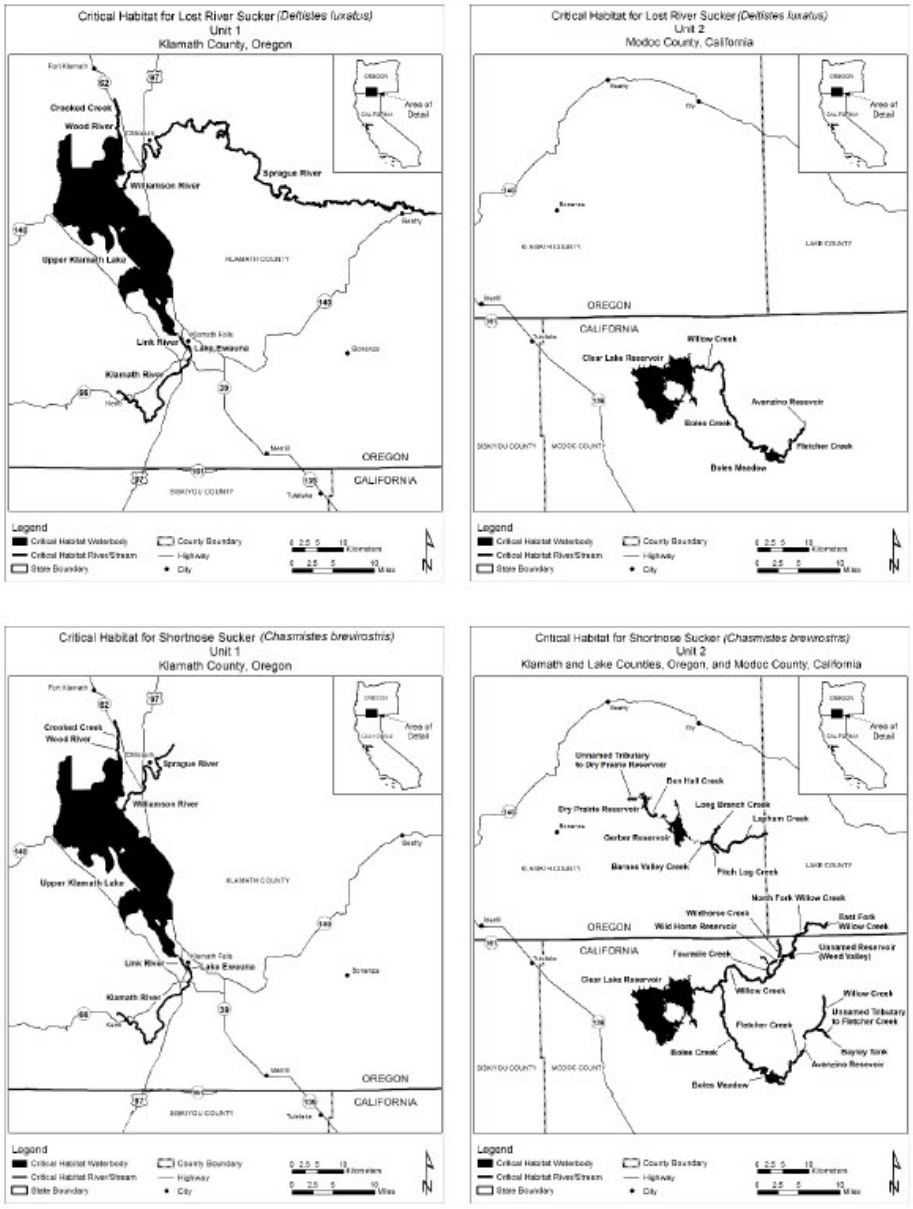

Figure 6. Designated critical habitat units for LRS and SNS (USFWS, 2012).

When designating critical habitat, the Service considers physical or biological features (PBFs) "essential to the conservation of the species and which may require special management considerations or protection" (USFWS, 2012). "These include, but are not limited to: 1) space for individual and population growth and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for breeding, reproduction, or rearing (or development) of offspring; and 5) habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species" (USFWS, 2012). The final critical habitat rule identified "accessible lake and river spawning locations that contain suitable water flow, gravel and cobble substrate, and water depth (as well as flowing water) that provide for larval out-migration and juvenile rearing habitat" as the essential PBFs for both LRS and SNS (USFWS, 2012).

Based on the current knowledge of the habitat characteristics required to sustain the species' life history processes, the Service has determined the PBFs essential for conservation of LRS and SNS are:

- **PBF 1—*Water.*** Areas with sufficient water quantity and depth within lakes, reservoirs, streams, marshes, springs, groundwater sources, and refugial habitats with minimal physical, biological, or chemical impediments to connectivity. Water must have varied depths to accommodate each life stage: Shallow water (up to 3.28 ft.) for the larval life stage and deeper water (up to 14.8 ft.) for older life stages. The water quality characteristics should include water temperatures of less than 82.4 °F; pH less than 9.75; dissolved oxygen levels greater than 4.0 mg per L; low levels of microcystin; and unionized ammonia (less than 0.5 mg per L). Elements also include natural flow regimes that provide flows during the appropriate time of year or, if flows are controlled, minimal flow departure from a natural hydrograph.
- **PBF 2—*Spawning and Rearing Habitat.*** Streams and shoreline springs with gravel and cobble substrate at depths typically less than 4.3 ft. with adequate stream velocity to allow spawning to occur. Areas containing emergent vegetation adjacent to open water provides habitat for rearing and facilitates growth and survival of suckers, as well as protection from predation and protection from currents and turbulence.
- **PBF 3—*Food.*** Areas that contain abundant forage base, including a broad array of Chironomidae, crustaceans, and other aquatic macroinvertebrates.

Special Management Considerations

When designating critical habitat, the Services assesses whether the specific areas within the geographical area occupied by the species at the time of listing contain features that are essential to the conservation of the species, and which may require special management considerations or protection (USFWS, 2012, p. 73750). The final critical habitat rule for LRS and SNS identifies several special management considerations or protections for PBFs (USFWS, 2012, pp. 73750–73756). Both critical habitat units contain the same considerations/protections for both species and are as follows:

- Maintain water quality by preventing the deleterious effects of nuisance algal blooms, increased sedimentation, excess nutrients, and other factors affecting water quality.

- Maintain water quantity to prevent reductions in water levels that may limit access to spawning locations or refugia and reduce the depth of water used as cover and cause a lack of access to essential rearing habitat (i.e., marsh and wetland areas).
- Maintain gravel and cobble substrata to prevent the degradation of spawning, rearing, and adult habitat caused by past land management practices.
- Protect the forage base by management of nonnative fish to reduce competition for available forage with LRS and SNS and minimize predation on LRS and SNS.

6.6 Recovery

The LRS and SNS recovery plan was finalized in 1993 and a revised recovery plan for the LRS and SNS was finalized in 2013 (USFWS, 2013). A substantial amount of new information about the species became available making it appropriate to revise the plan to incorporate the new information into the recovery program. The goal of the recovery program is to arrest the decline and enhance LRS and SNS populations so that Endangered Species Act protections are no longer necessary. The 2013 revised recovery plan describes recovery objectives for the LRS and SNS:

Threat-based Objectives

- Restore or enhance spawning and rearing habitat in Upper Klamath Lake and Clear Lake Reservoir systems.
- Reduce negative impacts of poor water quality
- Clarify and reduce the effects of non-native organisms on all life stages
- Reduce the loss of individuals to entrainment
- Establish a redundancy and resiliency enhancement program

Demographic-based Objectives

- Maintain or increase larval production
- Increase juvenile survival and recruitment to spawning populations
- Protect existing and increase the number of recurring, successful spawning populations.

6.6.1 Recovery Units

The 2013 revised recovery plan for the LRS and the SNS identified two recovery units for both of the sucker species, and both recovery units have four management units (USFWS, 2013, pp. 40–41). Recovery cannot occur without viable populations in each recovery unit; however, this does not mean that each management unit has equivalent conservation value or is even necessary for species recovery. Viable populations are ones that are able to complete their life cycle regularly with recruitment and diverse age composition of the adult population.

The Upper Klamath Lake Recovery Unit is subdivided into four management units:

(1) Upper Klamath Lake river-spawning individuals;

(2) Upper Klamath Lake spring-spawning individuals (LRS only);

(3) Keno Reservoir Unit, including the area from Link River Dam to Keno Dam; and

(4) Reservoirs along the Klamath River downstream of Keno Dam, known as the Klamath River Management Unit. This Recovery Unit no longer exists as of February 2024 due to dam removal on the Klamath River.

The Lost River Recovery Unit is also subdivided into four management units:

(1) Clear Lake;

(2) Tule Lake;

(3) Gerber Reservoir (SNS only); and

(4) Lost River proper (mostly SNS).

The 2013 LRS and SNS Recovery Plan provided criteria to assess whether each species has been recovered are focused on reduction or elimination of threats, and demographic evidence that sucker populations are healthy (USFWS, 2013). The threats-based criteria for down-listing include: (1) restoring and enhancing habitats, including water quality; (2) reducing adverse effects from nonnative species; and (3) reducing losses from entrainment. To meet the population-based criteria for delisting each species must exhibit an increase in spawning population abundances over a sufficiently long period to indicate resilience, as well as establish spawning subpopulations within Upper Klamath Lake.

6.6.2 Conservation Efforts

Both species spawn successfully in the Williamson and Sprague rivers, producing larvae that drift downstream to Upper Klamath Lake. Captures of 1,000s to 10,000s of larvae from the Sprague and Williamson Rivers (M. Cooperman & Markle, 2003, pp. 1146–1147; Ellsworth & Martin, 2012, p. 32) conservatively suggest that combined larval production of both species is on the order of 1,000,000s; note that these numbers are rough estimates and not a characterization of inter-annual variation, which is also substantial. Successful spawning in the Williamson and Sprague suggests that the needs of both species for spawning access and suitable egg incubation habitat are at least minimally met, although available information does not permit comparisons with historical conditions.

Larval collection efforts for hatchery rearing have been variable in recent years. During the Spring of 2023, the Klamath Falls National Fish Hatchery staff collected a total of 6,036 larval sucker from the lower Williamson River, near the town of Chiloquin, Oregon. Staff spent a total of 19 collections days on the river between the dates of May 8th and June 12th, collecting a mix predominantly of LRS and SNS with some potential for limited numbers of Klamath Largescale sucker. By contrast, in 2024, collection numbers were up from the previous year with 30,150 larvae collected despite a second year of depressed spawning numbers. It is believed that a combination of factors, such as a late and colder than normal spring, a very wet winter and spring leading to increased flows and turbidity in the river, followed by sporadic water temperature fluctuations that quickly warmed more than normal, and reduced numbers of returning adults, all contributed to a poor spawning year and thereby reduced numbers of larval fish available for collections in 2023. It is noteworthy that during

2023, larval suckers were in limited supply in the Williamson River and staff could not collect the desired number of larvae to meet the target collection goal of at least 40,000 fish.

LRS also spawn successfully at groundwater seeps along the Upper Klamath Lake shoreline. No robust estimates of larval production at these sites exist but given the number of LRS females and average fecundity, it is likely that millions of larvae hatch annually, even with the expected high mortality of eggs. There is typically access to these areas between February and May; however, lake elevations above approximately 4,141.4 ft. to 4,142.0 ft. are unlikely to limit the number of spawning individuals, and the amount of time spent on the spawning grounds (Burdick et al., 2015b, pp. 487). The range of elevations reflects the reality that shoreline spawning occurs across a number of weeks in the spring, and the start and end dates of spawning also vary interannually. This variance is due to multiple factors, such as lake elevation, temperature, and fish behavior (Burdick et al., 2015, p. 483). Due to this temporal variability, suckers may experience a range of elevations as spring snowmelt runoff raises lake elevations between the start and end of spawning.

Although numerous larvae are produced annually, the number of juveniles captured during sampling efforts is low and typically decreases to nearly zero in late summer. Very few individuals are captured as age-1 or older (Burdick & Martin, 2017, p. 30), suggesting complete cohort failure each year. The declines in captures commonly occur during the periods with the most degraded water quality conditions in Upper Klamath Lake, but a clear empirical link between water quality parameters and mortality rates has not been established. One prominent hypothesis is that water quality is directly responsible for the unnaturally high levels of juvenile mortality. Another is that water quality interacts with other sources of mortality by causing chronic stress that renders the individuals more susceptible to forms of predation or infection (USFWS, 2019, pp. 21–41). The specific causes of repeated cohort failure at the juvenile stage are a critical uncertainty challenging recovery because juvenile mortality is the primary factor that contributes to the low resilience of both LRS and SNS populations in Upper Klamath Lake.

Even though viable eggs and larvae are produced each year, there is a lack of recruitment of new adults into Upper Klamath Lake sucker populations, which continue to exist only because of their long life. Although the Service does not know specifically how this current uniform age distribution compares to historical conditions, healthy adult populations of long-lived species should generally possess multiple reproducing year-classes. Both species are expected to become extirpated from Upper Klamath Lake without significant recruitment, but the current dynamics are particularly untenable for the SNS. In 2018, it was posited that without substantial recruitment in the next decade, the SNS population will be so small that it is unlikely to persist without intervention (Rasmussen and Childress 2018 p. 586). Recent population data suggest that both sucker populations have seen considerable declines during the ensuing period (Krause & Paul-Wilson, 2024), highlighting the importance of the captive rearing and captive breeding programs at Klamath Falls National Fish Hatchery and the Klamath Tribes rearing facility to overcome the ongoing lack of recruitment in Upper Klamath Lake.

The Service started the sucker assisted rearing program for LRS and SNS in 2015 to augment populations in Upper Klamath Lake. The program has expanded, and in 2021, the rearing facility received designation as the Klamath Falls National Fish Hatchery. Since 2018, the

Service has released approximately 76,826 production size (age 2 + suckers that are approximately 200 mm) suckers into Upper Klamath Lake. Juvenile suckers grow rapidly until reaching sexual maturity sometime between four and nine years of age for LRS and between four and six years of age for SNS (Perkins, Scoppettone, et al., 2000, pp. 21–22). Less than 5,000 juvenile suckers were released each year, during the first few years (2016 to 2018) of the rearing program but production numbers have grown to over 15,000 juveniles released in 2020. It takes LRS and SNS more than four years to reach sexual maturity; therefore, juveniles released during the early years of the rearing program have only recently been encountered on the Williamson and Sprague Rivers PIT tag arrays. Preliminary data suggest a 1.4 percent return on the juvenile sucker year classes, released during 2016 to 2020, of approximately 42,000 juvenile suckers (M. Yost, USFWS, personal communication October 24, 2024). Therefore, approximately 580 of the 42,000 suckers released from the rearing program have been encountered on the Williamson and Sprague Rivers PIT tag arrays during spawning migration.

Summary

Significant efforts to increase the quality of the habitat for sucker, including restoration and sucker assisted rearing programs have contributed to preventing extinction of the species in Upper Klamath Basin since the species were listed. These efforts have resulted in a number of restoration efforts and the release of approximately 76,826 production size (age 2 + suckers that are approximately 200 mm) suckers into Upper Klamath Lake, but have not reversed the decline in species status.

7 ENVIRONMENTAL BASELINE

The regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as "the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline" (50 CFR § 402.02).

7.1 Status of the Species in the Action Area

7.1.1 Habitat Characteristics

The action area encompasses the Keno Reservoir impoundment (including Lake Ewauna and the Klamath River), approximately 300 meters (985 ft.) of upland area on both sides of the river, the KDD infrastructure that will be upgraded and improved by the proposed action, KDD operated rights-of-way and easements that will be used for construction staging and access, and the Lower Klamath National Wildlife Refuge (Figure 2). The action area consists of a complex of interconnected river, canals, lakes, marshes, dams, diversions, wildlife refuge areas, and agricultural lands in Klamath County, Oregon. The habitat in the action area is a highly altered system that consists of a complex network of water storage, diversions, and conveyance features including the Klamath River, dams, canals, laterals, and drains. This water conveyance system provides water for agricultural use within KDD. Irrigation return flows and local runoff is

collected from irrigated lands through drains. Pumping plants are used to convey irrigation and drainage water to different portions of the district and back to the Klamath River.

Habitat conditions are poor within the KDD water conveyance system. The canals and laterals that make up the system are linear, shallow narrow features with little to no habitat diversity. These features lack structures such as large woody debris, boulders, rocks, and gravel. Check dams, water withdrawals, and diversions create numerous obstacles for aquatic species. Canals and laterals are predominantly dewatered during the non-irrigation season (October1 to February 28). High macrophyte density in the Klamath Straits Drain provides some cover for aquatic species. However, Klamath Straits Drain water is listed as impaired for nutrients and pH, and it is likely that water within the canals and laterals of the system are similarly impaired (ODEQ, 2024; Parametrix, 2025, p. 28). Additionally, the Keno Reservoir reach is also on the list of impaired waters for ammonia, arsenic, chlorophyll-a, DO, pH, and harmful algal blooms.

The average depth of Keno Reservoir is 7.5 feet a maximum depth of 20 feet. Water levels are normally maintained to within a 0.5-foot range (4,086.0 – 4,086.5 feet) by operations at Link River and Keno Dams (USBR 2024). Keno Reservoir has a surface area of 2,475 acres at 4,085 feet surface elevation and a total storage capacity of 18,500 acre-feet (PacifiCorp, 2013, p. 17). Quantities of water are also diverted from, and discharged to, Keno Reservoir from four facilities, including the Lost River diversion channel, North Canal, Klamath Straits Drain, and the Ady Canal. In addition to these four facilities, there are numerous smaller water permits and claims along the Keno Reservoir, mostly for irrigation on adjacent privately owned agricultural lands. Surface elevation of Keno Reservoir remains relatively constant most of the year. However, every one to two years, the reservoir is drawn down about 2 feet for approximately one to four days, so that irrigators can conduct maintenance on their pumps and clean out their water withdrawal system before irrigation season begins.

The upland terrestrial habitats adjacent to the Klamath River within the action area are fragmented by agricultural fields and roadways and generally consist of a herbaceously vegetated 25- to 100-foot-wide strip of land. Herbaceous vegetation generally consists of non-native grasses such as reed canary grass and cheatgrass. The action area lacks forested and shrub-scrub areas.

The Project location for the North Canal fish screen, consists of a steeply inclined levee that is heavily vegetated. The upland terrestrial habitat along the rest of the KDD water conveyance system is of low quality, as these areas are moderately disturbed by operations and maintenance of pumps in addition to vegetation clearing within and adjacent to the canals and agricultural lands.

Riparian areas and floodplains have largely been developed with agriculture, resulting in a loss of backwater and wetland environments. A large swath of relatively intact wetlands are present along the eastern bank of the Klamath River within the action area. The stability in water levels in the Keno Reservoir inhibits the development of additional wetland habitats and degrades existing wetlands (Middleton, 1999).

7.1.2 Existing Conditions

The Klamath River within the action area is impounded at Keno dam (approximately 10 miles downstream of the North Canal) which maintains water levels at 4,086.5 ft. (USBR, 2025). The Keno Reservoir is characterized as a generally wide, shallow body of water. The riparian areas

and floodplains in the action area have largely been developed with agriculture, resulting in the loss of backwater and wetland environments. However, there is a relatively intact large swath of wetlands along the eastern bank of the Klamath River downstream of the North Canal, within the action area. The development of additional wetlands is inhibited, and the existing wetlands have been degraded due the relative stability in water surface elevation (Middleton 1999).

Loss and alteration of habitats (including spawning and rearing habitats) were major factors leading to the listing of both species (USFWS, 1988, pp. 27131–27132) and continue to be significant challenges to recovery. Both species utilize a spectrum of aquatic habitats during different stages of the life cycle, including river or stream habitats, open-water lake habitats, and wetland areas along banks and shores. However, alterations or total loss of habitats have occurred throughout the species' range. There is little wetland habitat for use by rearing larvae and juveniles in Keno Reservoir because of past diking and draining, and the water management operations that result in stable reservoir water levels. The lack of wetland habitat increases competition between larval and juvenile suckers. It also increases competition between, and predation risk from, the large numbers of non-native fish including fathead minnows (USFWS 2020).

The average depth of Keno Reservoir is 7.5 feet with a maximum depth of 20 feet. Water levels are normally maintained within a 0.5-foot range by the Keno Dam. Summer water quality is generally poor, with high temperatures, high pH, and low DO (Kirk et al., 2010; Sullivan et al., 2008, 2011; Sullivan, Annett et al., 2009). Dissolved oxygen levels of less than 1 mg/L, well below levels generally recognized as harmful to fish, occur regularly (Kirk et al., 2010). Water quality is also degraded in the reservoir by nutrient-rich agricultural return flows entering the reservoir at the Straits Drain, and from the Lost River Diversion Channel in winter and spring (Kirk et al., 2010).

7.1.2.1 *Water Quality*

Water quality within the Keno Reservoir is listed as impaired for chlorophyll-*a*, DO, pH, arsenic, ammonia, and harmful algal blooms (ODEQ, 2024). Blue-green algae are the primary driver of water quality dynamics in this reach during the summer months. Blue-green algae and associated nutrients are imported into the reservoir from Upper Klamath Lake and irrigation return flows. Dissolved oxygen typically reaches very low levels beginning in July through October as the algae blooms start to die off. Nutrient abundance in this reach is controlled by inputs from Upper Klamath Lake, the Lost River Diversion Channel, and Klamath Straits Drain. Upper Klamath Lake was historically a eutrophic lake owing to the underlying geology of the Upper Klamath Basin that consists of young volcanic rocks with relatively high levels of phosphorus. Currently, Upper Klamath Lake is hypereutrophic due to agricultural practices and the loss and degradation of adjacent wetlands. Blue-green algae blooms further contribute to nutrient impairment due to the ability to fix nitrogen by *Aphanizomenon flos-aquae* (AFA), a species of blue green algae. Nutrient and organic matter input from the Lost River Diversion Channel and Klamath Straits Drain are further sources of water quality impairment in the Klamath River.

Cyanobacteria

Cyanobacteria, such as AFA, are relevant to the sucker environmental baseline because the massive annual bloom and subsequent crash dynamics are the primary driver of most water quality dynamics in Upper Klamath Lake and Keno Reservoir during the high stress period of the summer months. Summertime blooms of AFA dominate Upper Klamath Lake phytoplankton

communities due to excessive phosphorus loading linked to watershed development. Water quality dynamics in Keno Reservoir/Lake Ewauna are largely due to cyanobacterial biomass imported into the system from Upper Klamath Lake in summer.

Cyanotoxins represent a potentially direct effect from cyanobacteria to suckers, in particular microcystin, a liver toxin produced by the cyanobacterium *Microcystis aeruginosa*. Microcystin may enter suckers orally through the gut as they consume midge larvae containing the toxin, rather than exposure to dissolved toxins in the gills (VanderKooi et al., 2010, p. 2). Due to the limited capacity of fish to detoxify microcystins, fish suffer from sub-lethal effects or succumb to the toxic effects of elevated microcystin concentrations. Because microcystin is a highly stable compound, persisting in situ for months, it potentially could accumulate in fish tissues and in aquatic biota. However, direct consumption of cell-bound microcystin by suckers in Upper Klamath Lake during the mesocosm study did not explain mortality or directly impact survival in those fish (Burdick et al., 2020, p. 261).

Dissolved Oxygen

Dissolved oxygen concentrations within water depend on several factors, including water temperature (colder water absorbs more oxygen), water depth and volume, atmospheric pressure, salinity, photosynthesis, and the activity of organisms that depend upon dissolved oxygen for respiration. In the waters of the Upper Klamath Basin, dissolved oxygen available for respiratory consumption by suckers is strongly influenced by the bloom and crash dynamics of phytoplankton communities, which in turn depend largely on availability of nitrogen and phosphorus. Within Upper Klamath Lake, low DO concentrations occur most frequently in August, the period of declining cyanobacterial blooms with associated decomposition and warm water temperatures in the lake. Downstream in Keno Reservoir, DO typically reaches very low levels from July through October as cyanobacteria transported from UKL settle out of the water and decay; these low-DO events can last for extended periods. Organic matter and nutrient inputs, which promote primary productivity, from the Lost River basin via the Klamath Straits Drain and the Lost River Diversion Channel also contribute to low DO levels in this reach. Relatively low water levels, combined with concomitant warm water temperatures in summer, may result in low dissolved oxygen concentrations in Lower Klamath National Wildlife Refuge (unpublished data).

Ammomia Toxicity

Low DO events are often associated with high levels of un-ionized ammonia, which can be toxic to fish. Ammonia toxicity is complex because it is a function of total ammonia nitrogen concentration, pH, and temperature. The toxic form, ammonia, is most prevalent at higher pH. Ammonia concentrations in Upper Klamath Lake can be high enough to threaten suckers (Burdick et al. 2015a p. 6). Total ammonia nitrogen concentrations in the Keno Reservoir frequently exceed Oregon's chronic criteria from June to September and can exceed the acute criteria in both June and September (ODEQ 2017 p. 48). These degraded conditions can occur throughout much of the 20-mile-long reservoir, with better conditions only in the uppermost and lowermost reaches.

pH

In the Upper Klamath Basin, summertime pH levels are elevated above neutral. Extended periods of higher pH are associated with large summer cyanobacterial blooms in Upper Klamath Lake. Generally, pH in the reach from Link River Dam through the Keno Reservoir increases from spring to early summer and decreases in the fall; however, there are site-dependent variations in the observed trend.

Water Temperature

Water temperatures in the Klamath Basin vary seasonally and by location. In the Upper Klamath Basin, water temperatures are typically very warm in summer months as ambient air temperatures heat surface waters. Both Upper Klamath Lake and Keno Reservoir may undergo periods of intermittent, weak summertime thermal stratification, but water temperatures in these water bodies are predominantly similar throughout the water column. Although maximum water temperatures do not typically exceed the acute thermal tolerance of endangered suckers in either lake, they may cause stress to suckers in the hottest months leading to reduced growth and/or increased susceptibility to other stressors. Increasing temperature has many potential indirect effects, including reducing DO concentrations, increasing total ammonia-nitrogen, increasing growth rates of pathogens, and requiring greater energy demands from fish, and thus is an exacerbating factor.

Nutrients

Concentrations of primary plant nutrients, including nitrogen and phosphorus, in lakes are affected by the geology of the surrounding watershed, upland land uses, and physical processes within the lake and its tributaries. The ability of riparian and floodplain habitats to retain or alter nutrients throughout the system is degraded as a result of ditches, dikes, and levees that promote drainage or prevent overbank flows. Keno Reservoir is hypereutrophic system due to human modifications to the environment. The relatively high levels of phosphorus present in the Upper Klamath Basin's young volcanic rocks and soils are a major contributor to phosphorus loading to the lake. Land use within the watershed increases inputs through soil erosion, pasture runoff, and irrigation return flows. Upper Klamath Lake is a major source of nitrogen and phosphorus loading to the Klamath River, primarily due to nitrogen fixation by AFA. Nutrient and organic matter inputs from the Lost River Basin via Klamath Straits Drain and the Lost River Diversion Channel are also an important source of nutrients to the Keno Reservoir and Klamath River below.

Climate

The climate of the Klamath Basin is classified by the Köppen-Geiger system as temperate with dry, warm summers, also known as a warm-summer Mediterranean climate (Peel et al., 2007). With this climate most of the precipitation falls in the form of snow during the winter. The climate of the Klamath Basin naturally fluctuates between wet and dry periods over a scale of years to decades. Droughts are of particular interest because of their influence on lake and reservoir elevations, which can affect suckers in a variety of ways.

For longer-term droughts (6-20 years), the decade of the 1930s ranks among the driest in nearly 500 years (Malevich et al., 2013). It is unclear how longer-term droughts affect the species, but these have the potential of affecting population-level dynamics such as persistent reduction in spawning production or other broad habitat modifications.

Prolonged drought conditions are becoming more frequent across the western U.S., (Dettinger et al., 2015; Mote et al., 2018; Overpeck & Udall, 2020) and these droughts create situations in which antecedent dryness can contribute to declining trends in overall hydrology across any given hydrologic basin. In the Klamath Basin, sufficient winter snowpack and runoff are relied upon to ensure refill of Upper Klamath Lake, a shallow lake that the Keno Reservoir relies upon as its primary sources of water supply.

7.1.3 Condition of Species

LRS and SNS in Keno Reservoir are from the upstream source populations in Upper Klamath Lake. They have drifted downstream from, or were entrained at, the Link River and Keno Dams. The Klamath River contains no known spawning habitat between the mouth of the Link River and Keno Dam (Buchanan et al., 2011). Spawning of LRS and SNS has not been documented in Keno Reservoir, though there is an anecdotal report of spawning behaviors in the Link River (Smith & Tinniswood, 2007, p. 1).

Upon entering Lake Ewauna/Keno Reservoir, there are three possible outcomes from surviving suckers: 1) they remain in the lake or reservoir, 2) they drift downstream past the Keno Dam, or 3) on rare occasions they return to the Link River and possibly back upstream to Upper Klamath Lake.

Small numbers of the LRS and the SNS reside in the Keno Reservoir (Desjardins & Markle, 2000; Korson et al., 2008; Kyger & Wilkens, 2011). Poor habitat conditions, nonnative fishes, and a lack of successful reproduction are thought to be responsible for the small numbers of LRS and SNS present in the Keno reservoir (Desjardins & Markle, 2000; Piaskowski, 2003). Though abundance does not appear high in the reservoir, it is likely Keno Reservoir regularly receives larval and juvenile fish from Upper Klamath Lake. The Upper Klamath Lake gyre suggests that Upper Klamath Lake water around the eastside spawning springs would carry emerging larvae south, towards the outlet of the lake.

Few larvae and juveniles survive to become adults in the reservoir. The poor water quality conditions likely restrict year-round use to the upper portions of the reservoir, near the Link River where water quality is better. Poor water quality in July and August results in stressful and lethal dissolved oxygen levels (Kirk et al., 2010; Piaskowski, 2003) affecting juvenile sucker survival.

The loss of larval and juvenile suckers also occurs through entrainment at irrigation diversions in Keno Reservoir. Major diversions include the Lost River Diversion Channel, North Canal, and Ady Canal. In addition, there are numerous smaller irrigation diversions in Keno Reservoir and the drains that enter the reservoir, including the Klamath Straits Drain.

The relatively low abundance of juvenile suckers in Keno Reservoir, suggests other ecological factors are challenging these fish in addition to poor water quality. Lack of physical habitat in the reservoir is one such ecological pressure. Keno Reservoir is essentially a long, narrow, slow-moving lake, with little fluctuation throughout the year. The stabilization of flow has led to siltation and excess growth of emergent vegetation in the channels within wetlands, causing a loss of connectivity between the interior portions of the wetland and the reservoir. Furthermore, over 66 percent of the historical wetland habitat in the Keno Reservoir and the historic Lower Klamath Lake have been drained and converted for agricultural production since the early 1900's.

The Tule Smoke Marsh is one of the few remaining historical marshes in the Keno Reservoir and is approximately 1,700-acre tract located on the east side of the reservoir, bordered by North Canal and Ady Canal and owned by the Tule Smoke Hunt Club. Fish and water quality monitoring were conducted in and around Tule Smoke Marsh in 2010 following restoration activities that removed silt from the interior marsh channels to restore connectivity with Keno Reservoir. The sampling effort resulting in the capture of 3,542 native fish which, includes only 70 suckers (Phillips et al., 2011, p. 4).

Of the 70 suckers captured, 53 (82 percent) were captured inside the Tule Smoke Marsh where most of the sampling was conducted. The catch per unit of effort was highest in the fringe habitat (0.38 suckers per hour), followed by open water (0.11 suckers per hour) and interior marsh (0.03 suckers per hour) (Phillips et al., 2011, p. 5). 58 of the 70 suckers captured were captured at the beginning of the study during the weeks of July 26, 2010 (12 suckers) and August 2, 2010 (46), when sampling was switched from overnight net sets to daytime net sets due to a decrease in water quality (Phillips et al., 2011, p. 9). The data suggests that very few suckers remain in the area when water quality decreases.

Larvae and juveniles younger than a year are generally most abundant in the upper part of Keno Reservoir near the terminus of the Link River and abundance decreases as you move downstream (Terwilliger et al., 2004). Several hundred adults from both species have been captured and tagged in Lake Ewauna near the confluence of the Link River (Kyger & Wilkens, 2011). There are no firm population estimates for Keno Reservoir, but the combined population of both species is estimated at 1,000 adults.

Based on the capture data for juvenile suckers in the Tule Smoke Marsh, densities of age-0 suckers in the action area are low. According to Phillips et al. (2011) 70 suckers were captured over a nine-week period with a total of 76 net sets throughout 1,700 acres of habitat. Based on these catches, densities for both suckers combined, the Service estimates that approximately 0.04 fish/acre in Tule Smoke Marsh in late summer and early fall. This estimate was calculated using the total number of suckers capture (70) and dividing that by the area sampled (1,700 acres). The Service estimated the number of juvenile LRS and SNS in the action area by extrapolating this data. Keno Reservoir is estimated to be 2,275 acres therefore, the Service estimates that 91 juvenile suckers (2,275 acres x 0.04 fish/acre) are likely to be present in the action area during the in-water work time frame.

7.1.4 Previous Consultations

Consulted on effects are an important component of characterizing the existing conditions of LRS and SNS and their environmental baseline in the action area. Although there are numerous actions in the Klamath River Basin where section 7 consultation has been completed, only the key projects most closely tied to the environmental baseline in the action area and the proposed action are addressed below.

The most significant action currently affecting the endangered suckers is the continued operation of the Bureau of Reclamation's Klamath Project. Additional actions associated with the action area include PacificCorp HCP, the surrender and decommissioning of the Lower Klamath Hydroelectric Project No. 14803, and conservation actions described below.

7.1.4.1 *The Klamath Project*

The Bureau of Reclamation manages several reservoirs in the upper Klamath Basin to provide water for the 250,000-acre Klamath Project (2022-0020519-S7-R002), which was established in 1905 as the second federal water project in the nation. The Bureau of Reclamation has consulted with the Service multiple times on the Klamath Project operations since 1991. KDD is part of the Klamath Project that is operated through recurring actions that affect water management in the Klamath Basin. The effects of the Klamath Project to suckers include entrainment, alteration of habitat, and water quantity and quality. However, some of the past actions included aspects that resulted in adjustments on the landscape, and those elements are described here. The Service has analyzed levels of lethal take for all life stages (30,000 eggs, 135,438 larvae, 2,263 juveniles, and 259 adults) of LRS and SNS as a result of past and ongoing activities associated with the Klamath Project and concluded that these levels did not cause jeopardy. Accordingly, the Service issued incidental take statements for these levels of take to Reclamation.

Most of the physical structures that are part of the Klamath Project (e.g., dams, canals, diversion points, etc.) were created prior to passage of the Act and listing of the SNS and LRS. Those physical structures altered the nature of the habitat both upstream and downstream. For example, habitat below Clear Lake Dam no longer functions as a migration corridor for spawning individuals because of impassable barriers and does not provide optimal habitat for out-migrating larvae given the unnatural flow patterns through the system. Conversely, the habitat above the dam has changed from a system with a large, vegetated wetland associated with open water prior to the dam to a nearly homogenous open-water system with few emergent plants in most years.

A number of conservation actions have been undertaken as part of Reclamation's project operations such as screening of irrigation diversions, installation of a fish ladder at Link River Dam, and assisted rearing of LRS and SNS.

7.1.4.2 *PacifiCorp HCP*

PacifiCorp finalized a Habitat Conservation Plan (HCP) for LRS and SNS in November 2013 (PacifiCorp, 2013) in accordance with section 10(a)(1)(B) of the Act. In response to this plan, the Service conducted an intra-service consultation (08EKLA00-2013-F-0043) on the effects to suckers from the authorization of the plan.

The HCP addressed direct effects to suckers, including entrainment at project diversions, false attraction at Project tailraces, ramp rates, lake level fluctuations, migration barriers, loss of habitat, and water quality, as well as effects to sucker critical habitat (PacifiCorp, 2013). Additionally, the HCP proposed the shutdown of the East Side and West Side facilities to reduce sucker mortality resulting from entrainment into the canals (PacifiCorp 2013). PacifiCorp established a Sucker Conservation Fund to support sucker conservation goals and objectives, and committed to continue support of the Nature Conservancy's Williamson River Delta Restoration Project (PacifiCorp 2013). These commitments included $100,000 to the fund and annual funding of about $20,000 to the Nature Conservancy over a ten-year period, as well as in-kind costs to implement management actions and monitoring (PacifiCorp 2013). This funding was provided and expended on priority projects identified in coordination with PacifiCorp and federal and state agency experts.

Implementation of the HCP required an Incidental Take Permit (Permit No. TE 52096A-0) from the Service under the Act. PacifiCorp operations at numerous facilities along the Link and Klamath Rivers were covered. There was a partial transfer and extension of this Incidental Take Permit and the associated HCP in 2023 to the Klamath River Renewal Corporation as part of the

transfer and surrender of the Lower Klamath Hydroelectric Project license. The permit called for authorization of lethal take of both species over a 10-year period, including 10,000 eggs, 66,000 larvae, 500 juveniles, and five adults. Additionally, harassment of 1,400,000 larvae, 6,700 juveniles, and 25 adults was included. However, much of the take was eliminated when PacifiCorp ceased operation of the East Side and West Side facilities. The Service determined that issuance of the Incidental Take Permit for the HCP was not likely to jeopardize the continued existence of the LRS or SNS and was not likely to destroy or adversely modify critical habitat for the species.

7.1.4.3 *Surrender and Decommissioning of the Lower Klamath Hydroelectric Project No.14803*

The KRRC began the decommissioning and removal of the Lower Klamath Hydroelectric Project dams (J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate) in 2023. The Lower Klamath Project consists of removing four of the mainstem Klamath River hydroelectric facilities, as well as the associated buildings and other infrastructure. The removal of the four hydroelectric dams was completed fall of 2024. The Klamath River is now free flowing from Keno Reservoir in Oregon through the former location of Iron Gate Dam in California to the mouth at the Pacific Ocean. Prior to the start of dam removal, NMFS and the Service completed ESA section 7 consultations (08EYRE-2021-F-0127) with the Federal Energy Regulatory Commission on the separate action of dam removal in the Klamath River and produced non-jeopardy biological opinions, accompanied by associated incidental take statements. The Service estimated that the action would result in the incidental take of 5,540 adults, 2,825 juveniles, and 365,229 larval LRS and SNS and the removal of 107,470 acre-feet of occupied reservoir habitat.

The proposed action for dam removal included a conservation measure of translocating adult sucker prior to reservoir drawdown and dam removal. Prior to dam removal, the KRRC, with logistical support from the Service, CDFW, ODFW, and the Klamath Tribes, mounted a capture and translocation efforts in the hydroelectric reach. Translocation efforts recovered 132 adult and 137 juvenile (< 350 mm) suckers ahead of the drawdown (215 shortnose suckers and 54 Lost River suckers). The recovered fish were transported to two locations: two ponds at the Lower Klamath National Wildlife Refuge and the Klamath Tribes Aquaculture Facility. There were 84 adult, and 97 juvenile suckers transported to the Lower Klamath National Wildlife Refuge ponds, of which 180 were shortnose suckers and one was a Lost River sucker, with the remaining individuals being transported to the Klamath Tribal Facility. The fish in the Lower Klamath National Wildlife Refuge ponds and the Klamath Tribes Aquaculture Facility were re-patriated to the Sprague River and Upper Klamath Lake in 2023.

LRS and SNS are lake dwelling suckers and will likely not persist in the Klamath River below Keno Dam now that dams have been removed, and the restoration of the hydroelectric reach has begun. Spawning by listed suckers below Keno dam is not known or documented; therefore, any suckers that may have been in the reservoirs prior to dam removal, or who might enter the river after dam removal, very likely originated upstream of Keno Dam and will likely not persist in the Klamath River below Keno Dam. These reservoirs were considered population sinks for these species because they lack spawning habitat, and LRS and SNS that inhabited the reservoirs did not represent self-sustaining populations. Reservoir habitat has been removed along with the dam removal. The remaining occupied habitat in the Upper Klamath Recovery Unit, and the range of the species, will not be impacted by this project and will remain available for the foreseeable

future. These upstream habitats provide suitable conditions and opportunities for spawning and rearing that contributes to the survival and recovery of the species.

7.1.4.4 *Scientific Research*

In 2024, the Service consulted (2024-0132350) on the effects to LRS and SNS of issuing scientific permits for the purpose of promoting recovery of the species under section 10(a)(1)(A) of the Act. The consultation addressed purposeful take of the species using a variety of scientific collection techniques, marking, transport and relocation, and biological sampling. Incidental take authorized as part of scientific research includes purposeful lethal take of 10 adults, 100 juveniles, 10,000 larvae, and 10,000 eggs per species. Additionally, non-lethal harm of 20 adults, 40 juveniles, 5,000 larvae, and 10,000 eggs pre species was authorized in a single year. The Service considered the effects of the issuance of scientific permits (as currently proposed) on the reproduction, abundance, and distribution of the species, as well as how the aggregation of these effects will affect the overall survival and recovery of the species. The Service determined that the action was not likely to jeopardize the continued existence of the LRS and SNS, nor adversely modify the designated critical habitat of the species.

7.1.4.4.1 Summary of Incidental Take from Prior Consultations

The Service has previously consulted on a number of projects in the action area including, the Klamath Project, PacifiCorp habitat conservation plan, decommissioning of the Lower Klamath Hydroelectric project, and scientific research. The prior incidental take for these actions has contributed to the condition of the species in the action area.

The decommissioning and removal of the four Lower Klamath Hydroelectric project dams resulted in the removal of those populations. Those populations were likely sinks, with new individuals generally being spawned elsewhere in the system, such as Upper Klamath Lake. None of these sink populations were thought to have contributed significantly to maintaining and recovering LRS and SNS because they had extremely low resiliency due to a combination of degraded habitat, low numbers, and restricted access to suitable spawning habitat (Desjardins and Markle 2000 pp. 14-15, Hodge and Buettner 2009 pp. 4-6, Kyger and Wilkens 2011 p. 3). The Klamath Project and the PacifiCorp HCP have contributed to LRS and SNS population abundance. However, the decreasing abundance and increasing age of the adult population in Upper Klamath Lake is consistent with a lack of recruitment of juvenile suckers into the adult population (Krause et al. 2022, p. 1429). Although numerous larvae are produced annually, the number of juveniles captured during sampling efforts is low and typically decreases to nearly zero in late summer. Very few individuals are captured as age-1 or older (Burdick & Martin, 2017, p. 30), suggesting complete cohort failure each year. Recruitment failure is the cause of LRS and SNS population declines in Upper Klamath Lake and not the result of past incidental take.

7.1.5 Recovery in the Action Area

There are several small habitat restoration projects within the action area on private lands. The Partners for Fish and Wildlife Program work with landowners to conserve and improve habitat for fish and wildlife. The Partners for Fish and Wildlife projects in the action area include wetland and marsh habitat creation and restoration that provides important habitat for LRS and SNS. Wetland restoration has the potential to result in improvements to water quality, due to the role of wetlands as a filtering system, removing sediments, nutrients and pollutants from the water. Habitat restoration will increase the amount and quality of areas important to complete

sucker life cycles. Water quality improvement projects will work towards addressing a major factor limiting listed sucker recovery in the basin. If water quality is improved in the Keno reservoir, this area has the potential to support a substantial population of adult suckers and/or provide habitat to support larval and juvenile suckers that eventually will return to Upper Klamath Lake as adults for spawning.

7.1.5.1 *Klamath Basin Sucker Assisted Rearing Program*

Though outside of the action area the Sucker Assisted Rearing Program augments LRS and SNS populations in Upper Klamath Lake which is the source for sucker populations within the Keno Reservoir reach. As mentioned in section 6.5.2 *Conservation Efforts,* the Service started an assisted rearing program for LRS and SNS in 2015 to supplement populations in Upper Klamath Lake through augmentation. The primary target of the effort was SNS, but the lack of an effective way to identify live larvae and juveniles means that both species, as well as a conspecific, the Klamath largescale sucker (*Catostomus snyderi*), are collected and reared before repatriation to Upper Klamath Lake. In 2013, the Bureau of Reclamation agreed to fund such a program to assist with sucker recovery with a 10-year target of releasing a total of 8,000 to 10,000 suckers with lengths of at least 200 mm annually. The Service has expanded funding of the program, and in 2021, the rearing facility received designation as a national fish hatchery. Construction is currently underway on an expansion and modernization of the facility with an expected completion date of 2026, at which time the facility would be capable of producing 60,000 captively reared LRS and SNS annually and maintain broodstock for captive propagation. Since 2018, the Service has released approximately 76,826 production sized suckers into Upper Klamath Lake.

The program was designed to maximize retention of genetic diversity and maintain natural behaviors post-release as much as possible (Day et al., 2017). Larvae are collected as they drift downstream in the Williamson River, so the effects of artificial breeding are avoided during this process. Collection efforts are currently spread across the drift season to maximize the genetic variability. Juveniles are stocked into semi-natural ponds and growth depends on a combination of natural and artificial feed. The program has been stocking juvenile suckers into net pens in Upper Klamath Lake and Gerber Reservoir for and extended grow out period prior to being stocked into Upper Klamath Lake. The Gerber net pen successfully raised 1,317 juvenile suckers in 2024 with a survival rate of over 96 percent. Additionally, the program has been conducting experimental incubation trials of collected and fertilized gametes from wild adult LRS spring spawners. In 2024, a total of twelve female LRS were crossed with four males each and one female was crossed with only two male LRS, for a total of 50 family groups collected overall. The Klamath Falls National Fish Hatchery (KFNFH), and the Klamath Tribal Hatchery collected and fertilized a total of 78,435 eggs were collected for production and 56,458 fry were hatched for broodstock and production fish (M. Yost, USFWS, personal communication October 24, 2024). The successful efforts of the hatchery experimental incubation have helped to standardized methods for captive spawning and incubation.

Development of a captive broodstock program began in 2017 to address the possibility that assisted spawning will be necessary in the future. Each year from 2017 to 2024, a random sample of juveniles were selected and are being maintained at the hatchery as broodstock. A genetic management plan is currently being produced to address any concerns with future genetic diversity of broodstock being held at the KFNFH. In 2025, KFNFH collected and fertilized

approximately 122,293 eggs for production from LRS at the eastside springs in Upper Klamath Lake and hatched 62,022 larvae from 46 family group crosses. Of these larvae approximately 53,992 fry were transferred to hatchery ponds for grow out in early summer. Additionally, KFNFH collected and fertilized approximately 83,452 eggs and hatched 44,589 larval SNS captive broodstock from 22 family group crosses. This effort resulted in ponding approximately 23,781 SNS fry for grow out. Approximately 25,336 LRS eggs were collected and fertilized from KFNFH captive broodstock resulting in 5,591 larvae from 8 family group crosses. Unfortunately, none of these larval fish survived early rearing to be ponded. However, this is the first year on record that the hatchery successfully spawned captive broodstock and eastside springs fish and raised viable fry to use for production fish in grow out ponds.

Another component of the program is seasonally rehabilitating salvaged suckers that were entrained in the forebay of the A-Canal headworks and other unscreened diversions and canals of the Klamath Project. Reclamation salvages suckers from canals and transports them to the Services hatchery, where they are placed in temporary isolation, treated using chemical therapeutants, scanned for a PIT tag, PIT-tagged if untagged, and weighted and measured to length. These wild, salvaged suckers were repatriated back to Upper Klamath Lake by hatchery staff. Since 2018, the Service has treated and repatriated a total of 7,336 salvaged suckers. This cooperative effort is important since these wild fish are some of the few suckers aged 0-2 that have survived until the late summer, fall, or early winter of each year and were encountered and found. It may be that these fish have a greater likelihood of surviving into adulthood and rehabilitating them may represent an important sucker conservation measure.

The first release of reared suckers into Upper Klamath Lake occurred in spring 2016, and the proportion of released individuals that will join the spawning population is being analyzed. Less than 5,000 juvenile suckers were released each year, during the first few years (2016 to 2018) of the rearing program but production numbers have grown to over 15,000 juveniles released in 2020. It takes LRS and SNS more than four years to reach sexual maturity therefore, juveniles released during the early years of the rearing program have only recently been encountered on the Williamson and Sprague Rivers PIT tag arrays. Preliminary data suggest a 1.4 percent return on the juvenile sucker year classes, released during 2016 to 2020, of approximately 42,000 juvenile suckers (M. Yost, USFWS, personal communication October 24, 2024). Therefore, approximately 580 of the 42,000 suckers released from the rearing program have been encountered on the Williamson and Sprague Rivers PIT tag arrays during spawning migration. Thus, the assisted rearing program is likely to be a source of recruitment for both SNS and LRS in Upper Klamath Lake, but the specific impact on population trajectories will be uncertain until information on survival and recruitment probabilities of released individuals has been fully analyzed.

7.2 Status of Critical Habitat in the Action Area

The action area is located within LRS and SNS designated Critical Habitat Unit 1, situated in Klamath County, Oregon. The area of critical habitat inside the action area is the Keno impoundment section of the Klamath River above Keno Dam. The action area encompasses approximately 21 river miles from the mouth of the Link River (river mile 252) and Lake Ewauna downstream to Keno Dam (river mile 231). These areas encompass habitat that has been determined to contain the physical and biological features that are essential to the conservation of the LRS and SNS.

Much of the information regarding the environmental baseline for the critical for LRS and SNS is similar to the that presented above in Section 7.1 *Status of the Species in the Action Area* are directly applicable to specific aspects of critical habitat.

Overall, the habitat of the species has been lost or degraded in numerous ways that are likely to reduce the capacity of the habitat to support the life history and provide the conservation of LRS and SNS. In Critical Habitat Unit 1, Keno Reservoir, the environmental baseline of poor water quality is of particular note because it creates stressful conditions for juvenile and adult suckers annually in late summer.

7.2.1 Physical or Biological Features in the Action Area

PBF 1: Water

This physical or biological feature can be summarized as sufficient water quantity and suitable water quality necessary to support the life history and to provide for the conservation of the species. Water quantity and water quality vary within and among sites and across multiple time scales. In general, the climate in recent years has been drier than average, which can limit the water needed to meet the needs of the species Water quality is poorer for Lake Ewauna and the Keno Reservoir compared to other designated critical habitat (Clear Lake Reservoir and Gerber Reservoir), though data for the latter are comparatively sparse (see section 7.1.2.1 *Water Quality).*

PBF 2: Spawning and Rearing Habitat

LRS and SNS in Keno Reservoir are from the upstream source populations in Upper Klamath Lake. They have drifted downstream from, or were entrained at, the Link River and Keno Dam. The Klamath River contains no known spawning habitat between the mouth of the Link River and Keno Dam (Buchanan et al., 2011). Spawning has not been documented in the Link River or Keno Reservoir.

Rearing habitat is present within Keno Reservoir and the Link River. Limited documentation of rearing suckers in the tributaries indicates this can occur (Hayes and Rasmussen 2017, entire), but it is unclear to what extent this occurs in the Keno Reservoir population. Larvae and juveniles primarily utilize vegetated areas along the fringes of UKL until they move into the deeper areas of the lake as they grow.

It is difficult to quantify the extent and quality of existing rearing habitat. Conversion of wetlands for agriculture since the turn of the 20th century has reduced the volume of littoral wetland habitat as by as much as 66 percent and much of the remaining areas have been modified (Natural Resource Council, 2004, pp. 72–73) so that the habitat is not functioning in the same ways it did historically.

PBF 3: Food

Very little empirical data exists on the quantity, quality, and availability of food throughout the designated critical habitat, but the available data suggest large quantities of food (including zooplankton, macroinvertebrates, and periphyton) are available (Stauffer-Olsen et al., 2017).

8 EFFECTS OF THE ACTION

Regulations implementing the Act define the effects of the action as "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of

other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action" (50 CFR § 402.17).

NRCS determined that the proposed action as described in the biological assessment, that the following activities will not affect LRS and SNS because suckers will not be present within the interior KDD system during the following infrastructure improvements:

1. North canal improvements
2. F and E pumping plant upgrades
3. Installation of recirculation pipeline at the E pumping plant
4. Installation of SCADA, automated gates, and upgraded turnouts

North Canal improvements, upgrading two pumping plants, installing a recirculation pipeline, constructing 14 SCADA stations, and upgrading 76 turnouts will occur adjacent to or within KDD conveyance infrastructure and will not be subject to the Oregon in-water work window. Most of the ground disturbance would occur in the uplands adjacent to canals. The upland construction footprint for upgrading pump stations, installation of a recirculation pipeline, SCADA installations, and upgrading of 76 turnouts is 0.4 acres. Increasing the capacity of the North Canal, installing and extending it 0.47 miles to the P-1 lateral at the Lower Klamath National Wildlife Refuge would require upgrading, at a minimum, five crossings and may involve widening or deepening the North Canal. A complete engineering analysis of the North Canal to increase its capacity from 250 cfs to 350 cfs has not been completed, thus it is conservatively assumed that all construction activities may occur throughout the canal and within 75-foot buffer extending from the center of the North Canal (Parametrix, 2025). The current construction footprint for the North Canal extension is 250.5 acres which includes approximately 150.5 acres of upland habitat and 100 acres of the canal within 75 ft. of its center line.

Based on the Service's review of the ground disturbing activities of the proposed action listed above, as described in the biological assessment, the ground disturbing activities have the potential to degrade water quality due to increased sedimentation via stormwater runoff and potential chemical spills, entering the adjacent waterbodies. Avoidance and minimization measures will be implemented to minimize the risk of increased sedimentation and accidental spills of hazardous materials from entering KDD's water conveyance system and the adjacent waterbodies. Additionally, after construction, disturbed soils will be recontoured or regraded and planted with native grasses and forbs to reduce post-construction erosion and stormwater runoff. Minimization measures reduce the risk of increased sedimentation, and accidental spills of toxic or hazardous material from entering adjacent waterbodies, through the implementation of all appropriate project avoidance and minimization measures. Due to implementation of the *Avoidance and Minimization Measures* (section 4.5), the potential for sedimentation and accidental spills into waterbodies in the action area during construction will result in only discountable effects from these four elements of the proposed Project.

LRS and SNS will not be present during these project activities within canals, laterals, and drains within the interior of KDD water conveyance system, as these features will be dewatered during

construction and therefore, LRS and SNS will not be affected. Additionally, any LRS and SNS that may have been entrained within the KDD water conveyance infrastructure have already been accounted for in the Bureau of Reclamations' Klamath Project 2024 biological opinion incidental take statement (2022-0020519-S7-R002; USFWS 2024). Any LRS and SNS encountered in the canals would be translocated as part of the Klamath Project's proposed action conservation measures.

8.1 Effects on LRS and SNS

In this section, the Service describes the general mechanisms by which the proposed Project is likely to result in adverse effects to LRS, SNS, and their habitats in the action area. Based on sucker life history, timing, and location of the construction, the Service anticipates that no eggs, larvae or adults are expected to be impacted by the proposed action (see section 6.2 *Reproduction*). Effects will occur through several mechanisms that reduce fitness, increase stress, or lead to injury or death (e.g., water quality and quantity impairments, noise disturbance, handling, altering movement, feeding, and other essential behaviors, and habitat alteration). The Project effects, include stressors and benefits, are described in detailed below. To minimize the adverse effects of the proposed Project, NRCS has proposed to complete the work during the Oregon in-water work window (July 1 to January 31). This scheduling will reduce the likelihood that life stages other than juveniles will be present during the proposed project activities.

8.1.1 Construction Access and Staging Areas

Construction of staging areas and repeated access to work sites from staging areas has the potential to degrade water quality due to increased stormwater runoff and accidental spills of toxic or hazardous material. Increased suspended sediments, otherwise known as turbidity, in the action area from stormwater runoff, erosion, staging construction materials and equipment, and barge and equipment operation are anticipated. Heavy equipment used for construction (e.g., trucks, dump trucks, barge, vibratory hammer, cranes, etc.) could potentially leak or spill fuel, oil and other hazardous materials.

During construction all vehicles will be parked on existing watermaster or other access roads. All machinery will be inspected daily and prior to operation for leaks. After construction, disturbed soils will be recontoured or regraded and replanted with a mix of native grasses and forbs to reduce post-construction erosion. Additionally, the proposed avoidance and minimization measures will reduce the risk of increased sedimentation, and accidental spills of hazardous material from entering adjacent waterbodies. Therefore, implementation of the avoidance and minimization measures will result in discountable effects to LRS and SNS from construction access and staging areas impacts to water quality.

8.1.2 Gravel Road Improvements and Powerline Extension

The gravel road improvements, extension of the electrical powerline, and clearing the staging area near the North Canal will include ground disturbance in upland areas and would not be subject to the in-water work window. Implementation of these Project components will facilitate equipment access to the site for fish screen construction and operation. Construction of roadway improvements will be completed by clearing and grading approximately 1.3 miles of an existing gravel road and widening a 100 ft section using 0.02 acres of fill in the Klamath River (Parametrix 2025 p. 10). Gravel road redevelopment will also result in 1.9 acres of impervious surface area and stormwater runoff. The installation of vegetated stormwater filter strips will treat runoff from the gravel road before it intercepts water and wetlands.

The proposed action is expected to result in short-term disturbances of approximately 1.3 miles of gravel road along the North Canal. Approximately 0.02 acres of permanent fill will be placed in the Klamath River, isolated wetlands, and ponds, resulting in the redevelopment and widening of North Canal gravel road. The addition of fill materials placed in these water bodies will disturb sediments and increase turbidity within approximately 50 ft. of the fill area. The resulting sedimentation in the adjacent area is expected to exceed Oregon Department of Environmental Quality Turbidity limits.

The number of sucker potentially affected within the immediate project area is difficult to quantify, however, the number is expected to be low. Based on Project timing, only juvenile suckers would be subject to effects during the installation of the new embankment. Small numbers of juvenile suckers could be present in the action area during construction activities (July 1– January 31) because they are known to use nearby habitats. However, adults generally prefer deeper more open water during the in-water work time frame and would likely avoid the area of disturbance (Simon et al. 2010, entire). Suckers could also be absent from the project area prior to disturbance if water quality at the time of construction limits the suitability of the area. This possibility is unlikely to occur throughout the entire in-water work period but is likely to occur during the beginning of the in-water work construction period (July – August) because air and water temperature are usually at their yearly maximum and the annual algal bloom crash typically occurs in late summer. For the purpose of this effects analysis, we assume that water quality will be poor but will not be so bad as to completely exclude suckers from the action area during construction. Juvenile suckers present in the action area are also likely to avoid the area of disturbance due to noise and activity unless trapped in the turbidity curtained area.

During construction the immediate in-water work area will be sectioned off from the rest of the Klamath River and wetland areas with a turbidity curtain, to minimize and contain the short-term sedimentation resulting from construction. A chain or weight is typically sewn into the bottom of the curtain to keep the curtain up right to prevent turbid water from spreading beyond the containment area but would not entrain fish. Installation of the turbidity curtain and construction related disturbance is expected to trigger avoidance behavior in fish present in the project area causing them to swim away from the disturbance. After installation the curtain will remain in place until the work is completed and the sediment has settled out. LRS and SNS juveniles may become injured and stressed from exposure to construction-related disturbance and suspended sediments.

In summary, gravel road improvements, extension of the electrical powerline, and clearing the staging area near the North canal could disturb and injure LRS and SNS from exposure to construction-related disturbance in the river and poor water quality conditions from fill-generated sediment. These adverse effects are likely to be minimized due to avoidance behavior of fish (e.g., fish will generally avoid areas of disturbance), habitat preference and the lack of suitable habitat in the area, timing of life stages occurrence, and construction avoidance and minimization measures.

8.1.3 Coffer Dam Installation and Removal and Levee Repair

8.1.3.1 *Hydroacoustic Effects*

North Canal levee repairs, and coffer dam installation and removal, includes installation of 24-inch sheet pilings with a vibratory hammer. Vibratory sheet pile installation will generate hydroacoustic sound pressure waves which, can harass fish. Potential effects of hydroacoustic range from alteration of behavior to physical injury or mortality. As the pressure wave passes through a fish, the swim bladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under-pressure component of the wave passes through the fish. This can cause adverse effects including rupture of the swim bladder, rupture of capillaries, internal hemorrhage, neurological stress, and auditory damage. Extreme sound waves can cause instantaneous death, latent death within minutes after exposure, or death can occur several days later. Increase in sound waves can also result in reduced fitness of fish, making them susceptible to predation, disease, starvation, or inability to complete its life cycle. The amount and extent of effects is dependent on the intensity and characteristics of the sound pressure, the distance and location of fish in the water column relative to the source of the sound, the size and mass of the fish, and the fish's anatomical characteristics.

To quantify the level of sound expected to cause harm, the Fisheries Hydroacoustic Working Group, an interagency working group that included the Service, established interim criteria for evaluating underwater noise impacts from pile driving on fish. These criteria are defined in the memo entitled "Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities" (Fisheries Hydroacoustic Working Group, 2008). This agreement identified a peak sound pressure level (SPLs) of 206 decibels (dB) and an accumulated sound exposure level of 187 dB as a threshold for injury to fish greater than or equal to 2 grams (g). For fish less than 2g, the accumulated sound exposure level threshold is reduced to 183 dB. Although there has been no formal agreement on a behavioral threshold, the National Marine Fisheries Service (NMFS) uses 150 dB-root mean square (rms) as the threshold for the onset of behavioral effects (National Marine Fisheries Service, 2024).

Even though the above criteria were developed for pile driving, and the proposed action uses a vibratory pile driver, it provides reasonable means to analyze the expected increase in underwater sound pressure waves to the species. There are no established injury or behavioral thresholds for fish from noise generated during vibratory pile driving. However, the 150 dB-rms behavioral noise level is applicable to the behavioral effects to fish from vibratory pile driving.

Vibratory pile driving is considered a continuous (non-impact) noise that has a lower rise time; energy imparted to the water column is distributed more evenly over the course of installation (California Department of Transportation, 2020). Vibratory pile driving can exceed 180 dB; however, the sound from these hammers rises relatively slowly. The vibratory pile driver produces sound energy that is spread out over time and is generally 10 to 20 dB lower than impact pile driving (California Department of Transportation, 2020). The hydroacoustic sound pressure levels generated by the vibratory pile driving are approximately 163 dB-rms for 24-inch sheet pile installation (California Department of Transportation, 2020). Noise levels at or above 150 dB-rms has the potential to cause behavioral changes to fish in the project area. These behavioral changes can range from relatively immeasurable effects or minor impacts (e.g., startling, momentary disruption in feeding, or avoidance of the area) to more significant impacts (e.g., injury or mortality) based on site conditions and the duration of the exposure. As described in section 4.1.3 (*Coffer Dam Installation and Removal*) and Table 1, vibratory sheet pile driving may require up to 80 non-consecutive days within the in-water work window July 1 to January 31. A total of 540 sheet piles will be installed for the levee extension and repairs, and installation

of the cofferdam. Duration of vibratory installation is estimated to be 20 minutes per pile with a maximum of 20 piles installed per day. Therefore, it is estimated that a maximum of 400 minutes of hydroacoustic sound pressure at approximately 163 dB-rms will impact LRS and SNS in the project area per day. Vibratory sheet pile installation is expected to exceed the 150 dB-rms behavioral threshold but not the 183 dB injury threshold. This hydroacoustic range has the potential to result in effect to LRS and SNS in the area such as, startling, fleeing the area, and avoiding the area, and/or disruption to feeding.

Therefore, the sound pressure from the Project will result in behavioral responses (likely avoidance of the area) that could disturb LRS and SNS. These effects are likely to be minimized due to avoidance behavior of fish (e.g., fish will generally avoid areas of disturbance), habitat preference and the lack of suitable habitat in the area, timing of life stages occurrence, and construction avoidance and minimization measures such as using a vibratory hammer, and the timing of construction.

8.1.3.2 *Water Quality Effects*

Vibratory hammers use oscillatory hammers that vibrate the pile, causing the sediment surrounding the pile to liquefy and allow the sheet pile to penetrate the substrate (California Department of Transportation, 2020). Project activities that will disturb sediment and elevate the turbidity levels in the Klamath River include sheet pile installation and removal, barge operations, gravel road widening (fill materials), runoff from upland construction areas, and dewatering and re-watering of the isolated work area.

Construction activities could produce suspended sediments, otherwise known as turbidity, in the action area. Sediment plumes result from sediments and other materials in the riverbed being discharged back into the water column. Increased turbidity from these plumes will be localized and temporary. The amount and extent of the turbidity will not exceed the conditions included in the applicable permits required for this project, including the section 401 water quality certification that will be obtained from ODEQ. NRCS anticipates that the ODEQ certification will include an established mixing zone (anticipated to be within 300 feet from turbidity generating activities) for turbidity and that it will require regular water quality monitoring every two hours during construction activities at compliance points (Parametrix, 2025). Exceedances of the turbidity standard within the mixing zone will be short in duration (four hours or less). However, there is a potential for a pulse of turbid water from construction activities. Turbidity will be managed consistent with the erosion and sediment control plan (section 4.5.2 *Erosion Control*) and all permit conditions such as section 401 water quality certification. NRCS anticipates that turbidity will not increase more than 50 nephelometric turbidity units (NTU) above background levels.

Exposure to excessive suspended sediment concentrations could lead to physiological stresses such as clogged gills, eroded gill and epithelial tissues, impaired foraging activity and feeding success, and altered movement patterns of juvenile and adult fish (Newcombe & Macdonald, 1991). Exposure of fish to elevated suspended sediment concentrations could also result in behavioral avoidance and exclusion from otherwise suitable habitat, disrupt movement patterns, reduce feeding rates and growth, result in sublethal and lethal physiological stress, habitat degradation, and under severe conditions could result in mortality.

LRS and SNS already live in a poor water quality environment with high background levels of turbidity and increased turbidity generally has not been documented to directly impact LRS and

SNS (Saiki et al., 1999). Specific turbidity thresholds for LRS and SNS effects are unknown, however, the Service assumes that they will be similar to documented salmonid thresholds. For example, fifty NTUs is above the range at which salmonids experience reduced growth rates (Sigler et al., 1984) but below the range salmonids would be expected to actively avoid the area (Bisson & Bilby, 1982). Due to implementation of avoidance and minimization measures (i.e., erosion control, spill prevention, stormwater runoff treatments, turbidity monitoring, and adherence to 401 certifications), adherence to the applicable permit conditions in the project area, habitat preference and the lack of suitable habitat in the area, and timing of the Project, will ensure that effects to LRS and SNS are limited to stress and behavioral avoidance response. Therefore, suspended sediment and water quality impacts are only expected to have insignificant effects to LRS and SNS from construction activities related to the installation of the fish screen.

8.1.3.3 ***Work Area isolation***

Installation of the cofferdam to create an isolated work area will temporarily block access to 0.9 acres of the Klamath River and 0.3 acres of the North Canal. Work area isolation for construction of the fish screen includes temporary water management of the site and translocation of any fish entrained in the site after the coffer dam has been sealed. The work area will be isolated from the Klamath River and dewatered for approximately four months during the in-water work window. Before the end of the in-water work window, the site will be rewatered, and the coffer dam will be dismantled.

Work area isolation will result in LRS and SNS being temporarily unable to use a total of 1.2 acres of habitat for approximately four months. Construction activities in the isolated work area will result in impacts to sucker habitat. However, habitat not permanently impacted by the construction on the fish screen will be restored to initial condition via re-establishment of vegetation and macroinvertebrates within one year of completion. The permanent impacts to the site from construction of the fish screen are discussed below in section 8.1.4 *Fish Screen Installation*.

The dewatered area behind the cofferdam will reduce the sound pressure from installation of the fish screen pile foundations. Piles will be approximately 20 ft. long, and a pile cap will be 180.75 ft. in length and approximately 19 ft. in width. This is the most effective isolation for installation of these piles. Pile driving behind the cofferdam does not eliminate the sound energy, as it can still be transmitted through the ground, but will reduce the sound to the extent that only behavior effects if any would impact fish (California Department of Transportation, 2020). Similar to the vibratory pile driving, the sound energy will likely result in startling and avoidance of the area around the cofferdam for the duration of the construction activities. Therefore, temporary reduction in habitat, and construction activities in the isolated work area are expected to result in only discountable effects to LRS and SNS from work area isolation.

8.1.3.4 ***Fish Relocation***

Installation of the sheet pile cofferdam using a vibratory hammer is likely to directly affect suckers present in the work area via behavioral disturbance. Suckers will likely avoid work activities but if suckers are found in the isolated work area behind the cofferdam, they will be captured and released back into the Klamath River. Fish translocation operations will be conducted within the cofferdam to remove trapped fish and other aquatic species before dewatering is complete (Parametrix, 2025, pp. 10, 17).

The number of suckers potentially affected within the immediate project area is difficult to quantify; however, the number is expected to be low. Sucker population densities are low in the action area, adult suckers generally occupy deeper water (depths of 6.6 – 13.1 ft.) (Banish et al., 2007, p. 10, 2009, pp. 151–161) and during the fall, juvenile suckers start to move to deeper waters reducing the likelihood of individuals becoming entrained within the cofferdam once sealed.

Based on the timing of the Project, only juvenile suckers would be subject to effects during cofferdam dewatering and sucker translocation. Small numbers of juvenile suckers could be present in the project area during construction activities (July 1 through January 31) because they are known to use nearby habitats. Suckers could also be absent from the project area prior to disturbance if water quality at the time of construction limits the suitability of the area. This possibility is unlikely to occur throughout the entire in-water work period but is likely to occur during the beginning of the in-water work construction period (July – August) because air and water temperatures are usually at their yearly maximum and the annual algal bloom crash typically occurs in late summer. For the purpose of this effects analysis, the Service assumes that water quality will be poor but will not be so bad as to completely exclude suckers from the action area during construction. Juvenile suckers present in the action area are also likely to avoid the area of disturbance due to noise and activity unless trapped within the cofferdam.

LRS and SNS within the cofferdam will be captured using trap, seine, or electrofishing equipment consistent with NMFS electrofishing guidelines (National Marine Fisheries Service, 2000). Most captured fish are expected to be release unharmed. However, it is possible that relocation efforts, including electrofishing, could induce physical stress, injury or mortality even when performed by skilled biologists. Any fish collecting gear, whether passive or active, has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Electrofishing can kill fish, and researchers have found serious sub lethal effects including spinal injuries (Snyder, 2003). The long-term effects of electrofishing on fish are not well understood. Although chronic effects may occur, most effects from electrofishing occur at the time of capture and handling. Immobilization thresholds for fish vary based on species, body form, and size. Larger bodied fish can be more vulnerable to voltage due to larger muscles, body length, and total surface area (Dolan & Miranda, 2004). Effects can include changes in behavior, physiological stress, or mechanical injury. Physiological stress can include harmful changes in blood chemistry attributes, such as cortisol and oxygen saturation, and changes in physical movements such as gilling rate and cardiac output (Emery, Lee, 1984). An electrofishing injury and mortality study on warm water fishes showed an average injury rate of 3 percent (0-25 percent) and an average mortality rate of 10 percent (0-75 percent); both differed among species and were related to duty cycle, fish size, and interactions among these variables (Dolan & Miranda, 2004).

The proposed Project will dewater approximately 1.2 acres of sucker habitat. Suckers are not expected to be present in most of the habitat due to avoidance during the vibratory installation of sheet piles and the low density of LRS and SNS within the action area. Given the lack of information regarding the actual number of LRS and SNS that may be present in the area, the Service will use a habitat surrogate (acres) for quantifying the effects of dewatering the cofferdam and translocating suckers. In the environmental baseline section, the Service determined the action area contained 0.04 sucker/acre. Assuming that sucker density is 0.04

sucker per acre, the total number of LRS and SNS in the action area impacted (1.2 acres) times the mean density of suckers (0.04 fish/acre). Thus, the estimated take is 0.04 fish per acre x 1.2 acres = 0.05 fish rounded to the whole number equals one sucker could be lethally harmed during dewatering and translocation. Therefore, the Service estimates that dewatering the cofferdam, electrofishing, netting, capture, handling, and relocation process is expected to result in direct mortality of no more than one sucker.

8.1.3.5 ***Summary of Effects of Coffer Dam Installation and Removal and Levee Repair***
In summary, the levee repairs to the North Canal and cofferdam installation and removal could disturb, injure, or kill LRS and SNS from hydroacoustic, dewatering habitat, handling, and water quality conditions. These adverse effects are likely to be minimized due to avoidance behavior of fish (e.g., fish will generally avoid areas of disturbance), habitat preference and lack of suitable habitat in the area, timing of life stages occurrence, and construction avoidance and minimization measures such as construction timing and tools, erosion control, and stormwater runoff treatments.

8.1.4 Fish Screen Installation

Completion of the North Canal fish screen will result in the permanent loss of 0.44 acres of sucker habitat in the Klamath River and alteration of the embankment resulting in changes to shoreline features and geomorphology. The fish screen, levee extension, and gravel road widening will result in approximately 0.34 acres of the Klamath River receiving fill material (Parametrix 2025 p. 38). Installation of the fish screen will also permanently block suckers from accessing 0.1 acres of the Klamath River and all of the North Canal. Extension of the levee embankment has the potential to increase shallow water habitat along the shoreline. Once aquatic plants have revegetated the banks and shoreline along the levee extension, this area could provide habitat for sucker rearing, feeding, and refugia from predation.

Sucker entrainment into water diversion is a concern in the Keno Reservoir as water is diverted at the North Canal, the Lost River Diversion Channel, and Ady Canal. Also, there are approximately 50 smaller diversions, most of these lack appropriate screens. Sampling in the Lost River diversion Channel and near Ady and North Canals indicates that juvenile suckers are present in low numbers near these locations during summer where they could be vulnerable to entrainment (Phillips et al., 2011). The North Canal fish screen would prevent sucker entrainment from this diversion point, decreasing sucker mortality from entrainment in the North Canal.

Screening of the North Canal will result in the permanent loss of 0.44 acres of sucker habitat in the Klamath River. However, the 0.44 acres of habitat loss is small (less than 1 percent) relative to the available habitat in the Keno Reservoir. Although resulting in minimal habitat loss, the installation of the North Canal fish screen will provide beneficial effects to LRS and SNS by reducing entrainment related mortality from the operation of the North Canal water diversion.

8.1.5 Summary of Effects to LRS and SNS

These Project activities will result in the following effects to LRS and SNS and their habitat. Some of these effects will be temporary, construction related and limited in both physical extent and duration. Others will be long-term, lasting for the functional life of the proposed action:

Effects and stressors to LRS and SNS:

- Injury or mortality from dewatering cofferdam, fish salvage and relocation activities.
- Short-term effects (i.e., stress and/or injury) resulting from exposure to construction related disturbance, hydroacoustic, turbidity and water quality.
- Short term effects from water quality impairments (e.g., sedimentation, spills).
- Short-term and spatially limited effects to LRS and SNS from reduced food sources, such as macroinvertebrates.
- Permanent loss of habitat.

Beneficial effects to LRS and SNS:

- The proposed fish screen installation will prevent future entrainment of LRS and SNS in the North Canal.
- Fish salvage during dewatering of the cofferdam will increase survivorship of individuals trapped behind the cofferdam.
- Levee extension and habitat alterations related to the Project have the potential to improve cover and protection for juvenile suckers.

8.2 Effects on LRS and SNS Critical Habitat

At issue for this biological opinion are the effects of the proposed Project on three PBFs: (1) water; (2) spawning and rearing habitat; and (3) food. Sucker critical habitat must provide adequate water quality and quantity; adequate spawning habitat for adult sucker; adequate rearing habitat for sucker embryos, larvae, and juveniles; and adequate foraging habitat (inclusive of a diverse and abundant prey base) for all sucker life stages to support the conservation of the listed sucker species. As noted above, within the project area the PBFs of critical habitat are generally poor for the listed sucker species within the Critical Habitat Unit, at the time of year when construction is proposed.

8.2.1.1 *PBF 1: Water*

Short-term and spatially limited adverse water quality impacts are expected to result from the construction activities (e.g., sheet pile installation and removal, barge operations, runoff from upland construction areas, and dewatering and re-watering of the isolated work area). Sedimentation is expected to be a primary effect on water quality, as substrate sediments begin to push up into the water column. Although sedimentation is expected to occur, it will be monitored to ensure levels will not increase more than 50 NTU above background levels. Increased levels of turbidity will only occur during construction activities allowing sediment to settle out during non-work hours. The Project includes minimizing the potential introduction of toxic or hazardous materials to critical habitat by restricting workspace (staging areas and isolated work area) outside of critical habitat, mandating storage of hazardous materials (e.g., fuel) in controlled and remote areas (150 feet away from waterbodies), and daily inspections of equipment for leaks. Riparian vegetation, biofiltration swales, or compost amended vegetation filter strips will be planted to reduce the movement of stormwater while increasing water infiltration and filtration, resulting in the reduction of pollutants entering the Keno Reservoir and the North Canal.

In the short-term, water quality is expected to be reduced as part of the in-water work portion of the proposed Project, but within a spatially limited area. In the long-term, improved water management and recirculation is anticipated to decrease the amount of agricultural drain water

entering the Klamath River. Water diversion appears to result in a net reduction in nutrient loading to Keno Reservoir by rerouting nutrient rich water. Therefore, the effects to water quality from implementation of the proposed Project are expected to be insignificant.

8.2.1.2 *PBF 2: Spawning and Rearing Habitat*

Implementation of the proposed Project would temporarily restrict sucker access to 0.9 acres of critical habitat due to the construction of the coffer dam. However, completion of the North Canal fish screen will result in the permanent loss of 0.44 acres of rearing habitat in the Klamath River and alteration of the embankment resulting in changes to shoreline features and geomorphology. No spawning sites are in the action area; therefore, the proposed action will have no effect on sucker spawning habitat. However, this area provides habitat for sucker rearing, feeding, and refugia from predation.

The proposed Project includes the modification and loss of 0.44 acres of critical habitat in the Klamath River. The negative effects to the critical habitat will be localized to the area within the Project footprint in the Keno Reservoir and limited to the period of active construction. It is anticipated that following completion of the in-water work designated critical habitat not permanently impacted will return to baseline condition. Overall, the permanent loss of 0.44 acres of critical habitat will result in adverse effects to Critical Habitat Unit 1. However, the area of adversely affected habitat is small (less than 1 percent) relative to the total area of Critical Habitat Unit 1.

8.2.1.3 *PBF 3: Food*

The installation of the fish screen and other construction activities are likely to impact food availability in the project area. The habitat disturbance and modification will temporarily decrease vegetation, zooplankton, and macroinvertebrate populations in the action area. However, the Service is of the opinion that this is not a limiting factor of habitat suitability in the Klamath River. While there are no known studies on invertebrates in the Keno Reservoir, the Service assumes invertebrate diversity and abundance in the Keno Reservoir are similar to those in Upper Klamath Lake. Upper Klamath Lake and its tributaries are highly productive and contain dense populations of zooplankton and macro invertebrates (Stauffer-Olsen et al., 2017, p. 263). Additionally, flows from Upper Klamath Lake likely bring prey species such as amphipods, cladocerans, copepods, and midges into the reservoir and the large number of organics that enter the reservoir from Upper Klamath Lake could provide a substantial food base for invertebrates.

The proposed action will result in a short-term, localized degradation of the food base through dewatering and sedimentation in the project area where production of macroinvertebrates will be reduced. However, the Project is not expected to change the overall availability of food in Critical Habitat Unit 1 but might temporarily change the distribution until zooplankton and other aquatic macroinvertebrates can move in to disturbed areas. Therefore, the effects to LRS and SNS food from the action are insignificant.

8.2.1.4 *Summary of Critical Habitat Effects*

In the preceding sections, the Service determined that the proposed action will result in localized and temporary degradation of PBF (1) water quality and quantity, and PBF (3) food availability. The Service also determined that the proposed action will result in adverse effect to PBF (2) rearing habitat due to permanent loss of 0.44 acres of near shore habitat.

8.3 Effects of Climate Change

Climatic models suggest that much of the recent trends in climate are driven by anthropogenic causes, primarily due to the burning of fossil fuels (Barnett et al., 2008, p. 1082). Climate change has the potential to profoundly alter the aquatic ecosystems upon which LRS and SNS depend via alterations in water quality, water quantity, and water temperature. Annual average temperatures in the Upper Klamath Basin have already risen 1° to 2.7° F since 1895 depending on the dataset (Halofsky et al. 2022 p. V) and are expected to rise 2.1 to 3.6 °F from the 1960-1990 baseline by the decade of 2035-2045 due to climate change (Barr et al. 2010 p. 8, Risley et al. 2012 p. 4). At present, air temperatures that primarily drive water temperature conditions lethal to suckers do not occur, but stressful water temperatures for suckers occur with regularity, particularly in late summer and early fall. Climate change may increase the frequency and duration of these stressful temperature events and is likely to make high stress events more common.

Future changes in precipitation are highly uncertain. Due to the geography of the Upper Klamath Basin, annual precipitation may increase or decrease overall under climate change (Barr et al. 2010 p. 8, Risley et al. 2012 p. 4). However, climate models consistently predict that a larger proportion of annual precipitation and run-off will occur as rain events in the winter (Barr et al., 2010; Risley et al., 2012b). Warmer temperatures during the winter are also projected to reduce the proportion of precipitation falling as snow (McCabe et al. 2018 p. 812). Precipitation in the form of snow acts as a reservoir within a hydrologic system, storing water in the form of snowpack and providing more gradual and manageable input into the lakes than rain. Altered precipitation has been observed in the basin over the past several years relative to historical observations, with overall average snowpack at or below median in the last 3 out of 5 winters.

The long-term effects of climate change may include, but are not limited to, depletion of cold-water habitat, variation in quality and quantity of rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, increased bio-energetic and disease stresses on fish, and increased competition among species. In general Project construction activities will contribute to climate change through high-carbon materials (e.g., cement and steel) and the carbon emission from construction and operation. However, the Service cannot interpret a meaningful connection between this Project to any future projection of climate change or its characteristics (e.g., precipitation amounts and patterns, air temperatures, etc.).

8.4 Summary of Effects

8.4.1 Species

Effect on Numbers

The proposed Project will reduce the number of juveniles of the species in the Keno Reservoir; however, that reduction will be minor (1 juvenile sucker). The Service does not expect that this reduction will appreciably reduce the numbers range wide, because the effects would be temporary, minor, and localized. Such effects are likely to be offset by future reproduction as the lost individual will be replaced in subsequent spawning seasons, and the loss of the individual would occur in a small, isolated location.

Effect on Reproduction

The proposed Project will not affect LRS and SNS reproduction as spawning is not known to occur in Keno Reservoir and the Project will occur between July 1 and January 31, outside of

sucker spawning season. Additionally, considering sucker life history, timing, and location of the construction, the Service anticipates that no eggs, larvae or adults are expected to be impacted by the proposed action. The Service does not expect that the number of juveniles affected will reduce the reproduction of the species range-wide, because the majority of the effects would be temporary, minor, and localized. Based on the analysis above, only one juvenile sucker is expected to be lethally harmed during this action and such effects will likely be offset by future reproduction.

Effect on Distribution

The proposed Project will result in behavioral effects (likely avoidance of the area) that could impact sucker distribution within the action area. However, this altered distribution in that area would be short in duration and spatially limited to the area of disturbance. Additionally, the installation of a fish screen in the North Canal will prevent suckers from entering the canal in the future. This may limit sucker distribution in the KDD water conveyance system but will decrease sucker entrainment and entrainment related mortalities. This localized change in distribution would not rise to the level where the species' overall range is reduced.

Effect on Recovery

The proposed fish screen installation is expected to prevent future entrainment of LRS and SNS in the North Canal from the Klamath River. Based on the Service's analysis of effects, the Service concluded that the loss of 1 juvenile sucker and the loss of 0.44 acres of sucker habitat as a result of the Project would not appreciably reduce the survival and recovery of LRS and SNS.

8.4.2 Critical Habitat

The Service determined that the proposed action will result in localized and temporary degradation of PBF (1) water quality and quantity and PBF (3) food availability. The Service also determined that the proposed action will result in adverse effects to PBF (2) rearing habitat due to permanent loss of 0.44 acres of nearshore habitat.

Although the Service anticipates localized adverse effects to designated critical habitat from implementation of the proposed action, these effects are not anticipated to appreciably reduce the likelihood of persistence through a reduction in the numbers, distribution, or reproduction of LRS and SNS in the affected area or within the listed species range. Additionally, the proposed action will not permanently reduce the function of the designated critical habitat in the action area to provide for the conservation of the species. Considering that localized nature of the effects of the proposed action, the Service concludes that the proposed action does not diminish the overall conservation role of the critical habitat.

9 CUMULATIVE EFFECTS

Cumulative effects are "effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 CFR § 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

9.1 Cumulative Effects for Lost River and Shortnose Sucker

Ongoing land use and agricultural activities in the action area are not expected to change from current conditions. Following implementation of the proposed action, KDD may further improve

water conveyance and irrigation efficient to improve water management. Other irrigation districts may also implement projects that will improve water management in water conveyance systems as well.

A private duck hunting club located between the North Canal Diversion and the Ady Canal Diversion has experienced habitat degradation due to the lack of water level fluctuations. The wetland and marsh habitat have been filling in with sediment and degrading the water quality making the habitat unsuitable for fish and waterfowl. Therefore, Tule Smoke Hunt Club and other stakeholders are collaborating to determine habitat restoration activities that would increase the wetland productivity and enhance water quality in the area. However, the details of this project have not been determined at this time.

The non-Federal actions that are expected in the action area include habitat restoration, water quality improvements, and other actions that are regularly funded by the Oregon Watershed Enhancement Board, National Fish and Wildlife Foundation, as well as other entities. For example, past work has been done by Klamath Watershed Partnership, Trout Unlimited, Klamath Soil and Water Conservation District, and Klamath Water Users Association. Funding has been consistent through these entities for years, but uncertainty always remains. However, given the amount of focused effort and the involvement of serval key organizations in the basin, progress is expected that will be measurable on some scales.

The Service is unaware of other non-Federal activities in the action area that need to be considered in relation in relation to this consultation. Most of the non-Federal activities listed above will improve water quantity, water quality, fish passage, and habitat in areas that support listed suckers, including Keno Reservoir. Screening will reduce entrainment of suckers and improve overall survival. Habitat restoration will increase the amount and quality of areas important to complete sucker life cycles. Water quality improvement projects will work towards addressing a major factor limiting listed sucker recovery in the basin. If water quality is improved in the Keno reservoir, this area would likely support a substantial population of adult suckers and/or provide habitat to support larval and juvenile suckers that eventually will return to Upper Klamath Lake as adults for spawning. Therefore, future State and private actions that are reasonably certain to occur in the action area will not cumulatively add to the adverse effects of the proposed Project. However, the beneficial effects cannot be quantified at this time because project details are limited and/or cannot currently be estimated.

9.2 Cumulative Effects for Lost River and Shortnose Sucker Critical Habitat

The actions identified above in Section 9.1, *Cumulative Effects for Lost River and Shortnose Sucker*, are the same actions considered for cumulative effects of designated critical habitat for LRS and SNS. The actions listed above will improve water quantity, water quality, and habitat in areas that support listed suckers. Habitat restoration will increase the amount and quality of areas important to complete sucker life cycles. Water quality improvement projects will work towards addressing a major factor limiting listed sucker recovery in the basin, specifically PBF 1 in Critical Habitat Unit 1. These future State and private actions that are reasonably certain to occur in the action area are anticipated to result in beneficial effects to designated critical habitat for LRS and SNS and therefore, will not cumulatively add to the adverse effects of the proposed Project. However, the benefits cannot be quantified at this time because specific project details are not available.

10 CONCLUSION

10.1 LRS and SNS Jeopardy Determination

After reviewing the current status of LRS and SNS, the environmental baseline for the action area, the effects of the proposed Project, and the cumulative effects, it is the Service's biological opinion that KDD's infrastructure modernization project, as proposed, is not likely to jeopardize the continued existence of the Lost River sucker and the shortnose sucker. The Service has reached this conclusion based on the factors analyzed above and the following reasons.

1. The project would have a minor effect on reproduction of the species but would not appreciably reduce reproduction of the species range wide.
2. The project would cause a low decrease in the number of individuals.
3. The project would not reduce the species' distribution range wide.
4. The project would not cause any effects that would preclude the recovery of the species.

In Section 6 (*Status of the Lost River and Shortnose Sucker*), we described the factors that have led to the current status of the LRS and SNS as endangered throughout their range under the Act. The threats to the listed suckers are habitat loss, disease and predation, water quality, entrainment, and climate change. The 2013 recovery plan identified a number of recovery actions to address these threats. Federal and non-Federal contributions to sucker recovery include improvements to habitat connectivity, multi-partner habitat restoration efforts, and implementation of a sucker rearing program.

A number of natural and anthropogenic past and ongoing actions contribute to the current conditions of the action area. The action area is Keno Reservoir located in the Lost River subbasin of the Lower Klamath Lake watershed. Keno Reservoir probably functions as a subpopulation to Upper Klamath Lake to some degree. Upper Klamath Lake contains the largest remaining populations of both Lost River and shortnose sucker. However, there has not been evidence of juveniles entering into the spawning populations since the late 1990s, and the lack of recruitment has led to sharp population declines. Specific factors limiting Lost River and shortnose sucker resilience in Upper Klamath Lake include higher than natural mortality of juveniles due to degraded water quality, algal toxins, disease, parasites, predation, competition with native and introduced species, and entrainment into water management structures. Adult populations in Upper Klamath Lake are limited by negligible recruitment, stress and mortality associated with severely impaired water quality, and the fact that adult suckers are approaching the limits of their life span. Additionally, these species are limited by a lack of connectivity throughout their range by dams, periodic low flows, and degraded habitat.

Because of a multi-decade lack of recruitment of LRS and SNS in Upper Klamath Lake and their current old ages, both species are at a high risk of extirpation without recruitment. A die-off of adult suckers in Upper Klamath Lake, similar to those that occurred in the 1990s, could be catastrophic, especially for shortnose sucker because of its low abundance. It is also possible that a low recent annual adult survival rate could portend an increase in mortality due to senescence, but additional years of data will be necessary to evaluate this hypothesis. Regardless, their continued survival in Upper Klamath Lake depends on recruitment in the near future.

In our *Environmental Baseline* (Section 7), the Service described conditions and past actions that currently affect the survival and recovery of LRS and SNS within the action area, including: (1) poor habitat conditions in the action area including the lack backwater and wetland habitat; (2)

existing conditions in the action area including poor water quality (e.g., low dissolved oxygen, high pH, algal toxins, and urban and agricultural run-off; and (3) the condition of LRS and SNS in the action area which is estimated to be approximately 1,000 adults.

As described in section 8, the proposed action will likely result in the lethal harm to one juvenile sucker and nonlethal harm to LRS and SNS which is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. The lethal harm of one juvenile sucker may result from dewatering habitat and/or handling. Only one juvenile sucker is expected to be subjected to lethal harm which is less than one percent of the listed species population. Other life stages will not be harmed. Project effects will be temporary in nature, spatially and temporally restricted, and affect less than one percent of LRS and SNS population.

In summary, the proposed action is not likely to result in jeopardy for the Lost River and shortnose sucker. The Service reached this conclusion based on the following finding, the basis for which is presented in the preceding *Status of the Lost River and Shortnose Sucker* (section 6), *Environmental Baseline* (section 7), *Effects of the Action* (section 8), and *Cumulative Effects* (section 9) of this Biological Opinion. The status of the species suggests that threats are still acting on the species; however, conservation partnerships, improvements to habitat connectivity, and captive rearing programs are working towards improving the status of the species. The Service recognizes it may be many years before the outcomes of these efforts are realized. The environmental baseline in the action area is degraded by natural and anthropogenic past and ongoing activities. The proposed action will lethally harm one juvenile LRS or SNS; as indicated above, the overall effect at the range-wide scale is very small (less than one percent). The proposed fish screen installation will prevent future entrainment and entrainment related mortalities of LRS and SNS in the North Canal.

Additionally, using recent history as a guide, the individual juvenile fish that may be lethally harmed by this action would likely not successfully recruit into the adult population due to a combination of threats faced by the species; therefore, the loss of one juvenile that is not likely to reach the adult life stage, is not anticipated to further imperil the species. One juvenile sucker (less than one percent of the populations) may be lethally harmed from the proposed action. Therefore, while there are adverse impacts to LRS and SNS, implementation of the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild.

10.2 Destruction or Adverse Modification of Critical Habitat

The regulatory definition of "adverse modification" focuses on assessing if the proposed action will result in alterations that appreciably reduce the value of critical habitat for the conservation of a listed species. This includes assessing the impacts of the proposed action on the physical or biological features essential to the conservation of a listed species or assessing if those alterations preclude or significantly delay development of such features. For that reason, the Service has used those aspects of the LRS and SNS critical habitat status as the basis to assess the overall effect of the proposed action on the critical habitat.

After reviewing the current status of the critical habitat of LRS and SNS, the environmental baseline of critical habitat for the action area, the effects of the proposed Project on critical habitat, and the cumulative effects, it is the Service's biological opinion that the KDD's infrastructure modernization project, as proposed, is not likely to result in the destruction or adverse modification of critical habitat of the LRS and SNS. The Service have reached this

conclusion for the following reasons:

1. The project would have a minor effect on the various physical and biological features, PBF (1) water quality and quantity, PBF (2) rearing habitat, (3) food availability.
2. The project would have a low effect on the conservation value and function of critical habitat, PBF (1) water quality and quantity, PBF (2) rearing habitat, (3) food availability.

In section 6.4 *Designated Critical Habitat*, we discussed the range-wide condition of designated critical habitat for LRS and SNS in terms of PBFs, factors responsible for the condition and the intended recovery function of critical habitat overall. Water quantity, water quality, and physical habitat for spawning, feeding, rearing, and travel corridors are generally poor in this portion of the critical habitat.

PBF 1 is water quantity and quality. The two critical habitat units have a similar status with respect to water quantity. Namely, water quantity across days, seasons, and years, and low lake elevations or streamflow can reduce the recovery support function of the critical habitat by reducing availability of and access to suitable habitat. The water quality is highly degraded in Critical Habitat Unit 1.

PBF 2 is spawning and rearing habitat. Spawning habitat is largely functioning as intended in both critical habitat units. The Klamath River contains no known spawning habitat between the mouth of the Link River and Keno Dam (Buchanan et al., 2011). Spawning of LRS and SNS has not been documented in Keno Reservoir. Rearing habitat has been greatly reduced from historical levels in Critical Habitat Unit 1 through the draining of wetlands. Riparian areas and floodplains have largely been developed with agriculture, resulting in a loss of backwater and wetland environments. A large swath of relatively intact wetlands are present along the eastern bank of the Klamath River within the action area. The stability in water levels in the Keno Reservoir inhibits the development of additional wetland habitats and degrades existing wetlands (Middleton, 1999).

PBF 3 is food. Although food availability has not been specifically evaluated across all of the critical habitat, the upper Klamath basin is highly productive, and all of the critical habitat appears to contain an abundant forage base.

Overall, the habitat of the species has been degraded in numerous ways that are likely to reduce the capacity of the habitat to support the life history and provide for the conservation of Lost River and shortnose sucker. In Critical Habitat Unit 1, the environmental baseline of poor water quality is of particular note because it creates stressful conditions for juvenile and adult suckers annually in late summer.

The *Effects on LRS and SNS Critical Habitat* (section 8.2) of this biological opinion described how the proposed action is likely to affect PBFs 1, 2, and 3, as well as recovery-support functions for Lost River and shortnose sucker in Critical Habitat Unit 1 Keno Reservoir. The area affected is small (less than 1 percent) relative to the total area of designated critical habitat. Furthermore, the adverse effects to water quality that are attributed to Project construction activities are likely small and temporary and occur when water quality is already poor for other reasons.

In summary, based on the information provided in this analysis, the proposed action is not likely to significantly affect the recovery-support function of designated critical habitat for Lost River and shortnose sucker. While the proposed action will result in the loss of 0.44 acres of critical habitat, it will not alter the essential physical or biological features to an extent that it appreciably reduces the conservation value of critical habitat range-wide for the LRS and SNS. Additionally, the Project has the potential to improve rearing habitat with the levee extension and habitat alterations have the potential to improve cover and protection for juvenile sucker. Therefore, the Service does not anticipate that effects of the proposed action, taking into account cumulative effects, will result in the destruction or adverse modification of Lost River and shortnose sucker critical habitat.

11 INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined by the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7 (o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement and occurs as a result of the action as proposed.

Regulations allow for Incidental Take Statements to rely on the use of "surrogates" for estimating the amount of take that is reasonably certain to occur as a result of the proposed action in certain circumstances. To use a surrogate to estimate take, the following criteria must be met: (1) the Incidental Take Statement must describe the causal link between the surrogate and the take of the listed species; (2) the Incidental Take Statement must explain why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and (3) the Incidental Take Statement must set a clear standard for determining when the level of anticipated take of the listed species has been exceeded.

11.1 Amount of Extent of Take

In the accompanying opinion, the Service determined that the proposed action will result in take of one juvenile Lost River or shortnose sucker in the form of lethal harm and nonlethal injury to LRS and SNS. The incidental take is expected to be lethal and nonlethal and result from translocation, desiccation, and fleeing behavior of juveniles from construction activities (sheet pile installation and removal, levee repairs, and negative water quality impacts). While fleeing from the sheet pile installation can cause stress to listed suckers, it is likely to reduce lethal harm relative to individuals trapped in the isolated work area. Based on sucker life history, timing, and location of the construction, the Service anticipates that no eggs, larvae or adults are expected to be taken (see section 6.1 *Reproduction*).

The amount of incidental take of listed juvenile suckers described below is based on limited data and numerous assumptions, and nearly all forms of take will be impracticable to detect and measure for the following reasons: (1) to identify juvenile listed suckers to species requires collecting, transporting to a lab, and x-raying the suckers to count the number of vertebrae; (2)

precise quantification of the number of listed suckers in the project area would require nearly continuous monitoring and would itself result in considerable lethal take; (3) the likelihood of finding injured or dead suckers in a relatively large area is very low; (4) a high rate of removal of injured or killed individuals by predators or scavengers is likely to occur, which also makes detection difficult. Furthermore, poor water quality is likely in the Keno Reservoir during the in-water work time frame causing suckers to leave the area resulting in a relatively small number of suckers present. Area of habitat impacted provides a measurable element that is a suitable surrogate for take. Because some information on sucker densities within Keno Reservoir are available, the Service has made a gross approximation of the number of suckers potentially affected in the project area by multiplying the estimated density of juvenile suckers in habitats near the site by the area impacted (see section 7.1.3 *Condition of the Species*).

The Service estimated the number of LRS and SNS likely to be affected in the action area by extrapolating data that have been collected. Based on the best available information and the assumptions described in the effects section, the Service anticipates that that one juvenile sucker may be incidentally killed as a result of the proposed action.

11.2 Effects of Take

In the accompanying biological opinion, the Service determined that the level of anticipated take (1.2 acres of modified habitat or approximately 1 juvenile sucker) is not likely to jeopardize the continued existence of LRS and SNS. The anticipated adverse effects to LRS and SNS are not expected to reach a level that would affect recovery of the species because the number of suckers taken is small.

The proposed action incorporates design elements and *Avoidance and Minimization Measures* (section 4.5) which are expected to minimize impacts during construction. Additionally, the construction of the North Canal fish screen will reduce LRS and SNS entrainment and the KDD infrastructure updates, and water management changes has the potential to improve water quality.

11.2.1 Reasonable and Prudent Measures

The measures described below are non-discretionary and must be undertaken by the NRCS or made binding conditions of any grant or permit issued to the KDD, as appropriate, for the exemption in section 7(o)(2) to apply. NRCS has a continuing duty to monitor and enforce the terms and conditions of the activity covered by this incidental take statement. If NRCS: (1) fails to assume and implement the terms and conditions, or (2) fails to require the KDD to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, NRCS or KDD must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

The Service determined that the following reasonable and prudent measures are necessary and appropriate to minimize the impact of the incidental take of LRS and SNS:

RPM 1. NRCS shall ensure that KDD and all contractors take all necessary and appropriate actions to minimize take of listed suckers in implementing the proposed Project

11.2.2 Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the NRCS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline monitoring and reporting requirements. These terms and conditions are non-discretionary.

TC 1.1 NRCS shall ensure that KDD and all contractors minimizes the potential for harm of LRS and SNS resulting from project related activities by implementation of the *Avoidance and Minimization Measures* as described in the *Description of the Proposed Action* in the biological assessment and this biological opinion.

TC 1.2 NRCS shall ensure that KDD and all contractors or operators of the equipment comply with the biological opinion. NRCS shall educate and inform KDD and contractors involved with the project as to the *Avoidance and Minimization Measures* and *Terms and Conditions* in this biological opinion.

TC 1.3 NRCS shall ensure that KDD and all contractors conducting the fish salvage and translocation during cofferdam drawdown identifies suckers to species if possible and collects physical measurements including total length of suckers, weight in grams, and any physical ailments before releasing them back into the Keno Reservoir. All data will be provided to the Service in the annual report including dates of salvage/translocation and the types of gear used.

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the projects is approached or exceeded, NRCS shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, NRCS must immediately reinitiate formal consultation as per 50 CFR 402.16.

12 REPORTING REQUIREMENTS

Pursuant to 50 CFR § 402.14(i)(3), NRCS must report the progress of the action and its impact on the species to the Service as specified in this incidental take statement. The Service has determined the following measures are necessary to monitor and report on project impacts:

NRCS will provide annual implementation monitoring reports of the proposed action by June 1 for the term of this biological opinion (2025 through 2029). Specifically, the annual report shall list and describe:

1) How much and which elements of the proposed action have been implemented to date?
2) Were there any changes to the proposed action and if so, please provide the rationale for changes?
3) Has anything occurred during project implementation that would potentially change the impacts to suckers in a way that is different from those described in the NRCS biological assessment? For example, is there any new information regarding sucker distribution and use of the project area?
4) Has anything changed during the project implementation that could have resulted in the take estimate being exceeded (see Amount or Extent of Take Anticipated section on biological opinion)?
5) Track and report LRS and SNS capture, handling, translocation data, including
    - Dates and description of capture activities.
    - Information on when capture occurred.

- A description of the equipment and methods used to capture, hold, and transport captured fish.
- If electrofishing is used to capture fish, report the electrofishing setting used.
- The number and species of fish captured and translocated, physical measurement of suckers, and any water quality constituents at the capture area.
- A brief narrative of the circumstances surrounding sucker injuries or mortalities including, number of individuals injured or killed during capture, handling, and translocation.

6) Implementation of any conservation measures recommended below.

Reports shall be submitted to the Field Supervisor, Klamath Falls Fish and Wildlife Office, 1936 California Avenue, Klamath Falls, Oregon, 97601.

12.1 Disposition of Sick, Injured, or Dead Specimens

As part of this incidental take statement and pursuant to 50 CFR 402.14(i)(1)(v), upon locating a dead or injured LRS and/or SNS, initial notification within three working days of its finding must be made by telephone and in writing to the Klamath Falls Fish and Wildlife Office at 1936 California Avenue, Klamath Falls, Oregon, 97601 or by telephone at (541) 885-8481. The report must include the date, time, location of the carcass, a photograph, cause of death or injury, if known, and any other pertinent information.

NRCS or KDD must take care in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. NRCS or KDD must transport injured animals to a qualified veterinarian. Should any treated LRS or SNS survive, NRCS or KDD must contact the Service regarding the final disposition of the animal(s).

During the implementation of the proposed action, NRCS shall coordinate with the Service to respond to any unforeseen effects, such as chemical spills or sucker translocation efforts. As part of meeting the reporting requirements of this Incidental Take Statement, NRCS shall provide the Service with an annual monitoring report due June 1 to report the progress of the action and its effects on the species for the term of this biological opinion. Upon completion of the proposed action, NRCS shall provide confirmation that the proposed action was implemented as described herein.

13 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information and can be used by NRCS to fulfill their 7(a)(1) obligations. The Service requests notification of the implementation of any conservation recommendations in order to be informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

CR 1. The Service recommends the NRCS should have KDD maximize the complexity of the levee extension in the Klamath River to improve habitat and provide long-term benefits to the species. A more complex habitat structure (e.g., vegetation,

large wood, or rocky substrates) is thought to provide more cover for fish and it often increases growth and survival (Strayer and Findlay 2010, p. 132-133).

14 REINITIATION OF CONSULTATION

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9.

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E.9 Supporting Information for Wetlands and Riparian Areas Resources

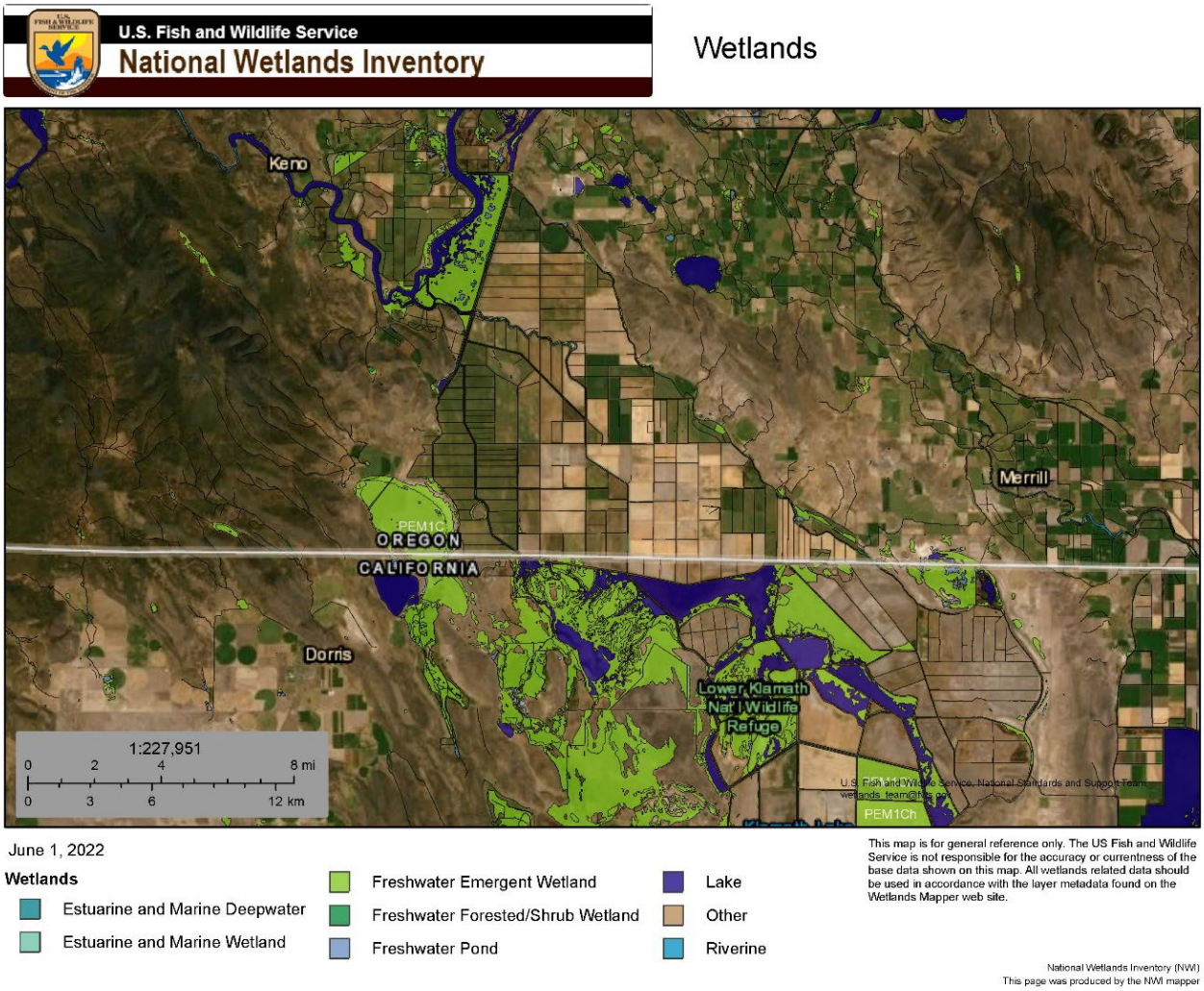


Figure E-11. Nation Wetlands Inventory Analysis for KDD (USFWS 2023).

Based on an analysis of the National Wetland Inventory (NWI) geographic information systems (GIS) data (USFWS 2023) and aerial imagery (Figure E-11), freshwater herbaceous wetlands and deepwater habitats occur in the planning area. As summarized in Table E-7, these habitats include Furber Marsh which is located at the diversion channels from the Klamath River to Ady Canal and North Canal diversions; freshwater emergent wetlands in the LKNWR and along fringes of canals and ditches; freshwater ponds; and riparian habitat associated with open waterbodies that include Sheepy Lake, Miller Lake, Lower Klamath Lake, and the Klamath River. The NWI data is used as a first-step approach in identifying and evaluating potential wetlands and Waters of the United States in the project area.

Table E-7. National Wetland Inventory Summary.

Cowardin Code	Type of Wetland or Deepwater Habitat	Resources in Planning Area
L2AB – Lacustrine Littoral Aquatic Bed	Lake	Lower Klamath Lake, Sheepy Lake
R2UB – Riverine Lower Perennial Unconsolidated Bottom and R2AB - Riverine Lower Perennial Aquatic Bed	Riverine/Perennial	Klamath Straits Drain and other semi-permanently flooded canals
R4SB – Riverine Intermittent Streambed	Riverine/Intermittent	North Canals, Center Canal, Ady Canal, and other seasonally flowing canals
PUS – Palustrine Unconsolidated Shore and PAB - Palustrine Aquatic Bed	Freshwater Pond	Ponds
PSS – Palustrine Scrub-Shrub	Freshwater Shrub Wetland	Few small localized isolated patches of wetland shrubs. Very minor component.
PEM – Palustrine Emergent	Freshwater Emergent Wetland	Furber Marsh, Miller Lake, fringe wetlands along North Canal and Center Canal, vegetated canals throughout the fields

Source: (USFWS 2023).

A wetland and waters delineation would be conducted prior to the implementation of Modernization Alternative projects to determine limits of direct and indirect impacts on wetlands and waters of the United States and the State. Jurisdictional determination by U.S. Army Corps of Engineers and concurrence by DSL of delineated boundaries of wetlands and waters would be obtained.

If the permitting agencies determine that compensatory mitigation is necessary to offset unavoidable impacts to aquatic resources, the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. An appropriate functional assessment tool and methods would be used to determine how much compensatory mitigation is required. There are no U.S. Army Corps of Engineers- or DSL-approved compensatory mitigation banks in the Lower Klamath Lake watershed. Therefore, a permittee-responsible mitigation could be provided on-site or off-site.

E.10 Supporting Information for Wildlife Resources

Table E-8. Wildlife Species Likely to Occur Within the Planning Area.

Wildlife Species	Scientific Name
Bat	*Vespertilionidae* spp.
Coyote	*Canis latrans*
Desert horned lizard	*Phrynosoma platyrhinos*
Golden mantled ground squirrel	*Spermophilus lateralis*
Mule deer	*Odocoileus hemionus*
Northern flicker	*Colaptes auratus*
Osprey	*Pandion haliaetus*
Pygmy rabbit	*Brachylagus idahoensis*
Pygmy short-horned lizard	*Phrynosoma douglasii*
Raccoon	*Procyon lotor*
Red-tailed hawk	*Buteo jamaicensis*
Rufous hummingbird	*Selasphorus rufus*
Turkey vulture	*Cathartes aura*
Western gray squirrel	*Sciurus griseus*
Western rattlesnake	*Crotalus viridus*
Western skink	*Eumeces skiltonianus*
Yellow pine chipmunk	*Eutamias amoenus*
Raccoon	*Procyon lotor*

Source: site observation, Taya MacLean, Senior Scientist, Parametrix, May 3, 2022.

Table E-9. Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act Species Potentially occurring within the Planning Area.

Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act Species	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Black Tern	*Chlidonias niger*
Cassin's Finch	*Carpodacus cassinii*
Clark's Grebe	*Aechmophorus clarkii*
Evening Grosbeak	*Coccothraustes vespertinus*
Franklin's Gull	*Leucophaeus pipixcan*
Lesser Yellowlegs	*Tringa flavipes*
Lewis's Woodpecker	*Melanerpes lewis*
Marbled Godwit	*Limosa fedoa*
Olive-sided Flycatcher	*Contopus cooperi*
Rufous Hummingbird	*Selasphorus rufus*
Sage Thrasher	*Oreoscoptes montanus*
Willet	*Tringa semipalmata*

Source: Site observation, Taya MacLean, Senior Scientist, Parametrix, May 3, 2022.

MAMMALS

NAME	STATUS
Gray Wolf *Canis lupus* Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA. Mexico. There is **final** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/4488	Endangered
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Threatened

BIRDS

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

FISHES

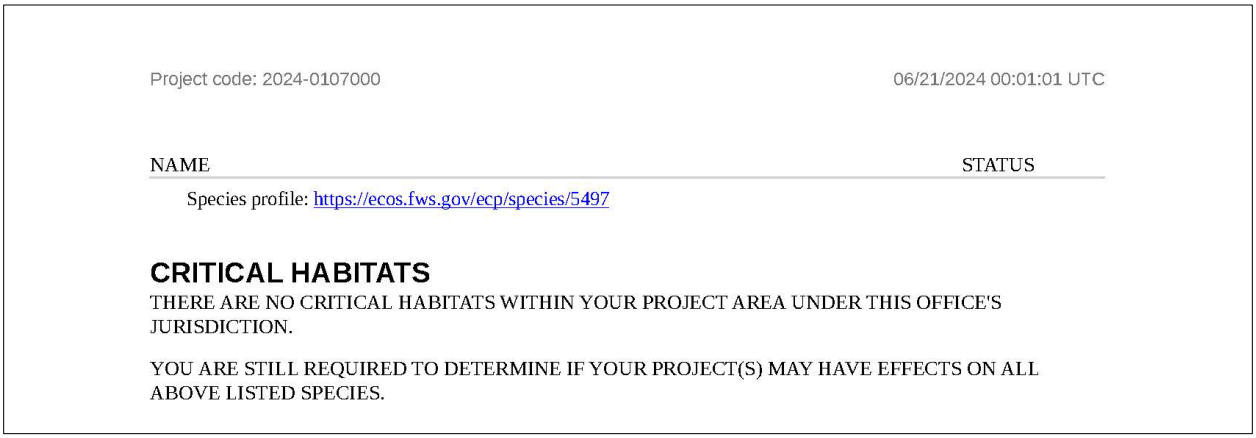
NAME	STATUS
Lost River Sucker *Deltistes luxatus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5604	Endangered
Shortnose Sucker *Chasmistes brevirostris* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7160	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Applegate's Milk-vetch *Astragalus applegatei* No critical habitat has been designated for this species.	Endangered



Project code: 2024-0107000 06/21/2024 00:01:01 UTC

NAME STATUS

Species profile: https://ecos.fws.gov/ecp/species/5497

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

Figure E-12. IPaC Official Species List provided by Klamath Falls Fish and Wildlife Office.

E.11 Supporting Information for Minimization, Avoidance, and Compensatory Mitigation Measures

Temporary Access

Prior to construction, the District would contact each landowner along the proposed route to discuss the KDD Infrastructure Modernization Project and if applicable, approve an easement agreement at the site of the proposed project. Adjacent landowners would be provided a construction schedule before construction begins. Construction limits would be clearly flagged to preserve existing vegetation and private property. Access to residences and farms would be maintained during construction. Construction would occur during the daytime to minimize disturbance to any landowners or other individuals in the construction area vicinity.

Staging, Storage, and Stockpile

Mechanized equipment and vehicles would be selected, operated, and maintained in a manner that minimizes adverse effects on the environment. Construction staging areas would be selected and used to minimize effects on vegetation and avoid the removal of trees. Construction equipment and vehicles would be parked a minimum of 150 feet away from streams, wetlands, ditches, and other waterbodies at the end of each workday. Fueling and maintenance operations would be performed on a flat surface, away from moving equipment, and at least 150 feet away from any water source.

Public Safety, Roads and Traffic Control

Standard construction safety procedures and traffic control measures would be employed to reduce the risk of collisions between construction vehicles and other vehicles, pedestrians, or bicyclists while construction is ongoing in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI – Traffic Controls for Street and Highway Construction and Maintenance Operations" published by the U.S. Department of Transportation. Street/lane closures on roadways would be avoided during peak travel periods where possible to reduce potential traffic delays from construction vehicles. If a street closure is required a traffic control plan will be developed. Prior to construction communication with adjacent landowners or organization such as the Tule Smoke Hunt Club would occur, to ensure the public would avoid construction sites as much as possible.

Erosion Control

Silt fencing, straw wattles, geotextile filters, straw bales, or other erosion control measures would be used to minimize soil erosion and prevent soil erosion from entering waterbodies during construction. Erosion control measures would be free of weeds and weed seeds.

In Water Work

All In Water Work will occur during the permitted In Water Work Window (July 1–January 31) to avoid fish spawning, sensitive life stages, and periods of high streamflow. All federal, state, and local permits will be secured prior to any work instream. Water quality protection measures will be implemented including erosion control, sediment control, and pollution control for all In Water Work and all dewatering efforts.

Equipment will be inspected, and power washed prior to entering the water. Equipment will remain in the water for the shortest time possible and not remain in the water while not working.

Coffer dams will be installed to dewater work areas as planned and scheduled. Nuisance water will be removed from the work area and discharged into appropriate locations.

Following the completion of work in dewatered areas, there will be a gradual return of streamflow to the extent possible.

Spill Prevention, Control, and Countermeasure

Spill kits would be located at fuel storage areas and the construction crew would have adequate absorbent materials and containment booms on hand to enable the rapid cleanup of any spill. Immediately upon learning of any fuel, oil, hazardous material including uncured concrete, or other regulated substance spill, or upon learning of conditions that would lead to an imminent spill, the person discovering the situation shall initiate actions to contain the fluid or eliminate the source of the spill and notify the Spill Coordinator or crew Foreperson immediately. If it is determined that a spill is beyond the scope of on-site equipment and personnel, an Environmental Emergency Response Contractor would be contacted immediately to contain or clean up the spill. Any spill into a waterbody or along the adjacent streambed would be reported immediately to Oregon Emergency Response Service at 1-800-452-0311 and the National Response Center at 1-800-424-8802. The Spill Coordinator would complete a Spill Report Form for each release of a regulated substance, regardless of volume.

Invasive Species Control

The measures below would be followed to avoid the introduction of invasive plants and noxious weeds into project areas. Any gear to be used in or near water would be inspected for aquatic invasive species. Ground disturbances would be limited to those areas necessary to safely implement the Preferred Alternative.

Begin activities in areas uninfested with invasive plants or noxious weeds before operating in infested areas.

Use uninfested areas for staging, parking, and cleaning equipment. Avoid or minimize all types of travel through infested areas, restrict to those periods when spread of seed, or plant reproductive parts are least likely.

When it is necessary to conduct soil work in infested roadsides or ditches, schedule activity when seeds or propagules are least likely to be viable to be spread.

Monitor disturbed areas for at least three growing seasons following completion of activities. Provide for follow-up treatments based on inspection results.

Inspect material sources at site of origin to ensure that they are free of invasive plant material before use and transport to the extent practicable. If possible, treat contaminated material before any use.

Revegetation

During excavation, any topsoil would be saved and replaced as the top layer after trenches are filled. Areas disturbed for access purposes or during construction would be regraded to their original contours. When necessary, compacted areas, such as access roads, staging, and stockpile areas would be loosened to facilitate revegetation and improved infiltration. Disturbed areas would be planted with a native seed mix appropriate to the habitat. Revegetation practices would follow NRCS's Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). Costs of revegetation are included in project installation cost estimates.

Wildlife

In appropriate cases and under consultation with U.S. Fish and Wildlife Service, ramps would be placed in open trenches during construction to avoid the potential for wildlife to become trapped overnight.

During construction, terrestrial wildlife could experience noise disturbance due to heavy equipment operation and habitat disturbance due to vegetation and soil clearing and grading. Most construction would occur in agricultural areas where heavy equipment use is commonplace; therefore, most wildlife in the area is accustomed to noise and these disturbances are anticipated to be minor.

Wintering or migrating birds would be minimally affected by construction disturbance because they have the flexibility to move away from disturbances to other suitable areas. There would be temporary moderate adverse effect on breeding migratory songbirds or water birds due to construction activities occurring withing the nesting season, which lasts from March 1 to August 31. To minimize adverse effects, prior to starting construction, the construction zone would be surveyed for active nests by a biologist qualified to follow the U.S Fish and Wildlife Service and the Oregon Department of Fish and Wildlife survey protocols. If nesting is occurring in or near the construction area, the biologist would work with the contractor to monitor the nest and confirm that chicks have fledged. Construction would commence after young chicks have fledged, or construction clearance has been received from Oregon Department of Fish and Wildlife.

The District would follow U.S. Fish and Wildlife Service guidelines to ensure minimal disturbance to bald or golden eagles nesting near the project area. The critical nesting period for bald and golden eagles in the planning area and vicinity is December 1 through August 31. North Canal in the northern half of the Project is adjacent to known golden eagle nesting sites located to the north of the planning area. Therefore, a seasonal restriction on the use of high noise equipment is in effect for construction in the northern part of the planning area. Additionally, pre-clearance surveys would occur prior to construction to verify the presence or absence of golden eagles in the area. These surveys would be consistent with U.S. Fish and Wildlife Service survey guidelines.

In the long-term, faster moving water of a higher quality in District waterways would potentially provide improved water quality and habitat for wildlife and bird species that may use canals as a water source. Additionally, the Modernization Alternative implementation would provide increased flows to LKNWR which is in critical need of receiving more water to support aquatic habitat for

migratory birds. Improved water flow would allow more consistent access to water for hydrophytic plants and aquatic organisms, and this could in turn enhance riparian wildlife habitat of LKNWR.

Construction activities related to fish screen installation would cause short-term, negligible adverse effects on wildlife due to increased human presence and initial clearing and grubbing of habitat.

Cultural Resources

If archaeological resources were inadvertently discovered during construction, an Inadvertent Discovery Plan would be followed. Construction would stop in the vicinity of the discovery, the area would be secured and protected, a professional archaeologist would assess the discovery, consultation with State Historic Preservation Office and NRCS cultural resources staff would occur as appropriate, and the appropriate tribes would be notified. Continuation of construction would occur in accordance with applicable guidance and law.

Land Rights and Easements

Prior to construction, the District would communicate with landowners and obtain necessary easement agreements or land acquisitions for North Canal Fish Screen, North Canal Extension, and SCADA. Following project installation, as-built surveys would be completed and attached to easements.

E.12 Guiding Principles (USDA 2017)

The Guiding Principles identified in the PR&G are considered when developing and evaluating alternatives, as described below:

Healthy and Resilient Ecosystems	A primary objective of the PR&G analysis is the identification of alternatives that protect and restore the functions of ecosystems. Alternatives should first avoid adverse impact. When environmental consequences occur, alternatives should minimize the impact and mitigate unavoidable damage. If damage occurs, mitigation to offset environmental damage must be included in the alternative's design and costs.
Sustainable Economic Development	Alternatives for resolving water resources problems should improve the economic well-being of the Nation for present and future generations. The PR&G analysis considers the effects of alternatives on both water availability and water quality to evaluate the sustainability of economic activity and ecosystem services. Water use or management factors that provide improved sustainability or reduced uncertainty should be identified in alternatives.

Floodplains	The PR&G seek to avoid unwise use of floodplains and flood prone areas. Alternatives should avoid investments that adversely affect floodplain function, such that the floodplain is no longer self-sustaining. If an alternative impacts floodplain function, then the alternative should describe efforts to minimize and mitigate the impact and the residual loss of floodplain function. The PR&G investment evaluation of alternatives must be consistent with Executive Order 11988 of May 24, 1977 (Floodplain Management), as modified by Executive Order 13690 of January 30, 2015 (Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input), and the Federal Flood Risk Management Standard, which require executive departments and agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The PR&G investment evaluation is informed by the processes to evaluate the impacts of Federal actions affecting floodplains consistent with Executive Order 11988, as amended.
Public Safety	An objective of the PR&G is to reduce risks to people, including life, injury, property, essential public services, and environmental threats concerning air and water quality. These risks to public health and safety must be evaluated and documented for all alternatives, including those using nonstructural approaches. The residual risks to public health and safety associated with each of the water investment alternatives should be described, quantified if possible, and documented.
Environmental Justice	An objective of the PR&G investment evaluation process is the fair treatment of all people including meaningful involvement in the public comment process. Any disproportionate impact to minority, Tribal, and low-income populations should be avoided. In implementing the PR&G, agencies should seek solutions that would eliminate or avoid disproportionate adverse effects on these communities. For watershed investments, particular attention should be focused to downstream areas. The study area may need to be reexamined to include the concerns of affected communities downstream of the immediate investment area. The PR&G process should document efforts to include the above-mentioned populations in the planning process. The PR&G process must be in compliance with Executive Order 12898 of February 11, 1994 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations). Applications of the PR&G process in USDA agencies must be in compliance with USDA DR 5600-002 (Environmental Justice).

Watershed Approach	A watershed approach must be used when completing a PR&G analysis. This approach recognizes that there may be upstream and downstream impacts of a water resources activity that may be outside of the applicable political or administrative boundaries. A watershed approach is not necessarily limited to analyzing impacts within a specific hydrologic unit. Rather, it is broad, systems-based framework that explicitly recognizes the interconnectedness within and among physical, ecological, economic, and social/cultural systems. A watershed approach enables examination of multiple objectives, facilitates the framing of water resources problems, incorporates a broad range of stakeholders, and allows for identification of interdependence of problems and potential solutions. In many instances, a specific hydrologic unit may be the appropriate scale to examine alternatives to address water resources problems and opportunities. In this case, the watershed would become the study area. In other cases, environmental, economic, or social conditions may merit a study area that is combination of various hydrologic units or other geographic groupings. Ideally, the area of analysis should represent a geographical area large enough to ensure plans address cause and effect relationships among affected resources, stakeholders, and investment options, both upstream and downstream of an investment site. The watershed approach also establishes the framework to examine cumulative effects and the interaction of a potential Federal investment with other water resources projects and programs. When considering the impact of Federal investments against some economic and ecological measures, the analysis may need to be expanded to include regional markets and habitat considerations beyond the initial study area (e.g., beyond the immediate hydrologic unit).