Draft Watershed Plan- Environmental Assessment for the Lone Pine Irrigation District Infrastructure Modernization Project

Osborne Canyon-Crooked River and Lone Pine Creek Watersheds

Deschutes, Crook, and Jefferson Counties, OR

April 20, 2021

United States Department of Agriculture, Natural Resources Conservation Service – Lead Federal Agency in cooperation with the Deschutes Basin Board of Control and Lone Pine Irrigation District

Prepared by Farmers Conservation Alliance

Draft Watershed Plan-Environmental Assessment for the Lone Pine Irrigation District Infrastructure Modernization Project

Lead Agency: United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Oregon

Sponsoring Local Organization (SLO): Deschutes Basin Board of Control (lead sponsor) and Lone Pine Irrigation District (co-sponsor).

Authority: This Watershed Plan-Environmental Assessment (Plan-EA) has been prepared under the Authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law [PL] 83-566). The Plan-EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, as amended (42 United States Code [U.S.C.] 43221 et seq.).

Abstract: This document is intended to fulfill requirements of NEPA and to be considered for authorization of PL 83-566 funding of the Lone Pine Irrigation District Infrastructure Modernization Project (project). The project seeks to improve water conservation and water delivery reliability in Oregon's Deschutes Basin. The project would include realigning the LPID canal system to achieve optimal efficiency, install 10.9 miles of buried and pressurized pipeline, construct a new river crossing at the Crooked River, and decommission 9.7 miles of open canal. Total estimated project costs are $13,893,000 of which $3,370,000 would be paid by the sponsors and other non-federal funding sources. The estimated amount to be paid through NRCS PL 83-566 funds is $10,523,000.

Comments: NRCS completed this Plan-EA in accordance with the NEPA and NRCS guidelines and standards. Comments must be submitted to NRCS during the allotted Public Review Period (within 30 days of the public release of the Plan-EA) and become part of the Administrative Record.

To submit comments, send via email to lonepinecomments@gmail.com or via U.S. Mail to:

Farmers Conservation Alliance, Attention Watershed Plan-EA
102 State Street
Hood River, OR 97031

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Summary Watershed Plan-Environmental Assessment Document For Lone Pine Irrigation District Infrastructure Modernization Project Upper Deschutes Basin Subwatersheds: Osborne Canyon-Crooked River and Lone Pine Creek Crook, Jefferson, and Deschutes County, Oregon Oregon 2nd Congressional District	
Authorization	PL 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et. Seq.) 1954
Lead Sponsor	Deschutes Basin Board of Control and Lone Pine Irrigation District (co-sponsor)
Proposed Action	The Lone Pine Irrigation District (LPID) Infrastructure Modernization Project is a large agricultural water conveyance efficiency project. The proposed action would pipe LPID's entire canal and lateral system.
Purpose and Need	The purpose of this project is to improve water conservation and water delivery reliability on District-owned canals and laterals. Implementation of the proposed action would meet PL 83-566 Authorized Project Purpose (v), Agricultural Water Management, through irrigation water conservation, water quality improvement, and more reliable agricultural water supply. Federal assistance through PL 83-566 would support the District in addressing the following watershed problems and resource concerns: water loss in District conveyance systems, water delivery and operations inefficiencies, and instream flow for fish and aquatic habitat. Implementing the proposed action would support the maintenance of agricultural production in a region undergoing rapid urbanization where environmental concerns necessitate federal support. The proposed action addresses the need to reduce conveyance water loss; provide better-managed water diversions for farm use; and improve streamflow for fish, aquatic, and riparian habitat. These measures would serve to stretch the supply of water for agriculture by increasing the reliability and efficiency of water delivered for irrigation while permanently reducing the amount of water diverted, and legally protecting saved water instream.
Description of the Preferred Alternative	Under the Preferred Alternative, LPID would realign the District's conveyance system to achieve optimal efficiency of water delivery and reduce costs, construct a new river crossing at the Crooked River and enter the District from the southern boundary, install 10.9 miles of pressurized buried pipe, and decommission 9.7 miles of open canal.
Project Measures	Under the Preferred Alternative, project sponsors would realign the conveyance system with pipe ranging in 4 to 48 inches in diameter, decommission 9.7 miles of open canal, and construct a new river crossing over the Crooked River. Additionally, 45 turnouts would be upgraded to accommodate pressurized delivery systems. Construction of the Preferred Alternative would occur in one project group over the course of 3 years.

Resource Information			
Subwatersheds	**12-digit Hydrologic Unit Code**	**Latitude and Longitude**	**Subwatershed Size**
Osborne Canyon-Crooked River	170703051101	44.248873, -121.356289	42,387 acres
Lone Pine Creek	170703051004	44.190339, -121.420120	15,609 acres
McAllister Slough-Crooked River	170703051006	44.361463, -120.954876	27,370 acres
North Unit Main Canal	170703051005	44.277094, -121.119267	11,450 acres
Town of O'Neil	170703050902	44.232138, -121.093840	21,526 acres
Subwatershed Total Size	118,342 acres		
Lone Pine Irrigation District Size	5,041 acres		
Climate and Topography	The project is located in the rain shadow of the Cascade Mountain range. LPID's annual average precipitation is 10-14 inches. The average high temperature for July is 82 degrees Fahrenheit and average low temperature for December is 23 degrees Fahrenheit. The land within LPID is slightly undulating with an average elevation of 3,864 feet above mean sea level.		
Land Use (Planning Area)	Use		Acres
	Agriculture (irrigated acres)		3,067
	Developed		325
	Undeveloped		2,454
Land Ownership (Planning Area)	Owner		Percentage
	Private		80%
	State-Local		0.5%
	Federal		19.4%

Population and Demographics	The Preferred Alternative would occur within Crook, Deschutes, and Jefferson Counties, Oregon. In 2015, the populations of Crook, Deschutes, and Jefferson Counties were 21,455, 174,246, and 22,541, respectively. The population growth rates between 2015 and 2019 were 13.7, 13.5, and 9.4 percent, respectively. The population of the State of Oregon grew by 4.5 percent in the same time period.				
Population and Demographics		Crook County	Deschutes County	Jefferson County	Oregon
	Population 2019	24,404	197,692	24,658	4,217,737
	Unemployment Rate	6.9%	5.9%	5.4%	5.0%
	Median Household Income	$49,006	$67,043	$53,227	$62,818
Relevant Resource Concerns	Resource concerns identified through scoping are water conservation and quality, groundwater, aquatic and fish resources, soil and geologic resources, cultural resources, socioeconomics, wetlands, terrestrial wildlife, and vegetation resources.				
Alternatives					
Alternatives Considered	Nine alternatives were considered. Four were eliminated from full analysis because they did not address the purpose and need for action; or because they became unreasonable due to cost, logistics, existing technology, social, or environmental reasons. The No Action Alternative and Piping Alternative were analyzed in full.				
No Action Alternative (Future without Federal Investment)	Under the No Action Alternative, construction activities associated with the project would not occur and LPID would continue to operate and maintain the existing conveyance system in its current condition. The need for the project would still exist; however, the District would only modernize its infrastructure on a project-by-project basis as funding became available and realignment for optimal efficiency would not occur. This funding is not reasonably certain to be available under a project-by-project approach at the large scale necessary to modernize the District's infrastructure.				
Preferred Alternative	Under the Piping Alternative, LPID would realign the District's conveyance system to achieve optimal efficiency of water delivery and reduce costs, construct a new river crossing at the Crooked River and enter the District from the southern boundary, install 10.9 miles of pressurized buried pipe, and decommission 9.7 miles of open canal. The Piping Alternative has been identified as the National Economic Efficiency (NEE) plan and is also the Preferred Alternative.				
Mitigation, Minimization, and Avoidance Measures	The channelized section of Lone Pine Creek would remain open, and avoidance measures would be practiced, including appropriate erosion control measures and riparian setbacks that would be temporarily staked in the field to ensure that construction equipment and personnel minimize disturbance during construction. Approximately 2.6 miles of the 12.3[1] miles of open canals and laterals that would be converted to upland vegetation currently provide seasonal wetland characteristics. Project canals and laterals are not considered jurisdictional wetlands by state or				

[1] In total, 9.7 miles of currently open canal would be decommissioned, and 2.6 miles of currently open canal would be piped, filled, and reseeded.

	federal agencies. The wetland characteristics that could occur in the open canals and laterals have low function, and the loss would be offset by gains in water quality and habitat function in the natural riverine systems along the Deschutes River. The National Wetland Inventory (NWI) geographic information systems data (USFWS 2016) shows one wetland feature to occur at the site of the proposed river crossing; however, these have not been field verified. Wetland determinations and/or delineations of areas where work would occur would be conducted prior to implementation of construction, and wetlands would be avoided to the extent practicable. Prior to construction, the District would hire a cultural resource specialist to complete surveys for historic properties in the project area. If eligible historic properties are documented in the project area, consultation would occur between the District, NRCS, State Historic Preservation Office (SHPO), and the Confederated Tribes of Warm Springs (CTWS) to determine the effect on such properties and identify appropriate mitigation. Potential mitigation measures are discussed in Section 6.1 and would be identified before construction and completed concurrently during or after construction. Ground disturbances would be limited to only those areas necessary to minimize effects on soil, vegetation, and land use. Where possible and where a new alignment has not been proposed, construction activities would avoid or minimize effects on agricultural lands by confining construction activities to the existing right-of-way. In areas where the realignment would extend out of the existing rights-of-way, new easements have been discussed with landowners and would be legally obtained prior to project implementation. Where roads or access routes do not currently allow construction access, temporary access routes would be selected in a manner to minimize erosion and effects on vegetation as well as avoid the removal of trees. Stormwater best management practices (BMPs) would be employed during and after construction, and construction schedules would minimize disturbance to wildlife and the public. After construction, disturbed areas would be graded and replanted with a mix of native grasses and forbs to reduce the risk of erosion and spread of noxious weeds.

Project Costs	**PL 83-566 Funds**		**Other Funds**		**Total**	
Construction	$9,248,000	75%	$3,082,000	25%	$12,330,000	100%
Engineering	$319,000	75%	$106,000	25%	$425,000	100%
SUBTOTAL COSTS	$9,567,000	75%	$3,188,000	25%	$12,755,000	100%
Technical Assistance	$765,000	100%	$0	0%	$765,000	100%
Relocation	Not Applicable					
Real Property Rights	Not Applicable					
Permitting	$0	0%	$150,000	100%	$150,000	100%

Project Administration	$191,000	86%	$32,000	14%	$223,000	100%
Annual Operation, Maintenance, and Replacement (OM&R)	Not Applicable					
TOTAL COSTS	$10,523,000	76%	$3,370,000	24%	$13,893,000	100%

Project Benefits	
Project Benefits	Implementation of the Preferred Alternative would improve water delivery reliability for LPID and NUID patrons, protect up to 1,600 acre-feet of water for instream uses, reduce LPID's OM&R costs, and reduce some patrons' electricity costs from pumping.
Number of Direct Beneficiaries	LPID serves 22 patrons, all of whom would directly benefit from the project.
Other Beneficial Effects-Physical Terms	Implementation of the Preferred Alternative would have long-term, beneficial effects on agricultural water availability, water quality, and fish and wildlife habitat.

Damage Reduction Benefits	**Proposed Project**
Other – Agricultural Damage Reduction	$237,000
Other - Reduced OM&R	$89,000
Other - Power Cost Savings	$61,000
Other - Social Value of Carbon (Avoided Carbon Emissions)	$6,000
Water Conservation	$17,000
Total Quantified Benefits	$16,000
Benefit to Cost Ratio	1.15
Period of Analysis	
Installation Period (years)	3
Project Life	100 years

Funding Schedule			
Year	**PL 83-566**	**Other Funds**	**Total**
2021, 2022, 2023	$10,523,000	$3,370,000	$13,893,000

Environmental Effects	
The Preferred Alternative would be planned, designed, and installed to have long-term net beneficial effects on agricultural production, water quantity, and water quality. Practices that improve waterbodies associated with District operations would assist in instream flow restoration goals for sensitive fish and aquatic species that have environmental requirements. Implementation of the Preferred Alternative may result in minor, unavoidable, short-term adverse effects, such as impacts to soils, land use, and water quality. Short-term, adverse effects on water hydrology, water quality, fish and aquatic species, and wetland and riparian areas could result from construction activities in the project area, depending on which river crossing design the District implements. The Sponsor would work closely with partners, contractors, and affected landowners to incorporate measures to avoid and minimize short-term, adverse effects. There would be long-term, minor adverse effects on soils in the project area where realignment and the river crossing would occur. BMPs would be implemented to minimize erosion and contain runoff. Other long-term minor effects would occur to vegetation, and wildlife, and artificial wetland habitat within the project area. Following construction, BMPs for ecological restoration would be followed and there would be an increase in native, upland vegetation in the project area, returning some of the project area to a more natural state. During construction, unavoidable effects on wetlands and riparian areas would be minimized using BMPs. Prior to construction, the District would complete pre-clearance surveys to verify the presence or absence of golden eagle in the area and all United States Fish and Wildlife Service (USFWS) guidelines would be followed to ensure minimal disturbance to bald or golden eagles nesting near the project area. The Sponsor would implement BMPs and identified minimization measures to avoid all adverse effects.	
Major Conclusions	The Preferred Alternative would improve water delivery reliability for farmers, reduce water loss to operational spill, seepage, and evaporation in District infrastructure, and enhance fish and aquatic habitat through greater instream flows while supporting agriculture and improving the environmental quality of rivers and tributaries.
Areas of Controversy	There have been no areas of controversy identified.
Issues to be Resolved	None
Evidence of Unusual Congressional or Local Interest	Comments on the Preliminary Investigative Report were received from the USFWS and local non-governmental organizations and individuals.
Compliance	Is this report in compliance with executive orders, public laws, and other statues governing the formulation of water resource projects? Yes _X_ No____

1 Introduction

Aging infrastructure, growing populations, shifting rural economies, and changing climate conditions have increased pressure on water resources across the western United States. Within the Deschutes Basin, irrigated agriculture is the main out-of-stream water use and primarily relies on 100-year-old infrastructure to divert, store, and deliver water to farms and ranches. In recent years, improving water resources has been a coordinated community focus among eight irrigation districts within the Deschutes Basin in order to address environmental needs for instream flows while still delivering enough water to district patrons (Figure 1-1).

Due to the basin-wide need for improved water management, Lone Pine Irrigation District (herein referred to as LPID or the District) is pursuing water conservation strategies in effort to construct a more efficient system and permanently restore flows in the Deschutes River. The District's aging and outdated infrastructure contributes to water delivery insecurity for out-of-stream users and limits streamflow, which affects water quality and aquatic habitat along the Deschutes River. Future climate change also could disrupt the District's water supplies as studies predict that future streamflow magnitude and timing in the area is projected to shift toward higher winter runoff, lower summer and fall runoff, and an earlier peak runoff (OCCRI 2017). Aging infrastructure also affects the financial stability of LPID and its patrons because the District must find new approaches to fund growing maintenance needs that are not accommodated in standard annual budgets.

Improving irrigation infrastructure offers an opportunity to conserve water, increase the reliability of water delivery to farms, enhance streamflow and habitat conditions for fish and aquatic species in the Deschutes Basin, and reduce operation and maintenance (OM&R) costs for farmers and the District. The Deschutes Basin Board of Control is the lead sponsor for the LPID Infrastructure Modernization Project (herein referred to as the project or proposed action).

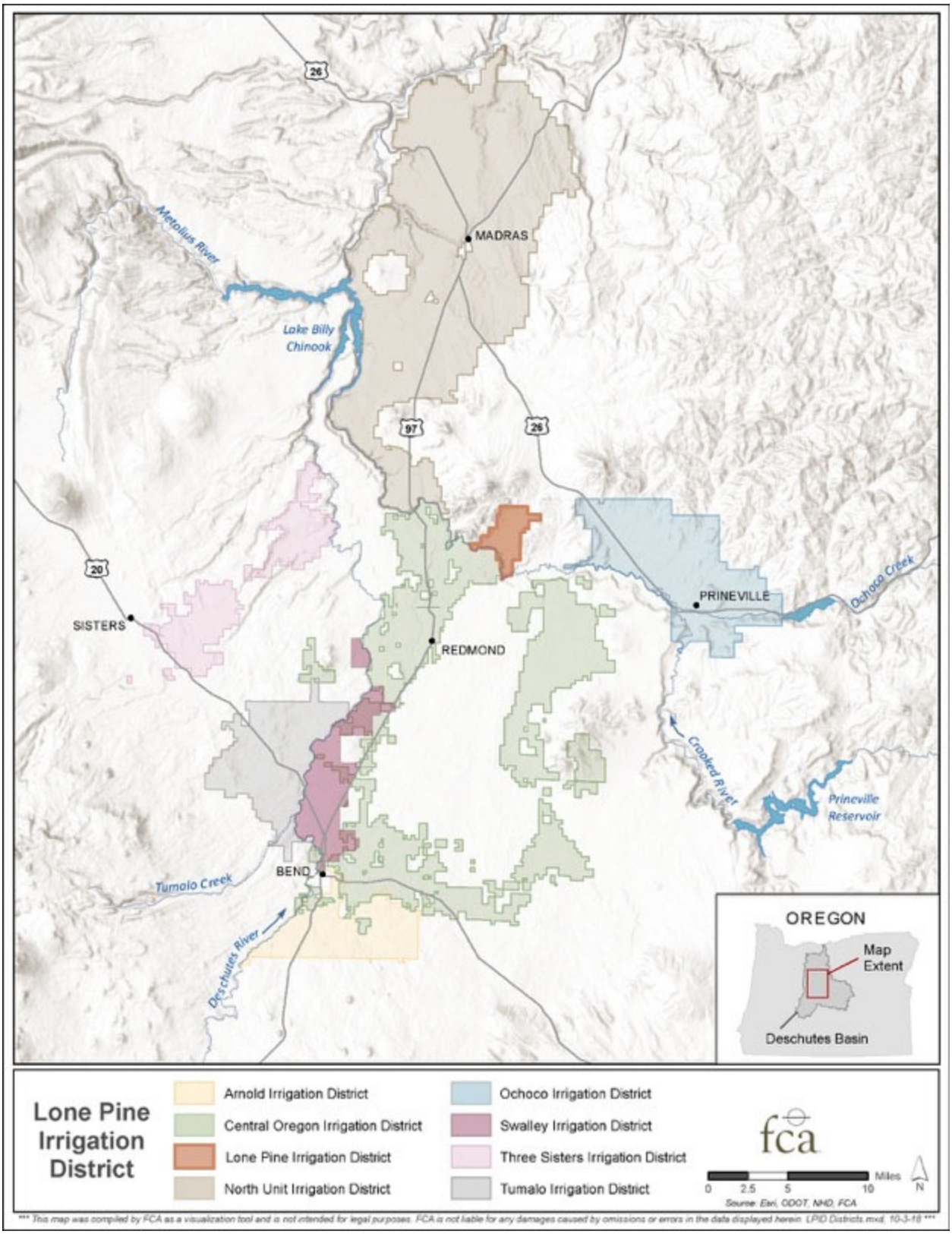


Figure 1-1. Irrigation districts within the Deschutes Basin.

1.1 Planning Area

The District and the project are located in five subwatersheds: Lone Pine Creek, McAllister Slough-Crooked River, North Unit Main Canal, Osborne Canyon-Crooked River, and Town of O'Neil. The planning area is based on the irrigation problem area and is identified as the tax lots traversed by the proposed project (Table 1-1 and Figure 1-2).[2]

Table 1-1. Lone Pine Irrigation District Planning Area.

Subwatershed Name	12-Digit Hydrologic Unit Code	Subwatershed Size (acres)	Planning Area Falling within the Subwatersheds (acres)
Lone Pine Creek	170703051004	15,609	3,060
McAllister Slough-Crooked River	170703051006	27,370	449
North Unit Main Canal	170703051005	11,450	151
Osborne Canyon-Crooked River	170703051101	42,387	2,169
Town of O'Neil	170703050902	21,526	16
	Total	**118,342**	**5,845**

[2] The planning area referred to in this Plan-EA is equivalent to the term "watershed area" as defined by the 2015 NRCS National Watershed Program Manual (NWPM; NRCS 2015a) 506.60. The term "planning area" is used in this Plan-EA in an effort to reduce confusion between the NWPM 506.60 watershed area definition and watershed areas as defined by hydrologic unit codes.

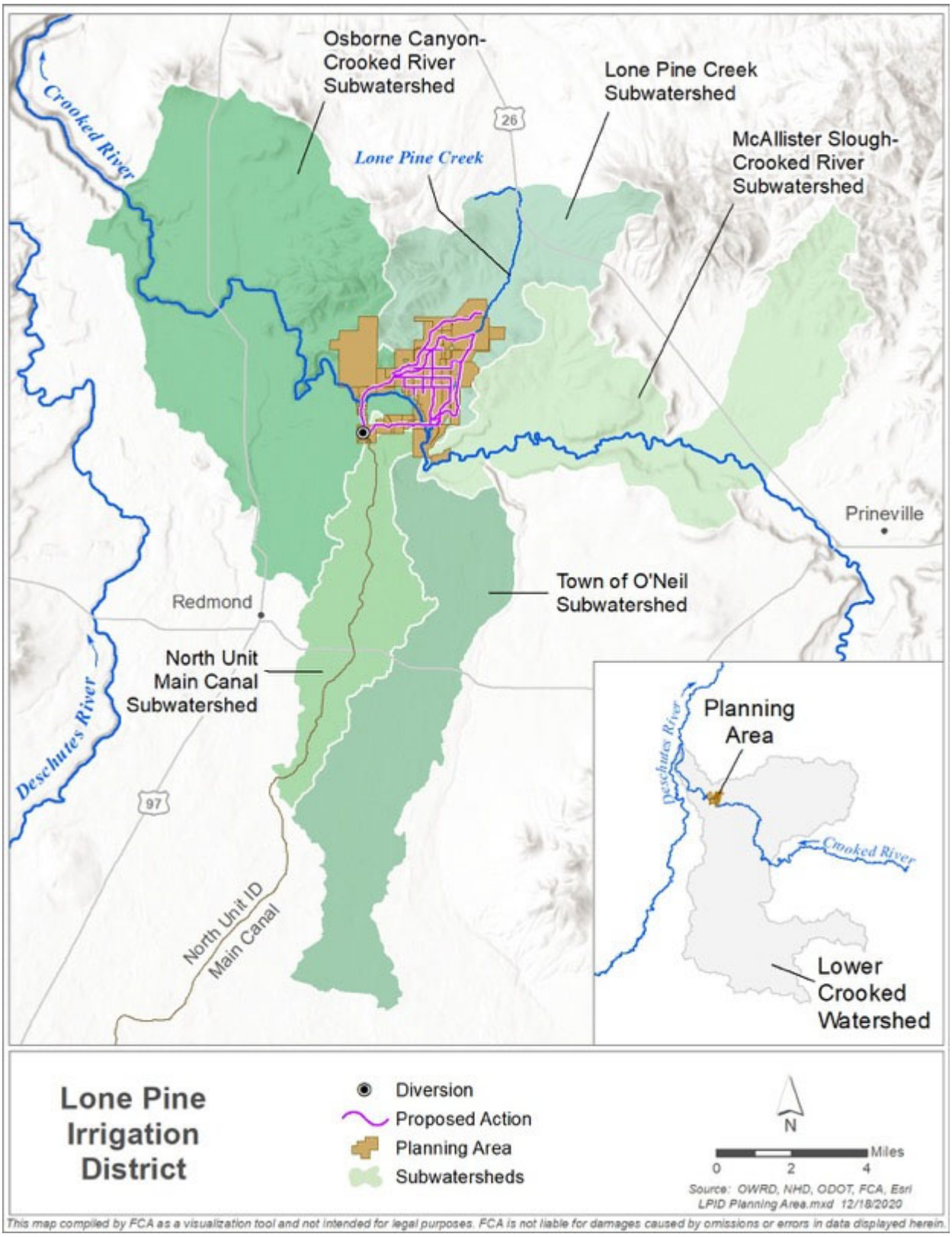


Figure 1-2. The Lone Pine Irrigation District planning area

1.2 Project Area

The project area includes the rights-of-way (ROWs) and easements associated with existing LPID infrastructure, as well as new easements where construction has the potential to occur due to realignment. The project area begins at the junction of Central Oregon Irrigation District's (COID) Pilot Butte Canal (PBC) and COID's L-Lateral and extends approximately 4.5 miles east. After crossing the Crooked River, the project area continues north through the Lone Pine Valley where eight laterals extend east and west off of the proposed main canal (Figure 1-3). The Crooked River Crossing is expected to occur at approximately River Mile (RM) 30.15.

1.3 Current Infrastructure

The District has 10,500 acre-feet of stored water rights in Crane Prairie Reservoir, which also stores water for other irrigation districts. Water from Crane Prairie Reservoir is released throughout the irrigation season and is conveyed through Wickiup Reservoir (a storage reservoir for North Unit Irrigation District [NUID]) and down the Deschutes River.

Water in the Deschutes River is diverted by the District at the COID PBC Diversion at North Canal Dam (RM 164.8). Water is conveyed through the COID PBC to the terminus where it is delivered to the LPID main canal. Total water delivery into the LPID system at the Lone Pine weir is determined by LPID staff and adjusted accordingly by COID personnel.

The main canal conveys water by means of a steel pipe starting below the Lone Pine Weir, traveling across the Crooked River, and then northeast to a main distribution point. The antiquated suspension-type bridge across the Crooked River supports a 36-inch wood stave pipe with low-pressure-rated polyvinyl chloride (PVC) alloy liner. The liner relies on the wood-stave pipe to withstand any significant pressure. The LPID system consists of approximately 15 miles of canals and laterals, including a few existing piped segments (4.5 miles) and a pumping plant.

From the main distribution point (Figure 1-4), the conveyance system branches into three laterals: Upper, Middle, and Lower. The Upper lateral uses a pump station, which raises the water 45 feet in elevation through a 500-foot pipe and is then fed by gravity in an open system. The Middle and Lower laterals are open and fed entirely by gravity.

Approximately 30 percent of the conveyance system is piped; however, these pipes would need to be replaced in order to withstand the pressure in the new system. Patron turnouts from the District's canals and laterals are typically gate-regulated and weir-measured. The District's part-time ditch rider regulates flows to each system lateral and patron turnout by operating a series of headgates.

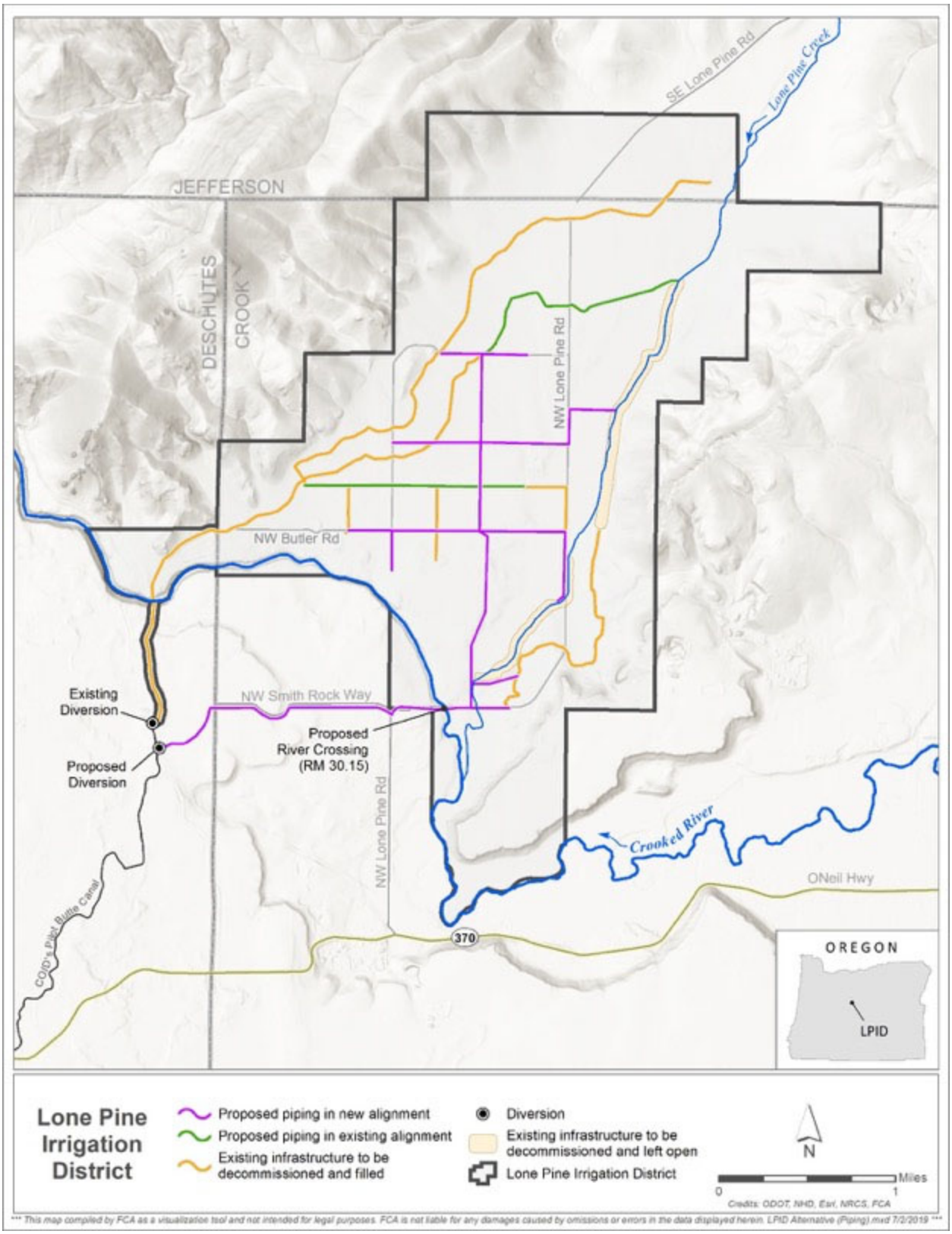


Figure 1-3. Lone Pine Irrigation District's infrastructure modernization project area.

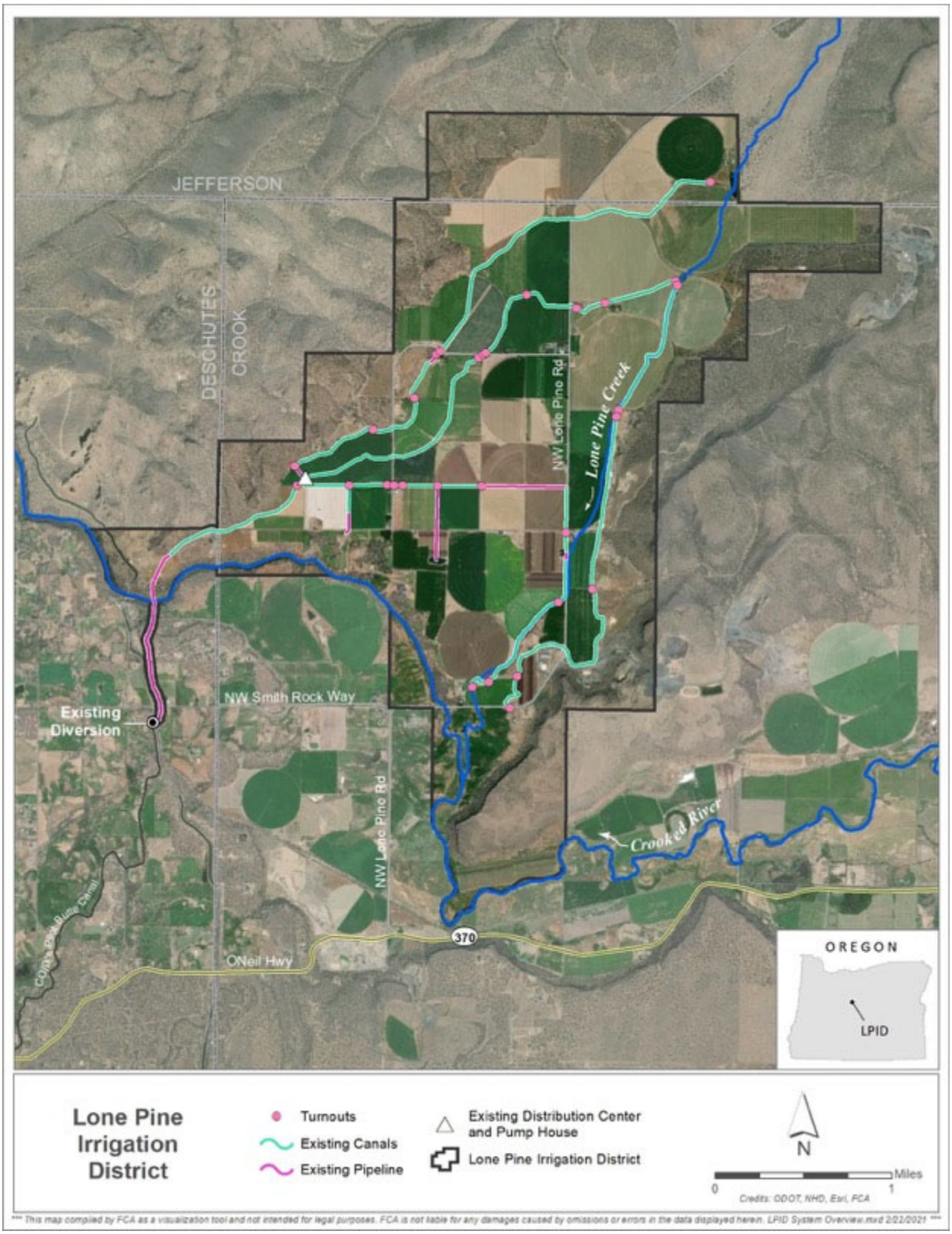


Figure 1-4. Lone Pine Irrigation District's current infrastructure.

1.4 Decision Framework

This Draft Watershed Plan-Environmental Assessment (Plan-EA) has been prepared to assess and disclose the potential effects of the proposed action. The Plan-EA is required to request federal funding through the Watershed Protection and Flood Prevention Program, Public Law 83-566 (herein referred to as PL 83-566). Through this program, the Natural Resources Conservation Service (NRCS) provides technical and financial assistance to project sponsors such as states, local governments, and tribes to plan and implement authorized watershed project plans for watershed protection; flood mitigation; water quality improvements; soil erosion reduction; rural, municipal, and industrial water supply; irrigation; water management; sediment control; fish and wildlife enhancement; and hydropower.

NRCS is the lead federal agency for this Plan-EA and is responsible for issuance of a decision in accordance with the National Environmental Policy Act (NEPA). NEPA requires that Environmental Impact Statements (EISs) are completed for projects using federal funds that significantly affect the quality of the human and natural environment (individually or cumulatively). When a proposed project is not likely to result in significant impacts requiring an EIS but the activity has not been categorically excluded from NEPA, an agency can prepare a Plan-EA to assist them in determining whether an EIS is needed (see 40 Code of Federal Regulations [CFR] 1501.4 and 1508.9; 7 CFR 650.8).

For purposes of NEPA compliance, the intent of this Plan-EA is to provide a programmatic approach for the implementation of the proposed action. LPID is partnered with NRCS to implement the Infrastructure Modernization Project within LPID's Planning Area under the watershed authority of the PL 83-566 program.

This Plan-EA follows a tiered approach to NEPA. Tiering is a staged approach as described in the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 to 1508). Broad programs and issues are described in initial analyses, while site-specific proposals and impacts are described in subsequent site-specific studies. The tiered process permits the lead agency to focus on issues that are ripe for decision and exclude from consideration issues already decided or not yet ready for decision. Tiering eliminates repetitive discussions of the same issues across site-specific areas through incorporation by reference of the general discussions.

NRCS has determined the need for a Plan-EA to implement the proposed action under PL 83-566 watershed authority. The proposed action is planned to be completed as one project group over the course of 3 years.[3] Consistent with the tiering process as described above, before implementing each site-specific project, an on-site Environmental Evaluation (EE) review would occur using Form NRCS-CPA-52, Environmental Evaluation Worksheet. The EE would determine if that individual project meets applicable project specifications and whether the site-specific environmental effects are consistent with those as described and developed in this Plan-EA. This process provides information for the Responsible Federal Official to determine if the proposed action has been adequately analyzed and if the conditions and environmental effects described in the Plan-EA are

[3] "Project group" refers to groupings of canals and laterals that would undergo construction during the same period. This project has only 1 project group that would be constructed over the course of 3 years.

still valid. Where the impacts of the narrower project-specific action are adequately identified and analyzed in the broader NEPA document, no further analysis would occur and the Plan-EA would be used for purposes of the pending action.

If it is determined that the Plan-EA is not sufficiently comprehensive, is not adequate to support further decisions, or if resource concerns or effects have not been adequately evaluated through the programmatic approach, a separate site-specific supplemental Plan-EA would be prepared.

This Plan-EA has been prepared to meet NEPA requirements[4] as well as program and environmental review requirements specific to NRCS federal investments in water resources projects.[5] Some considerations and analyses in the Plan-EA are strictly NRCS program requirements; they are not required by NEPA. These differences are identified throughout this Plan-EA.

[4] The Plan-EA has been prepared in accordance with applicable CEQ regulations for implementing NEPA (40 CFR 1500–1508), USDA's NEPA regulations (7 CFR Part 650), NRCS Title 190 General Manual Part 410, and the NRCS National Environmental Compliance Handbook Title 190 Part 610 (May 2016).

[5] The Plan-EA has been prepared in accordance with the guidelines in the 2015 NRCS National Watershed Program Manual (NWPM; NRCS 2015a) and the 2014 NRCS National Watershed Program Handbook (NRCS 2014). It has also been prepared in accordance with the Principles and Requirements for Federal Investments in Water Resources (NRCS 2013) issued in March 2013 along with Interagency Guidelines and Agency Specific Procedures established in Departmental Manual (DM) 9500-013. These documents comprise the Guidance for Conducting Analysis Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water and Resource Investments (PR&G; USDA 2017). The PR&G revised and replaced the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The PR&G constitutes the comprehensive policy and guidance for federal investments in water resources.

2 Purpose and Need for Action

The purpose of the project is to improve water conservation in District-owned infrastructure and to improve water supply management and delivery reliability to District patrons.

Federal assistance is needed to support the District in addressing water loss in District infrastructure, water delivery and operation inefficiencies, and diminished instream flows that limit fish and aquatic habitat. These topics are further discussed in Section 2.1.

To meet NRCS requirements for federal investment in a water resources project, the project must meet the Federal Objective set forth in the Water Resources Development Act of 2007; promote the Federal Objective and Guiding Principles (as identified in the Guidance for Conducting Analysis Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (PR&G; USDA 2017); and be an authorized project purpose under Sections 3 and 4 of PL 83-566.

Per the Federal Objective, water resource investments should:

> "…reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems." (NRCS 2013)

Additionally, the project should seek to achieve the following Guiding Principles as identified by the Federal Government: Healthy and Resilient Ecosystems, Sustainable Economic Development, Floodplains, Public Safety, Environmental Justice, and Watershed Approach.

The proposed project would be eligible for funding under PL 83-566 requirements as an "Authorized Project Purpose (v), Agricultural Water Management" through irrigation water conservation, water quality improvement, and more reliable agricultural water supply. [6]

2.1 Watershed Problems and Resource Concerns

2.1.1 Water Loss in District Conveyance Systems

Conserving water is a key goal of the District. Currently, the District's canal infrastructure loses water to operational spills, seepage through porous underlying soils, evaporation, and other conveyance inefficiencies. Based on a water loss study performed by Oregon Water Resources Department (OWRD) in July 2020, the calculated loss (Appendix E.3) is approximately 2,103 acre-feet of water annually. This water loss equates to approximately 19 percent of the average amount of

[6] A description of Authorized Purposes can be found in 390-NWPM, Part 500, Subpart A, Section 500.3B (NRCS 2015a).

water diverted by the District (11,812 acre-feet per year). This water enters the District's conveyance system but never reaches farms in the District.

2.1.2 Water Delivery and Operations Inefficiencies

When the District increases its diversion rate to refill the canals after they have run dry or low, the ends of the District's laterals remain dry for up to 3 days as the system recharges. During these recharge periods, the District cannot always fully meet its obligations to deliver water to its patrons due to conveyance inefficiencies.

The District's antiquated canals and laterals make it difficult to deliver the correct amount of water to patrons at the correct time, particularly early and late in the irrigation season when the District's water rights do not allow it to divert live flow at their full rate. At reduced flow rates, the canals and laterals are more sensitive to small changes in streamflow at the diversion or deliveries at each point of delivery. The reduced flow rates in the open canals and laterals make it much more challenging for the District to deliver the amount of water that patrons need when they need it. For example, a point of delivery near the end of a lateral may receive no water in the morning and excess water in the evening. The District also has to pass excess water, known as carry water, to ensure adequate water reaches all points of delivery when required by patrons according to their water rights. When the patrons' demand subsides, this excess water is spilled into the Crooked River. This excess water is another example of inefficiencies in the current conveyance system.

2.1.3 Instream Flow for Fish and Aquatic Habitat

Compared to the natural hydrologic regime, the Deschutes River and its tributaries experience high streamflow variability seasonally due to the storage and diversion of water for agricultural use. Resource agencies have identified streamflow as a primary concern in the Deschutes River (UDWC 2014).

Reservoir operations lead to low winter streamflow and high summer streamflow in the upper Deschutes River upstream from LPID's diversion. The combined diversions of the six major irrigation districts and the cities that divert water in or near the City of Bend lead to low spring, summer, and fall streamflow in the Deschutes River downstream of LPID's diversion.

The Deschutes River and its tributaries support a variety of sensitive species, of which three are currently listed as threatened under the Endangered Species Act (ESA) (Section 4.7.2). Major efforts have been made to support these species and their habitats; however, lawful irrigation-related activities continue to limit streamflow negatively impacting fish and aquatic habitat.

Current irrigation activities have the potential to result in incidental "take"[7] of ESA-listed species in the Deschutes River and its tributaries. The eight irrigation districts of the Deschutes Basin and the City of Prineville (the applicants) have together developed and submitted the Deschutes Basin Habitat Conservation Plan (HCP; AID et al. 2020) to the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), which includes irrigation activity conservation

[7] ESA defines "take" to include actions such as the harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capture, collection, or attempts to engage in any such conduct of ESA-listed species.

measures. The conservation measures include streamflow targets in the Deschutes River and its tributaries that the applicants must meet to benefit the ESA-listed species. USFWS and NMFS provided a final permit decision on December 31, 2020, which adopts the HCP and enables the applicants to avoid the unauthorized take of ESA-listed species by issuing incidental take permits. To meet the requirements set forth in the HCP, the applicants must identify mechanisms that would enable them to keep water instream.

Additionally, the Deschutes River is listed as an impaired waterway under Section 303(d) of the Clean Water Act (CWA) because it does not meet one or more of the State of Oregon's water quality standards for salmon and trout, as well as other beneficial uses throughout the year (see Section 4.6.3.6 for a more detailed description of water quality issues).

2.2 Watershed and Resource Opportunities

The following list of resource opportunities would be realized through implementation of the project.

- Provide a more reliable source of irrigation water to LPID patrons by enabling LPID to better deliver the amount of water that patrons need when they need it. A modern conveyance system would reduce the District's diversion rate while fulfilling patron water rights. By ensuring patrons' water supply, the project would allow patrons to anticipate and optimally plan for water uses that enhance agricultural productivity in the Deschutes Basin and would increase climate change resiliency.
- Increase streamflow and improve water quality, habitat, and habitat availability in the Deschutes River downstream from Wickiup Reservoir.
- Reduce the potential for discharging nonpoint source pollution into the Crooked River.
- Reduce the District's OM&R in delivering irrigation water to LPID patrons.
- Reduce energy costs by removing the need for some patrons' individual pumps. Currently, LPID patrons use individual pumps to pressurize water from their delivery turnout, canal, or lateral.

3 Scope of the Plan-EA

3.1 Agency, Tribal, and Public Outreach

Federal, state, and local agencies and representatives as well as non-governmental organizations received an invitation to participate in scoping of the Plan-EA. Advertisements announcing the scoping period and associated scoping meeting were placed in a local newspaper in addition to multiple online locations including NRCS's website and the project website. Additionally, the District notified patrons of the scoping meeting and invited comments on the scope of the Plan-EA.

NRCS conducted tribal consultation with the Tribal Historic Preservation Officer (THPO) in accordance with the National Historic Preservation Act (NHPA) of 1966 and Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*, to maintain NRCS's government-to-government relationship between native villages and tribes. NRCS sent a letter to the Confederated Tribes of Warm Springs (CTWS) requesting input and notifying them of the scoping process. CTWS responded and requested that they be consulted during the project planning phase.

3.2 Scoping Meeting

A scoping meeting was held on October 17, 2018, at the Wind River Conference Center in Terrebonne, Oregon. Presenters at the meeting included Tom Makowski, NRCS; Terry Smith, LPID; Amanda Schroeder, Farmers Conservation Alliance (FCA); and Alexis Vaivoda (FCA). The presentations covered the financial assistance available through PL 83-566, the project purpose and need, the Plan-EA process, and the ways in which the public could get involved. After the presentations, attendees asked questions and provided comments for the public record. A total of 11 people attended the meeting, excluding staff from LPID, NRCS, and FCA.

3.3 Scoping Comments

Scoping comments were accepted from October 2 to November 15, 2018. Comments were submitted via the following methods:

- At the public meeting on October 17, 2018
- Email, lonepinecomments@gmail.com
- Online, oregonwatershedplans.org
- Mail, Farmers Conservation Alliance, Attention Watershed Plan-EA, 11 3rd Street Suite #101, Hood River, OR 97031
- Phone, Farmers Conservation Alliance, (541) 716-6085

Comments generally supported the project. Table 3-1 presents comments received and where they are addressed in the Plan-EA.

Table 3-1. Public Scoping Comment Summary.

Comments Received	Section Where Topic is Discussed
Request to use the PL 83-566 purpose of "Public Fish and Wildlife (iv)"	Section 2 – "Public Fish and Wildlife (iv)" is not used.
Request to consider on-farm water conservation and other conservation tools from the findings of the Deschutes Basin Study Work Group	Section 5.2 and Appendix D.2
Request to survey for historically significant sections	Section 6.1
Concern for invasive species	Section 6.5.2.2
Concern for the effect on private wells	Section 6.6.2.3
Where and when will instream water from the project water go?	Section 6.6.2.2
Will instream water be tied to COID?	Section 6.6.2.2
Request to use the Allocation of Conserved Water Program to protect 100 percent of water saved from the project	Section 6.6.2.2- "Allocation of Conserved Water Program" is not used.
Request to measure and verify the amount of water saved from the project	Section 6.6.2.1
Request to consult with U.S. Fish and Wildlife Service	Section 7.1 – Agency has been notified
Suggestion to include Oregon Department of Transportation in planning	Section 8.3.3
Where will match funding come from?	Section 5.4 and 8.9
How will COID patrons in the area be affected?	COID patrons would not be affected by LPID's proposed project.

3.4 Identification of Resource Concerns

Resource concerns identified through scoping comments include surface water resources (water conservation and quality, groundwater), aquatic and fish resources, soils, cultural resources, socioeconomics, wetlands, fish, terrestrial wildlife, and vegetation resources. Table 3-2 provides a summary of resource concerns and their relevancy to the proposed action. Resource items determined not relevant have been eliminated from detailed study, and those resources determined relevant have been carried forward for analysis.

Table 3-2. Summary of Resource Concerns for the Lone Pine Irrigation District Infrastructure Modernization Project.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Air			
Air Quality		X	Review of Oregon Department of Environmental Quality (ODEQ) air quality data indicates that the entire project area is in attainment for all criteria pollutants. Emissions from equipment associated with implementation of proposed action activities would occur; however, such emissions are considered negligible when compared to background levels and the application of best management practices (BMPs).
Geology and Soils			
Soils	X		Construction of the project could affect soils.
Geology		X	Geology is not a concern for the proposed project; the area is not prone to earthquakes and there are no substrate concerns.
Prime Farmlands	X		Prime farmlands occur in the project area and could be affected by the project.
Human Environment			
Environmental Justice		X	There are no environmental justice groups within the area; the project is not anticipated to affect any environmental justice groups and would comply with EO 12898.
Cultural Resources	X		Consultation with the State Historic Preservation Office (SHPO), THPO, and other consulting parties including affiliated tribes is required for compliance with Section 106 of the NHPA.
Land Use	X		Construction and operation of the project could affect land use.
National Parks and Monuments		X	No national parks or monuments are present in the project area.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Noise		X	No relevant effect on noise. With implementation of BMPs, noise impacts during construction would be negligible and temporary.
Parklands		X	No parks are present in the project area.
Public Safety		X	No relevant effect on public safety.
Recreation Trails		X	No trails occur in the project area.
Visual Resources		X	Visual resources were not identified as a concern during scoping by private landowners where construction activities would occur.
Socioeconomics			
Local and Regional Economy	X		The proposed action involves an expenditure of public funds, which could affect the local and regional economy. An evaluation of the effects of providing NRCS funding is included.
National Economic Efficiency (NEE)	X		A NEE analysis is the national monetary effects of a benefit-cost analysis. A NEE analysis has been completed as required by the Departmental Manual (DM) 9500-013, Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments.
Vegetation			
Invasive Species/Noxious Weeds		X	No relevant impact. With implementation of BMPs, the spread of noxious weeds during construction would be avoided.
Mature Trees	X		Direct and indirect effects on mature trees could occur.
Special Status/Threatened or Endangered Species		X	None have been observed in the project area, and no designated critical habitat occurs in that area.
Water			

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Floodplain Management	X		Sections of the proposed action occur in the 100-year floodplain as represented by the Federal Emergency Management Agency's Flood Insurance Rate Maps (FEMA 2013). Consultation with the county's Floodplain Administrator would occur to determine the effects on the floodplain as well as any required mitigation.
Groundwater Mitigation Credits		X	The proposed action would not use groundwater mitigation credits.
Groundwater Quality		X	Groundwater quality would not be affected by the proposed action.
Groundwater Quantity, Aquifer Recharge	X		Reduced seepage from canals and increased instream flows could affect groundwater quantity and aquifer recharge.
Hydroelectric Development		X	The proposed action does not consider developing hydroelectric facilities.
Hydrology	X		Reduced seepage could affect hydrology. The proposed action would protect conserved water instream.
Private Water Features and Ponds		X	The proposed action would not remove or modify private water features and ponds.
Public Water Supply		X	The proposed action would not affect public water supply.
Regional Water Resources Plans	X		The development of the Deschutes Basin HCP, a regional resource management plan, coincided with the development of this Plan-EA, and the proposed action aligns with the HCP (See Section 6.11.2.2). The implementation of the proposed action would not trigger changes to the HCP or other regional water resource management plans.
Surface Water Quality	X		The proposed action could affect surface water quality by increasing flow in the Deschutes River and eliminating the operational spills, which may carry nonpoint source pollution, into the Crooked River.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Water Leasing	X		Implementation of the proposed action could remove leasing limitations for patrons.
Water Rights	X		The proposed action would protect conserved water instream through instream lease agreements, which would be renewed in perpetuity or until the State of Oregon provided the clarity needed for a permanent change.
Wild and Scenic Rivers	X		Reaches of the Deschutes River upstream and downstream from COID's diversion as well as a reach of the Crooked River are designated Wild and Scenic River and would be indirectly affected by the proposed action.
Wetlands and Riparian Areas			
Wetlands and Riparian Areas	X		Wetlands and riparian areas could be affected by project construction activities or changes in water levels.
Fish and Wildlife			
Bald and Golden Eagle Protection Act	X		Habitat for bald eagles (*Haliaeetus leucocephalus*) could occur in the project area.
Endangered Species	X		The proposed action would not affect the yellow-billed cuckoo (*Coccyzus americanus*), northern spotted owl (*Strix occidentalis caurina*), endangered gray wolf (*Canis lupus*), or their designated critical habitat due to species habitat preferences and range. These species will not be carried forward for consideration and analysis in this Plan-EA. Oregon spotted frog (*Rana pretiosa*), bull trout (*Salvelinus confluentus*), and steelhead (*Oncorhynchus mykiss*) or their habitats are known to occur in waterways that could be affected by the project.
Essential Fish Habitat (EFH)		X	Because neither the project nor affected waterbodies occur within EFH, consultation under the Magnuson Stevens Act is not expected to be required.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Fish and Fish Habitat	X		The proposed action could affect fish habitat within waterbodies associated with District operations.
General Wildlife and Wildlife Habitat	X		Construction and operation of project components could affect wildlife in the project vicinity.
Migratory Bird Treaty Act species	X		Construction and operation of project components could affect migratory birds.
Ecosystem Services			
Provisioning Services	X		Provisioning services supported by water quantity, quality, and availability could be impacted by the proposed action.
Regulating Services	X		Regulating services supported by water quantity, quality, and availability could be impacted by the proposed action.
Cultural Services	X		Cultural services supported by water quantity, quality, and availability could be impacted by the proposed action.

4 Affected Environment

The following sections describe the existing ecological, physical, biological, economic, and social environment of the project area and areas affected by operation of the LPID system. The project area is defined in Section 1.2 and is a single boundary.

Per requirements of the PR&Gs (USDA 2017), where applicable, the ecosystem services associated with each resource are described. Ecosystem services refer to the benefits that people and their communities derive from their natural environment in which they live. Contributions to water consumption, buffering against crop failure through pollination, and providing places in which people value living are all examples of benefits that flow from nature to people. Because these ecosystem services contribute to people's "health, wealth, and well-being," but often cannot be quantified in the same way as services sold in marketplaces, federal investment into projects that could impact ecosystems and natural resources require an ecosystem services assessment to illuminate how management decisions will enhance, sustain, or degrade the benefits that nature provides (USDA 2017; Olander et al. 2018). An assessment of links between ecological function and social well-being helps to ensure that beneficial ecological impacts of a project are recognized and that detrimental impacts are minimized to the extent possible (EEA 2019).

Per federal guidance, ecosystem services in this Plan-EA are assessed based on three of the four service categories (USDA 2017):

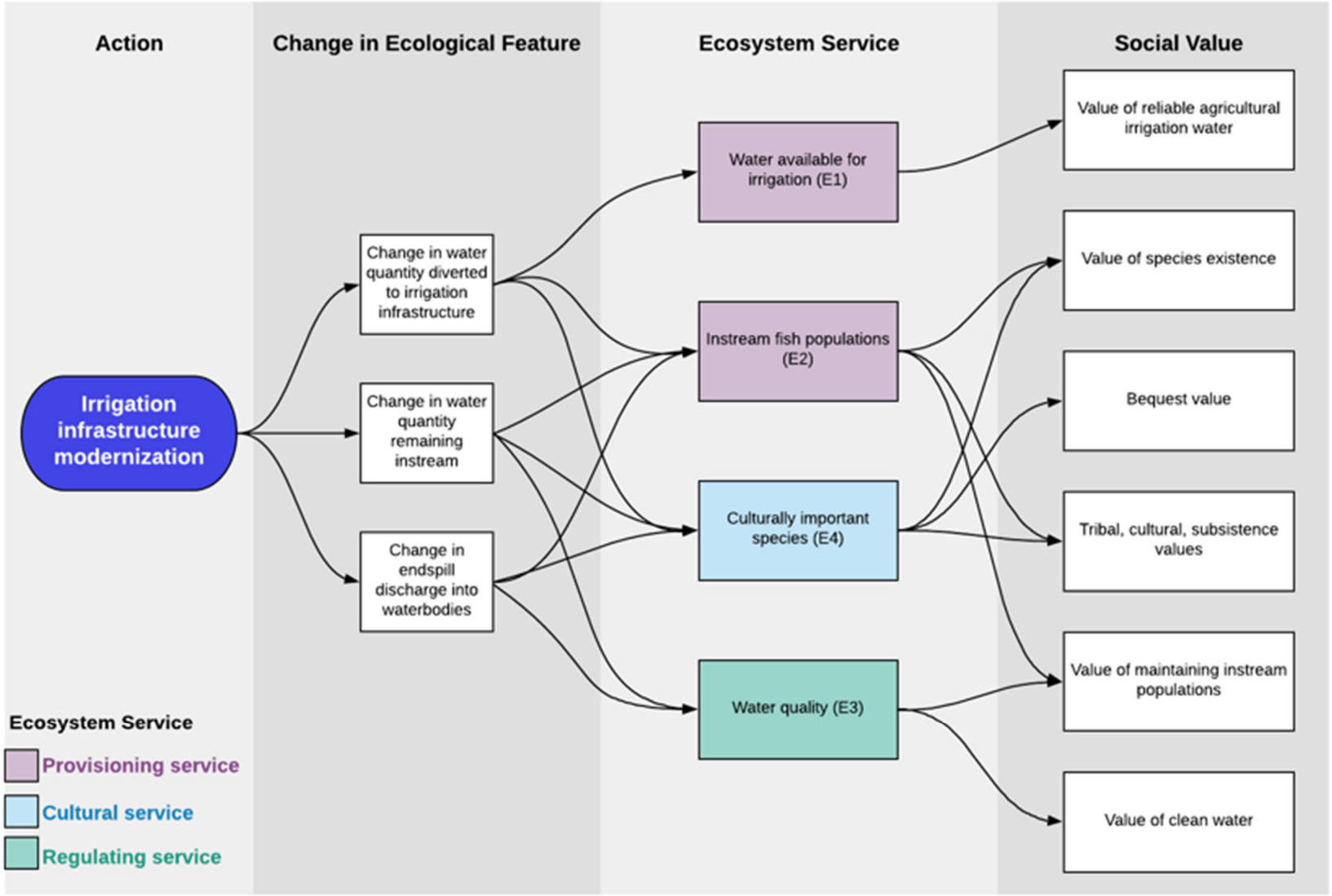
(1) Provisioning services: tangible goods provided for direct human use and consumption, such as food, fiber, water, timber or biomass;

(2) Regulating services: services that maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe—examples include flood and disease control, water filtration, climate stabilization, or crop pollination;

(3) Cultural services: services that make the world a place in which people want to live—examples include spiritual, aesthetic viewsheds, or tribal values; and

(4) Supporting services: services that refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.

Figure 4-1 provides a concept diagram that highlights the ecosystem services that interact with District operations and provides a baseline for discussion in Section 6. The diagram links an action that would modernize District infrastructure with potentially impacted ecosystem features and the provisioning, regulating, and cultural services that these ecosystems provide to people. Supporting services are not evaluated in this Plan-EA because they give rise to and support the final ecosystem services (Regulating, Provisioning, and Cultural) (EEA 2019; USDA 2017).



Note: E1 through E4 refer to ecosystem services 1 through 4. These services are referenced and explained in more detail in text above.

Figure 4-1. LPID Infrastructure Modernization Project ecosystem services concept diagram.

4.1 Cultural Resources

Section 106 of the NHPA requires federal agencies to consider the effects of federally funded projects on archaeological resources and historic properties, commonly referred to as cultural resources, prior to the expenditure of federal funds. The NHPA defines a historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places [NRHP], including artifacts, records, and material remains related to such a property or resource" (ACHP 2019).

There are no NRHP-listed historic properties within the project area based on a review of the Oregon Historic Sites Database. To date, no surveys for archaeological resources or historic properties have been completed for the project area. Consultation between NRCS, the State Historic Preservation Office (SHPO), THPO, and affiliated tribes for compliance with Section 106 of the NHPA would occur prior to project implementation.

4.2 Land Use

4.2.1 Land Ownership

The project area crosses nearly all privately owned land. Approximately 0.3 mile of the project area crosses land that is managed by the U.S. Bureau of Land Management (BLM). In this section, the District has a legal ROW beneath its infrastructure.

The District has a legal ROW, which was granted under the Carey Desert Land Act of 1894, underlying all of its existing infrastructure. The District's ROW extends 50 feet on each side of the canal from the toe of the bank, for a total width of 100 feet plus the width of the canal.

4.2.2 Land Use

The project area primarily traverses land within the District boundary; a small segment traverses land outside the District boundary. Along 15 miles of the project area, land use consists of the conveyance of irrigation water as well as OM&R of the irrigation system. There are an additional 8.5 miles of the project area that currently do not contain District infrastructure but would be affected by realignment of the canals. These 8.5 miles consist of land that is used for agricultural purposes.

The District is located in a rural area consisting of large parcels of land.[8] Of the 5,041 acres within LPID's boundary, 2,369 acres[9] are served by the District. All acres served by the District are for agricultural use, and Table 4-1 provides a breakdown of the average farm size. The crops grown are primarily alfalfa hay, grass hay, mint, pasture, wheat, carrot seed, and corn (T. Smith, personal communication, March 5, 2018). Farmers typically get three cuttings per year on hay. A mint

[8] The smallest parcel in the District is 0.7 acre, while the largest is over 658 acres. Of the 22 patrons, only 8 irrigate less than 30 acres of land (T. Smith, personal communication, March 5, 2018; T. Smith, personal communication, April 9, 2019; T. Smith, personal communication, April 19, 2021).

[9] In the Office of Management and Budget fact sheet, the total land used for agriculture within the LPID boundary totals 2,837 acres. The 468-acre difference in these numbers represent agricultural lands that are irrigated with private groundwater. These 468-acres are not served by LPID and are not part of the project.

processing plant is located within the District boundaries to process the mint that is harvested by LPID patrons.

Table 4-1. Breakdown of Acres Served by the District

Acres Served	Number of Patrons	Average Acres per Patron
Under 2	1	0.75
2.01 – 10	4	6.68
10.01 – 50	3	33.79
50.01 - 100	5	70.04
100.01+	6	315.00

Source: LPID 2018

Of the remaining land that is within the District boundary but not served by the District, there is some agricultural land that is irrigated by private groundwater wells. However, the majority of land not served by the District is undeveloped land consisting of shrub-scrub species and junipers. Rural residences are also present within the District.

The majority of land within LPID is zoned as Exclusive Farm Use (EFU)-Prineville Valley-Lone Pine Areas (EFU-2). The EFU designation is meant to maintain the agricultural economy of the state as well as assure the adequate provision of healthy food. The county is required to inventory and protect farmlands under Statewide Goal 3, Agricultural Land, Oregon Revised Statute (ORS) 215 and Oregon Administrative Rule (OAR) 660-033. The purpose of EFU zoned land is to preserve and maintain agricultural lands and serve as a sanctuary for farm uses.

4.2.3 Ecosystem Services

Agricultural land receiving water from the District in the project area provides ecosystem services categorized as *Provisioning service: Water available for irrigation* (Figure 4-1 [E1]). As described in Sections 1.3 and 4.6, water from the Deschutes River is diverted into the District's irrigation conveyance system and delivered to patrons for agricultural purposes. Provision of this water allows lands to be maintained in agricultural production.

4.3 Socioeconomic Resources

This section describes the socioeconomic conditions for the areas associated with the proposed action, which include Crook, Deschutes, and Jefferson counties. This area includes the communities of Redmond, Bend, Terrebonne, and Prineville.

4.3.1 Population

The project area falls within Crook, Deschutes, and Jefferson counties. Nearby cities and towns include Redmond, Bend, Terrebonne, and Prineville. Generally, the area has seen growth over the past 5 years (2015 to 2019; Table 4-2). The Oregon Office of Economic Analysis estimates that by 2040, Deschutes County could reach a population of 241,223, Crook County could reach a population of 26,117, and Jefferson County could reach a population of 29,413 (OEA 2013).

Table 4-2. Population Characteristics by City, County, and State.

Area	Year 2015 Population (number of people)[1]	Year 2019 Population (number of people)[2]	Population Growth Rate 2015 to 2019	Year 2019 Population per Square Mile (number of people)
Cities and Towns				
Redmond	27,450	30,167	9.9%	1,809
Bend	87,017	93,917	7.9%	2,819
Terrebonne	1,182	1,658	40.3%	368
Prineville	9,266	10,035	8.3%	782
Counties				
Crook	21,455	24,404	13.7%	8
Deschutes	174,246	197,692	13.5%	65
Jefferson	22,541	24,658	9.4%	13
State				
Oregon	4,028,977	4,217,737	4.7%	43

Source: 1. U.S. Census Bureau 2015; 2. U.S. Census Bureau 2019

4.3.2 Area Employment and Income

Table 4-3 presents the labor force characteristics for Crook County, Deschutes County, Jefferson County, and the State of Oregon in 2019. Unemployment in Crook, Deschutes, and Jefferson counties are all higher than the state average. Agriculture, forestry, fishing and hunting, and mining consist of 5.5 percent of the employment rate in Crook County, 3.3 percent in Deschutes County, and 10.2 percent in Jefferson County (U.S. Census Bureau 2017).

Table 4-3. Labor Force Characteristics in Crook County, Deschutes County, Jefferson County, and the State of Oregon, 2019.

Indicator	Crook County	Deschutes County	Jefferson County	Oregon (State)
Labor Force Participation Rate	51.6%	63.0%	65.8%	62.5%
Employment/Population Ratio	48.0%	59.3%	62.2%	59.3%
Unemployment Rate	6.9%	5.9%	5.4%	5.0%

Source: U.S. Census Bureau 2019

Median household income, per capita income, and poverty rate are summarized in Table 4-4. Median income in Deschutes County is the above that of the State of Oregon and the United States. Income in Crook and Jefferson counties are lower than both the State of Oregon and the United States. The poverty rate in Deschutes County is slightly lower than both the State of Oregon and the United States; however, the poverty rate in Jefferson and Crook County is greater than Deschutes County, the State of Oregon, and the United States.

Table 4-4. Income and Poverty Rates in Crook County, Deschutes County, Jefferson County, and the State of Oregon, 2019.

Indicator	Crook County	Deschutes County	Jefferson County	Oregon (State)	United States
Median Household Income	$49,006	$67,043	$53,227	$62,818	$62,843
Poverty Rate	13.5%	10.8%	17.9%	11.4%	12.3%

Source: U.S. Census Bureau 2019

4.3.3 Agricultural Statistics

Table 4-5 presents agricultural information for the lands served by the District. Appendix E.2 presents summarized agricultural information for Crook, Deschutes, and Jefferson counties from the 2017 and 2012 U.S. Department of Agriculture (USDA) Census of Agriculture.

Table 4-5. Crops Grown in Lone Pine Irrigation District.

Crop	Total Acreage
Carrot Seed	35
Wheat	191.6
Triticale	185.35
Alfalfa	527
Grass Hay	331
Corn	200
Mint	522
Harvested Trees	10
Pasture	367.05
Total	**2,369**

Source: LPID 2018

4.4 Soils

The predominant soil unit in the project area is Court gravelly ashy sandy loam (47 percent of the project area). These soils are well-drained and formed from volcanic ash over alluvium. Other soils in the project area include Era ashy loam and Era ashy sandy loam, Ochoco-Prineville complex, and Deschutes-Stukel complex. The Era soil series consists of well-drained soils formed from volcanic ash mixed with a small amount of colluvium from volcanic rock.

4.4.1 Farmland Classification

NRCS has developed technical soil groups that are associated with a particular soil type and a soil's rating for agricultural commodity production (NRCS 2015b). NRCS soil groupings within the project area are 82 percent prime farmland if irrigated, 15 percent farmland of statewide importance, and 3 percent not prime farmland.

4.5 Vegetation

4.5.1 General Vegetation

The common upland vegetation types found within the project area are wild rye, big sagebrush and low sagebrush, rabbit brush, and tall tumble mustard. Bunch grasses, some species of wildflowers, and other plant species commonly found in the dry Central Oregon steppe environment are also present. Few western junipers are found along the canals and laterals.

In some sections of the project area, a fringe of opportunistic hydrophytic (water-loving) plants has formed along the margins of the top of the canal bank. These plants are represented predominately

by bulrush and tufted hair grass. Occurring sporadically, it is up to a few feet wide in scattered locations and does not function as a habitat type due in part to infrastructure maintenance activities. The District infrastructure is maintained during the off-season by grading and clearing, and no vegetation is allowed to develop within the canals.

4.5.2 Special Status Species

No ESA endangered, threatened, species of concern, candidate plant species or their designated critical habitats, or Oregon special status plant species are known to occur within the project area. There are no special status species with the potential to occur within Crook or Jefferson counties. A small portion of the District occurs within Deschutes County where three special status species potentially occur: federal candidate whitebark pine (*Pinus albicaulis*); Oregon threatened pumice grape-fern (*Botrychium pumicola);* and federal species of concern, Oregon threatened Peck's milkvetch (*Astragalus peckii)* (CBD 2019; ODA 2019). Based on the USFWS Information for Planning and Consultation (IPaC) database, District observations, and the Oregon Department of Agriculture's identification of species population centers, and due to the elevation and plant communities these species generally inhabit, it is unlikely that any of the special status species would occur within the project area. Therefore, these special status plant species will not be discussed further.

4.5.3 Common and Noxious Weeds

The Deschutes Basin Board of Control determines a weed to be noxious if it is "injurious to public health, agriculture, recreation, wildlife, or any public or private property," and "impacts and displaces desirable vegetation (Deschutes County 2017)." Furthermore, it is recognized that certain noxious weeds are so pervasive that they have been classified by ORS 569.350 to be a menace to public welfare (ODA 2017). The Deschutes County Noxious Weed Policy and Classification System designates three weed categories. "A" designated weeds are of highest priority for control and are subject to intensive eradication, containment, or control measures using county resources. "B" designated weeds have a limited distribution; intensive containment control and monitoring by landowners is required, and support from the County is provided when resources allow. "C" designated weeds are the lowest priority for control and have a widespread distribution; landowner control and monitoring is recommended (Deschutes County 2017). Appendix E.6 lists the noxious weeds and common weeds and corresponding classifications known to occur in the project area.

Within canals and laterals, the District employs both mechanical and chemical management techniques to clear vegetation. Aquatic weeds are treated through an herbicide application in June, and algae is treated with an algicide two to three times during the summer months. The District does not control weeds along canals and laterals (T. Smith, personal communication, February 20, 2019).

4.6 Water Resources

The following section discusses water used for District operations, surface water hydrology, surface water quality, and groundwater potentially affected by the proposed action.

4.6.1 Lone Pine Irrigation District Water Rights and District Operations

The District delivers water to irrigate 2,369 acres. The District holds a live-flow water right with a priority date of October 31, 1900, for up to 29.1 cubic feet per second (cfs) [10] (LPID 2017). The District holds a storage water right for up to 10,500 acre-feet from Crane Prairie Reservoir; however, LPID is currently limited to storing 5,000 acre-feet per a voluntary settlement agreement. Both live flow and stored water are diverted at COID's PBC diversion (RM 164.8), conveyed through COID's PBC to its terminus, and delivered to LPID's main canal.

The District's live-flow water right identifies three seasons, each with a different delivery rate (Table 4-6). These delivery rates are lower in season 1 and season 2 than in season 3. To meet demands during the late summer and fall, the District may supplement live flow with stored water to address reduced live flow availability caused by drought and/or prolonged heat. Additionally, the District uses stored water to supplement live flow at the start of the season to help saturate the banks of the canals and laterals and carry water to the end of the conveyance system.

Table 4-6. LPID Diversion Flow Rates and Irrigation Season Dates per Water Right Certificate 72197.

Season	Start Date	End Date	Start Date	End Date	Season Duration (days)	Delivery Rate (cfs)	Percent of Full Rate
1	April 1	April 30	Oct. 1	Nov. 1	62	1 cfs to 137 acres	63%
2	May 1	May 14	Sept. 15	Sept. 30	30	1 cfs to 109 acres	79%
3	May 15	Sept. 14	N/A	N/A	122	1 cfs to 86.6 acres	100%

Notes:
Maximum live flow diversion rate is 29.1 cfs - 43.5 cfs with stored water rights.
N/A = Not Applicable

LPID has historically diverted an average of 11,812 acre-feet per year.[11] The actions included in the HCP are expected to reduce the water supply available to LPID patrons (AID et al. 2020). Modeling associated with HCP projects suggest that in years 1 to 12 of the HCP (January 2020 through December 2032), LPID will see a reduction in available water of 917 acre-feet in a dry year and no effects in normal or wet years (AID et al. 2020). Starting in year 13 of the HCP (January 2033), winter minimum streamflow levels in the Deschutes River below Wickiup Reservoir will increase.[12] Streamflow releases from Wickiup Dam will increase accordingly. Models suggest that LPID will see a reduction in available water of 1,734 acre-feet in a dry year and no effects in normal or wet years.

[10] With the supplemental storage right, the District's average maximum diversion rate between the end of June and the first week of September is 43.5 cfs. However, on average, the District diverts 38 to 40 cfs during the irrigation season.
[11] Data from OWRD Gauge #14069700 for the 2005 through 2019 irrigation years was used to calculate a historical average diversion rate.
[12] See Appendix E.4 for a summary of the operation measures set forth by the HCP.

4.6.2 North Unit Irrigation District Water Rights and District Operations

NUID provides irrigation water to nearly 59,000 agricultural acres in Jefferson County, Oregon. NUID diverts natural flow from the Deschutes River and stored water released from Wickiup Reservoir at its diversion in Bend, Oregon (RM 164.8). Wickiup Reservoir, located on the Deschutes River 60 miles southwest of Bend, has a maximum capacity of 200,000 acre-feet.

NUID also operates a pumping plant on the Crooked River. This pumping plant is located where NUID's main canal crosses the Crooked River. It provides water for both primary and supplemental use in NUID.

NUID historically sourced approximately 70 percent of its annual water supply from storage in Wickiup Reservoir (NUID 2019). With the HCP now in effect, winter flow releases from Wickiup Reservoir to meet minimum streamflow requirements set by the HCP in the Deschutes River are expected to result in a decline in storage water availability for NUID patrons. This decline in storage water availability is estimated to reduce water supply availability to NUID starting in year 8 of the HCP (i.e., January 2028) in normal to very dry years and in year 13 of the HCP (i.e., January 2033) in all water type years. It is estimated that following year 13 of the HCP, water supply storage in Wickiup Reservoir in a normal water year will be reduced by 75,017 acre-feet, a 40 percent reduction (AID et al. 2020).

4.6.3 Surface Water Hydrology

Table 4-7 presents waterbodies associated with District operations. The upstream end of Lake Billy Chinook at the confluence of the Deschutes, Crooked, and Metolius rivers serves as the downstream boundary of the area associated with District operations.

Table 4-7. Waterbodies Associated with District Operations.

Name	Associated River Miles	Size	Tributary To	Project Nexus
Crane Prairie Reservoir	N/A	50,000 acre-feet	N/A	LPID holds water rights to 10,500 acre-feet of stored water in this reservoir, but LPID is currently limited to storing 5,000 acre-feet per a voluntary settlement.
Deschutes River	Crane Prairie Reservoir (RM 238.5) to Wickiup Reservoir (RM 233.5)	N/A	Columbia River	Releases from Crane Prairie Reservoir affect flow in this reach.
Wickiup Reservoir	N/A	200,000 acre-feet	N/A	LPID irrigation water is conveyed through Wickiup Reservoir.
Deschutes River	Wickiup Reservoir (RM 226.8) to North Canal Dam (RM 164.8)	N/A	Columbia River	Releases from Crane Prairie Reservoir affect flow in this reach.
Deschutes River	North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	N/A	Columbia River	LPID's diversion of up to 43.5 cfs affects flow in this reach.
Crooked River	Crooked River (RM 30.15) to mouth	N/A	Deschutes River, confluence at Lake Billy Chinook (RM 120)	LPID's canal system terminates near the Crooked River, operationally spilling an average of 1.34 cfs to the Crooked River during the irrigation season (J. Camarata, personal communication, April 3, 2018).
Lone Pine Creek	N/A	N/A	Crooked River	Lone Pine Creek is an ephemeral creek and was channelized for conveyance purposes when the LPID system was constructed.

N/A = Not Applicable

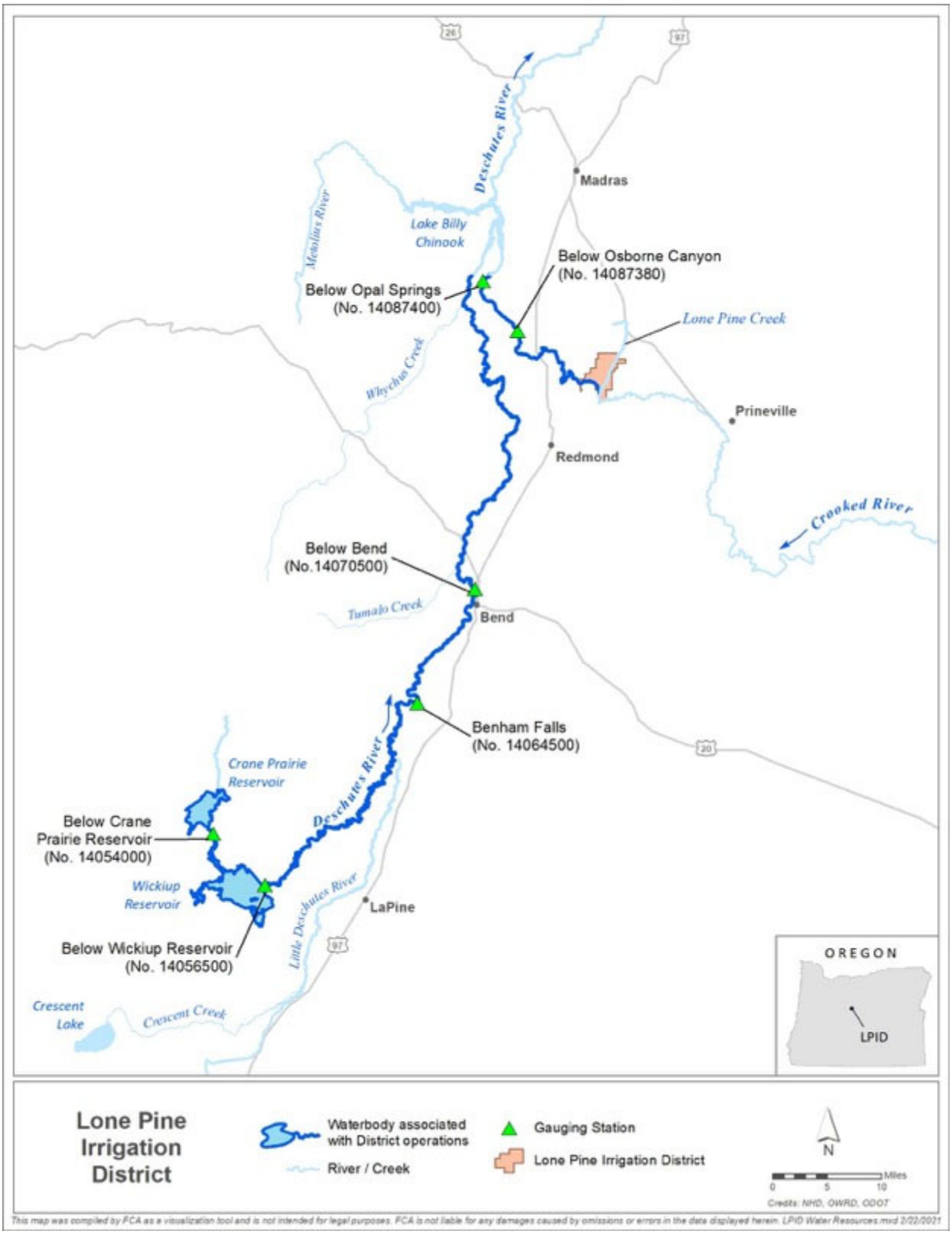


Figure 4-2. Waterbodies and gauging stations associated with District operations.

Historically, the spring-fed Deschutes River had relatively consistent streamflow seasonally and annually (DRC 2012). Hydrologic conditions in the Deschutes River have changed with the construction and operation of reservoirs, dams, and diversions on the river and its tributaries. Water is now managed for irrigation use, resulting in lower flows downstream from reservoirs during the storage season (i.e., late fall, winter, and early spring), higher flows downstream from reservoirs during the irrigation season (April through October), and lower flows downstream from irrigation diversions during the irrigation season.

In November 2020, LPID, seven other irrigation districts in the Deschutes Basin, and the City of Prineville finalized the Deschutes Basin HCP to support the issuance of incidental take permits by the USFWS and NMFS under Section 10(a)(1)(B) of the federal ESA of 1973, as amended. The activities covered under the HCP modified the streamflow of the Deschutes River by setting new streamflow targets (AID et al. 2020).

4.6.3.1 Crane Prairie Reservoir

Crane Prairie Dam is operated in coordination with Wickiup Dam and Reservoir and in accordance with the HCP. Storage in and releases from Crane Prairie Reservoir are directed by the OWRD Regional Watermaster and executed by COID personnel.

4.6.3.2 Wickiup Reservoir

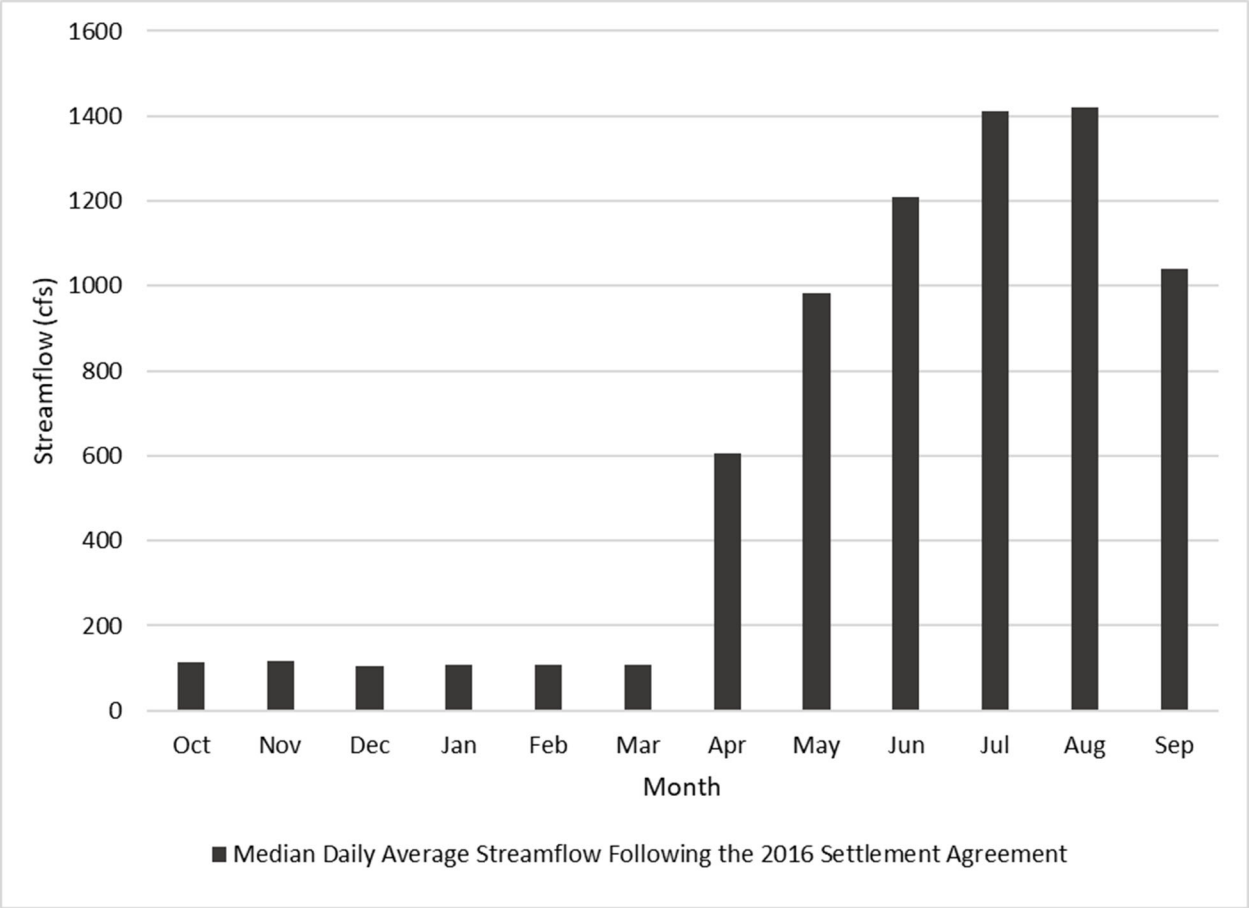
Wickiup Reservoir is 5 miles downstream from Crane Prairie Dam and relies on snowmelt, releases from Crane Prairie Reservoir, and precipitation for inflow. Throughout the year, water is released from Wickiup Reservoir as directed by the OWRD Regional Watermaster in accordance with the HCP and through an accounting arrangement whereby the storage accounts for COID, NUID, LPID, and Arnold Irrigation District (AID) are balanced over the course of the irrigation season.

During the irrigation season, water released from Wickiup Dam is conveyed through the Deschutes River to COID's, AID's, and NUID's diversions in Bend. During the non-irrigation season, water released from the dam is conveyed down the Deschutes River to Lake Billy Chinook (RM 120). The HCP (AID et al. 2020) limits reservoir operations; a summary of the operation measures set forth by the HCP can be found in Appendix E.4.

4.6.3.3 Deschutes River (RM 238.5) to the PBC diversion at North Canal Dam (RM 164.8)

Reservoir releases, tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in the reaches of the Deschutes River from Crane Prairie Reservoir (RM 238.5) to Wickiup Reservoir (RM 233.5) and from Wickiup Reservoir (RM 226.8) to the PBC Diversion (RM 164.8). As described in the prior subsection, target flows in this reach are set forth in the HCP, which are summarized in Appendix E.4.

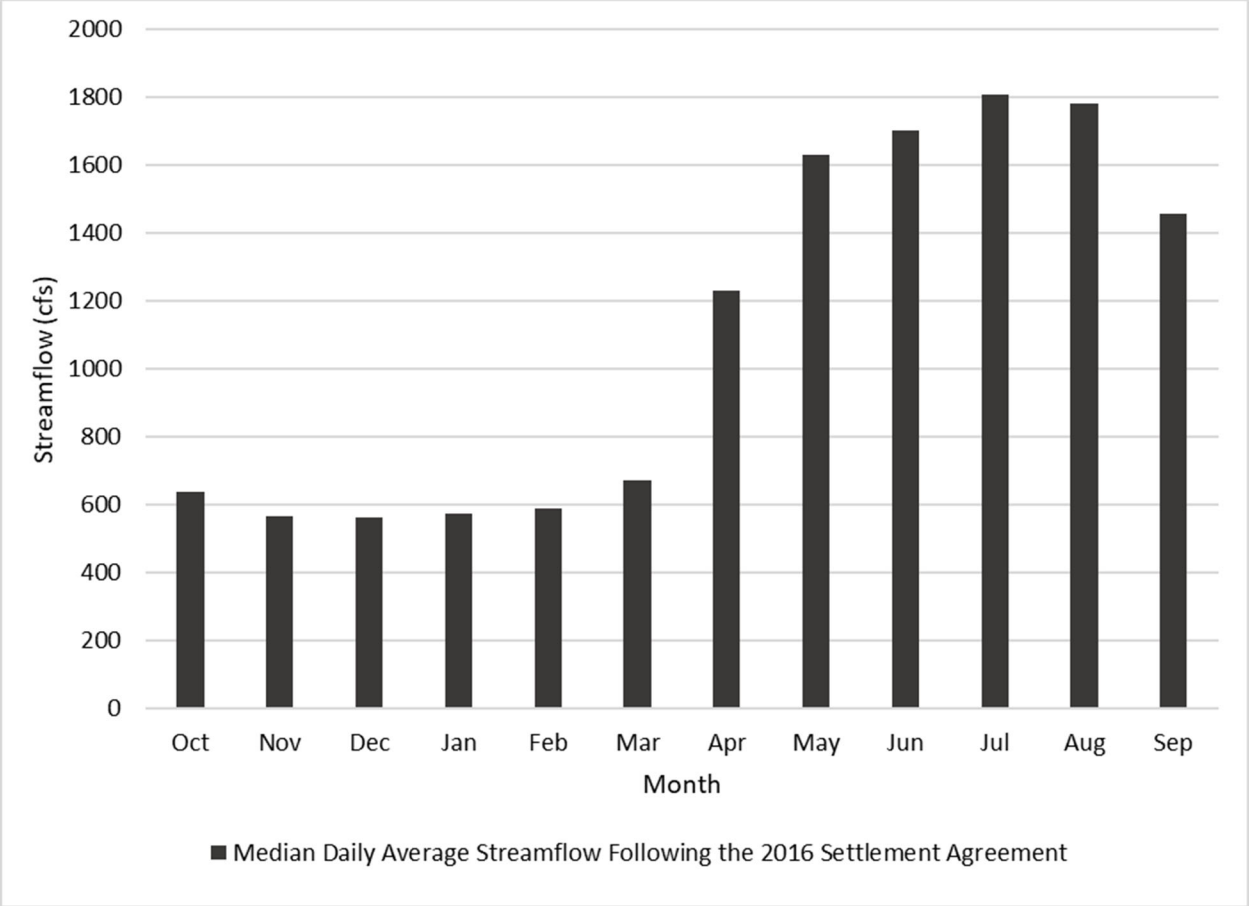
Figure 4-3 and Figure 4-4 display the Deschutes River's daily average baseline streamflow following the 2016 Settlement Agreement.[13] Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2020 water years.



Notes: Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2020 water years.

Figure 4-3. Streamflow in the Deschutes River downstream from Wickiup Reservoir at OWRD Gauge No. 14056500.

[13] In 2016, as part of an interim agreement until the finalization of the HCP, LPID and other districts that store water in Crane Prairie and Wickiup Reservoir agreed to maintain a minimum of 100 cfs in the Deschutes River outside the irrigation season (*Center for Biological Diversity et al.* v. *U.S. Bureau of Reclamation and Arnold Irrigation District et al.* 2016). This agreement is referred to as at the 2016 Settlement Agreement and was maintained until the finalization of the HCP in 2020.



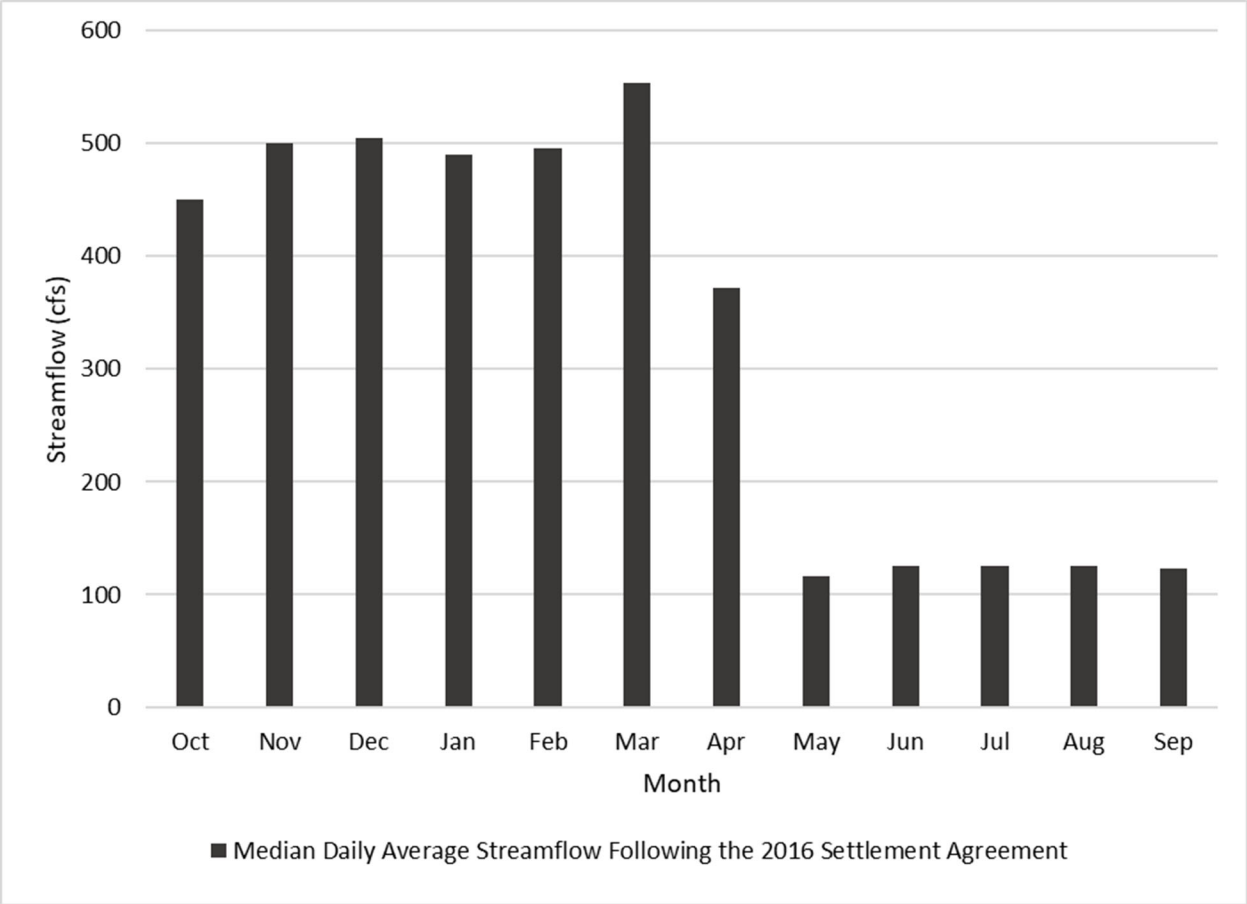
Notes: Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2020 water years.

Figure 4-4. Daily average streamflow in the Deschutes River at Benham Falls at OWRD Gauge No. 14064500.

4.6.3.4 Deschutes River, PBC Diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)

Lone Pine, Arnold, Central Oregon, North Unit, and Swalley Irrigation Districts divert water from the Deschutes River at the City of Bend, influencing streamflow patterns in the Deschutes River between North Canal Dam (RM 164.8) and Lake Billy Chinook (RM 120). Historically, these irrigation districts maintained a minimum of 30 cfs instream in this reach under a voluntary agreement. Extensive conservation efforts by the irrigation districts and their partners starting in the 2000s have enhanced streamflow during the irrigation season. Currently, during the summer irrigation season the irrigation districts maintain a minimum streamflow of approximately 130 cfs downstream from their diversions in the City of Bend.

Figure 4-5 displays streamflow in the Deschutes River downstream from the City of Bend. The figure demonstrates the daily average baseline streamflow following the 2016 Settlement Agreement (October 2016 to September 2020).



Notes: Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2020 water years.

Figure 4-5. Daily average streamflow in the Deschutes River downstream from the City of Bend at OWRD Gauge No. 14070500.

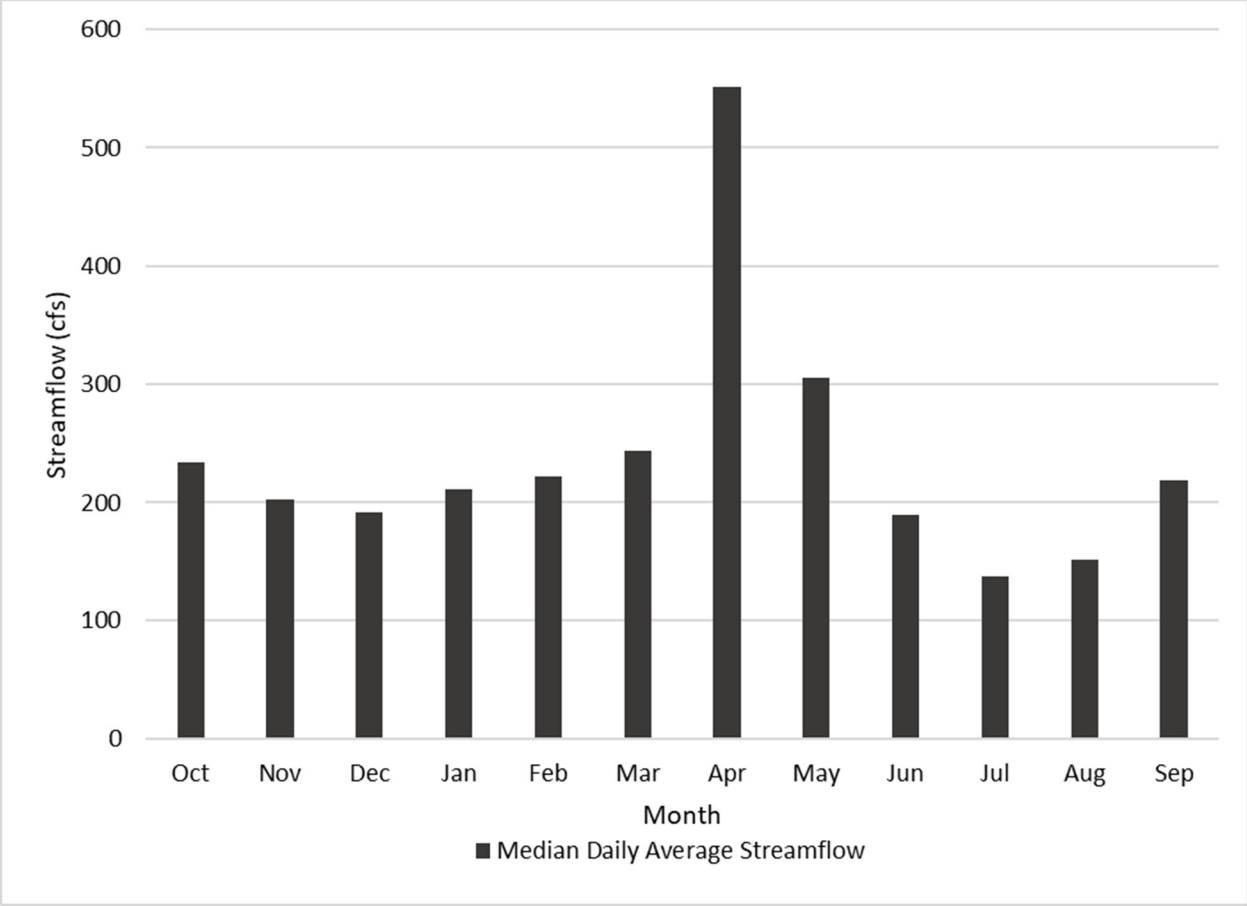
This reach of the Deschutes River has pending instream water rights that serve as preliminary streamflow restoration targets (Appendix E.3). Oregon Department of Fish and Wildlife's (ODFW) pending water right requests a year-round flow of 250 cfs, providing a target for what flows are needed for fish, wildlife, their habitat quality, or recreation between the North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120).

4.6.3.5 Crooked River (RM 30.15) to Lake Billy Chinook (mouth)

The Crooked River is a tributary to the Deschutes River with a confluence at Lake Billy Chinook. Currently, reservoir releases from Ochoco and Prineville reservoirs, tributary inflows, irrigation diversions, irrigation return flows, and groundwater interactions drive streamflow in this reach (Figure 4-6 and Figure 4-7).

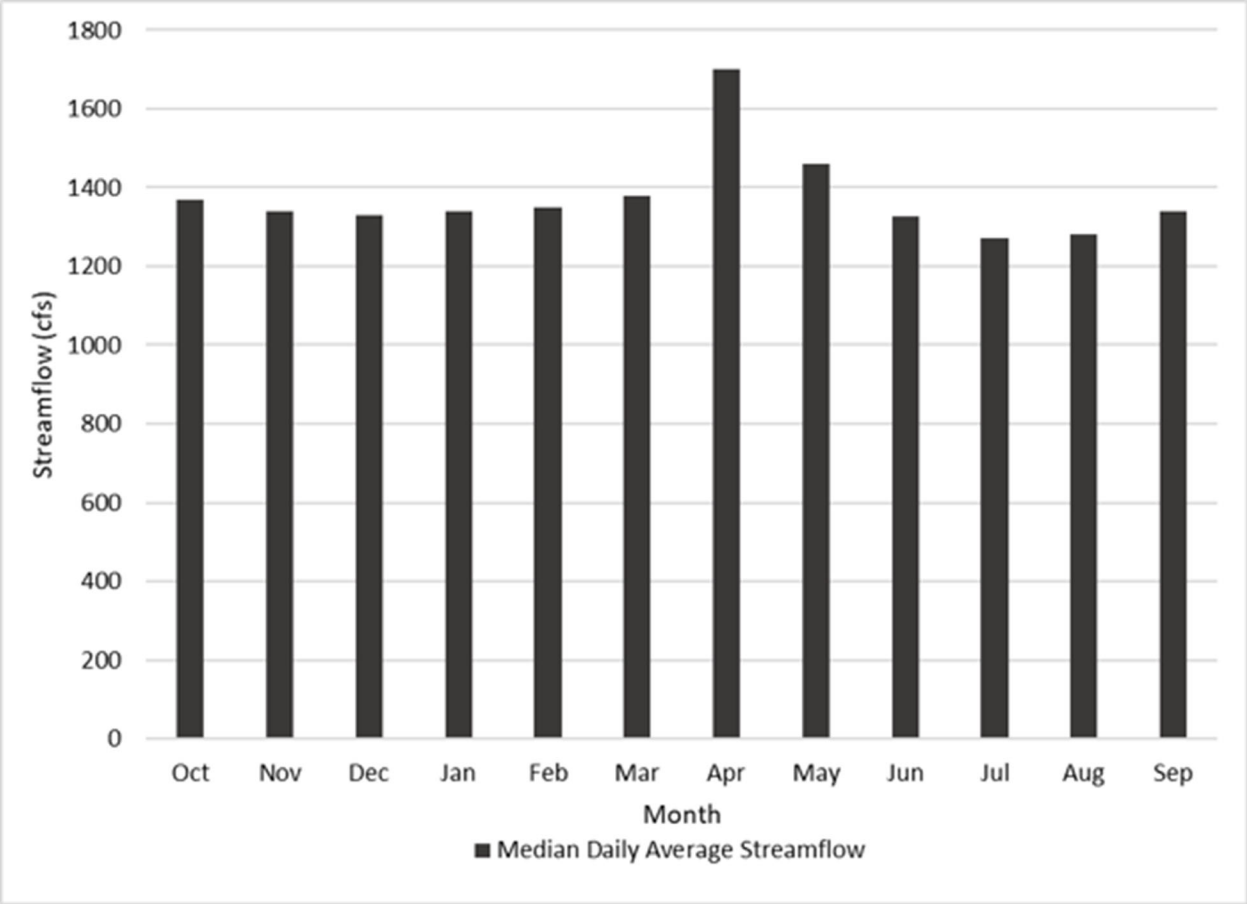
The District has one operational spill from the LPID system to the Crooked River at about RM 30.15 (located above both gauges shown in the figures below). This spill occurs throughout the irrigation season when there is excess water in the system due to changes in weather or irrigation demand. This excess water at the end of the District's system is referred to as tailwater. The District

has kept detailed recordings of its tailwater flows, showing on average 1.34 cfs of daily instantaneous flow to the Crooked River over a term of 182 days at the beginning and end of the irrigation season (J. Camarata, personal communication, April 3, 2018). River Mile 30.15 is also the location of the proposed river crossing.



Notes:
Data for streamflow represent the 2003 through 2020 water years.

Figure 4-6. Daily average streamflow in the Crooked River below Osborne Canyon at OWRD Gauge No. 14087380.



Notes:
Data for streamflow represent the 2003 through 2020 water years.

Figure 4-7. Daily average streamflow in the Crooked River below Opal Spring at OWRD Gauge No. 14087400.

This reach of the Crooked River has a pending instream water right that serves as a preliminary streamflow restoration target (Appendix E.3). ODFW's pending water right requests the flow shown in Table 4-8 for the river section between Bowman Dam (RM 70.5) and Lake Billy Chinook (mouth). This water right provides a target for what flows are needed for fish, wildlife, their habitat quality, or recreation.

Table 4-8. Target Streamflow in the Crooked River between RM 70.5 and Mouth of the Crooked River based on Pending ODFW Water Right.

Instream Rates (cfs)											
Jan	**Feb[1]**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
75	75/150	225	225	225	150	75	75	75	75	75	75

Notes:
[1] February target streamflow is split into two rates. The first rate of 75 cfs is for February 1–14, and the second rate of 150 cfs is for February 15 through the end of February.

4.6.3.6 Lone Pine Creek

Lone Pine Creek is an ephemeral creek that was channelized during the original construction of the LPID system and has been used for conveyance purposes (Figure 1-4).

4.6.4 Surface Water Quality

ODEQ maintains a list of all surface waters in the state that are considered impaired because they do not meet water quality standards under Section 303(d) of the CWA (33 United States Code [U.S.C.] 1251 et seq. All waterbodies associated with District operations are included on Oregon's 2012 303(d) list for not meeting state water quality standards for aquatic weeds or algae, temperature, dissolved oxygen, pH, sedimentation, turbidity, chlorophyll a, *E. Coli*, and biological criteria (Table 4-9).

Water management in the Deschutes Basin has altered seasonal streamflow patterns, increasing streamflow above historic levels in some reaches, and decreasing streamflow below historical levels in other reaches. Low flows affect water quality in the Deschutes River by exacerbating temperature and dissolved oxygen problems. In addition, water quality often dictates the spread and extent of invasive aquatic species (McCormick et al. 2009), and these problems interact synergistically to degrade wildlife habitat within and around the Deschutes River. ODEQ is required to develop total maximum daily loads for rivers and streams in the upper Deschutes Basin (these impairments may extend upstream or downstream of the reaches included in Table 4-9).

Table 4-9. Water Quality Impairments within Waterbodies Associated with District Operations.

Waterbody Name	River Mile Associated with District Operations	Parameters Included on Oregon's 303(d) List
Crane Prairie Reservoir	N/A	Aquatic Weeds or Algae
Deschutes River	Crane Prairie Dam (RM 238.5) to Wickiup Reservoir (RM 233.5)	Temperature
Wickiup Reservoir	N/A	Aquatic Weeds or Algae
Deschutes River	Wickiup Reservoir (RM 226.8) to Pilot Butte Canal Diversion at North Canal Dam (RM 164.8)	Temperature, Dissolved Oxygen, pH Sedimentation, Turbidity, Chlorophyll a
Deschutes River	Pilot Butte Canal Diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	Temperature, Dissolved Oxygen
Crooked River[1]	RM 30.15 to the mouth (RM 0)	Temperature, Dissolved Oxygen, pH, *E. Coli*, Biological Criteria

Source: ODEQ 2012
Notes:
[1] Chlorophyll a is also on the 303(d) list for the Crooked River from RM 0 to RM 5. However, this stretch is considered Lake Billy Chinook and, therefore, is not included in this section.
N/A = Not Applicable

4.6.5 Groundwater

Due to the porous geology of the area, groundwater levels and stream discharge are tied to the frequent movement of water between surface and groundwater systems. Irrigation canals in LPID and NUID's service area show seepage losses due to the area's permeable geology. A loss assessment study in 2020 measured up to 2,103 acre-feet of loss in LPID's canals due to seepage, evaporation, and operational spills (LPID 2020; Appendix E.3). Using data from a loss assesment study performed in NUID is 2017, it is estimated that approximately 36 percent of the water diverted at NUID's diversion is lost in the NUID canal and lateral system before reaching patrons on-farm (Appendix E.3). Gannett et al.'s (2001) groundwater flow model suggests that the loss associated to seepage enters the region's groundwater system and discharges into the Crooked River.

4.6.6 Ecosystem Services

Water flowing through the Deschutes River would provide the following ecosystem services:

- *Provisioning service, Irrigation water (*Figure 4-1 [E1]): As described in Sections 1.3 and 4.6, water from the Deschutes River is diverted into the District's irrigation conveyance system and delivered to patrons for agricultural-related purposes. This water provides irrigation for food production, feed production, and maintenance of agricultural lands.

- *Regulating service, Water quality (*Figure 4-1 [E3]): The amount of water instream impacts water quality including temperature, turbidity, sediment, and pollutants. In general, low streamflow challenges a waterbody's ability to resist warming because less water heats faster than more water. As a result, greater instream flow helps to keep water cool—an important factor for temperature-sensitive, aquatic species that live in these stream habitats. Given pollutant input, less water also leads to a higher concentration of pollutants than more water. Therefore, greater streamflow also helps dilute pollutants. However, while increasing streamflow generally improves water quality, an increase in streamflow from low quality operational spills can be counterproductive if the quality of the spilled water is low. Open irrigation canals can collect contaminants, and they can become warmer than surrounding waterbodies due to low water volume in the canals. This provides a source for heat and contaminates to transfer into waterbodies, resulting in lower stream water quality (Section 4.6.4).

4.7 Fish and Aquatic Resources

The affected environment for fish and aquatic species includes waterbodies that are associated with LPID operations (Table 4-7). These waterbodies include Crane Prairie and Wickiup reservoirs, the Deschutes River from Wickiup Reservoir (RM 226.8) to the PBC diversion at North Canal Dam (RM 164.8), the Deschutes River from the PBC diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120), and the Crooked River (RM 30.15) to the mouth at Lake Billy Chinook (RM 0.0). The Pelton Round Butte Dam forms Lake Billy Chinook through the impoundment of the Crooked, Deschutes, and Metolius rivers.

Historically, the Deschutes River had relatively consistent streamflow seasonally and annually (see Section 4.6.3). Since the development of agriculture in the late 1800s, water diversion, reservoir construction, fish passage barriers, land drainage, and other activities have affected the aquatic environment in the Deschutes Basin. Low streamflow and water quality impairments are recognized as key limiting factors for fish populations in the basin (NMFS 2009).

4.7.1 General Fish and Aquatic Species

The District's canals do not support resident or anadromous fish or threatened and endangered aquatic species. Fish screens compliant with ODFW standards were installed on the diversion at the North Canal Dam (RM 164.8) in 2004. These fish screens separate water diverted for consumptive use from debris and water left instream, and the screens prevent any fish from entering the District's irrigation conveyance system.

There are 18 species of fish documented in the waterbodies associated with District operations (Appendix E.5). All 18 of these fish species are potentially present in the Deschutes River from Steelhead Falls (RM 128) to Lake Billy Chinook (RM 120) and in the Crooked River from RM 30.15 to its confluence with Lake Billy Chinook. The summer steelhead (*Oncorhynchus mykiss*), Chinook salmon (*Oncorhynchus tshawytscha*), and sockeye salmon (*Oncorhynchus nerka*) in these waterbodies are part of a reintroduction effort that began in 2009 to mitigate for blocking fish passage when the Pelton Round Butte Dam Complex was constructed (ODFW and CTWS 2008). Chinook and sockeye salmon are unable to navigate Steelhead Falls at RM 128, which creates the uppermost

distribution limit for salmon in the Deschutes River. Summer steelhead are able to pass upstream of Steelhead Falls but are unable to navigate upstream of Big Falls at RM 132. Big Falls is considered the uppermost limit of anadromous fish distribution (ODFW 1996). Within the reach of the Crooked River that is associated with District operations (RM 0 to 30.15), there was one historic fish passage barrier—the Opal Springs Dam at RM 6.7—which was the second highest-priority fish passage barrier in the state of Oregon. As of fall 2019, upstream and downstream fish passage has been restored at the dam, eliminating the need for trap and haul methods.

Low streamflow and water quality impairments are recognized as key limiting factors for fish populations in the basin (NMFS 2009). Elevated water temperatures in the middle Deschutes River negatively affect salmonid growth and survival (Recsetar et al. 2012). Availability of cold water refugia for temperature-sensitive fish species is of key importance when river temperatures rise above acceptable standards. Water temperatures that are out of the normal range for a given fish species can increase physiologic stress, increase susceptibility to predators, and influence growth rates, feeding, metabolism, and development. Water temperature changes in the affected area are described in Section 4.6.4

In addition to fish, other aquatic species are potentially found within or along waterbodies that are associated with District operations. These other aquatic species include bullfrog (*Lithobates catesbeianus*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris regilla*), and long-toed salamander (*Ambystoma macrodacylum*). The western toad, Pacific treefrog, and long-toed salamander are native to Oregon and may be present in open irrigation canals and adjacent banks where there is suitable vegetation (S. Wray, personal communication, November 17, 2017). The bullfrog is an invasive species introduced to Oregon in the early 1900s. Bullfrogs are voracious predators that eat any animal they can swallow. The International Union for Conservation of Nature (ICUN) lists all of these amphibians as "Species of Least Concern" (International Union for Conservation of Nature [IUCN] 2017).

Two species of mollusks may be found in the waterbodies associated with District operations: western pearlshell mussel (*Margaritifera falcata*) and western ridged mussel (*Gonidea angulata*). The western ridged mussel is currently ranked as vulnerable by IUCN (2017) and recognized as a "Species of Greatest Conservation Need" in the State of Oregon (OCS 2016). The western pearlshell mussel is ranked as near threatened by IUCN (2017).

4.7.2 Federally Listed Fish and Aquatic Species

A list of fish and aquatic species protected under the ESA (16 U.S.C. 1531 et seq.), as amended in 1998, that are known or expected to occur in waterbodies associated with District operations was obtained using the USFWS Environmental Conservation Online System IPaC. The IPaC indicated that three federally listed fish and aquatic species—the Oregon spotted frog (*Rana pretiosa*), bull trout (*Salvelinus confluentus*), and Middle Columbia River steelhead—are, or may be found in, the waterbodies associated with LPID operations (USFWS 2019). None of these species are known to occur within the irrigation canals and laterals within the project area.

Oregon spotted frog

USFWS lists the Oregon spotted frog as threatened under the ESA. The Oregon spotted frog and its designated critical habitat occur in the Deschutes River upstream of the City of Bend (RM 173) and in Crane Prairie and Wickiup reservoirs (Appendix E.5; Figure E-1). USFWS has identified Primary Constituent Elements (PCEs) for Oregon spotted frog critical habitat (81 Federal Register [Fed. Reg.] 29335, 2016). They represent the biological and physical features essential to the conservation of a species and describe habitat components that support one or more life stages of the species. PCEs for the Oregon spotted frog describe areas that have appropriate water depths and refuge from predators, aquatic connectivity, and absence of non-native predators. A detailed list of the Oregon spotted frog critical habitat PCEs is provided in Appendix E.5.

Bull trout

USFWS also lists bull trout as threatened under the ESA. For bull trout above the Pelton Round Butte Project, all spawning and rearing occurs in the Metolious subbasin, and foraging by adult and subadult bull trout occurs in the Deschutes and Crooked rivers (AID et al. 2020). In the Deschutes River, bull trout are known to be present from Big Falls (RM 132) to Lake Billy Chinook (RM 120) (ODFW 2005 and 1996). Bull trout are typically only present in this reach during winter foraging when water temperature is sufficiently cold enough (59 degrees Fahrenheit [°F] or less) to support bull trout.

In the Crooked River, as of November 2019, bull trout have utilized the new, Opal Springs fish ladder to achieve both upstream and downstream passage past Opal Springs Dam, which has opened up all suitable habitat in the Crooked River and tributaries until RM 70 at Bowman Dam. In the Crooked River, significant cold groundwater discharge from springs begins at approximately RM 13.8 and likely creates suitable habitat for bull trout year-round. In the winter, water temperatures may support foraging bull trout up to Bowman Dam (RM 70). Naturally warmer water temperatures in the summer months will likely preclude bull trout from foraging upstream of RM 13.8.

Bull trout designated critical habitat occurs in the Deschutes River from Big Falls (RM 132) to Lake Billy Chinook (RM 120) and in the Crooked River from the LPID headgate spillway (RM 30.15) downstream to Lake Billy Chinook (RM 0.0) (Appendix E.5; Figure E-1). The PCEs for bull trout describe habitat that has aquatic connectivity, complex habitat structure, water temperatures ranging from 35.6 to 59 °F, natural variability in streamflow, a sufficient food base, and the absence of non-native predatory and competing fish (70 Fed. Reg. 56211, 2005). A detailed list of Critical Habitat PCEs for bull trout is provided in Appendix E.5.

Middle Columbia River steelhead

Steelhead populations listed as threatened under ESA are present within the area affected by the project (Appendix E.5; Figure E-2). However, the population in the middle Deschutes River above the Pelton Round Butte Project (Middle Columbia River steelhead) is classified as a non-essential experimental population under Section 10(j) of ESA, and critical habitat is not designated (76 Fed. Reg. 28715, 2011). Because of this classification, and because the non-essential experimental

population is located outside a National Wildlife Refuge System and a National Park System, the population is treated as "proposed for listing" under ESA Section 7 (76 Fed. Reg. 28715, 2011; 81 Fed. Reg. 33416, 2016). Beginning January 2025, the non-essential experimental population listing will be removed, and Middle Columbia River steelhead will be designated as threatened under ESA.

4.7.3 State-Listed Species

ODFW maintains a list of native wildlife species in Oregon that have been determined to be either threatened or endangered according to criteria set forth by rule (OAR 635-100-0105) (ODFW 2021). There are no threatened, endangered, or candidate fish or aquatic species known to occur within the waterbodies associated with LPID operations or in the irrigation canals and laterals within the project area.

4.7.4 Ecosystem Services

Fish and aquatic species in the Deschutes River provide the following ecosystem services:

- *Provisioning service, Instream fish populations (*Figure 4-1 [E2]): The waterbodies associated with District operations provide year-round trout fishing opportunities (ODFW 2019). Brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*) in the upper or middle Deschutes provide recreational anglers with opportunities to harvest fish for consumption. In addition, members of the CTWS have fishing rights and rely on the Deschutes River fisheries for subsistence.
- *Cultural service, Culturally important species (*Figure 4-1 [E4]): People's values for species conservation may arise from personal use (i.e., enjoying seeing the species and/or its habitat), personal beliefs and moral ethics (i.e., believe protecting a species and its habitat is the right thing to do), altruism (i.e., believing a resource should be protected so that others can use it or benefit from it), and/or a desire to bequest the resource (i.e., believing a resource should be protected for future generations). To many residents of Central Oregon, the conservation of fish and aquatic life has come to represent the restoration of the Deschutes River ecosystem. In addition, members of the CTWS have fishing rights and rely on the Deschutes River fisheries for subsistence. Culturally important fish and aquatic species in the Deschutes River ecosystem therefore include species such as salmon, bull trout, and steelhead for both subsistence and cultural values and the Oregon spotted frog for cultural values.

4.8 Wetlands and Riparian Areas

Wetland and riparian areas affected by District operations occur in two areas: the project area and 141.95 miles of natural waterbodies associated with District operations (Table 4-7; Figure 4-2).

Wetlands perform several valuable functions including water storage, water filtration, and biological productivity. They can also support complex food chains that provide sources of nutrients to plants and animals and specialized habitat for a wide variety of aquatic and terrestrial species. Wetlands in the area associated with the proposed action may be subject to federal or state regulations depending

on their characteristics. Within the State of Oregon, wetlands are managed under two regulations: the federal CWA and the Oregon Removal-Fill Law.

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the CWA with the oversight of the U.S. Environmental Protection Agency (USEPA). This law regulates the dredge or fill of wetlands over which the USACE has jurisdiction (or "jurisdictional wetlands").

Section 404 of the CWA defines wetlands as "those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1986).

The Oregon Department of State Lands (ODSL) implements the Removal-Fill Law (ORS 196.800-990), which regulates the removal or fill of material in wetlands or waterways, requiring any person who plans to "remove or fill" material within "waters of the state" to obtain a permit from ODSL.

Per the Oregon Removal-Fill statute OR 141-085-0515(9), an irrigation ditch is not jurisdictional under Oregon Removal-Fill permitting if it meets both of the following (ODSL 2013):

- The ditch is operated and maintained for the primary purpose of irrigation; and
- The ditch is dewatered[14] outside the irrigation season except for isolated puddles in low areas.

On July 24, 2020, the USACE and USEPA signed a memorandum providing a clear, consistent approach regarding the application of exemptions from regulation under Section 404(f)(1)(C) of the CWA for construction or maintenance of irrigation ditches and the maintenance of drainage ditches. As defined in this memorandum, an "irrigation ditch" is a ditch that either conveys water to an ultimate irrigation use or place of use or that moves and/or conveys irrigation water away from irrigated lands. Further, the construction and maintenance of irrigation ditches is considered an exempt activity under Section 404 of the CWA. However, the construction and maintenance of irrigation ditches[15] constructed in jurisdictional wetlands or other Waters of the United States may not meet this exemption.

Riparian areas are transition zones between waterbodies and adjacent upland areas that support hydrophytic vegetation that is dependent upon the hydrology of the waterbody. Riparian areas as defined by Section 404 of the CWA are "areas next to or substantially influenced by water. These may include areas adjacent to rivers, lakes, or estuaries" (USEPA 2015). Riparian areas are typically associated with high-water tables due to the close proximity to aquatic ecosystems, certain soil

[14] "Dewatered" means that the source of irrigation water is turned off or diverted from the irrigation ditch. A ditch that is dewatered outside the irrigation season may be used for temporary flows associated with stormwater collection, stock water runs, or fire suppression.
[15] Irrigation ditches in the LPID system are not drainage ditches; they do not intentionally accept water for any other use.

characteristics, and a range of vegetation that requires free water or conditions that are moister than normal (Oakley et al. 1985).

4.8.1 Wetland and Riparian Areas Along the Project Area

Water typically flows through LPID's canals and laterals during the irrigation season between April 1 and October 31. Water may also occasionally flow through these canals outside the irrigation season as standing water following rain or snow events. Wetlands adjacent to irrigation ditches are generally not regulated under Section 404 of the CWA, as long as the ditch was not constructed through previously existing jurisdictional waters. Hydrophytic plants are sometimes found along the banks of irrigation canals and laterals within the project area or in adjacent low-lying areas outside the project area, as the hydrology provided by the canals and laterals can create favorable growing conditions during a portion of the year. However, the District actively keeps the canal and lateral banks clear from vegetation; therefore, riparian vegetation is limited. When initially building the LPID canal and lateral system, Lone Pine Creek was channelized and used for conveyance purposes (Figure 4-8).

Analysis of the National Wetland Inventory[16] (NWI) geographic information systems data (USFWS 2016) and aerial imagery has identified one site as a Forested/Shrub Wetland within the project area at the site of the proposed river crossing. The NWI data is used as a first-step approach in identifying and evaluating potential wetlands in the project area; however, at the time of writing this Plan-EA, these sites have not been field verified and a wetland delineation has not yet been performed.

4.8.2 Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations

Wetlands are found within and sporadically adjacent to the Crane Prairie Reservoir and Wickiup Reservoir, and sporadically adjacent to the 141.95 miles of the Deschutes and Crooked rivers that are associated with District operations. The types of wetlands that are found include marshes and wet meadows dominated by herbaceous plants, and swamps dominated by herbaceous plants, shrubs, or trees (UDWC 2003). Low streamflow associated with upstream reservoir storage and irrigation withdrawal limits riparian vegetation and water accessibility to wetlands in these reaches. Because streamflow is strongly correlated with critical physical and biological characteristics of the river, it influences the functions of associated riparian areas (NRC 2002). As riparian areas become hydrologically disconnected from their adjacent stream channels with reduced streamflow, they lose many of their ecological functions.

[16] The NWI code uses the Cowardin classification system. For further information about Cowardin classifications, refer to *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et. al 1979).

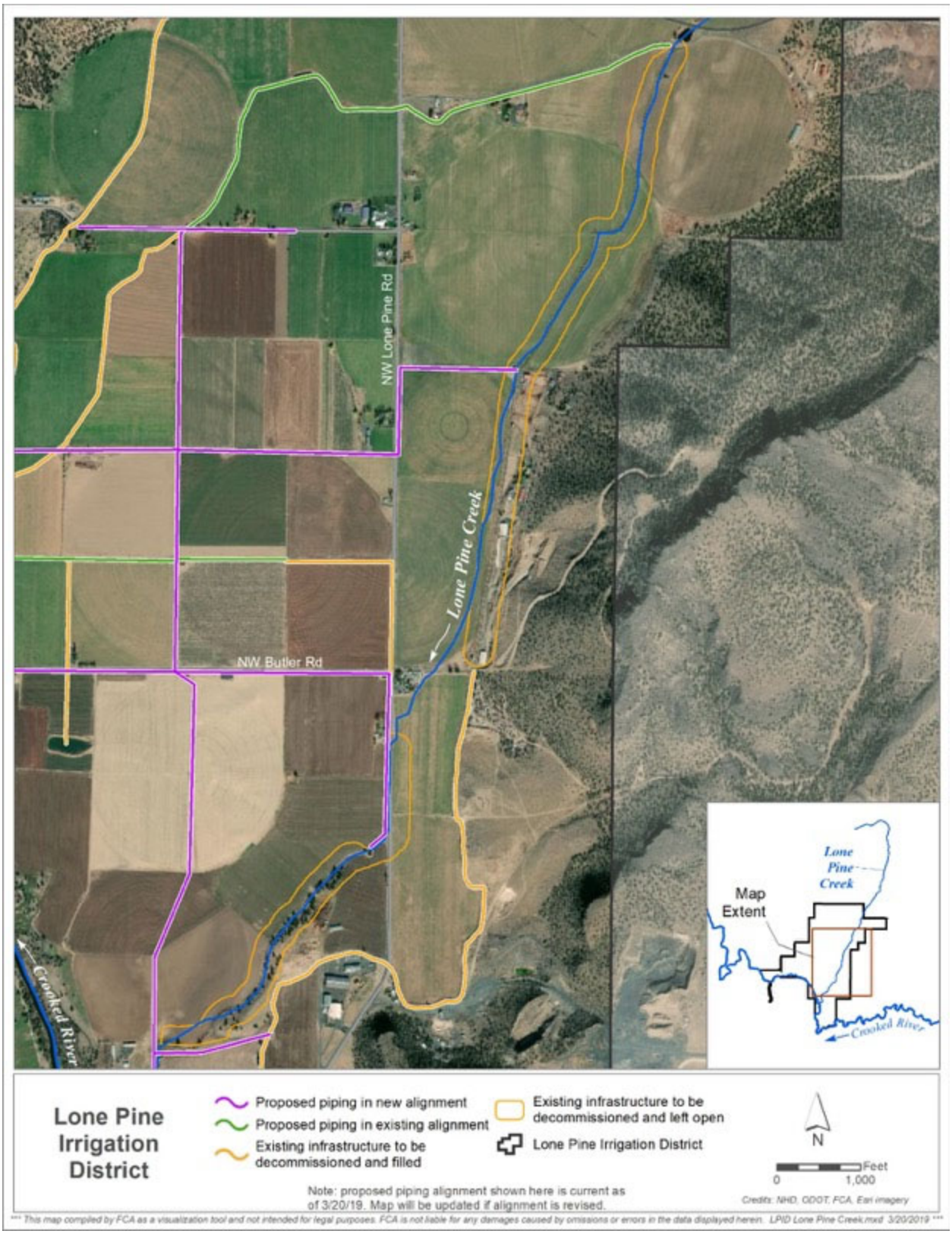


Figure 4-8. Project area in relation to Lone Pine Creek.

4.9 Wildlife Resources

4.9.1 General Wildlife

Generally, wildlife present within LPID's agricultural lands consists of habitat generalists or edge species with the ability to adapt to or exploit the agricultural environment. These species are tolerant to disturbance and include species such as deer, coyote, skunk, grey squirrel, raccoon, and red-tailed hawk (Blair 1996; Ditchkoff et al. 2006; McKinney 2002; Shochat et al. 2006).

Wildlife within the project area may use the canal and lateral system as a water source and dispersal corridor. Additionally, where not cleared, vegetation along canals and laterals can provide food, cover, and breeding sites for many wildlife species throughout the year. Appendix E.7 contains a list of wildlife species that are likely to occur in the project area.

4.9.2 MBTA/BGEPA Species

There are multiple bird species with the potential to occur within the project area, some of which are protected under the Migratory Bird Treaty Act (MBTA) or the Bald and Golden Eagle Protection Act (BGEPA). Although migratory birds are known to travel through the project area and its vicinity, limited habitat is provided within the project area and LPID's ROW due to maintenance activities that remove vegetation on an annual basis. Appendix E.7 has a list of MBTA/BGEPA species potentially occurring within the project area.

USFWS maintains a database of known golden eagle (*Aquila chrysaetos*) and bald eagle (*Haliaeetus leucocephalus*) nesting sites. The project area south of Lone Pine Road and at the proposed Crooked River crossing is approximately 0.4 mile from the O'Neil Golden Eagle Territory (J. Cordova, personal communication, January 30, 2019).

4.9.3 Federally Listed Species

A review of available USFWS data showed no federal threatened or endangered terrestrial wildlife species, designated critical habitat, or federal species of concern with potential to occur within the project area. Federally listed aquatic species are discussed in Section 4.7.2.

4.9.4 State-Listed Species

ODFW maintains a list of native wildlife species in Oregon determined to be either threatened or endangered according to criteria set forth by rule (OAR 635-100-0105) (ODFW 2017). There are no state-listed terrestrial wildlife species known to occur within the project area. State-listed aquatic species are discussed in Section 4.7.3.

4.10 Wild and Scenic Rivers

Three federally designated Wild and Scenic Rivers (Public Law 90-542; 16 U.S.C. 1271 et seq.) are within waterbodies associated with District operations:

- The Deschutes River from Wickiup Reservoir (RM 226.8) to the Bend Urban Growth boundary at the southwest corner of Section 13, T18S, R11E (approximately RM 172) is

classified as "Scenic"[17] and "Recreational"[18] with Outstandingly Remarkable Values (ORVs) including Cultural, Fish, Geologic, Recreation, Scenery, Wildlife, and Vegetation. The upper Deschutes River has no sections classified as Wild (USDA 1996).

- The Deschutes River from Odin Falls (RM 139.9) to the upper end of Lake Billy Chinook (RM 120) is classified as "Scenic" with its ORVs including Cultural, Fish, Geologic, Recreation, Scenery, Wildlife, Hydrology, Botanical/Ecological, and Wilderness (BLM 1992).
- The Crooked River from the National Grasslands boundary (RM 25.8) to Dry Creek (RM 8) is classified as "Recreation" with ORVs including Geologic, Recreation, Scenery, Wildlife, Hydrology, and Botanical/Ecological (BLM 1992).

Additional information regarding the ORVs is provided in Appendix E.8.

The overall goals of the Wild and Scenic River Management Plans (USDA 1996 and BLM 1992) are to maintain the current character of the river area and provide long-term protection and enhancement of its ORVs. Additional goals include protecting and enhancing instream and land-based biological, cultural, and physical resources; and providing for appropriate recreational use and public access while maintaining the wild and scenic nature of the river (USDA 1996 and BLM 1992).

In addition to federally designated Wild and Scenic Rivers, several reaches of the Deschutes River within the waterbodies associated with District operations are designated Oregon State Scenic Waterways (ORS 390.826). These locations, with specific exclusions and classifications, are detailed in Table 4-10.

[17] The section from the north boundary of Sunriver to Lava Island Camp is classified as Scenic, which is defined as, "those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads" (USDA 1996).

[18] The sections from Wickiup Dam to the northern boundary of Sunriver and the section from Lava Island to the Bend Urban Growth Boundary are classified as Recreational, which is defined as, "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past" (USDA 1996).

Table 4-10. Designated Oregon Scenic River Waterways Associated with District Operations.

Waterbody Name	Classification	Reach
Upper Deschutes River	Scenic River Area[1]	From RM 224.5 to RM 204, except for Pringle Falls (RM 217.5 to RM 216.5)
	Scenic River Area	From the Deschutes National Forest boundary in Section 20, T19S, R11E (approximately RM 184.8) to the Bend Urban Growth Boundary (approximately RM 172)
	River Community Area[2]	From RM 226.4 to approximately RM 224.5; from RM 217.5 to RM 216.8; from RM 204 to about RM 199; and from RM 172 to RM 171
	Recreational River Area[3]	From RM 190.6 to approximately RM 184.8
Middle Deschutes River	Scenic River Area	From Deschutes Market Road (approximately RM 157) to the south boundary of the Wilderness Study Area (approximately RM 131), with the exception of the Clines Falls Dam and powerhouse between State Highway 126 Bridge (RM 144.9) and RM 144 and the Crooked River Ranch River Community Area (RM 129.9 to RM 131.5)
	River Community Area	From RM 164 to approximately RM 161; from RM 129.9 to RM 131.5; and from RM 124.3 to RM 125.25
	Recreational River Area	From the northern Bend Urban Growth Boundary (RM 161) to Tumalo State Park (RM 158)
	Natural River Area[4]	From the south boundary of the Wilderness Study Area as approximately RM 131 to Lake Billy Chinook (RM 120), except for RM 129.9 to RM 131.5

Source: ORS 390.826

Notes:

[1] Those designated scenic waterways or segments with related adjacent lands and shorelines that are still largely primitive and largely undeveloped, except for agriculture and grazing, but accessible in places by roads. These classified areas will be administered to maintain or enhance their high scenic quality, recreational value, and fishery and wildlife habitat, while preserving their largely undeveloped character and allowing continuing agricultural uses.

[2] Those designated areas of a scenic waterway where density of structures or other developments already exist and precludes application of a more restrictive classification.

[3] Those designated scenic waterways that are readily accessible by road or railroad, that allow a wide range of compatible, river-oriented, public, outdoor-recreation opportunities, to the extent that these do not substantially impair the natural beauty of the scenic waterway or diminish its aesthetic, fish and wildlife, scientific, and recreational values.

[4] Those designated scenic waterways that are generally inaccessible except by trail or the river, with related adjacent lands and shorelines essentially primitive. These classified scenic waterways will be administered to preserve their natural, wild, and primitive condition, essentially unaltered by the effects of humans, while allowing compatible recreational uses, other compatible existing uses, and protection of fish and wildlife.

5 Alternatives

5.1 Formulation Process

The Preliminary Investigative Report (PIR) considered multiple alternatives (FCA 2018). The formulation of alternatives followed the CEQ's regulations for implementing NEPA and numerous USDA-NRCS watershed planning policies. Scoping comments were also incorporated into the formulation process of alternatives.

When formulating an alternative, it was first determined whether the alternative met the project purpose and need. The alternative was then further analyzed for four criteria: completeness, effectiveness, efficiency, and acceptability (USDA 2017; Appendix D.2). The alternatives of conversion to dryland farming, fallowing farm fields, voluntary duty reduction, exclusive or partial use of groundwater, and on-farm efficiency upgrades were initially considered during formulation but were eliminated from further analysis because they did not meet the formulation criteria (Appendix D.2).

5.2 Alternatives Eliminated from Detailed Study

The following subsection describes an alternative that met the formulation criteria but was not analyzed in detail as a viable alternative after further consideration.[19]

5.2.1 Canal Lining

Canal lining would involve covering the bottom and sides of the currently open canals and laterals with a geotextile liner and shotcrete to prevent water from seeping into the underlying soils and rock. Canal lining would require sub-grade preparation, geotextile liner installation, and application of a layer of shotcrete to protect the geotextile liner across open canals and laterals. In addition, the canal lining alternative would follow the current conveyance system design, requiring the District to renovate or repair the current suspension bridge (LPID 2017).

Lining would increase water velocity in the canals and laterals because the shotcrete cover is a smoother surface than the existing underlying rock. This makes the sides of the canals and laterals slippery and more difficult to climb out for anyone who might accidentally fall in the water. To address public safety concerns caused by the installation of lining, safety ladders would be installed every 750 feet in channels deeper than 2.5 feet to provide the opportunity for human and animal escape (this is included in the cost estimate of the canal lining).

The canal lining alternative would meet the project purpose of conserving water and improving fish and aquatic habitat; lining would reduce water loss from seepage by up to 1,893 acre-feet during the irrigation season; 75 percent of the saved water would be protected instream. Water loss in an open, lined system is estimated to be 10 percent based on studies of canal lining (Swihart and Haynes

[19] Alternatives that do not address the purpose and need for action, do not achieve the Federal Objective (Section 2) and Guiding Principles (Appendix E.10), or become unreasonable because of cost, logistics, existing technology, or environmental reasons may be removed from consideration (NWPM 501.37; NRCS 2015a; USDA 2017).

2002). Lined canals, however, are vulnerable to tears or cracks in the lining; seepage from torn or cracked lined canals is similar to that from unlined canals.

The lining materials would be expected to have a lifespan of 33 years before needing replacement. Before replacement, as the system aged it would likely require progressively increasing maintenance to account for lining cracks and tears.

Capital costs of canal lining were estimated based on the size of the existing open canals and laterals. Annual operating costs associated with canal lining were estimated based on LPID's current operating budget, with a 20 percent increase in equipment, maintenance, and labor costs due to the relatively fragile nature of a lined canal compared to an unlined canal. Assuming a 33-year design life,[20] the capital costs, replacement costs, and annual O&M costs for canal lining was estimated at $28,790,000 (2020 U.S. dollars) over 100 years. Based on this cost,[21] canal lining was eliminated from further study (see Appendix D for cost details). Furthermore, canal lining does not meet the purpose and need to improve water delivery reliability because canals and laterals would remain open and the District would continue to use operational spills—therefore, not significantly reducing water loss nor improving water reliability for patrons.

5.3 Alternatives Description

Of the project alternatives considered, two were selected for further evaluation and are discussed in the following sections. These alternatives include only LPID-owned infrastructure.

5.3.1 No Action (Future without Federal Investment)

Under the No Action Alternative, federal funding through PL 83-566 would not be available to implement the project. The District would continue to operate and maintain its existing open canal and pipe system in its current condition. Under this alternative, modernization of the District's system to meet the purpose and needs of the project would not be reasonably certain to occur. For the purposes of this Plan-EA, the No Action Alternative is a near-term continuation of the District's standard operating procedures under the HCP requirements.

The No Action Alternative would not meet the purpose and need. There would be no improvement to water loss from seepage in District infrastructure, water delivery reliability for farmers, or streamflow and habitat conditions for fish and aquatic species. Because no water would be conserved or protected instream, the No Action Alternative would not achieve the Federal Objective to protect the environment. Similarly, because no water would be conserved, the No Action alternative would not accomplish the Healthy and Resilient Ecosystem Guiding Principle, which seeks to support resilient ecosystems that can respond to climate change, or the Sustainable Economic Development Guiding Principle, which seeks to manage water resources sustainably to ensure water supply and water quality for present and future generations.

[20] The design life of canal lining was determined using data from Reclamation (Swihart 2002). To calculate the Canal Lining Alternative costs over 100 years, the canal lining was fully replaced at 33 and 66 years.
[21] A cost estimate for renovation or replacement of the suspension bridge was beyond the scope of the System Improvement Plan (LPID 2017); therefore, it was not included in this cost estimate.

5.3.2 Piping Alternative (Future with Federal Investment)

The Piping Alternative is LPID's desired alternative. Under the Piping Alternative, federal funding through PL 83-566 would be available and the District would realign the current conveyance system; construct a new river crossing at the Crooked River and enter the District from the southern boundary; install 10.9 miles of pressurized, buried pipe; and decommission[22] 9.7 miles of open canal (Figure 5-1).

Construction of the Piping Alternative would occur over the course of 3 years. Construction would occur predominately during the non-irrigation season (November to April), with construction beginning as early as the 2021 non-irrigation season. The new river crossing would consist of either a siphon going under the river or an updated bridge carrying the irrigation pipe over the river. If the river crossing were a siphon, construction in the Crooked River would follow ODFW's guidelines for timing of in-water work.

Under this alternative, 45 District turnouts would be upgraded. Modifications to each turnout would include an appropriately sized tee from the mainline or lateral, a pressure relief valve, a gear-actuated plug valve (or gate or possibly butterfly valve in smaller turnout situations), a magnetic meter, a combination air and vacuum relief valve and associated hardware, and spool pipe segments (LPID 2017).

The new river crossing would convey irrigation water from west to east across the Crooked River. The design would either take the form of an inverted siphon or updating an existing bridge to carry the pipe across the river. The District and NRCS engineers are in the process of determining which would be the best design option. For the purpose of this Plan-EA, both design options were considered when looking at the potential effects of the project (Section 6) and required permitting (Section 8). The siphon would cost slightly more than the bridge and, to be conservative in the cost-benefit analysis, the siphon costs have been included in the total cost of the project.

The siphon design would consist of a single pipe encased in concrete with a minimum of 3 feet of earth cover, or as required to mitigate potential scour depth in the river. A blow-off structure would be installed to permit draining of the siphon for inspection and maintenance or wintertime shutdown, and an air/vacuum relief valve would be placed on each end of the siphon to address potential air entrainment or vacuum issues during long-term operation of the system (K. Crew, personal communication, July 23, 2019).

The bridge design would utilize an existing patron's personal bridge[23], which is currently used for transporting livestock, to cross the river. All easements and agreements with the bridge owner would be secured prior to construction. All construction activities would occur above the Ordinary High Watermark. The bridge would be structurally reinforced to carry the pipe using a method such as concrete H columns. The pipe would be mounted to hang below the bridge.

[22] For this project, when canals are decommissioned, 9.7 miles would be filled and reseeded while the channelized Lone Pine Creek would remain open.
[23] The bridge owner has already given consent.

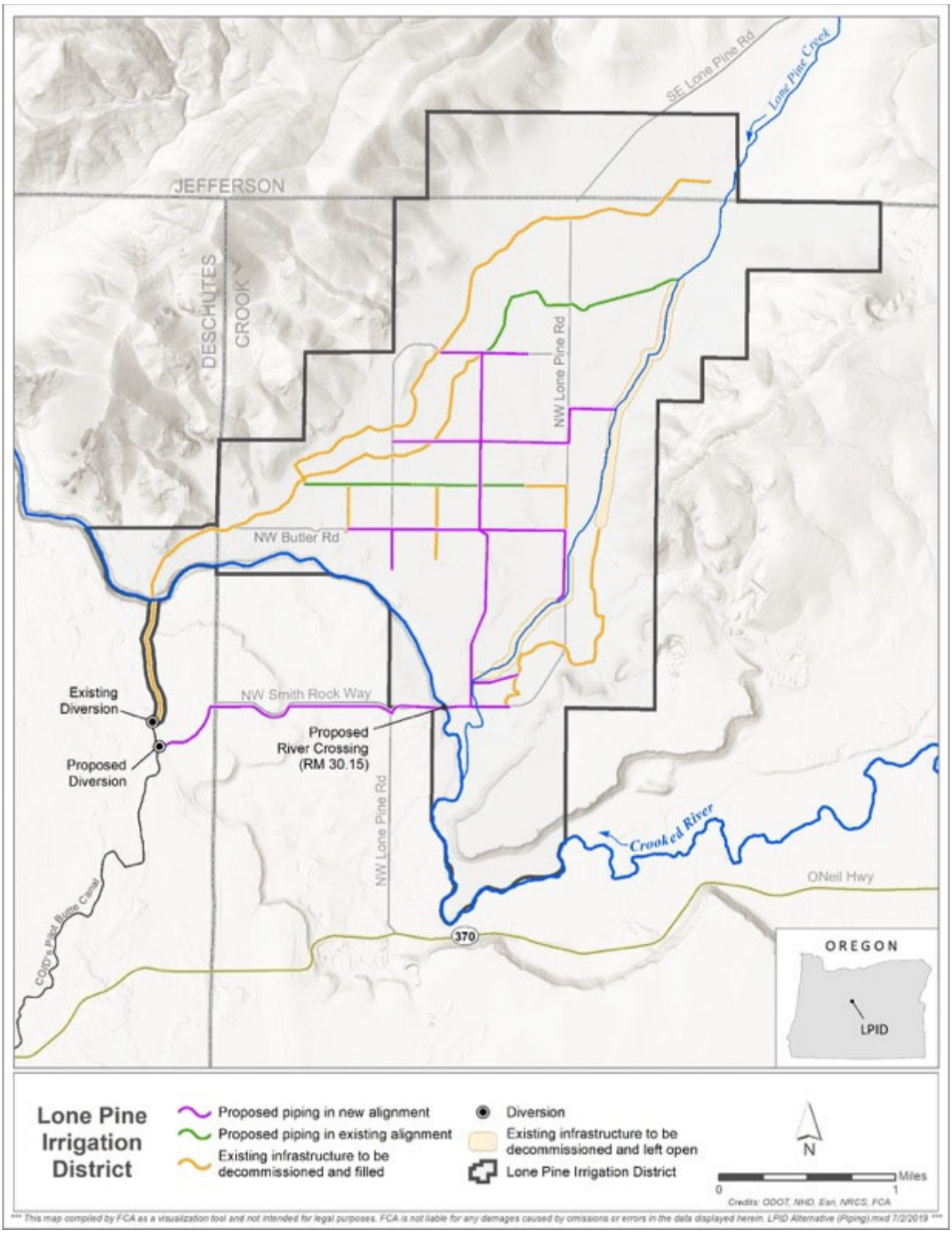


Figure 5-1. Overview of the piping alternative for Lone Pine Irrigation District Infrastructure Modernization Project.

Construction of this alternative would include equipment mobilization and staging, pipe delivery to construction areas, trench excavation, pipeline fusing, pipe placement, backfill compaction, and disturbed area restoration and reseeding. In some locations, construction access would need to be created before delivering pipe or equipment into construction areas. This could include vegetation removal within the construction area. Appropriately sized equipment would be used to minimize disturbance in the construction area. Pipe installation would most likely require some borrow or fill material and storage areas for pipe, other materials, and construction equipment. These areas have not yet been identified. Areas that have been previously disturbed and are accessible through existing access routes would be selected.

Vegetation clearing before construction, vegetation and weed management during construction, and reseeding after construction would be completed according to LPID's current vegetation management practices and the NRCS Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). During construction, vegetation clearing would be minimized to the extent practicable, and locations for vehicle and equipment access, staging, and storage would be selected to avoid trees and other slow-growing vegetation. Trees would only be removed if there were no other alternative to access the construction site or if they pose a safety threat to construction crews working in the canal or lateral trench.

Canals and laterals identified for piping would be accessed from LPID's existing maintenance roads when possible. Existing maintenance roads and overland access routes commonly used for O&M may require some improvements for use during construction.

Temporary overland travel routes within LPID's existing easements would be necessary to access certain canals and laterals that do not have established maintenance roads. To facilitate restoration, temporary travel routes would be left in their natural condition, with only minimal alteration when necessary to allow travel during construction. The most direct route possible would be used to access the construction area. Any work needed to create equipment access would occur prior to, or concurrently with, piping.

In project areas where landowners grant new easements,[24] the most direct route possible would be used to access the construction area, and as-built surveys would be created to attach to new easements following pipeline installation. In addition, LPID would use COID's L-Lateral ROW to connect to COID's infrastructure at the location of the proposed diversion (Figure 5-1).

Operation and maintenance (O&M) under the Piping Alternative would consist of an ongoing pipe inspection program that would systematically cover the entire system over a period of several years (most likely a 10-year cycle). During the irrigation season from April to October, work would be performed on an as-needed basis. Outside the irrigation season, LPID would perform system component maintenance and/or repairs to District meters, valves, and air and vacuum infrastructure.

[24] Landowners in the District have already given consent for the development of new easements.

The Piping Alternative contributes to the sponsors' objectives and the Federal Objective and Guiding Principles as follows:

- Improve water conservation—This alternative would reduce water loss from canal seepage, evaporation, and operational spills and result in an estimated annual water savings of 2,103 acre-feet.
- Increase water delivery reliability to patrons and farms—Modernizing the system would improve irrigation water delivery reliability for all the patrons served by LPID's canal and lateral system across 2,369 acres of irrigated land. Under this alternative, up to 24 percent of the water saved by the project (an estimated 502 acre-feet annually) would be used to increase the District's irrigation water supply. This alternative would improve operational efficiencies to ensure that patrons receive the water they need at the time they need it and eliminate the need to spill excess water.
- Reduce OM&R costs—A piped system would eliminate the need to inspect, repair, and remove obstructions from open canals.
- Enhance streamflow and habitat conditions for fish and aquatic species—Following the completion of the project and measurement and verification of the total water savings, LPID would pass up to 1,600 acre-feet/year to NUID from storage in Crane Prairie Reservoir.[25] In return, NUID would release and protect an equal volume of water from Wickiup Reservoir into the Deschutes River during the non-irrigation season (see Section 6.6). Streamflow and habitat conditions along the Deschutes River would benefit from this protected water. In addition, elimination of the operational spill would reduce the potential of contaminants from entering the Crooked River.

The Piping Alternative achieves the Federal Objective to protect the environment by restoring and protecting streamflow in the Deschutes River. By improving operational efficiencies and eliminating operational spills, thereby conserving water and improving water quality in the Deschutes and Crooked rivers, the Piping Alternative achieves the Federal Objective and Guiding Principle of sustainable economic development. Lastly, this alternative also achieves the Guiding Principles of Healthy and Resilient Ecosystems by contributing to a more resilient ecosystem (returning water instream) in the face of changing climate.

The estimated project cost for the Piping Alternative including NRCS Technical Assistance and Program Administration as well as permitting would be $13,893,000. Additional information regarding the costing and the net present value of the Piping Alternative can be found in Appendix D.5.

[25] The District anticipates that 100 percent of the project would be funded through PL 83-566 and other public or public-interest funding sources. If the District were to invest its own funds in the project, the District would pass an amount of conserved water in proportion to the amount of public and public-interest funding to NUID (i.e., if the project was 90 percent public funded, then 90 percent of the conserved water would be passed to NUID). The District would not apply to create new water rights for out-of-stream uses.

5.4 Summary and Comparison of Alternatives

Table 5-1 compares the No Action/Future without Federal Investment (Alternative 1) and the Piping Alternative/Future with Federal Investment (Alternative 2). The table summarizes measures addressed as well as environmental, social, cultural, and economic effects.

Table 5-1. Summary and Comparison of Alternative Plans.

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Alternative Plans		
Locally Preferred		✓
National Economic Efficiency (NEE)		✓
Socially Preferred		✓
Environmentally Preferred		✓
Guiding Principles Check marks indicate that the Guiding Principles (Appendix E.9) have been met		
Healthy and Resilient Ecosystems		✓
Sustainable Economic Development		✓
Floodplains		✓
Public Safety		✓
Environmental Justice		✓
Watershed Approach		✓
Watershed Approach	A watershed approach was used for analysis of the No Action Alternative; this alternative would neither benefit nor adversely affect resources or stakeholders both upstream and downstream of the study area.	A watershed approach was used for analysis of the Piping Alternative; tradeoffs and environmental consequences of affected resources were analyzed both upstream and downstream of the study area.
Provisioning Services		

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Irrigation water	No effect; Irrigation water would continue to be unreliable for farmers.	Piping would help provide more secure and reliable irrigation water for LPID farmers. The water saved from the project and passed to NUID would also support agricultural producers in NUID.
Instream fish species	No effect; Resident and anadromous fish populations would not be affected. Harvest of anadromous fish would continue to be available only when runs are sufficiently large to sustain fishing.	Up to 1,600 acre-feet of water released instream below Wickiup Reservoir into the Deschutes River during the non-irrigation season would have indirect, beneficial effects on resident fish populations and their habitat in the short-term.
Regulating Services		
Water quality	No effect; Instream water would continue to be warmer than state standards, and low-quality water from operational spills would continue to contribute pollutants and warm water to the Crooked River.	Up to 1,600 acre-feet of water protected instream below Wickiup Reservoir during the non-irrigation season would help improve water quality in the short-term. The addition of this water would help to alleviate bank erosion and sediment deposition from vulnerable riverbanks.
Cultural Services		
Culturally important species	No effect on habitat supporting populations of threatened fish species. Habitat limitations for culturally significant anadromous fish would continue to affect fishing, community, health, cultural identity, subsistence, and religious tribal values.	Up to 1,600 acre-feet of water protected instream below Wickiup Reservoir during the non-irrigation season would help improve threatened fish and aquatic species habitat and populations in the short-term. Improving populations would benefit cultural values such as tribal and religious values and bequest values.

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
National Economic Efficiency (NEE) Analysis[1]		
Installation Costs		
Federal PL 83-566	$0	$10,523,000
Local only or Matching PL 83-566	$0	$3,370,000
Total	$0	$13,893,000
Average Annual Cost		
Installation	$0	$370,000
Operation, Maintenance, and Replacement [1,2]	$0	$0
Other	$0	$0
Total		$370,000
Annual Benefits[3]	$0	$426,000
Annual Costs	$0	$370,000
Annual Net Benefits[3]	$0	$56,000

Notes:
1. All Costs and Benefits presented in the table for the Piping Alternative are included as a change from the No Action Alternative. Costs and Benefits for the No Action Alternative are shown as $0 to represent there would be no change to the existing costs and benefits.
2. A decrease in O&M costs of the canals and laterals for the Piping Alternative was included in the benefits rather than the costs.
3. Annual Net Benefits shown for the Piping Alternative are the additional net benefits compared to the No Action Alternative.

Regional Economic Impacts

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Annual Local Jobs during Construction	N/A	50
Annual Jobs from Recreation	N/A	Magnitude/direction of recreation visitation impacts not known, so no Regional Economic Development (RED) benefits quantified
Annual Jobs from Agriculture (including direct/indirect/induced)	1,360	1,370
Beneficial Effects Annualized[1] (Millions, 2020$)		
Region	$31.3[2]	$31.7[3]
Rest of Nation	Some ripple income/employment effects expected, but not estimated	Some ripple income/employment effects expected, but not estimated
Adverse Effects Annualized[4] (Millions, 2020$)		
Region	N/A	-$0.15
Rest of Nation	N/A	$0.4

Notes:
1. Beneficial effects include only those related to labor income and do not include the net economic benefits quantified in the NEE.
2. Local labor income, including direct, indirect, and induced annualized income from LPID and NUID agricultural production only.
3. Local labor income, including direct, indirect, and induced annualized income from LPID and NUID agricultural production and construction.
4. Adverse Effect Annualized includes only the direct costs (no indirect/induced costs included).

N/A = Not Applicable

6 Environmental Consequences

This section evaluates the environmental consequences of the No Action Alternative and the Piping Alternative. The beneficial and adverse effects of the two alternatives on each resource identified in Section 4 were evaluated. The intensity of an adverse effect was classified as negligible, minor, moderate, or major. The duration of an effect was classified as temporary, short-term, or long-term. Appendix E.1 presents the intensity threshold matrix used to categorize and define the range of expected effects.

6.1 Cultural Resources

6.1.1 No Action (Future without Federal Investment)

The District's ongoing O&M activities are not expected to affect archaeological resources or historic properties because these activities are expected to occur in previously disturbed areas.

6.1.2 Piping Alternative

NRCS has initiated coordination with SHPO and consultation with the Confederated Tribes of the Warm Springs by providing a project description and a map proposing the area of potential effect. Prior to construction of the project, the District would hire a cultural resource specialist to complete surveys for archaeological resources and historic properties in the project area. Once the survey has been completed, if the cultural resource specialist documents resources eligible for listing in the NRHP within the project area, consultation would occur between the District, NRCS, SHPO, THPO, and consulting parties including affiliated tribes to determine the effect on such resources and identify appropriate mitigation if that becomes necessary. Mitigation measures[26] would be identified and formalized before construction and completed concurrent with or after construction. The potential cost of mitigation for effects on cultural resources is included in the project cost. Consultation with the Confederated Tribes of the Warm Springs and the SHPO would be completed prior to project implementation.

If archaeological resources are inadvertently discovered during construction, an Inadvertent Discovery Plan would be followed (Appendix E.8). 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 SHPO, THPO, and NRCS cultural resources staff would occur as appropriate; and consulting parties including affiliated Tribes and Advisory Council on Historic Preservation would be notified and have the opportunity to comment. Continuation of construction would occur in accordance with applicable guidance and law.

[26] Based upon previous mitigation measures implemented by other districts in the Deschutes Basin, if mitigation were to be required, it could include but not be limited to actions such as working with the historic society to create a board with documentation and photos of the canal. This would be available at the District's office and on the District's website.

6.2 Land Use

6.2.1 No Action (Future without Federal Investment)

The No Action Alternative would have no direct effect on land use or land ownership within the project area or on lands served by canals and laterals in the project area. Ecosystem services of water for irrigation would not be affected.

6.2.2 Piping Alternative

Under the Piping Alternative, 9.7 miles[27] of currently open canals in the project area would be backfilled and covered with earth, as water would now be running through the new realigned piping. Although these segments would no longer be used for the conveyance of irrigation water, the District would still maintain its existing ROW. The 2.6 miles of channelized Lone Pine Creek would be left open to continue its current use as an ephemeral creek.

If the river crossing design uses a siphon, there would be no effect on land use. If the design is a bridge, the river crossing could temporarily affect the landowner's access to their land during construction. However, the District would work with the landowner to determine the best time for construction to minimize the effect.

Prior to construction, the District would obtain all necessary easements and agreements to realign pipe segments across patrons' lands. Within the segments of the project area that contain new pipe alignments, there would be short-term effects as trenches are dug to lay the pipe. Once pipe was laid, the trench would be backfilled and the land on top of the pipe would be able to return to its previous use. There would be minor effects on land use in the areas of new alignments and existing open canals because although there would be changes to how land is used, it would be consistent with existing ownership, easements, and ROWs.

Implementation of the Piping Alternative would support existing zoning designations and existing agricultural land use. Ecosystem services of water for irrigation would be supported through the improvement of delivery infrastructure. During and after construction, there would be no direct effect on agricultural land use in the project area or served by project canals and laterals. Construction would take place outside the irrigation season, causing no interruption to water deliveries or long-term change in the agricultural land use. Increased water delivery reliability would have beneficial indirect effects on agricultural land served by the project as it would reduce farmers' water uncertainty and increase resiliency.

6.3 Socioeconomic Resources

To estimate the total economic effects of the No Action Alternative and the Piping Alternative in terms of jobs and income supported, this analysis uses a 2017 IMPLAN economic impact model of

[27] This 9.7 miles would include the .3 miles of open canal that currently traverses BLM land.

Crook County,[28] linked through a multiregional analysis to Deschutes and Jefferson counties to include ripple effects of spending in those two counties.

6.3.1 No Action (Future without Federal Investment)

The No Action Alternative is expected to have no effects on the value or economic impact of agricultural production or other economic activity.

6.3.2 Piping Alternative

6.3.2.1 Regional Economic Development

The Piping Alternative construction expenditures of approximately $13.9 million would support construction sector jobs and income and would have economic ripple effects increasing jobs and income in other economic sectors in Crook, Deschutes, and Jefferson counties. Economic ripple effects would result from the construction sector spending more on labor, materials, and services, which would spur increased sales and economic activity in other sectors (such as hardware stores and construction equipment businesses). Effects of construction sector spending in these other sectors are known as indirect effects. As household income rises in construction and indirectly affected economic sectors, household spending would also increase and generate increased economic activity in such sectors as retail, wholesale trade, personal services industries, and real estate (known as induced effects). Total job and income effect of the economic activity that would be supported by the Piping Alternative are the sum of the direct effects (construction sector) and the indirect/induced effects (in other economic sectors).

The approximately $13.9 million in construction expenditure would be spread over 3 years, supporting approximately 50 jobs and $2.7 million in average income over the 3-year construction period (annualized over 103 years,[29] this would equate to approximately $0.2 million in annualized average income benefits). Of these effects, approximately 30 jobs and $2.1 million in annual income would be in the construction sector (direct effects), while the remaining 20 jobs and $0.6 million income would be in other sectors.

The Piping Alternative also is expected to result in higher hay yields in LPID in dry water years due to increased water supplies. Starting in Year 9, the water provided to NUID coincides with when NUID would otherwise start experiencing greater water shortages due to the increased instream flow requirements in the Deschutes River. With these benefits (reduced agricultural damages), the average annual total economic activity supported by LPID and NUID agricultural production is estimated to increase by approximately 10 jobs and $0.2 million in average annualized income.

The Piping Alternative would also result in reduced operation, maintenance, and replacement (OM&R) expenses for LPID and its patrons. The effects on District wages and employment are expected to be minimal. Reduced electricity use and OM&R for patron pumping may result in an

[28] Total construction expenditures were modeled in IMPLAN Construction Sector 57, construction of new commercial structures, including farm structures.
[29] Note that each project has a 100-year life; however, since construction takes 3 years, the analysis period for all project groups is 103 years (Year 0 to Year 103).

income transfer between LPID patrons, LPID staff, and the local construction/repair/electricity sectors. To the extent that increased flows enhance recreation and support additional recreation visitation and spending in Crook, Deschutes, and Jefferson counties, the long-term, positive regional economic contribution of the project would be much larger.

Implementation of the Piping Alternative would have a beneficial, short-term localized effect on employment and income in Crook, Deschutes, and Jefferson counties from construction activities, and a beneficial effect on agricultural production and related farm household income.

6.4 Soils

6.4.1 No Action (Future without Federal Investment)

Under the No Action Alternative, ongoing erosion of open canals and maintenance along the District's irrigation system would have minor effects on soils because it is localized to the canals. Continued operation of the District's system would have no effect on prime farmlands.

6.4.2 Piping Alternative

Under the Piping Alternative, in most of the project area where piping would be installed in new alignments or existing alignments soils would be disturbed, vegetation would be cleared, and backfilling and grading would occur. Clearing, compaction, and construction would increase soil erosion and sedimentation potential. Best management practices (BMPs) would be implemented to minimize erosion and contain runoff on-site, and they could include silt fencing; straw wattles; geotextile filters; and applying water to disturbed soils to prevent wind erosion.

During construction, soils adjacent to canals would be impacted due to construction equipment and staging. Existing maintenance roads and access routes would be used when possible. Temporary routes within LPID's existing easements would be necessary to access some project areas that do not have established maintenance roads. In some locations, construction access would need to be created prior to bringing pipes or equipment into construction areas.

Excavation for pipe placement would occur along 2.6 miles of existing canals and 8.3 miles in new alignments outside existing canals. Where topsoil is excavated, it would be segregated and saved for placement on top after trenches are filled. In addition, the District would decommission and fill approximately 9.7 miles of existing open canals.

After construction, new pipelines would be buried and all disturbed areas would be re-contoured and planted with a seed mix of native grasses and forbs in consultation with NRCS. Soil erosion from irrigation water conveyance would be reduced where open canals are replaced with buried pipe.

The river crossing if it is a siphon design would require excavation and removal of soil for the length and extent of the siphon being installed. If it were a bridge crossing, the river crossing would require excavation of soil for the addition of supports. Effects on soils for the river crossing construction would be short-term and minimized by BMPs that prevent erosion from entering the river.

Effects on soil resources would be minor and primarily short-term because much of the soil profile has been previously disturbed, BMPs would be implemented, and the effects would be localized to just the project area. In sections of the project area where realignment and the river crossing would occur and the soil profile has not been previously disturbed, the effects would be minor and long-term because it is localized and BMPs would be implemented.

6.4.2.1 Farmland Classification

No long-term effect would be expected to any federal or state-level farmland designations. Minor, temporary effects on limited amounts of agriculturally important soils would be expected during construction, but adherence to BMPs would minimize these effects. There would be a beneficial effect on farmlands due to improved irrigation water delivery reliability.

6.5 Vegetation

6.5.1 No Action (Future without Project)

Under the No Action Alternative, vegetation associated with the network of open irrigation canals and laterals would persist, and adjacent native upland vegetation would remain in its current condition.

6.5.2 Piping Alternative

6.5.2.1 General Vegetation

Construction of the Piping Alternative would involve trenching for pipe placement, disturbance of lands adjacent to canals and laterals for construction equipment access and use of existing ROW for moving and staging construction equipment and materials.

During construction, existing maintenance roads within the ROW would provide access to most of the project area. Given that the pipe segments would be installed in 50- or 100-foot lengths, some temporary travel routes within the ROW would be necessary along canals and laterals that are not accessible by existing roads. Selection of construction areas adjacent to canals and travel routes would consider existing vegetation and avoid mature trees to the extent practicable.

During construction, herbaceous, shrub, and woody vegetation along the canals, laterals, turnouts, and realignment would be disturbed through activities such as clearing, crushing, and digging.

After construction, the project area would be re-contoured and planted with a seed mix of native grasses and forbs. Planting would be done in consultation with NRCS. Vegetation within the ROW would transition to entirely upland species. If construction occurs in an agricultural field, the buried pipe would be covered with the topsoil and returned to agricultural use.

Some trees that are dependent upon the canal for water may not survive after construction. Prior experience with piping projects has shown that 70 to 80 percent of the well-established trees within the project area would survive after piping with active irrigation by the property owner (20 to 30 percent of the trees that do not normally survive in such a location without the canal did not survive after piping).

In the long-term, native vegetation would be gained because 12.3 miles[30] of open canals and laterals would be either piped or decommissioned and then covered with topsoil and seeded. A double track dirt access/maintenance trail would be left for District access. Over the project's life, vegetation within the ROW would be maintained according to LPID's vegetation management program and NRCS Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). Trees would not be allowed to establish above the buried pipe because roots may interfere with future OM&R activities.

Implementation of the Piping Alternative would have a minor effect on vegetation because disturbance would be localized and occur over a small proportion of the District (approximately 20.6 miles of canals, laterals, and realignment) and BMPs would be implemented to minimize effects on vegetation, such as revegetating with natural grasses and forbs in consultation with NRCS (BMPs are identified in Section 8.3).

6.5.2.2 Noxious Weeds

During construction, exposed soils would create temporarily susceptible areas where weeds could establish. The movement of construction vehicles could provide opportunities to transport weeds to new locations. During construction, the contractor would use BMPs such as avoiding unnecessary ground disturbances and using erosion control measures that are free of weeds and weed seeds.

After construction, weeds would be managed according to the protocol in NRCS Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). After construction, the closed system no longer presents opportunities for aquatic noxious weeds to grow or to be washed to other areas of the District.

Implementation of the Piping Alternative would have a negligible, short-term effect on noxious weeds because the spread of noxious weeds during construction would be controlled through BMPs. Over the long-term, there would be a beneficial effect because the conversion to a piped system would reduce the spread of noxious weeds through the open canal system.

6.6 Water Resources

6.6.1 No Action (Future without Federal Investment)

6.6.1.1 Water Rights

Under the No Action Alternative, LPID would maintain its existing water rights. Water in the District's system would continue to be lost to seepage and evaporation. This water would continue to be unavailable for agricultural production in the District or for streamflow in the Deschutes River. Concerns regarding water availability for agriculture in NUID would not be addressed.

6.6.1.2 Surface Water Hydrology

Under the No Action Alternative, there would be no effect on waterbodies associated with District operations (Table 4-7) as the District would continue to divert water volumes that include water

[30] Of these, 9.7 miles of open canal would be decommissioned, filled, and reseeded, and 2.6 miles of open canal would be piped, filled, and reseeded.

losses due to seepage and evaporation. No additional water would be protected instream, and the operational spill into the Crooked River would continue.

6.6.1.3 Surface Water Quality

The No Action Alternative would have no effect on surface water quality in the waterbodies associated with District operations. The Deschutes River would continue to be included on Oregon's 303(d) list for not meeting temperature, dissolved oxygen, pH, sedimentation, turbidity, and/or chlorophyll a water quality standards (Table 4-9). Discharge of canal water into the Crooked River would continue to occur, thus continuing to release nonpoint source pollutants into the river system.

With the open irrigation system, water quality within the irrigation canal and lateral system would continue to collect irrigation tailwater, subsequently delivering contaminates such as herbicides and pesticides to patrons down gradient in the system. This would continue to be a concern to some patrons within the District as this could affect the safety of the local food system.

6.6.1.4 Groundwater

There would be no effect on groundwater in the planning area or the upper Deschutes Basin. Annually, approximately 2,103 acre-feet of water would continue to leak from open canals and laterals into the surrounding area.

6.6.1.5 Ecosystem Services

The No Action Alternative would not affect ecosystem services associated with water resources (Section 4.6.6).

- *Provisioning service, Irrigation water* (Figure 4-1 [E1]): Under the No Action Alternative, there would be no effect on irrigation water because the amount of irrigation water diverted from the Deschutes River by the District would largely remain the same.
- *Regulating service, Water quality* (Figure 4-1 [E3]): Under the No Action Alternative, the quality of water remaining instream during the irrigation season downstream of the District's diversion would not be affected. Instream water would continue to be warmer than state standards. During the non-irrigation season, riverbanks would continue to be exposed and vulnerable to freeze-thaw cycles that increase bank erosion and sediment deposition.

6.6.2 Piping Alternative

6.6.2.1 Water Rights

Following construction of the Piping Alternative, LPID would pass up to 1,600 acre-feet of the water saved by the project to NUID to be used during the irrigation season. NUID would release the same volume of water from Wickiup Reservoir during the non-irrigation season (Section 6.6.2.2). This additional water would assist NUID in fulfilling its patrons' existing water rights throughout the irrigation season. The Piping Alternative would reduce NUID's patron's dependence on water stored in Wickiup Reservoir to fulfill their water rights. Following project completion, LPID would work with OWRD and its partners to verify and measure all water savings.

With the elimination of operational spills, the delivery of partially pressurized water, the installation of flow meters at each turnout, and the 503 acre-feet of saved water that would be used to improve water supplies for LPID's existing water rights, this alternative would benefit LPID patrons by ensuring the delivery of water rights throughout the irrigation season.

Protecting Water Released by NUID to the Deschutes River

Following project completion, NUID would legally protect the water released from Wickiup Reservoir through an instream lease under Oregon water laws (ORS 537.348 [2] and OAR 690-077). The water leased instream would retain the same priority date as the originating water right (Certificate 51229). The instream lease would protect water in the Deschutes River downstream from Wickiup Reservoir during the non-irrigation season (i.e., in the late fall, winter, and early spring). Once an instream lease is approved by OWRD, the leased portion of NUID's water right would be not be available for use by NUID or its patrons.

Oregon statute allows for NUID's storage water rights to be permanently transferred instream (ORS 537.348). However, new OARs need to be developed to allow storage water rights to be permanently transferred instream. Therefore, an agreement would be established prior to project implementation specifying that these instream leases would be renewed in perpetuity or until the State of Oregon provided the clarity needed for a permanent change.

Water released by NUID during the non-irrigation season would be in addition to the HCP minimum winter flow target of 100 cfs[31] in the Deschutes River downstream from Wickiup Reservoir until year 8 of the HCP (January 2028), when the minimum winter flow target will be increased to 300 cfs.

6.6.2.2 Surface Water Hydrology and Water Quality

Effects on individual reaches are identified below.

6.6.2.2.1 CRANE PRAIRIE

Surface Water Hydrology

Implementation of the Piping Alternative would have no effect on Crane Prairie Reservoir.

Surface Water Quality

Implementation of the Piping Alternative would have no effect on water quality in Crane Prairie Reservoir.

6.6.2.2.2 WICKIUP RESERVOIR

Surface Water Hydrology

[31] Other water conservation projects are occurring in the Deschutes Basin that will also protect water instream in addition to the HCP minimum flow target of 100 cfs. These cumulative effects are discussed in Section 6.11.

Up to 1,600 acre-feet of stored water in the reservoir would be dedicated to and released for instream use during the non-irrigation season, which is less than 1 percent of the reservoir's capacity.[32] The Piping Alternative would have negligible, long-term effects on Wickiup Reservoir because there would only be a slight change in active storage volume that would be barely at the level of detection with no perceptible impacts to the Reservoir.

Surface Water Quality

The Piping Alternative would result in negligible effects on water quality associated with lower reservoir levels in Wickiup Reservoir. These effects could include decreased oxygen levels and increased phosphorus levels, which in turn could increase intensity and duration of algae and cyanobacteria blooms in the reservoir during the summer and into early fall (AID et al. 2020). These effects are consistent with effects from the implementation of the HCP.

6.6.2.2.3 DESCHUTES RIVER FROM WICKIUP RESERVOIR (RM 226.8) TO LAKE BILLY CHINOOK (RM 120)

Surface Water Hydrology

The Piping Alternative would have beneficial effects in this reach of the Deschutes River during the non-irrigation season and no effect in this reach during the irrigation season. This alternative would increase streamflow in the Deschutes River during the non-irrigation season by 5.3 cfs below Wickiup Reservoir and by 4.6 cfs at Benham Falls. This additional flow would be beneficial to the Deschutes River until year 8 of implementation of the HCP (January 2028), when the minimum winter flow target will be increased to 300 cfs. After January 2028, there would be no effect on this reach; the water from this project would be released as part of the 300 cfs maintained instream under the HCP.

Surface Water Quality

The proposed action would increase late fall, winter, and early spring streamflow in the Deschutes River from Wickiup Reservoir (RM 226.8) to Lake Billy Chinook (RM 120) until year 8 of the HCP (January 2028), when the minimum winter flow target will be increased to 300 cfs. Water quality in the Deschutes River downstream of Wickiup Reservoir is greatly influenced by water quality in Wickiup Reservoir itself; and higher winter flows are typically associated with improved water quality. However, as storage volumes in Wickiup Reservoir are reduced throughout the irrigation season and reservoir water temperatures increase, late summer and early fall reservoir releases would result in reduced water quality in the Deschutes River below Wickiup Reservoir (AID et al. 2020). These effects would be short-term (until year 8 of the HCP [January 2028]) and would diminish further downstream as a result from tributary inflows and groundwater discharge (AID et al. 2020). Following year 8, this additional water would be used to meet the minimum streamflow targets and the proposed action would have no effect on surface water quality in this reach.

6.6.2.2.4 CROOKED RIVER FROM THE PROPOSED RIVER CROSSING (RM 30.15) TO LAKE BILLY CHINOOK (RM 0)

[32] Wickiup Reservoir has an active storage capacity of 200,000 acre-feet.

Surface Water Hydrology

Piping the District's infrastructure would eliminate 1.65 cfs of operational spills into the Crooked River during the irrigation season. Streamflow in the Crooked River from RM 30.15 to Lake Billy Chinook (RM 0.0) averages between 143 and 573 cfs (Appendix E.3). The reduction in operational spill entering the river would account for less than 1 percent of streamflow in this reach and would reduce the discharge of nonpoint source pollutants. This reach of the Crooked River would see negligible, long-term effects as a result of the Piping Alternative because the elimination of the spills would be below the level of detection and have no perceptible impacts.

Changes in canal and lateral seepage would occur as a result of project implementation and would have negligible effects on groundwater discharge into the Crooked River. Following the implementation of the Piping Alternative, 2,103 acre-feet of water annually would no longer contribute to groundwater recharge. This change would impact the amount of groundwater discharge into the Crooked River. Gannett and Lite (2001) indicate that groundwater discharge and associated streamflow respond gradually as the water table approaches a new equilibrium. Therefore, effects on groundwater discharge and, as a result, streamflow would not be expected to be immediate.

Construction of the river crossing as a siphon design would have moderate, short-term effects on surface water hydrology in the project area. Although streamflow would not be affected, construction of the river crossing would require a temporary bypass system used to reroute streamflow through or around the work area. The temporary change to streamflow path would be apparent in the construction area. Following construction completion, the river would be returned to pre-project condition. Unavoidable effects on water hydrology would be minimized using BMPs. Construction of the river crossing as a bridge design would not occur within the Ordinary High Watermark and would, therefore, have no effect on surface water hydrology in the project area. BMPs would be implemented to minimize any potential erosion.

Surface Water Quality

Piping the District's canals and laterals and removing the District's Crooked River operational spill would prevent contaminants such as herbicides, pesticides, and animal wastes from entering the conveyance system and spilling into the Crooked River. Similarly, piping would also prevent contaminants from entering the conveyance system during water delivery to LPID's patrons. The potential for these contaminants to remain on-farm, be carried by wind deposition, and infiltrate groundwater and groundwater recharge to surface water would continue. Overall, the Piping Alternative would benefit water quality in the Crooked River and the quality of water used for irrigation by eliminating nonpoint source contamination.

Construction of the siphon would take place in-stream and would cause direct habitat effects in the area and elevate levels of suspended sediments. Sediment deposited downstream can alter streambed composition, embeddedness, and morphology; however, effects are typically short-term and recovery to post-construction conditions is generally apparent within a year (Golder Associates Ltd. 1998). No blasting would occur in-water or next to the Crooked River. Unavoidable effects on water

quality would be minimized using BMPs. Construction of the proposed river crossing with a siphon design would have moderate, short-term effects on water quality because they would be relatively local and would occur only during the construction period.

Construction of the proposed river crossing as a bridge design would occur outside the Ordinary High Watermark, alongside the Crooked River, and would have minor, short-term effects on water quality due to the potential for elevated levels of suspended sediments entering the Crooked River through erosion during construction. Unavoidable effects on water quality would be minimized using BMPs.

6.6.2.2.5 LONE PINE CREEK

Surface Water Hydrology

The Piping Alternative would have a beneficial effect on Lone Pine Creek as it would naturalize Lone Pine Creek and allow for it to return to its ephemeral characteristics. The District would no longer use Lone Pine Creek for conveyance purposes.

Surface Water Quality

The Piping Alternative would benefit surface water quality in Lone Pine Creek by allowing the creek to return to its ephemeral characteristics and reducing the potential for contaminants such as herbicides, pesticides, and animal wastes from entering the conveyance system and entering into the creek.

6.6.2.3 Groundwater

Piping the system would eliminate approximately 2,103 acre-feet of annual seepage from the District's conveyance system. Wells in the area have not shown seasonal changes (i.e., irrigation season vs. non-irrigation season) in depth to groundwater (T. Smith, personal communication July 11, 2018), and this lack of seasonality suggests that canal and lateral seepage does not affect recharge of the deeper artesian aquifer. These effects on groundwater would be below the level of detection and have negligible effects on the shallow, unconfined aquifers that generally discharge at seeps or springs in or near the Crooked River downstream of the project area.

For a discussion about how the change in seepage would affect surface water hydrology in the Crooked River under the Piping Alternative, see Section 6.6.2.2.

No additional groundwater would be used as part of the Piping Alternative nor would the District apply to use or create groundwater mitigation credits.

6.6.2.4 Ecosystem Services

The ecosystem services provided by water in the Deschutes River would be affected by the Piping Alternative in the following ways:

- *Provisioning services, Irrigation water* (Figure 4-1 [E1]): Implementation of the Piping Alternative would have a beneficial effect on irrigation water deliveries to both LPID and NUID

patrons. Water conveyance through closed pipe would improve efficiency by eliminating water losses due to seepage, evaporation, and operational spills, which in turn would allow the District to deliver adequate and reliable water to patrons while diverting less water from the Deschutes River. By passing up to 1,600 acre-feet of the District's conserved water to NUID during the irrigation season, NUID would have access to more irrigation water to help fulfill its patrons' irrigation needs. Modernizing District irrigation infrastructure would enable the District to be more resilient to environmental changes and maximize the efficiency of water conveyance (Sections 2.1.2, 4.6, 6.6, and Appendix D.3).

- *Regulating services, Water quality* (Figure 4-1 [E3]): Following implementation of the Piping Alternative, NUID would release an equivalent volume of water in the non-irrigation season that LPID saved through modernization and passed to NUID. The addition of water instream during the non-irrigation season would help alleviate bank erosion and sediment deposition that occurs because of exposed riverbanks vulnerable to freeze-thaw cycles. Although the elimination of operational spills discharged into the Crooked River would negligibly reduce water quantity, reduced pollutant discharge would improve the water quality of this waterbody.

6.7 Fish and Aquatic Resources

6.7.1 No Action (Future without Federal Investment)

6.7.1.1 General Fish and Aquatic Species

Under the No Action Alternative, LPID would not pipe the remaining canals and laterals with funding from PL 83-566. The canals and laterals would remain open; however, piping would be completed if and when funding became available. Without piping, there would be no effect on fish and aquatic species in the area affected by District operations. The District would continue to divert water from the Deschutes River for consumptive use at the current rate and spill water to the Crooked River as necessary. The project area canals and laterals would continue to leak water. This would continue to alter the hydrologic pattern of instream flow similar to the last 50 years. The same amount of water would continue to be stored in Crane Prairie and routed along the Deschutes River to the LPID diversion.

LPID would continue to operationally spill water along with any nonpoint source pollutants into the Crooked River (Section 6.6.1.3).

6.7.1.2 Federally Listed Fish and Aquatic Species

Under the No Action Alternative, there would be no effect on habitat supporting the Oregon spotted frog in the upper Deschutes River. Any increase in streamflow and habitat improvement in that reach would be tied to the pace of system modernization for which the timing and certainty are unknown. Because bull trout and steelhead populations reside in downstream waterbodies (RM 132 to Lake Billy Chinook, Section 4.7.2) where instream flow changes would have little to no effect on habitat, the habitat supporting these populations would likely not change from its current state.

6.7.1.3 Ecosystem Services

The No Action Alternative would not affect ecosystem services provided by fish and aquatic species living in the Deschutes River (Section 4.7.4).

- *Culturally important fish species*: There would be no effect on habitat supporting populations of threatened fish species. Any improvement would be incremental and tied to the pace of modernization for which the timing and certainty are unknown. Habitat limitations for culturally significant anadromous fish would continue to affect fishing, community, health, cultural identity, subsistence, and religious tribal values.
- *Provisioning service, Instream fish populations* (Figure 4-1 [E1]): Harvest of anadromous fish would not be affected and would be available when runs are sufficiently large to sustain fishing. Although ODFW and CTWS are working to restore anadromous fisheries in the basin, the pace is likely to be slow.

6.7.2 Piping Alternative

6.7.2.1 General Fish Species

During and following project construction, there would be no direct or indirect effects on any fish in the project area where piping would be installed in existing canals or new alignments. However, common aquatic species such as western toad, Pacific treefrog, and long-toed salamander have been known to use open canals and laterals. Implementation of the Piping Alternative would have a moderate, direct effect on these species because habitat in open canals and laterals would be lost, but the effects on the resource would be localized. Furthermore, the habitat is low-quality and not considered critical to the long-term survival of these species (S. Wray, personal communication, November 17, 2017). Additionally, the invasive bullfrog species that also utilizes open canals and laterals would be impacted during construction.

During the irrigation season, up to 1,600 acre-feet of water saved through the District's Piping Alternative would be released from Wickiup Reservoir (RM 226.8) and conveyed through the Deschutes River. The saved water would be diverted by NUID (RM 164.8) for consumptive use (Section 6.6.2). Consequently, the Piping Alternative would not affect any fish or aquatic species in the Deschutes River from Wickiup Reservoir to NUID's diversion (RM 164.8) during this season.

In return for passing the District's saved water to NUID, NUID would release an equal volume of water (up to 1,600 acre-feet) from Wickiup Reservoir into the Deschutes River during the non-irrigation season continuing in perpetuity (Section 6.6.2). The effect that this activity would have on fish and aquatic species is evaluated in the context of the HCP requirements adopted December 31, 2020.

In the first 1 to 7 years that the HCP is in effect (January 2021 to January 2027), any saved water released and protected instream during the non-irrigation season would be in addition to the Deschutes River base instream flow requirements (100 cfs) between Wickiup Reservoir (RM 226.8) and North Canal Dam (RM 164.8). If the saved water were released at a flat rate for the duration of the non-irrigation season, NUID would release up to 5.31 cfs from Wickiup Reservoir (RM 226.8). Although the increase in streamflow in this reach would be small, this action would improve the

Deschutes River streamflow regime and water quality, which would have an indirect, beneficial effect on fish and aquatic species and their habitat between RM 226.8 and RM 164.8.

Of the 5.31 cfs of saved water released from Wickiup Reservoir into the Deschutes River, 4.32 cfs would pass North Canal Dam (RM 164.8) and continue downstream (see Section 6.6.2.2.3) during the non-irrigation season.[33] Because of contributions from tributaries and natural springs below North Canal Dam (RM 164.8), winter streamflow in that reach ranges between 450 and 1,200 cfs. Therefore, the addition of 4.32 cfs would be too minimal to detect. NRCS has determined that there would be no effect on fish and their habitats in this reach.

The HCP stipulates that beginning no later than 2028, base instream flow requirements during the non-irrigation season between Wickiup Reservoir (RM 226.8) and North Canal Dam (RM 164.8) shall be increased to 300 cfs (Appendix E.3). At this point, the allocation of up to 5.31 cfs (1,600 acre-feet) of water into the Deschutes River by NUID as a result of LPID's Piping Alternative would act to support the HCP instream flow requirements. No additional effects on fish and aquatic species would be observed.

The elimination of operational spills (RM 30.15) into the Crooked River following the implementation of the Piping Alternative would result in negligible, indirect effects on fish species because streamflow would decrease up to 1.34 cfs in this reach (RM 30.15 to RM 0.0) (Section 6.6.2.2.4). Although streamflow would be reduced after the elimination of District operational spills, the reduction is a small portion of the overall streamflow in the Crooked River and there would be no effect on fish and aquatic species at or downstream of RM 30.15.

Construction of the proposed river crossing as a siphon design would have moderate, short-term effects on fish and aquatic species in the project area because construction of the river crossing would require a temporary bypass system to reroute streamflow and any fish through or around the work area. After construction, the river would be returned to the pre-project condition. Impacts to fish and aquatic species would be minimized using BMPs (Section 8.3.10).

Construction of the proposed river crossing as a bridge design would have no-effect on fish and aquatic resources in the Crooked River because all construction would occur outside the Ordinary High Watermark.

6.7.2.2 Federally Listed Fish and Aquatic Species

LPID irrigation canals do not support federally listed fish, aquatic species, or their habitat. Therefore, during and following project construction there would be no direct or indirect effects on any federally listed fish, aquatic species, or their habitat in the project area as a result of the Piping Alternative.

[33] At North Canal Dam, 4.32 cfs accounts for water loss along the Deschutes River. According to OWRD, these losses include a 12.5 percent channel loss between Wickiup Reservoir and Benham Falls and a 7 percent channel loss between Benham Falls to the City of Bend.

Oregon spotted frog

Within the affected area, the federally listed Oregon spotted frog occurs in Crane Prairie Reservoir, Wickiup Reservoir, and the upper Deschutes River (Section 4.7.2). Water released from Wickiup Reservoir as a result of the Piping Alternative would increase streamflow during the non-irrigation season in the Deschutes River (Section 6.6.2.2.3). In years 1 to 7 (2021 to 2027) of the HCP, this action would benefit the Oregon spotted frog and its critical habitat in the Deschutes River (RM 226.8 to RM 164.8). Additionally, all PCEs of the Oregon spotted frog critical habitat would benefit from the Piping Alternative in the Deschutes River during the first 7 years of HCP implementation (Appendix E.4). Beginning in year 8 of the HCP (2028), the conserved water released instream as a result of this Piping Alternative would be part of the instream flow requirements for restoration and no additional benefits for Oregon spotted frog or critical habitat would be observed. The value of increased streamflow to Oregon spotted frog during years 2021 to 2027 is evaluated in Appendix D. Coordination with USFWS in ongoing as required by the provision of PL 83-566 Section 12.[34]

Bull trout

Bull trout critical habitat is located within the affected area (Appendix E.4; Figure E-1), and bull trout are known to forage in the middle Deschutes River during the non-irrigation from Big Falls (RM 132) to Lake Billy Chinook (RM 120). In this reach, during the non-irrigation season the Deschutes streamflow ranges between 450 and 1,200 cfs (Section 6.7.2.1). The addition of 4.32 cfs into the middle Deschutes River during the non-irrigation season as a result of the Piping Alternative would not be sufficient to produce a discernable effect on bull trout populations or PCEs identified in the critical habitat designations in the Deschutes River (75 Fed. Reg. 200, 2010). The Piping Alternative, therefore, would have no effect on bull trout populations or PCEs in the middle Deschutes River.

Elimination of the District's operational spill at RM 30.1 in the Crooked River would reduce streamflow in this waterbody by up to 1.34 cfs across the irrigation season but would also prevent low quality water from being spilled into the Crooked River (Section 6.6.2.2.4). In the irrigation season, bull trout that forage in the Crooked River are expected to be found downstream of RM 13 where cold groundwater contributions are made to the river supplying suitable habitat year-round (Section 4.7.2). Eliminating 1.34 cfs of low-quality water from this reach during the irrigation season would have no effect on bull trout populations and would have a negligible effect on their critical habitat in the Crooked River.

Overall, because of the seasonal timing of the small increase in streamflow in the Deschutes River and small decrease in streamflow in the Crooked River, NRCS has determined that there would be no direct effect on bull trout populations. There would be a negligible effect on PCEs identified in the critical habitat designations due to the elimination of the low-quality operational spill into the

[34] Coordination with USFWS has been initiated as required by the provision of PL 83-566. A Section 12 consultation request was sent to USFWS on January 11, 2021.

Crooked River (Section 6.6.2.2.4; Appendix E.4; USFWS 2005). Consequently, NRCS will initiate informal consultation with USFWS for this species following the public comment period.

Middle Columbia River steelhead

The Middle Columbia River steelhead population can potentially access the Deschutes River as far upstream as Big Falls (RM 132) and in the Crooked River as far upstream as suitable habitat is available (Section 4.7.2). Similar to the effects on bull trout, changes to streamflow or water quality as a result of the Piping Alternative in the Deschutes and Crooked rivers would be small. The Piping Alternative would have no effect on steelhead populations and a negligible effect on their habitat. Because Middle Columbia River steelhead are considered a NEP until January 2025, because NEPs are treated as "proposed for listing" under Section 10(j) of ESA (76 Fed. Reg. 28715, 2011), and because the implementation of the Piping Alternative is not likely to jeopardize the continued existence of the species (76 Fed. Reg. 28715, 2011; 81 Fed. Reg. 33416, 2016), NRCS has determined that Section 7 consultation with NMFS under ESA is not warranted.

6.7.2.3 Ecosystem Services

Ecosystem services provided by fish and aquatic species living in the Deschutes River are affected by the Piping Alternative in the following ways

- *Cultural service, Culturally important fish and aquatic species*: Following the modernization project, up to 5.31 cfs would be released instream during the non-irrigation season (Section 6.6.2.2). The released water would have a beneficial effect on instream habitat for culturally important fish, which would positively affect Central Oregon community member values and contribute to CTWS goals including enhancement of fishing, community, health, cultural identity, subsistence, and religious tribal values.

- *Provisioning service, Instream fish populations* (Figure 4-1 [E2]): Over the long-term, increased streamflow as a result of the Piping Alternative would improve habitat for resident fish species during the non-irrigation season. Bolstering fish populations may allow more consistent fishing for harvest and consumption.

6.8 Wetlands and Riparian Areas

6.8.1 No Action (Future without Federal Investment)

Under the No Action Alternative, there would be no effect on wetland and riparian vegetation associated with the network of open irrigation canals and laterals would persist; although canals and laterals within the project area are mechanically and chemically managed to clear vegetation, seepage supporting wetland and riparian features adjacent to the canals and laterals would remain in its current condition.

6.8.2 Piping Alternative (Future with Federal Investment)

6.8.2.1 Wetland and Riparian Areas Along the Project Area

The canals and laterals within the project area are mechanically and chemically managed to clear vegetation. Thorough analysis of the NWI geographic information systems data (USFWS 2016), aerial imagery identifies one site within the project area (identified as a Forested/Shrub Wetland) at the site of the proposed river crossing that could be affected by implementation of the proposed project. This site has not been field verified, and a wetland delineation has not been performed at the time of this Plan-EA development.

During construction, there could be potential temporary effects such as sedimentation from stormwater runoff and accidental fuel spills. Implementation of BMPs such as silt fencing would be utilized to minimize effects.

Construction would result in the permanent infill of all canals and laterals in the project area, with one exception: the canal that originally channelized Lone Pine Creek for conveyance purposes would remain open (Figure 5-1). Seasonally opportunistic hydrophytic plants that sporadically occur within and directly adjacent to canals and laterals would be removed or buried during excavation, fill placement, laying of pipe, or other construction activities. All wetlands within and adjacent to the project area would be avoided to the extent practicable, and the District would follow appropriate procedures to revegetate disturbed areas as uplands.

Generally, canals and laterals, except for the channelized Lone Pine Creek, are not considered wetlands or Waters of the United States by state or federal agencies; however, consultation with ODSL and USACE would occur prior to project implementation to determine exemption applicability.

In locations where piping would occur, seepage losses would be eliminated. If adjacent wetlands are dependent upon canal seepage for hydrology, water availability would potentially be limited. Wetlands in the project area may also provide some wildlife habitat that would be permanently changed to upland areas after project construction. Overall, minor long-term effects are expected to occur to wetlands and riparian areas within the project area because it would be localized to wetland habitat along canals and laterals.

The Piping Alternative would have no effect on excavated water storage ponds that occur adjacent to the project area. The hydrophytic vegetation along these ponds would not be disturbed.

Prior to construction of the river crossing as a siphon design, permits from ODSL and USACE for in-water work, consultation with ODFW, and a 401 Water Quality Certification from ODEQ would be required to confirm that the project meets water quality and temporary fish passage standards (see Section 6.8.2.3 for more information regarding compliance). Because construction would involge digging and removing wetland vegetation that would be very apparent during construction, temporary, moderate effects on exisiting banks and vegetation, from the siphon design would occur during construction. After construction was completed, the bank and vegetation would be restored to pre-construction conditions. Potential spill sources from construction would be derived primarily

from heavy equipment that would operate within the Crooked River during construction. Contractors would be required to follow strict BMPs.

Construction of the proposed river crossing as a bridge design would occur outside the Ordinary High Watermark, alongside the Crooked River. Although permits from ODSL, USACE, ODFW, and ODEQ are not anticipated, coordination with these agencies would occur prior to implementation. A bridge design would result in temporary, minor effects on the exisiting bank and vegetation during construction because there would be limited excavating and disturbance to the banks. After construction, if any bank and vegetation had been distrubed, it would be restored to pre-construction conditions. Contractors would be required to follow strict BMPs to reduce effects on wetland and riparian areas within the project area. No in-water work would occur.

6.8.2.2 Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations

The elimination of operational spills into the Crooked River would reduce available water to wetlands and riparian areas at the sites of the spill and along the Crooked River downstream of the LPID spillway (RM 31.15). The operational spills, however, only occasionally supply vegetation with water and in varying amounts. The water quality of the tailwater is also usually poor.

As a result of increased instream flows in the Deschutes River during the non-irrigation season, the proposed action would result in improvements in water quality and habitat function in the 44.8 miles of natural riverine systems downstream of Wickiup Reservoir. Effects on adjacent wetlands and riparian areas are expected to be small and short-term,[35] but any effect would be beneficial. These protected instream flows would contribute to a more natural hydrologic regime in the Deschutes River. Beneficial effects of a more natural hydrologic regime may include the ability for the river channel to supply water to wetlands and riparian areas via infiltration through channel banks. Wetland and riparian function would be enhanced through facilitating processes such as surface and groundwater exchange, physical and chemical transformations, and supporting riparian plant communities.

In summary, the Piping Alternative would have short-term, beneficial effects on wetlands and riparian areas along the natural waterbodies associated with District operations. Construction of the river crossing as a siphon design would have temporary, moderate effects in and directly downstream of the project area within the Crooked River. Construction of the river crossing as a bridge design would have temporary, minor effects on wetland and riparian areas in the project area. Unavoidable effects on wetlands and riparian areas would be minimized using BMPs.

6.8.2.3 Permitting and Compliance

The memorandum signed by the USACE and USEPA on July 24, 2020, states that if the proposed activity does not occur in Waters of the United States, the proposed activity is not prohibited nor regulated under Section 404 of the CWA. Under this exemption, it would be expected that no permit would be required for the disturbance to wetlands within LPID's existing canal and lateral system. However, the siphon river crossing would require a CWA Section 401 and 404 Removal/Fill

[35] Increased streamflow would only be realized until year 8 of the HCP (January 2028) when the minimum winter flow target is increased to 300 cfs (Section 6.6.2.2).

Permit from ODSL and USACE, in addition to a 1200-C permit from ODEQ. Coordination and consultation with ODSL, USACE, and ODEQ would occur prior to implementation of each site-specific project to ensure the proposed action either meets exemption criteria or that the proper permitting and construction activities are conducted in accordance with the permits' requirements.

EO 11990 requires federal agencies to avoid wetlands development when there are practibable alternatives, provide early public notice when considering undertaking or providing financial assistance for new construction in wetlands, and minimze impacts when proposing actions in wetlands. EO 11900 at Section 2 (a) states that agencies, "shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimze harm to wetlands. which may result from such use." EO 11990 defines "new construction" as "draining, dredgeing, channelizing, filling, diking, impouding, and related activities and any structures or facilities…" Directional boring or drilling beneath a wetland is not considered to fall within this definition of "new construction" and, unless determined unable to work from an engineering perspective, is exclused from the 8 Step Process required in EO 11990.

EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term effects associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Consultation with the Crook County Floodplain Administrator determined that the conversion of District canals and laterals located within the 100-year floodplain to buried pressurized pipelines are not within mapped regulatory floodways (A. Beier, personal communication, March 15, 2019) and, therefore, would have no effect on the floodplain elevation.

6.9 Wildlife Resources

6.9.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the wildlife communities in the project area would continue to use the artificial wetland habitat, with opportunistic hydrophytic plants, created by the District's open canal and lateral system. Wildlife dependent on the wetland and riparian habitat along the Deschutes River would not benefit from the increased summer flows and enhanced riparian function created by the proposed action.

6.9.2 Piping Alternative

The canals and laterals within the project area are mechanically and chemically managed to clear vegetation; therefore, very little habitat for wildlife exists. During construction, terrestrial wildlife could experience noise disturbance due to heavy equipment operation, habitat removal due to tree cutting and other vegetation removal, or injury due to collision with construction equipment or habitat removal. Canals are 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 is no expected effect on breeding migratory songbirds or water birds as construction activities would occur outside the nesting season.

The District would follow USFWS guidelines to ensure minimal disturbance to bald or golden eagles nesting near the project area. The critical nesting period for bald and golden eagles is January 1 through August 31. The project area south of Lone Pine Road and the proposed river crossing are approximately 0.4 mile from the O'Neil Golden Eagle Territory; therefore, a seasonal restriction for the use of explosives and/or hydraulic hammers is in effect for this segment of the project area (J. Cordova, personal communication, January 30, 2019). Additionally, pre-clearance surveys would occur prior to construction to verify the presence or absence of golden eagles in the area (E. Weidner, personal communication, May 12, 2020). These surveys would be consistent with USFWS' survey guidelines.

Construction activities would cause short-term, negligible effects on wildlife due to increased human presence. Regarding long-term effects, piping of irrigation systems would potentially reduce human presence through the project area, as fewer trips to maintain ditches and headgates would be necessary. This would result in less human-wildlife conflicts and increased seclusion for wildlife. In addition, the Piping Alternative could remove barriers to ungulates and other terrestrial wildlife within the project area as open canals are converted to buried pipelines.

As canal and lateral systems are piped and the removal of these water sources occurs, the distribution patterns of wildlife within the area could change; although some species may use canals as a water source, canals and laterals can have adverse effects on wildlife due to risk of drowning and the barrier that they create to terrestrial movement (Beier et al. 2008). As this alternative would be implemented over time, ungulates and other terrestrial wildlife would have ample time to adjust and find new water sources. Furthermore, this alternative would have no effect on excavated water storage ponds in the project area, and these ponds would still allow for summer drinking water and habitat availablilty for wildlife.

Project implementation would provide increased instream flows in the Deschutes River downstream from Wickiup Dam that could enhance riparian habitat. Improved streamflow would allow more consistent access to water for hydrophytic plants, and this could in turn enhance riparian wildlife habitat. Overall, the Piping Alternative would have a minor, long-term effect on general wildlife because effects would be localized and only occur in the project area. Unavoidable effects on wildlife would be minimized using BMPs.

6.9.2.1 Threatened and Endangered Species

The Piping Alternative would have no effect on threatened or endangered terrestrial species. As noted in Sections 4.7.2 and 4.7.3, no federally or state-designated species or federally designated critical habitat occur within the project area. Effects on federally or state-designated species or federally designated critical habitats within waterbodies affected by District operations are discussed in Section 6.7.2.2.

6.10 Wild and Scenic Rivers

6.10.1 No Action Alternative (Future without Federal Investment)

The No Action Alternative would have no effect on the values that support the designation of Wild and Scenic Rivers or on State Scenic Waterways. The No Action Alternative would also have no effect on the ORVs listed in Section 4.10.

6.10.2 Piping Alternative

Implementation of the Piping Alternative would have no effect on the Wild and Scenic River or State Scenic Waterways designation, or the free-flowing condition of the designated reaches of the Deschutes River from Wickiup Dam (RM 226.8) to Lake Billy Chinook (RM 120). Construction activities would not occur in the designated reaches (see Section 1.2 for a description of the project area) and the increased streamflow during the non-irrigation season is expected to be consistent with Wild and Scenic River management goals (BLM 1992). The proposed action would have negligible, beneficial effects on some of the qualities that support these designations. Specifically, any effect of increased streamflow would be an enhancement to fish, recreation, scenery, wildlife, hydrological, and botanical/ecological values.

Input of water to the lower Crooked River from cold water springs may be impacted by the reduction of canal and lateral groundwater seepage. However, the effects on hydrological ORVs impacted by cold water springs would be negligible due to the magnitude of groundwater reduction, described in Section 6.6.2.3. ORVs unrelated to the quantity and quality of river flow, including cultural, geologic, and wilderness, would be unaffected by the proposed action.

Since adverse effects are not expected to occur in the designated Wild and Scenic River reaches or in the State Scenic Waterways, consultation with Oregon Parks and Recreation Department, BLM, United States Forest Service, or USFWS is not warranted.

6.11 Cumulative Effects

This section includes a description of past, current, and reasonably foreseeable future actions and cumulative effects organized by resource.

6.11.1 Past Actions

Past actions are summarized as land development activities that include irrigated agriculture (consisting of construction of the canal system, previous piping projects, and diversions), urban and suburban development, industrial land and water uses, commercial development, water diversions for non-agricultural uses, and transportation infrastructure. The nature and extent of these past actions and how they have influenced the existing environment are described for each resource in Section 4.

6.11.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are presently underway, either because they are under construction or are occurring on an ongoing basis. Reasonably

foreseeable future actions generally include those actions formally proposed or planned, or highly likely to occur based on available information. Various sources including local, state, and federal agency websites as well as city and county staff were consulted to obtain information about current and potential future development in the project area. The following sections describe these current actions and reasonably foreseeable future actions.

6.11.2.1 Land Use and Development

Ongoing agricultural activities including farming and grazing in the project area are not expected to change from current conditions. As the project area falls within three counties, land use development in the project area is managed according to the Crook, Deschutes, and Jefferson counties zoning regulations and is implemented by the associated County Planning Department. Land development activities are expected to continue into the future and would include agricultural, residential, commercial, and industrial land uses.

6.11.2.2 Habitat Conservation Plan

The District, other irrigation districts in the Deschutes Basin, state and federal agencies, local municipalities, and environmental groups have developed a multi-species HCP for the upper Deschutes Basin (AID et al. 2020). The HCP covers both listed species and those that may become listed during the 20- to 50-year life of the HCP, including Oregon spotted frog, bull trout, Chinook salmon, steelhead salmon, and sockeye salmon. The Final HCP was released on November 6, 2020, and a Final Decision by USFWS and NMFS was made on December 31, 2020. Covered activities include.

- Storage and release of irrigation water from:
    - Crane Prairie Reservoir
    - Wickiup Reservoir
    - Crescent Lake Reservoir
    - Prineville Reservoir
    - Ochoco Reservoir
- Diversion of irrigation water
- Conveyance and delivery of irrigation water
- Irrigation return flows
- Existing hydropower
- City of Prineville water use activities

6.11.2.3 Deschutes Basin Irrigation District Modernization

Other irrigation districts in the Deschutes Basin are working to pipe their infrastructure and would implement projects similar to those proposed by LPID in this Plan-EA. Tumalo Irrigation District (TID), Swalley Irrigation District (SID), COID, and Ochoco Irrigation District (OID) have authorized Plan-EAs.

TID plans to pipe approximately 68.8 miles of its canals and laterals over the course of 11 years. SID plans to pipe approximately 16.6 miles of its canals and laterals over the course of 7 years. COID plans to pipe approximately 7.9 miles of its system over 4 years. OID plans to pipe

approximately 16.8 miles of its system over 3 years. These four districts are anticipated to cumulatively convert approximately 114 miles[36] of open canals and ditches to piped systems and save up to 109.5 cfs of water.

NUID and AID are currently developing Plan-EAs. AID has proposed to pipe 13.2 miles of its main canal over 7 years, and NUID's project is still being determined. These projects are contingent on Plan-EA authorization and the availability of funding.[37]

6.11.3 Cumulative Effects by Resource

Cumulative effects are considered for each resource using the intensity threshold matrix (Appendix E.1) in combination with past, present, and reasonably foreseeable future actions.

6.11.3.1 Cultural Resources

Although the canal system has undergone changes in the past (e.g., improvements between 1905 to present), basic operations of the District would not be altered due to the proposed improvement efforts. To date, the District's conveyance system has not been evaluated for its eligibility for listing in the NRHP.

Cumulative impacts to cultural resources would occur if other past, present, or reasonably foreseeable actions or projects affect the same historic properties and/or cultural resources as the proposed action. Cumulative impacts can result from individually minor but collectively significant actions that occur over a period of time. Where impacts to historic properties, including any previously recorded, unevaluated, or not yet documented resources such as archaeological sites, architectural sites, cultural landscapes, or traditional cultural properties, would be unavoidable, measures to mitigate the adverse effects would be identified in a Section 106 agreement document (e.g., memorandum of agreement, programmatic agreement). This document would be developed in consultation with the SHPO, THPO, and other consulting parties, including affiliated tribes.

Any cumulative impacts to the District's conveyance system, which is a possible historic property, by future actions such as new piping would be analyzed in light of the NRHP eligibility status of the conveyance system. Cumulative impacts would not be expected if the conveyance system were determined not eligible for the NRHP. However, if the conveyance system were determined eligible for the NRHP, and a future action would result in adverse effects under Section 106 of the NHPA, these effects would be addressed in consultation with SHPO, THPO, and other consulting parties, including affiliated tribes, to mitigate adverse impacts. The cumulative impact analysis would consider whether the impact and proposed mitigation is adverse or beneficial for the human environment.

All other projects considered in this cumulative impact analysis would likely be required to comply with Section 106 of the NHPA, which requires federal agencies to assess and mitigate adverse

[36] Although OID would install 16.8 miles of buried pipe, only 9.4 miles of that pipe is converted open canals and laterals to buried pipe; the other 7.4 miles is considered new infrastructure and not included in this total.
37 The NUID is also interested in pursuing PL 83-566 funding and has initiated the Watershed Planning process. The potential saved water and the extent of the project is still being determined.

effects, including cumulative effects, on historic properties/cultural resources. The District has developed a plan to address unanticipated discoveries of cultural resources and human remains during the construction of the proposed action. Other federal projects would implement similar plans and measures. These cultural resource studies agreement documents and plans ensure proper documentation, protection, and avoidance as well as minimization or mitigation of important cultural resources.

6.11.3.2 Land Use

The project area has been substantially altered over the past century by a variety of human activities, including agricultural development, livestock grazing, urban and suburban development, and road construction. Implementation of the proposed action would support existing land uses; therefore, any cumulative effects on land uses would be beneficial.

6.11.3.3 Socioeconomic Resources

Past actions, including agricultural and other land development, and recently completed projects have established the socioeconomic setting of the Deschutes Basin by supporting development and agriculture. Current and reasonably foreseeable future actions would continue to support agriculture through improved infrastructure. Since the proposed action would also support the local economy through construction expenditures and intensified agricultural production, it would contribute to a cumulative benefit to socioeconomic resources in the area.

6.11.3.4 Soils

Past, ongoing, and future actions in the surrounding area that affect soils include agricultural uses, land development, and water management activities. The amount of soil affected by the proposed action is small compared to the area affected by other past, present, and reasonably foreseeable future actions in the area; the proposed action would have minor, cumulative effects on soils.

6.11.3.5 Vegetation

Agricultural activities, livestock grazing, vegetation control along roads, and urban and suburban development are responsible for most of the past and ongoing effects on vegetation in the project area and in the region. Livestock grazing can introduce and spread weed species, degrade native vegetation communities, and trample riparian and wetland areas. In addition, vegetation and noxious weed control activities generally include herbicide applications and mechanical cutting. The amount of vegetation that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, vegetation control along roads, and other utility corridors in the area. In addition, these past actions are not expected to change measurably from current conditions, resulting in minor additional cumulative effects.

6.11.3.6 Water Resources

Past actions over the last 120 years that have affected water resources include urban and agricultural development, road construction, road maintenance, and other irrigation projects. Since the early 1990s, there has been increasing interest in conserving water in the Deschutes River. The District and other Deschutes area irrigation districts have implemented various water conservation projects. These recent past efforts have included piping existing irrigation canals, on-farm conservation, water

management changes, and changes to crop production, which have resulted in increased streamflow in the Deschutes River but decreased seepage into the groundwater table.

Ongoing and reasonably foreseeable future actions that could affect water resources include additional irrigation piping projects being considered by other Deschutes area irrigation districts that divert water from the Deschutes River (Table 6-1), on-farm water conservation work, and HCP requirements. These actions, accompanied by the proposed action, would cumulatively increase streamflow in the Deschutes River and its tributaries, resulting in beneficial cumulative effects on water resources.

Table 6-1. Potential Water Restored Instream from other PL 83-566 Projects Approved or Proposed in the Deschutes Basin.

Irrigation District	Total Water Protected Instream (cfs)	Reach Affected[1, 2]
Tumalo Irrigation District	48	Approximately 30 cfs would be allocated to Tumalo Creek during the irrigation season, and 18 cfs would be allocated to Crescent Creek during the non-irrigation season. Both creeks are tributaries of the Deschutes River and would be protected to Lake Billy Chinook (RM 120).
Swalley Irrigation District	15.2	The entire 15.2 cfs would be allocated to the Deschutes River, from the SID diversion (RM 164.8) to Lake Billy Chinook, during the irrigation season.
Central Oregon Irrigation District	30.3	Up to 30.3 cfs would be protected in the Deschutes River below Wickiup Reservoir (RM 238.8) to Lake Billy Chinook during the non-irrigation season.
Ochoco Irrigation District	16.02	Up to 4.82 cfs would be protected in the Crooked River below Bowman Dam to Lake Billy Chinook during the irrigation season. Up to 11.2 cfs would be protected in McKay Creek during the irrigation season, a tributary to the Crooked River.
Arnold Irrigation District	33.8	Up to 33.8 cfs would be protected in the Deschutes River below Wickiup Reservoir to Lake Billy Chinook during the non-irrigation season through an inter-district water resources management agreement.

Notes:
[1] The numbers presented for Swalley, Central Oregon, Tumalo, and Ochoco Irrigation Districts are from Plan-EAs that have already been authorized and are reasonably foreseeable to occur.
[2] Flows allocated instream during the irrigation season are shown as maximum flows and may be reduced during the shoulder season depending on the Districts' water right. Flows allocated instream during the non-irrigation season are shown as a flat rate (cfs). See each District's Plan-EA (TID 2018, COID 2020, SID 2019, OID 2021) for more information regarding the timing and location of instream flows.

Implementation of the proposed action and other reasonably foreseeable future actions are anticipated to have negligible cumulative effects on groundwater resources, as LPID's project is on the north side of the Crooked River and, therefore, groundwater effects are independent of the effects of other reasonably foreseeable irrigation modernization projects throughout the Deschutes Basin (Section 6.6.2.3; Gannett et al. 2001; Robinson and Price 1963). Increased flow in the Deschutes River from LPID's project and the reasonably foreseeable projects would have beneficial effects on water quality in the Deschutes River.

6.11.3.7 Fish and Aquatic Species

Past actions including road construction, road maintenance, and urban and suburban development projects would have minor effects on fish in combination with the proposed action. The effects from these past projects in LPID and the Deschutes Basin, such as sediment entering waterbodies or aquatic habitat disturbance, would be temporary and likely completed before construction of the proposed action.

Because LPID irrigation diversions are screened and the conveyance systems do not provide fish habitat, they do not have a direct effect on fish and aquatic species in the irrigation infrastructure itself. Irrigation diversions and reservoir operations are responsible for most of the past and ongoing direct and indirect effects related to water availability and seasonality on fish communities and associated riverine habitat in the area affected by District operations.

Ongoing land use activities in the project area are not expected to change from current conditions. Future land development and irrigation district modernization projects may cause indirect effects on fish, such as sediment inputs or aquatic habitat disturbance, and could potentially affect waters within the same watershed as the proposed action. However, ongoing and reasonably foreseeable future actions are all proposed for the purpose of improving aquatic habitat conditions. These actions include the HCP and installation of other irrigation modernization programs in the Deschutes Basin.

Implementation of the proposed action, when combined with other ongoing and future actions, is anticipated to have beneficial cumulative effects on fish and aquatic species and available habitat due to the projects' increased streamflow. Implementation of other irrigation modernization programs could have an additive effect on the amount of water conserved, and therefore could provide additional streamflow in the Deschutes Basin.

6.11.3.8 Wetlands and Riparian Areas

Past actions that may have affected wetlands, riparian areas, and floodplains consist of the original construction of the irrigation canals as well as agricultural activities, livestock grazing, vegetation control along roads and utility corridors, and urban and suburban development. Changes to riparian area vegetation caused by the proposed action would be relatively minor compared to these activities. Effects on wetlands and riparian areas in and directly downstream from the proposed river crossing would experience moderate, short-term effects; however, the area would be returned to the pre-project state following completion. Cumulative effect of the proposed action and other past, present, and reasonably foreseeable future projects on wetlands and riparian areas would be minor.

6.11.3.9 Wildlife

Some wildlife currently use open canals and laterals as a water source. Implementation of the proposed action would cause wildlife to find other water sources, as they did prior to installation of the canals. In addition, vegetation control activities mentioned earlier are ongoing actions that contribute to wildlife habitat changes. The amount of wildlife habitat that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, vegetation control, and urban and suburban development in the area. Since effects of the proposed action on wildlife would happen over a period of time in which animals would be able to adapt, the cumulative effect on wildlife from implementation of the proposed action would be minor.

6.11.3.10 Wild and Scenic Rivers

Sections of the Deschutes and Crooked River have been designated as Wild and Scenic under the National Wild and Scenic River Act and sections of the Deschutes River are also designated as an Oregon State Scenic Waterway. These designations aim to protect these areas from changes that generally alter the scenic, recreational, and ecological qualities of these areas. Changes to the current and future management of these river sections, which are in areas affected by District operations, are expected to be negligible. These wild and scenic waterways would continue to be managed by federal and state agencies consistent with their designations.

6.11.3.11 Ecosystem Services

All reasonably foreseeable actions regarding modernization of irrigation infrastructure in the Deschutes Basin would work in concert to improve water conservation and water availability to irrigators (Section 6.11.2.3). Past and ongoing actions described in the sections above have also contributed to water availability for irrigations and for instream flow. Past, ongoing, and reasonably foreseeable actions in the Deschutes Basin could all impact ecosystem services. However, implementation of the proposed action, when combined with other future actions, is anticipated to have a beneficial cumulative effect on all ecosystem services assessed.

7 Consultation, Coordination, and Public Participation

In developing the Plan-EA, the District and its partners planned and conducted a public scoping meeting, issued press announcements, and had frequent correspondence with federal, state, and local resource agencies, agriculture interests, and other interest groups and individuals. The project development process was designed to work collaboratively with partners, agencies, tribes, and stakeholders to ensure transparency and cooperation towards a solution that fits within the framework of the purpose and need for action.

A PIR (FCA 2018) was prepared to provide sponsors, local partners, agencies, and the public with information to evaluate the goals and objectives of the project. During development of the PIR, project sponsors conducted initial consultation with natural resource agencies and stakeholders in the Deschutes Basin.

Public participation activities prior to release of the Plan-EA included:

Public announcements

- Natural Resources Conservation Service public notice (October 2, 2018) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1422828
- Central Oregonian—three public notices (October 2, October 9, October 16, 2018)
- Natural Resources Conservation Service news release (October 11, 2018) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEPRD1423727

Public involvement website

Information about the proposed project was added to a website to inform the public. Oregonwatershedplans.org includes the following information:

- Overview of NRCS' PL 83-566 funding program
- Overview of NEPA and Plan-EA public participation process
- Frequently Asked Questions about the Plan-EA process
- Background on the District, the Plan-EA and appendices, the PIR and appendices, and presentations and handouts from public meetings
- Contact information and how to submit public comments
- Email signup option for more information; subscribers receive updates over the course of project development

Public Scoping Meeting

A public scoping meeting was held October 17, 2018, at the Wind River Conference Center in Terrebonne, Oregon. Participants had an opportunity to learn more about the proposed irrigation

improvements and discuss their comments, ideas, and concerns. Public scoping comments were accepted from October 2 through November 15, 2018.

7.1 List of Persons and Agencies Consulted

Table 7-1 describes communications with agency personnel that were consulted during development of the Plan-EA.

Table 7-1. Agency Consultation and Communication Record.

Date	Contact, Agency	Communication
January 29, 2019	Jerry Cordova, USFWS	Map of project area and any Golden Eagle sites
March 7, 2019	Maria Snodgress and Ellen Hammond, Oregon Department of Agriculture	Water quality and BMPs
March 12, 2019	Ann Beier, Crook County Community Development Department	Discussion of project area related floodplain and floodways
March 14, 2019	Kristen Hafer, USACE	Discussion of Plan-EA and process for Waters of the United States determination and consultation
May 3, 2019	Rachel Gebauer, NRCS to SHPO	Project description and map of proposed area of potential effect
May 3, 2019	Rachel Gebauer, NRCS to Austin Green, CTWS	Project description and map of proposed area of potential effect
May 12, 2020	Bridget Moran, USFWS	Discussion of the effects on federally listed species including Oregon spotted frog and bull trout
May 19, 2020	Kate Fitzpatrick and Gen Hubert of the Deschutes River Conservancy	Discussion of the instream flow needs in the upper Deschutes Basin.
November 16, 2020	Bridget Moran and Jennifer O'Reilly of the USFWS	Discussion of the effects on federally listed species including Oregon spotted frog and bull trout.

7.2 Review of the Plan-EA

[To be completed after public review of the Draft Plan-EA.]

8 Preferred Alternative

8.1 Selection and Rationale for the Preferred Alternative

NRCS and the District agree that the Piping Alternative is the Preferred Alternative. NRCS has selected the Piping Alternative[38] based on its ability to meet the purpose and need for the project, best address the Federal Objective and Guiding Principles, and provide the most beneficial effects on environmental, social, and economic resources.

Section describes effects on resources in detail. In summary, the Piping Alternative would have temporary, moderate effects on water quality and wetland and riparian vegetation in the Crooked River downstream from construction of the proposed river crossing. There would be minor effects on all other resources. All adverse effects would be mitigated through BMPs and other compliance measures.

In the long-term, the Piping Alternative would benefit several resources assessed. Instream flows would be permanently protected in the Deschutes River, which would support ecological resources in and along the river system, particularly fish and aquatic habitat and water quality resources. As analyzed in the National Economic Efficiency (NEE), there would be positive economic benefits including increased instream flow, agricultural damage reduction, reduced OM&R costs, reduced carbon outputs, and reduced pumping costs. When compared to the No Action Alternative in the face of current conditions and future environmental changes, the Piping Alternative would support the health and resiliency of the ecosystem downstream of Wickiup Reservoir to Lake Billy Chinook as well as the agricultural resiliency of District patrons.

8.2 Measures to be Installed

LPID would realign the current conveyance system with a 10.9-mile, gravity-pressurized pipe system. Included in the redesign is a proposed crossing of the Crooked River upstream from the antiquated suspension bridge crossing that is presently used. The river crossing would either consist of a siphon going under the river or an updated bridge carrying the irrigation pipe over the river (see Section 5.3.2 for further discussion). In addition, the District would decommission approximately 9.7 miles of the existing system. Pipe installed as part of the project would range in diameter from 4 to 48 inches.

In total, 45 turnouts would be upgraded to pressurized delivery systems. The pressure of water deliveries can vary depending on the demands of other patrons and rates of diversion. On-farm piping, fittings, and other appurtenances for each patron may not be rated to accommodate these pressure fluctuations; therefore, a pressure relief valve would be included for each turnout upgrade. Modifications to each turnout would also include an appropriately sized tee from the mainline or lateral, a gear-actuated plug valve, a magnetic meter, a combination air and vacuum relief valve and associated hardware, and spool pipe segments (LPID 2017).

[38] The Preferred Alternative is defined in the National Watershed Program Handbook as, "The option and course of action that the SLO and NRCS agree best addresses the stated purpose and need" (NRCS 2014).

The improvements described above are summarized in Table 8-1.

Table 8-1. Summary of the Lone Pine Irrigation District Canals and Laterals to be Piped under the Preferred Alternative.

Canal and/or Laterals	Project Components			
	Pipe Diameter (inches)	Pressure Rating Index (dimension ratio)	Length of Piping (feet)	Upgraded Turnouts
LPID Mainline Pipe	16-48	13.5-26	28,455	16
Butler Spur Pipeline	8	13.5	1,145	1
Core Botanica Spur Pipeline	8	15.5	1,455	1
E. Butler Rd. Lateral Pipeline	6-14	17	4,770	5
W. Butler Rd. Lateral Pipeline	6-12	17	3,935	5
Legacy Ranches Spur Pipeline	4	17	1,190	1
E. Low Ditch Lateral Pipeline	12	17	1,330	1
W. Low Ditch Lateral Pipeline	10-16	17	5,265	6
E. Mid Lateral Pipeline	10-12	17-21	5,065	3
W. Mid Lateral Pipeline	10	21	2,645	3
E. Lone Pine Ln. Lateral Pipeline	6	21	1,310	1
W. Lone Pine Ln. Lateral Pipeline	10	21	1,250	1
Gregg Spur Pipeline	4	21	845	1
		Total Quantity	**58,660**	**45**

Construction of the Preferred Alternative would include mobilization and staging of construction equipment, delivery of piping to construction areas, excavation of trenches, fusing of pipelines, removal of existing pipe in certain areas, placement of pipe, compaction of backfill, and restoration and reseeding of the disturbed areas. In some locations, construction access would need to be created prior to bringing pipes or equipment into construction areas. This could include removal of vegetation within the construction area. Appropriately sized construction equipment would be used to minimize disturbance in the construction area. Borrow material would most likely be needed to backfill the canal surrounding pipelines, assuming little to no material is available from prior canal dredging activities.

Construction would occur during the non-irrigation season (October to April), with project construction beginning as early as the 2021 to 2022 non-irrigation season. Construction of the project is anticipated to require three non-irrigation seasons to complete.

8.3 Minimization, Avoidance, and Compensatory Mitigation Measures

Project design features and BMPs that would be applied during construction of the Preferred Alternative to avoid and minimize effects on environmental and social resources are described below.

8.3.1 Temporary Access

Prior to construction, the District would contact each landowner along the proposed route to discuss the project and approve an easement agreement if necessary. The District would provide adjacent landowners with a construction schedule before construction begins. Where possible, work would be confined within the existing and new easements. In addition, construction limits would be clearly flagged to preserve existing vegetation and private property. Access to residences, farms, and businesses 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. Following project completion in an area, all temporary access roads that were created would be decommissioned and obliterated.

8.3.2 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 tree removal. 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. These areas are included in the project area (Section 1.2).

8.3.3 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. Lane closures on roadways would be avoided during peak travel

periods, where possible, to reduce potential traffic delays from construction vehicles. Communication with Oregon Deptartment of Transportation would occur prior to construction.

8.3.4 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. During construction of the proposed river crossing, turbidity testing would be conducted downstream from the Crooked River crossing to monitor for total dissolved solids. Drainage measures would be incorporated into the engineering design to minimize effects of piping canals on local flooding.

8.3.5 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-site to enable the rapid cleanup of any spill. Immediately upon learning of any fuel, oil, or hazardous material including uncured concrete or other regulated substance spill, or upon learning of conditions that would lead to an imminent spill, the person who discovered the situation shall 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 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.

8.3.6 In-water Construction

All equipment would be inspected for aquatic invasive species before use within a waterbody. Equipment in water would be treated on-site for removal of all aquatic remnants (plants, seeds, and animals), mud, and soil. Concrete BMPs would be followed, including concrete washout practices, pour containment, drip and spill control, pH moderation, proper disposal of excess concrete, and disposal of wash water. Sediment control would be used on-site, and turbidity testing would be conducted downstream from the Crooked River crossing during construction to monitor for total dissolved solids.

8.3.7 Invasive Species Control

Measures would be followed to avoid 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.

8.3.8 Revegetation

During excavation for new piping alignments, topsoil would be saved and replaced as the top layer after trenches are filled. In areas where canals are decommissioned, topsoil would be added from off-site. Areas disturbed during access or construction would be regraded to their original contours.

When necessary, compacted area, such as access roads, stream crossings, 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 Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). Pruning would occur entirely within the ROW and would not exceed what is required for equipment clearance. At adjacent landowners' requests and during the non-irrigation season, the District would remove trees in the ROW that do not survive piping for 2 years following construction.

Disturbance of jurisdictional wetlands would be avoided during construction. The segment of the existing canal system that intersects with Lone Pine Creek would be avoided and the pipeline installation would occur adjacent to it.

8.3.9 Wildlife Mitigation

Construction would occur outside the primary nesting period for migratory birds of concern (April 15 through July 15) and raptors (April through July). For rare occasions where construction would occur during the primary nesting period, construction would occur outside the USFWS-approved buffer distance of any known nests. Should an active nest be found, construction would be paused and consultation with a local USFWS biologist would occur to determine the following steps.

The project area south of Lone Pine Road and the proposed river crossing is approximately 0.4 mile from the O'Neil Golden Eagle Territory; therefore, a seasonal restriction for the use of explosives and/or hydraulic hammers is in effect for this segment of the project area. 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 USFWS's survey guidelines.

In appropriate cases and under consultation with USFWS, ramps would be placed in open pipeline trenches during construction to avoid the potential for wildlife to become trapped overnight.

8.3.10 Fish Passage Preservation

Fish passage would be maintained for any fish likely to be present during construction of the proposed river crossing. The District and contractors would work with ODFW or USFWS personnel to implement activities in accordance with required permits. Turbidity testing would be conducted downstream from the proposed river crossing during construction to monitor total dissolved solids.

8.3.11 Cultural Resources

If determined necessary, mitigation measures[39] to address any potential adverse effects on cultural resources would be formalized with the District, NRCS, SHPO, THPO, and affiliated tribes, as appropriate, and completed concurrent with or after construction. If archeological resources were inadvertently discovered during construction, an Inadvertent Discovery Plan would be followed.

[39] Based upon previous mitigation measures implemented by other districts in the Deschutes Basin, if mitigation were to be required, it could include but not be limited to actions such as working with the historic society to create a board with documentation and photos of the canal. This would be available at the District's office and on the District's website.

Construction would stop near the discovery; the area would be secured and protected; a professional archaeologist would assess the discovery; and SHPO, NRCS cultural resources staff, THPO, and other consulting parties including affiliated tribes and Advisory Council on Historic Preservation would be notified and have the opportunity to comment. Continuation of construction would occur in accordance with applicable guidance and law.

8.4 Land Rights and Easements

Not all of the Preferred Alternative would be located within the District's existing easements. New easements have already been agreed upon by landowners. Following pipeline installation, as-built surveys would be completed and attached to easements.

8.5 Permits and Compliance

The Preferred Alternative would be implemented in one project group. Permitting would be conducted at the time that funding is available for implementation. Prior to implementation, NRCS would complete an on-site EE utilizing the NRCS-CPA-52 form. This process would determine if the project meets the applicable project specifications and other conditions as developed in this Plan-EA and assess the environmental effects of any alternatives. If it is determined that there are significant issues or concerns, or if resource concerns have not been adequately evaluated through the programmatic approach in this Plan-EA, a separate analysis and appropriate agency consultation would be prepared as necessary.

Further, LPID would acquire all necessary permits prior to construction, including the permits discussed in the following subsections, as applicable.

8.5.1 Local and County

Deschutes County Planning: Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval prior to construction.

Jefferson County Planning: Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval prior to construction.

Crook County Planning: Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval prior to construction.

8.5.2 State

Department of Environmental Quality: The National Pollutant Discharge Elimination System program, implemented by ODEQ, would require a permit for construction activities including clearing, grading, excavation, material or equipment staging, and stocking piling that would disturb 1 or more acres of land and have the potential to discharge into a public waterbody. The proposed river crossing as an inverted siphon would require a 1200-C permit to fulfill CWA Section 402 requirements.

Oregon Water Resources Department: To change the place of use, character of use, and/or point of diversion/appropriation of a water right, a water right transfer application must be approved by OWRD.

Department of State Lands: A removal-fill permit from ODSL would not be required for work in existing canals and laterals, with the exception of Lone Pine Creek that was channelized for conveyance purposes. Prior to initiation of construction of the project, a wetland determination and/or delineation would be conducted, and wetlands would be avoided to the extent practicable. A removal-fill permit from ODSL would be obtained for the proposed river crossing as an inverted siphon.

Oregon Fish Passage Law: Since August 2001, the owner or operator of an artificial obstruction located in waters where native migratory fish are currently or were historically present must address fish passage requirements prior to certain trigger events, such as the construction, installation, replacement, extension, or repair of culverts, roads, or any other hydraulic facilities. Laws regarding fish passage are found in ORS 509.580 through ORS 509.910 and in OAR 635, Division 412. Functioning fish screens are present at COID's irrigation diversions. No fish are present within existing canals and laterals; therefore, no additional consultation or permitting is required for activities pertaining to the District's canals and laterals.

ODFW fish passage criteria (OAR 635-412-035) and/or guidance must be met for in-water work. Should the District pursue the proposed river crossing as an inverted siphon, prior to construction, the District would be required to obtain from ODFW an approval determination of a fish passage plan that meets the requirements of OAR 635-412-0035 for the specific artificial obstruction or obtain from ODFW a programmatic approval of a fish passage plan for multiple artificial obstructions of the same time. Programmatic approvals are only valid so long as the owner or operator complies with the conditions of the programmatic approval.

8.5.3 Federal

National Historic Preservation Act Section 106: Pursuant to 36 CFR Part 800 of the NHPA (1966, as amended in 2000) and the regulations of the Advisory Council on Historic Preservation implementing Section 106 of the NHPA (54 U.S.C. 306108), federal agencies must take into account the potential effect of an undertaking on "historic properties," which refers to cultural resources listed in, or eligible for listing in, the NRHP. Consultation with SHPO to fulfill Section 106 obligations would be completed for the project prior to implementation.

Clean Water Act:

Section 404: Under Section 404(f)(1)(C) of the CWA, discharges of dredged or fill material associated with construction or maintenance of irrigation ditches or the maintenance (but not construction) of drainage ditches are not prohibited by or otherwise subject to regulation under Section 404. Discharges of dredged or fill material associated with siphons, pumps, headgates, wingwalls, weirs, diversion structures, and such other facilities as are appurtenant to and functionally related to irrigation ditches are included in the exemption for irrigation ditches. Under 33 CFR 323.4(a)(1)(iii)(C)(1)(i), "[c]onstruction and maintenance of upland

(dryland) facilities such as ditching and tiling, incidental to the planting, cultivating, protecting, or harvesting of crops, involve no discharge of dredged or fill material into waters of the United States, and as such never require a Section 404 permit." The construction and maintenance of irrigation ditches and maintenance of drainage ditches may require the construction and/or maintenance of a farm road. Subsection 404(f)(1)(E) exemption for discharges of dredged or fill material associated with the construction or maintenance of farm roads applies where such related farm roads are constructed and maintained in accordance with BMPs. However, in 33 CFR 323.4(a)(6) and 40 CFR 232.3(c)(6), there must be assurance that flow and circulation patterns and chemical and biological characteristics of Waters of the United States are not impaired, that the reach of the Waters of the United States is not reduced, and that any adverse effect on the aquatic environment would be otherwise minimized. Prior to construction activities, coordination and consultation with USACE would occur and measures taken as required to identify and mitigate impacts to potential jurisdictional wetlands and Waters of the United States.

The proposed river crossing as an inverted siphon would include construction activities in Waters of the United States. A Section 404 permit is required from the USACE when a project requires fill or other modification of Waters of the United States. A request for a USACE permit to affect Waters of the United States involves other resource and regulatory agencies as part of the interagency review process, and applications for a Section 404 permit would be prepared and submitted prior to construction activities.

Section 401: Section 401 of the CWA authorizes the ODEQ to review proposed activities or facilities that require a federal permit and that may discharge into the waters of Oregon. Please see the "Department of Environmental Quality" paragraph in Section 8.5.2 for additional discussion.

Farmland Protection Policy Act: The Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*) directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands. The Act's purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses. The project occurs primarily in EFU zones; however, all work would be done within existing and new easement agreements and ROW. The project would support agricultural productivity and the intention of the Act.

Endangered Species Act:

The ESA establishes a national program for the conservation of threatened and endangered species and the preservation of the ecosystems on which they depend. The ESA is administered by the USFWS for wildlife and freshwater species and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the Act, called "Interagency Cooperation," is the mechanism by which federal agencies ensure that the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7, federal agencies must consult with USFWS when any action the

agency carries out, funds, or authorizes (such as through a permit) *may affect* a listed endangered or threatened species.

- Due to the location of bull trout populations at the very downstream end of the area affected by District operations, implementation of the Piping Alternative would not affect bull trout. Consequently, Section 7 consultation under the ESA as amended is not warranted for this species. Additionally, it has been determined that the project would not affect the PCEs identified for critical habitat for bull trout (70 Fed. Reg. 56211, 2005). Therefore, it has been determined by NRCS that no effects would occur to federally designated critical habitat for bull trout.

- Implementation of the Preferred Alternative *may affect, but is not likely to adversely affect*, Oregon spotted frog. Informal consultation with USFWS under Section 7 of the ESA has been initiated.

- The Middle Columbia River steelhead population present in the Deschutes and Crooked rivers is classified as a non-essential experimental population under Section 10(j) of ESA and is treated as "proposed for listing" because of its location outside a National Wildlife Refuge System or a National Park System. Federal agencies are not required to consult with NMFS because the action alternatives are entirely beneficial and would not likely jeopardize the continued existence of the species proposed to be listed. NRCS, therefore, has determined that engagement with NMFS to obtain a conference report is not necessary (76 Fed. Reg. 28715, 2011; 81 Fed. Reg. 33416, 2016).

Magnuson Stevens Act: The Magnuson-Stevens Act established requirements for including Essential Fish Habitat (EFH) descriptions in federal fishery management plans, and it requires federal agencies to consult with NMFS on activities that may adversely affect EFH (Public Law 104-297). EFH can include all streams, lakes, ponds, wetlands, and other viable waterbodies and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding, or growth to maturity. As the project would not affect EFH, consultation under the Magnuson Stevens Act is not required.

Safe Drinking Water Act: Since the project would have no direct or indirect discharge to groundwater, permitting under the Safe Drinking Water Act is not required.

Migratory Bird Treaty Act: The MBTA implements various treaties and conventions between the US and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 U.S.C. 703–712). Under the Act, taking, killing, or possessing migratory birds, or taking, destroying, or possessing their eggs or nests, is unlawful. The Act classifies most species of birds as migratory, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove. As the project would not affect MBTA species, consultation under the MBTA is not required.

Bald and Golden Eagle Protection Act: The BGEPA prohibits anyone from "taking" bald and golden eagles (including their eggs or nests) without a permit from the Secretary of the Interior (16 U.S.C. 668–668d). The project area south of Lone Pine Road and the proposed river

crossing is approximately 0.4 mile from the O'Neil Golden Eagle Territory; therefore, requirements of the BGEPA would be implemented appropriately.

National Wild and Scenic Rivers Act: The National Wild and Scenic Rivers Act (7 U.S.C. 1271 *et seq.)* preserves and protects certain selected free-flowing rivers of the United States that, with their immediate environments, possess outstandingly remarkably scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

8.6 Costs

Table 8-3 presents the total project cost of $13,893,000 for the Preferred Alternative. PL 83-566 funds would support $10,523,000 of the total project cost where the $3,370,000 remainder of the cost would be contributed by other, non-federal funds.

Table 8-4 itemizes the costs for each project feature and the distribution of how the costs would be shared by the sponsors and NRCS for each cost item.

- Construction costs account for all material, labor, and equipment necessary for the installation of piping and the construction of the river crossing associated with the Preferred Alternative. These costs were estimated based on costs for similar installations at nearby irrigation districts in Central Oregon. The planning construction costs are estimated using the best available information about the project without having detailed design information.
- Engineering costs were estimated as a percentage of the cost of construction.
- The costs presented are planning level estimates and do not reflect final costs. Detailed designs and construction cost estimates would be completed prior to initiating the project. Final construction costs would only reflect the time and materials to perform the work.

8.7 Installation and Financing

The following sub-sections present the installation and financing of the Preferred Alternative. Included in this section is a framework for implementing the Preferred Alternative, the sequence of installation, responsibilities, contracting, real property and relocations, other agencies, cultural resources, financing, and conditions for providing assistance.

8.7.1 Framework for Carrying out the Plan

The Preferred Alternative would be implemented in a planned sequence as discussed in Section 8.7.2. The responsibilities of NRCS and the sponsors for the project are outlined in Section 8.7.3. No cost-shared, on-farm measures are involved with this project; therefore, the responsibilities of individual participants do not need to be discussed. No preconditions are anticipated for installing the project.

8.7.2 Planned Sequence of Installation

The District would obtain all approvals and permits for the project prior to the start of construction. The entire project would be completed over a 3-year period commencing in 2021 and ending by 2023 (Table 8-2). The District developed an appropriate project phasing schedule that focused on

sections of the system with high operational spill loss but also worked within engineering and funding constraints to meet District, patron, and community development needs.

Table 8-2. Construction Timeline and Installation Costs by Funding Source for the Piping Alternative, Deschutes Watershed, Oregon, 2020$.[1]

Construction Year	Works of Improvement	Public Law 83-566 Funds	Other, Non-Federal Funds	Total Construction Costs
0-2	Project Group 1	$10,523,000	$3,370,000	$13,384,000
Total Project		**$10,523,000**	**$3,370,000**	**$13,893,000**

Note: Prepared: January 2021

[1] Price Base: 2020 dollars

8.7.3 Responsibilities

NRCS is responsible for leading the planning efforts, providing engineering design and construction oversight assistance, and certifying completion of the project. The District would be responsible for engineering design, project administration, environmental permitting, contracting, and construction implementation. The District has the needed authorities as an irrigation district organized under ORS 545 and has agreed to exercise those authorities to implement the actions described in this Plan-EA.

8.7.4 Contracting

The piping and pressurization of the delivery system would be completed using NRCS funding mechanisms. The District would be primarily responsible for overseeing and administering construction of the project in coordination with NRCS.

8.7.5 Real Property and Relocations

Real property acquisition or relocations would not be required for the Preferred Alternative. All construction would be completed under either LPID's existing easements or the newly obtained easement agreements as described in Section 8.4.

8.7.6 Financing

NRCS would provide 76 percent of the total project costs for the Preferred Alternative through PL 83-566. The District is responsible for securing funding for the remaining 24 percent of the costs, including funds that are not eligible under the National Watershed Program (project administration and technical assistance).

The majority of the required match funding is expected to be provided through grants. If necessary, a portion of the project cost would be financed through loans. If financing is required, LPID expects to apply for funding through the ODEQ Clean Water State Revolving Fund. The District expects that funding from this source would be at an interest rate of 2.5 percent with a 0.5 percent

annual fee paid on the remaining loan balance. These financing costs are not included in the NEE analysis. The District does not anticipate changing per acre annual rates or the overall base assessment fee as a result of any capital improvement project that is fully funded through grants.

OM&R costs after project completion would be provided through the revenues of LPID. OM&R costs would not increase due to the project and would be budgeted on an annual basis.

NRCS reserves the authority and right to discontinue or reduce program benefits based on changes in agency priorities, funding availability, or the failure of LPID to fulfill the provisions of their agreement.

8.7.7 Conditions for Providing Assistance

Conditions for the District to receive program funds for the proposed project include completion of a Final Plan-EA, NRCS issuing a Finding of No Significant Impact, and authorization of funding by the Chief of NRCS. The Chief of NRCS acts on behalf of the Secretary of the Interior to ensure the project meets 16 U.S.C. 1005.

8.8 Operation, Maintenance, and Replacement

The District would be responsible for the OM&R of the project for the 100 years of its design life. Prior to construction, a separate OM&R agreement based on NRCS's National Operation and Maintenance Manual would be made between NRCS and the District. The agreement would continue through the design life of the project and could be modified with NRCS's approval.

Project sponsors and NRCS would make annual inspections of project measures to assure the quality of ongoing OM&R. The District would be in charge of scheduling OM&R inspections and responsible for any necessary work. The District's O&M would consist of a pipe inspection program that would systematically cover inspection of the entire system over a period of several years.

The proposed system would continue its current operation schedule of April to October, in which work would be performed on an as-needed basis. During the winter months, outside the irrigation season, the District would perform system component maintenance including valve battery changes, magnetic meter maintenance, District operational valve maintenance, air and vacuum valve maintenance, pressure-reducing station filter maintenance, and valve repairs. The District would expand their current vegetation and weed management to include the areas on top of the newly piped system. All procedures would be followed as specified in the OM&R agreement between the project sponsor and NRCS.

8.9 Economic and Structural Tables

A summary of the economic analysis of the Preferred Alternative (NEE Alternative) and Future Without Project is provided in Section 5.4. The full NEE analysis can be found in Appendix D. The costs and benefits associated with the project are detailed in the following tables in this section. Table 8-3 (National Watershed Program Manual [NWPM] 506.11, Economic Table 1) presents the projected installation costs and the percentages of costs to be shared by the sponsors and NRCS for the project.

Table 8-4 (NWPM Economic Table 2, 506.12) presents the project's cost as well as the proportion of PL 83-566 funding and other funding sources. The average annual NEE costs are shown in Table 8-5 (NWPM 506.18, Economic Table 4).

Table 8-3. Economic Table 1—Estimated Installation Cost of the Piping Alternative, Water Resource Project Measures, Deschutes Watershed, Oregon, 2020$.[1,2]

Works of Improvement	Unit	Number			Estimated cost (dollars)						
					Public Law 83-566 Funds			Other Funds			Total
		Federal land	Non-Federal land	Total	Federal land	Non-Federal land NRCS[3]	Total	Federal land	Non-Federal land	Total	
Project Group 1	feet	0	58,660	58,660	$0	$10,523,000	$10,523,000	$0	$3,370,000	$3,370,000	$13,893,000
Total project					**$0**	**$10,523,000**	**$10,523,000**	**$0**	**$3,370,000**	**$3,370,000**	**$13,893,000**

Notes: Totals may not sum due to rounding Prepared: January 2021

[1] Price base: 2020 dollars

[2] Project cost as identified in the LPID System Improvement Plan prepared by Black Rock Consulting (LPID 2017), updated to 2020 dollars and including an additional 3 percent project administration cost and 8 percent technical assistance cost.

[3] Federal agency responsible for assisting in installation of works of improvement

Table 8-4. Economic Table 2 —Estimated Piping Alternative Cost Distribution, Water Resource Project Measures, Deschutes Watershed, Oregon, 2020$.[1,2]

Works of Improvement	Installation Costs—PL 83-566 Funds				Installation Cost—Other Funds				Total
	Construction	Engineering	Project Admin[3]	Total PL 83-566	Construction	Engineering	Project Admin[3]	Total Other	
Project Group 1	$9,248,000	$319,000	$956,000	$10,523,000	$3,082,000	$106,000	$182,000	$3,370,000	$13,893,000
Total Costs	**$9,248,000**	**$319,000**	**$956,000**	**$10,523,000**	**$3,082,000**	**$106,000**	**$182,000**	**$3,370,000**	**$13,893,000**

Notes: Totals may not sum due to rounding Prepared: January 2021

[1]Price base: 2020 dollars

[2]Project cost as identified prepared by FCA in 2020 dollars, including an additional 3 percent project administration cost and 8 percent technical assistance cost.

[3]Project Admin includes project administration, technical assistance costs, and permitting costs.

Table 8-5. Economic Table 4—Estimated Average Annual NEE Costs, Deschutes Watershed, Oregon, 2020$.[1]

Works of Improvement	Project Outlays (Amortization of Installation Cost)	Other Direct Costs[2] (Increased Pumping Costs Elsewhere in Basin from Reduced GW Recharge)	Total Cost
Project Group 1	$370,000	$0	$370,000
Total Costs	**$370,000**	**$0**	**$370,000**

Notes: Totals may not sum due to rounding. Prepared: January 2021

[1] Price base: 2020 dollars, amortized over 100 years at a discount rate of 2.5 percent.

[2] Other direct costs include the uncompensated economic losses due to changes in resource use or associated with installation, operation, or replacement of project structures including the river crossing.

The Preferred Alternative damage reduction benefits included agricultural damage reduction, power cost savings, reduced OM&R costs, improved fish and wildlife habitat, and avoided carbon emissions. Table 8-6 (NWPM 506.20, Economic Table 5a) presents the average annual watershed protection damage reduction benefits.

Table 8-6. Economic Table 5a—Estimated Average Annual Watershed Protection Damage Reduction Benefits Lone Pine Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2020$.[1]

	Damage Reduction Benefit, Average Annual	
Item	**Agricultural-related**	**Non-Agricultural-related**
On-Site Damage Reduction Benefits		
Other – Agricultural Damage Reduction	$237,000	
Other - Reduced OM&R	$89,000	
Other - Power Cost Savings	$61,000	
Subtotal	**$387,000**	
Off-Site Damage Reduction Benefits		
Avoided Carbon Emissions		$6,000
Instream Flows		$17,000
Support to Oregon Spotted Frog		$16,000
Subtotal		**$39,000**
Total Quantified Benefits		**$426,000**

Notes: Totals may not sum due to rounding. Prepared: January 2021

[1] Price base: 2020 dollars amortized over 100 years at a discount rate of 2.5 percent.

[2] These benefits would also accrue to local residents, but the majority of the value would be experienced outside the proposed project area.

Using the resulting benefits and costs from the previous two tables, Table 8-7 (NWPM 506.21, Economic Table 6) presents a comparison of the NEE average annual benefits and average annual costs.

Table 8-7. Economic Table 6—Comparison of Average Annual NEE Costs and Benefits, Lone Pine Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2020$.[1]

	Agriculture-related			Non-agricultural					
Works of Improvement	Agricultural Damage Reduction	Reduced OM&R	Power Cost Savings	Carbon Value	Instream Flow Value	Support to Oregon Spotted Frog	Average Annual Benefits	Average Annual Cost[2]	Benefit cost ratio
Project Group 1	$237,000	$89,000	$61,000	$6,000	$17,000	$16,000	$426,000	$370,000	1.15
Total	**$237,000**	**$89,000**	**$61,000**	**$6,000**	**$17,000**	**$16,000**	**$426,000**	**$370,000**	**1.15**

Notes: Prepared: January 2021

[1] Price base: 2020 dollars amortized over 100 years at a discount rate of 2.5 percent.

[2] From Economic Table 4

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10 List of Preparers

Under the direction of NRCS, the Watershed Plan-EA was primarily developed by FCA and its subcontractor Highland Economics. The staff responsible for preparation of the Watershed Plan-EA is included in Table 10-1.

Table 10-1. List of Preparers.

Name	Title	Education	Professional Experience	Area Responsible For
FCA Watershed Plan-EA Team				
Kristin Alligood	Program Specialist	Ph.D. Biology B.A. Neuroscience	5 years	Vegetation, Fish and Aquatic Resources, Wildlife Cumulative Effects, Ecosystem Services
Raija Bushnell	Program Specialist	M.P.A. Natural Resource Policy M.S.E.S Natural Resource Management B.A. Political Science	7 years	Purpose and Need, Land Use, Alternatives
Brett Golden	Director of Impact	M.E.M Environmental Management A.B. Environmental and Evolutionary Biology	15 years	General
David McKay	Program Specialist	M.P.A. Environmental Policy B.A. Political Science	6 years	Purpose and Need, Cultural Resources, Alternatives, Public Scoping
Amanda Schroeder	Program Specialist	B.S. Natural Resource Management	6 years	Water Resources, Wetlands, Socioeconomics, Preferred Alternative, Wild and Scenic Rivers

Name	Title	Education	Professional Experience	Area Responsible For
Kate Hart	Program Specialist	M.S. Earth Science B.S. Earth Science	5 years	Purpose and Need, Soils, Alternatives
NRCS - Oregon				
Gary Diridoni	Assistant State Conservationist-Watershed Resources and Planning	Fisheries Management Graduate Certificate B.S. Wildlife Management B.S. Interdisciplinary Studies, Ecosystem Conservation	18 years	General
Scarlett Vallaire	Watershed Planner	M.S. Ecology B.S. Biology	12 years	General
Lakeitha Ruffin	Agricultural Economist	M.S. Agricultural Economics B.S. Agricultural Economics	9 years	Economic and Socioeconomic Analysis, Alternative Analysis, Overall Watershed Planning
Employees from Firms Under Contract with FCA				
Barbara Wyse	Principal and Senior Economist, Highland Economics	M.S. Environmental and Natural Resource Economics B.A. Environmental Sciences and Policy	14 years	Economic Analysis
Winston Oakley	Research Economist, Highland Economics	M.S. Applied Economics B.S. Environmental Sciences, Policy, and Management	5 years	Economic Analysis

11 Distribution List

A Notice of Availability for the Plan-EA would be distributed to federal, state, and local agencies, community representatives, and area non-governmental organizations. The agencies, representatives and organizations on the mailing list include the following:

- Business Oregon
- Bureau of Reclamation (Reclamation)
- Central Oregon Land Watch
- City of Bend
- Coalition for the Deschutes
- Deschutes County
- Deschutes River Conservancy
- National Oceanic and Atmospheric Administration Fisheries
- Oregon Department of Agriculture
- Oregon Department of Energy (ODOE)
- Oregon Department of Environmental Quality (ODEQ)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of State Lands (ODSL)
- Oregon Department of Transportation
- Oregon Governor's Office
- Oregon Water Resources Department (OWRD)
- Oregon Watershed Enhancement Board
- State Historic Preservation Office (SHPO)
- Trout Unlimited
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management (BLM)
- U.S. Department of Agriculture, U.S. Forest Service, Deschutes National Forest
- U.S. Fish and Wildlife Service (USFWS)
- Upper Deschutes Watershed Council
- WaterWatch of Oregon

In accordance with EO 13175, Consultation and Coordination with Indian Tribal Governments, NRCS will contact CTWS regarding the availability of this Plan-EA.

The names of private stakeholders and members of the public who will receive notice of this Plan-EA are not listed for privacy.

12 Acronyms, Abbreviations, and Short-forms

°F	degrees Fahrenheit
AID	Arnold Irrigation District
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CTWS	Confederated Tribes of Warm Springs
CWA	Clean Water Act
COID	Central Oregon Irrigation District
District	Lone Pine Irrigation District
DM	Departmental Manual
EA	Environmental Assessment
EE	Environmental Evaluation
EFH	Essential Fish Habitat
EFU	Exclusive Farm Use
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FCA	Farmers Conservation Alliance
Fed. Reg.	Federal Register
HCP	Habitat Conservation Plan
IUCN	International Union for Conservation of Nature
IPaC	Information for Planning and Consultation
LPID	Lone Pine Irrigation District
MBTA	Migratory Bird Treaty Act
N/A	Not Applicable
NEE	National Economic Efficiency
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NUID	North Unit Irrigation District
NWI	National Wetland Inventory
NWPM	National Watershed Program Manual
O&M	operation and maintenance
OAR	Oregon Administrative Rule
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OID	Ochoco Irrigation District
OM&R	operation, maintenance, and replacement
ORS	Oregon Revised Statute
ORV	Outstanding(ly) Remarkable Value
OWRD	Oregon Water Resources Department
PBC	Pilot Butte Canal
PCE	Primary Constituent Element
PIR	Preliminary Investigative Report
PL 83-566	Watershed Protection and Flood Prevention Program, Public Law 83-566
Plan-EA	Watershed Plan-Environmental Assessment
PR&G	Guidance for Conducting Analysis Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water and Resource Investments
project	Lone Pine Irrigation District Infrastructure Modernization Project
proposed action	Lone Pine Irrigation District Infrastructure Modernization Project
PVC	polyvinyl chloride
Reclamation	United States Bureau of Reclamation
RED	Regional Economic Development
RM	River Mile
ROW	right-of-way
SHPO	State Historic Preservation Office

SID	Swalley Irrigation District
SLO	Sponsoring Local Organization
THPO	Tribal Historic Preservation Officer
TID	Tumalo Irrigation District
USACE	United States Army Corps of Engineers
U.S.	United States
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

13 Index

14 Appendix A-E

Appendices are provided in a separate document.

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