North Unit Irrigation District Infrastructure Modernization Project

Draft Watershed Plan-Environmental Assessment

Osborne Canyon-Crooked River, Haystack Draw-Deschutes River, Dry Canyon Watersheds

Jefferson County, OR

July 6, 2022

Prepared by United States Department of Agriculture, Natural Resources Conservation Service – Lead Federal Agency in cooperation with the Deschutes Basin Board of Control, U.S. Bureau of Reclamation, and North Unit Irrigation District

Draft Watershed Plan-Environmental Assessment for the North Unit Irrigation District Infrastructure Modernization Project: Jefferson County, Oregon

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

Cooperating Agency: U.S. Bureau of Reclamation

Sponsoring Local Organization: Deschutes Basin Board of Control (lead sponsor) and North Unit Irrigation District (NUID) (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 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 Public Law 83-566 funding of the North Unit 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 installing 27.5 miles of buried pipeline and four retention ponds. Total estimated Project costs are $34,020,000 of which $8,210,000 would be paid by the sponsors and other non-federal funding sources. The estimated amount to be paid through NRCS Public Law 83-566 funds is $25,810,000.

Comments: NRCS completed this Draft Plan-EA in accordance with the NEPA and NRCS guidelines and standards. Comments must be submitted to NRCS during the allotted draft Plan-EA public review period from July 6-August 10 (within 30 days of the public release of the draft Plan-EA) to become part of the Administrative Record.

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

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

Any questions can be directed to BJ Westlund of Farmers Conservation Alliance at 541-716-6085 or Gary Diridoni of NRCS at 503-414-3092.

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for
North Unit Irrigation District Infrastructure Modernization Project
Deschutes and Lower Crooked Rivers Subwatersheds: Osborne Canyon-Crooked River, Haystack Draw-Deschutes River, Dry Canyon
Jefferson County, Oregon
Oregon's 2nd Congressional District

Authorization	Public Law 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et. seq.) 1954
Lead Sponsor	Deschutes Basin Board of Control and North Unit Irrigation District (co-sponsor)
Proposed Action	The North Unit Irrigation District (NUID) Infrastructure Modernization Project is an agricultural water conveyance efficiency project. The proposed action would pipe and pressurize laterals 31, 32, 34, and 43 and construct four 1,000-cubic-yard retention ponds at the terminal ends of laterals 31, 34-2, 43, and 43-10.
Purpose and Need	The purpose of this project is Agricultural Water Management through improved water delivery reliability and water conservation along District infrastructure. There is a need to improve water conservation and water delivery reliability on District-operated laterals to support drought resilience across the District. There is also a need to reduce District irrigation return flows into the Crooked River and Lake Billy Chinook to improve water quality.
Description of the Preferred Alternative	Under the Preferred Alternative, NUID would install 27.5 miles of gravity-pressurized buried pipe and construct four 1,000-cubic-yard retention ponds, each approximately 0.5 acre in size.
Project Measures	Under the Preferred Alternative, project sponsors would install 27.5 miles of gravity-pressurized buried pipe ranging from 6 to 72 inches in diameter, upgrade 153 turnouts to accommodate the pressurized delivery system, and construct four 1,000-cubic-yard retention ponds to eliminate discharges from operational spills into the Crooked River, Lake Billy Chinook, and an unnamed ephemeral creek. Operational spills would discharge into the retention ponds. Preferred Alternative construction would occur in two project groups over the course of 6 years.

Resource Information

Subwatersheds	12-digit Hydrologic Unit Code	Latitude and Longitude	Subwatershed Size (acres)	Planning Area Within Subwatershed (acres)
Osborne Canyon-Crooked River	170703051101	44.3916029508, -121.170047779	42,386	2,550
Dry Canyon	170703060204	44.552928594, -121.163267571	34,040	5,293
Haystack Draw-Deschutes River	170703011104	44.5425993489, -121.260621848	18,578	1,349
Subwatershed Total Planning Area Size	9,192 acres			

<table>
<tr><td>North Unit Irrigation District Size</td><td colspan="3">135,607 acres</td></tr>
<tr><td>Climate and Topography</td><td colspan="3">The project area is in the rain shadow of the Cascade Range. Annual average precipitation in NUID is approximately 8.6 inches, with only 1.1 inches of rain falling during the summer months (June, July, and August). The summer temperature in July averages 66 degrees Fahrenheit with highs generally around 90 degrees Fahrenheit. The land within NUID is slightly undulating with an average elevation of 2,200 feet to 2,800 feet above mean sea level.</td></tr>
<tr><td rowspan="4">Land Use
(Planning Area)</td><td colspan="2">Use</td><td>Acres</td></tr>
<tr><td colspan="2">Agriculture (irrigated acres)</td><td>8,193</td></tr>
<tr><td colspan="2">Developed</td><td>379</td></tr>
<tr><td colspan="2">Undeveloped</td><td>1,505</td></tr>
<tr><td rowspan="4">Land Ownership
(Planning Area)</td><td colspan="2">Owner</td><td>Percent</td></tr>
<tr><td colspan="2">Private</td><td>98.8</td></tr>
<tr><td colspan="2">State-Local</td><td>0.2</td></tr>
<tr><td colspan="2">Federal</td><td>1.0</td></tr>
<tr><td rowspan="4">Population and Demographics</td><td colspan="3">The proposed action would occur within Jefferson County, Oregon. In 2019, the estimated population of Jefferson County was 23,840. The population growth rate between 2000 and 2019 was 9.8 percent. The population of the State of Oregon grew by 10.6 percent in the same time period.</td></tr>
<tr><td></td><td>Jefferson County</td><td>Oregon</td></tr>
<tr><td>Population 2019</td><td>23,840</td><td>4,190,713</td></tr>
<tr><td>Unemployment Rate (October 2019)</td><td>6.1%</td><td>3.4%</td></tr>
<tr><td>Median Household Income (2018 $)</td><td>$54,471</td><td>$70,116</td></tr>
<tr><td>Relevant Resource Concerns</td><td colspan="3">Resource concerns identified through scoping are water conservation, water usage, and water quality; fish and aquatic resources; soil resources; cultural resources; socioeconomics and public benefits; wetlands; wildlife resources; land use; visual resources; and vegetation resources.</td></tr>
<tr><td colspan="4">Alternatives</td></tr>
<tr><td>Alternatives Considered</td><td colspan="3">Eight alternatives were considered. Six were eliminated from full analysis because they did not fully meet the purpose and need for the action because of cost, logistics, existing technology, social, or environmental reasons, or because NUID lacks the legal authority to carry out, operate, and maintain works of improvement, which are requirements of project sponsors. The No Action Alternative and Modernization Alternative were analyzed in full.</td></tr>
<tr><td>No Action Alternative (Future without Federal Investment)</td><td colspan="3">Under the No Action Alternative, construction activities associated with the proposed action would not occur and NUID would continue to operate and maintain its existing conveyance system in its current condition. With the Deschutes Basin Habitat Conservation Plan in effect, the need for the proposed action would remain; however, the District would only modernize its infrastructure on a project-by-project basis as funding becomes available. This funding is not</td></tr>
</table>

	reasonably certain to be available under a project-by-project approach at the scale necessary to meet the need for the proposed action.
Preferred Alternative	Under the Modernization Alternative, NUID would convert the following 27.5 miles of open laterals to pipelines: Lateral 31 (4,427 ft.), Lateral 32 (3,241 ft.), Lateral 34 (24,188 ft.), and Lateral 43 (113,167 ft.). Additionally, the District would construct four 1,000-cubic-yard retention ponds at the terminal ends of Laterals 31, 34-2, 43, and 43-10 to eliminate discharges of tailwater spills into natural waterbodies. The Modernization Alternative has been identified as the National Economic Efficiency (NEE) Alternative and is also the Preferred Alternative.
Mitigation, Minimization, and Avoidance Measures	The National Wetland Inventory (NWI) geographic information systems data (USFWS 2016) shows zero wetland features near the proposed project area; wetland determinations or delineations have not occurred at this time. Generally, laterals within the project area are not considered wetlands or Waters of the U.S. by state or federal agencies; however, prior to project implementation, consultation with the Oregon Department of State Lands (ODSL) and the U.S. Army Corp of Engineers (USACE) would occur to determine exemption applicability to laterals in the project area. Wetlands would be avoided to the extent practicable. Consultation between the District; the Natural Resources Conservation Service (NRCS), as the lead federal agency; the Tribal Historic Preservation Office (THPO); the Oregon State Historic Preservation Office (SHPO); and consulting parties, including affiliated tribes, for compliance with Section 106 of the National Historic Preservation Act would occur prior to project implementation. Ground disturbance would be limited to only those areas necessary to minimize effects on soil, vegetation, and land use. Where possible, construction activities would avoid or minimize effects on agricultural lands by confining construction activities to the existing right-of-way. Stormwater best management practices (BMPs) would be employed during and after construction, and construction would be scheduled to minimize disturbance to wildlife and the public. After construction, disturbed areas would be returned to pre-construction contours and replanted with a mix of native grasses and forbs to reduce the risk of erosion and spread of noxious weeds.

Project costs	**P.L. 83-566 funds**		**Other funds**		**Total**	
Construction	$22,388,000	75%	$7,462,000	25%	$29,850,000	100%
Engineering	$1,075,000	75%	$358,000	25%	$1,433,000	100%
SUBTOTAL COSTS	$23,463,000	75%	$7,820,000	25%	$31,283,000	100%
Technical Assistance	$1,878,000	100%	$0	0%	$1,878,000	100%
Relocation	Not Applicable					
Real Property Rights	Not Applicable					
Permitting	$0	0%	$312,000	100%	$312,000	100%
Project Administration	$469,000	86%	$78,000	14%	$547,000	100%
Annual O&M	Not Applicable					
TOTAL COSTS	$25,810,000	76%	$8,210,000	24%	$34,020,000	100%

Project Benefits	
Project Benefits	Implementation of the Preferred Alternative would improve water delivery reliability to NUID irrigators, reduce NUID's operation and maintenance costs, reduce irrigators' electricity costs from pumping, and eliminate discharges of tailwater into natural waterbodies.
Number of Direct Beneficiaries	952 patrons would directly benefit from the proposed project.
Other Beneficial Effects – Physical Terms	Implementation of the Preferred Alternative would have negligible to moderate, long-term, beneficial effects on agricultural water availability and water quality.

Damage Reduction Benefits	**Proposed Project**
Other – Agricultural Damage Reduction	$945,000
Other – Power Cost Savings	$217,000
Other – Reduced Operations, Maintenance, and Replacement (OM&R)	$53,000
Other – Social Value of Carbon (Avoided Carbon Emissions)	$93,000
Total Quantified Benefits	$1,308,000
Benefit to Cost Ratio	1.5

Period of Analysis	
Installation Period (years)	6
Project Life (years)	100

Funding Schedule

Year	P.L. 83-566	Other Funds	Total
0	$2,688,000	$853,000	$3,541,000
2	$23,122,000	$7,357,000	$30,479,000

Environmental Effects

The Preferred Alternative would be planned, designed, and installed to have long-term net beneficial effects to agricultural production, water quality, and ecosystem services.

Implementation of the Preferred Alternative would result in minor, short-term adverse effects such as impacts to vegetation and wildlife along the laterals. Most short-term adverse effects would result from construction activities in the project area. Project sponsors would work closely with partners, contractors, and affected landowners to incorporate measures to avoid and minimize short-term adverse effects. See Section 8.3 for additional information regarding BMPs that would be implemented as part of the proposed project.

There would be minor, long-term adverse effects on vegetation and habitat from the permanent removal of opportunistic hydrophytic vegetation growing along the 27.5 miles of laterals in the project area. However, following construction, BMPs for ecological restoration would be followed, and there would be an increase in native, upland

vegetation in the project area, which would return the project area to a more natural state. Project sponsors would implement BMPs and identified minimization measures to avoid adverse effects. Alterations to the visual landscape would be negligible to minor and long-term following the elimination of the open laterals and subsequent return to native upland vegetation, and construction of the four retention ponds.	
Major Conclusions	The Preferred Alternative would improve water delivery reliability for NUID's farmers; reduce water loss to seepage and evaporation in District-operated infrastructure; eliminate discharges of tailwater into natural waterbodies; reduce NUID's operations and maintenance costs; and reduce electricity costs from patron pumping.
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, which was published during the scoping period, were received from the U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, local non-governmental organizations, and individuals.
Compliance	Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes _X_ No____

1 Introduction

Aging infrastructure, growing population, shifting rural economies, and changing climate conditions have increased pressure on water resources across the western United States (U.S.). Within the Deschutes Basin, irrigated agriculture is the main out-of-stream water use and relies on primarily 100-year-old infrastructure to divert, store, and deliver water to farms and ranches. In recent years, improving water resources to benefit irrigators and the environment has been a coordinated community focus among the North Unit Irrigation District (herein referred to as NUID or the District) and the seven other irrigation districts within the Deschutes Basin (

Figure 1-1).

The District seeks federal funding through the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Watershed Protection and Flood Prevention Act, Public Law [P.L.] 83-566 (herein referred to as P.L. 83-566), to implement the proposed irrigation infrastructure modernization project (herein referred to as the proposed project) within Jefferson County, Oregon.

The District and the Bureau of Reclamation (Reclamation) have a longstanding nexus that encompasses the proposed project. The District distributes water through 300 miles of District-operated canals and laterals.[1] Much of this infrastructure, and associated easements, was built or rehabilitated by Reclamation as part of the Deschutes Project's North Unit, which is owned by the U.S. Government and which Reclamation administers. The District is responsible for the operation and maintenance (O&M) of the North Unit portion of the Deschutes Project with oversight from Reclamation through various contract instruments. A map identifying ownership can be found in Appendix C, Figure C-5. Reclamation is a cooperating agency on this Draft Watershed Plan-Environmental Assessment (Plan-EA).

As with other irrigation infrastructure around the Deschutes Basin and the Western United States, most of District-operated infrastructure is aging. The water distribution system consists primarily of open earthen dug canals that are up to 83 years old, resulting in water lost to operational spills[2] from operational inefficiencies and canal seepage or evaporation from conveyance inefficiencies. In total, the District estimates that up to 37 percent of District-diverted water is lost to canal seepage or evaporation and operational spills (NUID 2018). Modernizing the NUID aging water distribution system would increase system efficiency and help to address local water resource concerns.

[1] Laterals are canals or pipelines that branch off from a main or larger canal or pipeline.
[2] The District operationally discharges excess water that is not used by irrigators at the ends of its canals and laterals. This excess water typically discharges into natural waterbodies and is referred to as *operational spills*.

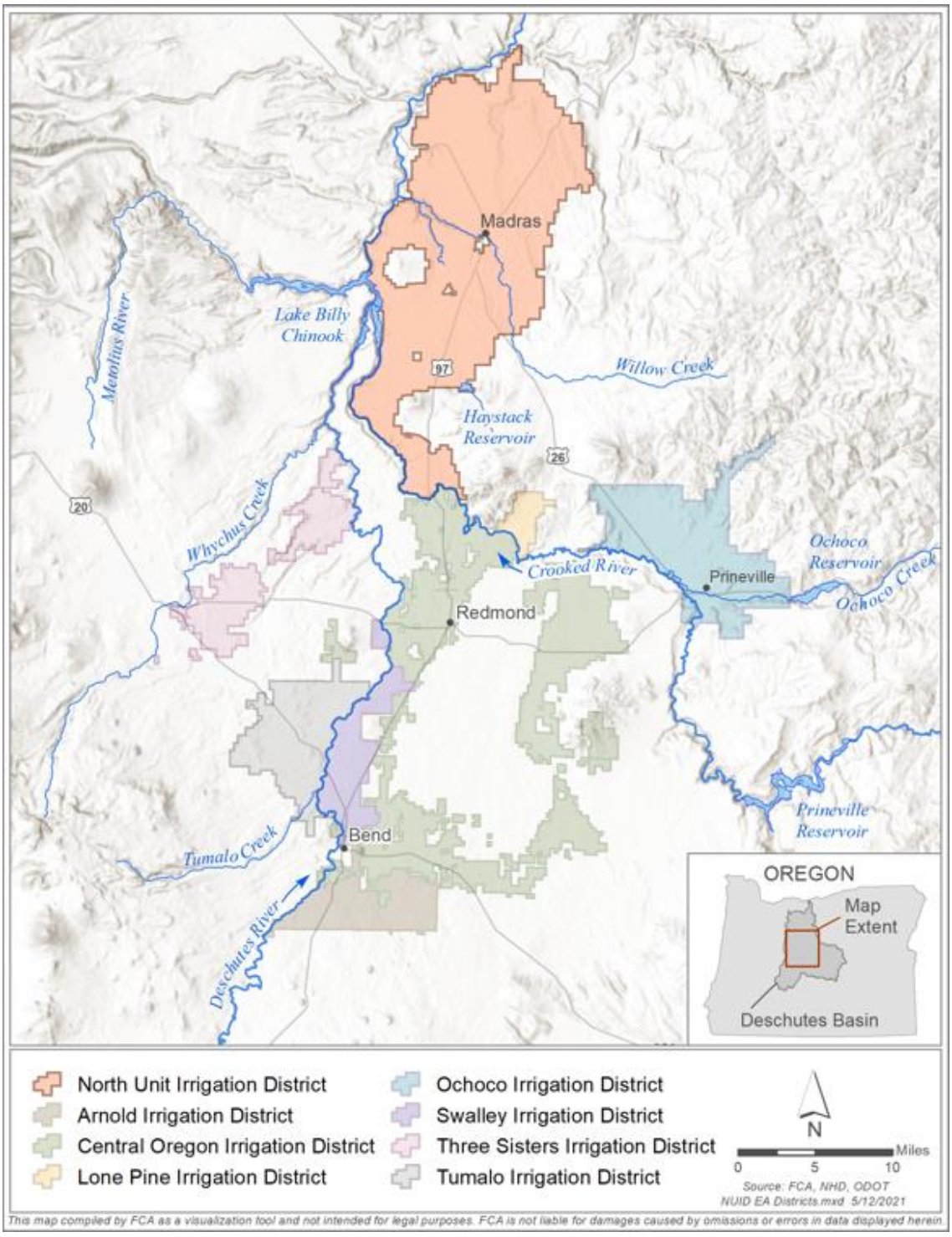


Figure 1-1. Irrigation districts within the Deschutes Basin.

1.1 Planning Area[3]

The District is located in and around the cities of Culver and Madras in Jefferson County, Oregon. The District is 135,607 acres in size, of which 58,885 acres are irrigated land used by 952 patrons. NUID diverts natural flow and stored water released from Wickiup Reservoir (river mile [RM] 226.8) via the Deschutes River and the North Canal Dam (RM 164.8). The District also operates a pumping plant on the Crooked River at RM 27.6. The planning area is based on the irrigation problem area and is identified as the tax lots traversed by the proposed project (see Table 1-1 for details and Appendix C for supporting maps).

Table 1-1. North Unit Irrigation District Watershed Area.

Lower Crooked River Subwatershed Name	12-digit Hydrologic Unit Code	Watershed Area Within Subwatershed (acres)
Osborne Canyon-Crooked River	170703051101	2,550
Dry Canyon	170703060204	5,293
Haystack Draw-Deschutes River	170703011104	1,349
	Total	**9,192**

1.2 Project Area

The project area is the portion of the planning area where the NUID Infrastructure Modernization Project would occur. The project area, making up only a small portion of the District's total system, consists of the District infrastructure to be modernized (laterals 31, 32, 34 and 43), areas where new infrastructure would potentially be built, and associated right-of-way or easements where construction would take place (see Figure 1-2).

1.3 Current Infrastructure

The District operates 65 miles of main canal and 235 miles of laterals including a few existing piped segments. NUID operates one diversion on the Deschutes River in Bend, Oregon; it diverts natural flow from the Deschutes River and stored water released from Wickiup Reservoir.

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

[3] The *planning area* referred to in this Plan-EA is equivalent to the term *watershed area* as defined by the National Watershed Program Manual (NWPM) 506.60.TTT. Planning area is used in this Plan-EA in an effort to reduce confusion between the NWPM 506.60.TTT watershed area definition and watershed areas as defined by hydrologic unit codes. A Watershed Area, in the case of irrigation projects, is defined by the 2015 NRCS NWPM (as 506.50.TTT) and National Watershed Program Handbook (600.4 [2]) as "the watershed boundary… based on the irrigation problem area."

supplemental use in the District. Water pumped from the Crooked River discharges directly into the District's main canal.

The water source supplied to patrons (i.e., Deschutes River, Wickiup Reservoir, or Crooked River) varies from year to year based on water year type (i.e., dry year, wet year, normal year). The majority of the District's canals and laterals are open and unlined. Privately owned pipelines and ditches stem off of the District's system. Patron turnouts from the District's canals and laterals to these private conveyances are generally gate-regulated and weir-measured. District staff regulate flows to each system lateral and patron turnout.

As identified in the beginning of this section, the U.S. Government owns, and Reclamation administers, much of the District-operated infrastructure (Appendix C, Figure C-5). The NUID irrigation conveyance facilities were built by Reclamation, are administered by Reclamation, are operated and maintained by the District, and are owned by the U.S. Government. Reclamation has acquired easements along the irrigation conveyance system through various mechanisms;[4] however, the District is responsible for the daily O&M of these easements.[5] The District is on a repayment contract with Reclamation for this infrastructure, some of which has been paid off (N. Coleman, personal communication, February 25, 2021). Reclamation still holds title to these assets.

[4] In the name of the United States, Reclamation acquired easements in NUID by entering into a contract for the acquisition or donation of the easement. Subsequently, Reclamation obtained a grant of easement document.
[5] Because Reclamation transferred O&M responsibilities to NUID through various contracts, Reclamation administers, but does not have the authority to maintain, irrigation facilities. The responsibility to maintain irrigation facilities rests with NUID. Any assistance provided by NRCS to modernize NUID facilities is, therefore, directed to the District and not to Reclamation.

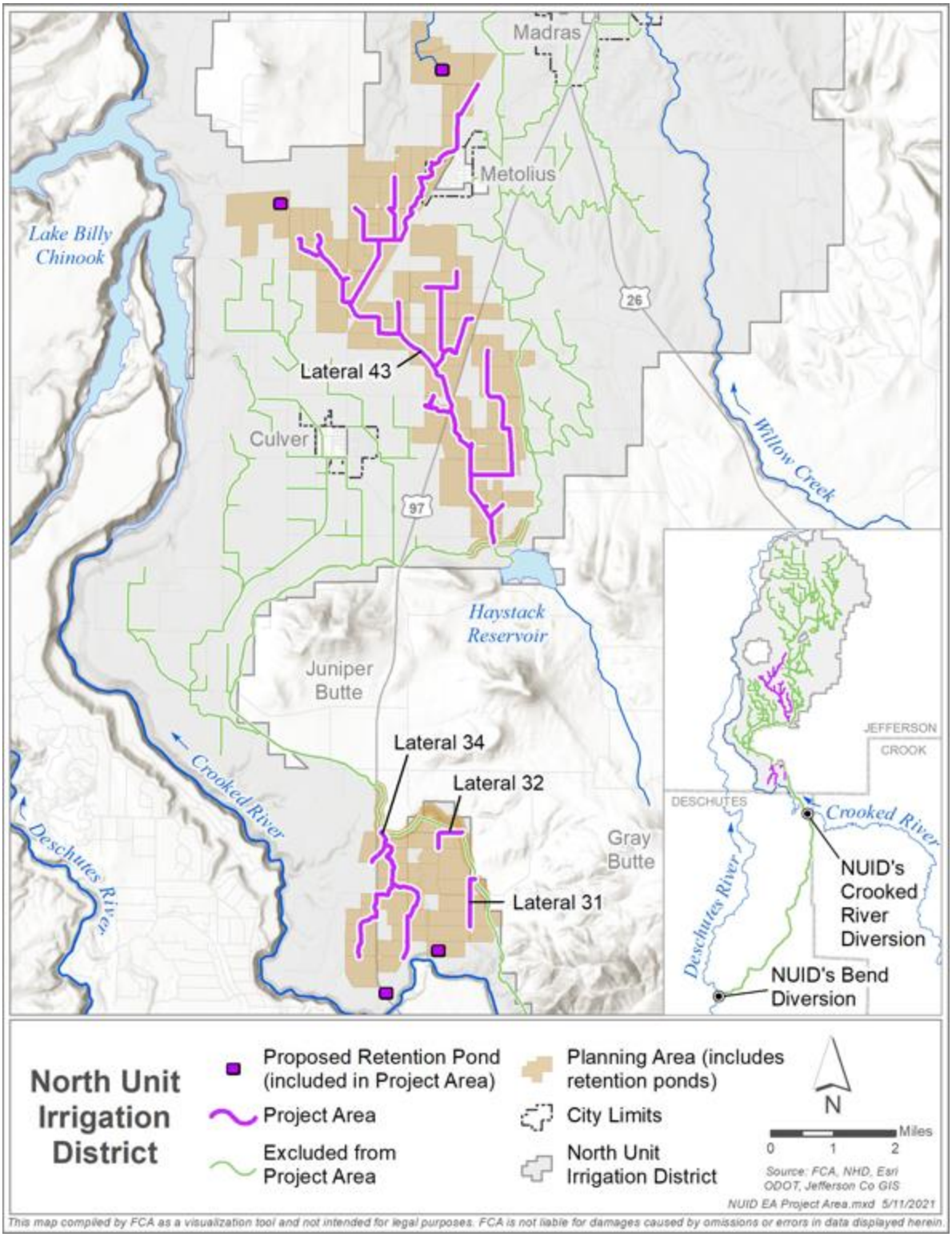


Figure 1-2. North Unit Irrigation District's Irrigation Modernization Project Area.

1.4 Decision Framework

This 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 P.L. 83-566. Through this program, 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 in determining whether an EIS is needed (see 40 Code of Federal Regulations [CFR] 1501.4 and 1508.9; 7 CFR 650.8).

NUID is partnered with NRCS to implement the Infrastructure Modernization Project within the NUID planning area under the watershed authority of the P.L. 83-566 program. Because Reclamation administers and holds title to many of the assets and real property that are proposed for modification, Reclamation has agreed to be a cooperating agency on this Plan-EA. Reclamation is not providing any federal funding for this proposed project, and the costs and benefits of the proposed project are not included in other federal agency accounting.

NRCS has determined the need for a Plan-EA to implement the proposed action under P.L. 83-566 watershed authority. The proposed action is planned to be completed as two project groups phased over 6 years beginning in 2023 and ending in 2029.[6] Prior to implementation of each site-specific project, an on-site Environmental Evaluation review would be conducted using Form NRCS-CPA-52, Environmental Evaluation Worksheet. The Environmental Evaluation would determine if that site-specific project meets applicable project specifications and whether the site-specific environmental effects are consistent with the effects described 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 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 this Plan-EA would be used for purposes of the pending action.

Additionally, the continued feasibility of a project is monitored and documented in the project files every 5 years in accordance with NEPA requirements in Title 190, General Manual, Part 410. Factors to be considered in determining the continued feasibility are economic, environmental, and social defensibility and the sponsoring local organizations' commitment to continue the proposed project. Modifications to this Plan-EA and project will be prepared as necessary.

[6] *Project group* refers to groupings of laterals and infrastructure that would undergo construction during the same period.

This Plan-EA has been prepared in accordance with applicable Council on Environmental Quality regulations for implementing NEPA (40 CFR 1500–1508), USDA's NEPA regulations (7 CFR 650), NRCS Title 190 General Manual Part 410, and NRCS's National Environmental Compliance Handbook Title 190 Part 610.[7] This Plan-EA also meets the NRCS program policy of the 2015 NRCS National Watershed Program Manual (NWPM; NRCS 2015a) and guidance of the 2014 NRCS National Watershed Program Handbook (NWPH; NRCS 2014). This Plan-EA serves to meet the NEPA and NRCS environmental review requirements for the proposed action.

Finally, in addition to the requirements and policies under NEPA listed above, USDA will also conduct its analysis of this Plan-EA following the federal Principles and Requirements for Federal Investments in Water Resources,[8] as well as the *Updated Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies* (PR&G; Council on Environmental Quality 2014). The USDA has issued guidance for analysis comprised of DM 9500-13 and DR 9500-13, and NRCS uses this guidance as the framework for evaluating water resources investments (U.S. Department of Agriculture [USDA] 2017a, b).

[7] The Plan-EA process began prior to the updated NEPA Council on Environmental Quality (CEQ) regulations effective September 14, 2020. This plan, therefore, is prepared in accordance with the CEQ regulations that were in place when planning began as provided for in the 2020 CEQ NEPA regulations at 40 CFR 1506.13. All references to NEPA CEQ regulations, therefore, correspond to the 1978 regulations and the existing agency NEPA procedures that were in place prior to the 2020 update.

[8] Principles and Requirements are established pursuant to the Water Resources Planning Act of 1965 (P.L. 89-8), as amended (42 U.S.C. 1962a-2) and consistent with Section 2031 of the Water Resources Development Act of 2007 (P.L. 110-114).

2 Purpose and Need for Action

The purpose of the proposed project is Agricultural Water Management[9,10] through improved water delivery reliability and water conservation along District infrastructure. There is a need to improve water conservation and water delivery reliability on District-operated laterals to support drought resilience across the District. There is also a need to reduce District irrigation return flows into the Crooked River and Lake Billy Chinook to improve water quality.

Per the Federal Objective,[10] water resource investments, including the proposed action put forth in this plan, 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 P&R 2013).

The proposed project would be eligible for funding under Public Law 83-566 requirements under "Authorized Project Purpose (v), Agricultural Water Management,"[9] due to the proposed project's focus on irrigation water conservation and more reliable agricultural water supply delivery.

2.1 Watershed Problems and Resource Concerns

Federal assistance is needed to support the District in addressing the following watershed problems and resource concerns: water loss in District infrastructure, water delivery and operation inefficiencies, and operational spill effects on water quality in surface water.

2.1.1 Water Loss in District Conveyance Systems

Overall, the District's open canals and laterals lose about 37 percent of their flow to seepage, evaporation, and operational spills (NUID 2017). During the irrigation season, Lateral 31 loses 1.1 cubic feet per second (cfs; 357 acre-feet), Lateral 32 loses 0.4 cfs (130 acre-feet), Lateral 34 loses 1.3 cfs (422 acre-feet), and Lateral 43 loses 15.9 cfs (5,179 acre-feet) (see Appendix E.5). Water losses due to inefficient conveyance systems reduce the District's ability from delivering to its irrigators the full rate and duty associated with each water right. The District has identified that reducing or eliminating operational spills is a high priority to both conserve water and improve operational efficiencies. Details of water losses can be found in Appendix E.5 of this Plan-EA and in the *North Unit Irrigation District System Improvement Plan* (SIP; NUID 2017).

2.1.2 Water Delivery and Operations Inefficiencies

The District's antiquated laterals convey water inefficiently. Open laterals can make it difficult to manage water throughout the system and deliver the correct amount of water to patrons' points of

[9] A description of Authorized Purposes can be found in 390-NWPM, Part 500, Subpart A, Section 500.3B.

[10] To meet NRCS requirements for a federal investment in a water resources project, the project must meet the Federal Objective set forth in the Water Resources Development Act of 2007 and be an authorized project purpose under Sections 3 and 4 of P.L. 83-566.

delivery. The District also must pass excess water, known as carry water, to ensure that adequate water reaches all points of delivery when required by patrons. When the patrons' demand subsides, this excess water is then discharged into retention ponds, unproductive lands, or the Crooked River. To meet patron demand under drought conditions and with recent changes to Deschutes and Crooked River water management, the District aims to minimize water losses through its distribution systems in an effort to transport and deliver water more precisely, accurately, and efficiently.

2.1.3 Water Quality

Water management and land use change in the Deschutes Basin have altered seasonal streamflow patterns; streamflow has exceeded historical levels in some reaches and has decreased below historical levels in other reaches. Low flow affects water quality in Lake Billy Chinook and the Deschutes and Crooked rivers by exacerbating temperature and dissolved oxygen problems. Waterbodies associated with District operations (see Section 4.8.3) are included on Oregon's 303(d) list for not meeting state water quality standards for temperature, dissolved oxygen, pH, and *E. coli*. The District manages four operational spills in the project area that discharge irrigation tailwater into the Crooked River and Lake Billy Chinook. The water that is discharged is often warmer in temperature and carries nutrients and sediments that can contribute to the water quality issues in the Crooked River.

2.1.4 Agricultural Production

Lands served by the District are primarily large-acreage farms (260 to 2000 acres) dedicated to high-value crops such as vegetable seeds, grass seeds, peppermint, garlic seed, alfalfa, and radish (Headwaters Economics 2017). The value of crop commodities sold in Jefferson County is greater than the value of crop commodities sold in the surrounding counties, and the crops grown in NUID are important contributors to the national and international crop market—hybrid carrot seed grown from NUID-irrigated lands produce 55 percent of the nation's and 40 percent of the world's supply (Headwaters Economics 2017; NUID 2021). However, the District's junior water rights, in concert with a changing climate and recent changes to Deschutes and Crooked river water management, have left agricultural production in the District vulnerable to water shortages.

Annual climatic variation impacts the degree to which reservoirs are able to fill and store water for irrigation use, and the District imposes a water allotment that limits the amount of water patrons receive based on the water available. When this scenario occurs, patrons may not be able to irrigate their fields to the extent necessary to support their crops. Often, patrons are forced to fallow more acres than they otherwise would choose to, as well as to deficit irrigate, which results in a decrease in crop production and revenue. Although many patrons have already invested in updating on-farm infrastructure to improve application efficiency of the water that they receive, in 2020 many patrons were forced to fallow 20 to 25 percent of their fields and in some cases, up to 40 percent (Kohn 2020a, b, c; Havstad and Casad 2020).

2.2 Watershed and Resource Opportunities

The following watershed resource opportunities would be realized through implementation of the proposed project:

- Improved irrigation water management and irrigation water delivery to irrigators along laterals 31, 32, 34, and 43 through improved conveyance efficiencies.
- Reduced O&M involved in delivering irrigation water to irrigators along laterals 31, 32, 34, and 43.
- Reduced tailwater spills into natural waterbodies.
- Increased water supply and drought resilience for irrigators throughout the entire District.

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 for the proposed project. Advertisements announcing the scoping period and associated scoping meeting were placed in The Madras Pioneer and Bend Bulletin local newspapers, as well as in multiple online locations including NRCS's website, the District's website, and the Deschutes Basin Board of Control's website. Additionally, the District notified patrons of the scoping meeting and invited comments on the scope of the Draft Plan-EA.

In accordance with 36 CFR 800, the National Historic Preservation Act of 1966 as amended, and its subparts, NRCS will consult and coordinate with the State Historic Preservation Office (SHPO), federally recognized tribes, and other Consulting Parties including Certified Local Governments (CLGs) on the Area of Potential Effects (APE) prior to cultural resources survey. Input received from these entities will be incorporated into the cultural resource identification survey.

Per Executive Order 13007, Indian Sacred Sites, NRCS will coordinate with federally recognized tribes whose ancestral lands are known to have been in the counties of the undertaking prior to conducting cultural resources surveys. Tribal input will be meaningfully incorporated into the cultural resource identification survey within the APE.

After completion of the cultural resources identification survey and subsequent NRCS review, a copy of the completed survey report will be furnished to the Oregon SHPO and Tribal Governments with ancestral lands within the counties of the APE. Further consultation may take place regarding the resolution of adverse effects (if any) to cultural resources until a Memorandum of Agreement is executed and signed by Oregon NRCS and relevant parties or by comment from the Advisory Council of Historic Preservation.

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 planning phase of the proposed project.

3.2 Scoping Meeting

A scoping meeting was held on October 21, 2019, at the Jefferson County Library's Rodriguez Annex in Madras, Oregon. Presenters at the meeting included Kevin Conroy, NRCS; Mike Britton, NUID; Amanda Schroeder, Farmers Conservation Alliance (FCA); and Margi Hoffmann, FCA. The presentations covered the financial assistance available through P.L. 83-566, the proposed 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 39 people attended the meeting, excluding staff from NUID, NRCS, and FCA.

3.3 Identification of Resource Concerns

Resource concerns identified through scoping comments include water conservation, water usage, and water quality; fish and aquatic resources; soil resources; cultural resources; socioeconomics and

public benefits; wetlands; wildlife resources; public safety; land use; visual resources; and vegetation resources. Table 3-1 provides a summary of resource concerns and their relevance to the proposed action. Resource items determined to be not relevant have been eliminated from detailed study, and those resources determined to be relevant have been carried forward for analysis.

Table 3-1. Summary of Resource Concerns for the North Unit Irrigation District Infrastructure Modernization Project.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Air Quality		X	Oregon Department of Environmental Quality air quality data indicates that the entire project area is in attainment for all criteria pollutants. Emissions from equipment associated with construction activities would occur; however, such emissions are considered negligible when compared to background levels and the application of BMPs.
Coral Reefs		X	There are no coral reefs located near the project area.
Cultural and Historic Resources	X		Consultation with SHPO, THPO, and other consulting parties including affiliated tribes is required for compliance with Section 106 of the NHPA.
Ecologically Critical Areas		X	The project area does not cross through any ecologically critical areas.
Endangered and Threatened Species: Animals	X		Steelhead and bull trout are known to occur in waterbodies that would be affected by the proposed project.
Endangered and Threatened Species: Plants		X	None has been observed in the project area, and no designated critical habitat occurs in that area.
Environmental Justice	X		Environmental justice communities are present in Jefferson County where the proposed project would occur.
Essential Fish Habitat		X	Because neither the proposed project nor affected waterbodies occur within Essential Fish Habitat, consultation under the Magnuson Stevens Act is not anticipated to be required.
Fish and Fish Habitat	X		The proposed project could affect fish habitat in the waterbodies associated with District operations.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
General Wildlife and Wildlife Habitat	X		Construction and operation of proposed project components could affect wildlife in the vicinity of District operations.
Floodplain Management		X	Construction and operation of the proposed project would not occur in the 100-year floodplain.
Forest Resources		X	The project area does not cross any forest resources.
Geology		X	There are no active fault lines around the project area.
Invasive Vegetation Species/Noxious Weeds	X		With implementation of BMPs, the spread of noxious weeds during construction would be avoided. Invasive aquatic vegetation that occurs within canals could be reduced in the project area.
Invasive Animal Species	X		Invasive bull frogs may occur within canal habitats.
Land Use	X		Construction and operation of the proposed project could affect land use.
Migratory Birds and Eagles	X		Migratory birds and eagles could occur within the project area.
Natural Areas		X	The project area does not cross any natural areas.
National Parks, Monuments, and Parklands		X	None occurs in the project area or would be affected by the project.
Noise		X	No relevant impact to noise. With implementation of BMPs, noise impacts during construction would be negligible and temporary.
Prime Farmlands	X		Construction and implementation of the proposed project could affect prime farmlands.
Public Safety	X		Drowning risk in open laterals could be reduced.

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
Recreation		X	No trails or parks occur in the project area; changes in instream flows would not be large enough to affect the quality, access, or participation in river recreation.
Regional Water Resource Plans		X	The proposed project would not affect any regional water resource plans.
Riparian Areas and Wetlands	X		Wetlands and riparian areas in the project area could be affected by the proposed project.
Scenic Beauty and Visual Resources	X		Construction and operation of the proposed project could affect visual resources.
Soils	X		Construction and operation of the proposed project could affect soils.
Scientific Resources		X	Scientific resources would not be affected by the proposed project.
Sole-Source Aquifers		X	The proposed project would have no effect on sole-source aquifers.
Socioeconomics	X		The proposed project would involve an expenditure of public funds that could affect the local and regional economy. An evaluation of the effects of providing NRCS funding is included.
Water: Groundwater Quantity, Aquifer Recharge,	X		Construction and operation of the proposed project could affect aquifer recharge.
Water: Hydrology	X		A change in discharges of operational spills and seepage could affect hydrology.
Water: Surface Water Quality	X		Operation of the proposed project could beneficially affect surface water quality.
Water: Water Rights		X	The proposed project would have no effect on water rights.
Wild and Scenic Rivers		X	The project area where construction would occur is not located near any Wild or Scenic River reaches. Any changes in instream

Resource	Relevant to the Proposed Action?		Justification
	Yes	No	
			flows as a result of the proposed project would have no relevant impact on any Outstanding Remarkable Values associated with Wild and Scenic Rivers.
Socioeconomics			
National Economic Efficiency	X		A NEE analysis has been completed as required by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

BMP = best management practice; EFH = Essential Fish Habitat; NEE = National Economic Efficiency; NHPA = National Historic Preservation Act; SHPO = State Historic Preservation Office; THPO = Tribal Historic Preservation Office

3.4 Scoping Comments

Scoping comments were accepted from October 2 to November 21, 2019. Comments were submitted via the following methods:

- At the public meeting on October 21, 2019
- Email – northunit.id.comments@gmail.com
- Online – oregonwatershedplans.org
- Mail – Farmers Conservation Alliance, Attention North Unit Watershed EA, 102 State St., Hood River, OR 97031
- Phone – Farmers Conservation Alliance, (541) 716-6085

Comments generally supported the project. Table 3-2 presents comments received and where they are addressed in this Plan-EA.

Table 3-2 Summary of Comments Received During Scoping.

Scoping Comments Received	Section Where Topic is Discussed
Will you consider updating the purpose and need statement to expressly state that the public purpose of conserved water with the requested taxpayer dollars is to place all the conserved water instream for the benefit of public fish and wildlife?	Section 6.8.2
How will the public benefit from this project?	Sections 6.3 and 6.4 and Appendix D.1
Who will own the land around the reuse/retention ponds?	Sections 6.2 and 8.7.5
Will you explain the environmental baseline for flows in the Plan-EA?	Section 4.8
Will you address on-farm modernization as an alternative?	Section 5 and Appendix D.2
Will you consider concrete pipes as an alternative? Specifically, ACI-346 and 246R CICP.	Section 5 and Appendix D.2
Will you look at the use of solar-powered pumps to move reuse pond water "back up the line"?	Section 5.3.2
Will you look at the cost of lining the retention or reuse ponds?	Section 5.3.2
Will you consider the alternative water conservation methods identified by the Upper Deschutes Basin Work Group in the Plan-EA as additional alternatives to the project?	Section 5 and Appendix D.2
Will a feasibility study be done for each potential site of a retention or reuse pond prior to selecting a site?	Sections 5.3.2, 6.5.2, and 8.2

Scoping Comments Received	Section Where Topic is Discussed
Will the District explore other alternatives including water leasing and on-farm conservation measures?	Section 5 and Appendix D.2
When you pipe a lateral, where on-farm will the water to the farm be supplied?	Section 8.2
Will you provide more detail regarding project groups and project details in the Plan-EA?	Sections 5.3.2 and 8.7.2
What is the rationale behind the retention reservoirs?	Sections 2 and 5.3.2
How will the project impact aesthetics in the area?	Section 6.7.2
Where will the saved water be going?	Section 6.8.2
Can we address the Oregon water law and policies in the plan?	Section 6.8
What will happen to any additional water saved by the project (in addition to that measured in the loss assessment presented in the SIP)?	Section 6.8.2
Will you describe the difference presented in the SIP regarding the seepage loss of 205.4 cfs and the total amount of conserved water?	Section 6.8 and Appendix E.5
Will you consider using the Conserved Water Act to permanently and legally protect the full amount of conserved water to instream purposes?	Section 6.8.2
If the Conserved Water Act does not allow water saved by this project to be conserved instream, will you provide detail on how the public can be ensured that the saved water goes instream permanently?	Section 6.8.2
Who will receive the water stored in the retention/reuse ponds?	Section 5.3.2
Will you identify any potentially significant impacts to the aquifer, stream flows, or fish and wildlife resources as a result of the lost seepage from the project?	Section 6.8.2 (water), Section 6.9.2 (fish), Section 6.11.2 (wildlife)
What will be the effect to groundwater in the area?	Section 6.8.2.3
What will happen with the tailwater that enters the retention/reuse ponds?	Section 5.3.2
District should use Oregon Conserved Water statute to permanently protect conserved water instream.	Section 6.8.2
Will you ensure confirmatory assessments for actual water loss prior and following the implementation of the project?	Section 6.8.2
Consider state fish passage and screening requirements as changes to instream infrastructure occurs	Section 6.9.2
Address currently unscreened diversions	Sections 4.9 and 6.9.2

Scoping Comments Received	Section Where Topic is Discussed
Request to coordinate with U.S. Fish and Wildlife Service	Sections 6.9.2 and 7
Request that the District coordinate with ODFW and a restoration partner to develop wetlands to treat tailwater and returning flows	Section 6.10
Who pays for the water that is conserved instream?	Section 6.8.2
How will chemical treatment of canals be handled?	Section 8.3
Will you review the percentage of contingency used for costing in the Plan-EA?	Section 8.6

246R CICP = ; ACI-346 = refers to cast-in-place concrete pipe; ODFW = Oregon Department of Fish and Wildlife; SIP = system improvement plan

4 Affected Environment

The following sections describe the existing ecological, physical, biological, economic, and social resources of the project area and areas that are affected by the operation of the NUID system. The project area is defined in Section 0.

Per requirements of the *Updated Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies*, where applicable, this Plan-EA describes the ecosystem services associated with each resource (PR&G; Council on Environmental Quality 2014). *Ecosystem services* refers to the benefits that people and their communities derive from the natural environment in which they live. Contributions to water for consumption, buffering against crop failure through pollination, and providing places in which people value living are 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 2017a; Olander et al. 2018). An assessment of links between ecological function and social well-being helps to ensure that beneficial and detrimental ecological impacts of a project are recognized and that detrimental impacts are minimized to the extent possible (European Environment Agency 2022).

Per federal guidance, this Plan-EA assesses ecosystem services based on three of the four federally identified ecosystem service categories (USDA 2017b):

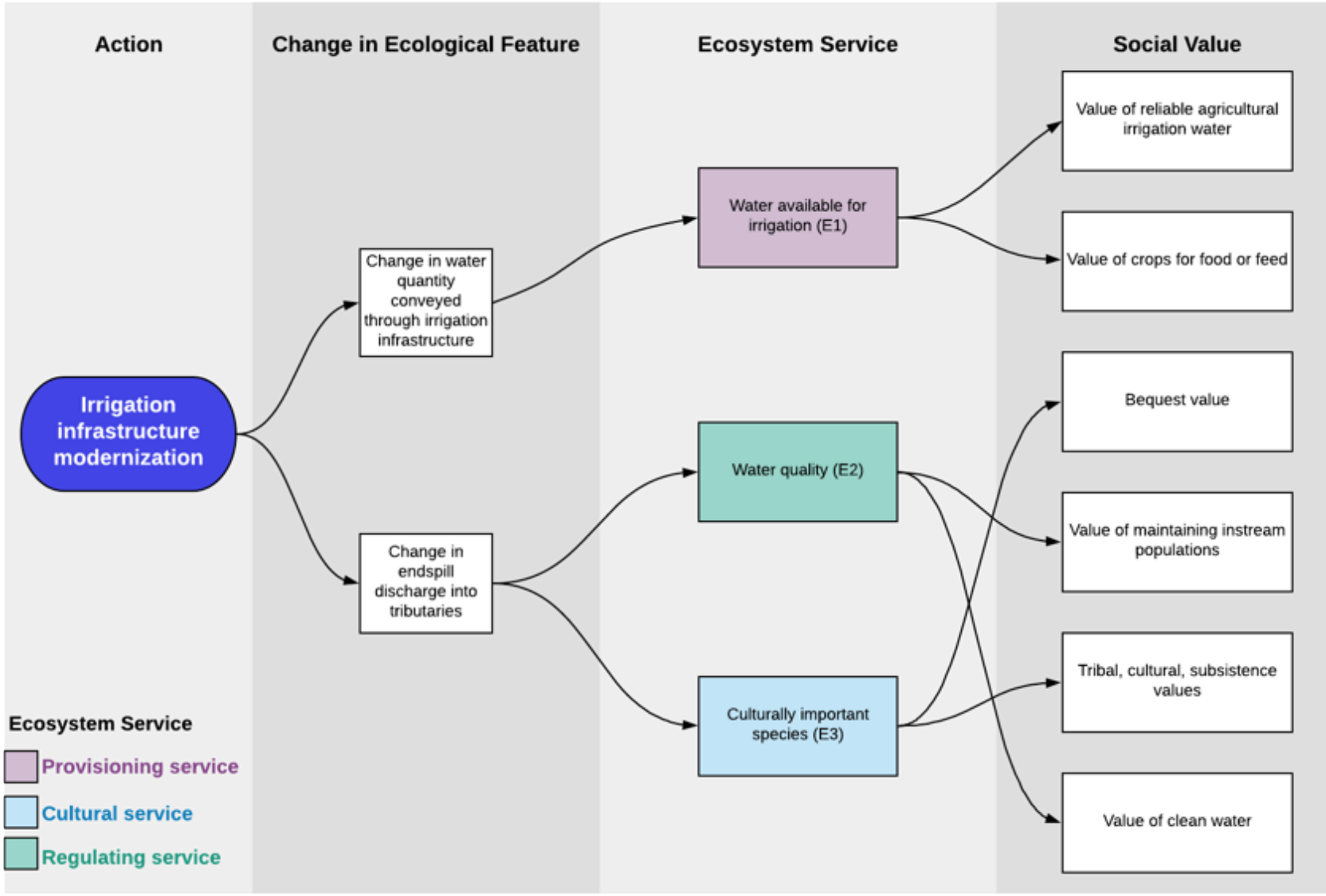
(1) Provisioning services: tangible goods provided for direct human use and consumption, such as food, fiber, water, timber or biomass;

(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 shows a concept diagram that highlights the ecosystem services that interact with District operations, and it 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. This Plan-EA does not evaluate supporting services because they give rise to and support the final ecosystem services (regulating, provisioning, and cultural) (European Environment Agency 2022; USDA 2017).



Note: E1 to E3 refer to ecosystem services 1 through 3. These services are referenced and explained in more detail in the text below.

Figure 4-1. NUID Modernization Infrastructure Project Ecosystem Services Concept Diagram.

4.1 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the effects of federally funded projects on historic properties, commonly referred to as cultural resources, prior to the expenditure of federal funds. 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, including artifacts, records, and material remains related to such a property or resource" (Advisory Council on Historic Preservation 2019).

NUID was established in 1916 and was the last district to form of the eight Deschutes Basin irrigation districts. Infrastructure to support NUID's anticipated water needs was built as part of Reclamation's Deschutes Project – North Unit, the largest of the Deschutes Project phases. Construction began in 1938 and was completed in 1949; it included construction of Wickiup Reservoir, reconstruction of Crane Prairie Reservoir, and construction of North Unit canal system infrastructure. The North Unit project was operated by Reclamation until 1955 when NUID assumed financial responsibility.

Beginning in 2003, Reclamation contracted with Renewable Technologies, Inc., to conduct an inventory and National Register of Historic Places evaluation of NUID historic resources. That research effort, captured in *Sagebrush to Clover, Volume 1*, was published in 2013. The report documents the historic context of irrigated agriculture in the Upper Deschutes Basin, outlines the impact NUID had on Jefferson County's agricultural economy, generally describes the District's water conveyance system, and highlights significant changes made to the water conveyance system since the construction of the original Deschutes Project North Unit (Doncaster et al. 2013). Volume 2 of the research effort, which includes site and feature descriptions and a National Registration Evaluation of the NUID irrigation system, was provided to SHPO for review in July 2021 (Doncaster et al. 2021). Following minor edits, Volume 2 was considered final as of fall 2021 and published spring 2022.

Sagebrush to Clover, Volume 2, evaluated the eligibility of listing the NUID water conveyance system in the National Register of Historic Places as a linear historic district. Volume 2 also evaluated if individual components of the District, based on their integrity,[11] contributed to the District's eligibility. Overall, Reclamation determined, and SHPO concurred, that the District is eligible for listing in the National Register of Historic Places as a linear historic district under criteria A[12] and C.[13] Reclamation also determined that laterals 43 and 34 have integrity and contribute to the eligibility of NUID as a linear historic district (North Unit Historic Linear District). Reclamation further determined that laterals 31 and 32 are non-contributing (Doncaster et al. 2021).

[11] Integrity is based on the following National Register criteria: location and setting; design, materials, and workmanship; and feeling and association.
[12] Criterion A: …[Be] associated with events that have made a significant contribution to the broad patterns of our history.
[13] Criterion C: …[E]mbody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

4.2 Land Use

4.2.1 Land Ownership

Most land traversed by and adjacent to the project area is privately owned.[14] The District and Reclamation have legal right-of-way (ROW) or easements for all the existing infrastructure in the project area. Authority for Reclamation to acquire and administer easements comes from the Deschutes Project authorization and from the Reclamation Act of 1902.

4.2.2 Land Use

Land use within the majority of the project area consists of irrigation water conveyance and O&M of the conveyance system. The District accesses its infrastructure through maintenance roads in the ROW and easements.

The majority of the conveyance system in the project area crosses and is adjacent to rural agricultural land. The majority of the agricultural lands served by laterals in the project area are zoned as Exclusive Farm Use.[15] Irrigators who would be served by the proposed project primarily grow alfalfa hay and grass hay. They also grow other crops such as pasture, grain, hemp, and carrot seed. Within NUID, farm area and farm size should remain constant, but overall irrigated agricultural land may decrease due to encroaching urban development around the communities of Madras, Metolius, and Culver, which are in proximity to the planning area (NUID 2012).

4.2.3 Agricultural Production

Due to the District's junior water right, and its operation under current Deschutes River water management with the measures in place the *Deschutes Basin Habitat Conservation Plan* (DBHCP), the District is vulnerable to water supply shortages during dry water years (National Marine Fisheries Service and U.S. Fish and Wildlife Service – Bend Office 2020). Historically, NUID has experienced water shortages where water supply is less than total water demand in the District (Britton, NUID District Manager, 2020). Since the adoption of the 2016 Settlement Agreement (see Section 4.8.2.2 for more information), NUID's water supply reliability has further decreased; the agreement includes provisions for irrigation districts in Central Oregon to maintain streamflow to support Oregon spotted frog (*Rana pretiosa*), which reduces water available for irrigation. Given the few years since the Settlement Agreement, and that water-year type and market conditions also affect acreage planted in any given year, Figure 4-2 shows that the average fallowed acreage in NUID increased from the 2009-to-2015 period to the 2016-to-2018 period. See the NEE Analysis in Appendix D.1.2.1.1 for an evaluation of the amount of water available and used for irrigation, which is a measure of ecosystem services as identified at the beginning of Section 4.

[14] A few segments of the project area (approximately 0.09 mile in total) pass adjacent to or through land owned by Reclamation. A table identifying the lengths of these segments can be found in Appendix E.2.
[15] The Exclusive Farm Use zoning designation is meant to maintain the agricultural economy of the state and ensure adequate food production. The county is required to inventory and protect farmlands under Statewide Goal 3, Agricultural Land, ORS 215 and OAR 660-033.

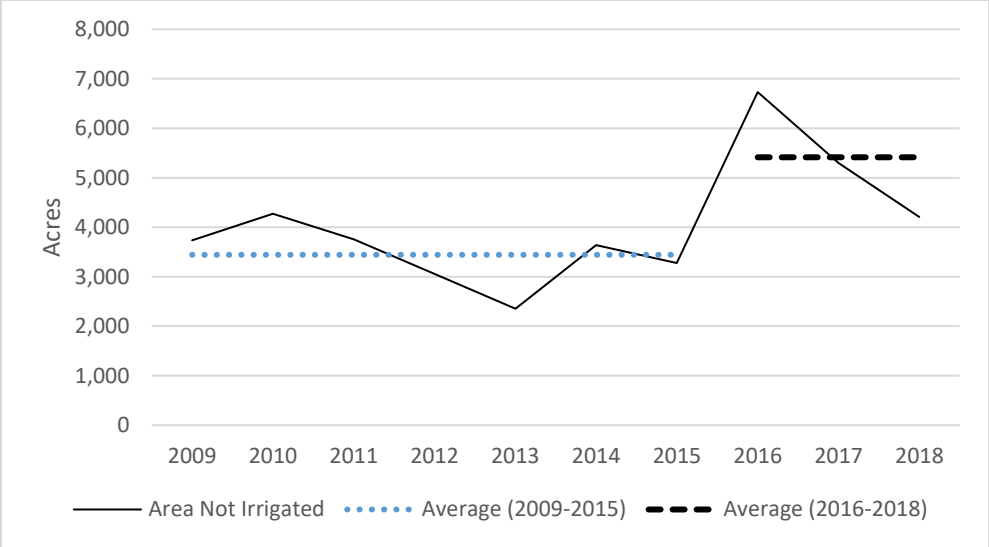


Figure 4-2. NUID Agricultural Area Not Irrigated. [16]

Table 4-1 presents agricultural information for the lands served by the District.

[16] Source: Bohle 2019

Table 4-1. Crops Grown in the North Unit Irrigation District.

Crop	Total Acreage
Cereals (barley, oats, wheat, triticale grain, corn)	948
Forage (alfalfa hay, other hay, irrigated pasture, grain hay)	24,739
Miscellaneous Field Crop	3,237
Vegetables	660
Nursery	367
Seeds	17,490
Nuts	5
Total Farmed Cropland[1]	**47,446**

Source: NUID 2019
[1] Estimate of total farmed cropland in the District. Total irrigated acres in the District are estimated to be 58,885 acres. 2019 was a dry water year which affected the total number of irrigated acres.

4.3 Public Safety

The open laterals in the project area pose a risk to public safety. During summer months when irrigation water is flowing at peak volume in the laterals, water depths can be up to 3 feet and velocities are approximately 2.3 feet per second depending upon location, grades, and structures (K. Crew, personal communication, May 11, 2021). These conditions make it difficult for a healthy, strong adult to stand in or climb out of a canal without assistance. A child or non-/weak swimmer would have a higher risk of drowning in a canal with these attributes. If a person or animal falls into a canal, they could have serious difficulty gaining a hold on the banks to climb out to safety. Several canal-related drowning or near-drowning events have occurred in nearby districts (Rosetta 2004; Britton 2017; KTVZ 2016a, b; Lerten 2020). Although non-accidental drowning deaths related to the District's open canals are infrequent, vehicular accidents that ultimately result with the vehicles in the canal are common. In 2008 and 2018, fatalities were associated with those canal-related vehicular accidents (NUID 2018).

Fields fallowed as an effect of water shortages[17] also pose a risk to public safety. The dry, fallowed fields, in conjunction with windy weather, have led to dust storms that decreased visibility along major highways which has resulted in car accidents (L. Windom, personal communication, April 30, 2021). These dust storms also cause severe air pollution.

[17] Water shortages have caused irrigators to increase the acres of field that they let fallow.

4.4 Socioeconomic Resources

The project area is in Jefferson County, Oregon, and the socioeconomic region of influence includes the planning area and the towns of Culver, Metolius, and Madras.

4.4.1 Population

Generally, the socioeconomic region of influence has seen consistent population growth over the past 9 years (2010 to 2019). Table 4-2 provides more information on the population and population growth within the socioeconomic region of influence and Oregon.

Ethnicity and race for the socioeconomic region of influence and Oregon can be seen in Table 4-3. Madras, Metolius, and Culver are majority white (around 70 percent of the population) with the percentages of other races varying across the three towns. In Metolius and Madras, the percentage of persons identifying as American Indian or Native Alaskan exceeds the state average; in Culver City the numbers are below the state average. A section of the CTWS Reservation falls within Jefferson County; therefore, the county population identifying as American Indian or Native Alaskan (17.4 percent), is substantially higher than the state average. Jefferson County, Metolius, Madras, and Culver have a higher percentage of persons identifying as Hispanic or Latino than the percentage reported for the state.

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

Indicator	Oregon	Jefferson County	Culver	Metolius	Madras
Population in 2019 (number of people)	4,236,400	23,840	1,560	852	6,380
Population growth 2010–2019	10.6%	9.8%	15%	16.2%	5.5%

Source: Portland State University 2020

Table 4-3. Race by State, County, and City.

Indicator	Oregon	Jefferson County	Culver	Metolius	Madras
Total Population in 2019[1] (number of people)	4,129,803	23,607	1,914	955	6,777
Two or More Races	4.8%	4.0%	7.6%	4.6%	3.2%
One Race	95.2%	96.0%	92.4%	95.4%	96.8%
White	84.3%	70.8%	72%	73.1%	73%
Black or African American	1.9%	0.8%	0.6%	0.5%	1.0%
American Indian and Alaska Native	1.2%	17.4%	0.7%	2.4%	9.5%

Indicator	Oregon	Jefferson County	Culver	Metolius	Madras
Asian	4.4%	0.6%	0.7%	0.9%	1.2%
Native Hawaiian and Other Pacific Islander	0.4%	0.1%	0.0%	0.0%	0.0%
Some Other Race	3.1%	6.4%	18.3%	20.8%	12.1%
Hispanic or Latino (of any race)	13.0%	20.0%	46.2%	34.3%	39.8%
Not Hispanic or Latino	87.0%	80.0%	53.8%	65.7%	60.2%

Source: U.S. Census Bureau 2021
[1] This number is an estimate.

4.4.2 Area Employment and Income

In 2018, manufacturing, health care and social assistance, and retail trade were the most common employment sectors in Jefferson County (DataUSA 2021). The county also had more people in agricultural, forestry, and fishing and hunting industries compared to other counties in the Deschutes Basin (DataUSA 2021). In 2017, the market value of agricultural products sold in Jefferson County was greater than $67 million (USDA 2017a).

Household income and persons living below the poverty level are summarized in Table 4-4. Income in the socioeconomic region of influence is below the state of Oregon median household income, while the percentage of persons in poverty falls both below and above the state value depending on the location. Madras and the broader Jefferson County area have higher percentages of people in poverty when compared the to the state, and Culver and Metolius have lower percentages.

Table 4-4. Income and Poverty by State, County, and City.

Indicator	Oregon	Jefferson County	Culver	Metolius	Madras
Median Household Income	$62,818	$53,277	$46,477	$50,000	$34,858
Persons in Poverty	11.4%	15.0%	10.3%	9.2%	21.8%

Source: U.S. Census Bureau 2021

4.4.3 Environmental Justice Communities

Areas with over 50 percent or "meaningfully greater" representation of minority or low-income communities are considered environmental justice communities (CEQ 1997), and their propensity to experience disproportionally adverse effects from a given action must be analyzed within NEPA documents per Executive Order 12898.

As seen in Table 4-3 and Table 4-4, a higher proportion of several minority groups and low-income populations reside in Jefferson County relative to the proportions in the state and planning area

cities. The Reservation of the CTWS overlaps with Jefferson County, leading to the relatively high proportion of American Indian and Alaska Native in the county. Additionally, while farm owners in the region are disproportionately white, farm workers are disproportionately low-income and minority (USFWS 2020).

4.5 Soils

The project area is located within the John Day Ecological Province, which encompasses the north-central area of Oregon (Anderson et al. 1998). The province's ancient sedimentary and tuffaceous geologic formations produce soils that are fine-grained and erode easily with precipitation (Anderson et al. 1998; Oregon Department of Geology and Mineral Industries 2019).

NRCS has developed technical soil groupings which are associated with soil types and soil ratings for agricultural commodity production (NRCS 2015b). Most soils within the project area are varieties of loam, and if irrigated, are primarily designated as Prime Farmland.

The District has identified that as irrigators fallow fields due to insufficient water supply (see Sections 4.2.3 and 2.1.4), topsoil, translocated by weather or erosion along canal banks, tends to accumulate in the canals. The soil is then transported with irrigation water as silt into other irrigation canals and ponds, natural drainages, and rivers; this requires the District to dig the silt out of the canals or results in sediment loading into natural waterbodies (Section 4.8.3; L. Windom, personal communication, April 30, 2021).

4.6 Vegetation

4.6.1 General Vegetation

The vegetation in the project area is a combination of grasses and weeds. 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 lateral banks. The hydrophytic fringe occurs sporadically, is up to a few feet wide in scattered locations, and does not function as quality habitat due in part to infrastructure maintenance activities.

The District engages in chemical and mechanical vegetation management. Aberrant terrestrial vegetation in the project area is typically treated two times a year with herbicides. Vegetation in the laterals is maintained through four chemical treatments with aquatic herbicide. Aquatic treatment also kills terrestrial seed that would have spread via the canal network. During the non-irrigation season, the District manages vegetation by grading, mowing, and clearing to minimize growth.

4.6.2 Special Status Species

No Endangered Species Act (ESA)-listed endangered or threatened plant species, plant species of concern, candidate plant species, their designated critical habitats, or Oregon special status plant species are known to occur within the project area (Oregon Department of Agriculture 2019).

4.6.3 Common and Noxious Weeds

The District manages terrestrial noxious weeds, such as cheat grass, with herbicide and regular mechanical mowing.

During the irrigation season, various species of pondweed and filamentous algae grow within the laterals. The District typically initiates three major in-water chemical treatments during the irrigation season to clear this vegetation.

4.7 Visual Resources

The project area passes through agricultural landscapes with scattered residences and is adjacent to the town of Metolius on the west side of SW Culver Highway. The open laterals in the project area generally lie flat against the landscape. In some sections of the project area, the laterals are a few feet lower than the landscape level. In these sections, the lateral banks are indistinguishable from other landscape features.

In addition to the laterals, the project area includes surrounding vegetation and a dirt or gravel maintenance road. In some instances, such as along Lateral 31, several residences are closely adjacent to the laterals and are included in the project area. Views of the laterals change throughout the year. During the irrigation season, the laterals carry water. Outside of the irrigation season, they do not carry water and are usually dry. The open laterals can be seen from residences and public road crossings.

In the regions of the project area where new retention ponds would be installed, there are currently no visible laterals and the land is privately owned. The proposed retention pond at the terminal end of Lateral 34 would be located on flat land that has been irrigated by the property owner between US 97 and SW Culver Highway. The pond would be visible from both roadways. The proposed retention ponds at the terminal end of laterals 31, 43, and 43-10 would be located far from any current roads or residences and would not likely be seen. Currently, the upland area is flat and dotted with sagebrush and juniper.

4.8 Water Resources

The following sections discuss water used for District operations, surface water hydrology, and surface water quality, as well as groundwater used in the project area.

4.8.1 Water Rights and District Water Supply

Water supplied to irrigated lands within the District comes from multiple water sources: live flow from the Deschutes and Crooked rivers and stored water from Wickiup Reservoir (released into the Deschutes River) and the Prineville Reservoir (released into the Crooked River) (Figure 1-2, Figure 4-3). Water allotments to irrigated lands in the District vary annually. Allotments are determined for each water source prior to the irrigation season and can be increased or decreased throughout the irrigation season depending on real-time water conditions.

4.8.1.1 Wickiup Reservoir and Deschutes River

The District supplies 53,721.9 irrigated acres with water sourced from Wickiup Reservoir and the Deschutes River. NUID holds a 1913 water right for a maximum diversion of 1,100 cfs of live flow from the Deschutes River and a 1913 water right for the storage of 200,000 acre-feet in Wickiup Reservoir. Given that NUID is a junior water right holder in the Deschutes Basin, the District can only divert live flow when live flow in the Deschutes River exceeds 1,250 cfs. Historically, 70 percent of the water diverted by NUID has been from storage in Wickiup Reservoir (NUID 2020).

Historical water supply conditions no longer represent current or future water supply conditions for NUID. In 2020, the DBHCP was signed into effect; it set limits on reservoir operations and set minimum streamflow measures in the Deschutes and Crooked rivers. Section 4.8.2 discusses streamflow measures set forth by the DBHCP, and Section 6.12.2.2 provides background information on the DBHCP. Under the DBHCP, flow releases from Wickiup Reservoir will be increased to maintain the new minimum streamflow in the Deschutes River. These increased flow releases are expected to reduce the amount of stored water available to NUID patrons during the irrigation season (NMFS and USFWS 2020).

Starting in year 8 of the DBHCP (i.e., January 2028), the District will experience a decrease in water availability from its diversion on the Deschutes River by 8,600 acre-feet/year in normal years.[18,19] During dry years,[20] the District will experience a 41,800 acre-feet/year decrease in water availability from its diversion on the Deschutes River (NMFS and USFWS 2020). In year 13 of the DBHCP (i.e., January 2033) and through the completion of the DBHCP, the District will see reduced water availability from its diversion on the Deschutes River during both normal and dry years. The District will experience a reduction of 25,600 acre-feet/year in normal years and 66,900 acre-feet/year in dry years (NMFS and USFWS 2020).

4.8.1.2 Prineville Reservoir and the Crooked River

The District supplies 5,164.9 acres of irrigated land with water sourced from the Crooked River. NUID holds a 1955 and 1968 water right allowing for a maximum diversion rate of 200 cfs of live flow from the Crooked River. The District also purchases additional storage of up to 10,000 acre-feet/year from Prineville Reservoir. Water sourced from Prineville Reservoir can be used to supplement water sources from the Deschutes River across the District. With the DBHCP in effect, it is estimated that NUID would increase use of Prineville Reservoir water rights, except in very dry years, to address the declining reliability of the stored water supply from Wickiup Reservoir (NMFS and USFWS 2020). Irrigation water stored in Prineville Reservoir is conveyed through the Crooked River and diverted at the Crooked River Pumping Plant (RM 27.3). The District withdraws

[18] Current normal year diversions average 200,000 acre-feet at the NUID Bend Diversion (L. Windom, personal communication, May 6, 2021)

[19] Normal years are defined as years with a 50 percent exceedance water supply, when half of all years have a greater water supply and half of all years have a lesser water supply.

[20] Dry years are defined as years with an 8 percent exceedance water supply, where 80 percent of all years have a greater water supply and 20 percent of all years have a lesser water supply.

an average of 17,521 acre-feet/year from the river (L. Windom, personal communication, May 3, 2021).

4.8.2 Surface Water Hydrology

Table 4-5 presents waterbodies associated with District operations.

Table 4-5. Waterbodies Associated with District Operations

Name	Associated River Miles	Size	Tributary To	Project Nexus
Wickiup Reservoir	N/A	200,000 acre-feet	N/A	NUID holds 200,000 acre-feet of stored water rights in this reservoir.
Deschutes River	Wickiup Reservoir (RM 226.8) to North Canal Dam (RM 164.8)	N/A	Columbia River	Releases from Wickiup Reservoir affect flow in this reach.
Deschutes River	North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	N/A	Columbia River	During the irrigation season, the NUID Bend diversion at RM 164.8 affects downstream flow. During the non-irrigation season, releases from Wickiup Reservoir affect downstream flow.
Prineville Reservoir	N/A	150,216 acre-feet	N/A	NUID purchases up to 10,000 acre-feet/year of stored water in this reservoir.
Crooked River	Prineville Reservoir (RM 70) to mouth	N/A	Deschutes River, confluence at Lake Billy Chinook (RM 120)	Releases from Prineville Reservoir affect flow in this reach. During the irrigation season, NUID's withdrawal of water at RM 27.3 affects downstream flow. The conveyance system in the project area terminates at two locations near the Crooked River that operationally discharge an average of 800 acre-feet/year to the Crooked River at RM 18.5 during the irrigation season (L. Windom, personal communication, May 3, 2021).
Lake Billy Chinook	N/A	500,000 acre-feet	N/A	Operational spills at Lateral 43 discharge an average of 600 acre-feet/year to Lake Billy Chinook (L. Windom, personal communication, May 3, 2021).

Name	Associated River Miles	Size	Tributary To	Project Nexus
Unnamed Ephemeral Creek	RM 5.4 to mouth	N/A	Willow Creek	Operational spills at Lateral 43-10 discharge an average of 600 acre-feet/year to the unnamed ephemeral creek and down to Willow Creek (L. Windom, personal communication, May 3, 2021).
Willow Creek	RM 1 to mouth	N/A	Lake Simtustus	Operational spills at Lateral 43-10 affect streamflow in this reach.

N/A = not applicable

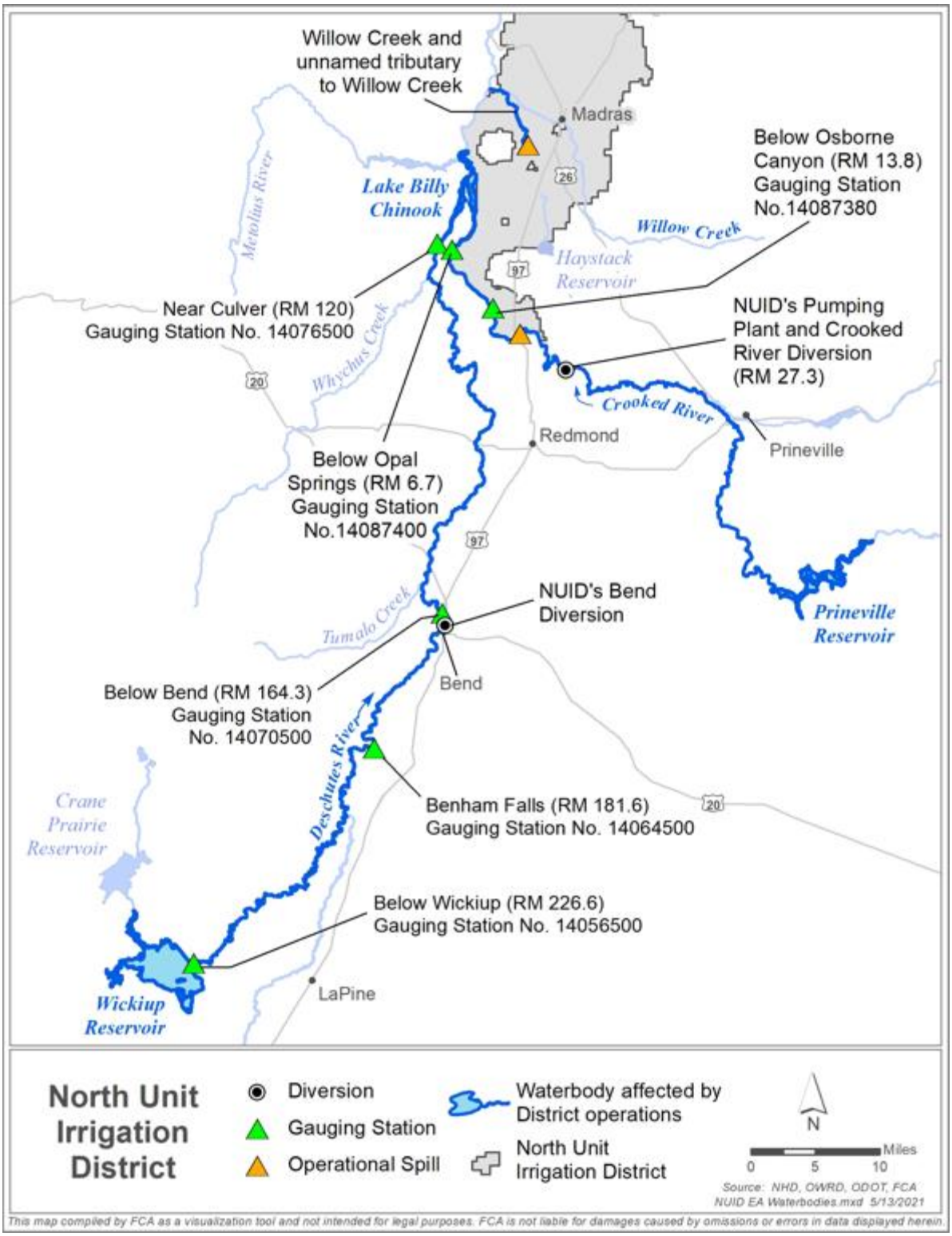


Figure 4-3. Waterbodies Associated with District Operations in the project area and locations of streamflow gauging stations.

4.8.2.1 Wickiup Reservoir

Wickiup Reservoir relies on snowmelt, releases from Crane Prairie Reservoir, and precipitation for inflow. Throughout the year, water is released from Wickiup Reservoir as directed by OWRD Regional Watermaster. Water is released in accordance with the DBHCP and through an accounting arrangement with the Central Oregon Irrigation District (COID), NUID, Lone Pine Irrigation District (LPID), and Arnold Irrigation District (AID) for storage that is balanced over the course of the irrigation season. During the irrigation season, water released from Wickiup Dam is conveyed through the Deschutes River to NUID, COID, and AID diversions in Bend. During the non-irrigation season, water released from the reservoir is conveyed down the Deschutes River to Lake Billy Chinook (RM 120).

The DBHCP guides reservoir operations, and a summary of the reservoir operation measures set forth by the DBHCP can be found in Appendix E.5. Flow releases from Wickiup Reservoir will be increased in year 8 and year 13 of the DBHCP. Increased flow releases are expected to reduce the amount of water stored in the reservoir for District use, with the greatest declines occurring following year 13 (i.e., January 2033) of the DBHCP (NMFS and USFWS 2020). Modeling projects that in a normal water year following year 13 of the DBHCP, the volume of water stored in the reservoir will be 75,334 acre-feet less than historical volumes[21] (NMFS and USFWS 2020).

4.8.2.2 Deschutes River from Wickiup Reservoir (RM 226.8) to the NUID Bend Diversion at North Canal Dam (RM 164.8)

Reservoir releases, tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in the Deschutes River from Wickiup Reservoir (RM 226.8) to the NUID Bend Diversion at North Canal Dam (RM 164.8). Target flows in this reach are set forth in the DBHCP; they are summarized in Appendix E.5.

Figure 4-4 and Figure 4-5 display the Deschutes River's daily average baseline streamflow following the 2016 Settlement Agreement.[22] Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2020 water years.

[21] From 2002 through 2015, annual use of storage water in Wickiup Reservoir averaged 122,387 acre-feet and ranged from 69,024 to 175,816 acre-feet (NMFS and USFWS 2020). Maximum storage capacity of Wickiup Reservoir is 200,000 acre-feet.

[22] In 2016, as part of an interim agreement until the finalization of the DBHCP, NUID 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 DBHCP in 2020.

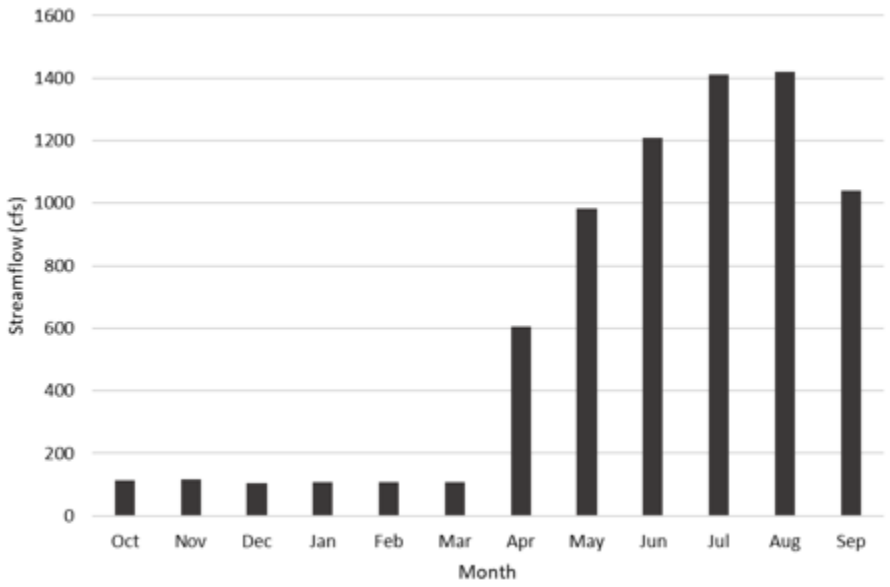


Figure 4-4. Median daily average streamflow by month in the Deschutes River downstream from Wickiup Reservoir at OWRD Gauge No. 14056500.

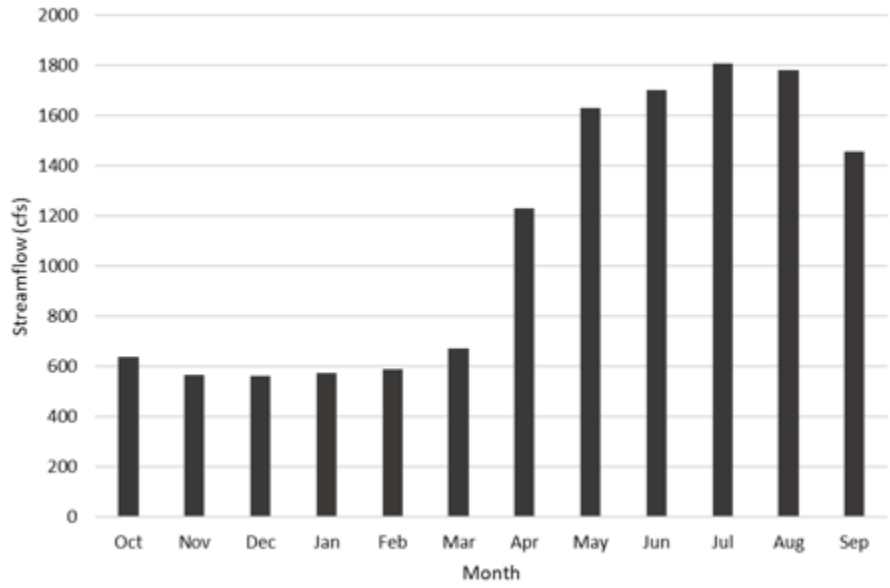


Figure 4-5. Median daily average streamflow by month in the Deschutes River at Benham Falls at OWRD Gauge No. 14064500.

4.8.2.3 Deschutes River from NUID Bend Diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)

NUID, LPID, AID, COID, and the Swalley Irrigation District 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. During the summer irrigation season, the irrigation districts currently maintain approximately 130 cfs downstream from their diversions at the City of Bend.

Figure 4-6 displays the Deschutes River's streamflow downstream from the City of Bend. The figure shows the daily average streamflow following the 2016 Settlement Agreement (October 2016 to September 2020).

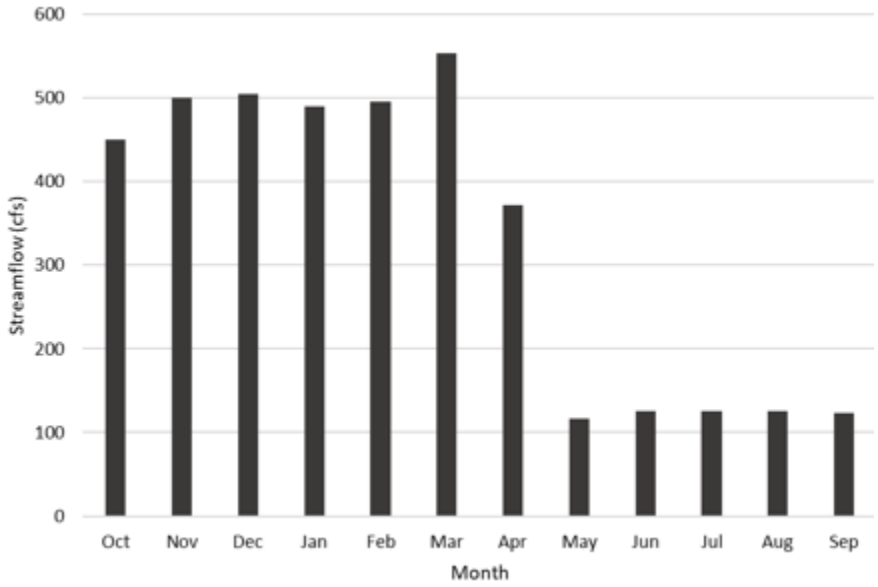


Figure 4-6. Median daily average streamflow by month in the Deschutes River downstream from the City of Bend at OWRD Gauge No. 14070500.

This reach of the Deschutes River has pending instream water rights that serve as preliminary streamflow restoration targets (see Appendix E.5). ODFW's pending water right requests a year-round flow of 250 cfs; this would provide a target for what flows are needed for fish and wildlife and their respective habitat quality, as well as for recreation. This reach extends from the North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120).

4.8.2.4 Prineville Reservoir

Prineville Reservoir has a storage capacity of 150,216 acre-feet and is used for irrigation and flood control. Reclamation requires that 60,000 acre-feet of storage space be reserved for flood control between November 15 and February 15 each year. After February 15, the reserved space may be filled according to a fill rule curve developed by Reclamation and USACE (OID 2012).

Releases from Prineville Reservoir are gauged (Gauge No. 14080500), and the reservoir elevation is measured (Gauge No. 14080400). Irrigation water released for NUID's consumption is conveyed through the Crooked River and diverted at the NUID Pumping Plant (RM 27.3).

Due to DBHCP measures, NUID is expected to use its available stored water from Prineville Reservoir more frequently and to a greater extent (NMFS and USFWS 2020). The DBHCP measures, combined with increased winter minimum flows in the Crooked River, would reduce

water stored in Prineville Reservoir in dry and very dry years (NMFS and USFWS 2020). Modeling projects that reductions would range from 7,946 acre-feet in a dry year to 14,328 acre-feet in a very dry year (NMFS and USFWS 2020).

4.8.2.5 Crooked River from Prineville Reservoir (RM 70) to the NUID Pumping Plant (RM 27.3)

Reservoir releases, tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in the reaches of the Crooked River from Prineville Reservoir (RM 70) to the NUID Crooked River Pumping Plant (RM 27.3) (Figure 4-7). Target flows in this reach are set forth in the DBHCP, which requires a minimum winter flow of 50 cfs at the Reclamation gauge (RM 70) near the base of Bowman Dam.

Due to DBHCP measures, NUID is expected to use its available stored water from Prineville Reservoir more frequently and to a greater extent (NMFS and USFWS 2020). Correspondingly, reservoir releases during the irrigation season are expected to increase following year 8 of the DBHCP (i.e., January 2028), and flow downstream from the reservoir would increase accordingly. (NMFS and USFWS 2020). This reach of the Crooked River has a pending instream water right applied for by ODFW. This pending water right, shown in Table 4-6, provides one target for what flows are needed for fish and wildlife and their respective habitat quality, as well as for recreation between the Bowman Dam (RM 70) to Lake Billy Chinook (mouth).

Table 4-6. Pending Instream Water Right on the Lower Crooked River

Instream Rates (cfs)											
Jan-Feb 14	**Feb 15-28**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
75	150	255	255	255	150	75	75	75	75	75	75

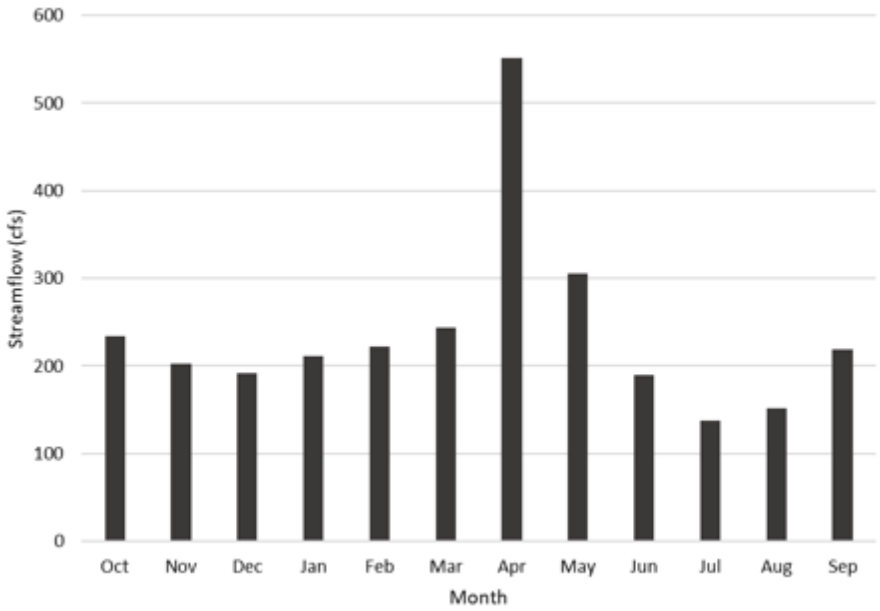
Source: Water rights application S-70354
Note: The place of use for this water right is the Crooked River from Bowman Dam to Lake Billy Chinook.

4.8.2.6 Crooked River from NUID Pumping Plant (RM 27.3) to Lake Billy Chinook (mouth)

NUID manages its pumping from the Crooked River so as not to decrease streamflow downstream from the District's Crooked River Pumping Plant below specified rates. These rates are identified in a collaborative agreement between the District and the Deschutes River Conservancy (NMFS and USFWS 2020). The rates are based on the volume of water conserved through the District's previous conserved water projects and the District's historical pattern of use from the Crooked River (NMFS and USFWS 2020).

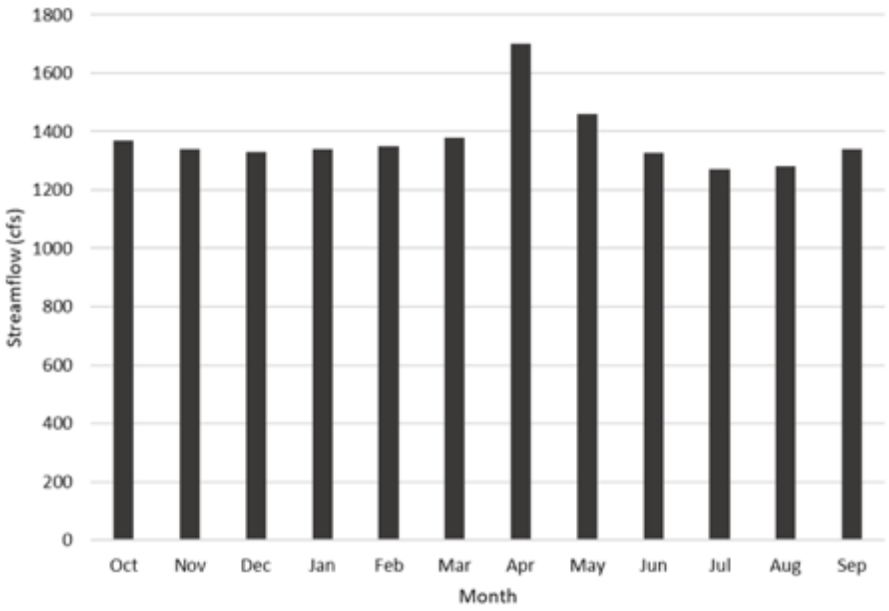
NUID manages two operational spills that discharge irrigation tailwater into the Crooked River; both are located at about RM 18.5 (Figure 4-3). The District estimates that on average, it operationally discharges about 400 acre-feet of water/year into the Crooked River at each spill (L. Windom, personal communication, May 4, 2021).

Flows in this reach are illustrated in Figure 4-7 and Figure 4-8. OWRD Gauge No. 14087380 at Osborne Caynon is located at RM 13.8. OWRD Gauge No. 14087400 at Opal Springs is located at RM 6.7.



Note: Data represent the 2003 through 2020 water years.

Figure 4-7. Daily average streamflow in the Crooked River below Osborne Canyon at OWRD Gauge No. 14087380.



Note: Data represent the 2003 through 2020 water years.

Figure 4-8. Daily average streamflow in the Crooked River below Opal Spring at OWRD Gauge No. 14087400.

4.8.2.7 Lake Billy Chinook

Lake Billy Chinook is the uppermost of the three reservoirs on the Deschutes River that comprise the Pelton/Round Butte Project. The reservoir has a storage capacity of 500,000 acre-feet. Throughout the year, water is released from the reservoir for power generation as directed by

Portland General Electric Company (Oregon Water Resources Department 2006). Built in 1964, inflows to the reservoir come from three sources: the Crooked, Deschutes, and Metolius rivers. There is also significant groundwater inflow to the reservoir (Gannet et al. 2001).

4.8.2.8 Unnamed Ephemeral Creek from NUID's Operational Spill (RM 5.4) to Willow Creek (Mouth)

NUID manages an operational spill that discharges into an unnamed ephemeral creek which is a tributary to Willow Creek (Figure 4-3). The District estimates that on average, it discharges about 600 acre-feet of water/year into this creek (L. Windom, personal communication, May 4, 2021).

4.8.2.9 Willow Creek (RM 1) to Lake Simtustus (Mouth)

Willow Creek is an intermittent creek that discharges to Lake Simtustus. Tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in Willow Creek. Higher flows occur during the winter in response to rain and snow events (ODA 2018). During the irrigation season, irrigation withdrawals upstream of Madras reduce the flows to nearly nothing, and the creek remains dry until RM 1.5 where groundwater springs increase flows (ODA 2018).

4.8.2.10 Drainage Courses

The District does not allow its canal and lateral system to be intentionally used for stormwater management. Any interception of stormwater, associated with overland flow in the area adjacent to the District's conveyance system, is incidental to the purpose of conveying water for irrigation. Due to the geology and climate of the area, these occurrences are minimal.

4.8.3 Surface Water Quality

The Oregon Department of Environmental 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 Clean Water Act (CWA) (33 USC 1251 et seq.). The 2012 303(d) list is effective for CWA purposes. Waterbodies associated with District operations are included on Oregon's 303(d) list for not meeting state water quality standards for temperature, dissolved oxygen, pH, and *E. coli* (Table 4-7).

Water management and land use change in the Deschutes Basin have altered seasonal streamflow patterns, which have increased streamflow above historical levels in some reaches and decreased streamflow below historical levels in other reaches. Low flow affects water quality in the Deschutes and Crooked rivers by exacerbating temperature and dissolved oxygen problems. In addition, water quality often dictates the spread and extent of invasive aquatic species, and these problems interact synergistically to degrade wildlife habitat within and around the Deschutes River (USFWS 2017). DEQ is required to develop total maximum daily loads for rivers and streams (these impairments may extend upstream or downstream of the reaches included in Table 4-7.

As discussed in Section 4.8.2, the District manages four operational spills within the project area. These operational spills discharge irrigation tailwater into waterbodies affected by District operations (Table 4-5). Irrigation tailwater at these sites has the potential to carry high loads of sediment and nutrients, thereby reducing water quality (L. Windom, personal communication, May 3, 2021).

Table 4-7 Impaired Waterbodies Associated with District Operation.

Waterbody	River Mile Associated with District Operations	Parameters Included on Oregon's 303(d) List
Wickiup Reservoir	N/A	Aquatic weeds or algae
Deschutes River	Wickiup Reservoir (RM 226.8) to NUID's Bend Diversion at North Canal Dam (RM 164.8)	Temperature, dissolved oxygen, pH sediment, turbidity, chlorophyll a
Deschutes River	NUID's Bend Diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	Temperature, dissolved oxygen
Crooked River[1]	Prineville Reservoir (RM 70) to the mouth (RM 0)	Temperature, dissolved oxygen, pH, *E. coli*, biological criteria
Lake Billy Chinook	N/A	Chlorophyll a
Willow Creek	Inflow from unnamed ephemeral creek (RM 1) to the mouth (RM 0)	Temperature

[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.
Source: Oregon Department of Environmental Quality 2012

4.8.4 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. The District's conveyance system shows seepage losses due to the area's permeable geology. A loss assessment study in 2017 measured up to 6,089 acre-feet of loss in NUID's laterals 31, 32, 34, and 43 due to seepage and evaporation (NUID 2017; Appendix E.5). A groundwater flow model (Gannett et al. 2001) suggests that the loss associated to seepage enters the region's groundwater system and discharges into the Crooked River.

Groundwater also discharges into the Crooked River at Opal Springs (RM 6.7). Groundwater that recharged regionally through the more permeable Deschutes Formation is blocked by the John Day Formation and is prevented from moving north. This groundwater instead discharges into the Crooked River at Opal Springs (RM 6.7) and areas downstream (Gannett et al. 2001).

OWRD has identified the Upper Deschutes Basin as a Groundwater Restricted Area for which mitigation is requred for impacts to the Deschutes Scenic Waterway (see Table 3-1). Groundwater wells for domestic and agricultural uses are prevalent in the area.

4.8.5 Ecosystem Services

Water flowing through the Deschutes and Crooked rivers would provide the following ecosystem services:

- *Provisioning service: Water available for irrigation (Figure 4-1 [E1])*: As described in Sections 1.3 and 4.8, water from the Deschutes and Crooked rivers is diverted or pumped, respectively, into the District's irrigation conveyance system and delivered to patrons for agricultural purposes. This water is used for food production, feed production, and maintenance of agricultural lands. High-value vegetable seed crops, including 55 percent of the nation's hybrid carrot seed, are grown in the District. This water is also used to grow feed grasses, such as hay and pasture, which contribute to the production of meat and dairy products. The annual volume of water delivered for irrigation provides a metric for water available for irrigation. Per District conveyance efficiency estimates detailed in Appendix D 1.2.1.1, NUID can deliver approximately 126,000 acre-feet of water per year to irrigators during a median year. However, on-farm demand in NUID is estimated to be approximately 151,500 acre-feet per year when factoring on-farm irrigation efficiency. This results in a water supply deficit of nearly 25,500 acre-feet (Section 4.2.3; Appendix D 1.2.1.1). With implementation of the DBHCP provisions in 2030, these shortages are expected to increase (NMFS and USFWS 2020).
- *Regulating Service, Water Quality (Figure 4-1 [E2]):* The amount of water instream affects water quality including temperature, turbidity, sediment, and pollutants. In general, low streamflow challenges a waterbody's ability to resist warming because small water volumes heat at faster rates than larger water volumes. Because of this property, greater instream flow can help to keep water cool—an important factor for temperature-sensitive aquatic species living in these stream habitats (Section 4.9). In the cold winter months, the banks of waterbodies with low streamflow are susceptible to freeze-thaw cycles that can increase bank erosion and increase sediment in the water. Given pollutant input, less water may also lead to higher concentrations of pollutants than does more water. Therefore, greater streamflow may also help to dilute pollutants. Section 4.8.3 describes surface water quality in the waterbodies associated with District operations.

4.9 Fish and Aquatic Resources

4.9.1 General Fish and Aquatic Species

4.9.1.1 Within the Project Area

The District's conveyance system does not support resident or anadromous fish or threatened and endangered aquatic species. Fish screens are present at the North Canal Dam and at the District's Bend Diversion. 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. The fish screens are scheduled to be replaced in the coming decade (L. Windom, personal communication, April 30, 2021).

The bullfrog (*Lithobates catesbeianus*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris regilla*), and long-toed salamander (*Ambystoma macrodactylum*) may be present in open irrigation canals and

adjacent banks where there is suitable vegetation (S. Wray, personal communication, November 17, 2017). All these amphibians are listed as species of least concern by the International Union for Conservation of Nature (2021).

The bullfrog is an invasive species that was introduced to Oregon in the early 1900s. Bullfrogs have the potential to exist in and along the District's canals, but their presence has not been reported likely due to the fast-moving irrigation water.

4.9.1.2 Within Waterbodies Associated with District Operations

There are 16 species of fish and mollusk documented in the waterbodies associated with District operations (Appendix E, Table E-16). All 16 fish and mollusk 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 70 to its confluence with Lake Billy Chinook.

The summer steelhead, Chinook salmon, and sockeye salmon in these waterbodies are part of a reintroduction effort that began in 2009 to mitigate for fish passage impairments at the Pelton Round Butte Dam Complex (ODFW and CTWS 2008). Chinook and sockeye salmon are unable to navigate Steelhead Falls at RM 128; summer steelhead are able to pass upstream of Steelhead Falls but are unable to navigate upstream of Big Falls at RM 132 (Oregon Department of Fish and Wildlife 1996). In the Crooked River, Bowman Dam at RM 70 is a barrier to fish passage.

In addition to fish, other aquatic species are potentially found within or along waterbodies that are associated with District operations (Figure 4-3). These other aquatic species include bullfrog, Oregon spotted frog, western toad, Pacific treefrog, and long-toed salamander. The Oregon spotted frog was listed as threatened under the ESA of 1973 (see Section 4.9.2).

Under the adopted DBHCP measures, surface hydrology in the Deschutes River will begin to resemble its historical conditions with more constant river levels year-round. From current conditions, streamflow will increase in the non-irrigation season beginning in 2028 and will be accompanied by corresponding decreases in summer streamflow (Section 4.8.2). Streamflow changes will occur in a phased approach over the life of the DBHCP to allow time for the river environment and fish and aquatic species to adjust to more natural conditions (NMFS and USFWS 2020). Overall, implementation of the DBHCP is expected to benefit fish and aquatic species in the Deschutes River (NMFS and USFWS 2020).

In the Crooked River between Bowman Dam (RM 70) and Lake Billy Chinook (RM 0), under the adopted DBHCP measures, surface hydrology will be more variable to meet irrigation demands of the District. As a result of the DBHCP and because of various conservation measures outlined in the DBHCP, overall, no adverse effects are expected to be incurred by fish and aquatic species or their habitats in this reach of the Crooked River (NMFS and USFWS 2020).

4.9.2 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 (Figure 4-3) was obtained using the USFWS Environmental Conservation Online System

Information for Planning and Consultation (IPaC) System. IPaC indicated that three federally listed fish and aquatic species— Oregon spotted frog, bull trout, and Middle Columbia River steelhead—are or may be found in the waterbodies associated with NUID operations (USFWS 2021). None of these species is known to occur within the irrigation laterals of the project area.

The three federally listed fish and aquatic species described below—Oregon spotted frog, bull trout, and Middle Columbia River steelhead—are covered species under the adopted DBHCP. Changes to surface hydrology in both the Deschutes and Crooked rivers as a result of the DBHCP will benefit or have no adverse effect on the federally listed species (NMFS and USFWS 2020).

4.9.2.1 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), in Crane Prairie and Wickiup reservoirs, and Crescent Creek/Little Deschutes River (Appendix E; Figure E-1). Oregon spotted frog is not known to occur outside of these critical habitat areas. Habitat conditions vary widely among these areas, and the environmental baseline for the Oregon spotted frog, its habitat, and status are discussed thoroughly in three documents:

1. The 2017 USFWS Biological Opinion.[23]

2. Reinitiation of formal consultation on Bureau of Reclamation approval of contract changes to the 1938 inter-district agreement for the operation of Crane Prairie and Wickiup Dams, and implementation of the review of operations and maintenance (ROM) and Safety evaluation of existing dams (SEED) Programs at Crane Prairie and Wickiup Dams. Deschutes Project, Oregon[24] (2017-2019) (Bureau of Reclamation 2019).

3. The Final DBHCP submitted by the eight irrigation districts of Deschutes Basin to USFWS and National Marine Fisheries Service (NMFS) (NMFS and USFWS 2020).

Because the 2017 USFWS Biological Opinion and DBHCP address the Oregon spotted frog environmental baseline, they are hereby incorporated by reference (Appendix E.6). Streamflow changes that occur because of DBHCP measures function to improve, where possible, Oregon spotted frog critical habitat (NMFS and USFWS 2020).

USFWS has identified Primary Constituent Elements (PCEs) for Oregon spotted frog critical habitat (81 Federal Register [FR] 29335, 2016). PCEs represent the biological and physical features that are essential to the conservation of a species and describe habitat components that support one or more life stages of the species. PCEs for Oregon spotted frog describe areas that have appropriate water

[23] The 2017 USFWS Biological Opinion discusses changes to the 1938 Inter-District Agreement for the Operation of Crane Prairie and Wickiup Dams and implementation of the Review of Operations and Maintenance and Safety Evaluation of Existing Dams programs at Crane Prairie and Wickiup Dams in Deschutes County, Oregon (Reclamation 2017). This biological opinion was updated in 2019.

[24] The review of Crane Prairie and Wickiup Dam procedures and programs included review of operation and maintenance and safety evaluation of existing dams programs. See the 2017 USFWS Biological Opinion cover page in Appendix E.6, Figure E.3.

depths and refuge from predators, aquatic connectivity, and absence of nonnative predators. A detailed list of Oregon spotted frog critical habitat PCEs is provided in Appendix E.6.

4.9.2.2 Bull Trout

USFWS lists bull trout as threatened under the ESA. For bull trout above the Pelton Round Butte Project, all spawning and rearing occurs in the Metolius subbasin, and foraging by adult and subadult bull trout occurs in the Deschutes and Crooked rivers (NMFS and USFWS 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 (15.0 degrees Celsius or less). Streamflow changes in the Deschutes River resulting from implementation of the DBHCP will not affect bull trout in the summer but may improve current conditions for foraging adults in the winter months.

In the Crooked River, bull trout have used the new Opal Springs fish ladder to achieve both upstream and downstream passage past Opal Springs Dam (RM 7.2) since November 2019. This fish ladder has opened access to all suitable habitat in the Crooked River and its tributaries up to Bowman Dam (RM 70). Significant cold groundwater discharge from springs along the Crooked River 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 likely preclude bull trout from foraging upstream of RM 13.8. Streamflow changes because of the DBHCP will not have an appreciable effect on water temperatures; bull trout are not expected to move upstream beyond RM 13.8 in the summer months.

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 RM 30.15 downstream to Lake Billy Chinook (RM 0.0) (Appendix E, Figure E-1). The PCEs for bull trout describe habitat that has aquatic connectivity, complex habitat structure, water temperatures ranging from 2 to 15 degrees Celsius, natural variability in streamflow, a sufficient food base, and the absence of nonnative predatory and competing fish (70 Fed. Reg. 56211, 2005). A detailed list of critical habitat PCEs for bull trout is provided in Appendix E.6.

4.9.2.3 Middle Columbia River Steelhead

Steelhead populations listed as threatened under the ESA are present within the area affected by the project (Appendix E; Figure E-2). However, the population in the 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 the ESA, and critical habitat has not been designated (76 Fed. Reg. 28715, 2011). Because of this classification and because the non-essential experimental population is located outside of 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 the ESA.

Middle Columbia River steelhead are present in the Deschutes and Crooked rivers. In the Deschutes River, steelhead are known to be present up to Big Falls (RM 132), which is a natural barrier. Habitat

and water temperatures downstream of Big Falls can typically support the life stages of steelhead in the cooler months of October through April. Generally, streamflow changes because of the DBHCP are not expected to appreciably affect steelhead habitat or water temperatures (NMFS and USFWS 2020).

In the Crooked River, steelhead can access all suitable habitat between the Crooked River arm of Lake Billy Chinook (RM 0) and Bowman Dam (RM 70); however, water temperature and channel depth are the primary limiting factors. During most life stages, and for the entirety of the Crooked River downstream of Bowman Dam (RM 70), water temperature is suitable for steelhead generally between the end of October through April. The cooling effect of cool water released from Prineville Reservoir via Bowman Dam is beneficial for young steelhead in the summer months. Streamflow changes in the Crooked River because of the DBHCP will not affect steelhead life stages in the summer months, but they will have a beneficial effect for steelhead in the winter (NMFS and USFWS 2020).

Coordination and consultation with USFWS and NMFS, and associated outcomes, are detailed in Sections 6.9.2.2 and 7.

4.9.3 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). Oregon spotted frog is state-listed as threatened and is known to occur within waterbodies associated with NUID operations. There are no state-listed threatened, endangered, or candidate fish or aquatic species known to occur in the irrigation laterals within the project area.

4.9.4 Ecosystem Services

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

- *Culturally important species (Figure 4-1[E3]):* 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 anadromous fish and aquatic life has come to represent the restoration of the Deschutes Basin ecosystem. In addition, members of the CTWS have fishing rights and rely on the Deschutes River fisheries for subsistence.

  Pacific salmon are a premier cultural icon of the West Coast where they contribute to educational, recreational, and community values. Of particular importance are the roles that Pacific salmon hold to native traditions and religious practices (Bottom et al. 2009). The Deschutes Basin is part of the ceded lands of the CTWS with usual and accustomed fishing stations. The basin provides subsistence and ceremonial fisheries for tribal members under

fishing rights reserved by their treaty with the U.S. Government (Treaty with the Tribes of Middle Oregon 1855, 12 Stats., 963., Ratified Mar. 8, 1859).

Salmon and steelhead populations have dwindled over the years because of impacts to habitat; however, CTWS has been working in the basin to rebuild these populations for conservation purposes and to provide consistent harvest opportunity (Confederated Tribes of Warm Springs 2019; Portland General Electric 2015)

4.10 Wetlands and Riparian Areas

Wetland and riparian areas affected by District operations have the potential to occur in two areas: the project area and 18.5 miles of the Crooked River downstream from the NUID spills (Table 4-5; Figure 4-3).

Wetlands perform a number of valuable functions including water storage, water filtration, and biological productivity. They 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 state Removal-Fill Law.

USACE administers Section 404 of the CWA with the oversight of the U.S. Environmental Protection Agency (EPA). This law regulates the placement of dredged or fill material in wetlands and other waters over which 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" (U.S. Army Corps of Engineers 1986).

The Oregon Department of State Lands (ODSL) implements the state's Removal-Fill Law (ORS 196.800-990), which regulates the removal or fill of material in wetlands or waterways. The law requires 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 OAR 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.
- The ditch is dewatered[25] outside of the irrigation season except for isolated puddles in low areas.

[25] Dewatered means that the source of the irrigation water is turned off or diverted from the irrigation ditch. A ditch that is dewatered outside of the irrigation season may be used for temporary flows associated with stormwater collection, stock water runs, or fire suppression.

On July 24, 2020, USACE and EPA signed a memorandum providing a clear, consistent approach regarding the application of the exemptions from regulation under Section 404(f)(1)(C) of the CWA for the construction or maintenance of irrigation ditches and for 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[26] constructed in jurisdictional wetlands or other Waters of the U.S. may not meet this exemption.

Riparian areas are transition zones between waterbodies and adjacent upland areas and support hydrophytic vegetation that is dependent upon the hydrology of the waterbody. As defined by Section 404 of the CWA, riparian areas are "areas next to or substantially influenced by water. These riparian areas may include areas adjacent to rivers, lakes, or estuaries" (U.S. Environmental Protection Agency 2015). Riparian areas are typically associated with high water tables due to their close proximity to aquatic ecosystems, certain soil characteristics, and a range of vegetation that requires free water or conditions that are moister than normal (Oakley et al. 1985).

4.10.1 Wetland and Riparian Areas Along the Project Area

Water typically flows through laterals in the project area during the irrigation season between April 1 and October 31. Water may also occasionally be present in these laterals outside of the irrigation season as standing water following rain or snow events. Wetlands adjacent to irrigation canals, laterals, and ditches are generally not regulated under Section 404 of the CWA as long as the conveyance infrastructure was not constructed through previously existing jurisdictional waters. Hydrophytic plants are sometimes found along the banks of irrigation laterals within the project area, or in adjacent low-lying areas outside of the project area, as the hydrology provided by the laterals can create favorable growing conditions during a portion of the year. However, the District actively keeps the lateral banks clear of vegetation, and therefore, riparian vegetation is limited.

Analysis of the National Wetland Inventory[27] (NWI) geographic information systems data (U.S. Fish and Wildlife Service [USFWS] 2016) and aerial imagery identified no wetland sites in the project area. NWI data was used as a first step in identifying and evaluating potential wetlands in the project area; however, at the time of writing this Plan-EA, a wetland delineation had not yet been conducted.[28]

[26] Irrigation ditches in the NUID system are not drainage ditches; they do not intentionally accept water for any other use.

[27] 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).

[28] Consultation with ODSL and USACE would occur prior to project implementation to determine whether a wetland determination or wetland delineation would occur and whether state and federal exemptions would apply to laterals in the project area.

4.10.2 Wetland and Riparian Areas Along Natural Waterbodies Associated with District Operations

Wetlands and riparian areas of varying size and quality are found within and sporadically adjacent to 18.5 miles of Crooked River downstream from the District's operational spill (RM 18.5). Low streamflow associated with upstream reservoir operations and irrigation withdrawals limits riparian vegetation and water availability 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 (National Research Council 2002). As riparian areas become hydrologically disconnected from their adjacent stream channels with reduced streamflow, they lose many of their ecological functions.

4.11 Wildlife Resources

4.11.1 General Wildlife

Generally, wildlife present within NUID'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, elk, coyote, skunk, grey squirrel, raccoon, and red-tailed hawk (Blair 1996; Ditchkoff et al. 2006; McKinney 2002; and Shochat et al. 2006).

Wildlife within the project area may use the laterals as a water source and dispersal corridor. Additionally, where not cleared, vegetation along the laterals can provide food, cover, and breeding sites for many wildlife species throughout the year. Interaction between large ungulates and open conveyance infrastructure sometimes results in wildlife injury or death if the animal falls into the open canal and is unable to find its way out (G. Jackle, personal communication, November 15, 2019).

Outside of the project area, wildlife also populate the banks of the Deschutes and Crooked rivers and other waterbodies listed in Table 4-5. Wildlife may use the river for water and the banks for habitat.

4.11.2 MBTA/BGEPA Species

Multiple bird species have the potential to occur within or closely proximate to the project area. Although migratory birds are known to travel through the project area and its vicinity, limited habitat is provided within the project area and in Reclamation and NUID ROW and easements due to maintenance activities that remove vegetation on an annual basis.

USFWS maintains a database of known golden and bald eagle nesting sites. Early coordination with a USFWS biologist regarding Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) species is ongoing. There are no known bald or golden eagles or nests within the project area that are protected under the BGEPA (E. Weidner, personal communication, February 24, 2021).

A list of migratory birds that may occur within the project area or near waterbodies affected by District operations is provided in Appendix E.7, Table E-17. These birds are protected under the MBTA.

4.11.3 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 the potential to occur within the project area (USFWS 2021). Federally listed aquatic species are discussed in Section 4.9.2.

4.11.4 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 state-listed terrestrial wildlife species known to occur within the project area.

5 Alternatives

5.1 Formulation Process

In 2016, the District worked with Black Rock Engineering to perform a water loss assessment and to identify potential energy and water conservation projects along District-owned infrastructure. The result of this work was the SIP (NUID 2017) which included a 10 percent engineering design of the entire system as a piped system and the associated costs, energy conservation/generation, and potential water savings. Since the completion of the SIP, the District has worked with stakeholders and NRCS to identify watershed problems and resources concerns related to District operations (Section 2) and to identify which projects outlined in the SIP would be eligible for P.L. 83-566 funding and help address these problems and concerns.

Eight action alternatives and one No Action Alternative were initially considered during the scoping process. The formulation of alternatives followed CEQ regulations for implementing NEPA and numerous USDA-NRCS watershed planning policies. Scoping comments were also incorporated into the formulation process for alternatives.

When formulating an alternative, it was first determined whether the alternative met the project's purpose and need. After considering whether the alternative met the project's purpose and need, the alternatives of conversion to dryland farming, voluntary duty reduction, partial use of groundwater, on-farm efficiency upgrades, piping private laterals, and piping the entire District were initially considered,[29] but they were eliminated from further analysis. More information on these alternatives and why they were eliminated during the formulation stage can be found in Appendix D.2.

5.2 Alternatives Eliminated from Detailed Study

The following describes an alternative that met the formulation criteria but was not analyzed in detail as a viable alternative after further consideration.[30]

[29] These alternatives were analyzed for four criteria: completeness, effectiveness, efficiency, and acceptability (NRCS PR&G 2017). Some of the initial alternatives considered did not meet these formulation criteria and were eliminated from further analysis see Appendix D.2.

[30] Alternatives that do not address the purpose and need for action, do not achieve the Federal Objective (Chapter 2) and Guiding Principles (Appendix E.9), or become unreasonable because of cost, logistics, existing technology, or environmental reasons may be removed from consideration (NWPM 501.37, NRCS 2015a; NRCS PR&G 2017).

5.2.1 Canal Lining

Canal lining would cover the bottom and sides of the currently open laterals within the project area with a geotextile liner and shotcrete to prevent water from seeping into the underlying soils and rock. Canal lining would require preparing the subgrade, installing a geotextile liner, and applying a layer of shotcrete to protect the geotextile liner across the open laterals.

Lining would increase water velocity in the laterals because the shotcrete cover is a smoother surface than the existing underlying rock. This would make the sides of the laterals slippery and more difficult for anyone who might accidentally fall in the water to be able to climb out. To address public safety concerns about 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 in Appendix D.3).

The canal lining alternative would meet the project purpose of conserving water; lining would reduce water loss from seepage by up to 16.8 cfs during the irrigation season (5,481 acre-feet, annually). Water loss in an open lined system is estimated at 10 percent based on canal lining studies (Swihart and Haynes 2002). Lined canals, however, are vulnerable to tears or cracks in the lining; seepage from torn or cracked lined canals can be similar to that from unlined canals.

Canal lining has a varying lifespan and can require extensive maintenance to continue operating at high efficiency (Swihart and Haynes 2002). Canal lining may be less expensive than piping to implement in its first installation cycle; however, the increased annual maintenance costs and replacement costs cause canal lining to exceed the cost of piping over a 100-year period.

In cooperation with Reclamation, a nearby irrigation district installed ten 500-foot-long sections of different lining technologies in 1991 and 1992 as part of the Deschutes Canal-Lining Demonstration Project (Swihart and Haynes 2002). Currently, 27 years after installation, most of the lining sections are degraded and in poor condition. There is widespread cracking in the shotcrete and there are holes in the lining where silt has collected; this forces the lining upward and impedes water flow in the canal.

The capital costs of canal lining were estimated based on the size of the existing open laterals. Annual operating costs associated with canal lining were estimated based on NUID's current operating budget including a 25 percent increase in equipment, maintenance, and labor costs due to the relatively fragile nature of a lined canal compared to an unlined canal. The capital costs, replacement costs, and annual O&M costs for lining the project area was estimated at $81,869,000 (2020 dollars) over 100 years. This is $47,849,000 more than the cost of the Preferred Alternative over 100 years. Based on this cost, canal lining was eliminated from further study (see Appendix D.3 for cost details). This alternative does not achieve the Federal Objective and Guiding Principles.

5.3 Alternatives Description

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

5.3.1 No Action (Future without Federal Investment)

Under the No Action Alternative, federal funding through P.L. 83-566 would not be available to implement the project. The District would continue to operate and maintain its existing system in its current condition. This alternative assumes that modernization of the District's system to meet the purpose and need 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 standard operating procedures.

The No Action Alternative would not meet the purpose and need. There would be no improvement to water loss from seepage in District infrastructure, no improvement to water delivery reliability for farmers, and tailwater would continue to be discharged into the Crooked River. Water delivery and operation inefficiencies would remain the same and potentially worsen over time. Since no water would be conserved and available for agricultural use, the No Action Alternative would not accomplish the Federal Objective to maximize sustainable economic development or to protect the environment.

5.3.2 Modernization Alternative (Future with Federal Investment)

The Modernization Alternative is NUID's desired alternative. Under the Modernization Alternative, federal funding through P.L. 83-566 would be available, and the District would convert the following 145,033 feet (27.5 miles) of laterals to pipelines: Lateral 31 (4,427 feet), Lateral 32 (3,241 feet), Lateral 34 (24,188 feet), and Lateral 43 (113,167 feet). Existing pipe that would need to be upgraded would be installed. Throughout Lateral 43, three pressure-reducing valves would be installed. Additionally, the District would construct four 1,000-cubic-yard retention ponds, each approximately 0.5 acre in size, at the terminal ends of laterals 31, 34-2, 43, and 43-10.[31, 32] These retention ponds would also be used when the District discharged remaining water out of the pipelines to allow tailwater to infiltrate into the groundwater system. Constructing these retention ponds would eliminate discharge from current operational tailwater spills into the Crooked River (RM 18.5), Lake Billy Chinook, and an unnamed ephemeral creek[33] (RM 5.4) (Figure 5-1). The retention ponds would also enable the District to winterize its system including the deliveries, pipeline, and pipeline accessories such as air vents, valves, and pressure-reducing valves. The District has determined that this alternative is technically feasible and addresses the project's purpose and need (NUID 2017).

[31] The retention ponds would be built to meet NRCS conservation Practice Standard Code 436 "Irrigation Reservoir." These retention ponds would not be lined and prior to construction, pre-engineering feasibility studies and permeability tests will occur to determine if the soils are suitable for a retention pond.

[32] Laterals 34-2 and 43-10 are sub-laterals off laterals 34 and 43.

[33] This unnamed ephemeral creek is a tributary to Willow Creek.

Construction of the Modernization Alternative would occur in two project groups over the course of 6 years. Construction would occur predominantly during the non-irrigation season (November to April) with construction beginning as early as the 2023 non-irrigation season.

Under this alternative, 153 district turnouts would be upgraded. Modifications to each turnout would include an appropriately sized tee from the mainline or lateral and may include a pressure-reducing 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 (NUID 2017; L. Windom, personal communication, May 3, 2021).

Construction of this alternative would include mobilizing and staging construction equipment, delivering pipe to construction areas; excavating trenches; fusing pipelines; placing pipe in trenches, which in some cases are below the grade of the lateral; upgrading existing outdated pipe in certain areas; compacting backfill; and restoring and reseeding disturbed areas. In some locations, construction access would need to be created before delivering pipe or equipment into construction areas and could include vegetation removal within the construction area. Appropriately sized construction 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 and will be determined prior to construction. 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 the NUID current vegetation management practices and 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 posed a safety threat to construction crews working in the lateral trench.

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

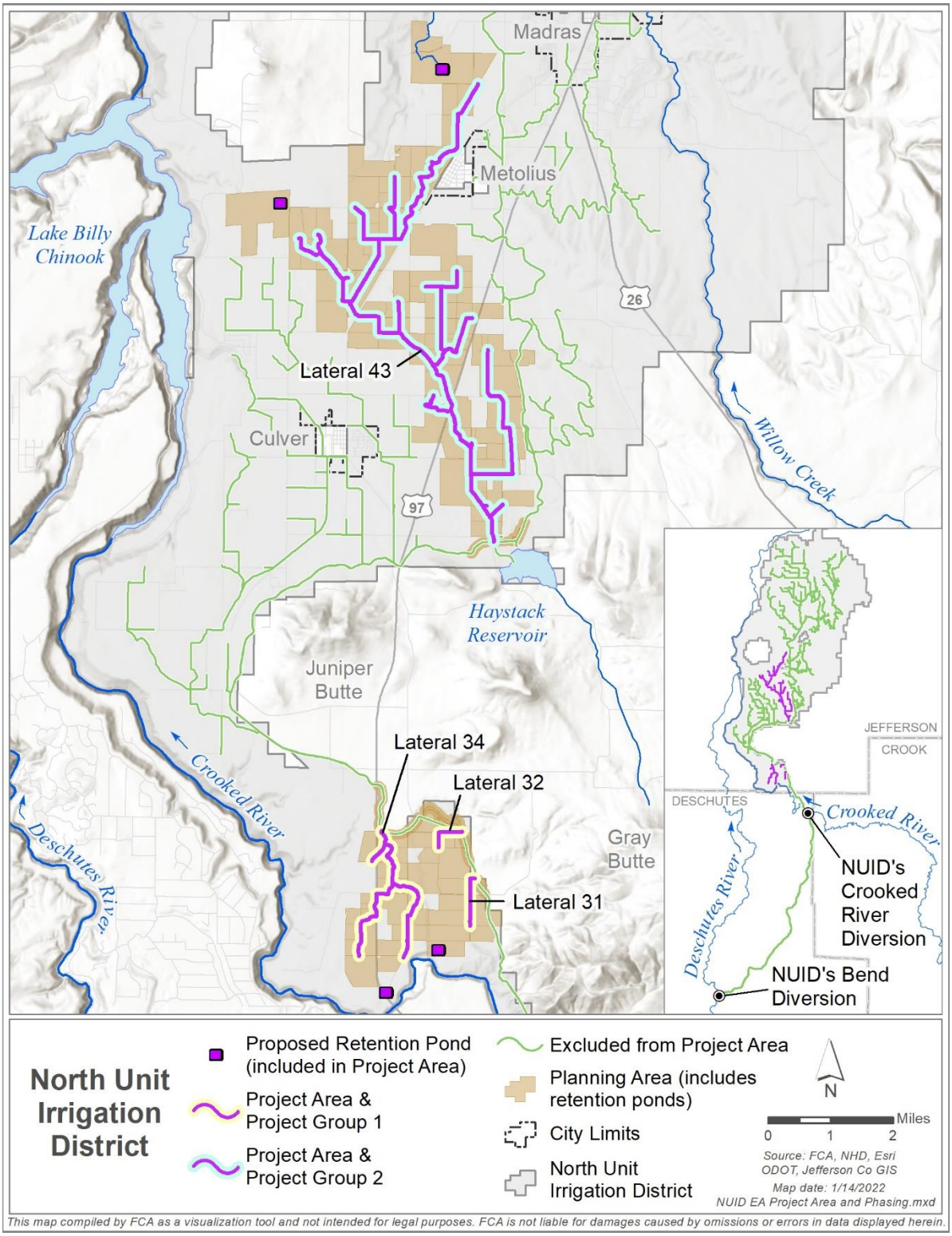


Figure 5-1. Overview of the Modernization Alternative for North Unit Irrigation District Infrastructure Modernization Project.

In some cases, temporary overland travel routes within existing NUID easements would be necessary to access certain laterals associated with the proposed action that do not have established maintenance roads. To facilitate restoration, temporary travel routes would be left in their natural condition with only minimal alterations when necessary to allow for 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.

O&M under the Modernization Alternative would be performed on an as-needed basis (L. Windom, personal communication, May 3, 2021). During the irrigation season from April to October, work would be performed on an as-needed basis. Outside the irrigation season, NUID would perform system component maintenance or repairs to District meters, valves, and air and vacuum infrastructure.

The Modernization Alternative would contribute to the sponsors' objectives and the Federal Objective and Guiding Principles as follows:

- **Improve water conservation** – This alternative would reduce water loss from seepage and evaporation in laterals 31, 32, 34, and 43 and result in an estimated annual water savings of 6,089 acre-feet.
- **Increase water delivery reliability to patrons and farms** – Modernizing laterals 31, 32, 34, and 43 would improve operational irrigation water delivery for all patrons served off these laterals and reduce the need to spill excess water. This alternative would also improve water availability and drought resilience for patrons throughout the District.
- **Reduce O&M costs** – Modernizing laterals 31, 32, 34, and 42 would eliminate the need to inspect, repair, and remove obstructions in the project area.

The estimated project cost for the Modernization Alternative including NRCS Technical Assistance and Program Administration as well as permitting would be $34,020,000 (2020 dollars). Additional information regarding the costing and the net present value of the Modernization Alternative can be found in Appendix D.4.

5.4 Summary and Comparison of Alternatives

Table 5-1 compares the No Action/Future without Federal Investment (Alternative 1) and the Modernization 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 Alternatives

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Major Features	**Laterals 31, 32, 34, and 43 remain open and four retention ponds are not installed**	**Pipe Laterals 31, 32, 34, and 43 and construct four retention ponds**
Alternative Plans		
Locally Preferred		✓
National Economic Efficiency		✓
Socially Preferred		✓
Environmentally Preferred		✓
Guiding Principles Checkmarks 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		✓

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Major Features	**Laterals 31, 32, 34, and 43 remain open and four retention ponds are not installed**	**Pipe Laterals 31, 32, 34, and 43 and construct four retention ponds**
Provisioning Services		
Irrigation Water	No effect. Irrigation water would continue to be unreliable for patrons.	Piping, pressurization, and District infrastructure upgrades would help provide more secure and reliable irrigation water for patrons.
Regulating Services		
Water Quality and Quantity	No effect. Instream water would continue to be warmer than State standards, and low-quality water discharged from operational spills would continue to contribute pollutants and warm water to surface waterbodies.	Removal of four operational spills would reduce the quantity of water discharged into surface waterbodies. However, constructing retention ponds at the site of these operation spills would reduce the potential for contaminants to be discharged into those surface waterbodies and improve water quality. The construction of the retention ponds may effect groundwater quality.
Cultural Services		
Culturally Important Species	No effect on habitat supporting populations of culturally important fish species. Habitat limitations for culturally significant anadromous fish would continue to affect fishing, community, health, cultural identity, subsistence, and religious tribal values.	No effect on habitat supporting populations of culturally important fish species. Habitat limitations for culturally significant anadromous fish would continue to affect fishing, community, health, cultural identity, subsistence, and religious tribal values.
National Economic Efficiency Analysis		
Installation Costs (2020$)[1]		
Federal P.L. 83-566	$0	$25,810,000
Local only or Matching P.L. 83-566	$0	$8,210,000

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Major Features	**Laterals 31, 32, 34, and 43 remain open and four retention ponds are not installed**	**Pipe Laterals 31, 32, 34, and 43 and construct four retention ponds**
Total	$0	$34,020,000
Average Annual Cost		
Installation[2]	$0	$859,000
Other	$0	$859,000
Total	$0	$0
Annual Benefits	$0	$1,308,000
Annual Costs	$0	$859,000
Annual Net Benefits[3]	$0	$449,000

[1] Installation costs are parametric costs based on planning level engineering and design.
[2] The Modernization Alternative Average Annual Costs are the additional average annual installation costs, above the No Action Alternative
[3] Annual Net Benefits shown for the Modernization Alternative are the additional net benefits compared to the No Action Alternative.

Regional Economic Impacts		
Annual Local Jobs during Construction	0	60
Annual Jobs from Recreation	Not Applicable	Magnitude/direction of recreation visitation impacts not known, so no Regional Economic Development benefits quantified.
Annual Jobs from Agriculture (including direct/indirect/ induced)	0	30

Item or Concern	Alternative 1 No Action (Future without Federal Investment)	Alternative 2 Modernization (NEE Recommended)
Major Features	**Laterals 31, 32, 34, and 43 remain open and four retention ponds are not installed**	**Pipe Laterals 31, 32, 34, and 43 and construct four retention ponds**
Beneficial Effects Annualized[1] (millions, 2020$)		
Region	$0	$1.2
Rest of Nation	Not Applicable	Some ripple income/employment effects expected, but not estimated.
Adverse Effects Annualized[2] (millions, 2020$)		
Region	Not Applicable	-$0.27
Rest of Nation	Not Applicable	$0.90

[1] Beneficial effects include only those related to labor income and do not include the net economic benefits quantified in the NEE.
[2] Adverse Effect Annualized includes only the direct costs (no indirect/induced costs included).
NEE = National Economic Efficiency

6 Environmental Consequences

This section evaluates the environmental consequences of the No Action Alternative and the Modernization Alternative. The effects of the two alternatives on each resource identified in Section 4 were evaluated and were determined to be beneficial or adverse. 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 historic or archaeological resources because these activities are expected to occur in previously disturbed areas.

6.1.2 Modernization Alternative (Future with Federal Investment)

Cultural resources are being addressed under NHPA, and analysis is ongoing. The following describes the information known to date.

6.1.2.1 Built Environment Surveys

As described in Section 4.1, a historic evaluation of the District and the irrigation features which comprise the District was compiled in *Sagebrush to Clover, Volume 2* (Doncaster et al. 2021).[34] Because laterals 43 and 34 retain integrity and contribute to the eligibility of the North Unit Historic Linear District, piping these laterals would result in an adverse effect on both the integrity of the laterals and on the eligibility of the District. Because laterals 31 and 32 are non-contributing, piping these laterals would have no effect on the integrity of the laterals or on the eligibility of the District.

NRCS has initiated consultation with the Tribal Historic Preservation Office (THPO) and SHPO. Following participation by the Advisory Council of Historic Preservation, mitigation measures would be identified before construction and would be completed concurrently with or after construction. The potential cost of mitigation for effects on cultural resources is included in the project cost.

6.1.2.2 Archeological Surveys

The District would hire an archeologist to complete surveys for archaeological resources in the project area. Prior to completing the surveys, NRCS would consult with SHPO and THPO for the proposed action by providing a project description, a map identifying the APE, and a report of the findings.

If archaeological resources are inadvertently discovered during construction, an Inadvertent Discovery Plan that complies with 36 CFR 800.13, Post-review Discoveries, would be followed.

[34] In 2013, Reclamation completed a District-wide inventory and National Register of Historic Places evaluation of NUID historic resources. Results of this evaluation are included in Sagebrush to Clover Vol. 1 (Doncaster et al. 2013) (Section 4.1).

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 THPO, SHPO, and NRCS cultural resources staff would occur as appropriate; and the appropriate tribes would be notified. Construction would continue in accordance with applicable guidance and law.

6.2 Land Use

6.2.1 No Action (Future without Federal Investment)

6.2.1.1 Land Use

The No Action Alternative would have no direct effect on land use within the project area or on lands served by laterals in the project area. Over time, the growth of Madras, Metolius, and Culver could encroach on agricultural land which would be converted from agricultural use to developed use.

6.2.1.2 Land Ownership

The No Action Alternative would have no direct effect on land ownership within the project area or on lands served by laterals in the project area.

6.2.1.3 Agricultural Production

Ecosystem services of water for irrigation would not be affected (Section 6.8.1.5). As a result of the No Action Alternative, agricultural production would continue to be a function of fallowing fields in response to available water supply.

6.2.2 Modernization Alternative (Future with Federal Investment)

6.2.2.1 Land Ownership

The Modernization Alternative would have no effect on existing land ownership within the project area. Any easements required for construction of the four retention ponds would be NUID's responsibility and would be acquired prior to implementation.

6.2.2.2 Land Use

In segments of the project area with existing District infrastructure, all construction would occur in the District and Reclamation existing ROW or easements, and adjacent landowners would be notified prior to the start of construction. Within segments of the project area where open laterals would be converted to pipe, any ground that was disturbed during construction of the newly covered pipe would be reseeded with a mix of native grasses and forbs. There would be negligible effects on these segments as the land use would continue as conveyance of irrigation water.

Implementation of the Modernization Alternative would support existing zoning designations and existing agricultural land use. The proposed project would not affect any projected land use trends. Ecosystem services of water for irrigation (*E1*) would be supported through the improvement of delivery infrastructure (see Section 6.8.2.4). During and after construction of the Modernization Alternative, there would be no direct effect on agricultural land use that is part of the project area or served by project laterals.

6.2.2.3 Agricultural Production

Implementation of the Modernization Alternative would beneficially affect agricultural production. Construction would take place outside the irrigation season; it would not interrupt water deliveries or result in a long-term change to the agricultural land use. As a result of implementation of the Modernization Alternative, patrons would have more a more reliable water supply which would reduce deficit irrigation on hay acres and increase the hay yield by one cutting. District patrons would have increased drought resiliency during water-short years. See Appendix D.1.2.1.1 for further discussion. Provisioning ecosystem services associated with water under the No Action and Modernization Alternatives and the effect on agricultural production are considered in Sections 6.8.1.5 and 6.8.2.4, respectively.

6.3 Public Safety

6.3.1 No Action (Future without Federal Investment)

Under the No Action Alternative, laterals 31, 32, 34, and 43 would remain open, and the risk of drowning and injury would remain unchanged.

6.3.2 Modernization Alternative (Future with Federal Investment)

During construction, vehicle and heavy equipment traffic would enter and leave the project area. Construction traffic could interact with motor vehicles, pedestrians, and bicyclists traveling through the project area. Standard safety protocols and best management practices (BMPs) would be followed during construction to minimize risk to public safety; therefore, only a minor short-term effect on public safety is anticipated during construction.

Over the life of the proposed project, the Modernization Alternative would minimize the risk of canal-related injury because the open laterals in the project area would be piped. This would result in beneficial effects on public safety for this area. Although the District would not be installing a fence along the newly piped sections, similar to its existing rules, the District would prohibit foot traffic and public access of those areas. If the public illegally accessed the piped areas, the public safety risk to private landowners and adjacent properties would be expected to be consistent with the general landscape and surrounding areas. See Appendix D.1.2.2.1 in the NEE Analysis for a more detailed discussion of how the proposed project would reduce public safety hazard in the District.

The newly installed retention ponds would be located on private property. The public safety risk to private landowners would be expected to be consistent with the general landscape and surrounding areas. Furthermore, the volume of water that would be discharged into the retention ponds would be small and would not create a detectable change to groundwater quality. Groundwater quality, therefore, would not affect public safety.

6.4 Socioeconomic Resources

To estimate the total economic impacts of the proposed project in terms of jobs and income supported, this analysis used a 2017 IMPLAN economic impact model of Jefferson County, which

was linked through multiregional analysis to Deschutes and Crook counties to include ripple effects of spending in those two counties.[35]

6.4.1 No Action (Future without Federal Investment)

Under the No Action Alternative, there would be no effect on the value of or economic impact to agricultural production or environmental justice communities.

6.4.2 Modernization Alternative (Future with Federal Investment)

6.4.2.1 Rural Economic Development

The Modernization Alternative would have both short- and long-term beneficial effects on socioeconomic resources in Crook, Deschutes, and Jefferson counties. Construction expenditures of $34.0 million would support construction sector jobs and income in Jefferson County, as well as increase jobs and income in related economic sectors. Construction spending on labor, materials, and services would spur increased sales and economic activity for businesses such as hardware stores and construction equipment suppliers. Impacts of construction sector spending to these other sectors are known as indirect impacts. As household income rises in construction and indirectly impacted economic sectors, household spending will also increase and generate increased economic activity in sectors such as retail, wholesale trade, personal services industries, and real estate; these are known as induced impacts. Total job and income impacts of the economic activity supported by the Modernization Alternative are the sum of the direct impacts (construction sector) and the indirect/induced impacts (in other economic sectors).

The $34.0 million in construction expenditure would be spread over 6 years and support approximately 60 jobs and provide $3.3 million in average income over the 6-year construction period. Annualized over 106 years,[36] this equates to approximately $0.48 million in annualized average income benefits from construction, as shown in Table 5-1. Of the impacts during the 6-year construction period, approximately 40 jobs and $2.6 million in annual income are in the construction sector (direct impacts) while the remaining 20 jobs and $0.7 million income are in other sectors.

The Modernization Alternative is also anticipated to result in higher hay yields in the District in dry-water years due to increased water availability (see Section 6.8.2 for project effects on water availability). With this benefit (reduced agricultural damages), the average annual total economic activity supported by NUID agricultural production is estimated to increase by approximately 30 jobs and $0.72 million in average annualized income.

The Modernization Alternative would also result in reduced well operation and pumping expenses for NUID patrons (see Appendix E.8 for a summary of the projected energy savings associated with the Modernization Alternative). However, there are not anticipated effects on District wages and employment. Reduced well maintenance and pumping costs may largely result in an income transfer

[35] Total construction expenditures were modeled in IMPLAN Construction Sector 57, construction of new commercial structures, including farm structures. The model data source is IMPLAN 2017 data for Oregon's Deschutes, Jefferson, and Crook counties.

[36] Note that each project has a 100-year life, but since construction takes 6 years, benefits extend out to year 106 resulting in an analysis period of 106 years.

between NUID patrons and the local construction/repair/electricity sectors. As such, there are expected to be limited Regional Economic Development effects of this reduced expenditure (i.e., less than the rounding margin of error), so effects were not quantified in this Regional Economic Development analysis.

6.4.2.2 Environmental Justice Communities.

Although environmental justice communities are present within the county where the proposed project would be constructed and implemented, the proposed project would not affect emissions or degrade environmental quality. The proposed project would benefit agricultural production, which would support farm operators and farm workers. As proposed project benefits accrue and agricultural production stabilizes or increases, the farm worker employment sector could benefit from increased production. Stabilization of the farm worker sector would likely benefit the environmental justice community component of the farm worker sector through seasonal certainty. Therefore, no effect on environmental justice communities would be expected.

6.4.2.3 National Economic Efficiency Benefits

A National Economic Efficiency (NEE) benefit-cost analysis was performed to evaluate the benefits of the Modernization Alternative (Appendix D). This evaluation identified the costs and benefits associated with the No Action Alternative and the Modernization Alternative. The analysis used NRCS guidelines for the evaluation of NEE benefits as outlined in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and the NRCS Natural Resources Economics Handbook.

6.5 Soils

6.5.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the continued operation of the District's system would have no effects on soils. Erosion of the open laterals, topsoil transport into canals, and maintenance along the District's irrigation system would be ongoing and potentially intensify as fields continue to be fallowed. The effect of the No Action Alternative on soils would be small but measurable, and therefore, would be minor.

6.5.2 Modernization Alternative (Future with Federal Investment)

Under the Modernization Alternative, soils would be disturbed, vegetation would be cleared, and backfilling and grading would occur. Prior to construction, pre-engineering feasibility studies and permeability tests would be conducted to determine if the soils are suitable at the sites of the proposed retention ponds. Clearance, compaction, and construction would increase soil erosion and sedimentation potential. BMPs would be implemented to minimize erosion and contain runoff on site; BMPs could include installing silt fencing, placing straw wattles, placing geotextile filters, and applying water to disturbed soils to prevent wind erosion.

During construction of the pipelines and retention ponds, soils adjacent to the laterals and soils within the area surrounding the retention ponds (including Prime Farmland) would be impacted due to construction equipment access and staging. Soils would be removed to create the retention ponds;

the District would store the soils at specified locations, and soils could be reused for general maintenance throughout the District. Existing maintenance roads and access routes commonly used for O&M would be used when possible.

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. After construction of the retention ponds, any contaminants in the irrigation water (such as sediments and nutrients) spilled to the retention ponds would seep into the soils associated with and surrounding the retention ponds. The irrigation water directed to the retention ponds would be the same water, and therefore have the same water quality, as that applied to crops and soils across the District. The effects of the irrigation water on the soils in the retention ponds would be anticipated to be the same as the effects of irrigation water applied to crops and soils elsewhere in the District. Because the irrigation water would only be spilled to the retention ponds infrequently, the spill effects on soils would be localized to the retention pond area and because the same quality of water would be applied to crops and soils across the District, the effects on soils are anticipated to be negligible.

Along most of the project area, effects on soil resources would be short-term and minor because the effects would only occur in a relatively small portion of the larger project area and only during the construction period. While building the retention ponds, effects to soils and Prime Farmland would be long-term and moderate where excavation would occur because the effects would be apparent but localized. Effects on soil resources would be minimized through BMPs. Additionally, the availability of saved water to reduce deficit irrigation would support agricultural use on Prime Farmland.

6.6 Vegetation

6.6.1 No Action (Future without Project)

Under the No Action Alternative, there would be no effect on vegetation associated with open irrigation laterals or on adjacent native upland vegetation.

Ecosystem services provided by vegetation in the project area would not be affected by the No Action Alternative.

6.6.2 Modernization Alternative (Future with Federal Investment)

6.6.2.1 General Vegetation

Construction of the Modernization Alternative would have a minor short-term effect on vegetation because changes to vegetation would be localized to the project area. Vegetation would be cleared in some areas where new pipe is installed, retention ponds are created, or access for construction equipment is required. Disturbance would occur over a small portion of the District, and BMPs designed to minimize effects on vegetation, such as revegetating with natural grasses and forbs in consultation with NRCS, would be implemented (BMPs are identified in Section 8.3).

When trenching for pipe placement in existing laterals, existing maintenance roads within the ROW would provide access to most of the project area. Given that the pipe segments would be installed in

40- or 50-foot lengths, some temporary travel routes within the ROW would be necessary along laterals that are not accessible by existing roads. Selection of construction areas adjacent to laterals and travel routes would consider existing vegetation and avoid mature trees to the extent practicable. Herbaceous, shrub, and woody vegetation along the laterals and turnouts would be temporarily disturbed through activities such as clearing, crushing, and digging.

After construction of pipelines, the project area would be re-contoured and planted with a seed mix of native grasses and forbs. Planting would be conducted in consultation with NRCS. Vegetation within the ROW would be returned to an upland type such as was present prior to the construction of each lateral. Some trees that are dependent upon seepage from the lateral for water may not survive the construction of the Modernization Alternative.

In the long term, native terrestrial vegetation would increase because 27.5 miles of open laterals would be piped and then covered with topsoil and seeded. A double-track dirt access/maintenance trail would be retained for District access. Over the proposed project's life, vegetation within the ROW would be maintained according to the NUID vegetation management program and the 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 could interfere with future O&M activities.

Vegetation would be permanently removed during construction of the four 1,000-cubic-yard retention ponds. The surrounding disturbed areas would be re-contoured and planted with a seed mix of native grasses and forbs to return the area to its pre-construction condition. Effects would be minimized through implementation of BMPs (Section 8.3).

6.6.2.2 Noxious Weeds

Soils exposed during construction would create areas temporarily susceptible to weed growth. Construction vehicles could 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.

In the project area where piping would occur, there would no longer be an opportunity for aquatic noxious weeds to be washed to other areas of the District. Growth of aquatic moss would also be eliminated in piped areas and would reduce the need for in-water herbicide treatment. The District would manage noxious terrestrial or aquatic weeds associated with the new retention ponds in accordance with District general practices and any agreements between the District and landowners. During O&M, weeds would be managed according to protocol in the NRCS *Oregon and Washington Guide for Conservation Seedings and Plantings* (NRCS 2000).

6.7 Visual Resources

6.7.1 No Action (Future without Federal Investment)

Under the No Action Alternative, there would be no effect on visual resources.

6.7.2 Modernization Alternative (Future with Federal Investment)

Under the Modernization Alternative, construction activities would be visible to anyone adjacent to the project area. Vegetation would be cleared within the project area where pipe would be installed, new retention ponds would be created, or access for construction equipment would be necessary. There would be minor short-term effects on visual resources because the construction activities would draw attention to the setting. However, similar large equipment is used in agricultural work and in District operational maintenance; therefore, construction equipment is not an uncommon feature in the landscape. Construction would be scheduled in the winter non-irrigation season during daytime hours, and the BMPs discussed below would further minimize visual disruptions.

After construction, in segments of the project area where open laterals would be converted to pipe, the disturbed areas including over the newly buried pipes would be planted with a seed mix of native grasses and forbs in consultation with NRCS. The view of the open laterals would change from an open channel (with or without water depending on the season) to a corridor of native upland vegetation. There would be a negligible long-term effect on visual change because visual changes would be localized and not contrast with the existing landscape.

Visual changes to retention pond areas would be moderate and long-term because construction activities would draw attention to the setting, and after construction, the view to anyone in the area would change from a flat vegetated area to a view with a pond with an associated berm. The proposed retention pond at the terminal end of Lateral 34 would be located on flat land that has been irrigated by the property owner between Highway 97 and SW Culver Highway. The pond would be visible from both roadways. The proposed retention pond at the terminal ends of laterals 31, 43, and 43-10 would be located far from any current roads or residences and would not likely be seen.

Overall, the change from open lateral to buried pipe would be expected to have a minor long-term effect on visual resources because visual changes would be localized, and although there would be an apparent change from open lateral to upland corridor, this change would blend in and not dominate the existing landscape. Retention pond construction would be expected to have a minor long-term effect because visual changes from an area of vegetation-covered field to a water-filled pond would be local and apparent but would not dominate the existing landscape.

6.8 Water Resources

6.8.1 No Action (Future without Federal Investment)

6.8.1.1 Water Rights and District Water Supply

Under the No Action Alternative, the water supply shortages projected for NUID would still be expected. Water in the District's system would continue to be lost to seepage and evaporation and be unavailable to help fulfill the water rights held by the District.

6.8.1.2 Surface Water Hydrology

The No Action Alternative would have no effect on waterbodies associated with District operations (Table 4-5). Reservoir operation and streamflow would not change as a result of the proposed

project, and the District would continue to discharge tailwater into the Crooked River, Lake Billy Chinook, and an unnamed ephemeral creek from the four operational spills in the project area.

6.8.1.3 Surface Water Quality

The No Action Alternative would have no effect on surface water quality in the waterbodies associated with District operations. Discharge of irrigation tailwater into the Crooked River would continue to occur and continue to release nonpoint source pollutants into the river system.

The open irrigation conveyance system would continue to collect stormwater runoff [37] or irrigation tailwater and subsequently deliver contaminants such as herbicides, pesticides, and high levels of sediment to patrons downgradient in the system. This water quality concern would not be addressed.

6.8.1.4 Groundwater

The No Action Alternative would have no effect on groundwater. Approximately 6,089 acre-feet of water would continue to seep and evaporate from the open laterals into the surrounding area each year.

6.8.1.5 Ecosystem Services

The No Action Alternative would not affect ecosystem services associated with water resources (Section 4.8).

- *Provisioning service: Water available for irrigation (Figure 4-1 [E1])*: Under the No Action Alternative, there would be no effect on irrigation water because the amount of irrigation water available for agricultural use would largely remain the same. Based on data from the DBHCP and the water shortage analysis presented in the NEE Analysis (Appendix D 1.2.1.1), NUID is expected to experience on-farm delivery water shortages of approximately 25,500 acre-feet annually. Appendix D 1.2.1.1 describes that under the No Action Alternative, annual hay net returns would generate $54 per acre.

6.8.2 Modernization Alternative (Future with Federal Investment)

6.8.2.1 Water Rights and District Water Supply

Under the Modernization Alternative, NUID would save up to 6,089 acre-feet/year, 2.8 percent of the District's average annual diversions,[38] from reduced seepage and evaporation in the project area. The water saved by the proposed project would augment water supplies for existing NUID patrons; the saved water would help fulfill existing water rights and would alleviate water supply shortages across the District. For additional information regarding the effects this saved water would have on

[37] The District does not allow its canal and lateral system to be intentionally used for stormwater management. Interception of stormwater associated with overland flow in the area adjacent to the District's conveyance system is incidental to the purpose of conveying water for irrigation; due to the geology and climate of the area, these occurrences are minimal.

[38] The District withdraws an average of 17,521 acre-feet/year from the Crooked River at the NUID Crooked River Pumping Plant (L. Windom, personal communication, May 3, 2021) and an average of 200,000 acre-feet at the NUID Bend Diversion (L. Windom, personal communication, May 6, 2021).

agricultural production within the District, please see the National Economic Efficiency Report (Appendix D).

6.8.2.2 Surface Water Hydrology and Water Quality

The following sections identify the effects that the Modernization Alternative would have on surface water hydrology and surface water quality in each waterbody associated with District operations.

6.8.2.2.1 Wickiup Reservoir

The Modernization Alternative would have no effect on Wickiup Reservoir hydrology or water quality. It would not affect the operation of the reservoir or water elevation in the reservoir.

6.8.2.2.2 Deschutes River from Wickiup Reservoir (RM 226.8) to Lake Billy Chinook (RM 120)

The Modernization Alternative would have no effect on streamflow or surface water quality in the Deschutes River from Wickiup Reservoir (RM 226.8) to Lake Billy Chinook (RM 120). It would not affect discharge rates or timing from the reservoir into the river or instream water rights in the river downstream from the reservoir.

6.8.2.2.3 Prineville Reservoir

The Modernization Alternative would have no effect on Prineville Reservoir levels, water quality, or the operational use of Prineville Reservoir.

6.8.2.2.4 Crooked River from Prineville Reservoir (RM 70) to Lake Billy Chinook (RM 0)

Surface Water Hydrology

The Modernization Alternative would have no effect on streamflow in the Crooked River from Prineville Reservoir (RM 70) to the District's Crooked River Pumping Plant (RM 27.3) or from the District's Pumping Plant to where the District discharges from operational spills into the Crooked River (RM 18.5).

The Modernization Alternative would have negligible long-term effects on streamflow in the Crooked River from RM 18.5 to Lake Billy Chinook (RM 0.0) because discharges to surface water from operational spills would be eliminated. Piping laterals 31 and 34 would eliminate approximately 1 to 2 cfs of irrigation tailwater from being operationally spilled into the Crooked River during the irrigation season. Streamflow in the Crooked River from RM 18.5 to Lake Billy Chinook (RM 0.0) averages between 143 and 573 cfs (Appendix E.5). 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. The effects of eliminating discharges to surface water from operational spills in this reach would be below the level of detection, and therefore, the effects would not be perceptible in the river.

The Modernization Alternative would have negligible effects on groundwater discharge into the Crooked River due to the elimination of seepage from laterals 31, 32, 34, and 43. See Section 6.8.2.3 for information on how this would affect groundwater and groundwater discharge.

Surface Water Quality

The Modernization Alternative would have no effect on surface water quality in the Crooked River from Prineville Reservoir (RM 70) to the District's Crooked River Pumping Plant (RM 27.3) or from the District's Pumping Plant to where the District discharges water from operational spills into the Crooked River (RM 18.5).

Overall, the Modernization Alternative would have beneficial long-term effects on surface water quality in the Crooked River from RM 18.5 to Lake Billy Chinook (RM 0.0). Piping the District's laterals and removing the District's Crooked River operational spills at laterals 31 and 34 would prevent contaminants such as sediment, herbicides, pesticides, and animal waste from entering the conveyance system and discharging into the Crooked River.

The proposed retention ponds 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. As stormwater flows over the construction sites, there is potential for it to pick up pollutants and discharge them into the Crooked River. Unavoidable effects on water quality would be minimized using BMPs.

6.8.2.2.5 LAKE BILLY CHINOOK

Surface Water Hydrology

The Modernization Alternative would have no effect on surface water hydrology in Lake Billy Chinook because there are no changes to inflow from the Deschutes or Crooked rivers. The reduction of water from the District's operational spill along Lateral 43 would be undetectable compared to reservoir levels.

Surface Water Quality

The Modernization Alternative would have beneficial long-term effects on surface water quality in Lake Billy Chinook. Piping the District's laterals and removing the District's operational spill along Lateral 43 would prevent contaminants such as sediment, herbicides, pesticides, and animal waste from entering the conveyance system and discharging into the reservoir.

6.8.2.2.6 UNNAMED EPHEMERAL CREEK FROM OPERATIONAL SPILL ALONG LATERAL 43-10 (RM 5.4) TO MOUTH

Surface Water Hydrology

The Modernization Alternative would have moderate long-term effects on surface water hydrology in the unnamed ephemeral creek due to the elimination of the District's operational spill along Lateral 43-10 and the reduction of available water (600 acre-feet/year). Water would instead enter the groundwater system and most likely be discharged from groundwater nearby to either Willow Creek or Lake Simtustus.

Surface Water Quality

The Modernization Alternative would have beneficial long-term effects on surface water quality in the unnamed ephemeral creek. Piping the District's laterals and removing the District's operational spill along Lateral 43-10 would prevent contaminants such as sediment, herbicides, pesticides, and animal waste from entering the conveyance system and discharging into the creek.

6.8.2.2.7 Willow Creek (RM 1) to Mouth

Surface Water Hydrology

The Modernization Alternative would have minor long-term effects on surface water hydrology in the unnamed ephemeral creek due to the elimination of the District's operational spill along Lateral 43-10 and the reduction of available water in the unnamed ephemeral creek, a tributary to Willow Creek. However, it is possible that some of the water entering the groundwater system in the proposed retention pond would be discharged from groundwater at springs along Willow Creek.

Surface Water Quality

The Modernization Alternative would have beneficial long-term effects on surface water quality in Willow Creek. Piping the District's laterals and removing the District's operational spill along Lateral 43-10 would prevent contaminants such as sediment, herbicides, pesticides, and animal waste from entering the conveyance system and discharging into the creek.

6.8.2.2.8 Drainage Courses

Although the District does not allow its canal and lateral system to be intentionally used for stormwater management,[39] the Modernization Alternative would eliminate the opportunity for the laterals to be indirectly used for stormwater conveyance or disposal. The conversion of the open canal to a piped system would return the landscape along the canal to its original grade and to the natural surface runoff patterns that existed prior to the presence of the open canal. Coordination between the District and landowners would occur to mitigate unintended consequences should they arise (L. Windom, personal communication, May 3, 2020). Due to the unlikely chance that the proposed project would cause issues, eliminating the proposed lateral section as a drainage course would result in a negligible long-term adverse effect on drainage courses.

6.8.2.2.9 Irrigation Water Quality Supplied to Patrons

The Modernization Alternative would have long-term beneficial effects on the water quality of irrigation water delivered to NUID patrons from the laterals proposed for piping. Piping these laterals would prevent contaminants such as herbicides, pesticides, animal waste, and stormwater runoff from entering the water supply for NUID patrons downgradient.

[39] The District does not allow its canal and lateral system to be used for stormwater management in an effort to avoid the risk of contaminating irrigation water with potential stormwater pollutants.

6.8.2.3 Groundwater

The Modernization Alternative would have negligible, long-term effects on groundwater in the project area. It would eliminate approximately 2,274[40] acre-feet of seepage and evaporation[41] annually from the District's conveyance system. OWRD observation wells[42] in the area have not shown seasonal changes (i.e., irrigation season vs. non-irrigation season) in depth to groundwater, and this lack of seasonality suggests that seepage from the laterals in the project area does not affect recharge of the deeper artesian aquifer. The effects on the regional aquifer from reduced seepage would be below the level of detection.

The Modernization Alternative would have negligible effects on groundwater discharge into the Crooked River and Lake Billy Chinook due to the elimination of seepage from laterals 31, 32, 34, and 43. The level of reduced groundwater discharge[43] is undetectable when compared to current flows in these waterbodies.

After construction of the retention ponds, any contaminants in the irrigation water spilled to the retention ponds would seep into the soils associated with and surrounding the retention pond. These spills would occur infrequently. The effects on soils are discussed in Section 6.5.2. Seepage of the irrigation water into groundwater via the retention ponds would be minimal and is expected to be below the level of detection in groundwater. The proposed action, therefore, would not affect private groundwater wells in the area.

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

6.8.2.4 Ecosystem Services

Ecosystem services would be affected by the Modernization Alternative in the following ways:

- *Provisioning service: Water available for irrigation (Figure 4-1 [E1])*: The Modernization Alternative would have a beneficial effect on irrigation water deliveries to NUID patrons. Modernizing

[40] The Modernization Alternative is estimated to save 6,089 acre-feet of water per year through the elimination of seepage and evaporation in open laterals proposed for piping. The District currently spills a total of about 800 acre-feet of water per year at the operational spills at the terminal ends of laterals 31 and 34 and 1,200 acre-feet of water per year at the operational spills at the terminal ends of laterals 43 and 43-10 (L. Windom, personal communication, May 5, 2021). Following completion of the proposed project, this water would spill into the proposed retention ponds instead of the natural waterbodies. The water is then anticipated to infiltrate into the groundwater system. Additionally, about 1,815 acre-feet of the saved water, or roughly 30 percent of the total saved water, from the Modernization Alternative would contribute (annually) to the groundwater system through seepage in other canals and laterals in the system.

[41] A water loss study completed for NUID included both seepage and evaporation but did not differentiate between loss from evaporation versus seepage.

[42] Data from the following OWRD observation wells were used for analysis: JEFF0050734, JEFF0000466, and JEFF0000435.

[43] To conservatively determine this effect, it was assumed that 2,274 acre-feet of water is equivalent to about 5.3 cfs when spread over the 214-day irrigation season. The effects of the reduced groundwater recharge would be spread throughout the Crooked River (RM 18.5 to mouth) and Lake Billy Chinook. Flows in the Crooked River are illustrated in Figure 4-7 and Figure 4-8 in Section 4.8.2.6. Lake Billy Chinook reservoir levels are discussed in Section 4.8.2.7.

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, 4.8, 6.8). The benefits of saved water delivered to NUID patrons are analyzed in the NEE Analysis (Appendix D.1.2.1.1). Based on data from the DBHCP and the water shortage analysis presented in the NEE Analysis, NUID is expected to experience on-farm delivery water shortages of approximately 25,500 acre-feet annually. The Modernization Alternative would reduce these water shortages. The NEE Analysis describes that with the addition of 4,274 acre-feet of water supply, annual hay net returns would generate $202 per acre.

- *Regulating Services, Water quality (Figure 4-1 [E2])*: Following the implementation of the Modernization Alternative, NUID would eliminate discharges from four operational spills into the Crooked River, Lake Billy Chinook, and an unnamed ephemeral creek. Operational spills would discharge into the retention ponds. Water quality metrics are based on reduced contributions to Oregon's 303(d) list (Table 4-7). Eliminating these spills would negligibly reduce the water quantity of the receiving waterbody. Eliminating these spills would also reduce pollutant discharge; however, the beneficial effects would fall below the limit of detection.

6.9 Fish and Aquatic Resources

6.9.1 No Action (Future without Federal Investment)

6.9.1.1 General Fish and Aquatic Species

The No Action Alternative would have no effect on fish and aquatic species in the project area. The District's fish screens would continue to function as they are currently. The District would continue to use the laterals in the project area to deliver water to patrons. These laterals would remain open, and they would continue to provide habitat for aquatic species.

The No Action Alternative would also have no effect on fish and aquatic species or associated habitat in the waterbodies affected by District operations because streamflow would not change. Deschutes River water diverted by the District would continue to be conveyed through open laterals that leak water, and the District would continue to discharge water from operational spills into the Crooked River at the current rate. Fish and aquatic species and associated habitat would likely not change from baseline conditions (Section 4.9).

6.9.1.2 Federally Listed Fish and Aquatic Species

The No Action Alternative would have no direct or indirect effects on federally listed fish and aquatic species or their respective habitat in the Deschutes or Crooked rivers. Because no change would occur to streamflow or reservoir levels (Section 6.8.1), habitat supporting bull trout, steelhead, and Oregon spotted frog populations would likely not change from baseline conditions (Section 4.9). Consequently, NRCS has determined that no effects would occur to federally designated critical habitat for bull trout, steelhead, or Oregon spotted frog, and therefore, Section 7 consultation under ESA is not warranted for these species.

6.9.1.3 Ecosystem Services

The No Action Alternative would have no effect on habitat supporting populations of *culturally important species (E3)*.

6.9.2 Modernization Alternative (Future with Federal Investment)

6.9.2.1 General Fish and Aquatic Species

Similar to the No Action Alternative, the Modernization Alternative would have no effect on fish species in the project area because fish are not able to pass through the District's fish screens into the District's conveyance system. Because the Modernization Alternative would have no effect on streamflow and water quality in the Deschutes River (Section 6.8.2.2), there would be no indirect or direct effect on fish and aquatic species or their respective aquatic habitats (i.e., water and aquatic vegetation) in the Deschutes River.

Eliminating the District's operational discharge would result in a streamflow reduction of 1 to 2 cfs at each of the four discharge sites (Section 6.8.2.2.4). As a result, there would be a negligible long-term effect on fish and aquatic species and their respective aquatic habitats in the Crooked River due to streamflow modification.

Elimination of irrigation tailwater from operational spills would benefit fish and aquatic species and their respective habitats because potential sediment and nutrient contaminants would be prevented from discharging into the Crooked River at RM 18.5 (Section 6.8.2.2.4). Seepage from retention ponds into groundwater and subsequent discharge into the Crooked River would be below the level of detection by fish and aquatic species and their respective aquatic habitats (Sections 6.8.2.3 and 6.5.2). Therefore, there would be no direct or indirect effect of groundwater discharge on fish and aquatic species or their respective aquatic habitats.

The effects of retention pond construction would have minor short-term effects on fish and aquatic species and their respective aquatic habitats due to the elevated potential of sediments entering the Crooked River through erosion (Section 6.8.2.2.4).

As a result of the Modernization Alternative, there would be a minor direct effect on aquatic species in the project area due to loss of canal habitat. 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 Modernization Alternative would have a direct adverse effect on these species' individuals because habitat in open canals and laterals would be lost during piping. However, this habitat is low quality and is not considered critical to the long-term survival of these species (S. Wray, personal communication, November 17, 2017).

The invasive bullfrog species that has the potential to use open canals and laterals would be affected when habitat is removed during construction because potentially suitable habitat would be reduced. Construction of retention ponds would not provide suitable habitat for the invasive bullfrog because operational spills would occur into the retention ponds infrequently, and for most of the irrigation season and during the winter months, the retention ponds are expected to be dry (M. Britton, personal communication, February 2, 2022).

6.9.2.2 Federally Listed Fish and Aquatic Species

The Modernization Alternative would have no effect on federally listed species including Oregon spotted frog, bull trout, and steelhead.

6.9.2.2.1 Oregon Spotted Frog

NRCS has determined that there would be no effect on Oregon spotted frog or its federally designated critical habitat. The Oregon spotted frog does not occur in District canals or laterals. Within the waterbodies affected by the District, the federally listed Oregon spotted frog occurs in Wickiup Reservoir and the Deschutes River upstream of Bend (see Section 4.9.2). The Modernization Alternative would have no effect on Oregon spotted frog populations or their habitats because it would not change streamflow or reservoir levels (Section 6.8.2.1). Consequently, Section 7 consultation under ESA is not warranted for this species.

6.9.2.2.2 Bull Trout

NRCS has determined that there would be negligible effects on bull trout and its federally designated critical habitat. Within the waterbodies affected by the District, the federally listed bull trout occurs in the Deschutes and Crooked rivers (Appendix E.6). The Modernization Alternative would have no effect on bull trout populations or their habitats in the Deschutes River because there would be no change to streamflow in the Deschutes River.

As a result of the Modernization Alternative, the District's operational spills discharging into the Crooked River (RM 18.5) would be eliminated (Section 6.8.2.2.4). During the irrigation season, operational spills discharged into the Crooked River contribute less than 1 percent of the streamflow volume in the reach downstream (RM 18.5 to RM 0). Bull trout are known to migrate up the Crooked River during the non-irrigation season when stream temperatures are cool; however, bull trout do not migrate up the Crooked River during the irrigation season past approximately RM 12 due to warm water temperatures (Torgersen et al. 2007). The reduction in water volume associated with eliminating District operational spills (RM 18.5) would be negligible on bull trout populations downstream of RM 12. Similarly, the effect on PCEs identified in bull trout critical habitat designations would be negligible (USFWS 2005). Construction of retention ponds may have minor short-term effects on water quality due to potential sediment influx (Section 6.10.2) during the non-irrigation season and would be mitigated with BMPs. Therefore, short-term construction-related effects on bull trout are anticipated to be negligible. Coordination with USFWS is ongoing. Technical assistance was received from Peter Lickwar and Anna Soens, both with USFWS, on November 30, 2021. Informal consultation would be formally initiated following the public comment period.

6.9.2.2.3 Middle Columbia River Steelhead

NRCS has determined that there would be minor effects on Middle Columbia River steelhead. Because this population is classified as a non-essential experimental population under Section 10(j) of the ESA (76 Fed. Reg. 28715, 2011), no critical habitat is federally designated.

The Modernization Alternative would have no effect on steelhead populations or their habitats in the Deschutes River because there would be no change to streamflow in the Deschutes River (Appendix E.5).

Similar to effects on bull trout, elimination of discharging tailwater to surface water from operational spills into the Crooked River (RM 18.5) would have a negligible effect on streamflow downstream of RM 18.5 (Section 6.8.2.2.4). Therefore, there would be a negligible effect on Middle Columbia River steelhead baseline conditions in the Crooked River (Section 4.9.2). Construction of retention ponds may have minor short-term effects on water quality due to potential sediment influx (Section 6.10.2) during the non-irrigation season, and effects would be mitigated with BMPs. Short-term construction-related effects on steelhead are anticipated to be negligible. Technical assistance was received from Scott Carlon, NMFS, on December 2, 2021. Informal consultation would be formally initiated following the public comment period.

6.9.2.3 Ecosystem Services

The Modernization Alternative would have a short-term minor effect on habitat supporting populations of *culturally important species (E3)*. See Section 6.8.2.4 for a discussion about water quality.

6.10 Wetlands and Riparian Areas

6.10.1 No Action (Future without Federal Investment)

Under the No Action Alternative, wetland and riparian vegetation associated with laterals 31, 32, 34, and 43 would persist, and seepage supporting wetland and riparian features adjacent to the laterals would remain in its current condition.

6.10.2 Modernization Alternative (Future with Federal Investment)

6.10.2.1 Project Area

The laterals within the project area are mechanically and chemically managed to clear vegetation. NWI geographic information systems data (USFWS 2016) shows no wetland features near the project area; however, as of this writing, wetland determinations or delineations at these sites had not been conducted.

Construction would result in the disturbance of all laterals in the project area. Seasonal opportunistic hydrophytic plants that sporadically occur within and directly adjacent to each lateral would be removed or buried during excavation, fill, placement of pipe, or other construction activity. However, any wetlands within and adjacent to the project area would be avoided to the extent practicable, and the District would follow appropriate Reclamation procedures to revegetate disturbed areas as uplands.

Eliminating seepage losses could potentially limit the water available to adjacent wetlands and hydrophytic vegetation if they are dependent upon seepage for hydrology. Therefore, the Modernization Alternative would have minor effects on wetland habitat near or adjacent to laterals in the project area.

The Modernization Alternative would have no effect on excavated water retention ponds (i.e., irrigation ponds) adjacent to the project area, and the hydrophytic vegetation along these ponds would not be disturbed.

The Modernization Alternative would create four 1,000-cubic-yard retention ponds: one at each of the termini of laterals 31, 34-2, 43, and 43-10.[44] These proposed retention ponds would be constructed in upland areas, and the surrounding disturbed areas would be re-contoured and planted with a seed mix of native grasses and forbs to return the areas to their pre-construction conditions. However, these ponds would support water for hydrophytic vegetation to take root near and adjacent to the ponds.

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

The Modernization Alternative would have negligible long-term effects on wetland and riparian areas along the Crooked River downstream of two NUID operational spills (RM 18.5), the drainage system between the District's operational spill along Lateral 43 and Lake Billy Chinook, and along the unnamed ephemeral creek[45] downstream of the NUID operational spill at RM 5.4. Eliminating tailwater discharge to these waterbodies from four operational spills would reduce available water to wetlands and riparian areas at the sites of the spills. The volumes of water discharged are minimal compared to natural streamflow in this reach (Section 6.8.2.2.4).

The proposed retention ponds would have minor short-term effects on wetland and riparian areas along the Crooked River downstream of the NUID spills (RM 18.5) due to the potential for erosion during construction. Unavoidable effects on water quality would be minimized using BMPs.

6.10.2.3 Permitting and Compliance

The memorandum signed by USACE and EPA on July 24, 2020, in reference to the exemption of construction and maintenance activities on irrigation ditches, states that if the proposed activity does not occur in Waters of the U.S., the proposed activity is not prohibited nor regulated under Section 404 of the CWA (Section 4.10). Under this exemption, it would be anticipated that no permit would be required for the disturbance to wetlands within the project area. Coordination and consultation with ODSL and USACE would occur prior to implementation of each site-specific project to determine whether a wetland delineation is necessary and 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. At minimum, a "No Permit Required" letter would be obtained from USACE prior to project implementation.

[44] Laterals 34-2 and 43-10 are sublaterals off laterals 34 and 43.
[45] This unnamed ephemeral creek is a tributary to Willow Creek.

6.11 Wildlife Resources

6.11.1 No Action (Future without Federal Investment)

The No Action Alternative would have no effect on wildlife resources because wildlife that use the wetland habitat created by the District's open lateral system would continue to do so. Risks that the laterals pose to larger wildlife species crossing the laterals, such as drowning, would remain.

The No Action Alternative would have no effect on the way in which wildlife use the river and riverbanks of waterbodies associated with District operations. Wildlife would continue to use the river for water and riverbanks as habitat as specified by the wildlife's life history.

6.11.2 Modernization Alternative (Future with Federal Investment)

The Modernization Alternative would have minor short-term effects to general wildlife in the project area due to short-term construction activities. 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. Heavy equipment use is commonplace in the project area; therefore, most wildlife in the area are accustomed to noise, and these disturbances are anticipated to be minor. Although construction activities would cause a short-term increased human presence throughout the project area, over the long term, piping laterals 31, 32, 34, and 43 would potentially reduce human presence because fewer trips to maintain ditches and headgates would be necessary. This would result in fewer human-wildlife conflicts and improve seclusion for wildlife.

Wintering or migrating birds would be minimally affected by construction because they have the flexibility to move away from disturbances to other suitable areas. There would be no anticipated effect on breeding migratory songbirds or waterbirds as construction activities would occur outside the nesting season. To comply with MBTA, clearance surveys would be completed prior to construction to ensure that project activity would not disturb the nests of non-raptor species, and early coordination with USFWS is ongoing (E. Weidner, personal communication, February 24, 2021).

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. No known nesting sites of bald or golden eagles are within proximity of the project area (E. Weidner, personal communication, February 24, 2021). To comply with BGEPA, the District would coordinate with USFWS should a nesting site be established in proximity of the project area.

While some wildlife may use laterals as a water source, the laterals provide poor habitat (Section 4.6), present a barrier to terrestrial movement, and pose a risk of drowning. In areas where the laterals are piped, the water source would be removed; however, nearby canals and laterals could continue to be open. Ungulates and other terrestrial wildlife would have ample time and opportunity to find new water sources. Traversing the landscape would also be easier for wildlife as they could cross the

piped area without the risk of drowning or injury (Beier et al. 2008). Unavoidable effects on wildlife would be minimized using BMPs.

Outside of the project area, the effects on streamflow in waterbodies affected by District operations, as a result of the Modernization Alternative, would be below the level of detection to wildlife that interact with the river and riverbanks. Therefore, there would be no effect on wildlife that are present or interact with these riverbanks.

6.11.2.1 Federally Listed Wildlife Species

The Modernization Alternative would have no effect on threatened or endangered terrestrial species. As noted in Sections 4.9.2 and 4.11.3, no federally or state-designated species or federally designated critical habitat occurs 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 6.9.2.2.

6.12 Cumulative Effects

Cumulative impacts are defined by CEQ regulations in 40 CFR 1508.7 (1978) as the "impact on the environment which results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time."

Cumulative effects may be additive or interactive. Additive effects are the sum of the effects on a resource; for example, diversions from surface water sources for agricultural irrigation and domestic consumption, which contribute incrementally and additively to surface water flow reductions. Interactive effects may be either countervailing – where the net adverse cumulative effect is less than the sum of the individual effects – or synergistic – where the net adverse cumulative effect is greater than the sum of the individual effects. This section includes a description of past, current, reasonably foreseeable future actions, and cumulative effects organized by resource.

6.12.1 Past Actions

Past actions include land and water use for irrigated agriculture (consisting of construction of the canal system, previous piping projects, and diversions); urban, suburban, industrial, and commercial development; water diversions for non-agricultural uses; the Crooked River Collaborative Water Security and Jobs Act (P.L. 113-244); 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.

6.12.2 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 are highly likely to occur based on available information. Various sources including local, state, and federal

agency websites and 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.

6.12.2.1 Land Use and Development

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

6.12.2.2 Deschutes Basin Habitat Conservation Plan

The District, other irrigation districts in the Deschutes Basin, state and federal agencies, local municipalities, and environmental groups have developed a multispecies DBHCP for the upper Deschutes Basin for listed species and those that may become listed during the 20- to 50-year life of the DBHCP: Oregon spotted frog, bull trout, Chinook salmon, steelhead salmon, and sockeye salmon. The Final DBHCP was published in the Federal Register on November 6, 2020 (85 FR 71086), and a Final Decision by USFWS and NMFS was made on December 31, 2020. DBHCP measures are included in the baseline affected environment of this Draft Plan-EA. 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

6.12.2.3 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 NUID in this Plan-EA. Five Districts (Tumalo Irrigation District, Swalley Irrigation District, COID, Ochoco Irrigation District, and Lone Pine Irrigation District) have authorized Plan-EAs. The Tumalo Irrigation District plans to pipe approximately 68.8 miles of its canals and laterals over the course of 11 years. The Swalley Irrigation District 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 the course of 4 years. The Ochoco Irrigation District plans to pipe approximately 16.8 miles of its system over the course of 3 years. The Lone Pine Irrigation District plans to pipe approximately 10.9 miles and decommission 9.7 miles of its system over the course of 3 years. The other district proposing to implement an irrigation modernization project in the next 2 years is AID. Arnold Irrigation District has initiated a Plan-EA process but has not yet received authorization. AID plans to pipe approximately 11.9 miles of its system over the course of 6 years. All six of these modernization projects are contingent on the availability of funding. These six districts are anticipated to cumulatively convert approximately 145.2 miles of open canals and ditches to piped systems and save up to 149.24 cfs of water that would otherwise be lost to seepage and evaporation.[46] Together, these projects are anticipated to improve the flexibility and resilience of water for all users in the Deschutes Basin.

6.12.3 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.

6.12.3.1 Cultural Resources

Cultural resources in the project area have been affected by past, present, and ongoing development activities such as agriculture, land development, forestry, and other ground-disturbing projects. As with the proposed action, other reasonably foreseeable future actions in the vicinity of the project area have the potential to disturb previously undiscovered cultural resources. Implementation of the proposed action would have an adverse effect on the eligibility of the North Unit Historic Linear District to be listed in the National Register of Historic Places. The implementation of mitigation measures as identified through consultation with SHPO and THPO would mitigate the adverse effects on cultural resources.

6.12.3.2 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, therefore, have a minor contribution to cumulative effects on soils.

6.12.3.3 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, cumulative effects to land uses would be beneficial.

[46] Not all water saved would be protected instream.

6.12.3.4 Public Safety

Cumulative effects are not anticipated on public safety due to the implementation of ongoing and reasonably foreseeable future actions; therefore, no cumulative effects to public safety are anticipated.

6.12.3.5 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 will continue to support agriculture through improved infrastructure and economic development. Since the proposed action would also support socioeconomics through construction expenditures and improved agricultural production, it would contribute to a cumulative benefit to socioeconomic resources in the area.

6.12.3.6 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. 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. Current and reasonably foreseeable future actions, such as the DBHCP, would have beneficial effects on vegetation; the DBHCP has localized effects on vegetation similar to those of the proposed action, but in different areas. Ongoing effects of past actions are not expected to change measurably from current conditions, and additional effects from the proposed action would be minor and would result in a minor contribution to cumulative effects on vegetation.

6.12.3.7 Visual Resources

The visual quality of lands in the Deschutes Basin has changed due to past and present development, and these changes due to future development are expected to continue. The effect on visual resources from the Modernization Alternative would be a minor long-term effect that would be similar in character to the existing landscape and development; therefore, combined with other actions, the cumulative effects on visual resources would be low.

6.12.3.8 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 and restoring streamflow to the Deschutes River. The District, other Deschutes Basin irrigation districts, and local agricultural producers have implemented various water conservation projects. These recent past efforts include piping existing irrigation canals and laterals, implementing on-farm conservation, changing water management, and changing crop production, which have resulted in increased streamflow in the Deschutes River (Section 4.8.2) but decreased seepage into the groundwater table (Section 4.8.4).

Ongoing and reasonably foreseeable future actions that could affect waterbodies associated with District operations include additional irrigation piping projects being considered by other Deschutes

area irrigation districts that divert water from the Deschutes River (Section 6.12.2.3), on-farm water conservation work, and DBHCP measures. These actions would cumulatively increase streamflow in the Deschutes River and its tributaries and result in beneficial cumulative effects on water resources. The proposed action in this Draft Plan-EA would have negligible long-term effects to streamflow (Section 6.8.2.2), and therefore, cumulative effects on surface hydrology would be negligible.

The implementation of the proposed action and other reasonably foreseeable future actions are anticipated to have minor cumulative effects on groundwater resources. As the proposed project is on the north side of the Crooked River, it is anticipated that only the LPID project would have a cumulative effect on groundwater resources; however, the extent of the LPID project is still being determined.

6.12.3.9 Fish and Aquatic Species

Past and ongoing land uses, water diversions, dam construction, and reservoir operations are responsible for most of the past and ongoing direct and indirect changes in water availability, seasonality, and access to habitat that has cumulatively affected aquatic communities and habitat in the Deschutes Basin.

Past and ongoing land use activities in the project area are not expected to change from current conditions. Current and future habitat improvement projects, including measures identified in the DBHCP, are all proposed for the purpose of improving habitat for fish and aquatic species in the Deschutes Basin.

Because the proposed action would not affect fish and aquatic species, the proposed action would not contribute any cumulative effects to current and future habitat improvement projects.

6.12.3.10 Wetlands and Riparian Areas

Past actions that may have affected wetlands, riparian areas, and floodplains consist of the original construction of the irrigation canals and laterals, 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 minor when considered in combination with these other activities. Therefore, the cumulative effect of the proposed action and other past, present, and reasonably foreseeable future projects on wetlands and riparian areas would be minor.

6.12.3.11 Wildlife

Past and ongoing land use activities including agriculture, urban, and suburban development have affected wildlife and wildlife habitat in the Deschutes Basin since the late 1800s. Agricultural activities have substantially altered the habitat in the region by removing native vegetation communities in some areas and diverting streamflow. Livestock grazing occurs in much of the region around the project area and can result in the introduction and spread of weed species, the degradation of native habitat, and trampling of riparian and wetland areas. Some native habitats have been replaced with disturbance-tolerant or introduced species assemblages that may support

different wildlife than previously existed. These ongoing activities would continue to affect wildlife and wildlife habitat in the project area.

Effects on wildlife due to implementation of both the proposed action and past, current, and future irrigation modernization projects would be localized and temporary. Effects would be limited to disturbance during the construction and removal of open canals and laterals as a water source. Implementation of the proposed action would cause wildlife to find other water sources. Since the effects 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.

In addition, vegetation control activities including herbicide applications to control noxious weeds and mechanical cutting of vegetation 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 addition, the intensity of these ongoing actions is not expected to change measurably in the future; this would result in minor additional cumulative effects.

6.12.3.12 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. Past and ongoing actions described in the sections above have also contributed to water availability for irrigation and for instream flow. Past, ongoing, and reasonably foreseeable actions in the Deschutes Basin could all impact ecosystem services in the proposed action watershed. However, implementation of the proposed action, when combined with other future actions, is anticipated to have an overall cumulative beneficial effect on ecosystem services assessed and would provide greater resiliency and flexibility to water users in the Deschutes Basin.

7 Consultation, Coordination, and Public Participation

In the development of the Draft 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 preliminary investigative report (FCA 2019) was prepared to provide sponsors, local partners, agencies, and the public with information to evaluate the goals and objectives of the proposed project. During the development of the report, project sponsors conducted initial coordination with natural resource agencies and stakeholders in the Deschutes Basin.

7.1 Public Participation

Public participation activities prior to release of the Draft Plan-EA included the following communication methods.

7.1.1 Public Announcements

- NRCS – Public notice (October 2, 2019) nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1493036
- Bend Bulletin – Three public notices (October 2, 9, and 16, 2019)
- Madras Pioneer – Three public notices (October 2, 9, and 16, 2019)
- NRCS – News release (October 2, 2019) nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEPRD1493037

7.1.2 Public Website

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

- Overview of the NRCS P.L. 83-566 funding program.
- Overview of NEPA and the Plan-EA public participation process.
- Answers to frequently asked questions about the Plan-EA process.
- Documents related to the proposed project including the Draft Plan-EA and appendices, the preliminary investigative report 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.

7.1.3 Public Scoping Meeting

A public scoping meeting was held October 21, 2019, from 6:30 p.m. to 7:30 p.m. at Jefferson County Library, Rodriguez Annex, 241 SE 7th Street in Madras, 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 August 27 through October 18, 2019.

7.2 List of Persons and Agencies Consulted

Table 7-1 describes communications with agency personnel that were consulted during development of this Plan-EA. This includes agencies that provided formal or required consultation, as well as individuals who were conferred with and who provided substantial input. Coordination with state and local agencies has been ongoing since project inception.

Table 7-1. Agency Consultation and Communication Record.

Date	Contact, Agency	Communication
August 29, 2019	Reclamation	Requested to be a cooperating agency on the project given its history and nexus with the District.
January 20, 2021	Chris Horting-Jones, Reclamation	Discussion about cultural resources work already completed in NUID and what still would need to occur.
January 20, 2021	Nancy Coleman, Reclamation	Discussion about land ownership in NUID.
February 17, 2021	Nancy Coleman, Reclamation	Discussion about land ownership in NUID.
February 23, 2021	Kyle Gorman, OWRD	Information gathering about DBHCP impacts to baseline conditions in the Crooked River.
February 24, 2021	Emily Weidner, USFWS	Technical assistance to determine if any known eagle nests were closely proximal to the project area.
February 25, 2021	Nancy Coleman, Reclamation	Discussion about Reclamation ownership in NUID and authority with respect to District infrastructure.
May 7, 2021	Theresa DeBardelaben, ODA	Discussion of the sediment loading from areas where the proposed retention reservoirs would be located.
November 3, 2021	Chris Horting-Jones, Reclamation	Review *Sagebrush to Clover, Volume 2,* and the effects that the project might have on eligible resources.
November 20, 2021	Scott Carlon, NMFS	Discussed potential effects to mid-Columbia steelhead and requested additional technical assistance if NMFS deemed necessary.
November 30, 2021	Peter Lickwar, USFWS Anna Soens, USFWS	Discussed potential effects on bull trout and requested additional technical assistance if NMFS deemed necessary.

Date	Contact, Agency	Communication
December 10, 2021	Peter Lickwar, USFWS	Consistency among watershed plans in terms of effects on fish and aquatic species from removal of operational spills into the Crooked River.

DBHCP = Deschutes Basin Habitat Conservation Plan; NMFS = National Marine Fisheries Service; NUID = North Unit Irrigation District; ODA = Oregon Department of Agriculture; OWRD = Oregon Water Resources Department; USFWS = U.S. Fish and Wildlife Service

7.3 Review of the Draft 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 Modernization Alternative is the Preferred Alternative. NRCS has selected the Modernization Alternative[47] 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 6 describes effects on resources in detail. In summary, the Modernization Alternative would have moderate effects on cultural resources because the changes would be measurable, apparent, and localized to the project area. The effects on soil resources would be short-term and minor because the effects would only occur in a relatively small portion of the larger project area and only during the construction period; however, when building the retention ponds, effects on soils would be long-term and moderate where excavation would occur because the effects would be apparent but localized. All adverse effects would be mitigated through BMPs and other compliance measures.

In the long term, the Modernization Alternative would benefit several resources assessed. As analyzed in the NEE Analysis, this alternative would yield positive economic benefits including increased agricultural yield, reduced O&M costs, reduced carbon outputs, and reduced pumping costs. Operational spills discharging to surface waters would be eliminated and would therefore decrease poor-quality tailwater from entering the Crooked River, Lake Billy Chinook, and an unnamed ephemeral creek. When compared with the No Action Alternative, in the face of current conditions and future environmental and agricultural changes, the Modernization Alternative would support the agricultural resiliency of District patrons and the health and resiliency of the ecosystem downstream from the NUID spills.

8.2 Measures to be Installed

The District would convert 27.5 miles of open laterals to gravity-pressurized buried pipe ranging from 6 to 72 inches in diameter. The District would construct four 1,000-cubic-yard retention ponds[48] to eliminate the discharge of operational spills into the Crooked River, Lake Billy Chinook, and an unnamed ephemeral creek.

In total, the District would upgrade 153 turnouts[49] to accommodate the pressurized delivery system. After the District turnouts, any on-farm upgrades, such as pond removal, are not included in this proposed project and would be the irrigator's responsibility.

The improvements and new installations would be completed in two project groups with construction occurring over 6 years. Table 8-1 summarizes the measures to be installed. Sections 8.7

[47] 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).

[48] Prior to construction, pre-engineering feasibility studies and permeability tests will occur to determine if the soils are suitable for a retention pond.

[49] All upgraded turnouts will remain at the site of the patrons' current turnouts.

and 8.8 provide more detailed information about construction and O&M of the Preferred Alternative. Appendix D.3 includes a detailed breakdown of project costs.

Table 8-1. Proposed Features for the Preferred Alternative within North Unit Irrigation District, 2020$.

Type	Project Feature	Quantity	Subtotal (2020$)
Pipe	Lateral 43	113,063 feet	$20,230,000
Pipe	Lateral 31	4,418 feet	$283,000
Pipe	Lateral 32	3,247 feet	$60,000
Pipe	Lateral 34	24,156 feet	$1,937,000
	Total New Infrastructure	**144,873 feet**	**$22,510,000**
Retention Pond	Lateral 31 Retention Pond	1	$40,000
Retention Pond	Lateral 34-2 Retention Pond	1	$40,000
Retention Pond	Lateral 43 Retention Pond	1	$40,000
Retention Pond	Lateral 43-10 Retention Pond	1	$40,000
	Total Retention Pond Infrastructure	**4**	**$160,000**
		Subtotal	$22,670,000
		Engineering, Construction Management, Survey[1]	$2,267,000
		Construction Contractor Markup[1]	$2,267,000
		Contingency[1]	$4,080,000
		Project Administration[2]	$2,737,000
		Total[3]	**$34,020,000**

Notes: Totals are rounded to nearest $1,000.
[1] Percentages for Engineering, Construction Contractor, and Contingency vary across project features.
[2] Project Admin includes project administration, technical assistance costs, and permitting costs.
[3] Total may not sum due to rounding.

Construction[50] 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 trench surrounding pipelines; this assumes little to no material is available from prior dredging activities.

Construction would occur during the non-irrigation season (October to April), and project construction would begin as early as the 2023–2024 non-irrigation season. The construction of the proposed project is anticipated to require six 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 proposed project, and if applicable, approve an easement agreement at the site of the proposed retention ponds. Adjacent landowners would be provided a construction schedule before construction begins. Where possible, work would be confined to 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 in the winter 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, restored to original contours, and reseeded.

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 the removal of trees. Construction equipment and vehicles would be parked a minimum of 150 feet away from streams, wetlands, ditches, and other waterbodies at the end of each workday. Fueling and maintenance operations would be performed on a flat surface, away from moving equipment, and at least 150 feet away from any water source. These areas are included in the project area (Section 0).

[50] The costs of the following construction activities are included in the project installation costs.

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, when possible, to reduce potential traffic delays from construction vehicles.

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 eroded soil from entering waterbodies during construction. Erosion control measures would be free of weeds and weed seeds. Drainage measures would be incorporated into the engineering design to minimize effects of piping laterals 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 hand to enable the rapid cleanup of any spill. Immediately upon learning of any fuel, oil, hazardous material including uncured concrete, or other regulated substance spill, or upon learning of conditions that could lead to an imminent spill, the person discovering the situation shall initiate actions to contain the fluid or eliminate the source of the spill and notify the spill coordinator or crew 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 the 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 Invasive Species Control

The following measures would be followed to avoid the introduction of invasive plants and noxious weeds into project areas.

- Inspect gear to be used in or near water for aquatic invasive species.
- Limit ground disturbance to those areas necessary to safely implement the Preferred Alternative.
- Begin activities in areas un-infested with invasive plants or noxious weeds before operating in infested areas.
- Use un-infested areas for staging, parking, and cleaning equipment. Avoid or minimize all types of travel through infested areas, and restrict travel to those periods when the spread of seed or plant reproductive parts is least likely.
- Schedule soil work in infested roadsides or ditches to periods when seeds or propagules are least likely to be viable and spread.

- Monitor disturbed areas for at least three growing seasons following completion of activities. Provide for follow-up treatments based on inspection results.
- Inspect material sources at their site of origin to ensure that they are free of invasive plant material before transport and use to the extent practicable. If possible, treat contaminated material before any use.

The following measures would ensure that the invasive bullfrog is not introduced to retention pond areas.

- Retention ponds would only capture infrequent operational spills of irrigation water.
- Retention ponds would be dry during most of the irrigation season and winter months which would limit the occurrence of vegetation that could support bullfrog habitat.

8.3.7 Revegetation

During excavation, topsoil would be saved and replaced as the top layer after trenches are filled. Areas disturbed for access purposes or during construction would be regraded to their original contours. When necessary, compacted areas such as access roads, 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 the NRCS *Oregon and Washington Guide for Conservation Seedings and Plantings* (NRCS 2000). Costs of revegetation are included in project installation cost estimates. Pruning and tree removal 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 wetlands not associated with irrigation laterals would be avoided during construction.

8.3.8 Wildlife Mitigation

Construction would occur outside of 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 (E. Weidner, personal communication, February 24, 2021).

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

8.3.9 Cultural Resources

If archaeological resources were inadvertently discovered during construction, an Inadvertent Discovery Plan would be followed. Construction would stop in the vicinity of the discovery, the area would be secured and protected, a professional archaeologist would assess the discovery, consultation with SHPO and NRCS cultural resources staff would occur as appropriate, and the

appropriate tribes would be notified. Construction would continue in accordance with applicable guidance and law.

8.4 Land Rights and Easements

If additional easements are needed, prior to construction, the District would communicate with landowners and obtain an easement agreement for the retention ponds. Following pipeline installation, as-built surveys would be completed and attached to easements.

8.5 Permits and Compliance

8.5.1 Local and County

- **Jefferson 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 DEQ, would require a permit for construction activities including clearing, grading, excavation, and materials and equipment staging and stockpiling that would disturb one or more acres of land and have the potential to discharge into a public waterbody. The proposed project would meet these conditions; therefore, prior to project construction, as appropriate, a permit would be applied for.
- **Department of State Lands**: Prior to project implementation, consultation with ODSL would occur to perform wetland determinations for sites throughout the project area, as well as to determine exemption applicability to laterals in the project area.
- **Oregon Fish Passage Law:** Since August 2001, the owner or operator of an artificial obstruction located in waters in which 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 the District's irrigation diversions, and no fish are present within existing canals and laterals; therefore, no additional consultation or permitting would be required.

8.5.3 Federal

- **National Historic Preservation Act Section 106**: Pursuant to 36 CFR 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 National Register of Historic Places. 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 with 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 U.S., 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 U.S. are not impaired, that the reach of the Waters of the U.S. 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 would be taken as required to identify and mitigate impacts to potential jurisdictional wetlands and Waters of the U.S.

- **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 proposed project would occur primarily in Exclusive Farm Use zones; however, all work would be done within existing and new easement agreements and ROW. The proposed project would support agricultural production 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 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.

  The small decrease in streamflow in the Crooked River during the irrigation season associated with the implementation of the Modernization Alternative (See Section 6.8.2.1), would not affect bull trout and Middle Columbia River steelhead populations. Construction

of the retention ponds during the non-irrigation season may result in short-term sediment influx, which may affect bull trout (Section 6.9.2.2), their critical habitat (70 CFR 56211, 2005), and Middle Columbia River steelhead (Section 6.9.2.2). Streamflow would not be altered in the Deschutes River as a result of the Modernization Alternative, and therefore, there would be no effect to Oregon spotted frog or its critical habitat (Section 6.9.2.2). Coordination with USFWS regarding bull trout and Oregon spotted frog is ongoing, and informal Section 7 consultation under the ESA, as amended, would be initiated following the public review period.

Middle Columbia River steelhead is currently listed as a 10(j) non-essential experimental population. After January 2025, the 10(j) designation will be lifted, critical habitat established, and Middle Columbia River steelhead will be subject to Section 7 consultation under the ESA, as amended. Because implementation of the Modernization Alternative would be ongoing after the 10(j) designation for this population would be lifted, coordination with NMFS is ongoing and informal consultation would occur following public review.

- **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 (P.L. 104-297). EFH can include all streams, lakes, ponds, wetlands, and other viable waterbodies, as well as 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 U.S. 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.

- **Bald and Golden Eagle Protection Act**: The BGEPA prohibits the taking or possessing of and commerce in bald and golden eagles, with limited exceptions (16 U.S.C. 668–668d). The Act only covers intentional acts or acts in "wanton disregard" of the safety of bald or golden eagles. The proposed project is not proximal to known nesting sites; however, should nesting sites be discovered, requirements of the BGEPA would be implemented appropriately.

8.6 Costs

Table 8-3 presents the total project cost of $34,020,000 for the Preferred Alternative. P.L. 83-566 funds would contribute $25,810,000 towards the total project cost. Non-federal funds would contribute the $8,210,000 remainder of the cost.

Table 8-4 itemizes the costs and shows the distribution of costs between the sponsors and NRCS.

- Construction costs account for all material, labor, and equipment necessary for the installation of piping 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 were estimated using the best available information about the proposed 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 proposed project. Final construction costs would only reflect the time and materials to perform the work.

8.7 Installation and Financing

The following subsections 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 proposed project are outlined in Section 8.7.3. No cost-shared on-farm measures are involved with this proposed 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 proposed project prior to the start of construction. The entire project would be completed over a 6-year period commencing in 2023 and ending by 2029. The District has developed a project phasing schedule that addresses District priorities while working 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 Modernization Alternative, Deschutes Watershed, Oregon, 2020$.[1,2]

Construction Year	Works of Improvement	Public Law 83-566 Funds	Other, Non-Federal Funds	Total Construction Costs[2]
0	Project Group 1	$2,688,000	$853,000	$3,541,000
2	Project Group 2	$23,122,000	$7,357,000	$30,479,000
	Total	$25,810,000	$8,210,000	$34,020,000

Notes: Prepared: March 2021

[1] Price Base: 2020 dollars.

[2] Percentages for engineering, construction contractor, and contingency vary across project items and are included in total costs.

8.7.3 Responsibilities

NRCS would be 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 it has agreed to exercise those authorities to implement the actions described in this Plan-EA.

As a cooperating agency, Reclamation is responsible for assisting in the planning effort; reviewing engineering designs to ensure construction methods meet Reclamation standards; participating in Section 106 of NHPA as the owner of the infrastructure; providing language for this Plan-EA; and providing subject matter experts to answer questions regarding topics such as the history of the Crooked River Project, O&M plans, past ESA consultations, and other topics as needed.

NRCS and Reclamation would each prepare its own Finding of No Significant Impact statement if warranted. Further site-specific environmental compliance may be required for specific implementation activities. Each agency would be responsible for preparing categorical exclusions or other such instruments for implementation.

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 the construction of the project in coordination with NRCS. Reclamation would be consulted as needed.

8.7.5 Real Property and Relocations

Any real property acquisition or relocations needed would be completed in conjunction with Reclamation. All construction would be completed under either existing NUID-operated and -maintained easements or the newly obtained easement agreements as described in Section 6.2.2)

Reclamation Realty staff would provide feedback and review internal documentation of existing ROW descriptions and stipulations.

8.7.6 Financing

NRCS would provide 75 percent of the total project cost for the Preferred Alternative through P.L. 83-566.[51] The District is responsible for securing funding for the remaining 25 percent of the costs including funds that are not eligible under the National Watershed Program (project administration and technical assistance). Table 8-3 and Table 8-4 present annual installation costs of the project and the proportion of funding through P.L. 83-566 funding and other funding sources.

The majority of the required match funding would be anticipated to be provided through grants. If necessary, a portion of the project cost would be financed through loans. If financing would be required, NUID anticipates that it would apply for funding through the DEQ Clean Water State Revolving Fund. The District anticipates 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.

O&M costs after project completion would be provided through the NUID revenues. O&M costs would not increase due to the proposed project and would be budgeted on an annual basis.

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 would act on behalf of the secretary of the interior to ensure that the proposed project meets 16 U.S.C. 1005.

8.8 Operation, Maintenance, and Replacement

The District would be responsible for the O&M of the project for the 100 years of its design life. Prior to construction, a separate O&M agreement, based on the NRCS 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 approval.

Project sponsors and NRCS would conduct annual inspections of project measures to ensure the quality of ongoing O&M. The District would be in charge of scheduling O&M inspections and be responsible for necessary work. District O&M would consist of a pipe inspection program that would systematically cover inspection of the proposed project 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 (non-irrigation season), the District would perform system component maintenance including valve battery changes, magnetic meter maintenance, District operational valve maintenance, air and vacuum valve

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

maintenance, pressure-reducing station filter maintenance, valve repairs, integrity inspection of the containment earthworks at each of the retention ponds, and sediment removal at each of the retention ponds. The District would expand its current vegetation and weed management to include the areas on top of the newly piped system and along the banks of the retention ponds. All procedures would be followed as specified in the O&M 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 Federal Investment is provided in Section 5.4. The full NEE Analysis can be found in Appendix D. The costs and benefits associated with the proposed project are detailed in the following tables in this section. Table 8-3 (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 proposed project.

Table 8-4 (NWPM Economic Table 2, 506.12) presents the proposed project's cost, as well as the proportion of P.L. 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 Modernization Alternative, Water Resource Project Measures, Deschutes Watershed, Oregon, 2020$.[1,2,3]

Works of Improvement	Unit	Number			Estimated Cost (dollars)						
					Public Law 83-566 Funds			Other Funds			
		Non-Federal Land	Federal Land	Total	Non-Federal Land NRCS[5]	Federal land NRCS	Total	Non-Federal Land	Federal Land	Total	Total
Irrigation Structure[4]	Miles	27.4	0	27.4	$25,810,000	$0	$25,810,000	$8,210,000	$0	$8,210,000	$34,020,000
Total project					$25,810,000	$0	$25,810,000	$8,210,000	$0	$8,210,000	$34,020,000

Note: Totals may not sum due to rounding. Prepared: May 2021

NRCS = Natural Resources Conservation Service

1/ Price base: 2020 dollars.

2/ Project cost as identified in the *North Unit Irrigation District System Improvement Plan* prepared by Black Rock Consulting, 2017 (NUID 2017), and by communications with Black Rock Consulting, 2017. All costs updated to 2020 dollars and include an additional 3-percent project administration cost and 8-percent technical assistance cost.

3/ Percentages for Engineering, Construction Contractor, and Contingency vary across project features and are included in total costs.

4/ The irrigation structure works of improvement includes two project groups. Project Group 1 would cost a total of $3,541,000 and Project Group 2 would cost $30,479,000.

5/ Federal agency responsible for assisting in installation of works of improvement.

Table 8-4. Economic Table 2 – Estimated Modernization Alternative Cost Distribution, Water Resource Project Measures, Deschutes Watershed, Oregon, 2020$.[1,2,3]

Works of Improvement	Installation Costs – P.L. 83-566 Funds				Installation Cost – Other Funds				
Piping	Construction	Engineering	Project Admin.[4]	Total P.L. 83-566	Construction	Engineering	Project Admin.[4]	Total Other	Total
Project Group 1: Lateral 31	$319,000	$15,000	$34,000	$368,000	$106,000	$5,000	$5,000	$116,000	$484,000
Project Group 1: Lateral 32	$59,000	$3,000	$6,000	$68,000	$20,000	$1,000	$1,000	$22,000	$90,000
Project Group 1: Lateral 34	$1,953,000	$94,000	$205,000	$2,252,000	$650,000	$31,000	$34,000	$715,000	$2,967,000
Project Group 2: Lateral 43	$20,057,000	$963,000	$2,102,000	$23,122,000	$6,686,000	$321,000	$350,000	$7,357,000	$30,479,000
Total Costs	$22,388,000	$1,075,000	$2,347,000	$25,810,000	$7,462,000	$358,000	$390,000	$8,210,000	$34,020,000

Note: Totals may not sum due to rounding. Prepared: May 2021
Admin. = administration; P.L. = public law
[1/] Price base: 2020 dollars.
[2/] Project cost as identified in the *North Unit Irrigation District System Improvement Plan* prepared by Black Rock Consulting, 2017 (NUID 2017), and by communications with Black Rock Consulting, 2017. All costs updated to 2020 dollars and include an additional 3 percent project administration cost and 8 percent technical assistance cost.
[3/] Percentages for Engineering, Construction Contractor, and Contingency vary across project features and are included in total costs.
[4/] Project Admin includes project administration, technical assistance costs, and permitting costs.

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

Works of Improvement	Project Outlays (Amortization of Installation Cost)	Other Direct Costs[2]	Total Cost
Project Group 1	$95,000	$0	$95,000
Project Group 2	$764,000	$0	$764,000
Total Costs	$859,000	$0	$859,000

Note: Totals may not sum due to rounding. Prepared: May 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.

The Preferred Alternative damage-reduction benefits would include agricultural yields, power cost savings, reduced O&M costs, 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, North Unit Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2020$.[1]

	Damage-Reduction Benefit, Average Annual	
Item	**Agricultural-Related**	**Non-Agricultural-Related**
Project Group 1		
On-Site Damage Reduction Benefits		
Agricultural Damage Reduction	$153,000	
Other – Power Cost Savings	$13,000	
Other – Reduced OM&R	$0	
Subtotal	$166,000	
Off-Site Damage Reduction Benefits		
Avoided Carbon Emissions		$5,000
Subtotal		$5,000
Project Group 2		
On-Site Damage Reduction Benefits		
Agricultural Benefits	$792,000	
Other – Energy Cost Savings	$204,000	
Other – Reduced OM&R	$53,000	
Subtotal	$1,049,000	
Off-Site Damage Reduction Benefits		
Avoided Carbon Emissions		$88,000
Subtotal		$88,000
Total Quantified Benefits		$1,308,000

Note: Prepared: May 2021

OM&R = operation, maintenance, and replacement

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 National Economic Efficiency Costs and Benefits, North Unit Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2020$.[1]

	Agriculture-Related			Non-Agricultural	Average Annual Benefits	Average Annual Cost[2]	Benefit Cost Ratio
Works of Improvement	Agricultural Benefits	Energy Cost Savings	Reduced OM&R	Carbon Value			
Project Group 1	$153,000	$13,000	$0	$5,000	$171,000	$95,000	1.8
Project Group 2	$792,000	$204,000	$53,000	$88,000	$1,137,000	$764,000	1.5
Total	$945,000	$217,000	$53,000	$93,000	$1,308,000	$859,000	1.5

Notes: Prepared: May 2021

OM&R = operation, maintenance, and repair

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

2/ From Economic Table 4 (Table 8-5 of this Plan-EA)

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10 List of Preparers

The Draft Watershed Plan-EA was prepared jointly by staff at NRCS Oregon and Farmers Conservation Alliance. The staff responsible for preparation of the Draft Watershed Plan-EA is included in Table 10-1.

Table 10-1. List of Preparers.

Name	Title	Education	Professional Experience	Area of Responsibility
FCA Watershed Plan-EA Team				
Kristin Alligood	Program Specialist	Ph.D. Biology B.A. Neuroscience	5 years	Fish and Aquatic Species, Soils, Purpose and Need, Vegetation, Wildlife, General
Raija Bushnell	Watershed Planning Program Manager	M.P.A. Natural Resource Policy M.S.E.S Natural Resource Management B.A. Political Science	7 years	General
Brett Golden	Director of Modernization	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	Public Process
Amanda Schroeder	Program Specialist	B.S. Natural Resource Management	6 years	Alternatives, Purpose and Need, Water Resources, Wetlands, General
NRCS – Oregon				
Gary Diridoni	Natural Resource Specialist	Fisheries Management Graduate Certificate B.S. Wildlife Management B.S. Interdisciplinary Studies, Ecosystem Conservation	17 years	General

Name	Title	Education	Professional Experience	Area of Responsibility
Scarlett Vallaire	Watershed Planner	M.S. Ecology B.S. Biology	12	General
Lakeitha Ruffin	Agricultural Economist	M.S. Agricultural Economics B.S. Agricultural Economics	8 years	Economic and Socioeconomic Analysis, Alternative Analysis, Overall Watershed Planning
Louis Landre	Agricultural Economist	M.S. Applied Economics B.S. Biology	23	Economic and Socioeconomic Analysis, Alternative Analysis, Overall Watershed Planning
Employees from Firms Under Contract with FCA				
Company	**Name**	**Education**	**Years of Experience**	**Area of Responsibility**
Highland Economics	Barbara Wyse	M.S. Environmental and Natural Resource Economics B.A. Environmental Sciences and Policy	13 years	Economic Analysis
Highland Economics	Winston Oakley	M.S. Applied Economics B.S. Environmental Sciences, Policy, and Management	4 years	Economic Analysis

11 Distribution List

A Notice of Availability for the Draft 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
- Central Oregon Land Watch
- Coalition for the Deschutes
- Jefferson County
- Jefferson County Soil and Water Conservation District
- Deschutes River Conservancy
- Middle Deschutes Watershed Council
- National Marine Fisheries Service
- Oregon Department of Agriculture
- Oregon Department of Energy
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of State Lands
- Oregon Department of Transportation
- Oregon Governor's Office
- Oregon Water Resources Department
- Oregon Watershed Enhancement Board
- State Historic Preservation Office
- Trout Unlimited
- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service
- Upper Deschutes Watershed Council
- WaterWatch of Oregon

In accordance with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, NRCS would contact CTWS regarding the availability of the Draft Plan-EA.

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

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12 Acronyms, Abbreviations, and Short-forms

AID	Arnold Irrigation District
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
COID	Central Oregon Irrigation District
CTWS	Confederated Tribes of Warm Springs
CWA	Clean Water Act
DBHCP	Deschutes Basin Habitat Conservation Plan
DEQ	Oregon Department of Environmental Quality
EA	Environmental Assessment
EFA	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCA	Farmers Conservation Alliance
IPAC	USFWS Environmental Conservation Online System 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
NUID	North Unit Irrigation District
NWI	National Wetland Inventory
NWPH	National Watershed Program Handbook
NWPM	National Watershed Program Manual

O&M	operation and maintenance
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
ORS	Oregon Revised Statute
OWRD	Oregon Water Resources Department
PCE	Primary Constituent Element
P.L. 83-566	Watershed Protection and Flood Prevention Program, Public Law 83-566
Plan-EA	Watershed Plan-Environmental Assessment
Project	North Unit Irrigation District Infrastructure Modernization Project
Reclamation	United States Bureau of Reclamation
RM	River Mile
ROW	right-of-way
SHPO	State Historic Preservation Office
SIP	System Improvement Plan
TID	Tumalo Irrigation District
U.S./US	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

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(To be completed prior to public review)

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14 Appendix A-E

Appendices are provided in a separate document.

Appendix A. Comments and Responses
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