US Army Corps of Engineers ®
Walla Walla District

OWYHEE RIVER ECOSYSTEM RESTORATION DRAFT FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

DUCK VALLEY INDIAN RESERVATION, IDAHO/NEVADA

Continuing Authorities Program
Section 206 of the Water Resources Development Act of 1996, as amended

March 2025

EXECUTIVE SUMMARY

The Owyhee River Ecosystem Restoration study was conducted under the Continuing Authorities Program (CAP) and in accordance with Section 206 of the Water Resources Development Act (WRDA) of 1996 (Public Law [PL] 104-303), as amended, and codified at 33 US Code 2330, that authorizes the U.S. Army Corps of Engineers (USACE) to study, design, and construct restoration projects in aquatic ecosystems (such as rivers, lakes, and wetlands). This authority requires a non-Federal Sponsor to partner with USACE to cost share the planning, design, and construction of the project; to provide all necessary lands; and to conduct long-term project operations and maintenance (O&M). The non-Federal sponsor (NFS) for this study is the Shoshone-Paiute Tribes, federally recognized by Executive Order on April 16, 1877. A Feasibility Cost Sharing Agreement was executed on September 8, 2021.

This feasibility study is intended to evaluate and identify the national ecosystem restoration plan (NER), and the tentatively selected plan (TSP) that would restore the ecological potential of the Owyhee River. An NER plan is needed because aquatic and riparian habitat and function in the study watershed have been degraded by land use practices and numerous other anthropogenic stressors, resulting in altered flow regime, impaired riparian habitat quality and function, simplified channel morphology, segregation of the river from the floodplain, and reduced fish and wildlife habitat diversity.

The USACE planning process was used to identify and select restoration measures to satisfy the study's purpose and need, which is used to develop project goals and objectives, while not violating any project-specific constraints. These measures were then used to develop nine initial alternatives. Three action alternatives and the No Action Alternative were identified in the final array of alternatives, each consisting of different combinations of one or more of the measures listed in the table below.

Table ES-1. Management Measures

Measure ID	Measure Name
A	Wetland Restoration
B	Side Channel Connection
C	Instream Habitat
D	Floodplain Connection

For each restoration alternative, benefits for aquatic habitat were estimated using the FACStream model, which is a reach-scale functional assessment tool that rates functional condition of stream health. Additionally, cost estimates for each alternative were developed as an average annual cost and included amortized initial construction costs over a 50-year project life. Costs for each measure were annualized using the USACE Institute for Water Resources (IWR) Planning Suite II version 2.0.9, a decision support software which conducts cost effective and incremental cost analyses.

Each action alternative considered was evaluated and compared based on its ability to address the planning criteria of acceptability (environmental effects), completeness, effectiveness (biological benefits), and efficiency (cost benefits). This process identified the NER plan and ultimately the TSP that reasonably maximized ecosystem restoration benefits compared to costs, and in consideration of other qualitative information.

Alternative 6 was identified as the Recommended Plan. After refinement of costs, this plan provides the combined improved habitat benefit of 27.0 net average annual habitat units (AAHUs) for the 50-year total average annual cost (AAC) of $348,000. This total AAC is based on total project first costs and includes O&M. The total AAC based on fully funded total project costs is estimated to be $368,000. Alternative 6 includes restoration of approximately 55 acres of wet meadow habitat, 4 acres of riparian habitat, and 11,370 linear feet of side channel.

Total project first cost for implementation of the TSP (not including the feasibility study) is estimated to be $8.18 million (fiscal year [FY] 2025 price level). The Federal share of the total project first cost is estimated to be $5.98 million, and the non-Federal share is estimated to be $2.21 million. Fully funded total project costs of the TSP escalated to the midpoint of construction is estimated to be $8.68 million. The Federal share of the fully funded total project costs is estimated to be $6.30 million, and the non-Federal share is estimated to be $2.38 million.

Costs include the following: construction; planning, engineering, and design with adaptive management and monitoring; construction management; and real estate (lands, easements, rights of way, relocations, and disposal areas [LERRDs]).

In accordance with the cost share provisions in Section 103 of WRDA 1986, as amended, the unadjusted total project first cost share is 65 percent Federal and 35 percent non-Federal. The current Section 1156 waiver (Economic Guidance Memorandum [EGM] 25-02, Cost Sharing for Territories and Tribal Nations, dated 25 November 2024) of $658,000 is applied to the non-Federal sponsor’s Design and Construction cost share. Not included within Design and Construction costs, the non-Federal sponsor is responsible for 100 percent of LERRDs, but cost-share credit for such costs is allowed.

Table ES-2. Total Project First Cost Share of Recommended Plan* ($1,000s)

	Federal Costs	Non-Federal Costs	Total Project First Costs
65/35 Unadjusted Cost Share	$5,319	$2,864	$8,183
LERRDs	$0	-$1,317	-$1,317
Design and Construction Subtotal	**$5,319**	**$1,547**	**$6,866**
Section 1156 Cost Share Waiver	$658	-$658	-
Post-Waiver Subtotal	**$5,977**	**$889**	**$6,866**
Add LERRDs Responsibility	$0	$1,317	$1,317

	Federal Costs	Non-Federal Costs	Total Project First Costs
Total Project First Cost	**$5,977**	**$2,206**	**$8,183**

*FY25 OCT 2024 Price Level

Table ES-3. Fully Funded Total Cost Share of Recommended Plan* ($1,000s)

	Federal Costs	Non-Federal Costs	Fully Funded Costs
65/35 Unadjusted Cost Share	$5,641	$3,038	$8,679
LERRDs	$0	-$1,361	-$1,361
Design and Construction Subtotal	**$5,641**	**$1,676**	**$7,317**
Section 1156 Cost Share Waiver	$658	-$658	-
Post-Waiver Subtotal	**$6,299**	**$1,018**	**$7,317**
Add LERRDs Responsibility	$0	$1,361	$1,361
Fully Funded Total Costs	**$6,299**	**$2,380**	**$8,679**

*FY25 OCT 2024 Price Level

OWYHEE RIVER ECOSYSTEM RESTORATION
DRAFT FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

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ACRONYMS AND ABBREVIATIONS

AIRFA	American Indian Religious Freedom Act
BGEPA	Bald and Golden Eagle Protection Act
°C	Degree Celsius
CAA	Clean Air Act
CAP	Continuing Authorities Program
cfs	cubic feet per second
CE/ICA	Cost Effectiveness and Incremental Cost Analyses
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
USACE	U.S. Army Corps of Engineers
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ER	Engineer Regulation
ESA	Endangered Species Act
°F	Degree Fahrenheit
FONSI	Finding of No Significant Impact
FR/EA	Feasibility Study/Environmental Assessment
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
FY	fiscal year
HMU	Habitat Management Units
IDC	interest during construction
MBTA	Migratory Bird Treaty Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NED	National Economic Development
NER	National Economic
NHPA	National Historic Preservation Act
NFS	Non-Federal Sponsor
O&M	Operations and Maintenance
PL	Public Law
Reclamation	Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
USC	United States Code
WRDA	Water Resources Development Act

SECTION 1 - INTRODUCTION

1.1 INTRODUCTION

This report presents the results of a collaborative ecosystem restoration feasibility study integrated with an environmental assessment (FR/EA) conducted by the U.S. Army Corps of Engineers (USACE) Walla Walla District and the Shoshone-Paiute Tribe (Tribe), located within the Duck Valley Indian Reservation in the states of Idaho and Nevada. The report identifies and evaluates alternatives for restoring riparian and aquatic habitat and ecosystem functionality in the Owyhee River in the Duck Valley Indian Reservation. The alternatives are compared to identify and recommend the tentatively selected plan (TSP).

This report has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA), applicable Federal laws and regulations, and internal USACE policies and regulations, including Engineering Regulation (ER) 1105-2-100, ER 200-2-2, and ER 1105-2-103, Planning Guidance.

1.2 USACE PLANNING PROCESS

This FR/EA incorporates the USACE planning process contained in the Planning Guidance Notebook ER 1105-2-100 Planning Guidance Notebook (April 2000) and in the Planning Policy for Conducting Civil Works Planning Studies (ER 1105-2-103, December 2023) with the requirements of NEPA, as amended (42 United States Code [USC] §§ 4321-4335), and implementing regulations (40 CFR Parts 1500-1508 and 33 CFR Part 230). The USACE planning process is not a separate effort from the NEPA process. They have been integrated into one document to complement each other in the project planning process. Table 1-1 presents a crosswalk between the USACE planning process and NEPA. This report documents the results of the planning process, recommends a plan, and determines whether the project proposed by USACE constitutes a "…major Federal action significantly affecting the quality of the human environment…" [NEPA, Section 102(c)], and whether it requires an environmental impact statement (EIS).

Table 1-1. Planning Process and NEPA Crosswalk

Plan Formulation Step	NEPA Compliance
Scope for project	Scope for NEPA
Specify problems, opportunities, objectives, and constraints	Describe Purpose and Need consistent with projects scope
Inventory forecast and conditions (future without project)	Describe affected environment, existing conditions, trends, No Action Alternative
Formulate alternative plans to address objectives	Include and describe reasonable range of alternatives based on Purpose and Need

Plan Formulation Step	NEPA Compliance
Compare alternative plans and evaluate effects	Evaluate and compare range of alternatives to the No Action Alternative, including direct, indirect and cumulative effects. Identify the Least Environmentally Damaging Practicable Alternative (LEDPA)
Select a TSP	Identify the Agency Preferred Plan
Release for public review	Public/agency involvement (review & comment)

1.3 STUDY AUTHORITY

This study was conducted under the Continuing Authorities Program (CAP) and in accordance with Section 206 of the Water Resources Development Act (WRDA) of 1996 (Public Law [PL] 104-303), as amended, and codified at 33 US Code 2330, that authorizes USACE to study, design, and construct restoration projects in aquatic ecosystems (such as rivers, lakes, and wetlands).

The USACE may plan, design, and build projects to restore aquatic ecosystems for fish and wildlife under this authority. Projects must improve the quality of the environment, be in the public interest, demonstrate cost effectiveness and be no more than $10 million in total Federal cost. There is no requirement that an existing USACE project be involved for a CAP 206 project.

This authority requires a non-Federal Sponsor to partner USACE to cost share the planning, design, and construction of the project; to provide all necessary lands; and to conduct long-term project operations and maintenance (O&M). Section 1156 of the WRDA of 1986 [Public Law (PL) 99-662], as amended and codified at 33 US Code 2310, provides a Government waiver of cost-sharing requirements up to $658,000 (at the time of the feasibility cost share agreement) on all studies and projects for any Indian Tribe, (as defined in Section 102 of the Federally Recognized Tribe List Act of 1994 (25 U.S.C. 5130)). The CAP 206 (33 U.S.C. § 577 (Pub. L. No. 86-645, as amended) focuses on water resource-related projects of relatively smaller scope, cost, and complexity. Unlike the traditional USACE civil works projects that are of wider scope and complexity, the CAP is delegated authority to plan, design, and construct certain types of water resource and environmental restoration projects without specific Congressional authorization. The non-Federal sponsor (NFS) for this study, the Owyhee River Ecosystem Restoration project, is the Shoshone-Paiute Tribe, a Tribe federally recognized by Executive Order on April 16, 1877.

The NFS is responsible for 35 percent of the study costs for projects of this type. The Federal share of planning, design, and construction cannot exceed $10,000,000 for the project. The NFS is also responsible for all land acquisition and easements, as well as project O&M.

1.4 STUDY AREA (PLANNING AREA)

The study area is defined as the focus area of the feasibility study, which is located along the Owyhee River within the Duck Valley Indian Reservation, and straddles both Owyhee County, Idaho and Elko County, Nevada. The study area is fully evaluated in the scoping phase of a feasibility study to identify locations for the proposed action(s). These specific locations are referred to as project area(s).

The Owyhee River is a 280-mile-long tributary of the Snake River with headwaters originating in the Independent Mountain Range of northern Nevada. Runoff from the upper Owyhee basin is stored in Wild Horse Reservoir, formed by the construction of Wild Horse Dam, owned by the Bureau of Indian Affairs (BIA). The Owyhee River flows northwest from the reservoir, through the Duck Valley Indian Reservation, and through Idaho into Oregon to join the Snake River (Figure 1-1).

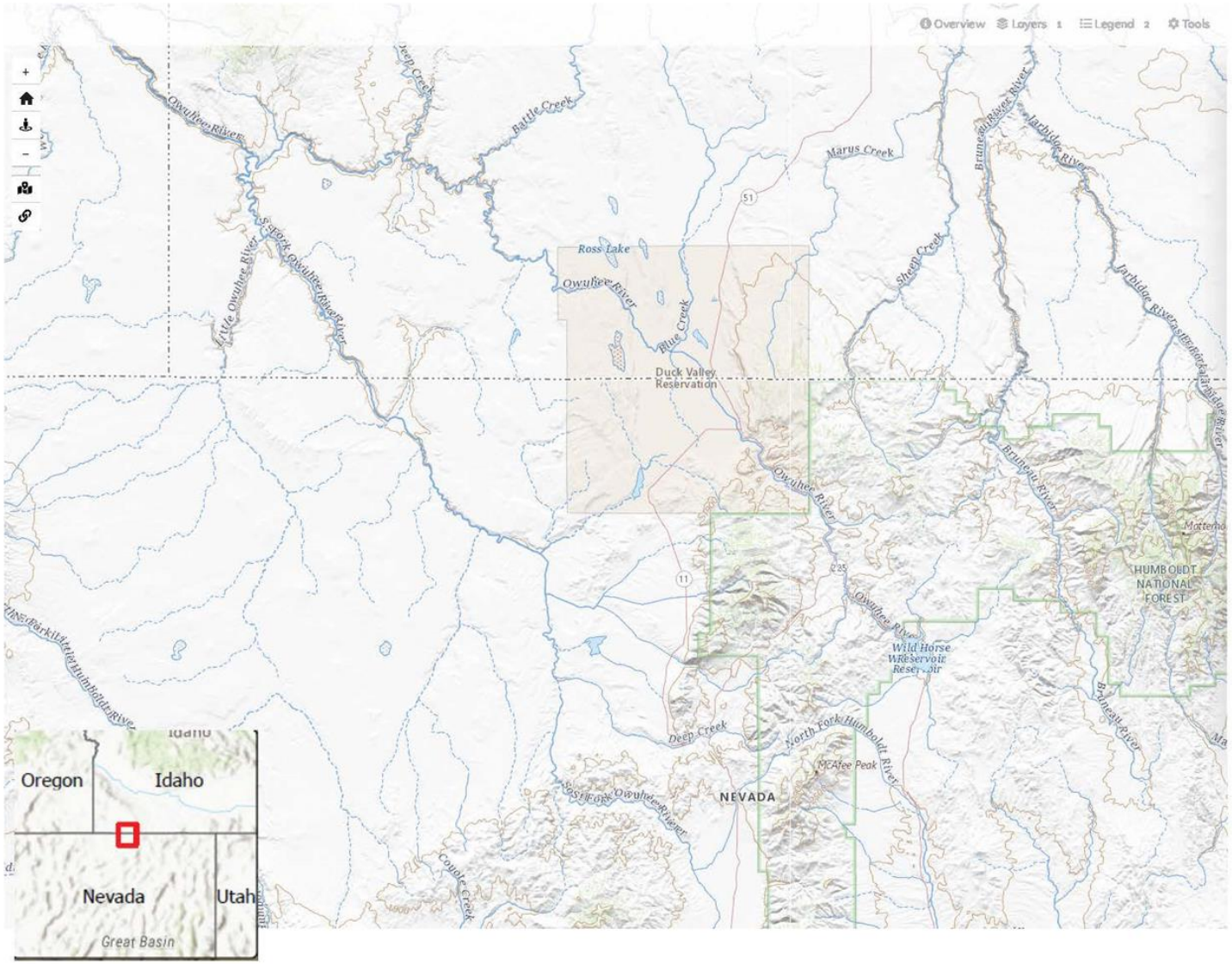

Figure 1-1. Vicinity Map of the Duck Valley Indian Reservation

The portion of the Owyhee River that resides within the study area flows for approximately 12 miles through the Duck Valley Indian Reservation (Figures 1-2 and 1-3). The upper extent of the Owyhee River is constrained by the China Diversion Dam, a regulating structure used for irrigation flows built in 1937, owned by the Bureau of Indian Affairs (BIA) and operated by the Shoshone Paiute Tribe, and is currently under rehabilitation with major improvements for irrigation. This structure is a part of the Duck Valley Irrigation Project (DVIP) and does not include fish passage; however, the Shoshone Paiute Tribe seeking funding to add fish passage at the China Diversion Dam.

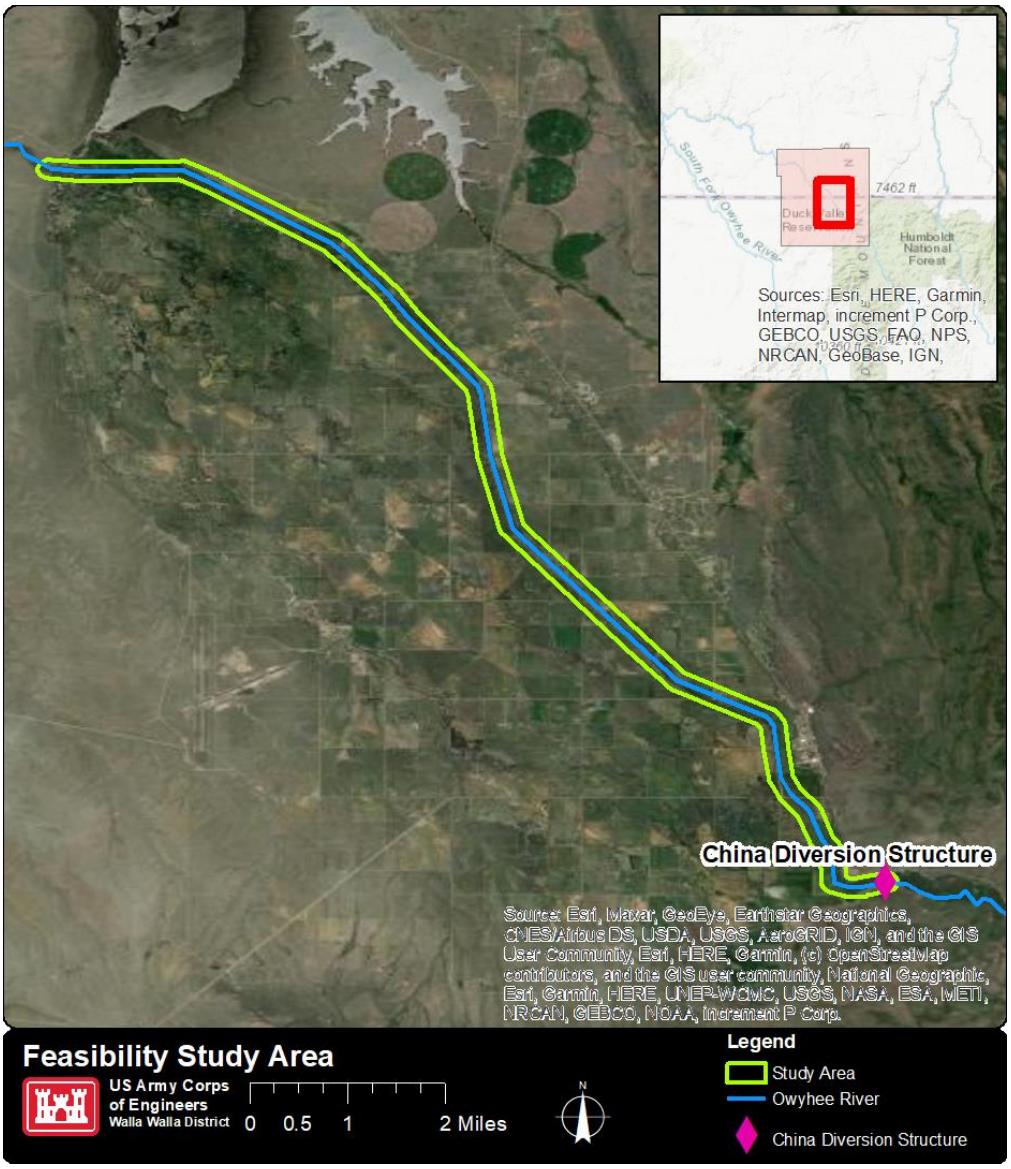

Figure 1-2. Feasibility Study Area

Figure 1-3. Typical View of the Owyhee River, Taken from National Guard Road (September 2023)

1.5 BACKGROUND AND HISTORY

Historically, the Owyhee River on the Duck Valley Indian Reservation was a braided system with an extensive floodplain, naturally carving out new channels and depositing sediment and debris. This process created a complex network of oxbows and backwaters, providing a refuge for a diverse range of habitats, supporting fish, wildlife, birds, and other aquatic and riparian species. The Owyhee River, with its instream cover and habitat complexity, supported native interior redband trout (*Oncorhynchus mykiss gibbsi*) and served as a rearing ground for salmon and steelhead species, now absent due to downstream dams. Wetlands within the floodplain acted as an oasis for riparian wildlife, boasting a rich diversity of wetland and upland plant species, including rushes, cattails, willows, wildflowers, camas, and bunchgrasses. These areas supported various grouse species, such as the greater sage-grouse (*Centrocercus urophasianus*) utilizing wet meadows for brood rearing, and willow riparian areas once thrived with sharp-tailed grouse (*Tympanuchus phasianellus*), with historical accounts indicating seasonal migrations of blue grouse (*Dendragapus spp.*) to the Owyhee River bottomlands.

These plant and wildlife resources were of great cultural importance to the Shoshone and Paiute people prior to the arrival of European settlers. Due to the arid and desert environment, resources were scarce, prompting the Tribes to adopt certain hunting and gathering traditions. They harvested forb seeds and camas bulbs, along with salmonids, grouse, and deer from lands adjacent to the Owyhee River and its tributaries to sustain themselves. These practices formed an integral part of the Tribes' connection to the land and their means of subsistence.

On April 16, 1877, United States President Rutherford B. Hayes established the reservation for the Western Shoshone and on May 4, 1886, United States President

Grover Cleveland expanded the Reservation for the Northern Paiute both through Executive Orders. On July 01, 1910, United States President William H. Taft further expanded the reservation by Executive Order. In the following years, the Tribes and Bureau of Indian Affairs converted the natural habitats and Owyhee River for agriculture and rangeland use. Irrigation lines were implemented for providing water for crops and livestock. Wildhorse Dam was included in the DVIP, owned by BIA and leased to the Tribe, to provide storage of irrigation water. The Bureau of Land Management (BLM) promoted grazing activities in nearby areas.

The ecological function and quality of the Owyhee River watershed have been negatively impacted by altered climatic conditions, changes in runoff, reduced floodplain connectivity, diminished riparian habitat, and barriers to historic salmonid spawning and rearing areas. In the 1950s and 1960s, the Bureau of Indian Affairs channelized the Owyhee River to manage flow for irrigation, installing a diversion at China Diversion Dam. This channelization and agricultural development removed riparian vegetation, converting wetlands into grasslands for grazing and crops. Consequently, habitats for native wildlife and aquatic species, including greater sage-grouse and redband trout, declined. These changes disrupted natural flooding cycles, reducing side channels, sediment deposition, and wetland creation, further impacting the ecosystem (Figure 1-4).

Figure 1-4. Owyhee River Steep Banks and Disconnected Floodplain

1.6 PURPOSE AND NEED

The Owyhee River flows through the Duck Valley Indian Reservation, providing vital water resources for the local community and ecosystem.

The purpose of this project is to improve or restore aquatic, wetlands and riparian habitat functions, structure and processes along a portion of the Owyhee River within the Duck Valley Indian Reservation for native fish and wildlife species. The project would accomplish this purpose by increasing aquatic habitat diversity to support native fish spawning and rearing, by reconnecting and restoring historic channel segments to promote a more natural hydrologic regime with improved ecological responses, and by restoring floodplain function to improve adjacent riparian and wetland habitat.

The project is needed because the aquatic ecosystem in the Owyhee River, as well as its adjacent habitats, has been altered by ranching, farming, and associated irrigation diversions. The river has been channelized and deepened to accommodate these practices. Consequently, the side channels and meanders were severed from the main channel, leading to the creation of stagnant pools. The adjacent wetland habitat no longer performs ecosystem functions and processes.

These management practices directly effect numerous species, particularly those dependent on riparian ecosystems. Juvenile sage-grouse, prevalent on the Reservation, rely on wet meadows as a critical food source. Additionally, native fish, such as the redband trout, require specific habitat features like riffles, pools, meanders, and an active floodplain. These species hold profound cultural importance for the tribe, serving as symbols, vital sources of tribal subsistence/first foods, contributors to biodiversity, and integral components of the natural food web. Without intervention to enhance these habitats, there is a risk that the existing habitat may not adequately support these unique riparian species, which play a crucial role in the ecosystems of this distinct portion of Idaho and Nevada.

The area holds cultural significance for the Shoshone-Paiute Tribes (Tribes), which have lived in the region for centuries. The Owyhee River and surrounding lands have historical, spiritual, and subsistence importance to the tribes. Although the project must result in aquatic ecosystem or habitat improvements, it is imperative to note that the tribal farm and ranch economy heavily depend on the existing irrigation system. The project must maintain existing irrigation systems and capacity and must not interfere with existing water rights. Additionally, the Tribes have entered into ranching and farming lease agreements on Reservation land adjacent to the River and the Recommended Plan cannot violate such agreements.

1.7 PROBLEMS AND OPPORTUNITIES

The first step in the USACE six-step planning process is the identification of problems and opportunities, which mirrors or overlaps considerably with the Purpose and Need statement in Section 1.6, above. A problem is an existing condition considered for change. An opportunity is a chance to create a more desirable future condition. The identification and development of problems and opportunities specific to Owyhee River resulted from reports and studies conducted by the Tribes in its watershed, internal discussions and workshops with the Project Delivery Team (PDT), external communication with stakeholders and resource agencies, and public interactions.

1.7.1 Problems

The channelization and dewatering of the Owyhee River, located near Owyhee, has resulted in the loss of side channels and meanders, reduced depth and pools, changed sedimentation processes, created blockages to fish passage, and decreased habitat complexity and diversity. The disconnected historic river off-channel segments offer little habitat value and the irrigation practices have led to a decrease in flows in the main channel, particularly near the China Diversion Dam.

1.7.2 Opportunities

Opportunities focus on desirable future conditions and potential ways to address specific problems within the study area. In addition to the general, overall goal of the project to improve or restore aquatic, wetland, and riparian ecosystem habitat functions, structure, and processes along a portion of the Owyhee River within the Duck Valley Indian Reservation for native fish and wildlife species, two opportunities were identified during the planning process:

1. Further understanding of the potential water supply flexibility or deficiencies in the region.
2. Educational opportunities for local community to focus on additional restoration efforts.

1.8 RESOURCE SIGNIFICANCE

The concept of output significance plays an important role in ecosystem restoration evaluation. Information on the significance of ecosystem outputs will help determine whether the proposed investment is worth its cost and whether a particular alternative should be recommended. Statements of significance provide qualitative information to help decision makers evaluate whether the value of the resources of any given restoration alternative are worth the costs incurred to produce them. Engineer Regulation 1105-2-103: Policy for Conducting Civil Works Planning Studies defines significance in terms of institutional, public, and technical recognition. Additionally, cultural significance was added due to the Tribal interests for this project.

1.8.1 Institutional Significance

Institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Sources of institutional recognition include public laws, executive orders, rules and regulations, treaties, and other policy statements of the Federal Government; plans, laws, resolutions, and other policy statements of states with jurisdiction in the planning area; laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area; and charters, bylaws, and other policy statements of private groups.

Greater sage-grouse depends on sagebrush steppe and wet meadow ecosystems. These ecosystems are managed in partnership across their range by Federal, state, tribal, and local authorities. In 2010, the USFWS determined that listing the greater sage-grouse under the Endangered Species Act (ESA) of 1973 was “warranted but precluded” by other priorities. In its determination, the USFWS found inadequate regulatory mechanisms to protect greater sage-grouse and conserve its habitat. In response, the BLM, in coordination with the Forest Service, USFWS, and state agencies, developed a management strategy that included targeted Greater sage-grouse management actions. These agencies designated Priority Habitat Management Areas for greater sage-grouse within the Duck Valley Indian Reservation (Figure 1.5). Priority Habitat Management Areas have the highest conservation value to maintain sustainable greater sage-grouse populations. These areas meet life cycle requirements, such as breeding and late brood-rearing habitats, winter concentration areas, and corridors spread across geographically diverse and naturally fragmented landscapes. Wet meadows are crucial habitat for juvenile greater sage-grouse survival.

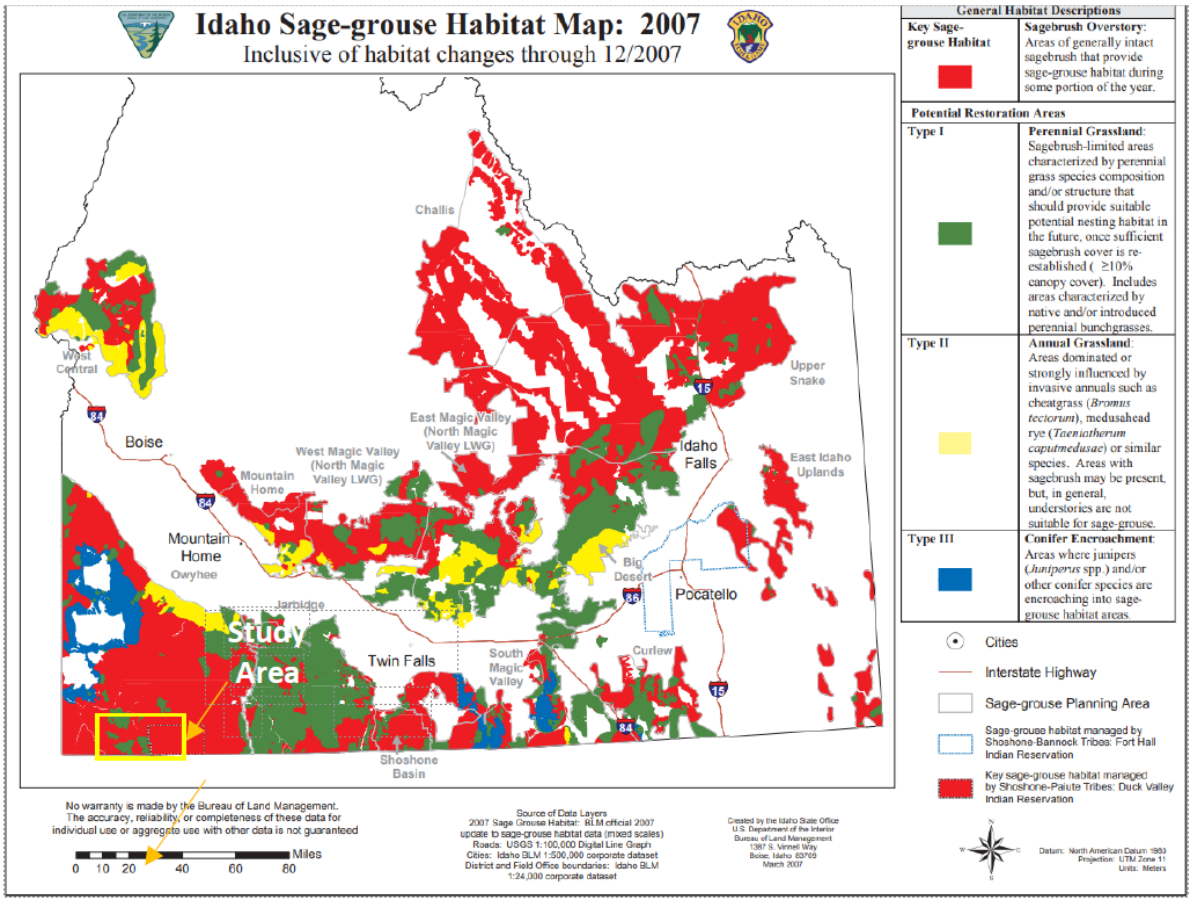

Figure 1-5. Priority Sage-Grouse Habitat for the State of Idaho

1.8.2 Public Significance

Public recognition means that some segment of the public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for that resource. Such activities may involve membership in an organization, financial contributions to resource-related efforts, and providing volunteer labor and correspondence regarding the importance of the resource. The interior redband trout holds significant public recognition in and around the Duck Valley Indian Reservation. Conservation efforts are supported by various organizations throughout the basin, including Trout Unlimited and the Western Native Trout Initiative. The Western Native Trout Initiative alone has directed over $1.3 million to 39 projects benefiting redband trout between 2007 and 2021 (Western Native Trout Initiative 2024). Additionally, the 2014 *Rangewide Conservation Agreement for Interior Redband Trout* commits six states, four Federal agencies, and five tribal governments to working together to conserve and protect habitat for this unique trout. This regionwide commitment reflects the public significance of the interior redband trout.

The sage grouse holds significant public importance on the Duck Valley Indian Reservation and the surrounding area, serving as a key indicator species for the health of the sagebrush ecosystem. Its presence reflects the vitality of a wide range of flora

and fauna that depend on this habitat. The management of sage grouse involves multiple state and private partnership organizations, including the Bureau of Land Management (BLM), Nevada Department of Wildlife, Idaho Department of Fish and Game, and conservation groups like the Nature Conservancy, American Bird Conservancy, and numerous other organizations and land trusts. These organizations work collaboratively to protect and restore sagebrush habitats, with tens of millions of dollars invested in sagebrush habitat restoration annually (Bureau of Land Management 2024).

1.8.3 Technical Significance

Technical recognition means that the resource qualifies as significant based on its "technical" merits, which are based on scientific knowledge or judgement of critical resource characteristics. Technical significance should be described in terms of scarcity, representativeness, status and trends, connectivity, critical habitat, or biodiversity. The interior redband trout historically occupied portions of major river basins in Nevada, California, Oregon, Washington, Idaho, and Montana. Interior redband trout have experienced large reductions in their distribution relative to their historically occupied habitats, primarily due to habitat degradation, habitat fragmentation, and nonnative species introductions (Williams et al. 1989; Thurow et al. 1997, 2007). As a result of declines in distribution, abundance, and genetic diversity, the interior redband trout is currently classified as a sensitive species by the U.S. Forest Service, BLM, and USFWS. In July 2014, six states, four Federal agencies, five tribal governments, and one non-governmental organization signed a Rangewide Conservation Agreement for Interior Redband Trout, agreeing to work together to conserve and protect habitat for this unique trout.

Interior redband trout habitats have been altered by a host of land use practices (Williams et al. 1989). Water diversions for irrigation affect many Redband populations in the southern portion of the range, through dewatering of stream reaches, loss of fish in unscreened diversions, blockage of migration corridors, and alternation of stream channels. The loss or conversion of riparian cover has been caused by livestock grazing, timber harvest, mining, urbanization, and agriculture (Meehan 1991). The loss of riparian cover has been associated with excessive stream temperature and reduced abundance and production in warmer and drier environments (Li et al. 1994, Trait et al. 1994). In Idaho, unaltered stream reaches supported 8 to 10 times the densities of interior redband trout than observed in altered channels (Thurow 1998).

The greater sage grouse is technically significant to in the project area due to its scarcity and population trends. Nationally, the sage-grouse population has declined dramatically, with an 80 percent reduction since 1965 and a nearly 40 percent decline since 2002 (Coates et al. 2023). This steep decline underscores the scarcity of the species, as their habitat has become increasingly limited and fragmented. Monitoring efforts have shown that the number of males per lek, an important indicator of population health, continues to decrease, reflecting ongoing habitat degradation and other environmental pressures (Coates et al. 2023). The technical significance of the

greater sage grouse is further highlighted by its role as an indicator species for the health of the sagebrush ecosystem, which supports a diverse array of flora and fauna.

The Duck Valley Indian Reservation contains approximately 22,000 acres of wetlands, accounting for about eight percent of its total area (Sho-Pai Tribes 2012). Riparian habitat is among the rarest and most sensitive habitats in the western United States (Krueper 1993), yet these areas are crucial for maintaining the sage grouse populations, as they provide the necessary resources that are not available in the surrounding sagebrush-dominated landscapes. Wetlands offer lush vegetation and a rich supply of insects, which are essential for the diet of growing chicks and brood-rearing hens during the late spring and summer months (Fedy et al. 2014). The abundance of flowering plants in wet meadows and riparian areas provides high-protein food sources necessary for chick development and overall reproductive success. Additionally, wetlands offer essential cover and protection from predators, enhancing the survival rates of sage grouse during these vulnerable periods (Donnelly et al. 2016). The presence of water in wetlands also supports a microhabitat that is cooler and more humid, which helps mitigate the harsh conditions of the surrounding arid landscapes, thereby improving the grouse's overall habitat quality and survivability.

1.8.4 Indigenous Knowledge/Cultural/Tribal Significance

Salmon and trout, including the native interior redband trout, are uniquely important to the Shoshone-Paiute Tribes. Fishing been a traditional food source for the Shoshone-Paiute people, playing an essential role in their diet and subsistence practices. Fishing is not only a means of sustenance but also a cultural practice that has been passed down through generations, encompassing knowledge about the best fishing techniques, seasonal patterns, and habitat conservation. Furthermore, the health of trout populations is a strong indicator of the overall health of aquatic ecosystems. The tribes employ traditional ecological knowledge to manage and restore these habitats, ensuring sustainable fish populations.

The greater sage grouse also holds a special place in the cultural and ecological knowledge of the Shoshone-Paiute Tribes. The sage grouse is considered a symbol of the sagebrush ecosystem, which is central to the Shoshone-Paiute’s traditional territory. Sage grouse have been incorporated into Indigenous storytelling across the west, embodying themes of survival, resilience, and the natural cycles of life (Thursby 2004). Sage grouse populations are monitored by the tribes as they are indicative of the health of the sagebrush habitat. The Shoshone-Paiute people utilize their understanding of the land to implement conservation strategies that protect and restore these habitats, ensuring the survival of the sage grouse and the myriad species that depend on the sagebrush ecosystem.

1.9 STUDY SCOPE: OBJECTIVES AND CONSTRAINTS

1.9.1 Project Goals and Objectives

Project goals and objectives were developed during the scoping phase of the feasibility study. Coordination with the Tribe and local community along with information from previous studies and reports were all used to further understand the scope of the study.

The goal of this project is to restore quality habitat for native fish and wildlife species in the study area. Objectives, which incorporate the Purpose and Need statement and are planned for 50 years, are show in Table 1-2.

Table 1-2. Project Goals and Objectives

Goal	Objectives
Restore Quality Habitat for Native Fish and Wildlife Species.	- Improve aquatic habitat diversity associated with in-stream features for native fish. - Reconnect and restore the historic disconnected channel segments to promote a more natural hydrologic regime with improved ecological responses. - Restore floodplain function to improve adjacent riparian and wetland habitat

1.9.2 Constraints

Planning constraints are significant barriers or restrictions that limit the extent of the planning process. Study-specific constraints are unique to a specific planning study that alternative plans should avoid. The following constraint has been identified for the study:

- Project must maintain existing irrigation systems and capacity and must not interfere with existing water rights Considerations

Planning considerations are areas of concern that could be challenging but do not limit the process. During scoping, the PDT focused on existing conditions of the study area. The following have been identified for the study:

- Limit impacts to local infrastructure (China Diversion Dam, irrigation canals/ditches, roads) and any associated mitigation sites. (Refer to Figure 1-6.)
- Limit impacts to leased lands (absent actual violations).
- Avoid Hazardous, toxic, radioactive waste (contaminated sites)
- Limit impacts to existing wetlands and other natural resources.
- Limit impacts to cultural resources.
- Limit impacts to tribal community and traditional practices.

- Limit long-term operations and maintenance as a result from the project as much as possible.
- Consider the Tribes' cost limitations.

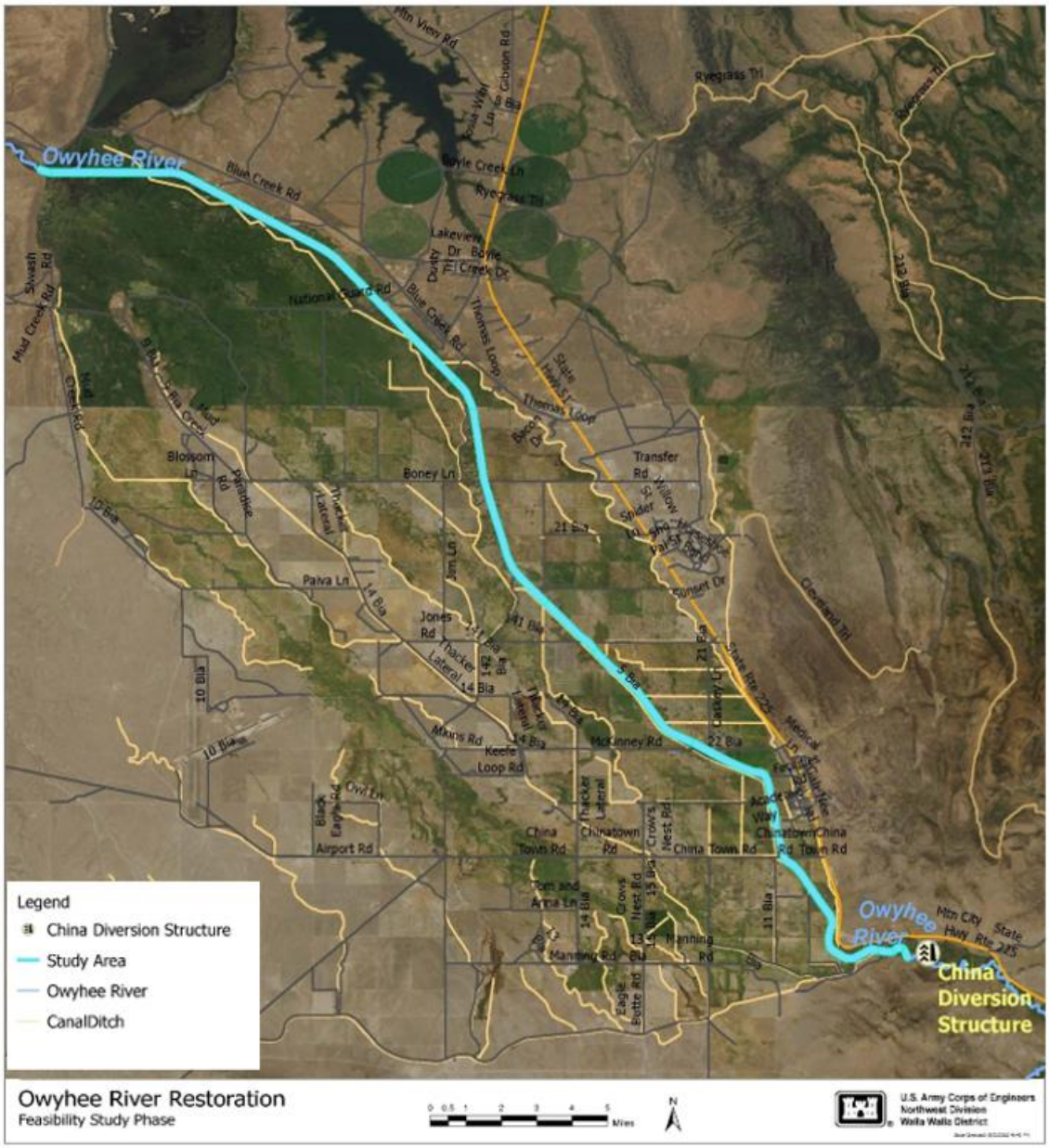

Figure 1-6. Existing Local Infrastructure in the Study Area

SECTION 2 - AFFECTED ENVIRONMENT AND FUTURE WITHOUT PROJECT CONDITIONS

This chapter provides both the existing conditions (a baseline), as well as a forecast of the Future Without Project (FWOP) conditions, which together provide the basis for plan formulation. The existing conditions provide a description of the human environment, which is subdivided into natural, physical, economic, and built environments. The FWOP, also known as the No Action Alternative under NEPA, is the most likely condition expected to occur in the future in the absence of the proposed action or action plans. In this case, the No Action Alternative means that no ecosystem restoration activities would be undertaken in the future, beyond those already being implemented or those that have been authorized through other means. A description of the Future without Project Condition will follow each resource discussion.

Under NEPA regulations, the affected environment includes the resources within the study area that could potentially be influenced by the endeavors related to the ecosystem restoration. This section provides a description of conditions that may be affected or altered by the proposed restoration activities within the study area.

This section provides the description of general environmental resources conditions that could be influenced by an ecosystem restoration project within the study area—along the Owyhee River within the Duck Valley Indian Reservation. The following resource areas were evaluated in more detail: Geology and Soils, Hydrology, Floodplains, Wetlands, Water Quality, Aquatic Resources, Vegetation, Wildlife, Land Use, Aesthetics, Cultural and Historic Resources, and Socioeconomics. On the other hand, USACE determined it was not necessary to further evaluate Noise, Threatened or Endangered Species, Public Infrastructure, Air Quality, Hazardous, Toxic, and Radioactive Waste, or Recreation, as implementation of the alternatives would have no or negligible effects on these resources (Table 2-1).

The Period of Analysis for the future without project condition considered probable effects on the Affected Environment over a 50-year period of analysis, as per USACE Planning Policy and guidance. The geographic scope of analysis was dictated by resource type and anticipated area of effect. In most instances, this corresponds to the study area, however due to the value of habitat connectivity and travel corridors the geographic scope has been expanded for Aquatic Resources and Terrestrial Wildlife to account for the range of the local populations of the affected species. The geographic scope for Socioeconomics is the Duck Valley Indian Reservation.

Table 2-1. Resources Not Evaluated under NEPA

Resource	Explanation
Noise	Due to the remoteness of the proposed action area, the proposed action is not located near residential areas or businesses. The closest homesite is approximately 850 feet away. While noise would be generated during construction, this noise would come from small bulldozer and excavators operated during daylight hours. This equipment does not make noise greater than that of a tractor or other agricultural equipment frequently used in the study area. No concrete sawing, jackhammers, or piledriving would occur. Noise would return to background levels immediately following construction. Any noise occurring from the ecosystem restoration activities is expected to be minor or negligible and not substantially contribute to noise levels in the area under any of the alternatives evaluated.
Threatened and Endangered Species	The USACE queried the U.S. Fish and Wildlife Service's Information for Planning and Consultation (IPAC) database on August 28, 2023, and has determined that there are no listed threatened or endangered species within the Duck Valley Indian Reservation. No threatened or endangered species would be affected by the alternatives.
Public Utilities and Infrastructure	The selection process for the sites included avoidance or minimize impacts to any of the tribe's infrastructure. No infrastructure would be majorly altered, demolished, or constructed by any of the action alternatives. While equipment and material would be brought to the study area via public roadways, this would not overburden local infrastructure. There would be no effect to public utilities and infrastructure.
Air Quality	The project area meets EPA's ambient air quality standards and is in "attainment". No Statement of Conformity is needed in attainment areas. Air quality would be negligibly affected by the alternatives' construction activities.
Hazardous, Toxic, and Radioactive Waste	A Hazardous, Toxic and Radioactive Waste (HTRW) report (Appendix I) concluded, "the subject properties do not contain any known recognized environmental conditions."
Recreation	Recreational fishing, camping, and antelope hunting are available on the Reservation. Due to the limited scale and type of project, the alternatives would have no effect on recreation.

2.1 GEOLOGY AND SOILS

The study area is primarily located within the Great Basin physiographic region, situated between the Sierra Nevada Range to the west and the Snake and Deep Creek Mountains along the Utah border to the east. The dominant features within the region are the north-south trending Bull Run Mountains and Bruneau Range, which are in the broad and arid valley of the Owyhee River.

The valley's formation is attributed to the uplifting of fault blocks from adjacent basalt plateaus, as well as the down-dropped fault block underlying the valleys. The valley has been partially filled with sediments that were eroded from the nearby higher lands. These sediments, known as alluvium, are made up of materials that filled the valley during the early Pleistocene era. Over time, the Owyhee River has further eroded into the older alluvium, creating broad and nearly level flood plains.

The topography of the valley floor is generally flat and follows the gradient of the Owyhee River, ranging from approximately 5,700 feet (ft) above Mean Sea Level (msl) at the southern end of the project area to 5,300 ft msl at the northern end. Drainage in the area flows north and northwest toward the plains of the Snake River. The local relief within the study area is generally less than 800 ft.

The soils in this region typically consist of silt loam, loam, silty clay loam, and clay loam, with a base layer of gravelly coarse sand. These soils exhibit characteristics consistent with hydric soils, indicating poor drainage, and are naturally found in wet meadows. The soils have a slow permeability down to a depth of 46 inches, beyond which permeability becomes rapid. They have a high available water capacity. The seasonal high-water table is typically found at a depth of 1.5 to 3.0 feet from March through June. The soils experience frequent and prolonged flooding during this period. After peak spring flows, runoff is slow, and the risk of water erosion is minimal. The soils would generally become moisture-deficient around July, as depicted in Figure 2-1, indicating a decrease in soil moisture levels during that month.

There are berms (elevated ground) located along the main Owyhee River. This berm material is primarily a sandy, silty soil with little to no coarse material. The main Owyhee River channel has a minimal amount of cobbles on the river bottom.

Future without Project

The straightened, incised condition of the Owyhee River contributes to extreme flow velocities during high water events. This causes erosion of the shoreline of the river. Without a natural meander and corresponding pattern of erosive and depositional zones, soils are exported from the study area to points further downstream, further entrenching the channel. This would continue until the Owyhee River has entrenched deep enough to accommodate high water flow velocity within an active floodplain. The entrenched channel would limit the development of well-graded gravel bars and prevent stream meanders. This can reduce the potential for natural channel adjustments and bank erosion, impacting the overall geomorphic processes within the watershed.

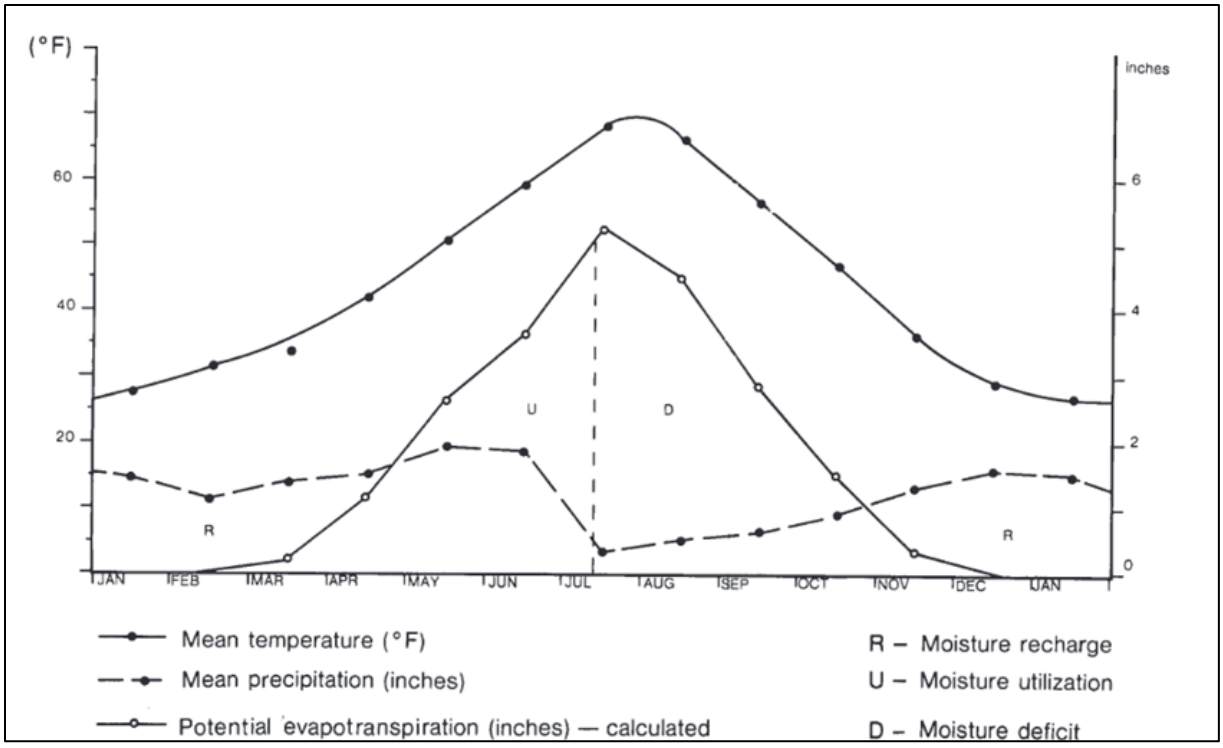

Figure 2-1. Typical Monthly Soil Moisture Levels at the Proposed Action Area

2.2 HYDROLOGY

Stream flow patterns in the Owyhee River above the China Diversion Dam are characterized by a seasonal snowmelt driven freshet of the basin upper elevations during late winter or early spring (February to May) that are used to refill Wild Horse Reservoir and support the Duck Valley Irrigation Project throughout the summer irrigation season (Figure 2-2). The pre-irrigation season is from March 1 to April 15, each year. During this time, if Wild Horse Reservoir is spilling water. during the Owyhee River annual spring runoff, the DVIP will divert Owyhee River water at the China Diversion Dam and deliver it to irrigators. The regular irrigation season starts April 1 and extends through October 31 and frequently diverts all the Owyhee River inflows into the two canal systems. There is no baseflow provision for the Owyhee River downstream of China Diversion Dam.

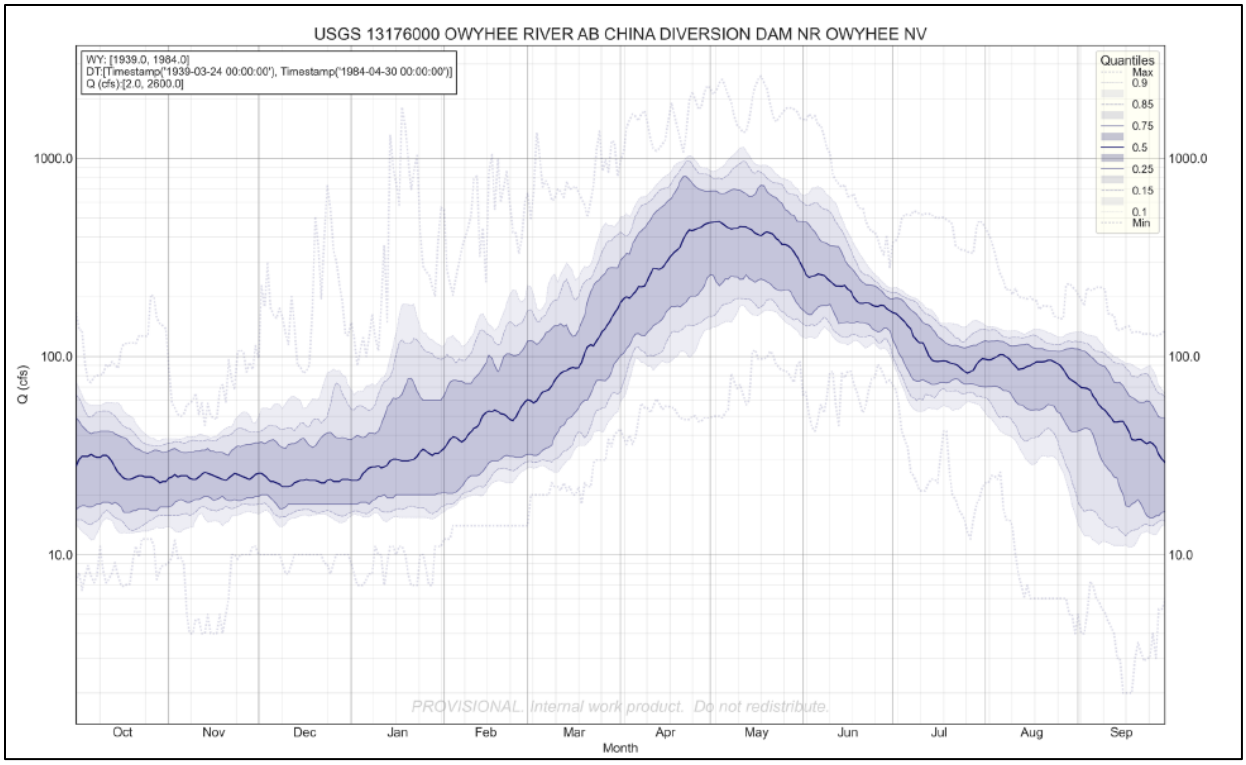

Figure 2-2. Historical Seasonal Flow for the Owyhee River above the China Diversion Dam

Between Wild Horse Reservoir and the China Diversion Dam, the Owyhee River flows about 27 river miles over a 458 square mile drainage area. At the upstream end of the Duck Valley Indian Reservation, the China Diversion Dam diverts flows into both the Agency (north branch) and Highline (south branch) Canals, and any remaining flow spills back into the Owyhee River, flowing north through the Duck Valley for approximately seven river miles to the feasibility study area. Downstream of the study reach, the Owyhee River valley flows for approximately another 2.5 river miles, gradually rejoining flow from other relic meanders in a wetland complex upstream of Blue Creek Reservoir.

Owyhee River inflows into the study area are directly affected by upstream irrigation diversions that generate notable periods of very low baseflow and dewater the river during a significant portion of each summer. The river within the study area is one straight main channel that is within a gully. Water depth when the river is flowing averages 2 to 3 feet deep. For low flows, all the flow is contained within the main straightened and leveed river channel. Low elevation side channels experience an increase in water flow (activate) less than 10 cfs (cubic feet per second). The higher elevation side channels do not activate until flows reach ~75cfs with majority of the side channels activated at 400 cfs. (Refer to Appendix A, Hydrology and Hydraulics, for more information.)

Future Without Project

Irrigation and water diversions would continue to dry the Owyhee River during the summer months making it inhospitable to aquatic wildlife. The river would continue to erode along the shorelines during spring freshet, as the channel cannot flood its relic floodplain.

Various improvements to the irrigation methods and structures to enhance delivery of irrigation water to agricultural lands will continue into the future. These improvements began fall 2018 and would be completed over the next 10 years (2028). Rehabilitation of the irrigation system would increase crop yield on tribal trust lands and allow for wetlands and soils to recharge (Bureau of Indian Affairs, 2021).

2.3 FLOODPLAINS

According to the Federal Emergency Management Agency (FEMA) Flood Maps (FEMA 2023), there are no regulatory floodplains officially delineated within the project area and its vicinity. The entire area is classified as Zone D, indicating that no analysis of flood hazards has been conducted.

Historically, the Owyhee River had a wide floodplain that regularly flooded the surrounding landscape. However, human activities such as farming and irrigation have altered the river channel, resulting in channelization and downcutting. As a result, the river is now mostly disconnected from its former floodplain. The remnant floodplain in the study area remains undeveloped with a few wooden pole structures.

Due to channelization, the bank of the Owyhee River in the study area is deeply incised up to a maximum of approximately 20 feet high, with riparian vegetation growing on the upper terrace. Erosion is occurring in some areas, leading to the formation of gravel bars adjacent to the river channel (Figure 2-3). Relic meanders support wetlands that are no longer directly connected to the main river, resulting in stagnant water conditions with very low-quality habitat (Figure 2-4).

Figure 2-3. Eroded Riverbank

Figure 2-4. Relic Oxbow Wetlands

There is an active floodplain located both upstream of the China Diversion Dam and downstream of the study area. This floodplain is estimated to be approximately 300 to 500 feet wide and is characterized by the presence of willows and alder. The wet meadows and shrublands found on these floodplains are typically attributed to the low-lying positions and nearly flat slopes of the soil in those areas (Figure 2-5). These floodplain areas likely experience periodic inundation during high-water events, contributing to the existing wetland vegetation.

Figure 2-5. Photo of a Section of the Owyhee River that Has an Active Floodplain

Future Without Project

The Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. The downcutting process would reduce opportunities for high water events to escape the channel, further disconnecting the river from its historic floodplain. This disconnection prevents regular flooding events that are essential for maintaining wetland habitats, side channels, and oxbow lakes. These floodplain features provide important breeding and feeding grounds for aquatic species and would not be accessible under the Future without Project condition. Incised channels create steep, high banks that can also act as physical barriers to the movement of terrestrial species. A small floodplain would develop near the shoreline of the river at the bottom of the gully as the shoreline fails during flood events. Severe erosion along the shoreline would be expected. Overall, the trend is a continued decline in floodplain activation and function, with the potential for increased channel incision and altered flood patterns.

2.4 WETLANDS

Wetlands play an important role in the ecosystem, serving as transitional areas between terrestrial and aquatic systems. They are characterized by a water table that is typically at or near the surface. Wetlands offer a variety of important benefits. They improve water quality by filtering out sediments and toxins. Acting like a sponge, they help reduce flooding and erosion, especially during spring when water runoff is high. Additionally, they provide essential habitats for various fish and wildlife species. According to the USFWS National Wetland Inventory database, the study area along the Owyhee River exhibits large areas of potential seasonally flooded palustrine emergent (PEM1C) and scrub-shrub (PSS1C) wetlands. These wetlands primarily rely on shallow groundwater, irrigation water, or the river flooding the floodplain for their existence.

Upstream of the China Diversion Dam, there are large extents of seasonally inundated palustrine shrub-scrub functioning wetlands near the Owyhee River (Figure 2-6). These wetlands primarily consist of shrubby willows, emergent rushes, sedges, and grasses typically found in moist meadow wetlands. These wetlands are like the type of wetlands that would have been present within the now relic floodplain, downstream of the China Diversion Dam.

Figure 2-6. Extensive Wetlands upstream of the China Diversion

Downstream of the China Diversion Dam, the Owyhee River undergoes channelization and downcutting, resulting in limited wetland areas. Most of the wetlands in this section are confined to small pockets, often found in adjacent oxbows, and are characterized by degraded and stagnant water conditions (Figure 2-4). These wetlands typically consist of willow shrubs within an extensive grassland environment. The willow shrubs in these

wetlands are located on high terraces situated approximately 20 feet above the streambed elevation of the Owyhee River. As a result, they are disconnected from the riparian system, which refers to the interface between land and a river or stream.

The channelization of the Owyhee River and disconnection of wetlands from the main river system downstream of the China Diversion Dam have influenced the characteristics and dynamics of these wetland areas, impacting their ecological functions and connectivity to the larger riparian ecosystem. Wetlands along the Owyhee River upstream of the study area and closer to Blue Creek Reservoir are intact and represent reference wetlands for the restoration sites. These wetlands are frequently flooded by the Owyhee River (Figure 2-7).

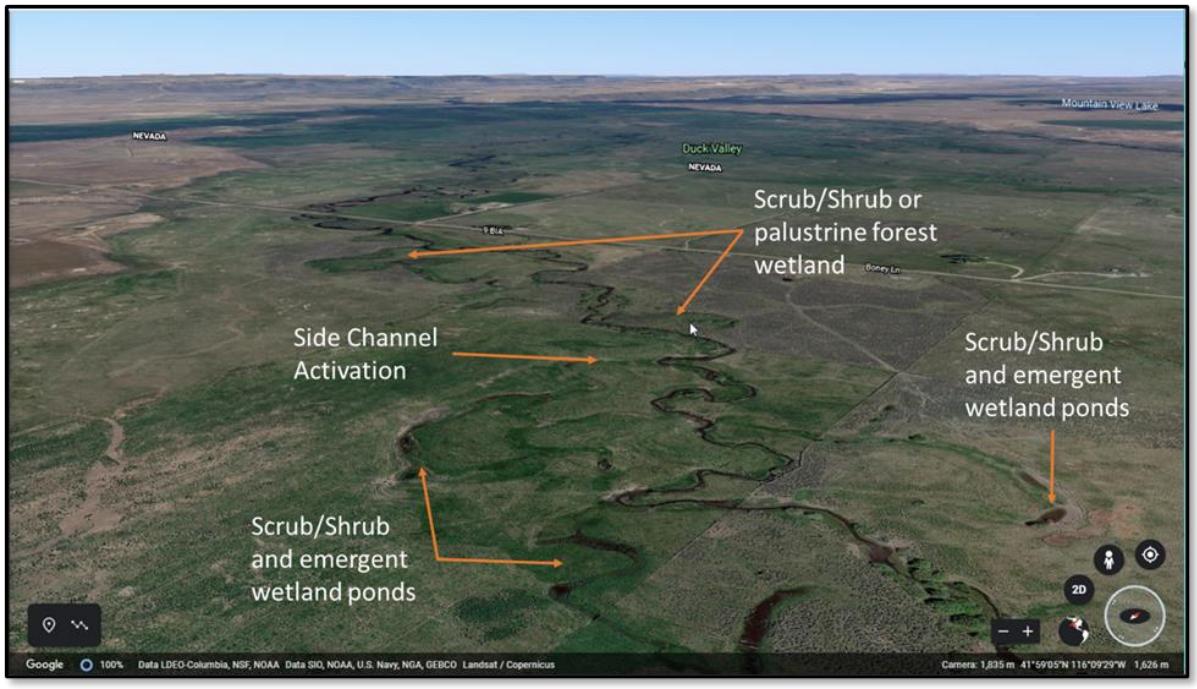

Figure 2-7. Disconnected Wetlands in the Study Area

Figure 2-8. Reference Wetlands for the Restoration Sites

Future Without Project

Adjacent wetlands and floodplain would continue to degrade without the project. Riparian and adjacent wetlands would only be occasionally inundated during the highest spring flows. As the channel continues to incise, groundwater would not recharge the wetlands causing further degradation. Species dependent on wetlands would decline as the wetland areas become marginalized and less frequently inundated. Sage-grouse would decline as there would be limited habitat for foraging juveniles.

2.5 WATER QUALITY

There are three primary water quality factors that limit native fish and other aquatic species in the Owyhee River: high summer water temperature, low stream flow, and high volume of fine sediments.

The Owyhee River has sustained changes in the water quality and stream flow. Operation of the Rio Tinto Mine from 1932 to 1947 introduced toxic levels of heavy metals to Mill Creek (an East Fork Owyhee River tributary, upstream of the study area), which significantly impacted fish and other aquatic organisms (NDEP 2005). The effects of mining, combined with the naturally iron and phosphorus-rich soils of Nevada, have impaired water quality throughout the stream between Wild Horse Dam and the Duck

Valley Indian Reservation. Additionally, agricultural activities requiring significant water withdrawals reduce stream flows throughout the basin. Ranching has also led to stream bank erosion caused by riparian deforestation, shoreline grazing, and instream wading by livestock.

Both the Nevada Division of Environmental Protection and Idaho Department of Environmental Quality review the water quality of the East Fork of the Owyhee River. In 2005, Total Daily Maximum loads (TMDL) were established. In 2012, an addendum stated that water temperature must be less than 71.6°F (22°C) daily maximum or less than 66.2°F (19° C) daily average to support cold water aquatic life and must be less than 50°F (10°C) daily maximum or less than 48.2°F (9°C) daily average to support salmonid spawning.

To sufficiently support native fish, including redband trout populations, water temperatures must remain cool enough for rearing juveniles. Figure 2-9 shows how temperature changed over the course of 1 year by averaging the monthly temperature measures over the period of record (1967-2010). Water temperature was highest between June and August months reaching over 68°F (20° C).

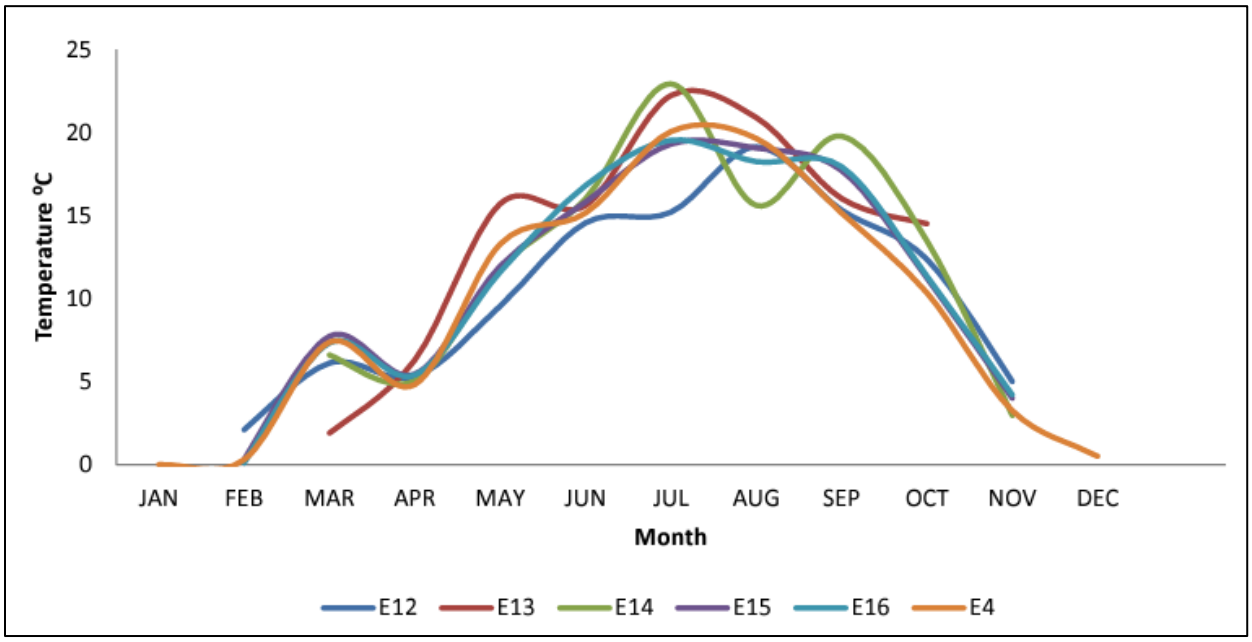

Figure 2-9. Average Monthly Temperature at Monitoring Sites in the Owyhee River near the Study Area

It is expected that high summer temperatures would be too warm for sustaining fish populations, specifically native redband trout, if no action were taken. The maximum daily average water temperatures for cold water fisheries specified by the states of Idaho (71.6° F or 22° C) and Nevada (69.8° F or 21° C) may be exceeded during summer months. In limited monitoring by USACE in 2022 and 2023, daily maximum stream temperature in the study area was consistently above 73.4° F (23° C) during the months of May and June, with daily temperature peaking at 86° F (30° C) in late June. While the monitoring locations were dewatered in the hottest months of the year (July to

September), these trends would be expected to continue if similar flow conditions persisted throughout the summer.

Limited turbidity sampling by USACE in June and August of 2022, indicated turbidity greater than allowed by water quality standards at Duck Valley Indian Reservation. Together, these findings suggest poor overall water quality in the summer months.

Future Without Project

Under the future without project condition, the Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. The downcutting process would reduce opportunities for high water events to escape the channel, further disconnecting the river from its historic floodplain. This disconnection prevents regular flooding events that are essential for maintaining wetland habitats, side channels, and oxbow lakes. This would continue until the Owyhee River has entrenched deep enough to accommodate peak spring discharge within the incised channel. This ongoing process of downcutting and erosion would lead to increased sediment and turbidity within the river, as the banks slough into the channel during high water events. The final product of this process is a broad and shallow river in a wide and deep gully, with little to no riparian zone. Such a channel would be prone to heating rapidly due to both its shape and the lack of riparian cover, further worsening water quality in the study area.

2.6 AQUATIC RESOURCES

Aquatic resources include planktonic and benthic species, aquatic plants, and fish. The following discussions present general descriptions of the key aquatic species that may be affected by the proposed action.

Plankton

Zooplankton and phytoplankton occur throughout the Owyhee River and form an important part of the aquatic food chain. Both phytoplankton and zooplankton are food sources for larger aquatic organisms, and high concentrations of zooplankton can attract smaller prey species that feed on these organisms. In turn, high concentrations of prey fish can attract larger predatory fish species. Zooplankton can also compose an important component to the diet of rearing fish.

The times of year when zooplankton and phytoplankton are most active can be measured by assessing the primary productivity within the Owyhee River. This measure is used to describe the rate that plants and other photosynthetic organisms produce organic compounds in the ecosystem. Primary productivity in the Owyhee River is lowest during the winter months due to reduced sunlight, colder temperatures, and lower levels of nutrient availability. Conversely, primary productivity in the Owyhee River is highest during March through May months due to increased sunlight, warmer temperatures, and higher levels of nutrient availability from seasonal runoff.

Benthic Invertebrates

The benthic invertebrate community consists of organisms such as aquatic worms, juvenile insects, crayfish, and mussels that live on the river bottom. These benthic organisms, also referred to as macroinvertebrates, significantly contribute to the food chain by providing a food source for fish and other aquatic species. When the Owyhee River is flowing, the invertebrate species composition and abundance would reflect riverine species typically found in shallower and higher velocity environments of the river. Still water or open water invertebrate species are found in deeper and slower velocity environments. Species diversity of macroinvertebrate communities at riverine sites can increase downstream movement or colonization of drifting organisms from upriver habitats (Bennett et al. 1983). Some of these organisms “drift in the upstream portion of the reservoirs primarily in the season of higher flow, which increases their availability to rearing and downstream-migrating juvenile resident fishes.

At the study area, benthic invertebrates found during a 2017 summer sample lead by students from the local school include mayflies, amphipods, and crayfish. While only a few species were recorded in the sample, the particular species found are indicative of relatively high water quality. An intensive survey would likely reveal a broad diversity of benthic macroinvertebrates at the study area.

Fish

The Owyhee River supports a diverse population of native fish (Table 2-2).

Table 2-2. Resident Native Fish Found in the Owyhee River

Common Name	***Scientific Name***
Interior Redband Trout	*Oncorhynchus mykiss gairdneri*
Bull Trout	*Salvelinus confluentus*
Mountain Whitefish	*Prosopium williamsoni*
Bridgelip Sucker	*Catostomus columbianus*
Largescale Sucker	*Catostomus macrocheilus*
Mountain Sucker	*Catostomus platyrhynchus*
Chiselmouth	*Acrocheilus alutaceus*
Leopard Dance	*Rhinichthys falcatus*
Longnose Dance	*Rhinichthys cataractae*
Speckled Dance	*Rhinichthys osculus*
Redside Shiner	*Richardsonius balteatus*
Peamouth	*Mylocheilus caurinus*
Northern Pikeminnow	*Ptychocheilus oreganensis*
Mottled Sculpin	*Cottus bairdii*
Paiute Sculpin	*Cottus belgingii*
Shorthead Sculpin	*Cottus confusus*

Interior Redband Trout are a significant biological resource in the Owyhee River and its tributaries. These trout are adapted to the harsh desert stream environment; however, they face threats from various factors such as common carp (*Cyprinus carpio*), dams, grazing, hybridization, mining, recreation, smallmouth bass (*Micropterus dolomieu*), timber harvest, and water diversion.

The current riparian vegetation along the Owyhee River and the project area is not contributing to redband trout habitat. The lack of woody riparian vegetation and high August stream temperatures are likely factors limiting the abundance of large redband trout in the study area. While there are willows within certain areas of the study area, they are not dominant in the riparian zone, and much of the Owyhee River in the study area lacks adequate shading.

Non-native fish species found in the Owyhee River include introduced rainbow trout subspecies (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), common carp, and smallmouth bass (*Micropterus dolumieu*). Smallmouth bass is a predatory fish and abundant downstream of the China Diversion Dam.

Since 2015, the Shoshone Paiute annually collect the Chinook salmon on the Snake River below Hells Canyon Dam and release the fish into a 5-mile stretch of the Owyhee on the Reservation.

Future Without Project

Redband trout population trend monitoring has been ongoing in southwest Idaho jointly between IDFG and Idaho BLM since the 1970’s. Zollick et al. 2005 reported decreasing population trends at the lower elevations, but stable to increasing population trends at higher elevations. The population of fish within the Owyhee River consists of portions of redband trout as well as areas that support smallmouth bass, a predatory fish.

The biodiversity of the fish and macroinvertebrates would continue to decline and only species that are tolerant of drought and drier conditions would be able to sustain in the environment. The aquatic habitat would decline and consist of stagnant pools and shallow riffles not conducive to aquatic habitats.

Aquatic habitat should benefit from improvements to the irrigation system by limiting the amount of demand on the Owyhee River. Owyhee River riverbed should not experience drying conditions as previously observed by historic demands. Fish would be able to utilize the channel longer durations than historic levels. Fish passage may be improved if the Shoshone Paiute secure a grant to improve fish passage at the China Diversion Dam. This could cause increase in diversity of fish below the China Diversion Dam.

2.7 VEGETATION

Most of the historic riparian vegetation of the Owyhee River has been lost to conversion of land practices to agriculture and channelizing the river. Thus, most riparian areas along the Owyhee Shorelines are highly altered. Native riparian vegetation in the region is typically comprised of narrowleafed cottonwood (*Populus angustifolia*), gray alder

(*Alnus incana*), water birch (*Populus angustifolia*), willows such as Lemmon's willow (*Salix lemmonii*) and yellow willow (*Salix lutea*), shrubby, thicket-forming willows, namely Arroyo willow (*Salix lasiolepis*), and a variety of additional native shrub species. In addition, there are a variety of forbs that included fleabanes (*Erigeron spp*.), milkweeds (*Asclepias spp*)., lupines (*Lupinus spp*.), and other type of flowering plants.

In the study area, field surveys of possible restoration sites found a shrub community dominated by Sitka willow (*Salix sitchensis*), with lesser amounts of golden currant (*Ribes aureum*), red-osier dogwood *(Cornus sericea*), as well as various species of rose (*Rosa spp*) and alder (*Alnus spp*). Common forbs identified included duckweed (Lemna minor), common cattail (*Typha latifolia)*, various rushes (*juncus spp*), Rocky Mountain iris (*Iris missouriensis*), silky lupine (*Lupinus sericeus*), Star-flowered lily-of-the-valley (*Maianthemum stellatum*), buck bean (*Menyanthes trifoliata)*, hellebore (*Veratrum viride*), field horsetail (*Equisetum arvense*), and graceful cinquefoil (Potentilla gracilis) with lesser amounts of common camas (*Camassia quamash*), field mustard (*Brassica rapa*), and common yarrow (*Achillea millefolium*).

Patches of sage-grouse habitat is found within the study area with an abundance of sagebrush canopy cover with a few grasses and forbs. Herbaceous cover, including grasses and forbs, is crucial for nest concealment and successful nesting, with research suggesting that grass-forb heights should be 7 inches or more during the nesting season to benefit sage-grouse (Pyke et al. 2015). Forb height is critically important to breeding sage grouse and their young as it provides essential cover and protection from predators, helps create a favorable microclimate by offering shade and reducing temperature extremes, and ensures an abundant food supply. Taller forbs offer concealment, reducing the risk of predation, while also moderating environmental conditions to lessen heat stress on chicks. Additionally, taller forbs indicate healthier vegetation, supporting a greater diversity and abundance of insects, which are a crucial food source for growing chicks (U.S. Geological Survey 2024)

Outside of the immediate riparian area of the Owyhee River, the lands surrounding the study area consist primarily of shrub-steppe, interspersed with irrigated croplands. The plant communities found in nearby shrub-steppe lands include basin big sagebrush (*Artemisia tridentata)*, Idaho fescue (*Festuca idahoensis*), and bluebunch wheatgrass (*Pseudoroegneria spicata*), rabbitbrush (*Chrysothamnus viscidiflorus*), tufted hairgrass (*Deschampsia cespitosa*), and slender wheatgrass (*Elymus trachycaulus*).

There are a few noxious weeds within the study area, primarily along roadsides, agricultural areas, and areas with intense grazing. These are plants that have the potential to cause harm to public health, crops, livestock, land, or other property. Noxious weeds have various means of dispersal, including wind, water, animals, machinery, and human activities. They produce abundant seeds and often have attaching devices that aid in their transport, such as hooks, barbs, or sticky resins. Highways, roads, trails, and river corridors can serve as initial routes for their establishment, and weeds can spread from these corridors to new areas. They can invade and dominate disturbed areas, such as roadsides or areas affected by wildfires,

across different precipitation regimes and habitats. No noxious weeds were seen during field surveys of potential restoration sites.

Future without Project

The Owyhee River is a deeply incised straightened channel with little riparian vegetation in the project area. Without the project, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The downcutting process would further erode the channel banks, destabilizing what little riparian vegetation is present at the study area. As the floodplain become increasingly disconnected from the river, low quality wetlands and remnant oxbows would become progressively less inundated and trend toward lower quality or conversion to upland habitat.

2.8 TERRESTRIAL WILDLIFE

The geographical area of the affected environment includes habitat for numerous birds, reptiles, amphibians, small non-game-mammals, furbearers, and big game animals. None of the species that are found within the vicinity of the affected environment are designated as threatened or endangered under the Endangered Species Act.

Much of the wildlife in the potential affected environment is dependent on sagebrush, wet meadows, and tree-shrub riparian habitat associated with the Owyhee River. Habitats associated with the river generally support sparce tree/shrub or dense grass-forb cover, which provides more structurally complex habitat and more abundant forage resources than adjacent uplands. The river provides food, water, and cover for numerous wildlife species and are especially important where moisture is extremely limited. Riparian areas serve as important wildlife habitat and are integral to the overall function of the river ecosystems. Wildlife that typically use riparian and wetland habitats associated with the Owyhee River can be divided into four main groups: birds, mammals, insects, and amphibians and reptiles.

Birds

Several bird species that are found within the affected environment prefer sagebrush or willow habitat. These birds are unique to the region and therefore designated by Nevada Department of Wildlife and Idaho Department of Fish and Game as Species of Concern. This designation identifies at-risk species for the state’s management and conservation. Within the study area, there are five bird species, including greater sage-grouse, that are sagebrush obligates meaning they require sagebrush for some part of their life cycle (Paige and Ritter 1999; IDFG, 2017) (Table 2-3). During the breeding season from March through August, several other birds of concern utilize the study area for dispersal and nesting (Table 2-3).

Table 2-3. Bird Species of Concern That May Utilize Sagebrush and Willow Habitat

Common Name	Scientific Name	Significance of Recognition
Greater Sage-grouse	*Centrocercus urophasianus*	Sagebrush obligate, Idaho Species of Greatest Conservation
Black-Throated Sparrow	*Amphispiza bilineata*	Sagebrush obligate
Brewer's Sparrow	*Spizella breweri*	Sagebrush obligate bird, Idaho and Nevada Species of Greatest Conservation
Sagebrush Sparrow	*Artemisospiza nevadensis*	Sagebrush obligate bird, Idaho and Nevada Species of Greatest Conservation
Sage Thrasher	*Oreoscoptes montanu*	Sagebrush obligate bird, migratory bird, Idaho and Nevada Species of Greatest Conservation
Swainson's Hawks	*Buteo swainsoni*)	Nevada Species of Greatest Conservation
Short-Eared Owls	*Asio flammeus*	Idaho and Nevada Species of Greatest Conservation
Loggerhead Shrikes	*Lanius ludovicianus*	Idaho and Nevada Species of Greatest Conservation
Dusky Flycatchers	*Empidonax oberholseri*	Nevada Species of Greatest Conservation
Common Nighthawks	*Chordeiles minor*	Idaho and Nevada Species of Greatest Conservation
Ferruginous Hawks	*Buteo regalis*	Idaho BLM Sensitive Species, Idaho Species of Greatest Concern
Prairie Falcons	*Falco mexicanus*	Idaho BLM Sensitive Species, Nevada Species of Greatest Conservation

Upland birds in the potential affected environment include greater sage-grouse. These birds typically congregate on communal mating grounds called "leks" from March to early May. The nesting season follows, generally occurring from May to June, but it may start earlier depending on elevation, weather, and plant phenology (Schroeder et al. 1999). Broods remain with females for several more months as they move from early brood-rearing habitat that consists of forb and insect rich upland areas surrounding nest sites. During late summer, these birds migrate to wet meadows and riparian areas from July to October. They are ground-dwelling birds that utilize various habitat types.

Other birds that may occur in the study area include a variety or raptors, owls, songbirds, and waterfowl.

Mammals

Small non-game mammals are relatively common throughout the potential affected environment. Common species include deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), Great Basin pocket mouse (*Perognathus parvus)*, house mouse (*Mus musculus*), mountain vole (*Microtus montanus)*, Townsend's big-eared bats (*Corynorhinus townsendii*), Western pipistrelle (*Pipistrellus herperus*), pallid bat (*Antrozonous pallidus*), and Western small footed myotis (*Myotis ciliolabrum*). These small mammals use a variety of available habitat throughout the area.

Furbearers occur in the potential affected environment and include beaver (*Castor canadensis*), river otter *(Lontra canadensis*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*). In general, the furbearers are dependent on riparian corridors and vegetated draws along the Owyhee River for den sites and foraging areas.

Big-game animals are found throughout the potential affected environment. These large mammals include mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus*), and cougar (*Puma concolor*). Deer use a wide variety of habitats including shrub communities for cover and fawning as well as grassland for foraging. These species utilize riparian corridors as migration routes as well as foraging areas. Cougars use a wide range of habitat that contains prey species Dense riparian trees and shrubs provide cover and ambush areas for cougars.

Some mammal species present within the affected environment are also recognized in the Idaho and Nevada State Wildlife Action Plans as Species of Greatest Conservation Need. This designation identifies at-risk species for the state's management and conservation. A species of greatest conservation (Table 2-4) depends on insects and plants found in riparian and wetland areas.

Table 2-4. Mammal Species of Concern That May Utilize Sagebrush and Willow Habitat

Common Name	Scientific Name	Significance of Recognition
Pronghorn Antelope	*Antilocapra americana*	Idaho Species of Greatest Conservation, Prefers Sagebrush
Pygmy Rabbit	*Brachylagus idahoensis*	Prefers Sagebrush; Idaho and Nevada Species of Greatest Conservation
Canyon Bats	*Parastrellus hesperus*	Nevada Species of Greatest Conservation
Little Brown Myotis	*Myotis lucifugus*	Idaho and Nevada Species of Greatest Conservation
Long-Eared Myotis	*Myotis evotis*	Nevada Species of Greatest Conservation
Merriam's Shrews	*Sorex merriami*	Nevada Species of Greatest Conservation

Montane Shrews	*Sorex monticolus*	Nevada Species of Greatest Conservation
Pallid Bats	*Antrozous pallidus*	Nevada Species of Greatest Conservation
Spotted Bats	*Euderma maculatum*	Nevada Species of Greatest Conservation
Western Jumping Mice	*Zapus princeps*	Nevada Species of Greatest Conservation
Western Small-Footed Myotis	*Myotis ciliolabrum*	Idaho and Nevada Species of Greatest Conservation
Western Water Shrews	*Sorex navigator*	Nevada Species of Greatest Conservation
Yuma Myotis	*Myotis yumanensis*	Idaho and Nevada Species of Greatest Conservation

Amphibians and Reptiles

Amphibians in the potential affected environment include frogs, toads, and salamanders that occupy a variety of wildlife habitat types, including riparian forest and scrub-shrub, wetlands and grasslands. Common species include the Pacific tree frog (*Pseudaris regilla*), American bullfrog, (*Rana catesbeiana*), long-toed salamander (*Ambystoma macrodactylum*) and western toad (*Bufo boreas*). Amphibians use riparian corridors for migration, forage, and shelter.

Reptile species in the area include a wide variety of turtles, snakes, and lizards. Commonly occurring species include the Great Basin gopher snake *(Pituophis catenifer desericola*), northern desert night snake (*Hypsiglena chlorophaea*), northern Pacific rattlesnake (*Crotalis organus oreganus*), western yellow-bellied racer (*Coluber constrictor*), western skink (*Plestiodon skiltonianus skiltonianus*), and painted turtle (*Chrysemys picta)*. Reptiles utilize all habitat areas from wetland and riparian zones to dry upland shrub-steppe.

Amphibians and reptiles depend on insects found in somewhat moist habitat communities. The species found in Table 2-5 are species of concern that depend on living within sagebrush habitats near water. The water provides breeding habitat or aquatic insects that serve as part of their diets.

Table 2-5. Amphibian and Reptile Species of Concern that May Utilize Sagebrush and Willow Habitat

Common Name	Scientific Name	Significance of Recognition
Columbia spotted frogs	*Rana luteiventris*	Idaho BLM Sensitive Species
Western toads	*Anaxyrus boreas*	Idaho BLM Sensitive Species
Greater Short Horned Lizard	*Phrynosoma hernandesi*	Nevada Species of Greatest Conservation

Common Name	Scientific Name	Significance of Recognition
Northern rubber boa	*Charina bottae*	Nevada Species of Greatest Conservation
Western skink	*Plestiodon skiltonianus*	Nevada Species of Greatest Conservation

Insects

A variety of insects can be found within the potential affected environment. These species include dragonflies, damselflies, mayflies, butterflies, beetles, and grasshoppers. All these species provide food for birds, reptiles, amphibians, and fish.

One species, Monarch butterfly (*Danaus plexippus*), is a candidate species for the Endangered Species Act. These butterflies are commonly observed in grasslands where the dominant plants are grasses and forbs. They feed exclusively on milkweed plants.

Future Without Project

The study area is completely located in Sagebrush Focal Areas and Priority Habitat Management Areas. These areas are known to support a large aggregation of interconnected breeding subpopulations of sage-grouse that have the highest likelihood of long-term persistence. These areas are the highest conservation value to sage-grouse and incorporates the presence of large leks, habitat extent, movement corridors, connectivity, and winter habitat.

There are several on-going projects for sage-grouse habitat restoration outside the perimeter of the Duck Valley Indian Reservation. These include the Bruneau-Owyhee Sage-Grouse Habitat Project (BOSH) and the East Shoshone Basin Management Area. BOSH was approved on February 5, 2019, and is a landscape-level project designed to improve and maintain sagebrush steppe habitat by removing encroaching juniper to benefit greater sage-grouse and other wildlife. The BOSH project is located on BLM Lands within the Owyhee and Bruneau field office boundaries in southwest Idaho and consists of a 1.67-million-acre project are encompassing a 617,000-acre focal treatment area.

2.9 LAND USE

The Tribe has established the Land Code Ordinance (Ordinance Nu. 82-SPO-08) to effectively manage tribal lands on the Reservation. The Tribal Land Committee oversees the implementation of this ordinance, which governs the leasing and assignment of tribal lands for agricultural purposes, particularly for farming and livestock production. The primary agricultural enterprise on the Reservation is beef cattle production.

Most of the soils within the study area are classified as Farmland of Statewide Importance. Irrigated farming began in Duck Valley just before the establishment of the

Duck Valley Indian Reservation. The Indigenous population constructed canals and cultivated hay in the fertile and loamy dark soils of the Owyhee River floodplain.

Most of the study area is utilized for farming and forage production for livestock. During the spring through fall seasons, cattle graze on the rangelands, while in winter, they are moved to valley pastures. The fertile floodplain of the Owyhee River supports the growth of alfalfa and grass hay. Additionally, native grass hay is harvested from wet meadows along Blue Creek. Some areas on the benches, where sagebrush has been recently cleared, are planted with alfalfa and barley. Most of the hay grown on the Reservation is used locally as livestock feed, with a small portion sold to external markets. Cattle currently have access to the proposed action area and water at the Owyhee River.

The study area provides opportunities for hunting, fishing, and gathering, primarily along the Owyhee River. Hunting is permitted for species such as deer, upland game birds, and waterfowl where open water is available. Gathering activities may involve foraging for native edible plants and collecting willow cuttings traditionally used for cradle boards. Timber harvesting is not allowed in the study area. There are tribal ceremonies that are periodically conducted within the study area.

Future without Project

The study area would continue to be managed according to the Land Code Ordinance. Present uses of the land in the study area are expected to continue largely unchanged. Most lands would be used for range or farmland, cattle would still be able to access the proposed action area.

2.10 AESTHETICS AND VISUAL RESOURCES

Aesthetics and visual resources refer to the natural and cultural landscape features that people see and that contribute to the public’s appreciative enjoyment of the environment. The study area generally embodies the aesthetic characteristics of a high desert, sage-steppe environment. However, various alterations from ranching, farming, and associated irrigation diversions have notably altered its visual resources.

Historically, the Owyhee River would have meandered naturally, enhancing the scenic diversity and visual interest of the riparian corridor. However, the main Owyhee River channel has been straightened through the majority of the Duck Valley Indian Reservation, resulting in a linear, engineered appearance that lacks the natural curves and variation that usually define a more visually pleasing riverine landscape. This straightening has also contributed to very high flow velocities during the spring, leading to severe incision and erosion of the stream channel. During low flows the side channels become disconnected and offer minimal to no ideal stream habitat. The steep, eroded banks present a stark and unattractive feature that contrasts with the gently sloping banks of a healthy riparian zone. Additionally, the disconnected side channels result in low flows with stagnant water.

The local plant community, normally comprising a variety of native species that provide color, texture, and ecological richness, has been significantly impacted by land use practices and grazing. The predominance of invasive weeds over native vegetation diminishes the visual quality, making the landscape appear degraded and less vibrant. The native plant diversity that would typically offer seasonal visual changes and habitat complexity is largely absent.

The vegetation in the area has also been heavily altered by land use and grazing. Instead of a diverse array of native plants that would typically characterize a riparian zone, the landscape is now dominated by invasive weeds and grass fields due to hay production. This shift in plant community reduces the visual appeal and ecological richness of the area, making it appear less vibrant and more degraded.

Additionally, the area shows significant signs of cattle trampling, particularly in the eroded streambanks. These trampled zones are visually unappealing, characterized by bare, compacted soil and disrupted vegetation. The presence of these disturbed areas further detracts from the natural beauty and ecological integrity of the landscape.

Overall, while the project area retains some intrinsic scenic qualities typical of a high desert, sage-steppe environment, the modifications to the main Owyhee River channel, the extensive erosion, the prevalence of invasive plant species, and the visible impacts of grazing and hay production have significantly reduced its aesthetic value. The visual character and quality of the landscape have been altered, resulting in a less natural and less appealing environment.

Future without Project

The Owyhee River is a deeply incised straightened channel with little riparian vegetation in the project area. Without the project, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The downcutting process would further erode the channel banks, destabilizing what little riparian vegetation is present at the study area. Most lands would be used for range or farmland, cattle would still be able to access the proposed action area. Aesthetics in the study area would be further diminished under the Future without Project condition.

2.11 CULTURAL AND HISTORIC RESOURCES

The Duck Valley Indian Reservation lies within the ancestral homelands of the Western Shoshone and Northern Paiute tribes. The reservation was officially established through executive orders issued by President Rutherford B Hayes in 1877 and the reservation was expanded by President Grover Cleveland in 1886 and President William H Taft in 1910. The living conditions on the reservation transitioned from traditional earthen structures to more permanent dwellings, and the development of agricultural practices as economic mainstays. The land use on the Duck Valley Indian Reservation has ranged from precontact traditional use up to historical and modern agriculture and livestock. Given the long and diverse use of the land by the Shoshone Paiute tribes it is possible to have a diverse set of both precontact and historic cultural resources present.

Cultural resources can include structures, properties, sites, and objects, and can be either historic, over 50 years old, or prehistoric, dating back to before European contact with indigenous American cultures. Their significance is determined by criteria established by the National Historic Preservation Act (NHPA) of 1966 and its subsequent amendments. Section 106 of the NHPA mandates Federal agencies to evaluate the impacts of their projects on such resources listed or eligible for listing in the National Register of Historic Places (NRHP), maintained by the Secretary of the Interior. There are no National Register listed properties located within the study area. In addition, a record search performed with the Idaho SHPO and the Shoshone Paiute tribes did not find any known historical or archaeological sites within the study area.

Future without Project

Under the future without project condition, the Owyhee River would continue to downcut and erode the shoreline of the river. This would continue until the Owyhee River has entrenched deep enough to accommodate high water flow velocity within an active floodplain. This ongoing process on downcutting and erosion would lead to some risk of exposing cultural material or damaging cultural sites, should any such sites or material be present, but unknown, at the study area.

2.12 SOCIOECONOMICS

The project is within the Duck Valley Indian Reservation, located on the border of Owyhee County in Idaho and Elko County in Nevada. The following data findings are based on the U.S. Census Bureau's 2022 American Community Survey 5-Year Estimates.

Population and Demographics

The Duck Valley Indian Reservation is located in a remote location with an estimated population of 1,253 people, with a gender distribution of 58 percent female and 42 percent male. Minors under 18 years old constitute 29 percent of the population, while 9 percent are elderly, aged 65 and over. Notably, 98 percent of the population identifies as belonging to only one race, which is higher compared to the 87 to 91 percent typically seen in Owyhee and Elko Counties, the states of Idaho and Nevada, and the United States overall. Within the Reservation, 90 percent identify as American Indian and Alaska Native, 6 percent as Some Other Race, 4 percent as White, and 2 percent as Native Hawaiian and Other Pacific Islander.

Housing Characteristics

Within the Duck Valley Indian Reservation, there are 473 housing units – of which 80 percent are occupied and 20 percent are vacant. Only 19 percent of the housing units are built in the year 2000 or later. 26 percent were built between 1980 and 1989, and 46 percent were built in 1979 or earlier. 56 percent of housing units are owner-occupied, and 44 percent are renter-occupied. Of the owner-occupied units, the median housing value is $58,900. The median rent is estimated to be $521. Comparatively, the median housing value and rent in Owyhee County, Idaho is $247,200 and $734 respectively;

and the median housing value and rent in Elko County, Nevada is $274,200 and $1,077 respectively.

Economic Characteristics

Of the working population within Duck Valley Indian Reservation (those aged 16 years and over), 56 percent are in the labor force. The unemployment rate is 6.9 percent. The largest industry within the labor force is Educational Services, Health Care, and Social Assistance, at 40 percent of the employed population working in this industry. The median household income is $47,361. Per capita income is estimated to be $21,008. Comparatively, Owyhee County, Idaho and Elko County, Nevada's per capita incomes are $25,106 and $39,001 respectively, while the nation's per capita income is $41,261. Of the people within Duck Valley Indian Reservation, 33 percent have an income within the past 12 months (2021-2022) that fall below the poverty level.

Social Characteristics

The average household size within the Duck Valley Indian Reservation is 3.30 people, and the average family size is 4.31. Of the population aged 25 years and older, 75 percent are high school graduates and 8 percent have a bachelor's degree or higher. 11 percent have no high school diploma. 5 percent of the civilian population is a Veteran. 17 percent of the population has a disability. Of those aged 65 years and older, 52 percent has a disability.

These data indicate disparities in demographics, housing, economics, and social factors, between the Duck Valley Indian Reservation and surrounding areas. It highlights the unique circumstances and challenges faced by the community on the reservation.

SECTION 3 - PLAN FORMULATION AND EVALUATION

3.1 PLANNING FRAMEWORK

The guidance for conducting civil works planning studies (Planning Guidance Notebook, Engineer Regulation [ER] 1105-2-100, April 2000) and in the Planning Policy for Conducting Civil Works Planning Studies (ER 1105-2-103, December 2023) requires the formulation of alternative plans to contribute to the Federal Objective. Specific project goals and planning study objectives are developed to contribute to Federal Objectives and National Ecosystem Restoration (NER) in accordance with national environmental statutes, applicable Executive Orders (EOs), and other Federal planning requirements and policies. Contributions to national improvements are increases in the net value of the national output of goods, services, and ecosystem integrity. Contributions to the Federal objectives include increases in the net value of those goods, services, and ecosystems that are or are not marketable. The use of the term “Federal objectives” is distinguished from planning/study objectives. Study objectives are more specific in terms of expected or desired outputs, whereas Federal objectives are considered a national goal. Federal Objectives were established by WRDA 2007 for water resources investments (ER 1105-2-103). Federal water resources investments must 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. Restoration of the Nation’s environment is achieved when the local ecosystem’s structure, function and processes are restored, and important cultural and natural aspects of the Nation’s heritage are preserved. Various environmental statutes and EOs assist in ensuring water resource planning is consistent with restoration. The objectives and requirements of applicable laws and EOs are considered throughout the planning process to meet the Federal Objective.

This section presents the results of the plan formulation process to include the USACE six-step planning process. The Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies (PR&G) govern how Federal agencies evaluate proposed water resource development projects. Principles and Requirements are established pursuant to the Water Resources Planning Act of 1965 (PL 89-8), as amended (42 USC 1962a-2) and consistent with Section 2031 of the Water Resources Development Act of 2007 (PL 110-114). The six planning steps are (1) specify problems and opportunities; (2) inventory and forecast conditions; (3) formulate alternative plans; (4) evaluate effects of alternative plans; (5) compare alternative plans; and (6) select recommended plan. Alternatives were developed in consideration of the study area problems and opportunities as well as the study objectives and constraints, which incorporated the project Purpose and Need Statement (P&N). The four evaluation criteria described in the Principles and Guidelines (completeness, effectiveness, efficiency, and acceptability) was used to

develop the alternatives, as well as during the comparison of alternatives, resulting in the selection of the TSP.

- **Acceptability.** Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public and compatibility with existing laws, regulations, and public policies. Acceptability has two dimensions – implementability and satisfaction. Implementability means the extent to which the alternative is feasible from a technical, financial, and legal perspective. Satisfaction is the extent to which the plan is welcome from a political or preferential perspective.
- **Completeness.** Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. Completeness must consider the sustainability and long-term aspects of the plans and whether all resource requirements are included. Completeness does not mean that all planning objectives are fully realized, only that the required resources and actions are included to achieve the estimated benefits.
- **Effectiveness.** Effectiveness is the extent to which the alternative plans contribute to achieving the planning objectives. Benefit metrics reflect the effectiveness of each alternative. Effectiveness does not mean that all planning objectives need to be addressed or fully realized. The degree of effectiveness will be used to illustrate the trade-offs between plans when compared.
- **Efficiency.** Efficiency is the extent to which an alternative plan is a cost-effective means of solving the problem and achieving the objectives. Efficiency is determined through a comparison of the costs and benefits of each alternative.

The planning horizon for this study is 50 years.

Figure 3-1 presents a summary of the plan formulation process presented throughout this chapter.

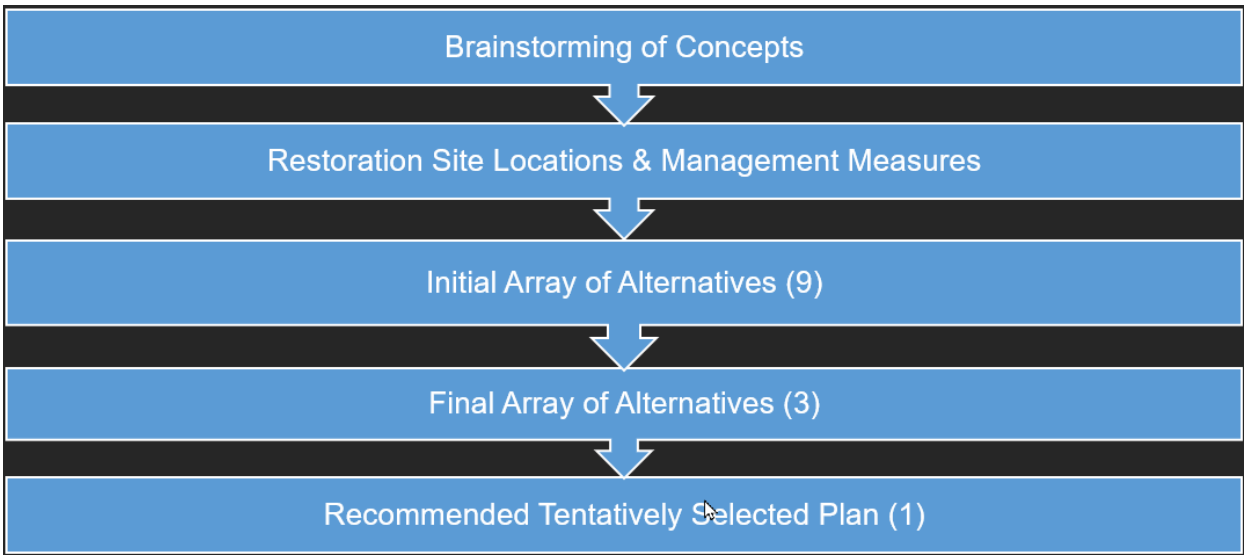

Figure 3-1. Summary of the Plan Formulation Process

3.2 DEVELOPMENT OF MEASURES AND IDENTIFICATION OF SITES

A management measure is a feature or activity that addresses one or more of the planning objectives and is considered a discrete element of an alternative. Alternatives would include measures, either alone or in combination with other measures. This is the same under NEPA.

Brainstorming of Measures and Sites. As part of the planning process for the study the Project Delivery Team (PDT), in coordination with the NFS, interested stakeholders and the public, brainstormed potential measures, and identified potential locations to focus on improving the degraded aquatic and riparian ecosystem in the study area. A Planning Workshop was held on February 17, 2022, with a public scoping comment period held August 11 to September 11, 2022. A public scoping meeting was held at the Duck Valley Indian Reservation on August 11, 2022, with a total of 16 attendees. One official comment was received during the scoping comment period, from the Environmental Protection Agency providing information on potential grants for the local high school for conducting habitat field work.

Additionally, the PDT conducted site visits to assess the existing conditions and identify specific locations along Owyhee River that could address the identified problem. During these site visits, the PDT focused on locations of degradation and used professional judgment with local knowledge of habitat and stream and valley morphology. The PDT focused on only the left descending bank of the Owyhee River since that area has more continuous intact relic channels and is generally a wetter side of the river with wider relic floodplain available for restoration. The PDT also confirmed there was no overlap of potential sites with any proposed compensatory mitigation areas for other, unrelated projects. A total of eight sites were identified that could apply potential measures (Figure 3-2).

Figure 3-2. All Sites Considered for Restoration along Owyhee River

Development of Measures. Four measures were identified during brainstorming that all are natural/nature-based features. A conceptual model was used to understand relationships between the drivers and stressors causing the habitat degradation and measures that could be applied (Figure 3-3).

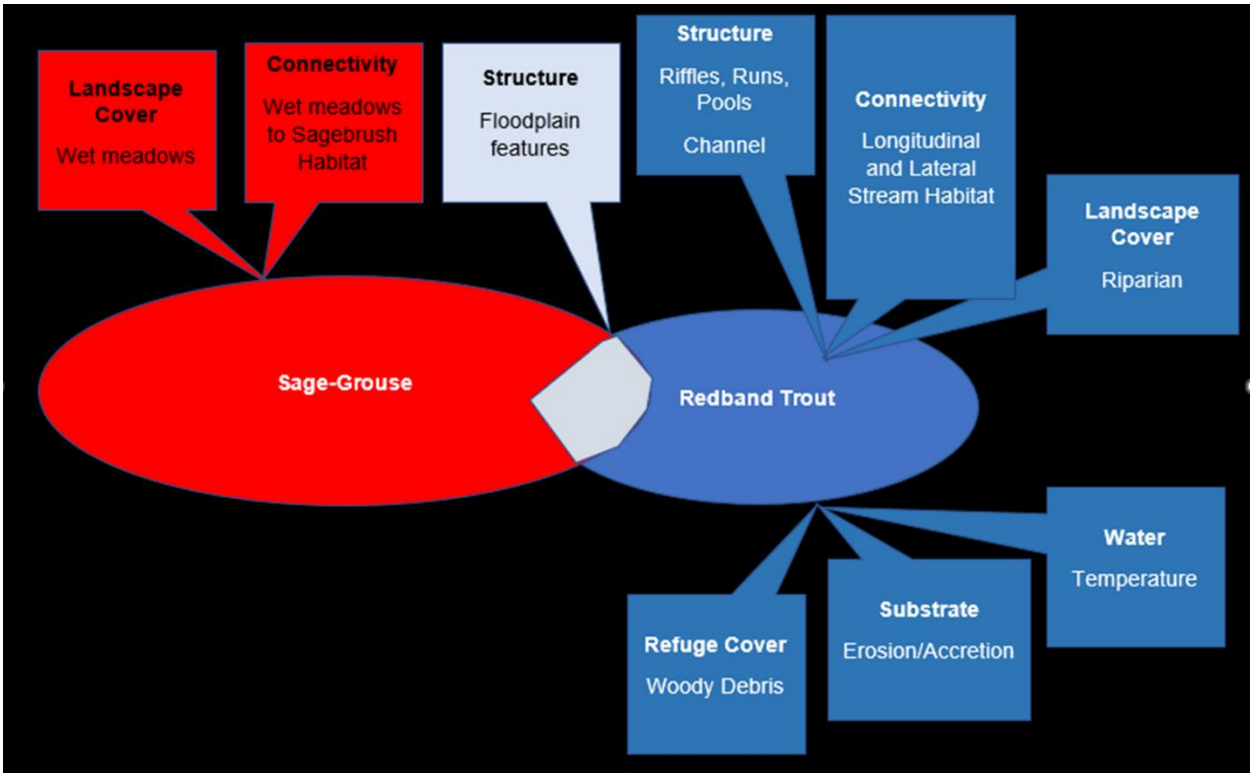

Figure 3-3. Conceptual Model Used in Development of Measures

Further understanding of the local irrigation demands was important to capture any potential limitations to benefits. For example, the main Owyhee River could potentially be dry Aug.-Nov., limiting the amount of all-year aquatic habitat. Therefore, any channel restoration would only have a seasonal aquatic benefit.

Measures were then georeferenced to understand if the action would be appropriate for main channel versus side channels or both. The PDT determined that all measures would be feasible and meet either one or both stated objectives. As site specifics were understood further (such as hydrology and infrastructure), each measure was applied to develop the initial array of alternatives (refer to Section 3.3 for more information on development of alternatives). Table 3-1 lists the measures and associated relationships, and detailed descriptions are provided below the table.

Table 3-1. Development of Measures

Concept	Measure Identification
Restore/Create adjacent riparian and wetland habitat.	Wetland creation/restoration (A); dependent on floodplain connection. Focus is mainly wet meadow and riparian wetland habitat.
Restore side channel habitat	Excavate to connect with main channel or main channel diversion (B). Since main channel runs dry at certain times of the year, this would be a seasonal connection and not all year flow.
Improve Instream habitat	Boulders to create pool/riffle pool, side channels and main channel to aquatic diversity (C). Beaver Dam Analogs (BDA) can be added to provide pools for instream habitat.
Reestablish floodplain	Notch berms along the main channel by excavation and grading (D). Beaver Dam Analogs (BDA) can be added to lengthen amount of time water stays onsite.

3.2.1 Descriptions of Measures Carried Forward

A: Wetland Creation/Restoration (Planting, Protection Fencing, Invasive Control)

Wet meadows would be created within areas that will undergo frequent flooding. It is assumed no excavation would be necessary with the low elevations present in the project area. The wet meadows would be seeded and excluded from grazing activities to establish vegetation. The planting list would be developed during the design-Implementation phase and would incorporate indigenous knowledge to promote ideal greater sage grouse habitat and drought tolerant species.

Approximately 100 feet of shoreline along the reactivated side channel would be planted with a variety of riparian wetland shrubs and trees. The recommended plantings are shown in Table 3-2.

Table 3-2. Recommended Shrub and Tree Species for Riparian Habitat Plantings

Common Name	Scientific Name
Blue Elderberry	*Sambucus nigra spp. Cerulea*
Chokecherry	*Prunus virginiana*
Silver buffaloberry	*Shepherdia argentea*
Woods' rose	*Rosa woodsii*
Gray alder	*Alnus incana*
Water Birch	*Betula occidetalis*
Black Cottonwood	*Populus balsamifra ssp. Trichocarpa*
Arroyo willow	*Salix lasiolepis*
Lemmon's willow	*Salix lemmonii*

Common Name	Scientific Name
Yellow willow	*Salix lutea*

The riparian preservation and enhancement measure is used to meet the objective of improving degraded riparian wetland conditions. It includes several possible techniques, such as herbivory exclusion devices, planting and seeding (to promote rapid vegetation establishment and improve soil retention, as shown in Figure 3-4), addition of soil amendments, invasive plant species control, and irrigation. This suite of vegetation-focused techniques is essential to the overall restoration project success and is an integral component to the long-term performance and resiliency of most other measures detailed herein.

Figure 3-4. Riparian Planting Example

B: Side Channel Reconnection

Channel shaping and grading is used to improve both degraded aquatic and riparian conditions. This measure includes a suite of techniques to modify channel bedform/gradation, cross section geometry, planform/alignment, and bankfull gradeline slope. Channel restoration and grading measures are implemented at a reach (or sub-reach) scale to improve resiliency by rebalancing the stream flow and improving stability and stream geomorphic function such as sediment transport, flood dynamics, and connectivity. Channel restoration and grading measures are designed to restore meanders, riffle-run-pool sequences and adjacent floodplain features. Due to the Owyhee River experiencing little to no flows at certain times of the year, the side channel connections would only flow seasonally and would not provide year-round aquatic habitat.

C: Instream Structures (Rock and Wood)

Instream structures are a category of measures used to improve degraded aquatic conditions. This measure includes a diverse suite of structural types and configurations comprised of native materials such as rock and wood (Figures 3-5 and 3-6). Instream structures provide and maintain localized hydraulic conditions that enhance aquatic habitat (e.g., creating both turbulent velocity and resting zones) and promote sustainable geomorphic processes (e.g., by maintaining reach scale grade for floodplain connection and localized facet slopes to promote deposition and storage of spawning gravels). As with other measures described herein, instream structures are typically designed to function in concert with a suite of other integrated restoration measures, providing resiliency. Beaver dam analogs (BDA) would be incorporated to enhance pooling at low elevations (Figure 3-7). These pools would need to be designed to avoid fish trapping during low flows. Beaver Dam Analogs are man-made structures designed to mimic the functions of a beaver dam in natural ecosystems. The functions that BDAs provide includes (1) water storage, (2) habitat creation, (3) water quality improvement, (4) temperature regulation, (5) floodplain connectivity, and (6) erosion control.

Figure 3-5. Example Instream Roughened Riffle with Boulder Grade Control

Figure 3-6. Example Meander Sequence with Integrated Instream Wood Structures

Figure 3-7. Example of BDA Pool
Source: Polderwood Report, 2021

D: Floodplain Connection (Excavation/Grading, Berm Notching)

Floodplain reestablishment is a measure that is intended to improve degraded wetland and riparian conditions. This measure includes several different techniques, including floodplain grading (direct shaping of floodplain elevations and slopes), construction of floodplain features such as swales and wetlands, and the addition of floodplain roughness elements (e.g., micro-topography and dispersed embedded woody debris).

Berm notching is a measure intended to improve degraded riparian conditions on the floodplain. Techniques for this measure include the potential setback, notching, lowering, and removal of berms (Figure 3-8). Modification of existing berms could be implemented to improve floodplain connectivity while providing more consistent flood routing and attenuation, allowing wetland and riparian restoration and recovery.

Figure 3-8. Berm Notching to Reconnect Adjacent Floodplains

3.2.2 Site Selection

During the initial brainstorming, eight sites were identified as potential locations for restoration. Due to the extensive agriculture and disconnected side channels on the right ascending bank, all eight sites were focused along the left ascending bank of the Owyhee River. The PDT also confirmed all eight sites did not overlap with existing mitigation sites form other projects. In order to ensure technical feasibility and no violation of the stated constraint of no negative impacts to irrigation, site visits were conducted. The PDT also considered the potential for each site to realize habitat benefits. Specifically, the benefits should *not* be limited by future development with adjacent infrastructure (roads, irrigation) nor should benefits be limited due to already having ideal habitat. As a result, six out of eight sites were eliminated from further analysis. Specifically, sites 5 through 8 were eliminated due to potential conflicts with irrigation activities, which would require moving existing infrastructure such as roads and irrigation canals and would violate the stated constraint. Sites 1 and 2 are highly functioning existing habitats and therefore were eliminated because restoration activities would provide a minimal benefit. Sites 3 and 4 were kept for further evaluation to be included into development of alternatives (Table 3-3 and Figure 3-9).

Table 3-3. Site Identification and Screening

Sites	Screening Criteria			Planning Constraints	Future Consideration	
	Feasible and Constructible?	**Realize habitat benefits?**	**Impacted by future development?**	**Project cannot negatively impact irrigation**	**Retained / Dismissed**	**Reason for Retention or Dismissal**
1	Yes	Limited	No	No	Dismissed	Area has ideal existing wetlands; improvements would capture minimal benefits
2	Yes	Limited	No	No	Dismissed	Area has ideal existing wetlands; improvements would capture minimal benefits
3	Yes	Yes	No	No	**Retained**	
4	Yes	Yes	No	No	**Retained**	
5	Yes	Limited	Yes	Yes	Dismissed	Sites 5-8 have low flows with diverted water usage for irrigation purposes. Future development (ex. Roads) potentially would impact benefits
6	Yes	Limited	Yes	Yes	Dismissed	Sites 5-8 have low flows with diverted water usage for irrigation purposes. Future development (ex. Roads) potentially would impact benefits
7	Yes	Limited	Yes	Yes	Dismissed	Sites 5-8 have low flows with diverted water usage for irrigation purposes. Future development (ex. Roads) potentially would impact benefits
8	Yes	Limited	Yes	Yes	Dismissed	Sites 5-8 have low flows with diverted water usage for irrigation purposes. Future development (ex. Roads) potentially would impact benefits

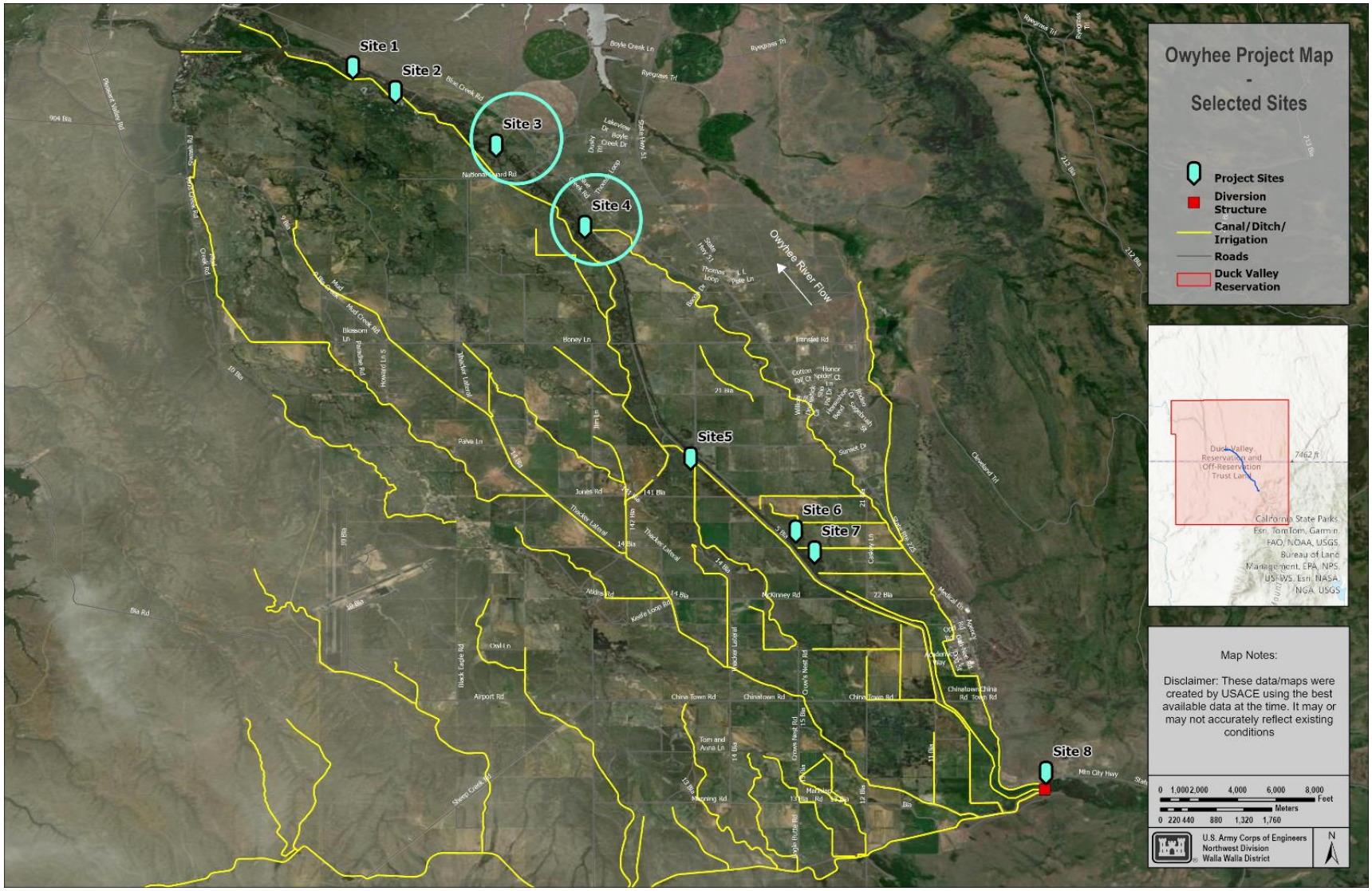

Figure 3-9. Circled Site 3 and 4 Kept for Further Consideration
Note site specifics (roads/irrigation) considered during site selection process.

3.3 FORMULATION OF ALTERNATIVES

Alternative plans are developed by combining one or more measures to form a plan that meets the Purpose and Need Statement, meets one or more planning objectives, and avoids all constraints. The evaluation criteria of acceptability, completeness, effectiveness, and efficiency are considered in the development of the alternatives and confirmed for the TSP. Alternatives are compared and evaluated against the No Action Alternative, with respect to ecosystem outputs (habitat benefits) and by incremental cost analysis. A No Action Alternative is required by NEPA and represents the Owyhee River as it currently is, without this ecosystem restoration project or any other improvements. Alternatives were scoped appropriately to fit a CAP study and included consideration of Sponsor cost limitations.

3.3.1 Initial Array of Alternatives

The IWR Planning Suite II (version 2.0.9) was used to generate the initial array of nine alternatives, resulting in different combinations of measures with specific locations identified within sites 3 and 4. All alternatives met at least one objective (Table 3-4). Further understanding on the relationships between those measures was required to establish dependencies and combinability as alternatives were developed. For example, wet meadow/riparian wetland habitat improvements were recognized to be established with improvements to the floodplain connection. In other words, more floodplain connection equates to more wetlands. Therefore, the wetland measure (measure A) became dependent upon the floodplain connection measure (measure D). Additionally, side channel reconnection (measure B) would provide excavated material to use for in-stream habitat (measure C); therefore, whenever measure B was used, this was combined with measure C. On the other hand, measure C could be standalone if the focus was just in-stream habitat improvements without side channel reconnection using boulders/large woody debris. Five out of the nine initial alternatives include different scales of floodplain connection (measure D) with dependent wetland establishment (measure A). Due to the limited existing hydrology, floodplain connection is dependent on either channel connection (measure B) or in-stream habitat (measure C) to provide benefits. In other words, an action is required to maintain hydrology for floodplain connection. This can be done by notching of berms, designing riffle/pool complexes for in-stream habitat, or incorporating BDAs for pooling adjacent to a channel. Notching of berms is assumed to have the highest floodplain connection benefits, while BDAs are more limited.

Specific locations for side channel connection were identified based on Lidar elevations and ideal location of continuous intact channel. The side channel meanders were identified with a riparian/wetland buffer along the entire channel. BDAs was deemed more appropriate for side channel, as main channel high flows could risk the long-term sustainability of these features. Additionally, sites 3 and 4 were treated as one due to similar topography and habitat types, as well as the hydrological dependency. In other words, upstream actions could influence downstream actions due to the limited main channel flows. The National Guard Road (see Figure 3-9) intersects the side channel at

Site 3, requiring consideration of the existing culvert. All measures were either in the main channel of the Owyhee River or the side channel or both. These features included appropriate rock size to minimize erosive impacts, design for pools to avoid fish stranding, and planting drought tolerant species.

Table 3-4. Initial Array of Alternatives

No.	Measure Identification and Brief Description	Objective 1: Improve aquatic habitat diversity associated with in-stream features, for native fish.	Objective 2: Restore floodplain function and resulting improvements to adjacent riparian and wetland habitat	Objective 3: Reconnect and restore the historic disconnected channel segments to promote natural regime with improved ecological responses.
1	No Action Plan			
2	Main Channel In-Stream Only C-In stream habitat; Main Channel only	X		
3	Main Channel In-Stream with Floodplain Connection A, C and D; Floodplain connection with riffle and pool In Stream habitat; Main Channel only	X	X	
4	Side Channel Connection and In-Stream Habitat B and C; Side Channel habitat Only. No floodplain connection.	X		X
5	Side Channel Connection, In-Stream Habitat with limited Floodplain Connection A, B, C, and D; In Stream and Side Channel Habitat; add in-stream complexity, ***limited*** floodplain connection with BDAs	X	X-limited	X
6	Side Channel Connection, In-Stream Habitat with Floodplain Connection	X	X	X

	A, B, C, and D; Notch berm for overbank flow for floodplain connection and side channel habitat, add in-stream complexity			
7	Main Channel Realignment Only B and C; Main Channel Realignment to Side Channel only. No floodplain connection.	X		X
8	Main Channel Realignment with limited Floodplain Connection A, B, C, and D; Main Channel Realignment to Side Channel, In Stream habitat with ***limited*** floodplain connection with BDAs	X	X-limited	X
9	Main Channel Realignment with Floodplain Connection A, B, C, and D; Main Channel Realignment to Side Channel, Notch berms for floodplain connection, and In Stream habitat	X	X	X

*Recall: A is wetland restoration, B is side channel connection, C is instream habitat, and D is floodplain connection

3.3.2 Final Array of Alternatives

Screening is the process of eliminating, based on planning criteria, the alternatives that would not be carried forward for consideration. Criteria are developed specific to the planning study based on the objectives, constraints/considerations, technical feasibility, and the stated Purpose and Need statement. The screening was also focused on Sponsor cost limitations, extensive long-term O&M requirements, and expected habitat benefits.

Alternatives 2 and 3 focus on aquatic habitat only in the main channel. The PDT determined that the main channel has been degraded to a point that any alternative that does not combine the main channel with the side channel connection would have very limited habitat benefits. Therefore, alternatives 2 and 3 were eliminated from further analysis.

Alternative 4 is a basic alternative that only connects the side channel. It was determined that using the excavated material from the side channel connection to create BDAs would provide additional benefits. Alternative 5 includes both the side channel connection and BDAs. Therefore, the PDT eliminated Alternative 4 as a standalone alternative. Alternative 5 was retained to capture benefits from the side channel connection and BDAs for limited floodplain connection.

Lastly, Alternatives 8 and 9 are scales of the main channel full realignment. All of the main channel full realignment alternatives require extensive grading to convert a 20-foot-wide stream to a 40-foot-wide stream to convey all flows. Additional engineering features would be required to armor the bends in the channel from erosion. Any associated floodplain connection has potential to impact that armoring by allowing water outside of the channel, requiring additional long-term maintenance. Extensive long-term maintenance does not provide for resiliency and impacts Sponsor’s ability to ensure project success. Therefore, alternatives 8 and 9 were eliminated from further consideration. Table 3-5 provides a summary of the screening process.

Table 3-5. Screening of Initial Array of Alternatives with Reasons for Retention/Dismissal

No.	Name and Brief Description	Retained / Dismissed	Reason for Retention or Dismissal
1	No Action Plan	**Retained**	Required per NEPA
2	Main Channel In-Stream Only	Dismiss	Less quality habitat in main channel, assumed to have limited habitat benefits
3	Main Channel In-Stream with Floodplain Connection	Dismiss	Less quality habitat in main channel, assumed to have limited habitat benefits
4	Side Channel Connection and In-Stream Habitat.	Dismiss	Dismiss this alt. as a standalone and rely on Alt 5 instead
5	Side Channel Connection, In-Stream Habitat with limited Floodplain Connection	**Retained**	
6	Side Channel Connection, In-Stream Habitat with Floodplain Connection	**Retained**	
7	Main Channel Realignment Only	**Retained**	
8	Main Channel Realignment with limited Floodplain Connection	Dismiss	Extensive long-term maintenance.
9	Main Channel Realignment with Floodplain Connection	Dismiss	Extensive long-term maintenance.

As a result of the screening process, the final array consists of Alternatives 5, 6, and 7, in addition to the No Action Alternative. These alternatives are carried forward to assess potential environmental consequences, as discussed in Section 4.

Alternative 5: Side Channel Connection, In-Stream Habitat with limited Floodplain Connection

This alternative includes excavation of a 20-foot-wide side channel and construction of beaver dam analogs at certain low elevations (Figure 3-10). The beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. Reactivating the side channel would create sinuosity and influence the development of backwaters and lateral pools to increase aquatic diversity. Boulders and logs would be placed in the

channel to provide fish habitat. Seeding of the banks would allow for stabilization after grading. Planting would also be incorporated at the same low elevation areas near the BDAs.

This alternative would create approximately 11,370 linear feet of side channel and create approximately 6 acres of wet meadows. The culvert at the National Guard Road would need to be upsized with corrugated steel pipe arch to allow for additional flows.

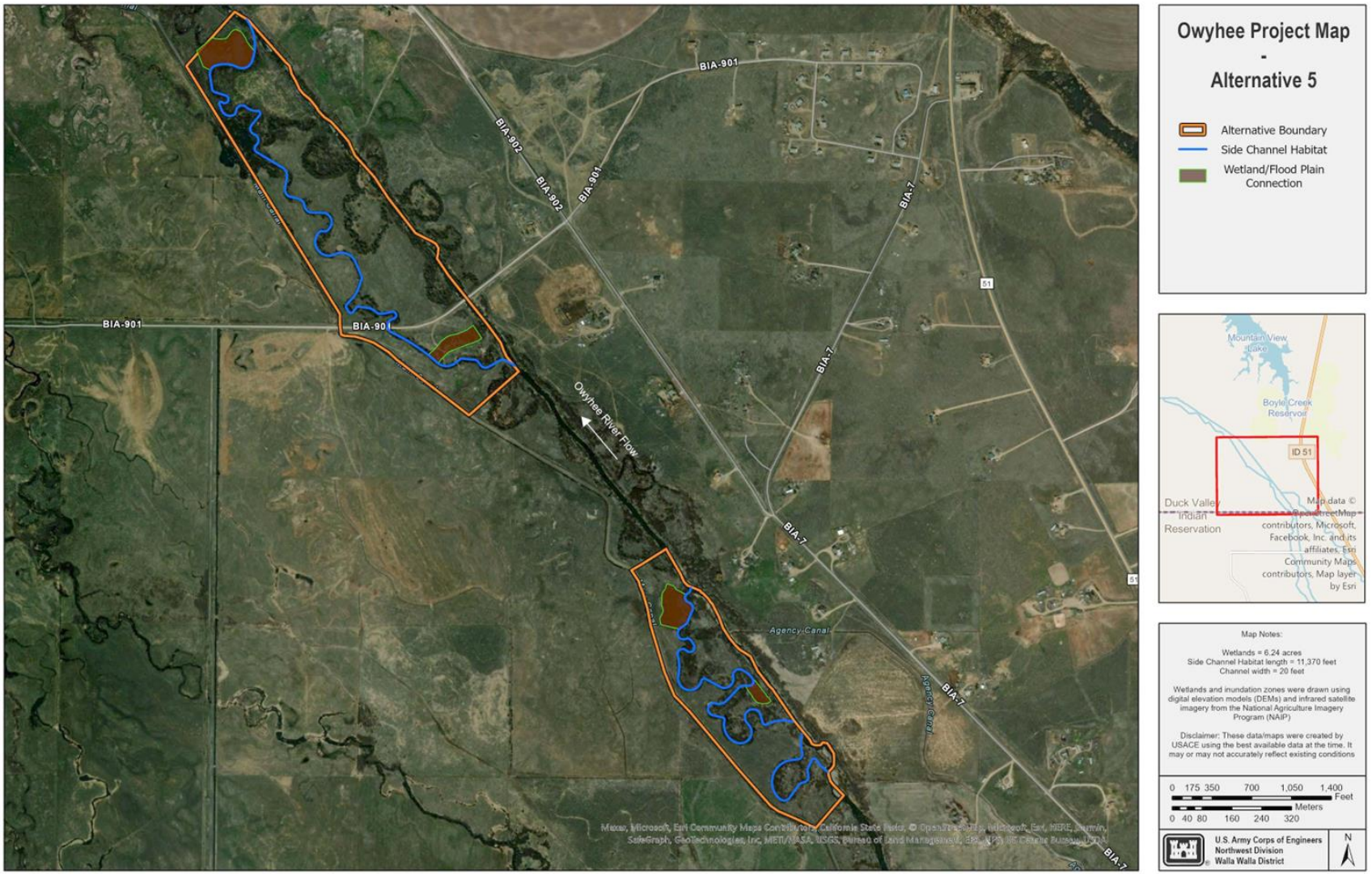

Figure 3-10. Conceptual Design of Alternative 5

Alternative 6: Side Channel Connection, In-Stream Habitat with Floodplain Connection

This alternative removes berms along the Owyhee River to allow for the river to flood the historic floodplain during high water events (Figure 3-11). Removal would also be created to redirect the flow of the Owyhee River into historic meanders to reactivate side channels. Seeding of the banks would allow for stabilization after grading. The fill material from the excavated berms would be strategically placed in the Owyhee River channel to raise the channel bottom, increase the water surface elevation, and therefore facilitate left overbank flooding onto the historic floodplain. This would support subsequent vegetation growth.

This alternative would restore approximately 11,370 linear feet of side channel and approximately 55 acres of wet meadows and 4 acres of riparian wetlands. Planting of riparian vegetation would occur along the side channel.

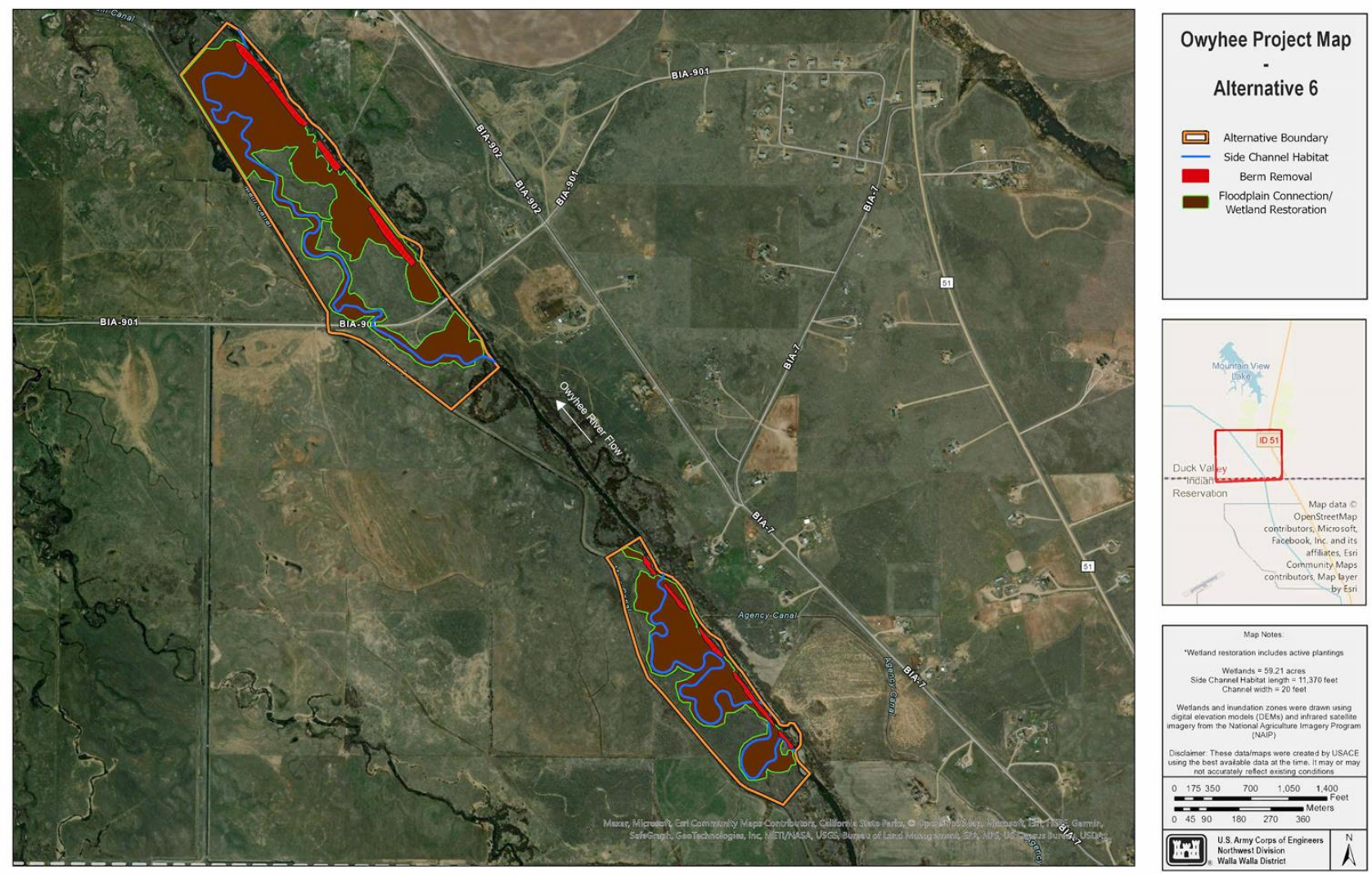

Figure 3-11. Conceptual Design of Alternative 6

Alternative 7: Main Channel Realignment Only

This alternative excavates a 5,300 linear foot, 40-foot-wide side channel within the historic floodplain large enough to contain all flows (i.e., high and low) of the Owyhee River (floodwater and normal) (Figure 3-12). The channel would accommodate floodwater events and earth embankment diversion structures would be constructed in the Owyhee River to divert the flows into the new channels. The fill material to construct the diversion structures would be taken from the side channel excavation. The excavated side channels would be armored with riprap and boulders along the outside bends of the meanders to provide channel stability. No seeding or plantings would be associated with this alternative.

This alternative would create approximately 11,370 linear feet of side channel. The new channel would have limited flooding except during extreme high flow events Boulders and logs would be placed within the new side channel. Avoidance of the National Guard Road requires the diversion to start downstream of the bridge.

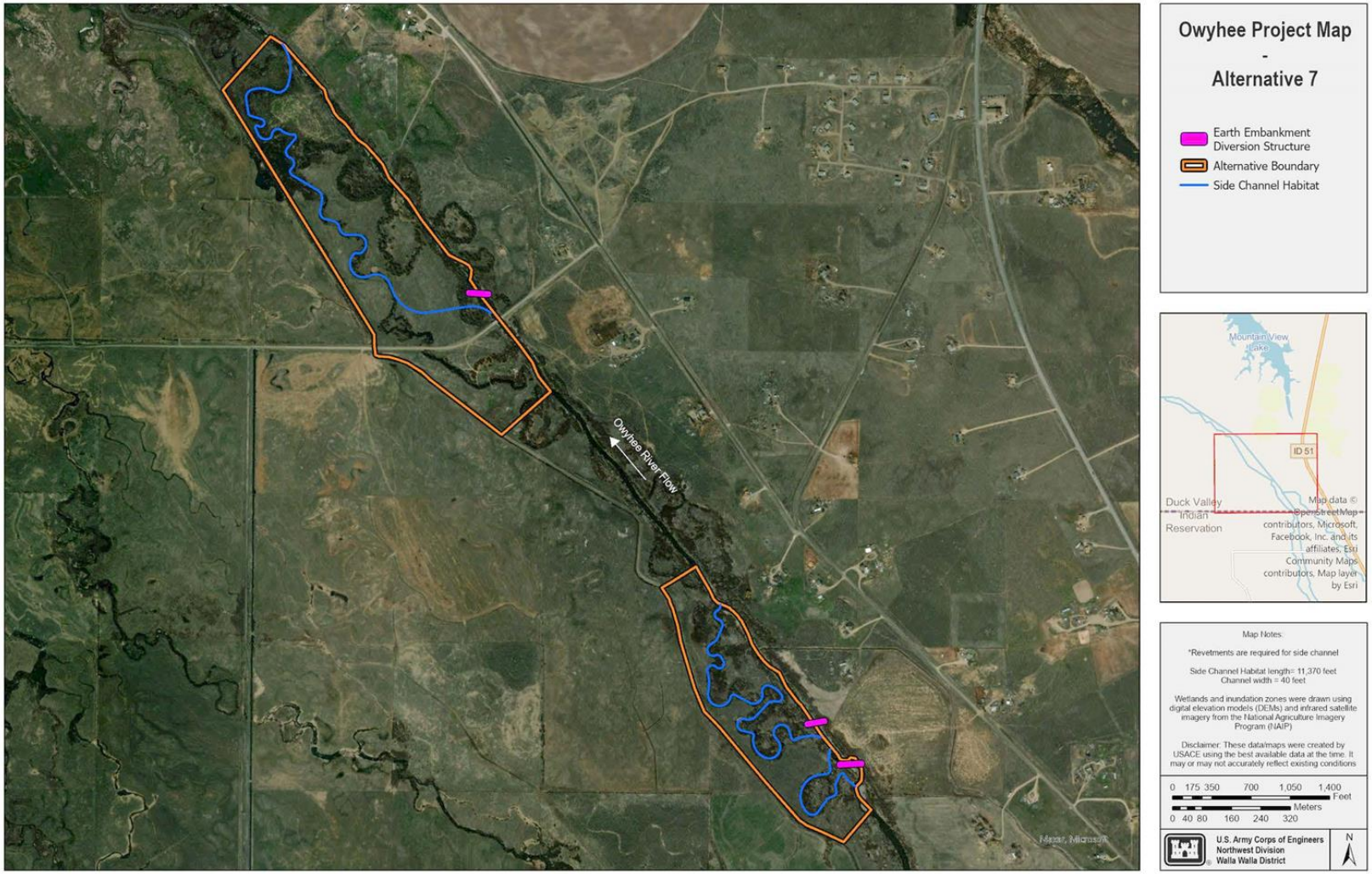

Figure 3-12. Conceptual Design of Alternative 7

3.4 PLAN EVALUATION

The Council on Environmental Quality (CEQ) regulations for implementing NEPA require that Federal agencies explore and objectively evaluate a reasonable array of alternatives. In this section, screening criteria developed by USACE are uniformly applied to each of the identified alternatives. This process helps to determine how well each alternative addresses the project purpose and need and provides the justification/rationale for eliminating any alternatives that were not considered in detail (40 CFR 1502.14).

Alternatives were evaluated and screened using the evaluation criteria (completeness, effectiveness, efficiency, and acceptability) as described in Section 3.1. Additionally, the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies, established by the Water Resources Council in 1983, created four criteria known as “accounts” to facilitate comparison of the effects of alternative plans:

1. The National Economic Development (NED) account displays changes in the economic value of the national output of goods and services.

2. The Environmental Quality (EQ) account displays non-monetary effects on significant natural and cultural resources. Under this account, the National Ecosystem Restoration (NER) plan displays increases in ecosystem restoration benefits compared to costs, consistent with the Federal objective. The intent of comparing alternative plans in terms of NER is to evaluate the overall benefits that the plans may provide to an ecosystem.

3. The Regional Economic Development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan.

4. The Other Social Effects (OSE) account registers plan effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts. The OSE benefit category relates to the quality of human life, health, and safety in the community.

3.4.1 Habitat Benefits

The evaluation of habitat benefits is a comparison of the with- and without-project conditions for each alternative. Environmental outputs are the desired or anticipated measurable products or results of restoration site plans and alternatives. The term “outputs” is often used interchangeably with “benefits” or “habitat units (HUs).” These benefits were calculated using the Functional Assessment of Colorado Streams (FACStream) model and were calculated for all alternatives (refer to Appendix D, Habitat Modeling).

While the FACStream model was developed for the Colorado landscape, Colorado’s physiographic regions are very similar to the Basin and Range Province which includes

the segment of the Owyhee River within the study area. More specifically, Colorado's Shrublands, Grasslands, and Coniferous Forest ecoregions as presented in Johnson et al. (2015) are comparable to the Semiarid uplands found in the upper Owyhee River watershed (EPA, 2003b) ecoregion. Therefore, Northwestern Division (NWD) approved this model for the Owyhee River Restoration Feasibility Study. No alterations were made to the model.

FACStream is a reach-scale functional assessment tool that rates functional condition according to the degree of impairment of ten ecological forcing factors (State Variables) that each describe a foundational driver of stream health (Table 3-6). The degree of impairment is determined by comparison of the study reach to a reference reach. For this study, the portion of the Owyhee River upstream of the China Diversion Dam and Sites 1 and 2 served as reference reaches.

Table 3-6. FACStream State Variables and Brief Descriptions

Variables*	Description
Flow Regime	
Total Stream Volume	Considers the total annual volume of water delivered to the reach from its contributing watershed.
Peak Flow	Considers the magnitude and duration of peak flows, or t“e "high ”nd" of the hydrograph.
Base Flow	Considers the magnitude, and duration of base flows, or t“e "low ”nd" of the hydrograph.
Flow Variability	Considers the temporal pattern of flows including the characteristic timing of peaks, base flows, and rate of change.
Sediment Regime	
Land Erosion	Considers the amount of sediment produced in the watershed via land erosion including both surface erosion and mass erosion.
Channel Erosion	Considers the rate of sediment produced by channel erosion in the contributing watershed.
Sediment Transport	Considers the transport of sediment to and through the reach.
Water Quality	
Temperature Regime	Considers temperature as a critical biotic habitat factor.
Organic Nutrient Inputs	Considers organic nutrient supply as foundational to trophic structure.
Inorganic Nutrients/Toxins	Encompasses all the other physicochemical properties of a reach that are not accounted for in prior variables.
Floodplain Connectivity	
Saturation Frequency	Considers the access of water to the floodplain and riparian area from the stream channel(s).
Floodplain Width	Assesses the degree to which the lateral extent of the floodplain is decreased from stressors.

Variables*	**Description**
Saturation Duration	Considers the amount of time the floodplain is saturated during the vegetation growing season.
Riparian Vegetation	
Woody Veg Structure	Considers the physical structure of the woody vegetation layers in the riparian area.
Herbaceous Veg Structure	Considers the physical structure of the herbaceous vegetation layers in the riparian area.
Species Diversity	Considers plant species diversity across all layers.
Organic Debris	
Large Woody Debris (LWD) Supply	Considers the LWD supply to the reach.
Detritus Supply	Considers the detritus supply to the reach.
Stream Morphology	
Stream Evolution	Considers gross impacts to stream morphology from stressors.
Stream Planform	Considers gross changes to stream branching, sinuosity patterns, etc.
Stream Dimension	Considers gross changes to stream cross section, width/depth ratio, etc.
Stream Profile	Considers gross change to stream slope or gradient.
Stability/Resilience	
Channel Dynamic Equilibrium	Considers stream deposition, scour and migration as measures of stability.
Channel Resilience	Considers stream response to disturbance as a measure of stability.
Physical Structure	
Hydraulic Structure	Considers changes to characteristic distribution of depth and velocity.
Coarse Features (flow, LWD, etc.)	Considers coarse physical structure including bed and bank form.
Fine Features (deposition of detritus, etc.)	Considers fine scale physical structure within the stream channel.
Biotic Structure	
Stream Biotic Structure	Considers all taxonomic and trophic groups present.

Stream “functions” are processes that drive the physicochemical makeup of a stream and are objective in the sense that they are not tied to plant or animal species or community requirements. Optimizing habitat for a singular species, habitat feature, or function may result in diminished suitability for other species. FACStream is a value-neutral assessment of function, meaning it is designed to assess holistic aquatic, riparian, and watershed-level components of the ecosystem (Johnson et al. 2015). Hence, this model is appropriate for “ecosystem restoration” where the intended outcome is an improvement for all associated organisms, including fish, wildlife, and plants.

The scores for the state variables for existing and future conditions were assigned using a mix of field data collection and professional judgement (scoring sheets and assumptions provided in Appendix D) and were combined as a model-derived weighted average to give an overall reach Functional Capacity Index (FCI). The FCI is an index value between 0 and 1 (1 being optimal) of the degree of aquatic functioning of a given reach. The FCI can be multiplied directly by project acreage to estimate HUs for alternatives comparison. Future Average Annual Habitat Units (AAHU) for each site plan are presented in Table 3-7. Model scores for future with- and without-project outcomes were based on professional judgement of anticipated conditions over the 50-year horizon. As expected, alternatives that extended the floodplain connection provided the greatest benefit (Figure 3-13).

Table 3-7. AAHU Calculations for Each Alternative

Alternative	Gross AAHU	Net AAHU
No Action	15.2	0
Alternative 5	25.7	10.5
Alternative 6	42.1	27.0
Alternative 7	24.3	9.2

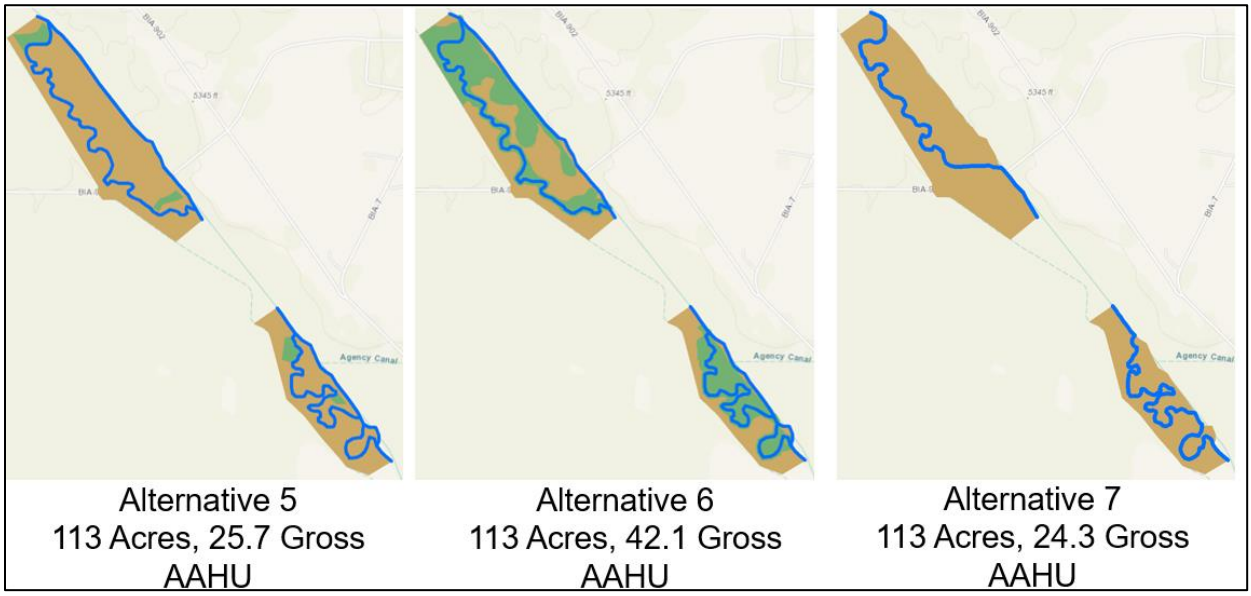

Figure 3-13. Simplified Comparison of AAHUs

3.4.2 Cost Effectiveness and Incremental Cost Analysis

Cost Effectiveness and Incremental Cost Analyses (CE/ICA) are required for ecosystem restoration projects per ER 1105-2-100, Planning Guidance Notebook and IWR Report 95-R-1, Evaluation of Environmental Investments Procedures Manual, Interim: Cost Effectiveness and Incremental Cost Analyses.

The CE/ICA must show that ecosystem outputs for an alternative cannot be produced more cost-effectively by another alternative. Cost-effective means that, for a given level

of non-monetary output, no other plan costs less and no other plan yields more output at a lower cost. Through CE/ICA, the cost-effective alternatives were examined sequentially (by increasing scale and increment of output) to ascertain those providing the greatest increase in environmental benefits for the smallest cost increases. Once cost-effective alternatives are determined and cost-ineffective alternatives are screened out, best buy plans are generated from the cost-effective plans to determine which alternatives give the highest incremental output at the lowest incremental cost.

The CE/ICA was conducted using IWR Planning Suite II version 2.0.9, a decision support software.

The total project first cost breakdown for the no action alternative and alternatives 5, 6, and 7 can be found in Table 3-8 below in FY24 OCT 2023 price levels.

Costs detailed in this section are initial estimates, and costs of the TSP (alternative 6) are ultimately refined in section 6.

Total project first costs consist of construction costs; planning, engineering, and design with adaptive management and monitoring included; construction management; and LERRDs. Planting and seeding costs were included in the construction costs, based on local tribal input for a cost/acre calculation. Seeding costs are to aid in bank stabilization and included for all alternatives, whereas the planting costs are for wetland/riparian areas and only included in alternatives 5 and 6. Fencing would be required due the potential cattle trampling. However, this was considered the same for all alternatives as a construction feature and not included during this phase of the study.

Table 3-8. Alternatives Summary of Total Project First Cost Breakdown* ($1,000s)

Alternative	Alternative Description	Construction Cost	PED	Construction Management	LERRD	Total Project First Cost
No Action	No Action	$0	$0	$0	$0	$0
5	*High flows, no overbanking*	*$3,209*	*$804*	*$355*	*$38*	*$4,405*
6	Overbanking	$2,712	$785	$321	$38	$3,856
7	Full diversion	$7,317	$1,832	$809	$38	$9,995

*FY24 OCT 2023 Price Level

To perform CE/ICA, the total project first costs are annualized over a 50-year period of analysis utilizing the FY24 Federal discount rate of 2.75 percent. Interest during construction (IDC) is added to the total project first cost of the alternatives to obtain the total project investment costs. IDC is calculated over the 12-month construction period with middle-of-month cost expenditures assumed for calculations. Average annual equivalent costs (AAEC) of the alternatives are then obtained by annualizing the investment costs over the 50-year period of analysis with the same FY24 Federal discount rate of 2.75 percent.

The adaptive management and monitoring plan covers the initial 10 years of the study's 50-year period of analysis. O&M is therefore determined to be $0 during years 1-10. An estimated one percent of total project first costs is estimated for the next 5 years (years 11-15) for bank stablization of all alternatives. An additional one percent of total project first costs is estimated for the same 5 years (years 11-15) for fencing maintenance of alternatives 5 and 6. For the remaining 35 years of the study's period of analysis (years 16-50), O&M is estimated to be minimal at $4,000 for routine maintenance. These O&M costs are annualized accordingly over the 50-year period of analysis using the FY24 Federal discount rate of 2.75 percent. Average annual O&M costs are calculated to be $14,000, $13,000, and $16,000 for alternatives 5, 6, and 7 respectively.

Average annual costs (AAC) used for the CE/ICA are the AAEC and average annual O&M summed. Table 3-9 provides a summary of the alternatives annualized costs and benefits (net AAHUs) that are inputted into CE/ICA.

Table 3-9. Alternatives Summary of Annualized Costs and Benefits* ($1,000s)

Alternative	Alternative Description	IDC	Total Project Investment Cost	AAEC	Average Annual O&M	Average Annual Cost (AAC)	Net AAHU
No Action	No Action	$0	$0	$0	$0	$0	0.0
5	High flows, no overbanking	$60	$4,466	$165	$14	$179	10.5
6	Overbanking	$53	$3,908	$145	$13	$158	27.0
7	Full diversion	$137	$10,132	$375	$16	$391	9.2

*FY24 OCT 2023 Price Level, 2.75 Percent Federal Discount Rate, 50-Year Period of Analysis

The CE/ICA determined there is only one cost-effective plan and consequently, only one best buy plan. Cost effective plans can differ from lower to higher costs but are plans in which no other plan produces the same level of output at a lower cost and no other plan produces more output at the same cost. Best buy plans are cost-effective plans which give the highest incremental output at the lowest incremental cost and are therefore the most efficient cost-effective plans. Meaning, no other plan provides more output (benefits) for less cost.

The cost per output for the no action plan, Alternative 5, Alternative 6, and Alternative 7 were $0, $17,000, $6,000, and $43,000 respectively – indicating that alternative 6 has the lowest cost for one unit of output aside from the no action plan. A summary of the CE/ICA results follows in Table 3-10. Alternative 6, the only best buy plan, provides an output of 27.0 net AAHUs with an average cost per AAHU of $6,000. This is an average annual cost (AAC) of $158,000. From the No Action Alternative, Alternative 6 has an incremental cost of $158,000 and an incremental output of 27.0 AAHUs, being an incremental cost per output of $6,000.

Table 3-10. Cost Effectiveness and Incremental Cost Analysis Best Buys* ($1,000s)

Alternative	Output (Net AAHUs)	AAC	Average Cost (AAC/ AAHUs)	Incremental Cost	Incremental Output (AAHUs)	Incremental Cost/Output ($/AAHUs)
No Action	0.0	$0	$0	$0	0.0	$0
6	27.0	$158	$6	$158	27.0	$6

*FY24 OCT 2023 Price Level, 2.75 Percent Federal Discount Rate, 50-Year Period of Analysis

Figure 3-14 demonstrates possible plan combinations, with best buy plans represented as green squares, cost effective plans represented as red triangles, and non-cost effective plans represented as blue circles. The no action plan and Alternative 6 are the only best buy plans, showing that there are no other plans that provide more output at a lower cost.

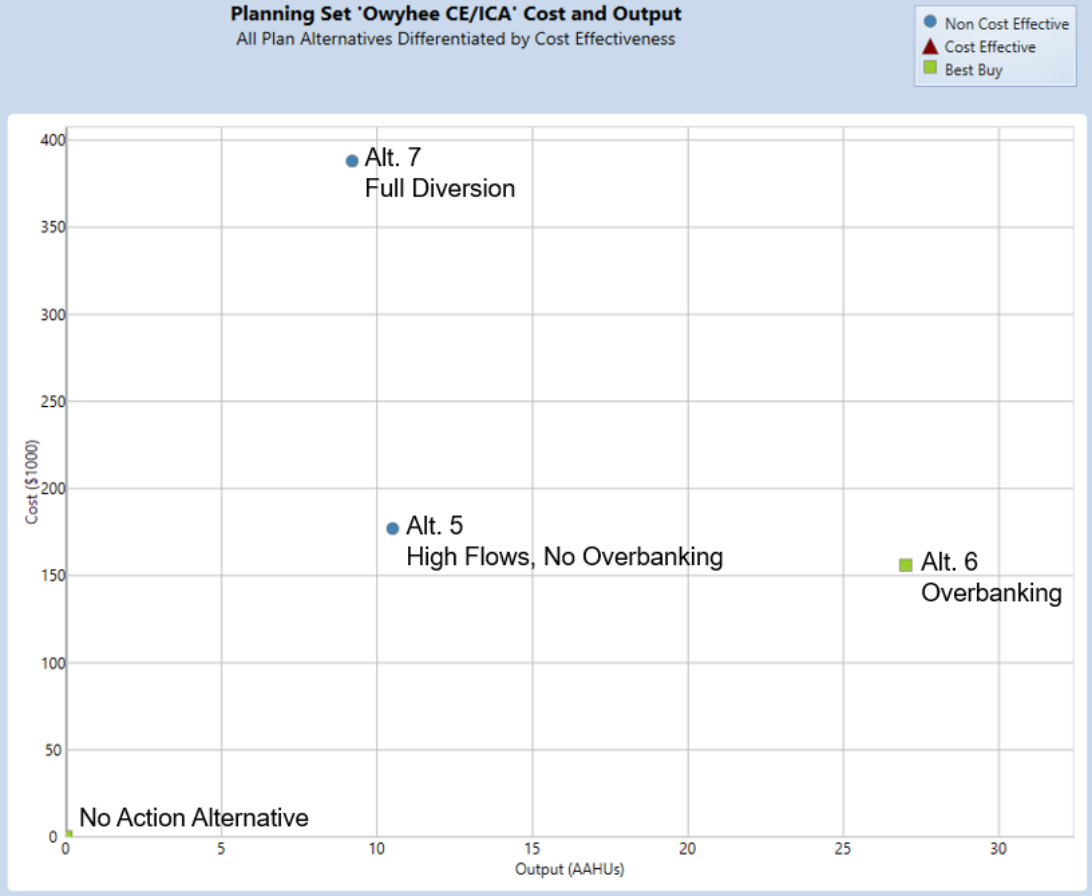

Figure 3-14. Plot of Possible Plan Combinations for Final Array of Alternatives

Figure 3-15 provides a plot for the best buy plans found from the CE/ICA. As shown, there is only one best buy plan with Alternative 6 providing 27.0 AAHUs at an incremental cost per unit of an estimated $6,000.

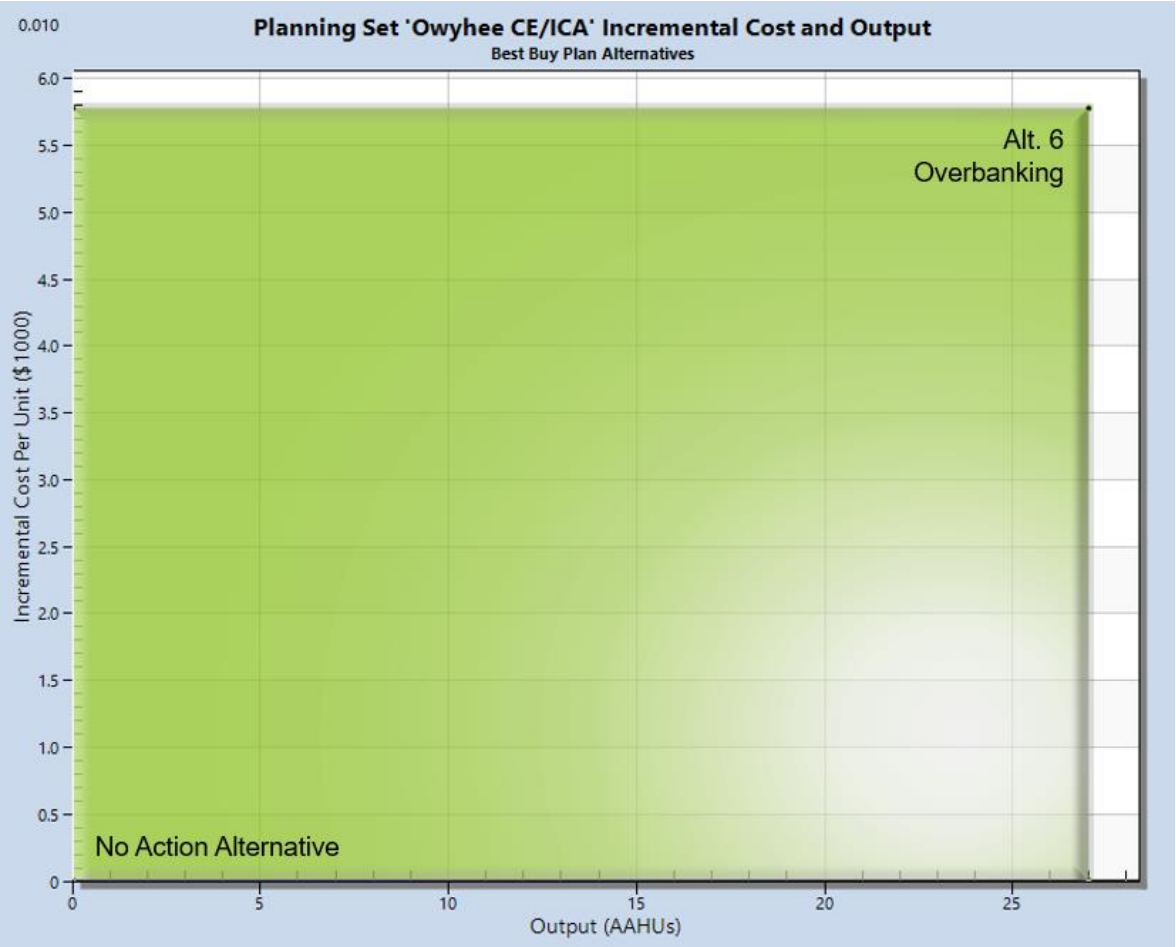

Figure 3-15. Best Buy Plans for Final Array of Alternatives

SECTION 4 - ENVIRONMENTAL EFFECTS AND CONSEQUENCES

The NEPA regulations in 40 CFR 1502.16 describe analysis required to determine the environmental consequences. The Environmental Consequences describe the probable effects or impacts of implementing the action alternatives over a 50-year period of analysis. These effects can be either beneficial or adverse and are summarized in Table 4-1.

The probable effects or impacts described in this section may include changes to the affected environment in terms of land use, water quality, air quality, vegetation composition, wildlife populations, habitat quality, cultural resources, and socio-economic conditions. The analysis considers both short-term and long-term effects, considering the dynamic nature of ecosystems and the potential for cumulative impacts over the 50-year period.

The potential effects are typically supported by scientific data, modeling, professional judgement, and other relevant studies conducted during the environmental assessment process. The analysis considers the interactions and trade-offs between different resources and factors to provide a comprehensive understanding of the anticipated effects of each alternative.

The following descriptors are used in the body of this chapter for consistency in describing effect intensity and relative durations in relation to potential significance:

Adverse Effect: Negative, unfavorable, or harmful effects that are detrimental or undesirable.

Beneficial Effect: Positive or advantageous outcome, consequence, or effect resulting from a particular action, intervention, treatment, or circumstance.

No or Negligible Effect: The action would result in no effect, or the effect would not change the resource condition in a perceptible way. Negligible is defined as of such little consequences as to not require additional consideration or mitigation.

Minor Effect: The effect to the resource would be perceptible; however, the effect is unlikely to result in an overall change in resource character.

Moderate Effect: The effect to the resource would be perceptible and may result in an overall change in resource character. Moderate effects are not significant due to their limited context (the geographic, biophysical, and social context in which the effects would occur) or intensity (the severity of the impact, in whatever context it occurs).

Significant Effect: The effect to the resource would be perceptible and would be severe. The effect would likely result in an overall change in resource character. The determination of significant effect to any resource would require the completion of an Environmental Impact Statement.

Direct Effect: Direct effects are caused by the action and occur at the same time and place. Activities that occur from implementation of an alternative would directly create a change, and initial effects would be immediately evident.

Indirect Effect: Indirect effects are caused by the action but are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Activities that occur from implementation of an alternative would not immediately create this change, but would enable change to occur, or change would occur later in time, or farther in distance than the actions.

Short-Term Duration: An effect with a duration measured in hours for aquatic habitat to 3 years in terrestrial habitat.

Long-Term Duration: An effect with duration of more than a month in aquatic habitat and 3 years to 10 years in terrestrial habitat.

Permanent Duration: An effect that would persist for the foreseeable future.

This information serves as a basis for decision-making and allows stakeholders to evaluate the trade-offs and make informed choices regarding the NER Plan/preferred alternative for ecosystem restoration (Table 4-1).

Table 4-1. Summary of Direct and Indirect Effects to Resources

Resource	No Action Alternative	Alternative 5	Alternative 6	Alternative 7
Geology and Soils	Moderate adverse effects	Minor adverse effects over the short term to minor benefit over the long term	Moderate adverse over the short term to moderate benefit over the long term	Minor adverse over the short term to Minor benefit over the long term
Hydrology	Moderate adverse effects	Minor benefits over the short and long term.	Negligible adverse short-term to moderate benefits over the long-term	Negligible adverse short-term and Minor benefits over the long-term.
Floodplains	Moderate adverse effects	Minor adverse short-term and minor benefit long-term.	Minor adverse effect over the short-term and moderate benefits over the long-term.	Moderate adverse effect short-term and negligible benefits over the long term.
Wetlands	Moderate adverse effects	Negligible short-term and minor beneficial effects long-term.	Minor short-term and moderate beneficial effects long-term.	Minor adverse effects short-term and negligible beneficial effects long-term.

Resource	No Action Alternative	Alternative 5	Alternative 6	Alternative 7
Water Quality	Moderate adverse effects	Minor short-term adverse effects and Minor beneficial effects long-term	Minor adverse effects short-term and moderate beneficial effects long-term	Minor adverse effects short-term and minor long-term benefits
Aquatic Resources	Moderate adverse effects	Minor adverse short-term and negligible benefit effect over long-term.	Minor adverse effect over the short-term and moderate benefit effect over the long-term.	Minor adverse effect in the short-term, negligible benefit affects in the long-term.
Vegetation	Minor adverse effects over the short term and moderate adverse effects over the long term	Moderate adverse effect over the short term and minor benefit effect over the long term.	Moderate adverse effect over the short term and moderate benefit effect over the long term.	Minor adverse effect over the short term and minor benefit effect over the long term.
Wildlife	Negligible effects over the short term and moderate adverse effects over the long term.	Moderate adverse impacts short-term and minor beneficial effects long-term.	Moderate adverse impacts short-term and moderate beneficial effects long-term.	Moderate adverse impacts short term and minor benefits long term.
Land Use	No effect	Minor adverse impacts over the short-term and negligible adverse effect over the long-term.	Minor adverse impacts over the short-term and negligible adverse effect over the long-term.	Minor adverse impacts over the short-term and negligible adverse effect over the long-term.
Aesthetics and Visual Resources	Minor adverse effects	Minor adverse impacts short-term and moderate beneficial effects long-term.	Minor adverse impacts short-term and moderate beneficial effects long-term.	Moderate adverse impacts short-term and minor beneficial effects long-term.
Cultural and Historic Resources	No effect	Minor adverse impacts over the short-term and negligible adverse effect over the long-term.	Minor impacts over the short-term and negligible adverse effect over the long-term	Minor impacts over the short-term and negligible adverse effect over the long-term.

Resource	No Action Alternative	Alternative 5	Alternative 6	Alternative 7
Socioeconomics	Minor adverse effects.	Negligible short-term beneficial effects and minor long-term beneficial effects.	Negligible short-term beneficial effects and minor long-term beneficial effects.	Negligible short-term beneficial effects and minor long-term beneficial effects.

4.1 GEOLOGY AND SOILS

Determination of Significance

Significance impacts to geology or soil resources would be any substantial and lasting changes or damage to geological features or soil characteristics of an area. These effects may include soil erosion, sedimentation, soil compaction, soil contamination, alternation of geological features, and groundwater impacts.

None of the Alternatives would result in significant changes to the geology and soils of the affected environment. The effects ranged from minor to moderate. A description of the effects is listed below.

4.1.1 Alternative 1 – No Action

The No Action alternative would have moderate adverse impacts over the short and long term.

The No Action alternative would have moderate adverse short- and long-term effects to soils. The straightened, incised condition of the Owyhee River causes the river to overbank during high water events. This causes erosion of the shoreline of the river. This would continue until the Owyhee River has the entrenched deep enough to accommodate high water flow velocity within an active floodplain. The entrenched channel would limit the development of well-graded gravel bars and prevent stream meanders. This can reduce the potential for natural channel adjustments and bank erosion, impacting the overall geomorphic processes within the watershed.

4.1.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have a minor short-term adverse effect on the soils and geology of project area and minor long-term beneficial effects.

In the short term, construction would result in minor adverse impacts on geology and soils by the excavation of the 20-foot-wide side channels and construction of the beaver dam analogs. This effect would be minimized by excavating in lower elevation areas within the sites that likely were meanders in the past and by fully implementing Best Management Practices and Erosion and Sediment Control measures.

In the long term, Alternative 5 would have minor beneficial effects on soils and geology within the study area. The installation of instream structures and channel realignment

would allow for the dissipation of energy and the natural deposition of sediments. However, the reconnection to the floodplain would be limited. The presence of beaver dam analogs, and the side channels would create depositional areas, capturing sediments that are currently transported out of the system during high flows. Compared to the FWOP, there would be less erosion expected during high water flows associated with Alternative 5 because the water velocities would be lower as the side channel would support high water flows. The shoreline of the side channel would be at a lower height and therefore, should overbank during high flows. However, there would be no active floodplain. This effect would be a minor benefit over the long term.

4.1.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have a moderate short-term adverse effect on the soils and geology of project area and moderate long-term beneficial effects.

In the short term, construction would result in moderate direct adverse impacts on geology and soils by the excavation of the bank and placing fill within the Owyhee River to partially divert the river into the side channels. Alternative 6 would include land disturbance to lower the shoreline mounds on the left bank and partially fill the Owyhee River and partially diverting the river high flows into the side channels. The implementation of BMPs and erosion and sediment control measures would minimize adverse effects and promote the long-term restoration of the ecosystem.

Alternative 6 would affect soils immediately post-construction through the side channels being reactivated. Owyhee River flows would be diverted to the relic meanders to reactivate the channels. These flows would erode the soils to form a new channel. This would have a moderate adverse effect for the first 3 to 5 years post construction.

In the long term, Alternative 6 would have moderate beneficial effects on soils and geology within the study area. The installation of instream structures, side channel realignment, and reconnection to the floodplain would allow for the dissipation of energy and the natural deposition of sediments in a more natural pattern. The reconnection to the floodplain would be extensive. The presence of large woody debris and the side channels would create depositional areas, capturing sediments that are currently transported out of the system during high flows.

4.1.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have a minor short-term adverse effect on the soils and geology of project area and moderate long-term beneficial effects.

Alternative 7 includes excavation of 40-foot-wide side channels and therefore, has more land disturbance than Alternatives 5 or 6. This would be a moderate adverse effect over the short term. The implementation of BMPs and erosion and sediment control measures would help minimize adverse effects and promote the long-term restoration of the ecosystem.

The side channels would be designed to capture high flow velocities with no opportunity of frequent flooding of a floodplain. Therefore, the side channel shorelines would be stabilized to prevent erosion. Overall, the larger armored side channels would allow for the stable meanders, deposition of sediment, formation of point bars, and reduction of stream flow velocity to promote sediment accretion over the long term. This would be a moderate benefit to the restored habitat.

4.2 HYDROLOGY

Determination of Significance

An effect to hydrology would be considered significant if the action causes a substantial deviation from the present hydrograph, meaning there is a significant alteration in the flow regime or water patterns within a stream or water body. This deviation should be substantial enough to impair one or more important stream function. Stream functions can include processes such as water flow, sediment transport, nutrient cycling, groundwater recharge, habitat creation and flood regulation.

None of the alternatives would result in significant changes to the hydrology of the affected environment. The effects ranged from minor to moderate. A description of the effects is listed below.

4.2.1 Alternative 1 – No Action

The No Action Alternative would have moderate adverse effects over the short and long term.

Under the No Action Alternative, the Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. The downcutting process would reduce opportunities for high water events to flood adjacent areas and recharge the groundwater. Therefore, while the system-wide hydrologic variables are expected to remain similar, the No Action Alternative would have moderate adverse effects to hydrology.

4.2.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor long-term beneficial effects to hydrology.

Alternative 5 would have minor benefits over the long term on the hydrology variables of the watershed, primarily through detainment of spring freshet within Beaver Dam Analogs. These structures could extend the hydroperiod of the study area by up to one additional month, particularly in the summer months. In addition, they would improve groundwater recharge and base flow during low flow conditions. However, these effects would be localized to the study area and the alternative would not reactivate the floodplain extensively.

4.2.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have moderate long-term beneficial effects to hydrology.

Alternative 6 would have moderate long-term beneficial effects to hydrology through detainment of spring freshet, improved base flow, and groundwater recharge within the study area. This would allow for areas of the Owyhee River downstream of the study area to flow for longer durations, extending into the summer months. The soils would be saturated by flood events and seep into the groundwater table. Groundwater would be stored within the soil, allowing for seepage of the ground into the side channels and areas of the Owyhee River downstream of the restoration sites. These effects would be greater than those seen in Alternative 5 due to the more frequent activation of the floodplain and the establishment of wet meadow areas.

Alternative 6 would extend flow duration and allow for aquatic wildlife to utilize the flow of the Owyhee River for an extended period. Having higher flows during the summer months extends the duration of flow that provides benefits to wildlife, aquatic resources, wetlands, and agriculture located downstream of the restoration areas. This improves water availability for fish, macrobenthics, and other aquatic wildlife at the proposed action area and downstream, including redband trout, as well as improves mesic habitats including wet meadows that may be used by sage-grouse.

4.2.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have negligible effects to hydrology in the study area.

Alternative would have negligible effects to hydrology because this alterative does not have an active floodplain or areas that detain water to allow for groundwater recharge. Therefore, there is no anticipated groundwater recharge that would extend the hydroperiod of the Owyhee River.

4.3 FLOODPLAINS

Determination of Significance

An effect to floodplains would be considered significant if it causes an unmitigated permanent loss of floodplain area, functions, or values greater than 20 percent of the existing floodplain or promotes development in the 1 percent Annual Exceedance Probability (AEP) floodplain.

None of the Alternatives would result in significant changes to the floodplain. The effects ranged from minor to moderate. A description of the effects is listed below.

4.3.1 Alternative 1 – No Action

The No Action Alternative would have moderate adverse effects on the floodplain both short and long term.

Under the No Action Alternative, the Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. The downcutting process would reduce opportunities for high water events to escape the channel. A small floodplain would develop near the shoreline of the river at the bottom of the gully as the shoreline fails during flood events. Severe erosion along the shoreline would be expected. Overall, the trend is a continued decline in floodplain activation and function, with the potential for increased channel incision and altered flood patterns. It would take more than 50 years for a new floodplain to develop without human interaction. This effect would be moderately adverse.

4.3.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor long-term beneficial effects to the floodplain**.**

Alternative 5 would have minor adverse effects during construction as construction would occur within the floodplain. Grading and vegetation grubbing would temporarily expose soils to erosion. Construction equipment would be physically in the floodplain. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

Alternative 5 would have **minor** beneficial effects through reactivation of the floodplain. Some floodwaters that normally would have been contained in the ravine system, would overbank during extremely high-water events, and flood the areas adjacent to the side channels. However, the frequency of these events would be rare as the Owyhee River would only overbank during exceptionally high spring flows. Cattle exclusion fencing would protect the side channel and associated riparian areas from trampling and associated erosion.

4.3.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor adverse short-term and moderate long-term beneficial effects to the floodplain**.**

Alternative 6 would have minor adverse effect during construction as construction would occur within the floodplain. Grading and vegetation grubbing would temporarily expose soils to erosion. Construction equipment would be physically in the floodplain. As there would be more physical construction in Alternative 6, these effects would be greater than those in Alternative 5. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

Alternative 6 would provide moderate benefits over the long term by extensively enlarging the floodplain to include areas around the side channels. Wet meadow habitats would develop within the floodplain due to the greater frequency and duration of flooding. Cattle exclusion fencing would protect the floodplain and wet meadows from trampling.

4.3.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have minor adverse short-term and minor long-term beneficial effects to the floodplain**.**

Alternative 7 would have moderate adverse effect during construction as construction would occur within the floodplain. Adverse effects to floodplains from this alternative would be similar to those seen in Alternative 6. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

After construction, the alternative would provide negligible benefits over the long term because the floodplain connectivity would be limited. Cattle exclusion fencing would protect the side channel and associated riparian areas from trampling, which would be a minor beneficial effect.

4.4 WETLANDS

Determination of Significance

A significant effect to wetlands refers to a substantial or noticeable alteration or impairment of the ecological structure, functions, or services provided by wetland ecosystems.

None of the Alternatives would result in significant changes to the wetlands of the affected environment. The effects ranged from minor to moderate. A description of the effects is listed below.

4.4.1 Alternative 1 – No Action

The No Action Alternative would have moderate adverse effects to wetlands over the short and long term.

Under the No Action Alternative, the Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. Wetlands within the study area would continue to deteriorate over time. The wetlands would become drier environments due to irrigation demand, lack of groundwater recharge, and lack of floodplain. Ultimately, wetlands would be reduced to areas along irrigation canals and the Owyhee River. This would be a moderate adverse effect.

4.4.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have negligible short-term adverse effects and negligible long-term beneficial effects to wetlands.

Construction activities would affect marginal wetlands associated with the relic meanders. These wetlands are low functioning and do not support many species of plants or wildlife. Post-construction, functioning wetlands would form in the beaver dam analogs areas and along the side channel. However, other poor functioning wetlands in the study area may convert to uplands as runoff and rainfall is captured by the new side channel. Cattle exclusion fencing would protect the side channel and associated riparian areas from trampling. The overall effect may be a slight loss of total wetland acreage in the study area, but pair with a slight improvement of overall wetland function.

4.4.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor short-term adverse effects and moderate long-term beneficial effects to wetlands.

Alternative 6 would have minor adverse effect during construction as construction would occur within the existing riparian wetlands. Grading and vegetation grubbing would temporarily expose soils to erosion. These effects would be minor during the construction period during the following year.

Long-term beneficial effects would occur over the next 3 to 5 years, as wetlands would expand throughout the floodplain in areas where there is frequent flooding. Alternative 6 would create notches in the bank of the Owyhee River and allow for flooding of the reactivated floodplain. Areas of the floodplain would be seeded and planted to establish wetland and riparian vegetation and increase species diversity. The side channel would become reactivated and would create wetland pockets in areas where the channel is reforming. Cattle exclusion fencing would protect the river and wetlands for adverse trampling and overgrazing effects.

4.4.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have minor short-term adverse effects and minor long-term beneficial effects to wetlands.

Construction activities would have a minor short-term adverse effect to existing marginal wetlands associated with the relic meanders. These wetlands are low functioning and do not support many species of plants or wildlife. Similar to Alternative 5, new high functioning riparian wetlands would form along the side channel. However, other poor functioning wetlands in the study area may convert to uplands as runoff and rainfall is captured by the new side channel. Cattle exclusion fencing would protect the side channel and associated riparian areas from overgrazing. The overall effect may be a slight loss of total wetland acreage in the study area, but a slight improvement of overall wetland function.

4.5 WATER QUALITY

Determination of Significance

A significant effect to water quality refers to a substantial and noticeable degradation or alteration of the chemical, physical, or biological characteristics of water bodies. This can include the introduction or accumulation of pollutants, contaminants, or harmful substances that exceed acceptable levels and pose risks to human health, aquatic life, and ecosystem integrity.

None of the Alternatives would result in significant changes to the water quality of the affected environment. The effects ranged from minor to moderate. A description of the effects is listed below.

4.5.1 Alternative 1 – No Action

The No Action Alternative would have moderate adverse effects to water quality over the short and long term.

The straightened, incised condition of the Owyhee River causes the river to overbank during high water events. This causes erosion of the shoreline of the river. This would continue until the Owyhee River has the entrenched deep enough to accommodate high water flow velocity within an active floodplain. This ongoing process on downcutting and erosion would lead to increased sediment and turbidity within the river. The conclusion of such a process is an overwide and shallow channel in a deep and steep gulley. Such a channel would be prone to heating rapidly due to both its shape and the lack of riparian cover, further worsening water quality in the study area.

4.5.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor short-term adverse effects and minor long-term beneficial effects to water quality.

During the construction phase, the excavation of a side channel would result in temporary increase of turbidity. The land grading activities would be expected to have a minor short-term effect to water quality. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would help minimize the adverse effects.

Alternative 5 would have long-term minor beneficial effects to water quality. The new side channel would create small wetland pockets within the beaver dam analogs, and the new riffle-pool complex would filter the water column to remove sediment and nutrients from the water. In addition, the cattle would be excluded from the shoreline of the new side channels which would reduce streambank erosion and excessive sediment loading.

4.5.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor short-term adverse effects and moderate long-term beneficial effects to water quality.

During the construction phase, excavation of the stream banks would result in temporary increases in turbidity. Alternative 6 would have minor adverse effects because the land grading associated with removal of the banks. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would help minimize the adverse effects.

Alternative 6 would have moderate long-term beneficial effects on water quality. The presence of a functional floodplain and wetlands would improve sediment transport and allow for more natural flow patterns. This would decrease turbidity, increase dissolved oxygen, and allow for the uptake of nutrients from the Owyhee River. Livestock would be excluded from riparian and wetland areas which would prevent the cattle from entering the side channels, thereby reducing turbidity and nutrient loading. The establishment of improved riparian vegetation could contribute to lower water temperatures within the river by providing adequate shade.

4.5.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have negligible short-term adverse effects and negligible long-term beneficial effects to water quality.

During the construction phase, the excavation of a side channel would result in temporary increases of turbidity. Alternative 7 would have minor adverse effects because the extensive land grading associated with constructing a new channel for the Owyhee River. During construction, water pollution may be altered due to changes in water flow through the construction area. The source of agricultural runoff would not change, but the flow rate and direction may be altered. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would help minimize the adverse effects.

Long-term minor benefit would occur from implementing Alternative 7 by providing a more stable channel design that erodes less than the no action alternative. There is some erosion that may occur within unarmored sections of the channel. However, areas that are experiencing erosion should be minor effects and should stabilize naturally over time. Therefore, the effect would diminish over time. Cattle exclusion would reduce nutrient input and sedimentation associated with trampling of streambanks.

4.6 AQUATIC RESOURCES

Determination of Significance

An effect to aquatic resources would be considered significant if there is a substantial loss in the population or habitat of any native or valuable aquatic species, defined as an

unmitigated negative change in a population greater than 5 percent than natural variability for a period of 5 years or longer; or the movement or migration of fish is permanently impeded in a way that is unmitigated.

None of the Alternatives would result in significant changes to the aquatic resources of the affected environment. The effects ranged from negligible to moderate. A description of the effects is listed below.

4.6.1 Alternative 1 – No Action

The No Action Alternative would have minor long-term adverse effects to aquatic resources.

The Owyhee River at the project area is a deeply incised straighten channel with little riparian habitat or instream habitat diversity to support aquatic species. Under the No Action Alternative, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The downcutting process would release soft sediments, increasing turbidity in the channel. This sediment would further degrade water quality, reduce light penetration, and affect the reproduction and survival of aquatic organisms. This process would also shift the species composition of aquatic invertebrates towards a small suite of species tolerant of poor environmental conditions. Sediment and turbidity have a moderate adverse effect under the no-action alternative.

However, as described in Section 2.7, aquatic resources at the project area are already considerably diminished. Overall, the effect on aquatic resources under the no-action alternative would be only a minor adverse effect.

4.6.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor adverse effect to aquatic resources in the short term and minor benefits for aquatic resources over the long term.

Construction activities would lead to direct minor adverse effects to aquatic resources. During construction, water flow would be directed out of the construction work area to allow for construction to be conducted in a dry environment. This may cause a temporary disruption in the invertebrate community within the study area. Turbidity caused by construction of the side channel would make the Owyhee River segment within the construction area less hospitable to aquatic life, including fish and invertebrates. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

Post-construction, Alternative 5 would have minor beneficial effects. The side channel would flood during high flow events. This secondary channel would not allow water to flood adjacent lands and would not facilitate the full reconnection of aquatic organisms with the floodplain. BDAs placed in the main channel would increase habitat complexity and create a pool-riffle structure in the study area. This effect would be a minor benefit effect over the long term for macrobenthic and other aquatic organisms that need a

connection with riffle and pool complex and stream structure such as boulders and organic material such as logs. However, the benefits would only be minor as there would still be no connectivity with the floodplain and limited riparian vegetation.

4.6.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor adverse effect to aquatic resources in the short term and moderate benefits for aquatic resources over the long term.

Construction activities would lead to direct minor adverse effects to aquatic resources. During construction, water flow would be directed out of much of the construction work area to allow for construction to be conducted in a dry environment. This may cause a temporary disruption in the invertebrate community within the study area. Turbidity caused by construction of the notches, grading, and side channel would make the Owyhee River segment within the construction area less hospitable to aquatic life, including fish and invertebrates. Adverse direct effects from construction would be greater than those seen in Alternative 5 due to the greater amount of construction activity: however, river conditions at the study area would quickly rebound to pre-construction levels. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

Post-construction, the removal of the shoreline banks along the Owyhee River would allow for frequent flooding of the floodplain, thereby allowing for aquatic organisms to temporarily colonize wet meadows and the side channel during high flow events. This would provide foraging habitat for fish and macroinvertebrates that are currently not connected to a floodplain. BDAs placed in the main channel would increase habitat complexity and create a pool-riffle structure in the study area. The floodplain near the side channel would remain cooler during the summer because of the riparian plantings.

This effect would be a moderate long-term benefit effect for fish, invertebrates, and other aquatic resources.

4.6.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have minor adverse effect to aquatic resources in the short term and moderate benefits for aquatic resources over the long term.

Construction activities would lead to direct minor adverse effects to aquatic resources. During construction, water flow would be directed out of much of the construction work area to allow for construction to be conducted in a dry environment. This may cause a temporary disruption in the invertebrate community within the study area. Turbidity caused by construction of the new channel for the Owyhee River would make the river segment within the construction area less hospitable to aquatic life, including fish and invertebrates.

Adverse direct effects from construction would be similar to those seen in Alternative 5. While there would be more construction activity, most of the work would be done

outside the main channel and would only affect the main channel during a brief period after the new channel and old are connected. There would be a notable pulse of turbidity when the channels are connected, but river conditions at the study area would quickly rebound to pre-construction levels. Conducting the construction activities during the dry season and fully implementing Best Management Practices and Erosion and Sediment Control measures would minimize adverse effects.

Post-construction, the new channel would contain all flows of the Owyhee River. The new channel would have a more complex structure and greater habitat diversity. Aquatic organisms would quickly colonize the new channel, utilizing riffle and pool habitats, decaying wood, and boulders. However, without the riparian vegetation, the water temperatures may be too warm for cold water fish. There would be long-term moderate beneficial effects to aquatic resources from Alternative 7.

4.7 VEGETATION

Determination of Significance

Significant impacts to vegetation refer to substantial and noticeable adverse effects on plant communities, including the composition, structure, and functioning of vegetation within the study area. Significant impacts could include clearing or removal of vegetation such as deforestation or land clearing, introduction and spread of invasive plant species, fragmentation of habitats through human activities, pollution from various sources such as air pollution, chemical spills and agricultural runoff, overgrazing by livestock, and poor land management practices.

None of the Alternatives would result in significant changes to the vegetation of the affected environment. The effects ranged from minor to moderate.

4.7.1 Alternative 1 – No Action

The No Action Alternative would have minor long-term adverse effects to vegetation.

The Owyhee River at the project area is a deeply incised straighten channel with little riparian habitat or riparian vegetation. Under the No Action Alternative, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The downcutting process would further erode the channel banks, destabilizing what little riparian vegetation is present at the study area. As the floodplain become increasingly disconnected from the river, low quality wetlands and remnant oxbows would become progressively less inundated and trend toward lower quality or conversion to upland habitat. However, as described in Section 2.8, vegetation at the study area is already considerably diminished. There would be minor long-term adverse effects to vegetation from the No Action Alternative.

4.7.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have moderate adverse effect to vegetation in the short term and minor benefits for vegetation over the long term.

Construction activities would lead to direct short-term moderate adverse effects to vegetation. Vegetation in the construction area would be grubbed away or trampled by equipment during construction. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River, side channel, and floodplain. Best Management Practices would ensure that only the necessary amount of vegetation is removed. Areas that are disturbed would be revegetated with a native wetland seed mix and riparian plantings. It may take as many as three growing seasons for new vegetation to fully establish.

Alternative 5 would have long-term minor beneficial effects to vegetation in the study area.

Reactivating the side channel would create sinuosity, backwaters, and lateral pools. This would create substantial additional riparian area. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. These changes would be moderate benefits to riparian vegetation in the study area.

While excavation of the new side channel through the existing oxbow and poor-quality habitat would enhance vegetation conditions in the immediate vicinity of the new channel, it would also accelerate the conversion of these habitats to upland areas. This would create a change in vegetation types within the study area but would not necessarily be beneficial or adverse.

Grazing would be reduced by implementing the action alternative, as the side channel would be fenced to discourage grazing and keep the shoreline of the side channel stable. Grazing is a direct adverse effect to vegetation as it is consumed and trampled by grazing cattle. Grazing also limits diversity as preferential species are rapidly consumed by the cattle. The overall effect on vegetation due additional channel length and protection from grazing is a minor beneficial effect**.**

4.7.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have moderate adverse effect to vegetation in the short term and moderate benefits for vegetation over the long term.

Construction activities would lead to direct short-term moderate adverse effects to vegetation. Vegetation in the construction area would be grubbed away or trampled by equipment during construction. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River and riverbank. Best Management Practices would ensure that only the necessary amount of vegetation is removed. Areas that are disturbed would be revegetated with a native wetland seed mix and riparian plantings. The alternative would also plant the floodplain with a variety of

forbs, riparian shrubs, and trees to establishment of wet meadows. It may take as many as three growing seasons for new vegetation to fully establish.

The long-term effects of the Alternative 6 would be moderately beneficial to vegetation. Reactivating the side channel and floodplains would create sinuosity, backwaters, and lateral pools. This would create substantial additional riparian area. The bank notches and diversion structures would promote frequent flooding and encourage the development of wet meadows. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. Combined with planting and exclusion fencing, vegetation would flourish.

4.7.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have moderate adverse effect to vegetation in the short term and minor benefits for vegetation over the long term.

Construction activities would lead to direct short-term moderate adverse effects to vegetation. Vegetation in the construction area would be grubbed away or trampled by equipment during construction. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River, new channel, and floodplain. Best Management Practices would ensure that only the necessary amount of vegetation is removed. Areas that are disturbed would be revegetated with a native wetland seed mix and riparian plantings. It may take as many as three growing seasons for new vegetation to fully establish.

Alternative 7 would have long-term minor beneficial effects to vegetation in the study area.

Post-construction, the new channel would contain all flows of the Owyhee River. The new channel would have more sinuosity, backwaters, and lateral pools. This would create substantial additional riparian area. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. These changes would be moderate benefits to riparian vegetation in the study area.

Grazing would be reduced by implementing the action alternative, as the new channel would be fenced to discourage grazing and keep the shoreline of the new channel stable. Grazing is a direct adverse effect to vegetation as it is consumed and trampled by grazing cattle. Grazing also limits diversity as preferential species are rapidly consumed by the cattle. The overall effect on vegetation due additional channel length and protection from grazing is a minor beneficial effect.

4.8 WILDLIFE

Determination of Significance

A significant effect to wildlife refers to substantial and noticeable adverse effects on the biological components of ecosystems, including animal populations, species diversity, and ecological interactions. Some examples of significant impacts to wildlife include destruction or degradation of habitats used by wildlife, introduction and spread of non-native invasive species, or disruptions to key ecological interactions.

None of the Alternatives would result in significant changes to the wildlife of the affected environment. The effects ranged from negligible to moderate. A description of the effects is listed below.

4.8.1 Alternative 1 – No Action

The No Action Alternative would have minor long-term adverse effects to wildlife.

The Owyhee River at the project area is a deeply incised straighten channel with little riparian habitat or riparian vegetation. Under the No Action Alternative, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The entrenched shoreline of the Owyhee River makes it difficult for wildlife to access the river, and riparian habitat is disconnected from the river, requiring species to travel longer distances to reach adjacent habitat types. These problems are expected to worsen as conditions at the river continue to deteriorate. However, as described in Section 2.9, wildlife at the study area is already considerably diminished. There would be minor long-term adverse effects to wildlife from the No Action Alternative.

4.8.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have moderate adverse effect to wildlife in the short term and minor benefits for wildlife over the long term.

During construction wildlife habitat would be disrupted and animals would be driven from the study area. All but the most disruption tolerant species are likely to leave the construction area until the activities cease. Vegetation and local habitats utilized by wildlife would be disturbed by construction activities. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River, side channel, and floodplain. Best Management Practices would ensure that only the necessary amount of vegetation is removed. Areas that are disturbed would be revegetated with a native wetland seed mix and riparian plantings. It may take as many as three growing seasons for new vegetation to fully establish. Wildlife would return to the restored areas under a similar timeline. Alternative 5 would have moderate adverse short-term effects to wildlife.

Alternative 5 would have long-term minor beneficial effects to wildlife in the study area.

Reactivating the side channel would create substantial additional riparian area. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. These changes would improve wildlife habitat in the study area and reduce fragmentation. By detaining water longer on the sites, more water will be available to wildlife populations, a key habitat feature in arid environments. It may increase amphibian populations and bird populations that are dependent on insects. Wildlife populations at the study area would likely be more diverse than upstream and downstream habitats.

4.8.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have moderate adverse effect to wildlife in the short term and moderate benefits for wildlife over the long term.

During construction wildlife habitat would be disrupted and animals would be driven from the study area. All but the most disruption tolerant species are likely to leave the construction area until the activities cease. Vegetation and local habitats utilized by wildlife would be disturbed by construction activities. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River and riverbank. Best Management Practices would ensure that only the necessary amount of vegetation is removed. Areas that are disturbed would be revegetated with a native wetland seed mix and riparian plantings. It may take as many as three growing seasons for new vegetation to fully establish. Wildlife would return to the restored areas under a similar timeline. Alternative 6 would have moderate adverse short-term effects to wildlife.

Alternative 6 would have long-term moderate beneficial effects to wildlife in the study area.

Reactivating the side channel and floodplains would create sinuosity, backwaters, and lateral pools. This would create substantial additional riparian area. The bank notches and diversion structures would promote frequent flooding and encourage the development of wet meadows. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. The reactivation of the floodplain would enable the connection of floodplain with the Owyhee River and expansion of wetland habitats. Wet habitats are crucial for various wildlife species, including sage-grouse providing foraging, nesting, and roosting habitats. The overall effect on wildlife from new habitat creation and reducing habitat fragmentation would be a moderate benefit effect over the long term.

4.8.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have moderate adverse effect to wildlife in the short term and minor benefits to wildlife over the long term.

Construction activities would lead to direct short-term moderate adverse effects to wildlife. The alternative would require the removal of vegetation for construction equipment to access the Owyhee River, new channel, and floodplain. Areas that are disturbed would be planted, but it may take as many as three growing seasons for new vegetation to fully establish and provide habitat for wildlife.

Alternative 7 would have long-term minor beneficial effects to wildlife in the study area.

Post-construction, the new channel would contain all flows of the Owyhee River. The new channel would have more sinuosity, backwaters, and lateral pools. This would create substantial additional riparian habitat. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. These changes would be moderate benefits to riparian vegetation in the study area, which would support healthy terrestrial invertebrate populations. Terrestrial invertebrates would in turn, provide forage for amphibians and birds in the study area.

4.9 LAND USE

Determination of Significance

Significant impacts to land use refer to the notable and often consequential changes in how land is used or developed within a particular area. These impacts can result from various factors, including human activities, natural events, or government policies.

None of the Alternatives would result in significant impacts to the land use of the affected environment. The impacts ranged from negligible to minor. A description of the impacts is listed below.

4.9.1 Alternative 1 – No Action

The No Action Alternative would have no effects to land use.

The No Action Alternative would have no direct or indirect effects to land use in the short term or long term. Specifically, it is expected that the existing conditions would remain constant. There are no anticipated changes to the development or usage of the potential restoration sites.

4.9.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor impacts to land use over the short term and negligible impacts over the long term.

Construction activities would have a minor impact on land use for the short term. Areas along the side channel and BDAs would need to be excluded from grazing activities until the riparian and emergent vegetation establishes. These impacts would be temporary in nature and would be in effect for approximately 5 to 10 years of the restoration effort, post construction. After 10 years, these areas could return to grazing so long as the effect from grazing remains minimal to the vegetation composition. Long term effects to grazing would be negligible.

4.9.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor impacts to land use over the short term and negligible effects over the long term.

Construction of Alternative 6 would have a minor effect on land use during construction. Areas around the restoration plantings would be fenced off from grazing. These impacts would be temporary in nature and would be in effect for approximately 5 to 10 years of the restoration effort, post construction. After 10 years, these areas could return to grazing so long as the effect from grazing remains minimal to the vegetation composition. All other aspects of land use would have negligible impacts over the long term.

4.9.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have minor impacts to land use over the short term and negligible impacts over the long term.

Construction activities would lead to direct short-term minor adverse effects to land use. The alternative would have a larger channel in the floodplain but would have few plantings associated with it. The channel and the plantings would be fenced to protect the plantings and stream channel from cattle. These impacts would be temporary in nature and would be in effect for approximately 5 to 10 years of the restoration effort, post construction. After 10 years, these areas could return to grazing so long as the effect from grazing remains minimal to the vegetation composition. All other aspects of land use would have negligible effects over the long term.

4.10 AESTHETICS AND VISUAL RESOURCES

Determination of Significance

Significant impacts to aesthetics refer to changes that substantially alter the visual character or quality of an environment in a way that affects public perception and enjoyment. This would be identified by evaluating the extent and intensity of the visual impact, considering the sensitivity of the affected visual resources, and gathering public

and stakeholder input on the aesthetic values of the site. Such impacts are determined to be significant if they notably diminish the visual quality or public enjoyment of a scenic resource.

None of the Alternatives would result in significant impacts to the aesthetics of the study area. The impacts ranged from negligible to minor. A description of the impacts is listed below.

4.10.1 Alternative 1 – No Action

The No Action Alternative would have minor adverse long-term effects to aesthetics.

The Owyhee River is a deeply incised straightened channel with little riparian vegetation in the project area. Under the No Action Alternative, the river would continue to downcut and channelize, becoming more isolated from its diminished riparian zone. The downcutting process would further erode the channel banks, destabilizing what little riparian vegetation is present at the study area. Most lands would be used for range or farmland, cattle would still be able to access the proposed action area. Aesthetics in the study area would be further diminished without intervention.

4.10.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have minor adverse effects to aesthetics over the short term and moderate beneficial effects over the long term.

Alternative 5 would have minor short-term adverse effects to the aesthetics of the project area. The use of heavy machinery such as bulldozers, excavators, and trucks will introduce a visual and auditory disturbance to the natural environment of the Owyhee River. The presence of construction equipment and ongoing excavation will disrupt the landscape's visual harmony, creating a scene of industrial activity that contrasts sharply with the natural setting.

The initial excavation and construction activities will lead to disturbed soil, removal of some existing vegetation, and potentially muddied waters, further detracting from the visual appeal. The physical presence of workers and machinery, along with the noise generated, will temporarily alter the experience of the area for any visitors and wildlife, making it less attractive and tranquil during the construction period.

In the long term, Alternative 5 would have moderate beneficial effects to the aesthetics of the project area. The creation other side channel, along with the construction of BDAs, will restore a more natural and meandering river course. This increased sinuosity and the development of backwaters and lateral pools will enhance the visual complexity and attractiveness of the landscape, providing a more dynamic and visually interesting environment compared to the current straightened and incised channel.

The introduction of boulders and logs to provide fish habitat will add naturalistic elements to the Owhyee River, further improving the scenic quality. These structures will mimic natural river features, enhancing the ecological authenticity of the landscape.

The reactivation of the floodplain and the creation of wet meadows will introduce lush, green areas that contrast beautifully with the surrounding arid sage-steppe environment. These wet meadows will support a diverse array of plant species, including native grasses and forbs, which will contribute to a vibrant and visually pleasing landscape.

4.10.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have minor adverse effects to aesthetics over the short term and moderate beneficial effects over the long term.

Alternative 6 would have minor short-term adverse effects to the aesthetics of the project area. The use of construction equipment such as bulldozers and excavators to remove berms and redirect the river flow will introduce visual and auditory disturbances. This phase will be characterized by the sight of heavy machinery, disturbed soil, and possibly muddied waters, detracting from the natural beauty of the landscape.

The initial construction activities, including the strategic placement of fill material and the excavation of berms, will create an industrial appearance that contrasts sharply with the natural setting. The presence of construction crews and machinery will further contribute to the temporary alteration of the scenic quality of the area.

In the long term, Alternative 6 would have moderate beneficial effects to the aesthetics of the project area. By removing berms and allowing the Owyhee River to flood its historic floodplain, the landscape will regain a more natural and dynamic appearance. The reactivation of historic meanders and side channels will restore the natural sinuosity of the river, creating visually appealing backwaters and lateral pools.

Raising the channel bottom and increasing the water surface elevation to facilitate overbank flooding will promote the growth of native vegetation, significantly improving the visual quality of the floodplain. The creation of wet meadows will introduce lush, green areas that contrast beautifully with the surrounding arid landscape. These wet meadows will support diverse plant species, contributing to a vibrant and visually appealing environment.

4.10.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have moderate adverse effects to aesthetics over the short term and minor beneficial effects over the long term.

Alternative 7 would have moderate short-term adverse effects to the aesthetics of the project area. The use of heavy machinery such as bulldozers and excavators to excavate the side channel and construct diversion structures will introduce significant visual and auditory disturbances. The presence of construction equipment, piles of excavated soil, and ongoing earth-moving activities will create an industrial appearance that contrasts with the natural landscape.

During the construction phase, the landscape will appear disrupted and less visually appealing due to the exposed soil, machinery tracks, and construction materials. The

temporary visual impact includes the removal of vegetation, which will expose bare ground and potentially muddy waters, detracting from the area's scenic qualities.

In the long term, Alternative 5 would have minor beneficial effects to the aesthetics of the project area. The creation of a new side channel within the historic floodplain will reintroduce some natural sinuosity and variation to the landscape, providing visual interest and breaking the monotony of the previously straightened Owyhee River channel.

The placement of boulders and logs within the new side channel will enhance the naturalistic appearance of the waterway, adding structural diversity that mimics natural river features. These elements will contribute to a more aesthetically pleasing environment by creating habitats that attract wildlife and adding visual complexity to the landscape.

Armoring the side channels with riprap and boulders along the outside bends of the meanders will provide channel stability, ensuring that the new features remain visually appealing over time. However, the use of riprap can sometimes detract from the natural look of the landscape if not carefully integrated. The limited flooding of the new channel, except during extreme high flow events, means that the area would not develop wet meadow habitats. This would result in a less vibrant appearance compared to the other action alternatives that promote more extensive floodplain reconnection and wetland creation.

4.11 CULTURAL AND HISTORIC RESOURCES

Determination of Significance

A significant impact to cultural and historic resources refers to unmitigated adverse impacts on the integrity, significance, or values associated with such resources. Cultural and historic resources can include archaeological sites, historic structures, traditional cultural properties, sacred sites, cultural landscapes, artifacts, and other tangible or intangible aspects of human history and heritage.

None of the Alternatives would result in significant impacts to cultural resources of the affected environment. The effects ranged from negligible to moderate.

4.11.1 Alternative 1 – No Action

The No Action alternative would have no direct or indirect effects to cultural resources.

4.11.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have a negligible adverse effect to cultural resources in the short term and minor beneficial effects to cultural resources over the long term.

During construction, there would be a negligible adverse effect to cultural resources. The effects would be only for the short term. The presence of construction equipment

would alter the character of landscape during the construction phase. These effects would be minimal and limited to the duration of the construction period.

Although no specific, discreet historic properties have been identified within the footprint of the action alternatives, there could be direct, negligible adverse impacts anticipated to occur regarding as-yet unrecorded cultural resources within the study area that may be impacted from construction. The probability of the restoration sites being cultural resources sites is low based on the USACE's due diligence search. However, measures to avoid, minimize, and mitigate any significant impacts that may arise are to be implemented to reduce the chance of a significant impact.

The restoration of aquatic habitat and its minor benefits to culturally significant fish, such as redband trout and salmon species, are generally considered to be beneficial effects for the preservation of traditional lifeways. These lifeways are an integral part of maintaining the overall landscape-scale cultural significance that is ubiquitous throughout the study area. These effects would be mostly localized to the study area and would be a minor beneficial effect.

4.11.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have a negligible adverse effect to cultural resources in the short term and minor beneficial effects to cultural resources over the long term.

During construction, there would be a negligible adverse effect to cultural resources. The presence of construction equipment would alter the character of landscape during the construction phase. These effects would be minimal and limited to the duration of the construction period. Reactivating the floodplain would cause periodic flooding throughout the study area, which may result in less access to the study area for traditional and recreation uses. This effect would be minimal and limited only to occasional high-water periods.

As with Alternative 5, there is a slight risk of the discovery of historic properties at the study area. However, measures to avoid, minimize, and mitigate any significant impacts that may arise are to be implemented to reduce the chance of a significant impact.

Alternative 6 would maximize habitat restoration for both interior redband trout and sage-grouse and would have the most beneficial effects for the preservation of traditional lifeways. These effects would be mostly localized to the study area and would be a minor beneficial effect.

4.11.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have a negligible adverse effect to cultural resources in the short term and minor beneficial effects to cultural resources over the long term.

During construction, there would be a negligible adverse effect to cultural resources. The presence of construction equipment would alter the character of landscape during the construction phase. These effects would be minimal and limited to the duration of

the construction period. Alternative 7 would have the greatest amount of construction and the greatest effect to cultural resources, but like the other alternatives, the effect would be limited to the duration of construction and, ultimately, negligible.

As with Alternative 5, there is a slight risk of the discovery of historic properties at the study area. However, measures to avoid, minimize, and mitigate any significant impacts that may arise are to be implemented to reduce the chance of a significant impact.

4.12 SOCIOECONOMICS

Determination of Significance

Significant impacts to socioeconomics refer to substantial and noticeable adverse effects on the social, economic, and environmental conditions, particularly for disadvantaged and marginalized communities.

None of the Alternatives would result in significant changes to the socioeconomics of the affected environment. The effects ranged from negligible to moderate.

4.12.1 Alternative 1 – No Action

The No Action Alternative would have minor adverse effects to Socioeconomics.

Under the No Action Alternative, the Owyhee River would continue to downcut and channelize, becoming more isolated from its diminished riparian zone and floodplain. The downcutting process would reduce opportunities for high water events to flood adjacent areas and recharge the groundwater. Ultimately the river would be disconnected from the surrounding landscape and diminish wildlife diversity, aquatic resources including fish, and first food plants.

4.12.2 Alternative 5 – Side Channel Reconnection

Alternative 5 would have negligible short-term beneficial effects and minor long-term beneficial effects to socioeconomics.

Alternative 5 would have negligible effect to socioeconomics of the Duck Valley Indian Reservation. Construction may lead to a short-term increase in employment or demand for local services. This effect would last only for the duration of construction. Reactivating the side channel would create substantial additional riparian area. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. This in turn would support aquatic and wildlife resources in the study area, providing a minor beneficial effect. These lifeways are an integral part of maintaining the overall landscape-scale cultural significance that is ubiquitous throughout the study area.

4.12.3 Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have negligible short-term beneficial effects and minor long-term beneficial effects to socioeconomics.

Alternative 5 would have negligible effect to socioeconomics of the Duck Valley Indian Reservation. Construction may lead to a short-term increase in employment or demand for local services. This effect would last only for the duration of construction. This would likely be a larger effect than seen in Alternative 5 but would still be negligible overall. The establishment of healthy riparian areas and wet meadows in the study area would support fish, wildlife, and first foods and would be a minor beneficial effect.

4.12.4 Alternative 7 – Main Channel Diversion

Alternative 7 would have negligible short-term beneficial effects and minor long-term beneficial effects to socioeconomics.

Alternative 7 would have negligible effect to socioeconomics of the Duck Valley Indian Reservation. Construction may lead to a short-term increase in employment or demand for local services. This effect would last only for the duration of construction. Reactivating the side channel would create substantial additional riparian area. Boulders, logs, and beaver dam analogs would be placed along the stream channel to detain water on the sites for extended periods of time to allow for water retention and groundwater recharge. This in turn would support aquatic and wildlife resources in the study area, providing a minor beneficial effect.

4.13 CUMULATIVE EFFECTS ANALYSIS

CEQ Regulations implementing NEPA require Federal agencies to consider the cumulative impacts of their actions. Cumulative effects are defined as “the impact on the environment” which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time” (40 CFR § 1508.7).

USACE conducted a cumulative effects analysis to evaluate the potential effect of each alternative on certain resources in the local and regional area. Cumulative effects were determined for each effect that was greater than minor. While the proposed action is expected to have a positive long-term effect overall, there may be some short-term negative effects during implementation. The analysis considers several aspects, including the cumulative effect boundary (spatial and temporal) of the resources, their historical condition and impacts, their current condition and impacts, foreseeable future actions that could affect them, and the effects of the various alternatives when combined with past, present, and future actions.

4.13.1 Scope of Cumulative Effects Analysis

Guidance for setting appropriate boundaries for a cumulative effect analysis is available from the CEQ and the Environmental Protection Agency (EPA). Generally, the scope of a cumulative effects analysis should be broader than the scope of analysis used in assessing different or indirect effects. The analysis should delineate appropriate geographic areas, including natural effects. Discussed below are the past, present, and reasonably foreseeable future actions considered for the cumulative effects analysis, The effects of the actions on the resources assessed, and a summary of the cumulative effects of the Action Alternatives. The geographic boundary for the cumulative effects analysis was the Owyhee River watershed from Wild Horse Dam to the northern border of the Duck Valley Indian Reservation. The temporal boundary was from 1974 to 2074, or 50 years in each direction.

Past, Present, and Reasonably Foreseeable Actions

Due to the remoteness of the proposed action area and consistency in land use and demographics over the past 50 years, no substantial new development was assumed for the purpose of the cumulative effects analysis. Actions considered in this evaluation include the current agricultural practices on the Duck Valley Indian Reservation and the current Fish and Wildlife programs maintained by the Shoshone-Paiute Tribe. Other actions considered in the analysis of cumulative effects of the action alternatives include the following:

Lake Billy Shaw – Lake Billy Shaw was impounded in 1998 and is filled annually from Owyhee Rivers flows diverted directly upstream of the action area at the China Diversion Dam.

Duck Valley Indian Reservation Habitat Enhancement – This ongoing BPA-funded program was established in 1997 in response to concerns about the impacts of land use practices on fish and wildlife habitat. This project focuses on improving backcountry roadways, fencing and trough placement, restoring and protecting the Owyhee River, its tributaries, and wetland areas, and overall protection of native fish and wildlife habitat on the Duck Valley Indian Reservation.

Rio Tinto Mine Site Remediation - The Rio Tinto Mine Site, a 280-acre abandoned copper mine in northern Elko County, Nevada, is a Superfund Alternative Approach site due to heavy metal pollution impacting Mill Creek, an upstream tributary of the Owyhee River. Remediation included excavating over 800,000 cubic yards of tailings and reconstructing Mill Creek to aid fish movement, with construction completed in November 2016.

4.13.2 Geology and Soils

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional cumulative effects to soils or geology. While annual filling of Lake Billy Shaw does alter the hydrologic regime to reduce peak flows

and related erosive forces, this would not be an additive effect to the construction related alterations to soils at the proposed project area. Additionally, any construction would take place during lower flow periods, after Lake Billy Shaw was filled.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional cumulative effects to soils or geology. While annual filling of Lake Billy Shaw does alter the hydrologic regime to reduce peak flows and related erosive forces, this would not be an additive effect to the construction related alterations to soils at the proposed project area. Additionally, any construction would take place during lower flow periods, after Lake Billy Shaw was filled.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional cumulative effects to soils or geology. While annual filling of Lake Billy Shaw does alter the hydrologic regime to reduce peak flows and related erosive forces, this would not be an additive effect to the construction related alterations to soils at the proposed project area. Additionally, any construction would take place during lower flow periods, after Lake Billy Shaw was filled.

4.13.3 Hydrology

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to hydrology. Alternative 5 would lessen present adverse effects to hydrology from other actions which divert Owyhee River flows by detaining a small portion of the remaining Owyhee River flow onsite.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to hydrology. The hydrologic variables of the watershed are expected to remain relatively stable and like the no action alternative. Alternative 6 would lessen present adverse effects to hydrology from other actions which divert Owyhee River flows by detaining a small portion of the remaining Owyhee River flow onsite.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to hydrology. The new channel would provide a conveyance of flow through the sites, but no added infiltration of water to provide groundwater recharge.

4.13.4 Floodplains

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to floodplains. The new channel would provide a conveyance of flow through the sites, but no added infiltration of water to provide groundwater recharge.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to floodplains. There are no additional actions adversely effecting floodplain devilment at the proposed action area and no nexus for interaction.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to floodplains. There are no additional actions adversely effecting floodplain devilment at the proposed action area and no nexus for interaction.

4.13.5 Wetlands

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to wetlands.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to wetlands. Construction effects would be temporally separate from peak diversion times and during the most normal annual hydrograph period. No other ongoing action would interact with the minor short term adverse effects from the proposed construction. In the long term, there may be minor beneficial synergistic effects with ongoing restoration effects, but no additive adverse effects.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to wetlands.

4.13.6 Water Quality

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to water quality. Water diversions upstream of the proposed action sire reduce water quantity and potentially contribute to impaired water temperature, but these effects occur most in the spring high flow period, outside of the proposed construction window. Effects from these diversions would not interact with short term adverse effects to water quality from construction associated with this alternative.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to water quality. Water diversions upstream of the proposed action sire reduce water quantity and potentially contribute to impaired water temperature, but these effects occur most in the spring high flow period, outside of the proposed construction window. Effects from these diversions would not interact with short term adverse effects to water quality from construction associated with this alternative.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to water quality. Water diversions upstream of the proposed action sire reduce water quantity and potentially contribute to impaired water temperature, but these effects occur most in the spring high flow period, outside of the proposed construction window. Effects from these diversions would not interact with short term adverse effects to water quality from construction associated with this alternative.

4.13.7 Aquatic Resources

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to aquatic resources.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to aquatic resources

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to aquatic resources.

4.13.8 Vegetation

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to vegetation. There may be minor beneficial effects from interaction with other restoration actions on the Duck Valley Indian Reservation.

Alternative 6 – Floodplain and Side Channel Reconnection
Alternative 6 would have no additional adverse cumulative effects to vegetation. There may be minor beneficial effects from interaction with other restoration actions on the Duck Valley Indian Reservation.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to vegetation. There may be minor beneficial effects from interaction with other restoration actions on the Duck Valley Indian Reservation.

4.13.9 Wildlife

Alternative 5 – Side Channel Reconnection

Alternative 5 would have no additional adverse cumulative effects to wildlife.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to wildlife. There would be no nexus between prior or ongoing actions and the minor adverse effects associated with construction under this alternative. Alternative 6 would create the most new wildlife habitat and have the greatest potential for beneficial interactions with other restorations efforts on the Duck Valley Indian Reservation.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to wildlife.

4.13.10 Land Use

Alternative 5 – Side Channel Reconnection

Alternative 5 would have no additional adverse cumulative effects to land use.

Alternative 6 – Floodplain and Side Channel Reconnection
Cumulative Effects

Alternative 6 would have no additional adverse cumulative effects to land use.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to land use.

4.13.11 Aesthetics and Visual Resources

Alternative 5 – Side Channel Reconnection

Alternative 5 would have no additional adverse cumulative effects to Aesthetics, as the alternative would be beneficial to aesthetics in the study area. Furthermore, the alternative would be small in nature and localized in its aesthetic effects and would not interact with any other past, present, or reasonably foreseeable actions.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effects to Aesthetics, as the alternative would be beneficial to aesthetics in the study area. Furthermore, the alternative would be small in nature and localized in its aesthetic effects and would not interact with any other past, present, or reasonably foreseeable actions.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to Aesthetics, as the alternative would be beneficial to aesthetics in the study area. Furthermore, the alternative would be small in nature and localized in its aesthetic effects and would not interact with any other past, present, or reasonably foreseeable actions.

4.13.12 Cultural and Historic Resources

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effects to cultural or historic resources.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 5 would have no additional adverse cumulative effects to cultural or historic resources.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effects to cultural or historic resources.

4.13.13 Socioeconomics.

*Alternative 5 – Side Channel Reconnectio*n

Alternative 5 would have no additional adverse cumulative effect to socioeconomics. Neither the alternative nor the past and ongoing actions have adverse effects to these resources, either individually or cumulatively.

Alternative 6 – Floodplain and Side Channel Reconnection

Alternative 6 would have no additional adverse cumulative effect to socioeconomics. Neither the alternative nor the past and ongoing actions have adverse effects to these resources, either individually or cumulatively.

Alternative 7 – Main Channel Diversion

Alternative 7 would have no additional adverse cumulative effect to socioeconomics. Neither the alternative nor the past and ongoing actions have adverse effects to these resources, either individually or cumulatively.

4.13.14 Summary of Cumulative Effects

There are no known adverse cumulative impacts from implementation of the action alternatives. Restoration of aquatic and riparian habitat in the Owyhee River would not have any long-term negative effects. Stream restoration projects typically result in minor

short-term construction related impacts to soils, water quality, and fish and wildlife and the habitats upon which they depend; however, these effects are brief in nature and result in substantial long-term beneficial effects. The action alternatives would not result in significant adverse effects, either individually or cumulatively.

SECTION 5 - PLAN COMPARISON AND SELECTION

5.1 EVALUATION AND COMPARISON OF FINAL ARRAY OF ALTERNATIVES

5.1.1 National Economic Development

The National Economic Development (NED) account displays changes in the economic value of the national output of goods and services.

This project does not have significant beneficial or adverse NED effects. The quantified NED effects are total project cost and project operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The No Action Alternative would result in no project expenditure associated and would have no positive or negative effect on national output of goods and services.

Rough parametric costs were estimated for the final array and are listed in Table 5-1. Additional effects to NED resources, such as flood risk reduction or recreation, generated by the alternatives in the final array are not expected to have a significant impact. Table 5-1 provides the comparison between all alternatives.

5.1.2 Environmental Quality

The EQ account is intended to indicate the long-term effects that the alternative plans may have on significant environmental resources (refer to Section 4). Significant environmental resources are defined by the Water Resources Council as those components of the ecological, cultural, and aesthetic environments which, if affected by the alternative plans, could have a material bearing on the decision-making process. Significance is derived from institutional, public, or technical recognition that a resource or an effect is significant (refer to Section 1.8). All alternatives were formulated to maximize benefits to the local significant resources. All alternatives include measures that fulfill stated objectives; however, the scale of that restoration differs among the alternatives.

The National Ecosystem Restoration (NER) account displays increases in ecosystem restoration benefits compared to costs, consistent with the Federal objective. The intent of comparing alternative plans in terms of NER is to evaluate the overall benefits that the plans may provide to an ecosystem. Beneficial effects are increases in the ecological value of the output of goods and services attributable to a plan. In this case, NER benefits are the creation or expansion of habitat compared to existing and future without project. These benefits were then compared to cost and used to identify the best buy plans, as mentioned in Section 3.4.

Alternative 6 is the least expensive cost plan with highest number of AAHUs. This alternative is the most balanced of excavation to hauling, which reduces costs. All measures are incorporated, all objectives are met, and this plan has the highest habitat benefit. (Refer to Table 5-1 for the comparison between all alternatives.)

5.1.3 Regional Economic Development

The Regional Economic Development (RED) account measures changes in the distribution of regional economic activity that would result from each alternative plan. Evaluations of regional effects are measured using nationally consistent projections of income, employment, output, and population. The Regional Economic System (RECONS) is a tool designed to provide estimates of regional, state, and national contributions of Federal spending associated with Civil Works and American Recovery and Reinvestment Act projects. The model implements regional economic development multipliers to estimate the additional economic output, jobs, earnings, and value added to the region from alternative plans based on project implementation costs. As a result, larger, more expensive plans result in higher regional economic benefits. The study uses the RECONS model to evaluate the regional effect of the NER Plan and present the findings. The generated benefits to the regional economy are mainly through construction activities. These activities can affect the levels of income, economic output, and employment throughout the region.

Alternative 6, with the least total project first cost from the no action alternative, is analyzed below from initial cost estimates within section 3.4.2 Cost Effectiveness and Incremental Cost Analysis. As alternatives increase in restoration efforts, these benefits have an equivalent increase due to additional construction elements. (Refer to Table 5-1 for the comparison between all alternatives.)

The expenditures associated with All Work Activities, with Ability to Customize Impact Area and Work Activity at Owyhee River Restoration for alternative 6 are estimated to be $3.86 million. Of this total expenditure, $3.72 million will be captured within the local impact area of the Duck Valley Indian Reservation within the state of Nevada (Figure 5-1). The remainder of the expenditures will be captured within the state impact area and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditure of $3.87 million supports a total of an estimated 55 full-time equivalent jobs per year, $3.79 million in labor income, $3.43 million in the gross regional product, and $5.89 million in economic output in the local impact area. More broadly, these expenditures support an estimated 95 full-time equivalent jobs per year, $5.98 million in labor income, $6.82 million in the gross regional product, and $12.3 million in economic output in the nation. All benefits captured here are provided in annual units in FY24 OCT 2023 price levels.

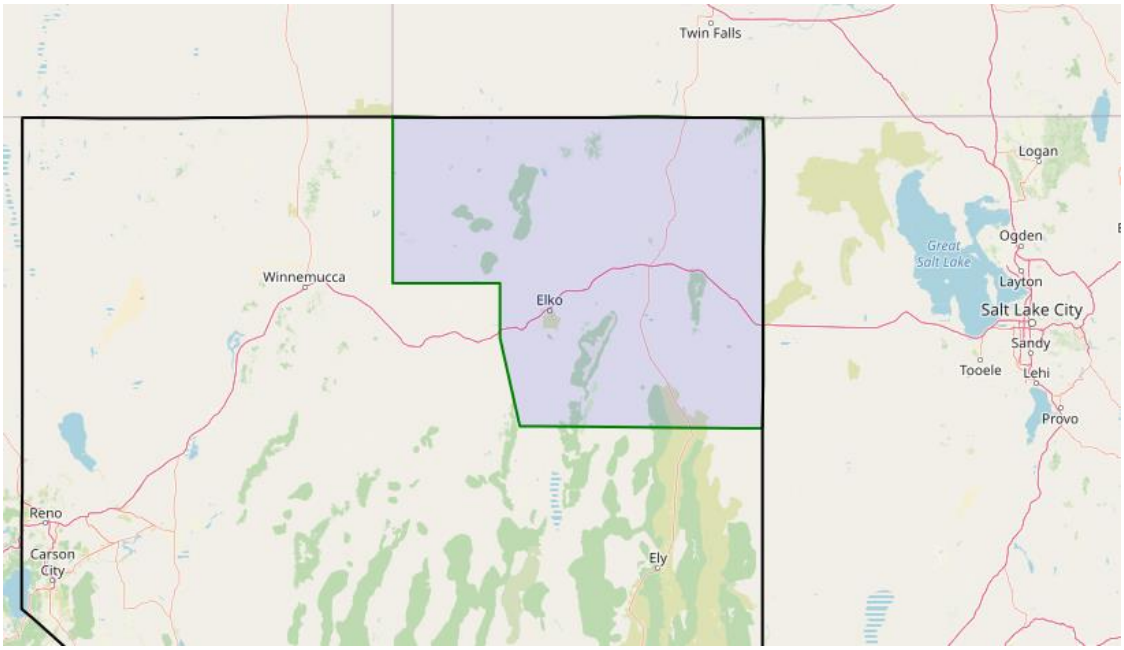

Figure 5-1. Local Impact Area of Regional Economic Development Benefits

5.1.4 Other Social Effects

The OSE benefit category relates to the quality of human life, health, and safety in the community. Destruction or disruption of the built environment, aesthetic values, community cohesion, economic viability, and availability of public facilities and services may be analyzed under this benefit category. Assessments of beneficial and adverse effects are based on comparisons to the No Action Alternative. The purpose of the OSE analysis is to show the beneficial and adverse effects of an ecosystem restoration project on the social wellbeing of the study area. The OSE account typically includes long-term community impacts in the areas of public facilities and services, recreational opportunities, transportation and traffic, and manmade and natural resources. The OSE account also integrates information into the planning process that is not reflected in the other three accounts used by the USACE to evaluate projects and alternative plans. OSE effects include impacts to humans under the following categories: health and safety, social vulnerability and resilience, economic vitality, social connectedness, identity, participation, and leisure and activity. The study area is considered economically-disadvantaged with lower than national average income, higher than average unemployment rates, and low-education levels as described in Section 2. All alternatives provide restoration of the Owyhee River and its associated natural resources. This restoration allows for improved identity and social connectedness by sustaining a sense of connection and pride in the community. All alternatives will require fencing to protect the restoration from grazing and cattle stomping. Due to the extensive floodplain connection and an increase of wetlands with Alternative 6, wildfires are expected to be reduced within the project area. Table 5-1 provides the comparison between all alternatives.

Table 5-1. Comparison of Alternatives

Alt	Name and Brief Description	NED (First costs)	RED	EQ and NER; Net AAHUs	OSE; Tribal Knowledge and Practices
5	Side Channel with BDA	$4.41M	Estimated local impacts for 1-year of construction: - 62 full-time jobs per year - $4.32 million in labor income - $3.91 million in gross regional product - $6.73 million in economic output Estimated national impacts for 1-year construction: - 109 full-time jobs per year - $6.83 million in labor income - $7.79 in gross regional product - $14.1 million in economic output	10.5	Requires fencing, may limit grazing. Minimal wetland/sage-grouse habitat
6	Side Channel and Main Channel	$3.86M	Estimated local impacts for 1-year of construction: - 55 full-time jobs per year - $3.79 million in labor income - $3.43 million in gross regional product - $5.89 million in economic output Estimated national impacts for 1-year construction: - 95 full-time jobs per year - $5.98 million in labor income - $6.82 in gross regional product - $12.3 million in economic output	*Only Cost Effective/Best Buy 27.0; More floodplain connection than other alts=More wetland meadow for sage grouse= increase in significant habitat	Requires fencing, may limit grazing. More acres for tribal plantings than other alts. Increase in wetland/sage grouse habitat which is culturally significant. Improves wildfire resilience with increase of floodplain connection.

Alt	Name and Brief Description	NED (First costs)	RED	EQ and NER; Net AAHUs	OSE; Tribal Knowledge and Practices
7	Main Channel Realignment	$10.0M	Estimated local impacts for 1-year of construction: - 142 full-time jobs per year - $9.82 million in labor income - $8.88 million in gross regional product - $15.3 million in economic output Estimated national impacts for 1-year construction: - 247 full-time jobs per year - $15.5 million in labor income - $17.7 in gross regional product - $31.9 million in economic output	9.2	Requires fencing, may limit grazing. No additional wetland/sage-grouse habitat

5.1.5 Risks

Ecosystem restoration may have relatively low risk to life safety but the associated risk and uncertainty of achieving the proposed level of outputs for the NER plan were considered. The primary risks associated with the Owyhee River ecosystem restoration project are the potential for not reaching stated desirable ecological outcomes, possibly resulting from natural hazards or human actions. During the comparison of alternatives, it was determined that all alternatives had similar risks and one alternative did not alleviate risks more than another. Risks evaluated include the following:

- Operation of the irrigation system may change local hydrology due to irrigation or water rights, resulting in impacts to predicted benefits of the project. Risk is medium and incorporated into the monitoring and adaptive management plan (refer to Appendix E, Monitoring and Adaptive Management Plan) to ensure project is successful.
- The sites selected for the proposed action are not crop production sites and are used primarily for cattle grazing and hay production. Cattle grazing and associated land use will be impacted from required fencing of project area. Risk is high and requires coordination with local community to understand this in more detail.

5.2 IDENTIFICATION OF THE NER/COMPREHENSVE BENEFITS/LEDPA PLANS

5.2.1 NER Plan

The plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, is referred to as the NER plan. ***Alternative 6 has been identified as the NER plan.*** This is the only alternative that maximizes habitat benefits and fully achieves the stated objectives.

5.2.2 Comprehensive Benefits Plan

In addition to the NER account, the plan that also maximizes benefits for social, environmental, and economic considerations (see above four accounts) should be identified. This plan is referred to as Comprehensive Benefits Plan. ***Alternative 6 has been identified as the Comprehensive Benefits Plan.*** Under the EQ, OSE, and RED accounts, the increase in restoration efforts equals an increase in environmental, social, and economic benefits.

5.2.3 Least Environmental Damaging Practicable Alternative

In accordance with ER 1105-2-103 and 40 CFR 230, the Least Environmental Damaging Practicable Alternative (LEDPA) should be identified for all feasibility studies. The LEDPA focus is mainly on discharges into the Waters of the United States. Although ***Alternative 6*** does have fill placed in the main Owyhee River, this alternative ***has been identified as the LEDPA*** due to the long-term benefits to the Waters of the United States, including adjacent floodplain/wetlands. All alternatives have short term construction impacts to either the main channel or side channel; however, Alternative 6 is the only alternative with projected habitat benefits to improve floodplain connection structure and function.

5.3 SELECTION OF THE TENTATIVELY SELECTED PLAN

The evaluation and comparison of alternatives led the PDT to recommend **Alternative 6 as the TSP**. Alternative 6 includes restoration of approximately 55 acres of wet meadow habitat, 4 acres of riparian habitat, and 11,370 linear feet of side channel. This alternative has the highest amount of habitat benefits with the majority being wet meadow habitat. As described previously, wet meadow habitat is a significant resource to the area due to this being preferred habitat for sage grouse.

SECTION 6 - TENTATIVELY SELECTED PLAN

6.1 REFINEMENT OF TSP

Refinement of the TSP was conducted to further understand details and costs. Design during the feasibility study phase is kept at the 25-30% level (refer to Appendix F, Cost Engineering). Total project costs are estimated with this level of design to include 55 percent contingency applied to Construction costs, and a 25 percent contingency applied to LERRD costs. Additional details will be required during the next Pre-Construction Engineering Design (PED) phase prior to construction.

Assumptions made during plan formulation were revisited during TSP refinement. Grading of the estimated berm cuts/notches and channel fill was completed to balance mass across sites 3 and 4 and optimize hydraulic performance for side channel activation and flood conveyance. Modeling of the TSP was conducted to quantify flow activation thresholds, evaluate side channel hydraulics, and potential for impacts to adjacent infrastructure (road/irrigation ditch), as detailed in Appendix B.

Fencing is considered a construction feature and the same for all alternatives; therefore, not included during the CE/ICA process. This fencing cost was included during the refinement of the TSP. Overall, the updates did increase the estimated total project costs for the TSP from the CE/ICA. It was determined since the alternatives are very similar in nature, these updates to costs are relative and not anticipated to change the results of the CE/ICA.

6.2 PLAN COMPONENTS

The TSP includes lowering of berms, notching of side channel inlets and fill placement within the main Owyhee River channel. Conceptual design used during feasibility provides hydraulic responses over a wide range of flows to maintain conveyance and stability during flood events. Additional design optimization will occur during the Pre-Construction Engineering Design (PED) phase.

Target elevations for berm lowering and removal tracked with floodplain bankfull elevations, which were ~1-3 feet above the relic side channel invert elevations at both sites. The overall material volume generated from the berm cuts at sites 3 and 4 were ~12.5 kcy and ~11.9 kcy, respectively. Site 4 will require roughly double the fill quantity relative to site 3 (~16.5 kcy vs. ~8 kcy) because it is more incised into the alluvial fan floodplain. To balance volumes, the plan calls to short-haul ~4.4 kcy of excavated berm material from site 3 to site 4. Based on conceptual design, it is estimated a 125-lf notch length is required at site 3 and a 760-lf notch length is required at site 4. Site 3 has approximately 3,125 lf of channel fill, and site 4 has approximately 3,500 lf of channel fill. Additional design details will be produced during PED. (Refer to Figure 6-1 for typical berm removal and fill.)

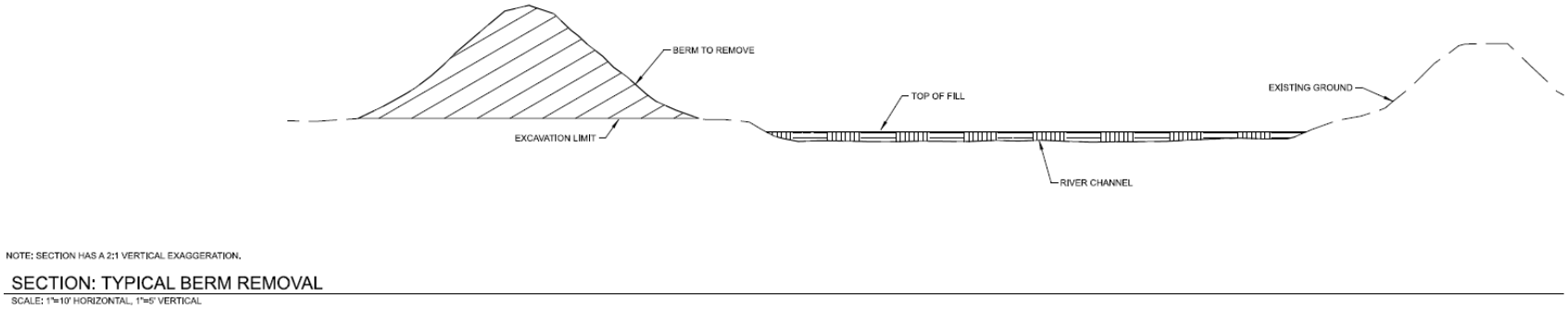

Figure 6-1. Cross Section of Berm Removal
See page C-301, Appendix H, Conceptual Design

As detailed in Appendix H, the Owyhee River channel fill was provisionally designed as a bench graded at or near the target side channel inlet elevations, with an inset baseflow channel to convey flows through the left overbank side channels. At site 4, the inlets to select side channels would be regraded to maintain an equivalent width and notched ~1-2 feet to tie the invert into the Owyhee River channel fill. This approach was less necessary at site 3 due to better floodplain connection, where side channel notches averaged 0.5 feet of cut. Fill depths at site 3 averaged about 1 foot for the baseflow channel and up to 2 feet for the channel bench. At site 4, the Owyhee River is more incised into the alluvial fan, which required deeper fill to compliment side channel notching and achieve side channel activation with depths of ~2+ feet for the baseflow channel and averaging 3 feet for the channel bench. Grading of the longitudinal profile for the Owyhee River was designed to promote side channel activation at low flows and utilized smooth upstream and downstream slope transitions to minimize hydraulic effects and promote dynamic equilibrium. In general, for the TSP, the notches, side channels and some floodplain overbanks inundate for peak flows at the 95 percent AEP (i.e., 1.1 year flow). The mean daily exceedance reaches a maximum of 39 percent of the year due to the main channel being dewatered the remainder of the year. See Figure 6-2 for inundated areas under certain flow (cfs) conditions.

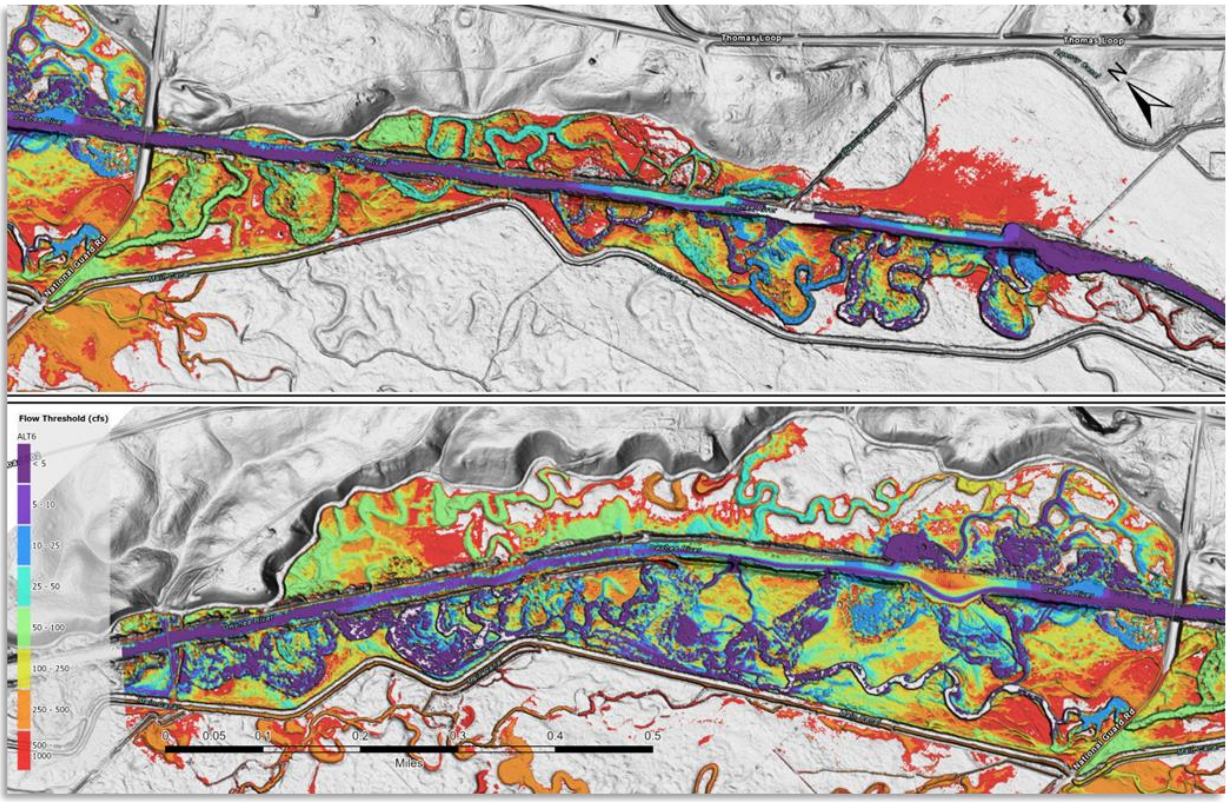

Figure 6-2. TSP Flow Inundation Thresholds at Sites 3 and 4 in Cubic Feet per Second

Top is Site 4; bottom is Site 3. Flow is towards the northwest (from right to left). (See Appendix A, Hydrology and Hydraulics.)

Based on limited shovel sampling, the excavated berm material to be removed is comprised primarily of sandy, silty soil with little to no coarse material larger than small

cobble. Additional assessment of the berm core material gradations and variability will be required during the PED phase.

The TSP raises the base level of the river channel at both Sites 3 and 4 which activates the floodplain and reduces channel erosion potential. Provisional hydraulic modeling of the TSP indicates that channel fill with an alluvial framework will be dynamically stable with a nominal gradation of d_{84}>2.5 in and d_{50}>0.25 in. In select areas of concern (e.g. riffle crest and steeper runs), channel stability risk could be reduced by installing vertical grade control. Three possible approaches to this include:

1. Install subgrade cobble stabilizer within channel spanning trenches. The anticipated trench depth would be <2 feet with the stabilizer fill comprised of nominal 6 inch minus cobble with a typical gradation of (d_{100}=6 in, d_{84}=4 in, d_{50}=2.5 in, and d_{16}=1 in). This is the currently recommend approach in that it minimizes import material quantities and accommodates minor adjustments to the channel profile.

2. Install channel spanning boulders in an appropriate configuration such as a cross-vane or rib. The subgrade footer boulders are placed without spaces, while the at-grade boulders can be slightly spaced to improve sediment transport through the structure. One potential drawback to this structure type is that large boulders are not present in the project reach and could appear out of place for this ecosystem restoration project if installed above grade.

3. Install roughened riffles constructed of a coarse alluvial framework that seasonally scours to a design depth and then aggrades. This approach provides stability while maintaining sediment transport and can be enhanced with small boulders or other habitat features that add form roughness.

Finally, the TSP also includes the installation of beaver dam analogs or other simple detainment structures in the left overbank side channels and swales to improve water retention and groundwater recharge over extended periods of time.

6.3 MONITORING AND ADAPTIVE MANAGEMENT

Section 2039 of WRDA 2007 directs the Secretary to ensure that, when conducting a feasibility study for a project (or a component of a project) for ecosystem restoration, the recommended project includes a plan for monitoring the success of the ecosystem restoration. Within a period of 10 years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost.

Adaptive management redirects the restoration effort in the event the system does not function or become established as predicted. The adaptive management process consists of the following steps:

- Step 1. Monitor and assess progress of restoration.

- Step 2. Identify potential adverse conditions impacting progress toward restoration.
- Step 3. Identify whether potential adverse conditions can or should be remedied.
- Step 4. Implement the appropriate adaptive management action, as required.
- Step 5. Replant riparian or replace physical habitat features.

Monitoring includes the systematic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits. The following habitat factors would be monitored.

A. Plant survival and increase in cover

B. Aquatic macroinvertebrate distribution

C. Flows during targeted season

D. Side channel connection

Success criteria were established as follows for the above four habitat factors based on expected growth within ten years, plant survival targets, and noxious weed control. Expected plant growth was used to estimate project benefits over time and provides an appropriate metric for success criteria. Success criteria are summarized in Table 6-1.

Table 6-1. Summary of Success Criteria for Post-Restoration Monitoring

Metric	Criteria
Vegetation abundance and survival	80 percent years 1-5 (shrubs) 65 percent at year 10 (shrubs) 80 percent across years 1-10 (trees)
Distribution of aquatic macroinvertebrates	Increase in macroinvertebrate diversity, distribution or recruitment is observed after year two.
Floodplain Function	Surface flow observed during targeted season in >2 of 5 years.
Side Channel Connection	Increase in flow volume or persistence or habitat complexity (pool/riffle/meander development) within 5 years.

As a broader adaptive management action, noxious weed control would occur throughout the restored riparian to aid in plant establishment and dominance. Herbicide and physical control methods would be employed and adjusted to the appropriate level of effort throughout the life of the project.

If annual plant survival and noxious weed presence and success criteria are not met, action would need to be taken. If after a 5-year period the success criteria are not met for habitat factors, then adaptive management actions may be necessary. Such actions may be undertaken by the sponsors prior to the end of the five years, if deemed appropriate.

Plantings must have 80 percent survival, monitored annually, for the first 5 years after planting. After the first 5 years, survival must be maintained at 65 percent for shrubs and 80 percent for trees out to year 10. Individual plants that die must be replaced in kind (i.e., replace a tree with a tree) with species from the list agreed upon between the USACE and the Tribes.

(Refer to Appendix E, Monitoring and Adaptive Management Plan for more details.)

6.4 COST ESTIMATE AND COST SHARE

After refinement of the Recommended Plan, Alternative 6 is estimated to have a total project first cost of $8.18 million (FY25 OCT 2024 price level) with the Federal share estimated to be $5.98 million and the non-Federal share estimated to be $2.21 million. The final cost share breakdown is shown in Table 6-2.

In accordance with the cost share provisions in Section 103 of WRDA 1986, as amended, the unadjusted total project first cost share is 65 percent Federal and 35 percent non-Federal. The current Section 1156 waiver (EGM 25-02, Cost Sharing for Territories and Tribal Nations, dated 25 November 2024) of $658,000 is applied to the non-Federal sponsor's Design and Construction cost share. Not included within Design and Construction costs, the non-Federal sponsor is responsible for 100 percent of LERRDs, but cost-share credit for such costs is allowed.

Table 6-2. Total Project First Cost Share of Recommended Plan* ($1,000s)

	Federal Costs	Non-Federal Costs	Total Project First Costs
65/35 Unadjusted Cost Share	$5,319	$2,864	$8,183
LERRDs	$0	-$1,317	-$1,317
Design and Construction Subtotal	**$5,319**	**$1,547**	**$6,866**
Section 1156 Cost Share Waiver	$658	-$658	-
Post-Waiver Subtotal	**$5,977**	**$889**	**$6,866**
Add LERRDs Responsibility	$0	$1,317	$1,317
Total Project First Cost	**$5,977**	**$2,206**	**$8,183**

*FY25 OCT 2024 Price Level

Table 6-3 provides an economic summary of the recommended plan's ecosystem benefits. Using the current FY25 Federal discount rate of 3.0 percent, a 1-year construction period, and a 50-year period of analysis with base year of 2025, interest during construction computed from the refined total project first costs is $122,000,

AAEC is $323,000, average annual O&M is $25,000, and total AAC is $348,000. Average annual cost per AAHU is $13,000 and per acre restored is $6,000.

Table 6-3. Economic Summary of the Recommended Plan* ($1,000s)

	Cost and Benefit Summary
Federal Discount Rate (FY25)	3.00%
Federal Discount Rate, Monthly	0.25%
Construction Period, Years	1
Period of Analysis, Years	50
Total Project First Cost	$8,183
Average Annual Cost	
Interest During Construction (IDC)	$122
Average Annual Equivalent Cost	$323
Average Annual O&M	$25
Total Average Annual Cost	$348
Average Annual Benefits	
Output (AAHUs)	27.0
Average Annual Cost/AAHU	$13
Average Annual Cost/Acre Restored	$6

*FY25 OCT 2024 Price Level

Fully funded costs are total project first costs escalated to the midpoint of construction with a construction period of 1 year. Alternative 6 is estimated to have fully funded total costs of $8.68 million (FY25 OCT 2024 price level) with the Federal share estimated to be $6.30 million and the non-Federal share estimated to be $2.38 million. The final cost share breakdown is shown in Table 6-4.

Table 6-4. Fully Funded Cost Share of Recommended Plan* ($1,000s)

	Federal Costs	Non-Federal Costs	Fully Funded Costs
65/35 Unadjusted Cost Share	$5,641	$3,038	$8,679
LERRDs	$0	-$1,361	-$1,361
Design and Construction Subtotal	**$5,641**	**$1,676**	**$7,317**
Section 1156 Cost Share Waiver	$658	-$658	-
Post-Waiver Subtotal	**$6,299**	**$1,018**	**$7,317**
Add LERRDs Responsibility	$0	$1,361	$1,361
Fully Funded Total Costs	**$6,299**	**$2,380**	**$8,679**

*FY25 OCT 2024 Price Level

The economic summary of the recommended plan's fully funded total project costs and ecosystem benefits is detailed in Table 6-5. Using the current FY25 Federal discount rate of 3.0 percent, a 1-year construction period, and a 50-year period of analysis with

base year of 2025, interest during construction computed from the refined fully funded total project costs is $130,000, AAEC is $342,000, average annual O&M is $26,000, and total AAC is $368,000. Average annual cost per AAHU is $14,000 and per acre restored is $6,000.

Table 6-5. Fully Funded Economic Summary of the Recommended Plan* ($1,000s)

	Cost and Benefit Summary
Federal Discount Rate (FY25)	3.00%
Federal Discount Rate, Monthly	0.25%
Construction Period, Years	1
Period of Analysis, Years	50
Fully Funded Total Project Cost	$8,679
Average Annual Cost	
Interest During Construction (IDC)	$130
Average Annual Equivalent Cost	$342
Average Annual O&M	$26
Total Average Annual Cost	$368
Average Annual Benefits	
Output (AAHUs)	27.0
Average Annual Cost/AAHU	$14
Average Annual Cost/Acre Restored	$6

*FY25 OCT 2024 Price Level

6.5 LANDS, EASEMENTS, RIGHTS-OF-WAY, RELOCATIONS, AND DISPOSAL

According to Engineer Regulation (ER) 405-1-12 Ch. 8 fee interest is required for ecosystem restoration projects. Construction of Alternative 6 would require Fee Interest (Standard Estate #1) of 241.40 acres (estimated by required construction limits) of land to support the ecosystem restoration project. Temporary Work Area Easements (Standard Estate #15) for access to the sites and staging of equipment and materials of 2.4 acres. Construction activity of Alternative 6 takes place on NFS owned Tribal Trust lands. Alternative 6 would not require the need for a disposal or borrow site. Fill material gained from the berm would be used within the current Owyhee River channel, an additional disposal site for any extra material is not anticipated. (Refer to Real Estate Plan, Appendix G.)

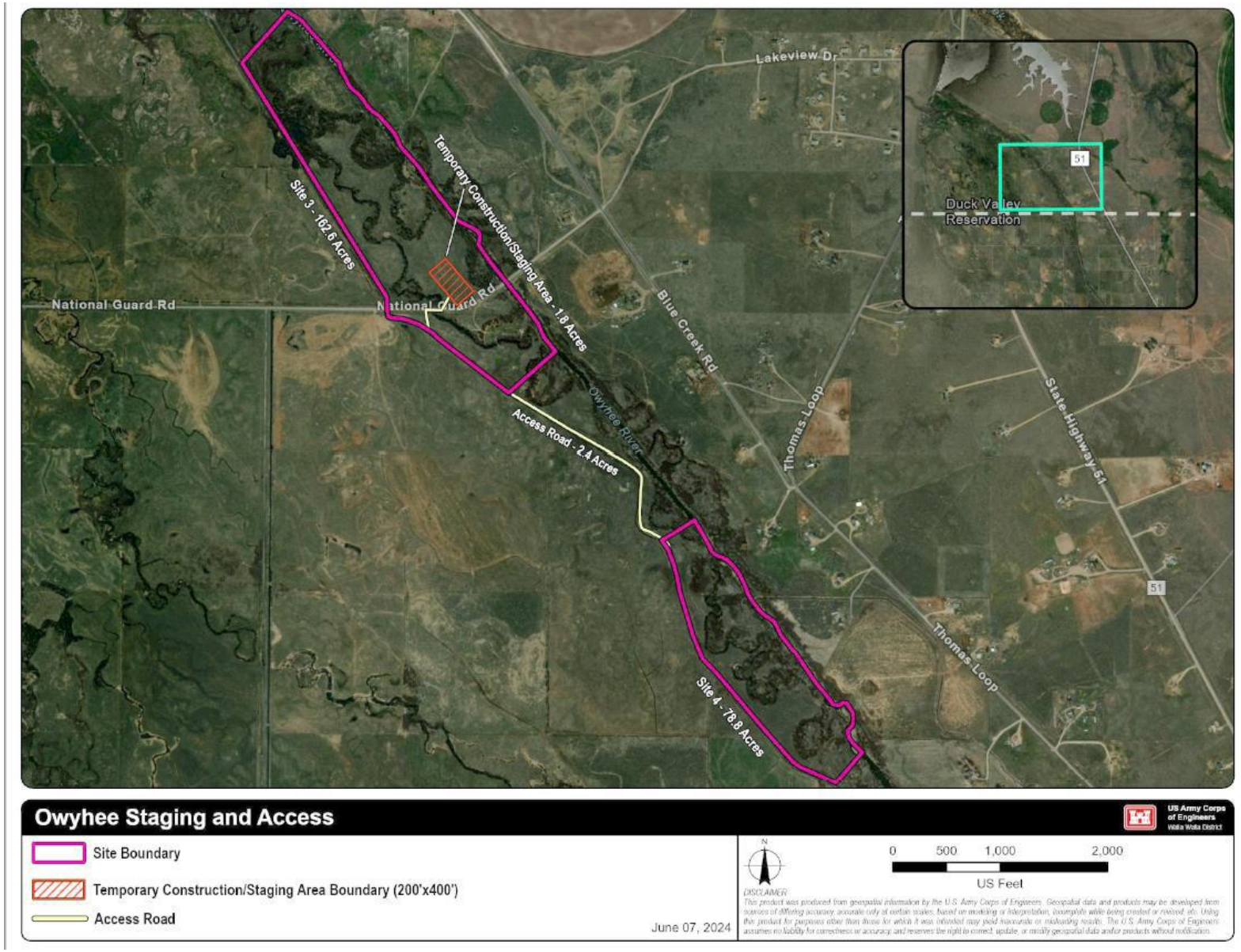

Figure 6-3. Potential Staging and Access with Project Boundary

6.6 DESIGN AND CONSTRUCTION

Effective restoration of both aquatic and riparian ecosystem function will need to account for an altered hydrograph where Owyhee River flows below the China Diversion Dam can drop abruptly with the start of the irrigation season (around the April/May timeframe) with the reach rapidly dewatering to zero inflow typically by June until the end of the water year. Proposed measures to develop a riparian corridor by reactivating relic side channels to cause water to backflow and flood onto the historic floodplain should be designed with progressive grading to maximize volume capture of the spring freshet before May, increase roughness and sustain riparian processes.

Live riparian vegetation components of the proposed ecosystem restoration will be the essential “glue” necessary to improve project durability and should be strategically integrated into banklines and low benches, in-channel structures, and wetland inlets/outlets. It will be critical for the revegetation rooting depths to be installed such that they extend much deeper than proposed channel and wetland inverts (recommend >3 feet below finished grade) to intercept irrigation return groundwater to provide resilience during the summer period (June through September) when the reach is dewatered.

During the subsequent Pre-Construction Engineering and Design (PED) phase for the preferred alternative, hydraulic modeling and design analysis will be necessary to optimize site specific design parameters, including final alignment planform, hydraulic geometry, slope transitions, detailed structure layout, and stability criteria for higher energy flood events. Light Detection and Ranging (Lidar) data from 2017 was provided by the Shoshone-Paiute Tribe at the beginning of the feasibility study phase. This Lidar was used to create a digital terrain model for analyzing the various alternatives and creating the conceptual design drawings (Appendix H). A more detailed survey accomplished by USACE or contracted surveyors will be needed during the PED phase to more accurately capture existing site conditions and topography.

Integrated restoration measures should be designed to optimize hydraulic performance for both stability and ecologic resilience. Key components of proposed structural and grading measures should be designed to remain stable at the 1 percent AEP of ~4500 cfs with design criteria and countermeasures that account for localized hydraulic conditions to address known modes of failure, including impingement, overtopping, tear-out, break-apart, and scour.

6.7 DIVISION OF IMPLEMENTATION RESPONSIBILITIES

The division of implementation responsibilities are as follows:

- USACE is responsible for project management and coordination with the NFS. USACE would submit the Feasibility Report; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration.
- The NFS has provided technical and other advisory assistance during all phases of the project and would continue to provide assistance during implementation and monitoring. Any post-project performance assessment monitoring (beyond 10 years associated with cost-shared Monitoring and Adaptive Management) would be the responsibility of the NFS.

SECTION 7 - ENVIRONMENTAL COMPLIANCE

The preferred alternative presented in this integrated document follows appropriate statutes, EOs, and memoranda, including the National Historic Preservation Act of 1966, as Amended; the Endangered Species Act of 1973; the Fish and Wildlife Coordination Act; EO 11988, Floodplain Management; EO 11990, Protection of Wetlands; and the Rivers and Harbors Act of 1899. The proposed project follows the Clean Air Act (CAA), the Clean Water Act (CWA), and the National Environmental Policy Act (NEPA) of 1969.

Section 7 identifies the legal, policy, and regulatory requirements applicable to the Proposed Action Alternative. The following paragraphs address the principal environmental review and consultation requirements applicable to the plan. Pertinent Federal treaties, statues, and Executive Orders (EO) are included.

7.1 ENVIRONMENTAL COMPLIANCE TABLE

Table 7-1 is a list of all relevant environmental laws, regulations, and executive orders (EOs) with a brief statement summarizing how the project will comply with the requirements. The USACE has included the status of all Federal permits, licenses, and other authorizations that must be obtained in implementing the project and any issues preventing full compliance with any of the laws, regulations, and EOs.

Table 7-1. Table of Compliance Status for the Owyhee River Restoration Project

Environmental Law, regulation, and Executive Order	Completion Documentation	Compliance Status and Date of Completion
National Environmental Policy Act	Signed Finding of No Significant Impact and Environmental Assessment	Prepared Draft Final FONSI and FREA
National Historic Preservation Act	Concurrence Letter from SHPO	On-going consultation with the Shoshone-Paiute Tribe and the Idaho SHPO
Endangered Species Act	No Documentation Needed	No ESA-listed species identified in study area
Magnuson-Stevens Fishery Conservation and Management Act	No Documentation Needed	No Essential Fish Habitat Identified in Study Area.
Fish and Wildlife Coordination Act	Waiver of FWCA requirements	Received on August 22, 2023, from USFWS.

Environmental Law, regulation, and Executive Order	Completion Documentation	Compliance Status and Date of Completion
The Migratory Bird Treaty Act	Section of the NEPA documentation (Wildlife)	No incidental take from proposed action. (Section 7.1.2.6)
Bald and Golden Eagle Protection Act	Section of the NEPA documentation (Wildlife)	No disturbance to bald or golden eagles anticipated. (Section 7.1.2.7)
American Indian Religious Freedom Act	Section of the NEPA documentation (Cultural Resources)	No effect to tribal customs, religion, or ceremonies. (Section 7.1.2.8)
Clean Water Act (Section 402)	Requires a Stormwater Pollution Prevention Plan prior to construction	Will notify the Shoshone-Paiute Tribe and prepare a SWPPP prior to construction. (Section 7.1.2.10)
Clean Water Act (Section 404)	Review of the Nationwide Permits and adherence to NWP 27.	Adhere to NWP 27 conditions. (Section 7.1.2.10)
Clean Water Act Section 401	Obtain Individual Water Quality Certification from Shoshone Paiute	Prepare and submit a Joint Permit Application to the Shoshone Paiute Tribe and secure an Individual Water Quality Certification prior to initiating construction. (Section 7.1.2.10)
Clean Air Act	Area of Attainment documented	No documentation needed. (Section 7.1.2.9)
Executive Order 11988, Floodplain Management	Section of the NEPA documentation (Floodplain)	Prepared in the draft EA, no adverse effect to floodplain or future development in floodplains. (Section 7.1.3.3)

Environmental Law, regulation, and Executive Order	Completion Documentation	Compliance Status and Date of Completion
EO 13007, Native American Sacred Sites	Section of the NEPA documentation (Cultural Resources)	Prepared NEPA documentation in draft EA. (Section 7.1.3.4)
EO 13175 consultation and Coordination with Indian Tribal Governments	Coordination with Tribal Council	No documentation is necessary, full disclosure to Tribal Council. (Section 7.1.3.5)
EO 13112, Invasive Species	Section of NEPA documentation (Vegetation)	Prepared NEPA documentation in the draft EA. (Section 7.1.3.6)

7.1.1 Treaties and Native American Treaties

Treaties are formally ratified agreements between sovereign nations that establish the political and property relations of those nations. Treaties between Native American Tribes and the United States confirm the rights and privileges of each nation. In most of these treaties, the Tribes ceded title to vast amounts of land to the United States but reserved certain lands (reservations) and rights for themselves and their future generations. It is important to clarify that the rights of sovereign Indian tribes pre-existed their treaties; they were not granted by treaties or the United States Government. Rather, the treaties gave legal recognition to their rights (Hunn et al. 2015:58). Like other treaty obligations of the United States, Indian treaties are considered the supreme law of the land, forming the foundation for Federal Indian law and the Federal Indian trust relationship. These reserved rights were retained by the tribes and continue to be exercised by their members today.

On April 16, 1877, President Rutherford B. Hayes signed an Executive Order establishing the Duck Valley Indian Reservation. On May 4, 1887, President Cleveland issued an Executive Order expanding the Duck Valley Indian Reservation on the Idaho side. In 1910, President Taft issued another Executive Order for further extension of the Duck Valley Indian Reservation.

The Shoshone and Paiute united at Duck Valley under the Indian Reorganization Act of 1934 and formed a tribal government through a Constitution and Bylaws which was adopted in 1936. The Tribes explicitly reserved certain rights, including the exclusive right to fish in streams running through or bordering the reservation, the right to fish at all usual and accustomed places in common with citizens of the territory, and the right to erect temporary buildings for curing, along with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle on open and unclaimed lands. These reserved rights also include the right to fish within identified geographical areas, among other rights.

Implementation of Alternative 6 would not adversely affect treaty resources, rights, or obligations.

7.1.2 Federal Laws

7.1.2.1 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) of 1969 is a United States Federal law that was enacted on January 1, 1970. NEPA established a framework for considering the environmental impacts of major Federal actions, including infrastructure projects, Federal permits, and other activities that may significantly affect the environment.

The main purpose of NEPA is to promote informed decision-making by requiring Federal agencies to evaluate the potential environmental consequences of their proposed actions. The law mandates that agencies assess the environmental impacts of their projects and consider alternatives that may have fewer adverse effects.

NEPA requires Federal agencies to prepare an Environmental Impact Statement (EIS) for significant projects that could have substantial environmental effects. The EIS provides information on the potential environmental impacts of the proposed action, alternative options, and measures to mitigate adverse effects. During the decision-making process, the public is given the opportunity to review and comment on the EIS.

In cases where the expected impacts are not significant, NEPA allows for the preparation of less comprehensive environmental assessments (EAs). EAs evaluate the potential environmental effects of a project and determine if an EIS is necessary.

NEPA applies to all Federal agencies and requires them to integrate environmental considerations into their decision-making processes. Its goal is to ensure that environmental factors are given proper consideration and that Federal actions are undertaken with an understanding of their potential impacts on the environment.

This Environmental Assessment (EA) examines and describes potential environmental effects related to the ecological restoration of the Owyhee River. USACE has released the Draft Finding of No Significant Impact (FONSI) and EA to other Federal and state agencies, Tribes, and the public for a 30-day review and comment period starting on or around March 10, 2025. During the preparation of the EA, USACE did not identify any effects that would significantly impact the quality of the human environment. If no such effects are identified during the public review process, compliance with NEPA would be achieved upon the signing of the FONSI, which would be posted on the USACE website and made available to the public.

This Feasibility Report (FR) and Environmental Assessment (EA) document fulfill the NEPA requirements for this project. USACE has prepared a draft environmental assessment and Finding of No Significant Impact (FONSI) in accordance with Engineer Regulation (ER) 200-2-2, Procedures for Implementing NEPA, and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA), Title 40 Code of Federal Regulations

(CFR), Part 1500-1508, to determine potential environmental effect associated with restoration of habitat. If the USACE determines potential effects are relatively minor and would have no significant environmental effects, USACE would sign a Finding of No Significant Impact (FONSI) and would proceed with the Federal action. If USACE determines the environmental effects would be significant, USACE would prepare an Environmental Impact Statement (EIS) before a decision is reached on how to implement the proposed action. Applicable laws under which these effects would be evaluated include but are not limited to NEPA, the Endangered Species Act, the Clean Water Act, the Clean Air Act, and the National Historic Preservation Act.

NEPA is a full disclosure law, providing for public involvement in the NEPA process. All persons and organizations that have a potential interest in this proposed action—including the public, other Federal agencies, state and local agencies, Native American tribes, and interested stakeholders—are encouraged to participate in the NEPA Process.

7.1.2.2 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) requires agencies to assess the potential effects of their actions on properties listed or eligible for listing on the National Register of Historic Places (NRHP). The implementing regulations of the NHPA, outlined in 36 CFR Part 800, mandate that Federal agencies engage in consultation with the State Historic Preservation Officer (SHPO), Tribes, and other interested parties to ensure comprehensive identification, evaluation, and consideration of all historic properties in the planning of proposed undertakings.

Section 106 requires that Federal agencies evaluate the effects of Federal undertakings on historic properties and afford the Advisory Council on Historic Preservation opportunities to comment on the proposed undertaking. To accomplish this, USACE would initiate consultation with the appropriate consulting parties, in this case the Shoshone Paiute Tribe and other interested parties. Once the consulting parties have been identified, USACE would then complete identification of all historic properties potentially affected by the selected plan. Once this step is complete USACE would finalize its determination of effect and seek comment regarding those effects. Consultation would be necessary to address any effects determined to be adverse, and efforts would be made to avoid, minimize; and if necessary, mitigate for those effects.

USACE initiated Section 106 Consultation with the Idaho SHPO and Shoshone Paiute Tribe on July 12, 2024, with a determination of no historic properties affected with the requirement of having a professional archaeological monitoring during ground disturbing activities. Idaho SHPO responded on July 19, 2024, and the Shoshone Paiute Tribe on July 25, 2024, with a concurrence of the determination of no historic properties affected.

In the case of this project, which is taking place within the external boundaries of a federally recognized Tribe that does not possesses a Tribal Historic Preservation Officer (THPO), the SHPO in addition to the Shoshone Paiute Tribe’s Cultural Resources Director would serve as the consultation points.

7.1.2.3 Endangered Species Act of 1973

The Endangered Species Act of 1973 (ESA) established a national program for the conservation of threatened and endangered fish, wildlife, and plants, as well as the preservation of their dependent habitats. Section 7(a)(2) of the ESA mandates that Federal agencies engage in consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NOAA) as necessary to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Additionally, Section 7(c) of the ESA and the Federal regulations on endangered species coordination (50 CFR § 402.12) require Federal agencies to prepare a Biological Assessment (BA) that analyzes the potential effects of significant actions on listed species and their critical habitat.

The USACE has conducted a review of the IPAC database and determined that there would be no effect on ESA-listed species. There were no threatened or endangered species indicated within the Duck Valley Indian Reservation. The potential impact on the monarch butterfly, identified as a candidate species, was assessed by the USACE. It was determined that the effect on the monarch butterfly would be minimal and temporary since the species relies on milkweed for its survival, which has not been identified in the restoration areas. Therefore, the project is expected to have no impact on the monarch butterfly and does not jeopardize its existence. Two other ESA-listed species under the jurisdiction of USFWS are known to occur on the Duck Valley Indian Reservation—Bruneau hot springsnail (*Pyrgulopsis bruneauensis*) and bull trout (*Salvelinus confluentus*). However, these species do not occur near or downstream of the proposed action area. The Bruneau hot springs snail is only found in geothermal springs and seeps along an 8-kilometer length of the Bruneau River, no closer than 50 km to the study sites. Likewise, bull trout are restricted to high elevations on the eastern margin of the Reservation and are not found near the study areas, nor in the mainstem Owyhee River in this area.

As for NMFS species, which typically include anadromous fish, their migration into the Duck Valley Indian Reservation is hindered by a series of downstream dams that lack fish passage. The implementation of Alternative 6, the tentative selected plan, would comply with ESA.

7.1.2.4 Magnuson-Stevens Fishery Conservation and Management Act-Essential Fish Habitat

The consultation requirement of Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs Federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions or proposed actions that may adversely affect Essential Fish Habitat (EFH).

EFH refers to areas within the marine and estuarine environments that are necessary for fish to carry out their life processes, such as spawning, feeding, or growth.

Therefore, EFH primarily applies to coastal areas and marine waters rather than inland regions like Nevada or Idaho.

There is no EFH within the Duck Valley Indian Reservation nor any species that would be considered under the jurisdiction of NMFS. The implantation of Alternative 6, the tentative selected plan, would comply with MSA.

7.1.2.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires agencies to consult with state fish and wildlife agencies, the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) to assess the effects of proposed Federal water resource development projects on fish and wildlife species. This consultation process particularly focuses on projects that could involve controlling or modifying the ‘waters of a natural stream or other body of water’ that might impact the fish and wildlife resources dependent on that body of water or its associated habitats. As part of the consultation, these agencies provide recommendations for habitat enhancement.

The FWCA also mandates that wildlife conservation be given equal consideration and coordination alongside other water resources development programs.

The proposed action involves habitat restoration. The U.S. Fish and Wildlife Service (USFWS) support this restoration effort and have determined that a coordination under the Fish and Wildlife Coordination Act (FWCA) is not required. The USFWS provided a response from July 17, 2023, through August 22, 2023, via phone, email, and meetings. In the e-mail dated August 22, 2023, USFWS waived FWCA engagement for the project.

The Implementation of Alternative 6, the tentative selected plan, would comply with FWCA.

7.1.2.6 The Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-712, as amended) prohibits the taking and commerce of migratory birds (whether alive or dead), any parts of migratory birds, their feathers, or nests. The term ’take' is defined in the MBTA to encompass any means or methods that involve hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof. Additionally, a memorandum of understanding between the Department of Defense and the U.S. Fish and Wildlife Service (USFWS), signed on July 31, 2006, aims to enhance the conservation of migratory birds.

A wide variety of species listed under the MBTA occur within the Owyhee River study area. Best Management Practices would be implemented to ensure no take of migratory birds, including pre-construction surveys and an approved Nest Protection Plan. Details of these BMPS may be found in Annex D of the Adaptive Management Plan, *NWW Quality Management Standard for MBTA Compliance*. There would be no take of migratory birds and the proposed action would develop and enhance habitat in and

along identified sections of Owyhee River. The implementation of Alternative 6, the tentative selected plan, would comply with MBTA.

7.1.2.7 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) is a Federal law in the United States that provides legal protection for bald eagles and golden eagles. The main purpose of the BGEPA is to conserve and protect these iconic bird species and their habitats.

The BGEPA prohibits the taking of bald eagles and golden eagles, which includes actions such as killing, harassing, disturbing, or possessing these birds, their eggs, or their nests. It also prohibits the sale, purchase, or trade of bald eagles or golden eagles or any parts of these birds, including feathers and other body parts.

Under the BGEPA, there are limited exceptions that allow for certain activities involving Native American tribes and specific activities related to conservation, education, and scientific research. These exceptions ensure that tribes can continue their traditional practices and that necessary activities for research and conservation purposes can be conducted while still protecting the eagles.

The BGEPA plays a crucial role in the recovery and conservation efforts for bald eagles and golden eagles, which were once endangered or threatened. Due to successful conservation efforts, the bald eagle was removed from the endangered species list in 2007, but it remains protected under the BGEPA and other laws.

Bald and golden eagles are known to nest and roost within the Duck Valley Indian Reservation. While all nest sites have not been formally documented, locations of nests are known by the Tribes. No nests are found within the restoration area and eagles would not be harmed by the project activities.

The implementation of Alternative 6, the tentative selected plan, would comply with BGEPA and would not result in disturbance or take of bald or golden eagles.

7.1.2.8 American Indian Religious Freedom Act

The American Indian Religious Freedom Act (AIRFA) is a Federal law in the United States that was enacted in 1978. The purpose of the act is to protect and preserve the rights of Native Americans to freely exercise their traditional religions, including their beliefs, practices, and ceremonies.

Under the American Indian Religious Freedom Act, Native Americans have the right to access and use sacred sites, perform religious rituals and ceremonies, and possess and use sacred objects and artifacts. The law recognizes the significance of these religious practices to Native American cultures and seeks to ensure that they are respected and protected.

The AIRFA was a landmark legislation that aimed to address historical infringements on Native American religious practices and to promote greater understanding and accommodation of their religious freedom. It affirms the importance of religious freedom and cultural rights for Native American communities and recognizes their unique spiritual and religious traditions.

Courts have interpreted AIRFA to mean that public officials must consider Native Americans' AIRFA interests before undertaking actions that might harm those interests.

The preferred alternative would comply with AIRFA and would not result in impacts to tribal customs, religion, or ceremonies.

The implementation of Alternative 6, the tentative selected plan, would comply with AIRFA and would not result in impacts to tribal customs, religion, or ceremonies.

7.1.2.9 Clean Air Act

The Clean Air Act is a comprehensive Federal law in the United States that governs air pollution control. It was first enacted in 1963 and has been amended and expanded over the years. The primary goal of the Clean Air Act is to protect and improve air quality to safeguard public health and the environment.

The Clean Air Act establishes regulatory requirements for various sources of air pollution, including industrial facilities, power plants, motor vehicles, and other emissions sources. It sets emission standards, requires the use of control technologies, and establishes monitoring and reporting requirements to ensure compliance with air quality standards.

The Clean Air Act is administered and enforced by the EPA at the Federal level, while states play a crucial role in implementing and enforcing the requirements through their own air quality management programs. The Act has been instrumental in reducing air pollution and improving air quality across the United States, leading to better public health outcomes and environmental protection.

The Duck Valley Indian Reservation is in an air quality attainment area. The operation of equipment (trucks, loaders, excavators) associated with the restoration of the Owyhee River would result in localized, temporary, minor increases in emissions but would not adversely affect air quality. The implementation of Alternative 6, the TSP, would comply with the Clean Air Act.

7.1.2.10 Clean Water Act

The Clean Water Act (CWA) is a comprehensive Federal law in the United States that governs water pollution control. It was originally enacted in 1972 and has been amended and expanded over the years. The primary goal of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters to protect human health and the environment.

It is administered and enforced by the EPA at the Federal level. It also provides for delegation of authority to states to implement and enforce the requirements through their own water pollution control programs, known as State Water Pollution Control Programs or State Revolving Fund Programs.

It establishes a framework for regulating the discharge of pollutants into Waters of the United States, including rivers, lakes, streams, wetlands, and coastal areas. It grants the Environmental Protection Agency (EPA) the authority to set water quality standards and establish pollution control programs.

Key provisions of the Clean Water Act include:

Section 402 National Pollutant Discharge Elimination System (NPDES)

The EPA sets water quality standards that define the acceptable levels of pollutants in different water bodies. States are required to develop water quality standards that meet or exceed these Federal standards. The standards are based on the designated uses of the water bodies, such as drinking water supply, recreation, or aquatic habitat. The project must meet water quality standards during the construction activities. The current status of this segment of the Owyhee River is designated as “impaired” and therefore, There are total maximum daily loads (TMDL) limits placed on the waterbody to reduce pollution and restore water quality. The project must meet TMDL’s during construction activities for temperature and turbidity.

Section 402 of the Act, the National Pollutant Discharge Elimination System (NPDES) program, pertains to discharge of pollutants. The USACE has identified one pollutant, herbicide that would be discharged near the Owyhee River in the event of establishing new vegetation.

Section 402 of the Clean Water Act also regulates ground disturbance that could potentially cause storm water run-off into Waters of the United States. Soil disturbance would be minimal to create the new side channel and move material from berms. If the area of soil disturbance for the activity would be more than an acre and would discharge stormwater into surface water, that activity would be subject to the provisions of Section 402. The USACE would comply with the applicable Section 402 construction general permit for these activities.

The project would also need a Stormwater Pollution Prevention Plan under Section 402 of the CWA. The Clean Water Act includes provisions for oil and hazardous substance spill prevention, response, and liability. It requires facilities to have spill prevention plans in place and provides for enforcement actions and penalties in the event of spills or releases. The project activities must include a spill prevention and response plan as part of the Stormwater Pollution Prevention Plan.

Section 404 Regulation of Discharge of Dredged or Fill Material

Discharge of dredged or fill material below the line of ordinary high water requires evaluation under Section 404 of the Clean Water Act. Several of the activities would

involve placement of fill below the ordinary high water line in the Owyhee River or wetlands within the relic floodplain. As currently proposed under Alternatives 6 and 7, the removal of berms and placement within the Owyhee River would meet this requirement. Alternative 5 may require fill in relic oxbows, which would be considered wetlands to create the new secondary channel.

The plan may meet the conditions of the U.S. Environmental Protection Agency (EPA) Section 401 Water Quality Certification for NWP 27, but this cannot be determined until final designs are complete. This permit is a Section 404 permit that is implemented nationwide and allows for restoration of aquatic habitat or riparian areas that are like other reference sites in the region. USACE would coordinate with Tribes to obtain Water Quality Certification during the design phase. The activity would not require compensatory mitigation as the functions and values of the wetlands and restoration of secondary channels would mitigate for impacts to the current impaired condition.

Section 401 State Water Quality Certification

Section 401 requires a certification from the applicable permitting agency that the discharge of a pollutant or dredge or fill material meets water quality standards. If a permit under Section 404 is needed for an action, Section 401 water quality certification is also needed. The CWA grants states and authorized tribes the authority to grant, deny, or waive certification of proposed Federal licenses or permits that may discharge into Waters of the United States. The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation were granted treatment in a manner similar to a state (TAS) on June 17, 2020

The project would require an Individual Water Quality certification from the Shoshone-Paiute Tribe. Initial coordination with the Tribes began during the early phase of the feasibility study and will continue until final report approval. Water quality certification would be finalized following the design phase.

The implementation of Alternative 6, the tentative selected plan, would comply with CWA and would not result in adverse impacts to wetlands or Waters of the United States.

7.1.3 Executive Orders

7.1.3.1 Executive Order 11990, Protection of Wetlands

Executive Order 11990, titled 'Protection of Wetlands,' was issued by President Jimmy Carter on May 24, 1977. The purpose of this executive order is to protect the nation’s wetlands by ensuring that Federal agencies consider the impacts of their activities on wetland ecosystems and take steps to avoid or minimize harm to these valuable resources.

Under Executive Order 11990, Federal agencies are required to avoid, to the extent possible, actions that would result in the destruction or degradation of wetlands. They

are directed to consider alternatives to minimize harm, such as locating activities in non-wetland areas or implementing mitigation measures to offset any adverse impacts.

The executive order also emphasizes the need for Federal agencies to coordinate their actions with state, local, and tribal governments in wetland protection efforts. It recognizes the importance of wetlands in maintaining water quality, supporting wildlife habitats, preventing flood damage, and providing recreational opportunities.

Executive Order 11990 has played a significant role in the protection and preservation of wetlands in the United States. It aims to ensure that Federal activities contribute to the overall conservation and sustainable management of wetland ecosystems, which are vital for ecological health and human well-being.

The ecosystem restoration at the restoration sites along the Owyhee River would have no adverse effect on local wetlands. While short-term effects of construction may potentially have a brief adverse effect on wetlands, site restoration and adherence to Best Management Practices (BMPs) would minimize these effects. Following project completion, the reconnection of the floodplain and creation of a side channel would enrich and promote the development of riparian wetlands within the Owyhee River watershed.

The implementation of Alternative 6, the tentative selected plan, would comply with Executive Order 11990 and would not result in adverse impacts to wetlands.

7.1.3.2 Executive Order 11988, Floodplain Management

Executive Order 11988, titled 'Floodplain Management,' was issued by President Jimmy Carter on May 24, 1977. The purpose of this executive order is to establish guidelines for Federal agencies to effectively manage floodplains and minimize the risk of flood damages.

Under Executive Order 11988, Federal agencies are required to consider the impacts of their actions on floodplains and to avoid, to the extent possible, the long-term adverse impacts associated with the occupancy and modification of floodplain areas. Agencies are directed to assess flood hazards, avoid acquiring flood-prone land whenever possible, and minimize potential harm to floodplains.

The executive order also emphasizes the need for Federal agencies to consider floodplain management in their planning and decision-making processes. It encourages the adoption of nonstructural measures, such as land use planning and floodplain zoning, to reduce flood risks. Additionally, agencies are encouraged to promote the restoration and preservation of floodplain functions and values.

Executive Order 11988 aims to improve floodplain management practices and increase resilience to flooding events. By considering floodplain impacts and implementing appropriate measures, Federal agencies can help protect lives, property, and natural resources in flood-prone areas.

Procedures under Engineering Regulation 1165-–-26 - Implementation of Executive Order 11988 on Floodplain Management require a statement of findings, which are as follows: The Proposed Action is located within the 1 percent Annual Exceedance Probability (AEP) floodplain and would affect the floodplain. However, the restoration efforts would increase the flooded area and discourage development. The long-term effects of the preferred alternative would be broadly beneficial to the floodplain. No rise at the 1 percent AEP is anticipated, and the final design would ensure that this level is maintained. The implementation of Alternative 6, the TSP, would comply with Executive Order 11988.

7.1.3.3 Executive Order 13007, Native American Sacred Sites

Executive Order 13007, Indian Sacred Sites, was issued by President Bill Clinton on May 24, 1996. The purpose of this executive order is to protect and preserve Indian sacred sites on Federal lands and to promote dialogue and cooperation between Federal agencies and Native American tribes regarding the management and protection of these sites.

Under Executive Order 13007, Federal agencies are directed to accommodate access to and ceremonial use of Indian sacred sites by Native American tribes. Agencies are required to maintain ongoing communication and consultation with tribes regarding the identification, documentation, and protection of sacred sites.

The executive order emphasizes the importance of respecting tribal religious and cultural practices and recognizes the significance of sacred sites as an integral part of Native American heritage. It acknowledges the government-to-government relationship between the United States and tribal nations and calls for cooperation in the management and preservation of sacred sites.

Executive Order 13007 also encourages Federal agencies to consider the religious and cultural significance of sacred sites when making decisions that may affect these areas. It calls for the integration of tribal views and concerns into the planning and decision-making processes related to land management, resource development, and other activities on Federal lands.

The order directs agencies to avoid adversely affecting the physical integrity of sacred sites and to maintain the confidentiality of such sites when appropriate. It promotes government-to-government consultation with tribes regarding sacred sites and recognizes that some of these sites may qualify as historic properties under the National Historic Preservation Act (NHPA).

The project is being prepared in coordination with the Tribes and the Cultural Resources Director. No adverse impacts to sacred sites have been identified, and the project would undergo further coordination with the public during the public comment period. The implementation of Alternative 6, the TSP, would comply with Executive Order 13007.

7.1.3.4 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, November 6, 2000, and Presidential Memorandum, Government to Government Relations with Native American Tribal Governments, April 29, 1994

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, was issued by President Bill Clinton on November 6, 2000. The purpose of this executive order is to promote meaningful and timely consultation and collaboration between Federal agencies and tribal governments on policies and actions that may affect tribal interests.

Under Executive Order 13175, Federal agencies are directed to engage in regular and meaningful consultation with tribal officials in the development of policies, regulations, and other actions that have substantial direct effects on tribal communities. The order recognizes the government-to-government relationship between the United States and tribal nations and aims to strengthen tribal self-governance and sovereignty.

The executive order requires Federal agencies to establish policies and procedures to ensure effective consultation with tribal governments. Agencies are directed to identify tribal officials or their designated representatives as points of contact for consultation and to consult early in the policy development process to allow for meaningful input and consideration of tribal concerns.

Executive Order 13175 emphasizes the importance of respecting tribal sovereignty, promoting tribal self-determination, and recognizing the unique legal and political status of tribal governments. It encourages Federal agencies to consider the impacts of their actions on tribal rights, resources, and lands and to work collaboratively with tribes to address their needs and interests.

The order also recognizes the diversity of tribal governments and cultures, acknowledging that consultation processes may vary depending on tribal circumstances. It encourages Federal agencies to be flexible and sensitive to tribal traditions and customs during the consultation process.

Overall, Executive Order 13175 aims to strengthen the government-to-government relationship between the Federal government and tribal nations, promote tribal self-governance, and ensure that tribal interests are considered in Federal decision-making processes.

During the scoping process for the Feasibility study, a public and agency scoping workshop was held on August 11th, 2022, in the Tribal Council meeting room. Letters announcing the public scoping period were sent to interested members of the public, Tribal governments, organizations, stakeholders, congressional offices, and Federal and state agencies, offering them the opportunity to comment on the scope of the feasibility study. The public scoping comment period was from August 11, 2022, until September 11, 2022. Announcements for the scoping period were also distributed in local offices, on the USACE website, and through local radio stations. USACE received

a total of 13 comments during the scoping period. The implementation of Alternative 6, the TSP, would comply with Executive Order 13175

7.1.3.5 Executive Order 13112, Invasive Species

Executive Order 13112, titled "Invasive Species," was issued by President Bill Clinton on February 3, 1999. The purpose of this executive order is to prevent and control the introduction and spread of invasive species that may harm ecosystems, agriculture, and other natural resources.

Under Executive Order 13112, Federal agencies are directed to take actions to prevent the introduction of invasive species, control and manage existing populations, and restore ecosystems affected by invasive species. The order emphasizes the need for coordinated efforts among federal, state, tribal, and local governments, as well as non-governmental organizations, to address the issue of invasive species.

The executive order establishes the National Invasive Species Council (NISC), which is composed of various Federal agencies. The NISC is responsible for coordinating and implementing a national strategy to address the threat of invasive species. The order also requires Federal agencies to develop and implement invasive species management plans and coordinate their activities with the NISC.

The purpose of this project is to restore aquatic and riparian habitat. An element of the proposed project is the control of invasive plant species in the study area to ensure a healthy riparian habitat. Control activities include implementation of Best Management Practices during construction (e.g., requirements for weed free materials), and an invasive species control plan in the study area as part of the OMRR&R. This project complies with the Executive Order 13112.

This section explains the public and agency coordination that occurred throughout the preparation of this feasibility study.

7.2 PUBLIC INVOLVEMENT

7.2.1 Project Kick-Off and Scoping

USACE initiated the feasibility study with a workshop with the Tribes that took place in Tribal Council chambers and via WebEx on August 11, 2022. The workshop consisted of USACE team members from the Walla Walla District and representatives from Tribes Tribal Fisheries. During the workshop, participants were informed of the initial environmental considerations and conceptual alternatives to inform the scope and scale of the project. Various agencies attended via WebEx including Nevada Department of Wildlife, Bureau of Land Management, and Idaho Fish and Game.

The objectives of the workshop were to document Tribal input and concerns, communicate USACE processes to Tribal leadership, and identify study opportunities, objectives, and initial measures.

A public notice was posted rom August 11, 2022 to September 11, 2022 to solicit initial comments regarding the scope of the project. A total of 13 comments were received. These comments were used in the development of the scope of the project.

7.2.2 Cooperating and Coordinating Agencies

In January 2020, USACE officially invited the following agencies to participate in the Study as Cooperating Agencies under NEPA:

- Environmental Protection Agency.
- The U.S. Fish and Wildlife Service.
- The Idaho Department of Fish and Game.
- Nevada Department of Wildlife.
- Bureau of Land Management.

Bureau of Land Management, Nevada Department of Wildlife, and Idaho Department of Fish and Game did all accept the invitation to be cooperating agencies and have participated actively in periodic meetings to assist in scope development, answer technical questions regarding redband trout and sage-grouse habitat, and develop the alternatives.

Coordination with the Services was also requested under the Fish and Wildlife Coordination Act.

7.2.3 Tribal Consultation

Tribal governments consulted include the Shoshone Paiute Council and Shoshone Paiute Fish and Game Department.

7.2.4 List of Statement Recipients

In compliance with NEPA, the draft FONSI and Integrated FR/EA would be available for public review and comment for at least 30 days in DATE OF PUBLIC REVIEW. All material comments would be addressed prior to signing a final FONSI.

7.2.5 Public Comments Received and Responses

Any substantial comments received through the public involvement process and actions taken to involve the public and agencies would be listed in this section.

SECTION 8 - DISTRICT ENGINEER RECOMMENDATION

USACE Walla Walla District and the Shoshone-Paiute Tribe (Tribe), have conducted an environmental assessment in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended. The draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) dated March 2025, for the Owyhee River Ecosystem Restoration addresses the feasibility of restoring riparian and aquatic habitat and ecosystem functionality on the Duck Valley Indian Reservation.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for authorization and implementation funding. However, prior to transmittal to higher authority, the sponsor, the states, interested Federal agencies, and other parties would be advised of any modifications and would be afforded an opportunity to comment further.

The draft IFR/EA evaluated various alternatives that would restore ecosystem function within the Owyhee River watershed. The recommended plan/preferred alternative is Alternative 6 and includes restoration of approximately 55 acres of wet meadows, 4 acres of riparian and habitat restoration and 11,370 linear feet of side channel.

All applicable laws, Executive Orders, regulations, and local government plans were considered in the evaluation of the alternatives. The recommended plan does not constitute a major Federal action that would significantly affect the quality of the human environment; therefore, an Environmental Impact Statement is not recommended (refer to Finding of No Significant Impact/FONSI).

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