BUREAU OF RECLAMATION

Boise River Basin Feasibility Study

Specialist Report:

Wetlands

Boise Project, Idaho

Interior Region 9: Columbia Pacific Northwest

U.S. Department of the Interior May 2020

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
BURP	Beneficial Use Reconnaissance Program
CCE	Cat Creek Energy
CWA	Clean Water Act
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAC	facultative
FACW	facultative wetland
IDEQ	Idaho Department of Environmental Quality
JD	jurisdictional determination
LF	linear feet
NHD	National Hydrography Dataset
NWI	National Wetlands Inventory
OBL	obligate wetland
Reclamation	Bureau of Reclamation
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOUS	Waters of the United States

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1. Introduction

The Boise River Basin Feasibility Study is a feasibility study to evaluate increasing water storage opportunities within the Boise River basin by expanding Anderson Ranch Reservoir. The project is located at Anderson Ranch dam and reservoir, the farthest upstream of the three reservoirs within the Boise River system and located 28 miles northeast of the city of Mountain Home in Elmore County, Idaho. Anderson Ranch Dam is a zoned earth fill embankment structure that provides irrigation water, flood control, power generation, and recreation benefits. The reservoir also provides a permanent dead storage pool for silt control and the preservation and propagation of fish and wildlife. Anderson Ranch Dam is operated by the Bureau of Reclamation (Reclamation). Reclamation, in partnership with the Idaho Water Resource Board (IWRB), proposes to raise Anderson Ranch Dam. New water storage would provide the flexibility to capture additional water when available, for later delivery when and where it is needed to meet existing and future demands. The alternatives analyzed in this document include the No-Action Alternative (Alternative A), a 6-foot raise of Anderson Ranch Dam (Alternative B), and a 3-foot raise of Anderson Ranch Dam (Alternative C).

Alternative A provides a basis for comparison with the two action alternatives, Alternative B and Alternative C. Under Alternative A, current baseline conditions would continue, without increasing Anderson Ranch Dam height or constructing associated reservoir rim projects, access roads, or facilities. The expected project duration of Alternative B is approximately 51 months and Alternative C is 44 months. Reclamation would continue existing operations of Anderson Ranch Dam. Alternative B proposes to raise the dam by 6 feet from the present elevation of 4196 feet to 4202 feet to capture and store approximately 29,000 additional acre-feet of water. Alternative B would inundate an estimated 146 acres of additional land around the reservoir above the current full pool elevation of 4196 feet. Alternative C proposes to raise the dam by 3 feet to 4199 feet, allowing for the ability to capture and store approximately 14,400 additional acre-feet of water. Alternative C would inundate an estimated 73 acres of additional land around the reservoir above the current full pool elevation of 4196 feet.

Each of the two action alternatives, Alternative B and Alternative C, includes two separate but similar, structural construction methods for the dam raise, downstream embankment raise, or mechanically stabilized earth wall raise. Otherwise, the only difference is the dam raise elevations of 6 feet for Alternative B and 3 feet for Alternative C. Project areas and construction durations for each method are nearly identical, except for a 200-foot difference in approach road length at the right abutment and an approximate 1-month difference in construction duration. The longer road length is within the dam footprint on previously disturbed ground. Because these differences are negligible, they are not differentiated within the analysis of each alternative. Alternative analysis assumes the longer road length and

construction duration; however, a final construction method will be chosen during later phases of engineering evaluation.

Chapter 1 and Chapter 2 of the Boise River Basin Feasibility Study Environmental Impact Statement (EIS) provide a detailed description of the proposed action, project's purpose and need, project area, and alternatives including design features applicable to the action alternatives. This specialist report supports the analysis of expected impacts on wetlands as described in the EIS.

1.1 Regulatory Framework

Regulatory framework in place to guide the analysis of wetland resources surrounding the Anderson Ranch Reservoir includes Executive Order 11990, Protection of Wetlands; Section 404(b)(1) of the Clean Water Act (CWA), Guidelines for Specification of Disposal Sites for Dredged or Fill Material; and Section 9.

Executive Order 11990, Protection of Wetlands

Executive Order 11990, Protection of Wetlands, requires all federal agencies to provide leadership in the protection of wetlands in acquiring, managing, and disposing of federal lands; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs affecting land use. Federal agencies shall take action to minimize destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands (*Federal Register*, 1997).

Clean Water Act

The U.S. Environmental Protection Agency (EPA) administers the CWA and authorizes the Department of the Army to regulate discharges of dredged or fill material into Waters of the United States (WOUS), including jurisdictional wetlands. The U.S. Army Corps of Engineers (USACE) regulates these discharges through Section 404(b)(1) guidelines of the CWA. In accordance with Section 404 of the CWA, a permit must be obtained from the USACE for any discharge of dredged or fill material in WOUS.

2. Affected Environment

The general project area for the evaluation of wetlands and riparian areas for each of the action alternatives is presented on the next page. Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands have the following general diagnostic environmental characteristics (USACE 1987).

1. **Hydrophytic Vegetation.** Classified by the estimated probability of occurrence in wetland versus non-wetland areas throughout its distribution.
2. **Hydric Soils.** Soils that are saturated, flooded, or ponded for sufficient periods during the growing season and that develop anaerobic conditions in their upper layers.
3. **Hydrological Characteristics.** Determined by the frequency of flooding, duration of inundation, and soil saturation.

Riparian corridors are areas between a stream or other waterbody and adjacent upland areas with a unique vegetative community influenced by the presence of water. Wetland and riparian area functions include groundwater recharge/discharge, flood/flow alteration, sediment stabilization, sediment and toxicant retention, nutrient removal and transformation, aquatic and terrestrial diversity and abundance, and uniqueness.

Data were analyzed from several resources to help identify the extent and characteristics of potential wetlands and riparian areas within the project area. Following is a summary of resources that were used to assess the affected environment for wetlands and riparian areas.

- The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) was reviewed to locate possible wetland areas and identify wetland types within the project area (USFWS, 2019).
- The U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) was reviewed to identify potential lakes, ponds, streams, rivers, canals, dams, and stream gages within the project area (USGS, 2019).
- The Idaho Department of Environmental Quality (IDEQ) Beneficial Use Reconnaissance Program (BURP) information was used to analyze the quality of the riparian corridors within the project area. BURP supports assessing biological assemblages and physical habitat structure of streams. These assessments characterize individual stream integrity and quality of Idaho waters (IDEQ, 2017).
- U.S. Forest Service (USFS) Riparian Conservation Areas (RCAs) include a 300-foot buffer on perennial streams and a 150-foot buffer on intermittent streams and waterbodies as specified by the Boise Forest Plan to help ensure appropriate management of riparian areas (USFS, 2019a).
- USFS wetlands on the Boise National Forest geospatial database estimates wetland extents across the Boise National Forest (USFS, 2019b).

- USGS 7.5-minute series topographic maps were reviewed to identify potential wetlands, streams, topography, and general information in the project area (Environmental Systems Research Institute, 2019).
- Google Earth was used to review historical aerial photographs for the presence or absence of wetland signatures (Google Earth, 2019).

2.1 Anderson Ranch Reservoir

The project area includes the shoreline of Anderson Ranch Reservoir; upstream and downstream of Anderson Ranch Reservoir; areas of rim projects (areas impacted by the proposed increase in reservoir pool elevation, i.e. roadways, Pine airstrip, bridges, culverts, and recreational areas); and associated areas for proposed ground disturbance (access roads, borrow areas, staging areas).

To characterize wetland and riparian areas around the rim of Anderson Ranch Reservoir, the area was divided into two topographically unique areas as summarized below.

South Fork Boise River Varial Zone

The varial zone is located in the northern portion of the project area where the South Fork Boise River discharges into Anderson Ranch Reservoir. The varial zone is the area subject to periods of watering and dewatering corresponding to the summer/fall drafting and winter/spring refill of Anderson Ranch Reservoir. This area is characterized by broad, flat valley topography with a braided channel system where silt, sand, and gravel deposit (Bureau of Reclamation [Reclamation], 2019).

NWI identified a complex system of riverine, palustrine, and lacustrine wetlands within the area of inundation, as depicted on Figure 1. A determination survey of wetland indicators, including hydrophytic vegetation, hydric soil, and wetland hydrology, was conducted at several point locations in the varial zone by Reclamation in October 2019 (Reclamation, 2019). Vegetation species were categorized by the standardized USACE wetland indicator or "hydrophytic" status in one of five categories as provided in Table 1.

Table 1. Wetland plant indicator status

Wetland Indicator	Abbreviation	Probability to Occur in Wetlands
Obligate Wetland	OBL	Almost always occur in wetlands
Facultative Wetland	FACW	Usually occur in wetlands, but may occur in non-wetlands
Facultative	FAC	Occur in wetlands or non-wetlands
Facultative Upland	FACU	Usually occur in non-wetlands, but may occur in wetlands
Obligate Upland	UPL	Almost never occur in wetlands

Source: Lichvar et al. 2016.

The October 2019 determination survey found that facultative wetland (FACW) and facultative (FAC) species made up the majority of the vegetative cover at the sample locations in the varial zone, Table 2 provides a list of species observed in the varial zone during the determination survey.

Table 2. Vegetation species in varial zone, October 2019

Scientific Name	Common Name	Wetland Indicator
Abies spp.	fir species	FACU
Achillea millefolium	common yarrow	FACU
Alnus species	alder species	FAC/FACW
Bromus tectorum	cheatgrass	UPL
Carex concinnoides	northwestern sedge	FAC
Carex douglasii	Douglas' sedge	FAC
Equisetum sylvaticum	woodland horsetail	FAC
Ericameria nauseosa	rubber rabbitbrush	UPL
Euphorbia virgata	Russian leafy spurge	UPL
Festuca idahoensis	Idaho fescue	FACU
Juncus spp.	rush species	FACW
Luzula parviflora	forked woodrush	FAC
Phalaris arundinacea	reed canarygrass	FACW
Pinus contorta	lodgepole pine	FAC
Pinus ponderosa	ponderosa pine	FACU
Poa secunda	Sandberg bluegrass	FACU
Populus angustifolia	narrowleaf cottonwood	FACW
Populus balsamifera	balsam poplar	FACW
Populus tremuloides	quaking aspen	FACU
Rosa woodsii	Woods' rose	FACW

Scientific Name	Common Name	Wetland Indicator
Rumex acetocella	common sheep sorrel	FACU
Salix exigua	narrowleaf willow	FACW
Salix spp.	willow species	FAC/FACW/OBL
Saxifraga spp.	rockfoils species	NI*
Solidago lepida	Canada goldenrod	FAC
Trifolium pratense	red clover	FACU

**NI: No wetland indicator for species*

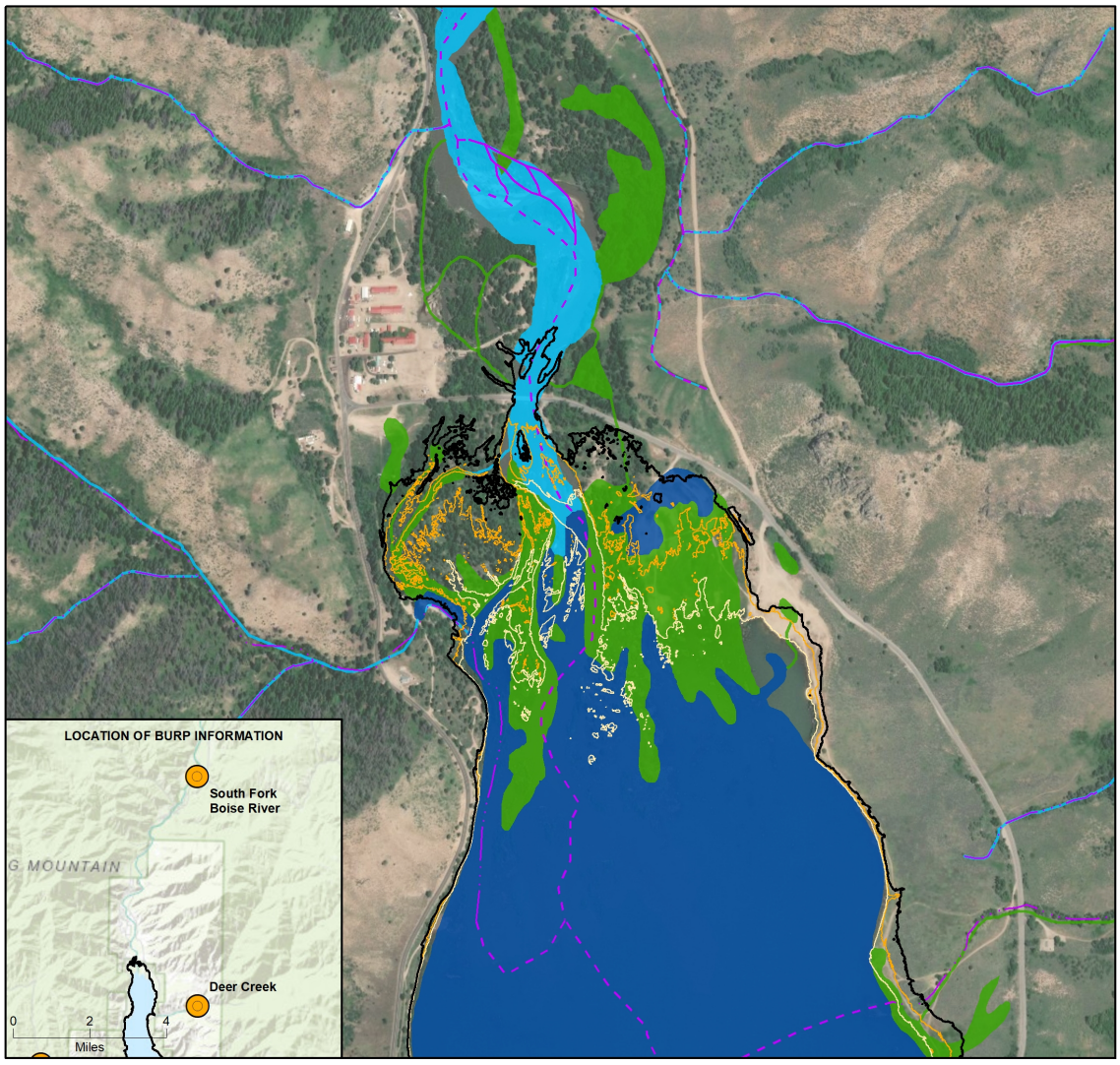
These efforts identified a mosaic of wetland and upland vegetation composition, topography, and soil types with high ecological functions and values that support preliminary boundaries identified in the NWI.

The varial zone is within the riparian corridor of the South Fork Boise River, identified by NHD as a perennial stream. Additionally, one intermittent stream enters the varial zone to the west. BURP data for the South Fork Boise River was available at a location approximately 5.4 miles upstream of the varial zone.

Rim of Anderson Ranch Reservoir

In contrast to the varial zone, the perimeter of Anderson Ranch Reservoir is typically characterized by a narrow, steep-sided valley cut through several hundred feet of igneous extrusive and intrusive rock. Due to the steep slopes, wetland formation around the rim is limited. NWI identified potential lacustrine wetlands around the perimeter of Anderson Ranch Reservoir, potential riverine wetlands in areas where streams and rivers discharge into the reservoir, including the South Fork Boise River downstream of Anderson Ranch Dam, and potential palustrine wetlands in areas of more gradual slopes and in depressional areas subject to ponding as depicted in Figure 2 through Figure 4.

Riparian areas found around the rim of Anderson Ranch Reservoir include 15 perennial streams and 32 intermittent streams as identified by NHD. BURP information was available for eight of the streams, all of which were classified as perennial.



LEGEND

- BURP Location
- 4202 ft - Proposed Full Pool
- 4199 ft - Proposed Full Pool
- 4196 ft - Existing Full Pool

USGS NHD Streams

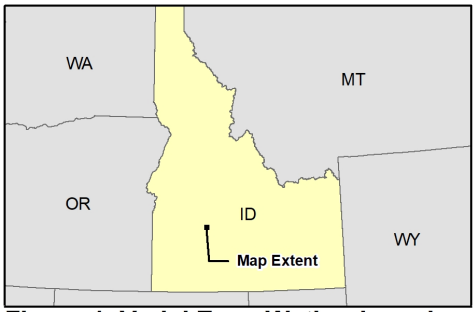
- Artificial Path
- Intermittent Stream
- Perennial Stream

USFWS NWI Wetlands

- Palustrine Wetland
- Lacustrine Wetland
- Riverine Wetland

N

0 0.1 0.2
Miles



Notes:
1. This map is provided as-is and may contain representations of property boundaries. It is intended for general references only. None of the parties involved in preparing this map or data contained herein warrant or represent information to be complete and accurate and cannot be held responsible for errors or omissions.

Figure 1. Varial Zone Wetlands and Riparian Area
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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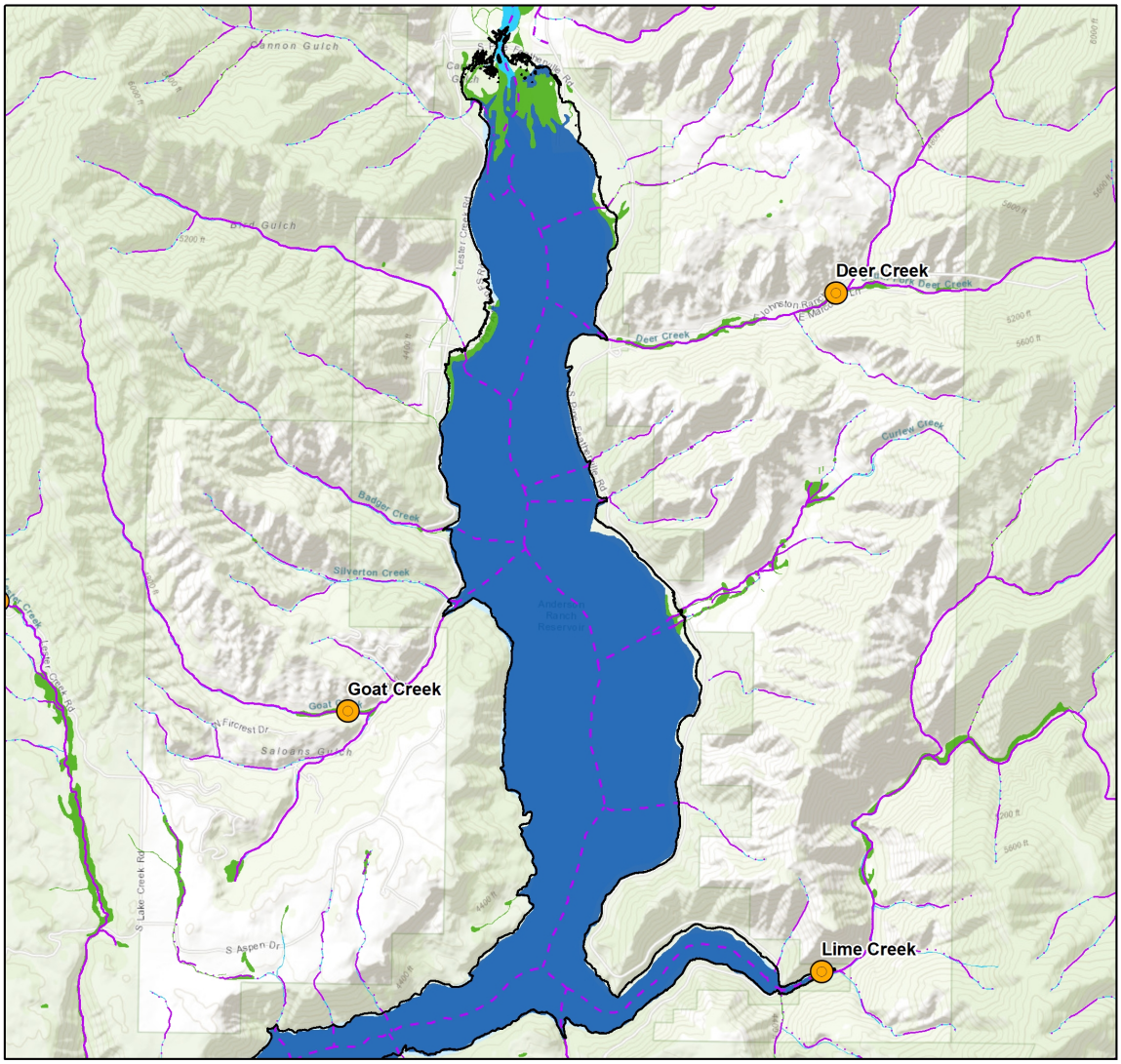

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Figure 2. Rim Wetlands and Riparian Area - North
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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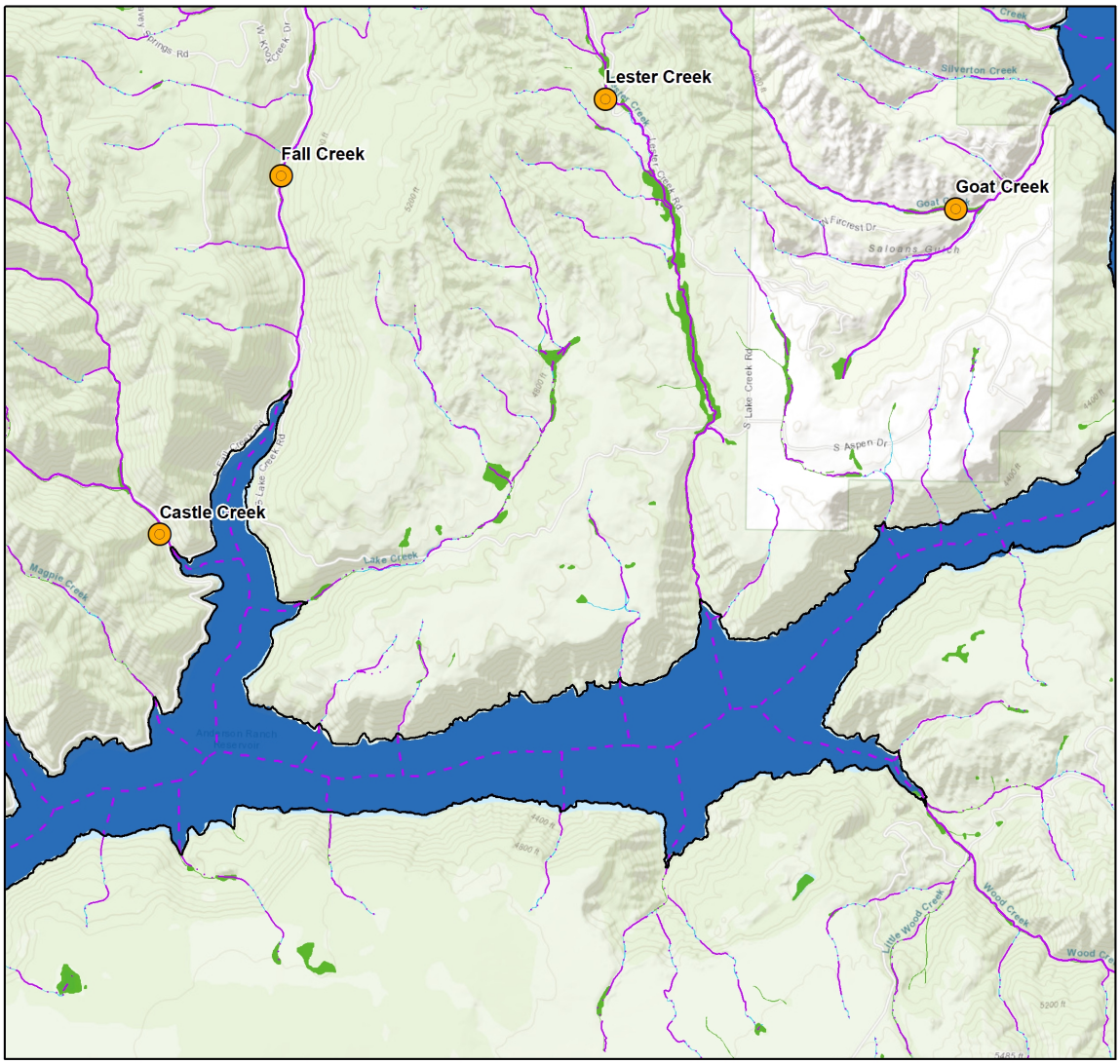

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Figure 3. Rim Wetlands and Riparian Area - Mid
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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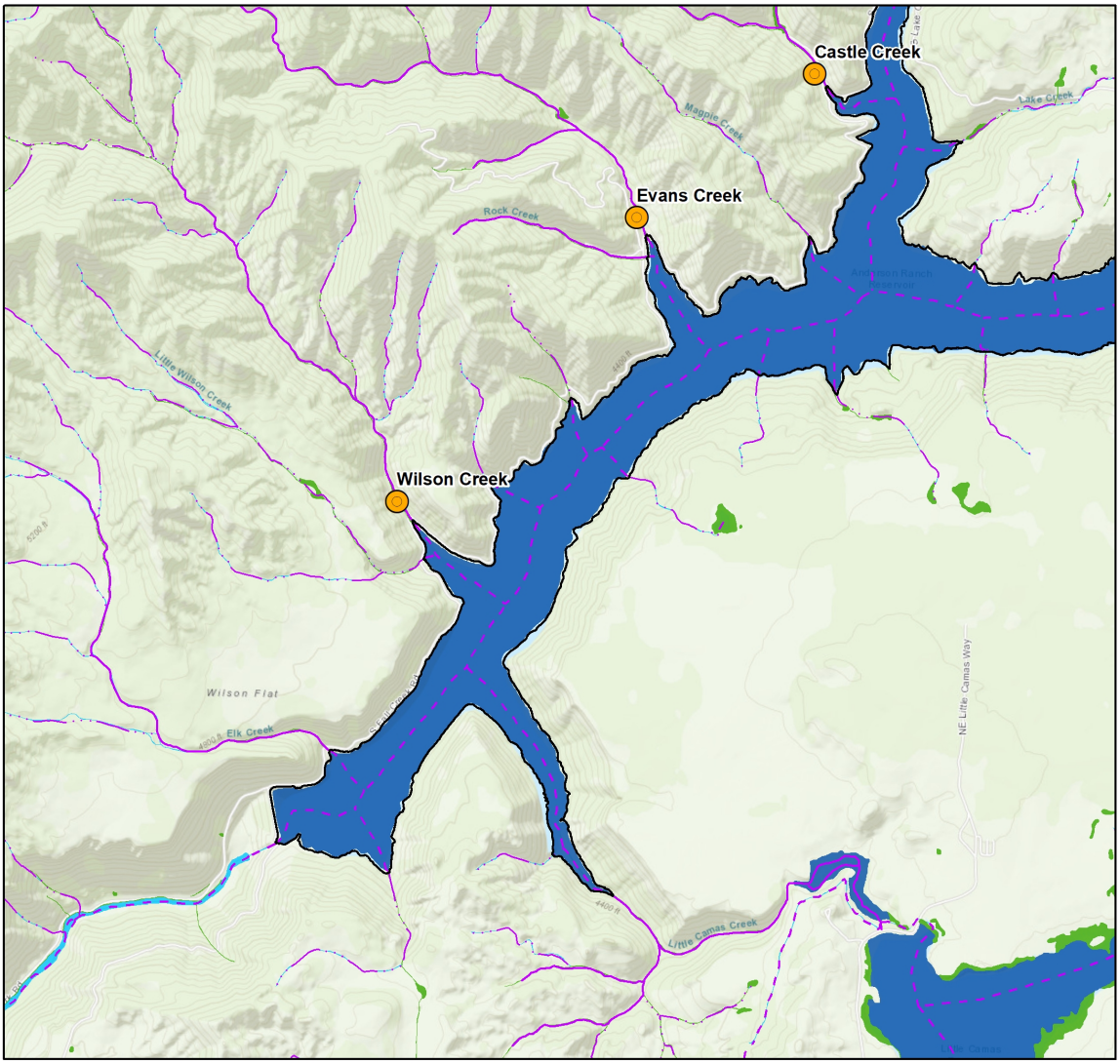

LEGEND

- BURP Location
- 4202 ft - Proposed Full Pool

USGS NHD Streams

- Artificial Path
- Intermittent Stream
- Perennial Stream

USFWS NWI Wetlands

- Palustrine Wetland
- Lacustrine Wetland
- Riverine Wetland

N

0 0.375 0.75

Miles

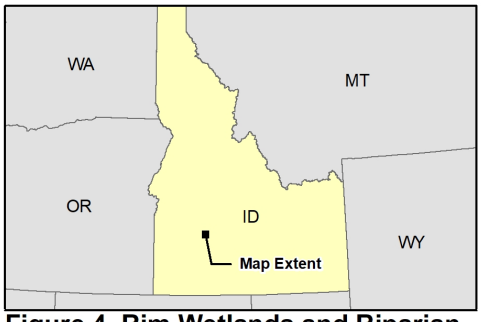

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Figure 4. Rim Wetlands and Riparian Area - South
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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3. Environmental Consequences

3.1 Methods for Evaluating Impacts

Impacts were assessed based on potential wetlands and riparian areas that would be gained, lost, and/or altered by construction or inundation as a result of Alternative B or Alternative C.

3.1.1 Wetlands

Generally, wetland areas that fell within the boundaries of the project area were characterized and quantified using NWI potential wetland type and acreage. In the varial zone, an analysis of wetland characteristics as provided by the Varial Zone Habitat Survey for Wetlands Determination was used to analyze wetland impacts (Reclamation, 2019).

As a result of the project, the amount of wetland acreage would potentially increase with the increased perimeter of surface water at Anderson Ranch Reservoir. Wetland creation around the perimeter of Anderson Ranch Reservoir was assessed based on topographic information and a review of aerial imagery to identify areas that are relatively flat, are subject to ponding, and/or within proximity to a new hydrology source.

Several of the rim project areas overlap with the boundaries of the new inundation areas. Where this occurred and the NWI indicated the area contained wetlands, potential impacts to wetlands were included in the calculations for the rim project areas only.

3.1.2 Riparian Areas

The riparian areas that fell within the project area were quantified using linear length of NHD streams and were characterized using BURP information.

Several streams around the rim of Anderson Ranch Reservoir were identified as artificial paths, as opposed to perennial, intermittent, or ephemeral streams, by NHD. Where this occurred, the stream designation directly upstream from the artificial path was assigned to that segment down to the 4196-foot contour (current full pool). For example, the South Fork Boise River was identified as an artificial path through the varial zone, and the next upstream segment is identified as a perennial stream. Therefore, for the purposes of this analysis, the South Fork Boise River in the varial zone is considered a perennial stream.

The BURP habitat assessment, which is a modification of the EPA Region 10 In-Stream Biological Monitoring Handbook habitat assessment known as the “Hayslip approach” (Hayslip, 1993), incorporates a combination of quantitative and qualitative measures of habitat variables including prevalence, instream cover, embeddedness, channel shape, disruptive pressures, zone of influence, pool substrate characteristic, and pool variability (IDEQ, 2017). Habitats are assessed for an entire reach using the stream habitat index developed as an analytical tool for specifically assessing aquatic life beneficial uses for wadeable streams.

Idaho's streams exhibit considerable variability in climates, hydrology, geology, landforms, and soils, so BURP uses the Rosgen and Silvey stream classification system (Rosgen and Silvey, 1996) to compare streams (IDEQ, 2017). This system integrates stream characteristics into one of seven geomorphic stream types. Entrenchment is the most important characterizing attribute and is the measure of how easily the stream can access its floodplain during flood stage, defined as twice bankfull depth. These types of streams are summarized below in Table 3.

Table 3. Description of Rosgen stream types

Entrenchment Ratio	Gradient	Stream Type	Further Attributes
<1.4	>4%	A	Steep entrenched, cascading step/pool streams. High energy/debris transport associated with depositional soils. Very stable if bedrock or boulder dominated channel. Typically, of low stream order.
<1.4	2%-4%	G	Low bankfull width/depth ratio (<12). Narrow, deep bankfull channel (a gully). Step/pool and moderate gradients. Gradient may be <2% in downcut meadow sections.
<1.4	2%-4%	F	High bankfull width/depth ratio (>12). Entrenched meandering riffle/pool channel on low gradients. Highly erodible banks and significant bar deposition. Little or no visible flood plain.
2.2-1.4	2%-4%	B	Riffle-dominated, moderate sinuosity. Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools. Very stable plan and profile. Stable banks. Often found in narrow, moderately sloping valleys.
>2.2	<2%	E	Very low bankfull width/depth ratio (<6) and high sinuosity. Low gradient, tortuously meandering stream with many pools and little deposition. Very efficient and stable. Often found in flat-bottomed valleys and alpine meadows.
>2.2	<2%	C	High bankfull width/depth ratio (>12) and moderate-high sinuosity. Low gradient, meandering riffle/pool alluvial channels with broad, well defined floodplains and point bars.
N/A	<4%	D	Multiple channels (three or more braids). Braided channel with longitudinal and transverse bars. Very wide channel with eroding banks.

BURP habitat assessment data and the stream type based on the Rosgen stream classification were used to categorize (or classify or assign) riparian health. Specifically, the disruptive pressures, sinuosity, and zone of influence indices were evaluated for each reach to determine the existing condition and quality of the riparian corridor of each stream in the project area for which BURP assessments were available. BURP assessments were available for 10 of the 17 perennial streams analyzed in the project area. These include Goat Creek, Castle Creek, Deer Creek, Evans Creek, Fall Creek, Lester Creek, Lime Creek, Wilson Creek, South Fork Boise River, and Cow Creek. The Cow Creek Road realignment project area includes one perennial stream which is a tributary to Cow Creek, but BURP data were not available for the stream. However, BURP data were available along the mainstem of Cow Creek less than one mile downstream from the Cow Creek Road realignment project area. The sample dates for these assessments range from 1995 to 2019. For these streams, a riparian corridor quality based on the BURP habitat assessment was assigned as low, fair, moderate, or high. The key indices used in this evaluation are summarized as follows.

Disruptive pressures. A qualitative measure pertaining to anthropogenic impacts on a riparian zone. Seasonal human impacts on riparian zones are used to evaluate this index such as recreational pressures (camping, hiking, fishing), and/or livestock grazing. This index is rated using a scale from 0 to 10. Disruptive pressure ratings are presented in Table 4.

Table 4. Disruptive pressure ratings

Score	Description	Riparian Corridor Quality*
0-2	Disruption of streambank vegetation is very high. Vegetation has been removed to less than 30% of the potential plant biomass	Low
3-5	Disruption obvious; some patches of bare soil or closely cropped vegetation present, 30-60% of potential plant biomass remains.	Fair
6-8	Disruption evident but not affecting community vigor. Vegetative use is moderate, 60-90% of the potential plant biomass remains.	Moderate
9-10	Vegetative disruption minimal or not evident. Almost all potential plant biomass at present stage of development remains	High

** The riparian corridor quality was designated based on the BURP assessment analysis.*

Sinuosity. The measure of the stream channel's tendency to meander back and forth within the stream valley. It is calculated as the ratio of the channel length between two points in a channel and the straight-line distance between the same two points. Sinuosity is a characteristic used to define the Rosgen stream type. Sinuosity ratios are presented in Table 5.

Table 5. Sinuosity ratios

Sinuosity Ratio	Description
1 – 1.3	Low sinuosity. Relatively straight with few bends or meanders.
1.3 – 1.7	Moderate sinuosity. Few bends greater than 90 degrees.
> 1.7	High sinuosity. Significant number of bends and meanders more than 90 degrees.
N/A	Braided. Channel has been divided into several smaller channels due to accumulation of deposits within the bankfull channel.

Zone of influence. This is the width of riparian vegetation zone and affected by nearby ditches, channels, and other drainage features. Presence and condition of riparian vegetation is important to the overall ecological health of the river. Index is used to determine the overall human impacts on the riparian zone such as roads, logging, lawns, campgrounds, and urban areas. Rated using a scale from 0 to 10 based on the least-buffered side of the riparian corridor. The zone of influence ratings is presented in Table 6.

Table 6. Zone of influence ratings

Score	Description	Riparian Corridor Quality*
0-2	Little to no riparian vegetation due to man induced activities (parking lots, clearcuts, lawns or crops planted to the edge of the stream).	Low
3-5	Width of riparian vegetative zone (each side) is at least as wide as the stream. Human activities have caused a great deal of impact.	Fair
6-8	Width of riparian vegetative zone (on each side) is at least twice the width of the stream. Human activities have caused minimal impact.	Moderate
9-10	Width of riparian vegetative zone (on each side) is at least 4 times the width of the stream. Human activities have caused no impact at all.	High

** The riparian corridor quality was designated based on the BURP assessment analysis.*

Based on the information gathered, wetland and riparian impacts were classified as one or a combination of the following.

- Short term: such as temporary impacts during construction activities.

- Long term: such as a permanent loss or an alteration resulting from the alternative.
- Direct: such as loss due to inundation or fill.
- Indirect: such as a change to characteristics due to a change in surrounding conditions.
- Adverse: such as loss due to inundation or fill.
- Beneficial: such as the creation of a resource due to inundation.
- Negligible: impacts that are expected to be offset by the project, such as inundation resulting in the loss of wetlands that would be offset by the creation of wetlands upgradient.
- Insignificant: such as a change in wetland type or temporarily filled wetland areas during construction that are then returned to pre-construction conditions or the loss of riparian areas of low to moderate quality.
- Significant: such as the permanent loss of wetlands over 0.1 acres, which is the typical threshold for compensatory mitigation under Section 404 of the CWA, or a permanent loss of high quality riparian areas.

3.1.3 Assumptions

Estimates of impacts on wetlands are not based on formal wetland delineations as these have not been completed for the project area; therefore, the actual extent of the impacts on wetlands may differ from the analysis presented below.

The NWI was developed based on an analysis of vegetation, visible hydrology, and geography as identified in high-altitude aerial imagery. The resulting wetland areas or types of wetlands described have not been field-verified by USFWS. Therefore, NWI wetland boundaries and types are limited to the characteristics that were evident on the date the aerial image was captured and to the resolution of the image. The NWI and NHD are meant to be used as guidance tools to aid in resource management, they are not meant to delineate the actual extents of wetlands and streams. For this analysis, NWI identified wetlands are considered “potential wetlands” and NHD streams are considered “potential streams.”

The NWI utilizes the Cowardin Classification (Cowardin et al. 1979) for wetlands and deeepwater habitats. However, it is not expected that all areas defined as lacustrine wetlands would exhibit the three wetland parameters as defined in Section 2; therefore, it is likely that many of the NWI lacustrine wetlands within the project area are not lacustrine wetlands but open water. However, this has not been confirmed because a wetland delineation defining the lacustrine wetland/open water boundary has not been completed; therefore, NWI lacustrine wetlands have been included in the description of wetlands in the Effected Environment and for consistency have been included in the Environmental Consequences analysis. Before beginning construction activities, Reclamation would work with USACE as well as state and local agencies to obtain all applicable permits.

It is important to note that impacts to wetland and riparian areas resulting from inundation beyond existing conditions would largely be dependent upon the frequency and duration of inundation. Impacts may not occur in a given year or could occur in consecutive years and would likely be of varying duration. Impacts from inundation may not be expressed consistently across the area or may occur over many years.

The location and area of created wetlands is based on the best available information and professional judgment; therefore, these areas would be approximate. The extent of created wetlands can only be verified with a wetland delineation at the completion of the project.

The geographic focus of the wetlands and riparian impact analysis is the dam, Anderson Ranch Reservoir and shoreline, area of proposed new water levels after the proposed dam raise, area of rim projects, and Cow Creek Road realignment area. The geographic focus also includes the shoreline immediately downstream of the dam (up to 1 mile). The dam raise is not anticipated to impact existing wetlands or create new wetlands outside of this area.

3.1.4 Impact Indicators and Significance Criteria

Impacts and significance criteria to wetlands are indicated by effects on the following.

Table 7. Wetland impact indicators and significance criteria

Impact Indicator	Significance Criteria
Alteration to wetland hydrology, hydrophytic vegetation, or hydric soils such that the area loses wetland characteristics, acreage, or the wetland type is altered.	Long-term or permanent adverse impacts on wetlands through direct removal, filling, hydrological interruption, or other means that exceeds 0.1 acres, which is the typical threshold for mitigation under Section 404 of the CWA.
Loss in riparian linear feet or change to the quality of the riparian corridor.	Long term loss of high-quality riparian corridors.

3.2 Direct, Indirect, and Cumulative Impacts

3.2.1 Alternative A – No Action

Under Alternative A, the baseline conditions as they occur currently would continue, and there would be no increase in the Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. Reclamation would continue to operate Anderson Ranch Dam as it currently does.

Under Alternative A at Anderson Ranch Reservoir wetlands and riparian areas found along the shoreline of Anderson Ranch Reservoir would continue to be exposed to varying levels of inundation because of ongoing operational fluctuations in water storage and releases. Anthropogenic activities effecting riparian quality such as roads, forestry, agriculture, recreation, and livestock grazing would also continue. Wetlands downstream of the dam

would continue to experience varying levels of inundation based on reservoir capacity and downstream water supply and irrigation needs. Wetlands that are present in the borrow areas, road realignment area, and rim project areas would not be impacted, as project construction would not occur and there would be no project-related temporary or permanent loss, alteration, or creation of wetlands or riparian areas. Wetlands and riparian areas under Alternative A would continue to be effected directly by exposure to varying levels of inundation and indirectly by anthropogenic activities; however, these impacts are not considered significant.

3.2.2 Alternative B – Anderson Ranch Dam Six-Foot Raise

The proposed 6-foot dam raise would result in activities that have the potential to impact wetlands and riparian areas, including inundation from the dam raise, projects along the rim of Anderson Ranch Reservoir, borrow areas, and access road construction.

Inundation from Dam Raise

Under Alternative B, the proposed full pool elevation of Anderson Ranch Reservoir would be increased by 6 feet, which would impact wetlands and riparian areas. To describe the impacts on the shoreline of Anderson Ranch Reservoir, the reservoir was split into two topographically unique areas: the South Fork Boise River varial zone and the rim of Anderson Ranch Reservoir, as described in Affected Environment in Section 2.

Rim Inundation

Wetlands

The increased pool elevation at Anderson Ranch Reservoir would impact approximately 11.031 acres of NWI palustrine wetlands,13.078 acres of NWI lacustrine wetlands, and less than 1 acre (0.385 acre) of NWI riverine wetlands, totaling 24.494 acres of NWI potential wetlands within the inundation area. As mentioned in the Affected Environment in Section 2, much of the rim of Anderson Ranch Reservoir is characterized by a narrow valley cut through several hundred feet of igneous extrusive and intrusive rock with slopes too steep to support emergent or submerged aquatic vegetation. As such, it is likely that most of the areas identified as lacustrine wetlands are not wetlands and are actually open water. However, since NWI mapped wetlands are used for the impact analysis, NWI defined lacustrine wetlands within the inundation area have been included in the analysis for consistency. The NWI lacustrine wetlands would experience increased inundation that may no longer support wetland characteristics; therefore, it is anticipated that these wetlands would be lost and the area would become open water. However, new lacustrine wetlands are expected to be created upgradient in response to the increased inundation.

The existing palustrine wetland fringe is located on flatter slopes around the rim of Anderson Ranch Reservoir and is classified as having emergent vegetation. As the water surface rises, it is anticipated that the lower to middle portions of the existing palustrine wetlands would shift to lacustrine wetlands as surface water depths exceed 8.2 feet. However, it is anticipated that palustrine wetlands would migrate upgradient in response to the increased

area of inundation. The lower portion of the new palustrine wetland edge may be in water depths not conducive to emergent vegetation growth but may be conducive to submerged and floating leaf aquatic vegetation growth.

Overall, impacts on wetlands around the perimeter of Anderson Ranch Reservoir due to this alternative would be long-term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 6-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alteration as a result of Alternative B is expected to be offset by the creation of wetlands upgradient.

Riparian Areas. The 6-foot dam raise could potentially impact several intermittent and perennial streams and their associated riparian zone within the project area. Table 8 summarizes the length of inundation based on linear feet (LF) of each of the NHD streams for which BURP assessments are available, the habitat scores, sinuosity, Rosgen stream type, anthropogenic activities observed, and the concluded quality of the existing riparian zone based on the assessment scores as described in Section 3.1 Methods for Evaluating Impacts. For analysis consistency, the South Fork Boise River and Cow Creek are included in Table 8 although the impacts on the riparian zone are analyzed in the sections below.

Evaluation of the BURP assessments for the eight streams within the rim inundation area indicates that most have a riparian corridor quality of fair to moderate. Fair to moderate disruptive pressures indicate that human activities have caused impacts, that the riparian vegetation zone is at least as wide to at least twice the width of the stream, and disruption is obvious or evident where 30% to 90% of potential plant biomass remains. Lester Creek, which would experience inundation along approximately 41 LF, is the only stream with a riparian corridor determined to be of moderate to high quality. This indicates that the riparian vegetative zone is at least four times the width of the stream and human activities have caused minimal visible impacts. Minimal disruption here is not affecting the community vigor, and 60% to 90% of the potential plant biomass remains.

Anthropogenic activities observed during these assessments include roads, forestry, agriculture, recreation, and livestock grazing. According to *Subbasin Assessment for the Upper Boise River Watersheds* (IDEQ, 2002), roads directly affect the natural sediment and hydrologic regimes by altering stream flow and riparian conditions within a watershed. Research findings from the assessment suggest that cattle grazing contributes significant damage to riparian areas, and stream banks are generally more unstable. Recreation, which is a predominant use in the project area, has had a steady impact on wetlands, floodplains, and riparian areas. Recreational overflow into non-developed areas due to popularity of the area has led to impacts on riparian vegetation and streambank stability in these isolated locations (IDEQ, 2002).

BURP assessments were not available for seven perennial streams totaling 537 LF and approximately 32 intermittent streams totaling 1,263 LF within the project area. These

perennial streams without BURP assessments include Elk Creek, Little Camas Creek, Rock Creek, Badger Creek, Curlew Creek, Louse Creek, and Wood Creek. It is assumed that the riparian corridors of these streams have been subject to varying levels of impact from similar anthropogenic and natural disturbances as summarized above and are therefore, of similar quality. Based on this similarity, the perennial and intermittent streams lacking BURP assessments are of fair to moderate quality.

Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas around the rim of Anderson Ranch Reservoir would be inundated from the permanent 6-foot increase in the full pool elevation. However, these impacts would be insignificant as the riparian corridors have been determined to not be high-quality habitat. The existing habitat has been subject to varying levels of impact from anthropogenic and natural disturbances.

Table 8. Alternative B - Inundation area quality of existing riparian zone

Stream	Type	Impacts on NHD Streams (LF)	Sample Year for BURP Assessment	Anthropogenic Activities Observed	Disruptive Pressures Score	Zone of Influence Score	Sinuosity	Rosgen Stream Type	Quality of Existing Riparian Zone*
Goat Creek	Perennial	170	1998	Beaver Complex, Roads	4	7	Moderate	Type F	**Fair to Moderate**
Castle Creek	Perennial	112	1998	Roads	7	7	Moderate	Type D	**Moderate**
Deer Creek	Perennial	6	2017	Forestry, Agriculture, Recreation	3	5	Low	Type B	**Fair**
Evans Creek	Perennial	40	2007	No data	5	6	Moderate	Type A	**Fair to Moderate**
Fall Creek	Perennial	19	2008	No Data	6	4	Low	Type G	**Fair to Moderate**
Lester Creek	Perennial	41	1998	Roads	7	9	Moderate	Type E	**Moderate to High**
Lime Creek	Perennial	69	2019	Roads, Recreation	8	6	Moderate	Type B	**Moderate**
Wilson Creek	Perennial	42	2019	Roads, Recreation, Grazing	4	5	Low	Type B	**Moderate**
South Fork Boise River	Perennial	1,157	1995	No Data	5	5	Moderate	Type B	**Fair**
Cow Creek**	Perennial	206	1998	Roads, Grazing	1	1	Low	Type B	**Low**

** The riparian corridor quality was designated based on the BURP assessment analysis.*

*** BURP data were not available for the perennial stream within the project area of the Cow Creek Road realignment; however, BURP data were available along the mainstem of Cow Creek less than one mile downstream from the project area. It is assumed the stream within the project area has been subject to varying levels of impact from similar anthropogenic and natural disturbances. Therefore, BURP information from Cow Creek is used in this analysis of the Cow Creek Road realignment project.*

Varial Zone

Wetlands. Currently, the vegetation composition in the varial zone is typically comprised of FACW and FAC vegetation species (Reclamation, 2019). With the increased inundation from the 6-foot permanent pool raise it is likely the connection to hydrology would be of sufficient duration during the growing season to shift the plant community composition to be predominantly comprised of FACW species. Due to the watering and dewatering of this area, a transition to a vegetation composition with a dominance of OBL species is not expected in the varial zone. It is also anticipated that emergent wetlands would migrate upgradient potentially creating wetlands where they currently do not exist. The lower portion of the new wetland edge may be in water depths not conducive to emergent vegetation growth; however, it may be conducive to submerged aquatic vegetation and floating leaf aquatic vegetation growth.

Overall, impacts on wetlands in the varial zone due to this alternative would be long-term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 6-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alteration as a result of Alternative B is expected to be offset by the creation of wetlands upgradient. The overall ecological function of the wetland/upland mosaic in the varial zone is expected to remain intact as it migrates upgradient in response to the increased full pool elevation.

Riparian Areas. Approximately 1,157 LF of the South Fork Boise River, a perennial stream, and 153 LF of one intermittent stream are expected to be impacted in the varial zone due to the increased inundation as a result of the 6-foot dam raise. As summarized in Table 8, the quality of the riparian corridor is considered fair, indicating that human activities have caused impacts, riparian vegetation zone is at least as wide to at least twice the width of the stream, and disruption is obvious or evident where 30% to 90% of potential plant biomass remains.

Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas within the varial zone would be inundated from the permanent 6-foot increase in the full pool elevation. However, these impacts would be insignificant because the riparian corridors are subject to periods of watering and dewatering and would likely continue to seasonally function as riparian areas. Additionally, the riparian areas in the varial zone have been determined to be of fair to moderate quality, the existing habitat is not high-quality habitat because it has been subject to varying levels of impact from anthropogenic and natural disturbances.

Rim Projects, Roadway Projects, and Borrow Areas

The rim projects include roadway projects, recreational facilities, and the realignment of Pine Airstrip. Rim projects involve both permanent roadway improvements (such as the Cow Creek Road realignment, abutment approach road, and roadway improvements), and temporary construction access road activities. Activities associated with recreational facility

improvements and construction as well as the Pine Airstrip could require clearing and grading activities in wetlands.

Wetlands. Construction activities associated with alternative B would result in adverse impacts on wetlands. NWI potential wetlands are mapped in staging areas, borrow pit areas, and the Cow Creek Road realignment area; any dredging or filling from activities such as excavation for borrow, fill for road construction, and site grading in these areas would alter the characteristics or acreage of those wetlands, constituting a long-term, direct, and adverse impact. In addition, activities associated with the reservoir rim projects, such as recreational facility modifications, roadway armoring, and culvert and bridge improvements may occur in areas where wetlands are present. A detailed description of the proposed rim projects is provided in the 6-foot Dam Raise Engineering Summary (Appendix C). Much of the proposed construction for the dam crest raise, cofferdam, and spillway approach is within previously disturbed areas that do not support wetlands. Construction associated with these features would not be expected to impact wetlands. Table 9 provides a summary of potential wetlands as identified by NWI within the areas of impact for the rim projects, Cow Creek Road realignment, staging areas, and borrow areas.

Table 9. Alternative B - NWI-defined wetlands within potential construction area

Impact Type	Wetland Type	Impact Duration	Acres
Roadway Riprap Placement and Mechanically Stabilized Earth Wall Construction	Lacustrine	Permanent	0.114
	Freshwater Emergent	Permanent	**0.085**
Pine Airstrip Realignment	Riverine	Permanent	**0.084**
Pine Bridge Construction	Riverine	Permanent	0.189
Lime Creek Bridge Armoring	Lacustrine	Permanent	0.134
Deer Creek Culvert	Lacustrine	Permanent	0.192
Fall Creek Culvert	Lacustrine	Permanent	0.009
	Riverine	Permanent	**0.055**
Campground Modifications and Improvements	Lacustrine	Permanent	0.443
	Freshwater Emergent	Permanent	**0.041**
	Freshwater Forested/Shrub	Permanent	**0.038**
Cow Creek Road Realignment	Freshwater Forested/Shrub	Permanent	**0.084**

Impact Type	Wetland Type	Impact Duration	Acres
Staging and Borrow Areas	Lacustrine	Temporary	0.019
	Freshwater Forested/Shrub	Temporary	0.273
	Freshwater Emergent	Temporary	1.698
		Total Impacts	**3.458**

Impacts from project construction activities on wetlands would be considered both long term and temporary, direct, and adverse. These impacts would be mostly permanent, except for the staging and borrow areas, where impacts would be temporary, as these areas would be returned to preconstruction conditions and do not require mitigation; therefore these temporary impacts are considered insignificant (Table 9). Permanent impacts on lacustrine wetlands are also considered insignificant as it is likely that the NWI identified lacustrine wetlands within the project area are actually open water, which does not meet the criteria for a wetland and does not provide the high quality function and value a lacustrine fringe wetland would. Impacts on wetlands at Pine Bridge would be negligible and insignificant because it is anticipated that riverine wetlands at the Pine Bridge would not change as a result of Alternative B. With the height of the structure increased, the wetted width of the river would remain the same post construction. The current riprap is performing sufficiently and there will be no net increase in riprap below reservoir pool elevations compared to existing conditions. All new riprap would be placed above reservoir pool elevations up to the anticipated increased water level to accommodate the increased inundation.

Culvert modifications will occur at Fall Creek and Deer Creek that are similar in scope. The NWI identified riverine wetlands at Fall creek, however none were identified at Deer Creek.

The remaining permanent impacts are on freshwater emergent, freshwater forested/shrub, and riverine wetlands, these are considered significant as they would result in the permanent fill of approximately 0.387 acres (bolded in Table 12) which is above the typical threshold for compensatory mitigation. Significant impacts would result from roadway riprap placement, mechanically stabilized earth wall construction, and construction of instream step pool weirs and culvert modifications at Fall Creek.

Riparian Areas. NHD streams were mapped in the area of impact for the Pine Creek Bridge improvements, the Deer Creek and Fall Creek culvert construction areas, the Pine airstrip realignment, and the Cow Creek Road realignment. Linear feet of disturbance and the quality of the existing riparian zone are summarized in Table 10.

Table 10. Alternative B - Riparian area within potential construction areas

Impact	Stream	Stream Type	Impacts (in LF of Disturbance) to NHD Streams	Quality of Existing Riparian Zone*
Pine Creek Bridge Improvements	South Fork Boise River	Perennial	39	Fair
Deer Creek Culvert	Deer Creek	Perennial	76	Fair
Fall Creek Culvert	Fall Creek	Perennial	75	Fair to Moderate
Pine Airstrip	Unnamed	Intermittent	185	Fair to Moderate**
Cow Creek Road Realignment***	Cow Creek	Intermittent	206	Low

** The riparian corridor quality was designated based on the BURP assessment analysis.*

*** Assumed to have been subject to varying levels of impact from similar anthropogenic and natural disturbances as nearby streams and are, therefore, of similar quality assumed to be fair to moderate.*

**** Assumed to have been subject to varying levels of impact from similar anthropogenic and natural disturbances as downstream Cow Creek and are, therefore, of similar quality assumed to be low.*

Overall, impacts on riparian areas would be considered long term, direct, and adverse because construction would occur within riparian areas and would be permanent. However, impacts would be insignificant due to the minimal extent of impact on riparian corridors and these areas have been determined to be of fair/fair to moderate/low quality.

Rim of Anderson Ranch Reservoir – Lime Creek

Lime Creek is designated as a protected recreational river by the Idaho Comprehensive State Water Plan: South Fork Boise River Sub-Basin, making it important to address riparian and wetland concerns in its vicinity (Idaho Water Resources Board, 1996). Near the mouth of the Lime Creek bridge, two potential impacts on wetlands/riparian areas have been identified. The first is protecting the existing bridge, which includes grading the slope to the original 1.5:1 with riprap installed up to the anticipated water level and extending a minimum of 25 feet beyond the bridge limits. Earthwork and riprap placement are not planned within the streambed of Lime Creek and construction would be completed during low reservoir levels and during low stream flows from Lime Creek. As depicted in Figure 5, NWI potential wetlands within the bridge protection area are designated as lacustrine; therefore, impacts occurring at the bridge would be classified as impacts on water within Anderson Ranch Reservoir, not within Lime Creek.

The second potential impact on wetlands in the vicinity of Lime Creek from Alternative B include the additional area of inundation due to the 6-foot rise of the full pool at Anderson Ranch Reservoir. The 6-foot rise has the potential to shift the habitat type from a riverine system to a lacustrine system. However, the extent of impact would be small with a maximum impact length of 69 LF of NHD perennial stream. Additionally, this area would continue to experience variability in stream flow and reservoir levels similar to baseline conditions.

Discussion of wetland and riparian impacts associated with Lime Creek are included in the Rim Inundation and Rim Projects, Roadway Projects, and Borrow Areas subsections above.

Downstream

Downstream of the dam, changes in the flow magnitude and timing of water would likely have an impact on the riparian shoreline vegetation. However, vegetation communities along riverine systems naturally experience high levels of disturbance from flood and drought conditions. As outlined in the Water Operations and Hydrology Specialist Report (Appendix B), baseline conditions indicate high variation, with little difference in average flow when the impact scenarios are compared to the baseline. Changes in peak flow may result in slightly less disturbance, and more established riparian vegetation, but overall, the change in operations would not differ significantly from the variation that occurs under baseline conditions and impacts on vegetation would be negligible.

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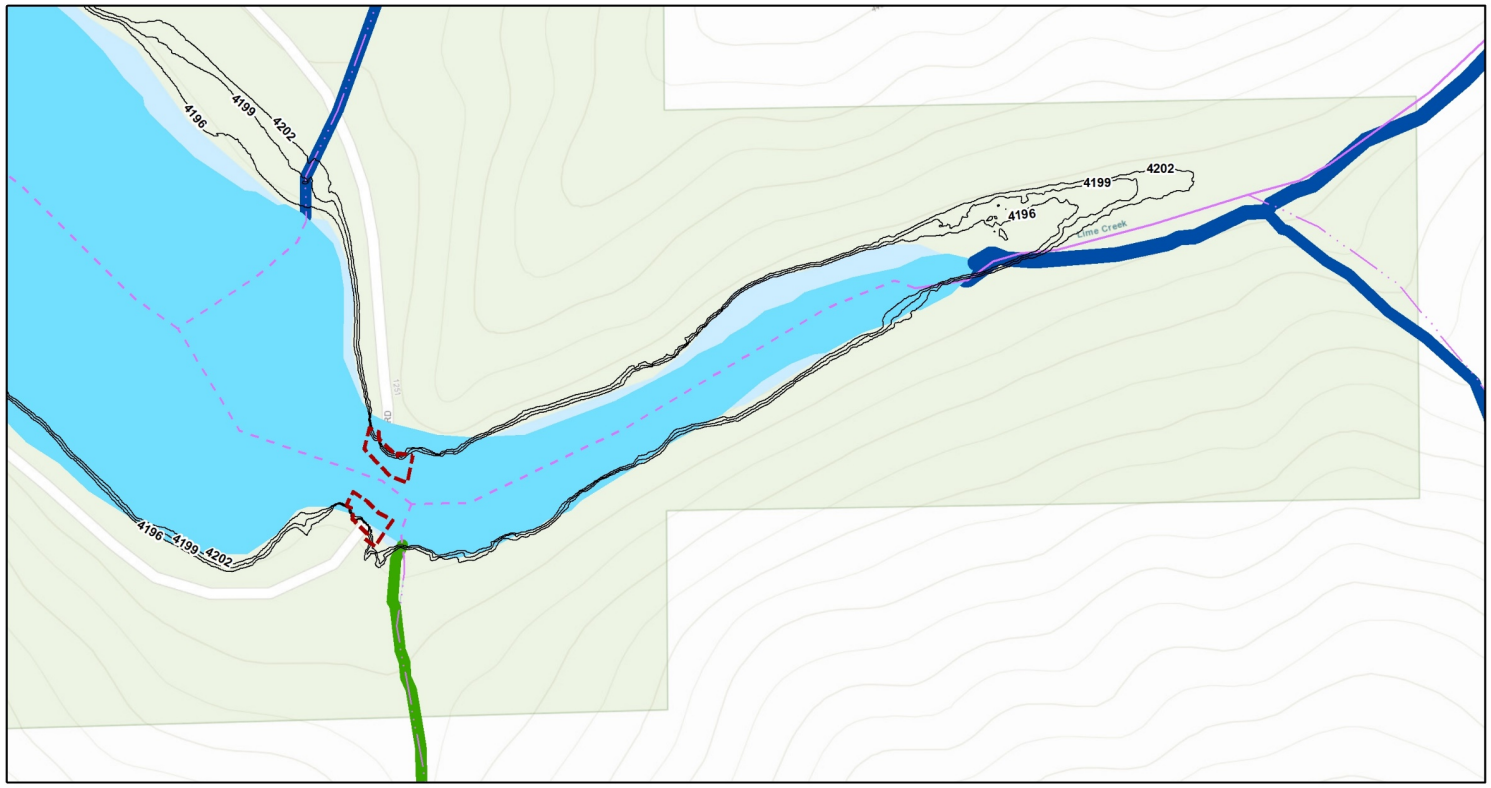

Figure 5. Wetlands and Waters Near the Mouth of Lime Creek
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3.2.3 Alternative C – Anderson Ranch Dam Three-Foot Raise

Similar to Alternative B, the proposed 3-foot dam raise would result in activities that have the potential to impact wetlands and riparian areas, including inundation from the dam raise, projects along the rim of Anderson Ranch Reservoir, borrow areas, and access road construction.

Inundation from Dam Raise

Under Alternative C, the proposed full pool elevation of Anderson Ranch Reservoir would be increased by 3 feet, which would impact wetlands and riparian areas. The types of impacts that would occur from Alternative C would be similar to those described above for Alternative B, but impacts would be anticipated to be lower in extent for Alternative C as less land surrounding the reservoir would be inundated. As with Alternative B, impacts on the shoreline are described in terms of the South Fork Boise River varial zone and the rim of Anderson Ranch Reservoir, as described in Affected Environment in Section 2.

Rim Inundation

Wetlands. Under Alternative C, the increased pool elevation at Anderson Ranch Reservoir would impact approximately 8.774 acres of NWI palustrine wetlands, 7.098 acres of NWI lacustrine wetlands, and less than 1 acre (0.146 acre) of NWI riverine wetlands, totaling 16.018 acres of NWI potential wetlands within the inundation area. The migration of wetlands upgradient and change of the lower existing wetland edge from emergent to supporting submerged or floating leaf aquatic is as described for Alternative B but at a lesser extent as less area would be inundated as a result of Alternative C.

Overall, impacts on wetlands around the perimeter of Anderson Ranch Reservoir due to this alternative would be long-term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 3-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alteration as a result of Alternative C is expected to be offset by the creation of wetlands upgradient.

Wetland impacts under Alternative C would be at a lesser extent than under Alternative B as less acres of potential wetlands surrounding the reservoir would be inundated; however, these impacts are considered insignificant as they are expected to be offset by the creation of wetlands upgradient.

Riparian Areas. As with Alternative B, the 3-foot dam raise could potentially impact intermittent and perennial streams and their associated riparian zone within the project area. The inundation and other characteristics for NHD streams is summarized on Table 11, including the quality of existing riparian habitat as outlined in Section 3.1 Methods for Evaluating Impacts. The South Fork Boise River and Cow Creek are included in Table 11 but are analyzed in the sections below.

BURP assessments were not available for seven perennial streams totaling 347 LF and approximately 31 intermittent streams totaling 532 LF within the project area. These perennial streams without BURP assessments include Elk Creek, Little Camas Creek, Rock Creek, Badger Creek, Curlew Creek, Louse Creek, and Wood Creek. The quality of the existing riparian zone based on information from the BURP assessments would be the same as those described above for Alternative B.

Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas around the rim of Anderson Ranch Reservoir would be inundated from the permanent 3-foot increase in the full pool elevation. However, these impacts would be insignificant as the riparian corridors have been determined to not be high-quality habitat. The existing habitat has been subject to varying levels of impact from anthropogenic and natural disturbances.

Riparian impacts under Alternative C would be at a lesser extent than Alternative B as less linear length of NHD identified streams would be impacted. As with Alternative B, impacts on riparian areas are considered insignificant as impacts are not to high-quality riparian corridors.

Table 11. Alternative C - Inundation area quality of existing riparian zone

Stream	Type	Impacts on NHD Streams (LF)	Sample Year for BURP Assessment	Anthropogenic Activities Observed	Disruptive Pressures Score	Zone of Influence Score	Sinuosity	Rosgen Stream Type	Quality of Existing Riparian Zone*
Goat Creek	Perennial	79	1998	Beaver Complex, Roads	4	7	Moderate	Type F	**Fair to Moderate**
Castle Creek	Perennial	57	1998	Roads	7	7	Moderate	Type D	**Moderate**
Deer Creek	Perennial	3	2017	Forestry, Agriculture, Recreation	3	5	Low	Type B	**Fair**
Evans Creek	Perennial	18	2007	No data	5	6	Moderate	Type A	**Fair to Moderate**
Fall Creek	Perennial	8	2008	No Data	6	4	Low	Type G	**Fair to Moderate**
Lester Creek	Perennial	20	1998	Roads	7	9	Moderate	Type E	**Moderate to High**
Lime Creek	Perennial	28	2019	Roads, Recreation	8	6	Moderate	Type B	**Moderate**
Wilson Creek	Perennial	26	2019	Roads, Recreation, Grazing	4	5	Low	Type B	**Moderate**
South Fork Boise River	Perennial	367	1995	No Data	5	5	Moderate	Type B	**Fair**
Cow Creek**	Perennial	206	1998	Roads, Grazing	1	1	Low	Type B	**Low**

** The riparian corridor quality was designated based on the BURP assessment analysis.*

*** BURP data were not available for the perennial stream within the project area of the Cow Creek Road realignment; however, BURP data were available along the mainstem of Cow Creek less than one mile downstream from the project area. It is assumed the stream within the project area has been subject to varying levels of impact from similar anthropogenic and natural disturbances. Therefore, BURP information from Cow Creek is used in this analysis of the Cow Creek Road realignment project.*

Varial Zone

Wetlands. Under Alternative C, wetland characteristics and impacts within the varial zone would be similar to those discussed for Alternative B. As such, the increased inundation from the 3-foot permanent pool raise would likely be of sufficient duration during the growing season to shift the plant community composition to be predominantly comprised of FACW species. It is also anticipated that emergent wetlands would migrate upgradient potentially creating wetlands where they currently do not exist. The lower portion of the new wetland edge may be in water depths not conducive to emergent vegetation growth; however, it may be conducive to submerged aquatic vegetation and floating leaf aquatic vegetation growth.

Under Alternative C, impacts on wetlands in the varial zone would be long-term and direct because the impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 3-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alteration as a result of Alternative C is expected to be offset by the creation of wetlands upgradient. The overall ecological function of the wetland/upland mosaic in the varial zone is expected to remain intact as it migrates upgradient in response to the increased full pool elevation. Overall, wetland impacts under Alternative C would be at a lesser extent than under Alternative B as less acres of potential wetlands in the varial zone would be inundated; however, impacts under both alternatives would be insignificant.

Riparian Areas. Approximately 367 LF of the South Fork Boise River, a perennial stream, and 62 LF of one intermittent stream are expected to be impacted in the varial zone due to the increased inundation as a result of the 3-foot dam raise. As summarized in Table 11, the quality of the riparian corridor is considered fair.

Under Alternative C impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas within the varial zone would be inundated from the permanent 3-foot increase in the full pool elevation. However, these impacts would be insignificant because the riparian corridors are subject to periods of watering and dewatering and these areas would likely continue to seasonally function as riparian areas. Additionally, the riparian areas in the varial zone have been determined to be of fair to moderate quality because the existing habitat is not high-quality habitat because it has been subject to varying levels of impact from anthropogenic and natural disturbances. Overall, riparian impacts under Alternative C would be at a lesser extent than Alternative B as less linear length of NHD identified streams would be impacted; however, impacts under both alternatives would be insignificant.

Rim Projects, Roadway Projects, and Borrow Areas

Under Alternative C, construction activities associated with reservoir rim projects, the Cow Creek Road realignment, and borrow/staging areas would be similar in scope to those described above for Alternative B and would constitute long-term, direct, and adverse

impacts. In general, rim project footprints would be decreased under Alternative C, and some projects, such as the Pine Airstrip and Pine Bridge and their associated staging areas, would no longer be needed under Alternative C. Borrow areas under Alternative C would be the same as described under Alternative B.

Wetlands. Table 12 provides a summary of potential wetlands as identified by NWI within the areas of impact for the rim projects, Cow Creek Road realignment, staging areas, and borrow areas.

Table 12. Alternative C - NWI-defined wetlands within potential construction area

Impact Type	Wetland Type	Impact Duration	Acres
Roadway Riprap Placement and Mechanically Stabilized Earth Wall Construction	Lacustrine	Permanent	0.113
	Freshwater Emergent	Permanent	**0.013**
Lime Creek Bridge Armoring	Lacustrine	Permanent	0.114
Deer Creek Culvert	Lacustrine	Permanent	0.192
Fall Creek Culvert	Lacustrine	Permanent	0.008
	Riverine	Permanent	**0.054**
Campground Modifications and Improvements	Lacustrine	Permanent	0.443
	Freshwater Emergent	Permanent	**0.041**
	Freshwater Forested/Shrub	Permanent	**0.038**
Cow Creek Road Realignment	Freshwater Forested/Shrub	Permanent	**0.084**
Staging and Borrow Areas	Lacustrine	Temporary	0.019
	Freshwater Forested/Shrub	Temporary	0.239
	Freshwater Emergent	Temporary	1.364
		Total Impacts	**2.722**

Impacts from project construction activities on wetlands would be considered both long term and temporary, direct, and adverse. Impacts from construction would be mostly permanent, except for the staging and borrow areas, where impacts would be temporary, as these areas would be returned to preconstruction conditions and do not require mitigation. Given this, temporary impacts are considered insignificant (Table 9). Permanent impacts on lacustrine wetlands are also considered insignificant as it is likely that the NWI identified lacustrine wetlands within the project area are actually open water, which does not meet the criteria for

a wetland and does not provide the high quality function and value a lacustrine fringe wetland would.

Culvert modifications will occur at Fall Creek and Deer Creek that are similar in scope. The NWI identified riverine wetlands at Fall creek, however none were identified at Deer Creek.

The remaining permanent impacts are on freshwater emergent, freshwater forested/shrub, and riverine wetlands and these are considered significant as they would result in the permanent fill of approximately 0.230 acres (bolded in Table 12) which is above the typical threshold for compensatory mitigation. Significant impacts would result from roadway riprap placement, mechanically stabilized earth wall construction, and construction of instream step pool weirs and culvert modifications at Fall Creek.

The types of impacts on wetlands from rim projects, the Cow Creek Road realignment, roadways, and staging and borrow areas would be similar to those described under Alternative B; however, there would be 0.157 less acres of impacts on potential wetlands under Alternative C as project footprints would be smaller and certain rim projects would no longer be needed under this alternative.

Riparian Areas. NHD streams were mapped in the area of impact for the Deer Creek and Fall Creek culvert construction areas and the Cow Creek Road realignment. The linear feet of disturbance and the quality of the existing riparian zone are summarized in Table 13.

Table 11. Alternative C - Riparian area within potential construction areas

Impact	Stream	Stream Type	Impacts to NHD Streams	Quality of Existing Riparian Zone*
Deer Creek Culvert	Deer Creek	Perennial	76	Fair
Fall Creek Culvert	Fall Creek	Perennial	75	Fair to Moderate
Cow Creek Road Realignment	Unnamed	Intermittent	206	Low**

** The riparian corridor quality was designated based on the BURP assessment analysis.*

*** Assumed to have been subject to varying levels of impact from similar anthropogenic and natural disturbances as downstream Cow Creek and are, therefore, of similar quality assumed to be low.*

Overall, riparian zone impacts under Alternative C are anticipated to be less adverse than under Alternative B, as projects such as the Pine Airstrip and Pine Bridge are not needed for the 3-foot raise. Under Alternative C impacts on riparian areas would be considered long term, direct, and adverse because construction activities would occur within the riparian areas and would be permanent. However, impacts would be insignificant due to the minimal extent of impacts on riparian corridors and that these areas have been determined to be of fair/fair to moderate/low quality.

Rim of Anderson Ranch Reservoir – Lime Creek

Lime Creek is designated as a protected recreational river by the Idaho Comprehensive State Water Plan, making it important to address riparian and wetland concerns in its vicinity. As with Alternative B, earthwork and riprap placement to protect and armor the bridge at Lime Creek are not planned within the streambed of the creek and construction would be completed during low reservoir levels and during low stream flows from Lime Creek. NWI potential wetlands within the bridge protection area are designated as lacustrine; therefore, impacts occurring at the bridge would be classified as impacts on water within Anderson Ranch Reservoir, not within Lime Creek.

An additional potential impact includes a shift of habitat type from a riverine system to a lacustrine system due to inundation from the 3-foot rise of the permanent pool. However, the extent of impact would be small with a maximum impact length of 28 LF of NHD perennial stream. Additionally, this area would continue to experience variability in stream flow and reservoir levels similar to baseline conditions.

Discussion of wetland and riparian impacts associated with Lime Creek are included in the Rim Inundation and Rim Projects, Roadway Projects, and Borrow Areas subsections above.

Downstream

Impacts on riparian shoreline vegetation downstream of the dam would be as described under Alternative B. Overall, Alternative C would not result in significant variation in water flow magnitude or timing and impacts on riparian vegetation and habitat would be negligible.

3.2.4 Cumulative Impacts

Cumulative effects are analyzed for Alternative B and Alternative C. Cumulative effects are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The cumulative effects analysis considers projects, programs, and policies that are not speculative and are based on known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable. While no present actions are identified, Reclamation has identified two past actions: Pine Bridge replacement and the Anderson Ranch Dam crest raise for security enhancement. Reclamation has also identified two potential future actions to be considered for the cumulative impact analysis: Cat Creek Energy Project and South Fork Boise River Diversion Project. Additional project proposal information for these, as known by Reclamation to date, is provided in Chapter 2 of the EIS.

The Pine Bridge replacement resulted in one bridge being replaced with another bridge in the same location, and therefore would not have changed the overall wetlands in the area. The Anderson Ranch Dam crest raise was completed on top of the existing dam and would not have impacted wetlands. Therefore, these past projects would not contribute to cumulative effects.

Alternatives B or C would result in permanent loss and/or change in wetland type and riparian areas due to construction and inundation. Information regarding the two projects is limited but for purpose of this analysis, it can be assumed that the Cat Creek Energy project would also cause loss or change in potential wetlands and riparian areas from installing a pipeline from Anderson Ranch reservoir to Cat Creek reservoir, construction of the Cat Creek Reservoir, and installation of the wind and solar energy equipment. The South Fork Boise River Diversion Project would also cause loss or change in potential wetlands and riparian areas from the installation of a pipeline. Cumulatively, the effects of the Cat Creek Energy project and the South Fork Boise River Diversion Project along with either Alternative B or C would likely contribute to direct adverse effects on wetlands.

3.2.5 Mitigation

Impacts on wetlands and riparian resources due to inundation or fill are anticipated to occur around the rim of Anderson Ranch Reservoir, in the varial zone, and in the project footprints for the rim projects. In accordance with EO 11990, impacts from construction activities would be minimized and avoided in wetland and waterway areas to the maximum extent practicable. The location of site clearing, staging areas, access routes, stockpile areas, and material handling areas would be in locations that minimize the overall disturbance to riparian vegetation, and preclude sediment delivery to water resources, including wetlands and riparian areas. Many of the selected locations for the projects previously mentioned will be on formerly disturbed ground. Efforts to reduce the potential for sediment to enter water resources will include the placement of certified weed free silt fences, straw bales, straw wattles, or other sediment barriers around disturbed sites prior to construction and will be kept in place until erosion control is assured. All project operations will be ceased, except efforts to minimize storm or high-flow erosion, during precipitation and high-flow conditions that result in uncontrollable erosion in the construction area. Additionally, all in-water work would be completed during low water/low flow periods. Construction, staging, and borrow areas will be monitored and issues will be addressed as necessary and a supply of erosion control materials will be kept readily available to quickly respond to sediment emergencies that may arise during construction.

Conservation measures that would be implemented to manage vegetation impacts, including wetland and riparian vegetation, are outlined in the Vegetation Specialist Report. In general, temporarily disturbed wetland and/or riparian vegetation would be seeded with native species and monitored for success, infestations of invasive species would be monitored and controlled as directed by Reclamation, and efforts would be taken to reduce the risk of introducing aquatic invasive species into waters within the project area.

Prior to beginning construction activities, Reclamation would work with USACE, as well as state and local agencies, to obtain all applicable permits, including CWA Section 401 and Section 404 permits. Reclamation would direct the development and execution of mitigation measures that offset the permanent wetland impacts of the selected alternative.

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