BUREAU OF RECLAMATION

Boise River Basin Feasibility Study

Specialist Report:

Threatened and Endangered Species

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
asl	above sea level
BiOp	biological opinion
BNF	Boise National Forest
DEIS	Draft Environmental Impact Statement
DPS	distinct population segment
eDNA	environmental DNA
ESA	Endangered Species Act
FMO	foraging, migration, and overwintering
FR	*Federal Register*
IDFG	Idaho Department of Fish and Game
IPaC	Information for Planning and Consultation
m	meter
MBTSG	Montana Bull Trout Scientific Group
MIS	management indicator species
NEP	nonessential experimental population
NOAA	National Oceanic and Atmospheric Administration
O&M	operations and maintenance
Reclamation	Bureau of Reclamation
RMRS	Rocky Mountain Research Station
SNF	Sawtooth National Forest
USACE	U.S. Army Corps of Engineers
T&E	threatened and endangered
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
YBCC	yellow-billed cuckoo

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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 reservoir 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 to threatened and endangered species as described in the EIS.

1.1 Regulatory Framework

The Endangered Species Act (ESA) protects species that are listed as endangered, threatened, or proposed for listing. Pursuant to the ESA, a federal agency must consult with the U.S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration (NOAA) Fisheries (as appropriate) to ensure that any actions it authorizes, funds, or carries out, would not jeopardize the continued existence of the listed species or destroy or adversely modify critical habitat.

Pursuant to Section 7 of the ESA, the Bureau of Reclamation (Reclamation) has contacted NOAA Fisheries and USFWS to request information about listed and candidate T&E species that may be present within the project area (referred to as action area under ESA consultation) of the evaluated proposed alternatives under the Boise River Basin Feasibility Study. No listed species under the jurisdiction of NOAA Fisheries occur in the project area and none would be affected by any of the action alternatives downstream of the project area. Therefore, species under the jurisdiction of NOAA are not discussed further in this document. A list of T&E species that have potential to occur in the project area and are under the jurisdiction of USFWS was initially generated through the Information for Planning and Consultation (IPaC) online project planning tool on June 4, 2019. This list was initially updated on December 10, 2019 (01EIFW00-2019-SLI-1774, 01EIFW00-2020-E-00619) and once again on May 12, 2020. Reclamation is currently consulting with USFWS for effects to species under their jurisdiction that may occur in the project area.

2 Affected Environment

This T&E Species Specialist Report describes the affected environment related to the proposed alternatives under the Boise River Basin Feasibility Study. Chapter 2 of the EIS describes the project area for T&E species potentially affected by the evaluated alternatives under the Boise River Basin Feasibility Study. The alternatives are evaluated in their respective areas below.

The project area for T&E species analyzed for the no action alternative, as well as both structural action alternatives —Alternative B and Alternative C is the same. The primary project area relating to all Alternatives refers to the general vicinity in and around Anderson Ranch Reservoir extending downstream to the extent of Arrowrock Dam, via the South Fork Boise River.

Idaho is a diverse state comprised of semiarid shrub- and grass-covered plains, irrigated agricultural valleys, volcanic plateaus, forested mountains, woodland- and shrubland-covered hills, glaciated peaks, lava fields, and wetlands. The state is divided into ecoregions that group areas of similar ecosystems by type, quality, and quantity.

T&E resources analyzed include all lands and/or waters within the project area that provide potential habitat for listed species, and their designated critical habitat that may be affected as a result of either the existing operation of Reclamation activities or by future construction activities and water operations related to the action alternative.

The USFWS IPaC web site for environmental review identifies all ESA listed, proposed, and candidate species for each county (USFWS, 2020).

T&E species identified by USFWS that are known or expected to occur in Elmore County, Idaho, and may be affected under Alternative B and Alternative C include three federally listed species, one species proposed for listing, and one candidate species. Federally listed species are yellow-billed cuckoo (YBCC) (*Coccycus americanus*), Canada lynx (*Lynx canadensis*), and bull trout (*Salvelinus confluentus*). North American wolverine (*Gulo gulo luscus*) is proposed for listing as threatened and whitebark pine (*Pinus albicaulis*) is a candidate for listing. Critical habitat has been designated for Canada lynx and bull trout, and proposed for YBCC. Only critical habitat for bull trout occurs in the project area (Table 1).

Table 1. USFWS federally listed species potentially occurring in the project area

Species (DPS)	Listing Status	Critical Habitat in Project Area
Yellow-billed Cuckoo (*Coccycus americanus*)	Threatened: October 2014 (79 FR 59991)	No
Canada Lynx (*Lynx canadensis)*	Threatened: March 24, 2000 (65 FR 16052)	No
North American Wolverine (*Gulo luscus*)	Proposed Threatened: August 2016 (81 FR 71670)	No
Whitebark Pine (*Pinus albicaulis*)	Candidate: July 19, 2011 (76 FR 42631)	No
Bull Trout (*Salvelinus confluentus*)	Threatened: June 10, 1998 (63 FR 31647)	Yes

DPS = distinct population segment

FR = Federal Register

Canada lynx and North American wolverine

Affected areas for Canada lynx and North American wolverine include all areas upslope of waters described below for bull trout potentially affected as a result of noise, ground disturbance, and other activities (including lighting at night and alternative transportation routes) that may occur as a result of the action alternatives. No suitable habitat for Canada lynx occurs in these areas however, North American wolverine may utilize these areas as they move between higher elevation habitats in surrounding mountain ranges. Noise levels over the level of a conversation (approximately 60 decibels) may affect quiet communication between individuals of wildlife species. Noise analysis for the project indicates that this level would occur about 800 feet to 3000 feet from all construction footprints (including staging areas and access routes), which is the furthest extent of noise impacts associated with construction that would be anticipated to occur.

Yellow-billed cuckoo

Affected areas for YBCC include all areas upslope of waters described below for bull trout potentially affected as a result of noise, ground disturbance, and other activities (including lighting at night and alternative transportation routes) that may occur as a result of the action alternatives. Although no suitable nesting or breeding habitat is considered present in these areas, YBCC may utilize the area during migration. Noise impacts would occur about 800 feet to 3000 feet from all construction footprints (including staging areas and access routes), which is the furthest extent of noise impacts associated with construction that would be anticipated to occur.

Whitebark pine

Affected areas for whitebark pine include all areas potentially affected as a result of ground disturbance and other construction activities (including fugitive dust) that may occur as a result of the action alternatives. This is anticipated to extend approximately no more than 100 feet from all construction footprints (including staging areas and access routes), which is the furthest extent impacts associated with construction on immobile species would be anticipated to occur. All of these areas however occur below 5000 feet, which is considered outside of the elevation range of whitebark pine (which are considered to only occur above 7300 feet).

Bull trout

Anderson Ranch Reservoir and entering tributaries, the South Fork Boise River downstream of Anderson Ranch (including its tributaries) and Arrowrock Reservoir and entering tributaries support migratory populations of bull trout. This encompasses all aquatic environments that provide habitat for foraging, migrating and overwintering (FMO) bull trout and may be potentially affected by construction activities (e.g., dam raise, bridges, culverts, roadways); altered environmental conditions (e.g., elevated pool and downstream releases); and operation and maintenance activities under all the action alternatives.

2.1 Existing Conditions

2.1.1 Terrestrial Habitat Conditions

The terrestrial environment in the project area is a mix of developed and un-developed areas at an elevation ranging from 4100 to 5000 feet above sea level (asl). There are many rural residences scattered through the project area with areas of denser development. Other developed areas include recreational resorts and developed campgrounds. Some undeveloped areas are used for dispersed recreation. Habitats include areas are a mix of coniferous forest, mixed coniferous-deciduous forests, shrublands, open sagebrush steppe, and semiarid uplands. Riparian vegetation is found along the tributaries to Anderson Ranch and Arrowrock reservoirs and scattered around the edge of both reservoirs. The South Fork Boise River below Anderson Ranch Dam has a well-developed, but not contiguous, riparian zone interspersed with upland grassland and sage. The undeveloped areas have considerable human activity due to the popularity of both reservoirs and the South Fork Boise River with recreationists. Road densities in the South Fork Boise River subbasin range from 0 to 4.36 miles per square mile (IDEQ, 2008).

2.1.2 Aquatic Habitat Conditions

Reclamation operates the Boise River reservoir system as a unified storage system for joint irrigation and flood control. Construction on Arrowrock Dam, located on the Boise River approximately 22 miles upstream from the city of Boise, began in 1911. As the population and infrastructure in the Treasure Valley increased, water demands and the need for flood

control increased. Reclamation constructed Anderson Ranch Dam in 1954 on the South Fork Boise River 42 river miles upstream from Arrowrock Dam.

In the 1950s, the U.S. Army Corps of Engineers (USACE) built Lucky Peak Dam, approximately 10 miles upstream from Boise, to provide additional flood risk management for the Treasure Valley. Reclamation and USACE operate the three storage dams in a coordinated method for their authorized purposes. Individual facility authorizations include Anderson Ranch Reservoir: irrigation water supply, power development, flood control, with dead storage space providing for silt control, fish conservation, and recreation; Arrowrock Reservoir: irrigation water supply; and Lucky Peak Reservoir: irrigation water supply, flood control, and recreation

To the extent possible, water is stored in the uppermost reservoir (Anderson Ranch) to maximize refill capabilities of the system. At full pool, Anderson Ranch Reservoir stores 474,900 acre-feet of water with a surface elevation of 4196 feet and a surface area of 4743 acres. Slightly more than 413,000 acre-feet of the full volume is active storage. Flood control operations could occur from November 1 through May 31 and the reservoirs typically reach their greatest volume in May or early June.

From April to October, Reclamation drafts Arrowrock Reservoir for irrigation. At full pool, Arrowrock Reservoir stores 271,700 acre-feet of water with a surface elevation of 3216 feet and a surface area of 3141 acres. The lowest reservoir volumes occur October through March. In wet years, volumes may drop in early spring to meet flood control criteria (Reclamation, 2004).

In general, the project area provides a diversity of suitable habitat for bull trout to forage, migrate, and overwinter. These habitats include deep reservoir habitat that provides cold water refugia for bull trout during most times of the year, shallow shoreline habitat that promotes increased primary productivity and supports a diversity of prey fishes (Idaho Department of Fish and Game [IDFG], 2019g), and complex riverine habitats in the South Fork, Middle Fork, and Nork Fork Boise Rivers, and additional tributaries entering the system. This diversity of habitat supports an abundant food base consisting of terrestrial organisms, aquatic macroinvertebrates, and forage fish in both the reservoirs and their tributaries (including the South Fork Boise River).

Anderson Ranch Dam does not have fish passage capability; however, bull trout above and below the dam have access to spawning habitat. Downstream of Anderson Ranch Dam, bull trout populations can move freely from Arrowrock Reservoir up into the Middle and North Fork Boise Rivers to spawn, as well as the South Fork Boise River (to the extent of the Anderson Ranch Dam) to forage and overwinter (Salow and Hostetler, 2004). Connectivity to tributaries entering the reservoirs is maintained under most conditions. *Biological Opinion for Bureau of Reclamation Operations and Maintenance in the Snake River Basin above Brownlee Reservoir* (2005 BiOp; (USFWS, 2005) identified operational conditions for both Anderson Ranch and Arrowrock reservoirs to minimize impacts of bull trout. Since that time, Reclamation has operated the system to meet these operational conditions, as specified in the

2005 BiOp. For Anderson Ranch Dam, Reclamation identified a reservoir storage volume above 62,000 acre-feet (this volume includes powerhead and dead space) through the end of September as an operational condition to minimize impacts to water quality in dry water years (USFWS, 2005, pp. 254). For Arrowrock Dam, Reclamation identified the mean daily reservoir operation below a surface water elevation above 3100 feet (37,912 AF storage volume) from September 15 to October 31 as an operational condition to minimize impact to the migration corridor and predation (USFWS, 2005, pp. 258). In cases where storage volumes drop below identified operation indicators, adverse effects to water quality and migratory corridors may occur. Otherwise, water quality in the reservoirs and the South Fork Boise River is suitable for all life stages of bull trout and releases of cold water (that extend into the summer) out of Anderson Ranch Reservoir provide additional cold water refugia and habitat in the South Fork Boise River than likely occurred under historic conditions and provides colder summer temperatures compared to nearby unmanaged systems, with reduced diel fluctuations (Benjankar et al., 2018).

2.1.3 Yellow-Billed Cuckoo

The YBCC is a medium-sized, slender long-tailed nearctic-neotropical migrant (Hughes, 2015) found throughout North America. The breeding range of the species formerly included most of North America from southeastern and western Canada to the Greater Antilles and northern Mexico (78 FR 61621).

The western distinct population segment (DPS) of the YBCC was designated as threatened on October 3, 2014 (79 FR 59991). The western DPS includes populations in portions of 12 western states west of the crest of the Rocky Mountains, with the Canadian and Mexican borders constituting the northern and southern boundaries, respectively (78 FR 61621). Critical habitat was proposed on December 2, 2014 (79 FR 78321) and includes portions of Arizona, California, Colorado, Idaho, New Mexico, Nevada, Texas, Utah, and Wyoming. No proposed critical habitat for YBCC exists in the project area or vicinity. The closest critical habitat is on the lower Wood River.

Life History and Habitat Requirements

The western YBCC's preferred habitat contains a combination of a dense willow understory for nesting and a cottonwood overstory for foraging (Gaines and Laymon, 1984). Canopy height is typically 15 feet to 100 feet with the understory 3 feet to 18 feet high (Laymon and Halterman, 1989). Western YBCC breed in large blocks of riparian habitat (larger than 212 acres and at least 328 feet wide), particularly woodlands with cottonwoods and willows (78 FR 61621). Sites with less than 40% canopy closure are unsuitable, those with 40% to 65% are marginal to suitable, and those with more than 65% are optimal (Laymon and Halterman, 1989).

Most nesting in the western region occurs between June and early August, with nests often placed in willows, cottonwoods, and shrubs (Gaines and Laymon, 1984). Clutch size ranges from one to five eggs (Hughes, 2015). Primary foraging items include caterpillars, crickets,

cicadas, grasshoppers, and katydids. Small frogs and salamanders may also be consumed (Hughes, 2015). Seeds and fruits form part of their diet on wintering grounds. Although riparian areas are the primary feeding ground, open areas, woodlands, orchards, and adjacent streams are also used (Hughes, 2015).

Status of Yellow-Billed Cuckoo in the Project Area

Four recorded sightings of western YBCC have occurred in north and central Idaho (Taylor, 2000). Although rare, more sightings have occurred in southern Idaho, including Owyhee, Canyon, Ada, Twin Falls, and Elmore counties (Taylor, 2000). Seven sightings have been made in the 2000s in the IDFG Southwest Region (IDFG, 2019a). One sighting was approximately 6 miles north of Arrowrock Reservoir in 2001 and two different sightings were made approximately 6 miles north of Arrowrock Reservoir in 2000 (IDFG, 2019a). All three sightings were reported at different locations.

The closest reported observation to the project area was two yellow-billed cuckoos near Prairie in Elmore County in 1979 (Rogers, 1979; IDFG, 2019a). Most reports of breeding birds in Idaho have come from locations along the Snake River in southeastern Idaho (Taylor, 2000). The Lake Lowell, Canyon County location is the only place in Idaho where the species has been observed more than once (1970s, 1980s, and 1990s) in a single location (Taylor, 2000).

Suitable closed canopy cottonwood/willow habitat is located along the South Fork Boise River up and downstream of Pine Bridge. The extent of the habitat is estimated to be approximately 75 acres. The habitat within the project area is not large enough to provide breeding habitat but could be used for foraging or during migration. Riparian habitat is also found downstream of the Anderson Ranch Dam mostly on the south side of the river. The downstream riparian habitat is fragmented and not large enough to serve as suitable YBCC nesting habitat.

There is no proposed critical habitat for YBCC in the project area or vicinity. The closest proposed critical habitat is on the lower Wood River, approximately 50 miles east of Anderson Ranch Reservoir.

2.1.4 Canada Lynx

The Canada lynx (*Lynx canadensis*) is a medium-sized cat with long legs, large, well-furred paws, long tufts on the ears, and a short, black-tipped tail. The species' historical range included Alaska, Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

The Canada lynx was listed as a threatened species on March 24, 2000 (65 FR 16052). The final rule lists the DPS of the Canada lynx in the contiguous U.S. as threatened. The contiguous U.S. DPS includes Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. Critical habitat was finally determined to include wherever the lynx occurs in the contiguous U.S. (79 FR 54781). Critical habitat for Canada lynx has not been designated for this species

in or near the project area. The closest designated critical habitat is in western Wyoming/southwestern Montana.

Life History and Habitat Requirements

Canada lynx are solitary carnivores generally occurring at low densities in southern boreal forest habitats (65 FR 16052). Within most of their range, Canada lynx densities and population dynamics are strongly tied to the distribution and abundance of snowshoe hare *(Lepus americanus*; Ruediger et al., 2000). Kittens are born in May or June and typically remain with their mothers until about 10 months of age. Females may not reproduce during food shortages, and food availability directly correlates with the survival probability of young Canada lynx. Few kittens are born or survive when food is scarce (Ruediger et al., 2000).

The primary forest types used by lynx in the western U.S. are moist forest cover types including lodgepole pine, Engelmann spruce, and subalpine fir (Interagency Lynx Biology Team, 2013). A variety of stand ages and structures of forest cover is needed to provide suitable lynx habitat for denning and foraging. On a landscape scale, suitable Canada lynx habitat includes a mosaic of early seral stages that support snowshoe hare populations and late seral stages of dense old growth forest that provide ideal denning, security, and red squirrel habitat. Lynx have large home ranges, so connectivity between populations is critical. Dispersal corridors and linkage habitat is typically several miles wide with only narrow gaps (Interagency Lynx Biology Team, 2013). Large tracts of continuous coniferous forest are most desirable for Canada lynx travel and dispersal.

Status of Canada Lynx in the Project Area

Five Canada lynx sightings have been reported in the IDFG Southwest Region in the 2000s (IDFG, 2019b). One of those was north of Garden Valley, Idaho, in 2019, and another was in the Shafer Butte area north of Boise, Idaho, in 2012 (IDFG, 2019b). Two reported sightings were in Elmore County, both approximately 19 miles north of Pine, Idaho. One individual was observed in 1996, and tracks were found in 1997 (IDFG, 2019b).

Habitat in the action area is not suitable for Canada lynx. Denning and rearing habitat requires deep snow, which would not occur in the action area. Summer and winter habitat depend on the presence of main prey species snowshoe hare or red squirrel. Prey habitat does not exist in the action area. Connectivity between suitable habitats requires linkage habitat several miles wide with only small breaks. There is no dispersal corridor in the action area.

2.1.5 North American Wolverine

The North American wolverine (*Gulo gulo luscus*) resembles a small bear with a bushy tail. It has a round, broad head; short, rounded ears; and small eyes. The species' historical range included Colorado, Idaho, Minnesota, Montana, Nevada, North Dakota, Utah, and Wyoming.

The DPS of the North American wolverine was proposed to be listed as threatened in 2013 (78 FR 7863). At the same time, USFWS proposed to establish a nonessential experimental

population (NEP) of the North American wolverine in Colorado, Wyoming, and New Mexico (78 FR 7890). This was in response to Colorado reviewing re-introduction of the North American wolverine in that state. In 2014, USFWS withdrew the proposed threatened status rule and the proposed NEP rule (79 FR 47521). The District Court for the District of Montana vacated the 2014 proposed withdrawal rule, which resulted in reopening the comment period for the original 2013 proposed threatened listing (81 FR 71670). The current listing status is proposed threatened.

Life History and Habitat Requirements

North American wolverine occur in very low densities and are associated year-round near areas with permanent snowpack. North American wolverines are opportunistic feeders that primarily scavenge carrion within large home ranges. They are known for traveling long distances over rough terrain in search of food. North American wolverine summer habitat in Idaho is associated with high-elevation whitebark pine communities with steep slopes and coarse talus (Jacobs, 2019; IDFG, 2014). The primary habitat during winter is mid-elevation conifer forest, and summer habitat is subalpine areas associated with high-elevation cirques (IDFG, 2019c). In Idaho, North American wolverine historically occupy alpine and subalpine habitats of the Rocky Mountains (IDFG, 2014). Home ranges of adult females in central Idaho average 148 square miles and home ranges of adult males average 588 square miles (IDFG, 2019c).

Female North American wolverines use natal (birthing) dens that are excavated in snow and breeding generally occurs from late spring to early fall (78 FR 7863), with litters containing one to five kits born from mid-February through March. Persistent, stable snow greater than 1.5 meters (m) (5 feet) deep appears to be a requirement for natal denning, because it provides security for offspring and buffers cold winter temperatures. In Idaho, natal den sites occur above 2500 m (8200 feet) on rocky sites, such as north-facing boulder talus or subalpine cirques (steep-walled semicircular basin carved by a glacier) in forest openings (78 FR 7863).

Status of North American Wolverine in the Project Area

There have been 21 reported sightings of North American wolverines in Elmore county since 1974 (IDFG, 2019d). Sightings in or near the action area and some from further away include the following locations.

- 2019 – 40 miles north of Pine
- 2014 – 19 miles north of Pine
- 2007 – tracks south of Atlanta
- 2009 – tracks 19 miles north of Pine
- 2006 – 31 miles northwest of Pine
- 2002 – carcass 5 miles NW of Pine

- 1995 – 2 miles west of Anderson Ranch Dam
- 1991 – just north of Prairie
- 1983 – 2 miles west of Anderson Ranch Dam
- 1974 – less than 1 mile south of the South Fork Boise River and 2 miles from the upper end of Anderson Ranch Reservoir pool.

Alpine and subalpine habitats used by North American wolverines are not present in the action area. However, they travel long distances between habitats foraging for food. Suitable habitat is found in the upper areas of surrounding mountain ranges, and the occasional sighting of North American wolverines near the action area indicates they do move through the South Fork Boise River drainage periodically.

2.1.6 Whitebark Pine

Whitebark pine is a 5-needle conifer and a member of the white pine subgenus. It ranges from 16 feet to 66 feet tall, exhibits a rounded or irregularly spreading crown shape, and is typically found at alpine tree lines or subalpine elevations (76 FR 42631). It is known to occur in Washington, Oregon, Nevada, California, Montana, Idaho, and Wyoming, and in British Columbia and Alberta, Canada (81 FR 87246).

Whitebark pine was listed as a candidate species on July 19, 2011 (76 FR 42631). It remains a candidate species as of the last endangered and threatened wildlife and plant review of native species that are candidates for listing as endangered or threatened (81 FR 87246).

Life History and Habitat Requirements

On sites with a high conifer density, whitebark pine tends to grow as tall, single-stemmed trees. On open, more exposed sites, it tends to have multiple stems. It takes a krummholz form (stunted, shrub-like growth) above tree line (76 FR 42631). It can tolerate poor soils, windy exposures, and steep slopes. Whitebark pine is a slow-growing, long-lived tree that often lives for 500 and sometimes more than 1000 years (76 FR 42631). Whitebark pine grows under a wide range of precipitation amounts, from about 20 inches to more than 100 inches per year. It is found as a climax species and an early successional species. It can be a mid-successional species as a codominant with other tree species. It typically occurs in stands of mixed species, but it occurs in pure or nearly pure stands at high elevations (76 FR 42631).

Whitebark pine seeds cannot be wind disseminated; therefore, primary seed dispersal occurs almost exclusively by Clark's nutcrackers (*Nucifraga columbiana*) in the avian family Corvidae (whose members include ravens, crows, and jays). Its regeneration and location are facilitated through the nutcracker's seed-caching activities (76 FR 42631).

Status of Whitebark Pine in the Project Area

Whitebark pine is distributed throughout Elmore County at high elevations from 7300 feet to 10,500 feet (U.S. Forest Service [USFS], 2019; IDFG 2019e). Whitebark pine are not considered to occur at elevations below 7300 feet, which defines the lower extent of their

range. The action area elevation ranges from 4100 feet to 5000 feet, well below 7300 feet and therefore whitebark pine are not expected to occur in an ecologically functional density within the action area.

2.1.7 Bull Trout

The Columbia River Basin bull trout (*Salvelinus confluentus*) DPS was listed (under a final rule) as threatened under the ESA on June 10, 1998 (63 FR 31647). All populations of this char in the contiguous 48 states were designated with threatened status on November 1, 1999 (64 FR 58910). On October 18, 2010 (75 FR 63897), USFWS designated critical habitat for bull trout throughout their U.S. range. Critical habitat for bull trout came into effect on November 17, 2010, and is designated for the project area, including waters of Anderson Ranch Reservoir, the South Fork Boise River between Anderson Ranch and Arrowrock reservoirs.

Life History and Habitat Requirements

Bull trout have a complex life history, heavily influenced by the habitat in which they live. Bull trout can exhibit resident (remaining in the spawning and rearing streams throughout their entire lives), fluvial (migrate between streams and larger rivers), or adfluvial (migrate between streams and lakes/reservoirs) life history strategies (Pratt, 1992).

Habitat characteristics including water temperature, stream size, substrate composition, cover, channel stability, migratory corridors and hydraulic complexity have been associated with distribution and abundance (Jakober, 1995; Rieman and McIntyre, 1993). The habitat components required by bull trout are often summed up by the four Cs: cold, clean, complex, and connected. Bull trout exhibit patchy distributions because even under pristine conditions, the required habitat components are not ubiquitous throughout river basins. High-quality bull trout habitat is typically characterized by abundant cover in the form of large wood, undercut banks, and boulders; clean substrate for spawning; interstitial spaces large enough to conceal juvenile bull trout; and stable channels. Juveniles prefer larger substrate and deep pools along with other forms of complex cover (Montana Bull Trout Scientific Group [MBTSG], 1998).

Bull trout have repeatedly been associated with the coldest stream reaches within basins. Very cold water is required for incubation (8°C [46°F]), and juvenile rearing appears to be restricted to areas with cold water (15°C [59°F]) (MBTSG, 1998). However, because they can display several life history types within a single geographic area, they can also be found in larger, warmer river systems that may cool seasonally or provide migratory corridors and important forage bases.

Many factors can potentially limit the distribution of spawning and rearing habitat for bull trout, including barriers, water temperature, interactions with non-native fish species, geomorphic processes, or human disturbances. However, because migratory fish are not dependent upon a single type of habitat for all life stages, the species may be more resistant to catastrophic disturbance.

Adult migratory bull trout are primarily piscivorous (Rieman and McIntyre, 1993). Their food preferences include whitefish, smelt, sculpins, eggs drifting following redd construction, and other salmonids. Juvenile bull trout prey on terrestrial and aquatic insects, micro-zooplankton, and small fish (Donald and Alger, 1993; McPhail and Baxter, 1996).

Soon after spawning in the fall, out-migrating adults move downstream to larger waterbodies where they take advantage of higher productivity and deeper pools for overwintering (Fraley and Shepard, 1989). Adult bull trout are observed to migrate primarily from dusk until dawn (McPhail and Murray, 1979; Swanberg, 1997; Downs et al., 2006). Young bull trout emerge from redds in the spring and then out-migrate during periods of increased flow to rear in the most suitable and areas within a drainage (Leider et al., 1986) consisting of adequate temperature and cover formed by substrate and large woody debris (Fraley and Shepard, 1989).

Status of Bull Trout in the Project Area

Bull trout in the action area may belong to any of 29 local populations from two core areas encompassing the Boise River system in the Upper Snake Bull Trout Recovery Unit. Bull trout are known to use spawning and rearing areas in at least 11 streams or stream complexes (i.e., local populations) in the Anderson Ranch Core Area and 18 in the Arrowrock Core Area (USFWS 2015, pp. E-98-99). Almost all of the local populations occur on forested land managed by the Boise National Forest (BNF) and the Sawtooth National Forest (SNF), which conduct stream surveys for bull trout as a management indicator species (MIS) for their respective Land and Resource Management Plans. Reclamation periodically conducts stream and reservoir surveys and radio-telemetry studies for bull trout during ESA Section 7 consultations for various proposed actions at the storage facilities (Reclamation, 2006). IDFG surveys fish populations in streams, lakes, and reservoirs for their fisheries management activities (IDFG bull trout plan or fishery management plans). Surveys in spawning and rearing habitat primarily use electrofishing or snorkeling techniques while those in FMO habitat primarily use weirs, rotary screw traps, or gill nets. Environmental DNA (eDNA) sampling is used by USFS to determine the presence or absence of bull trout to focus electrofishing effort for their MIS programs.

Anderson Ranch Core Area

The Anderson Ranch Core Area (Figure 1 and Figure 2) encompasses Anderson Ranch Reservoir and the upper South Fork Boise River system. Local populations of bull trout include Elk Creek, Trinity Creek, Willow Creek, Deadwood Creek, Boardman Creek, Skeleton Creek, Bear Creek, Ross Fork Creek, Emma Creek, Big Smokey Creek, and Bluff Creek (USFWS, 2015a p. E-98). Genetic analysis shows bull trout in this core area differ in their colonization history, expressing a distinctly different genetic structure than bull trout of the Arrowrock Core Area that predates dam construction (Whiteley et al., 2003).

Local populations with a migratory life history that use Anderson Ranch Reservoir as FMO habitat are known from a radio-telemetry study conducted by IDFG in 1998–1999 (Partridge et al,. 2000). Adults migrate from the reservoir to spawning areas in Ross Fork, Emma

Creek, Bear Creek, Big Smoky Creek, Boardman Creek, Skeleton Creek, and Willow Creek, with post-spawning migrations back to the reservoir or the mainstem South Fork Boise River occurring in the fall (Partridge et al. 2000). Subadult migrations to the reservoir also occur in the fall and comprised about 20% of the 151 bull trout captured during operation of the IDFG kokanee weir near the Pine Road Bridge in 2008 (Grunder, 2009).

The IDFG telemetry study (2000) identified migratory life history in 7 of the 11 local populations, it is likely that additional studies would document similar migrations in most, if not all of the other four populations as well. Many of these populations also contain a resident life history component (USFWS, 2015a p. E-8). Thus, the Anderson Ranch Core Area conserves the full diversity of bull trout life histories in the expression of the resident, fluvial, and adfluvial forms.

In 2005, IDFG assessed the abundance of bull trout (>70 mm) across Idaho and estimated there were 10,412 fluvial and resident bull trout in the Anderson Ranch Core Area (High et al., 2005). Average density across all stream sites where bull trout were present in the southwest Idaho core areas was 2.7 bull trout per 100 meters (High et al., 2005). The abundance and densities of bull trout vary over the years and correlate with large-scale climatic conditions, with stream flow 3 and 4 years previous the most important index for bull trout in Idaho (Copeland and Meyer, 2011). Based on this and other information, IDFG concluded that status and trend of bull trout in the core area is increasing and the risk of extirpation in the foreseeable future is low (Meyer et al., 2014).

Bull trout in the upper South Fork Boise River are most abundant in the Boardman and Skeleton creek populations and are monitored by SNF as index sites. In 2002, USFS staff sampled 283 bull trout in the Boardman Creek drainage and 93 bull trout in the Skeleton Creek drainage. More than 70% of the bull trout sampled in these drainages were shorter than 150 millimeters (mm; 59 inches) and less than 5% were greater than 200 mm (7.8 inches). Using multiple pass depletion methods bull trout densities were calculated and those values used to estimate population sizes in reaches not surveyed but with suitable habitat. A total bull trout population of 6200 (1600 longer than 150 mm) was estimated in Boardman Creek and 2200 bull trout (700 longer than 150 mm) in Skeleton Creek prior to spawning during 2002 (Reclamation 2004a). In addition, weirs with trap boxes operated from late August through late October captured 85 out-migrating bull trout at the Boardman Creek weir and 69 out-migrating bull trout at the two Skeleton Creek weirs. Nearly all bull trout trapped were traveling downstream. Only one of the bull trout captured at the weirs was less than 150 mm in length, but only nine were greater than 300 mm (11.8 inches) total length. For the three weir sites combined, 77% of the downstream migrants were from 175 mm (6.8 inches) to 249 mm (9.8 inches) in length (Kenney, 2003).

During 2011 to 2015, SNF resurveyed index sites in Boardman and Skeleton creeks. Bull trout densities in rearing areas varied each year and in Boardman Creek ranged from 2.67 fish/100 m in 2011 to 18.04 fish/100 m in 2013 (Vuono, 2015). A similar pattern occurred in Skeleton Creek, with densities ranging from 7.26 fish/100 m in 2012 and 15.29 fish/100 m in 2013 (Vuono, 2014).

Anderson Ranch Reservoir

During the telemetry study from 1998–1999, the number of bull trout using the reservoir was estimated as 370 individuals, with a range in length from 215 mm (8.4 inches) to 737 mm (29.0 inches; Partridge et al., 2000). Bull trout leave the reservoir in late spring and enter spawning areas in local populations of the upper watershed in late July or August (Partridge et al., 2000). Thirty-seven of 57 radio-tagged bull trout migrated out of the Anderson Ranch Reservoir between May and June. Telemetry indicates bull trout are in the Anderson Ranch Reservoir or in the upper watershed during the IDFG recommended in-water work window of July 15 through August 31 for the mainstem South Fork Boise River (Partridge et al., 2000). Most bull trout return to Anderson Ranch Reservoir between mid-September and the end of November, where they remain until late spring/early summer when they begin their upstream spawning migration again (Partridge et al., 2000). Tagged bull trout were relocated throughout the reservoir, with about half using the upper third or north end of the pool, and few in the southern end near the dam.

In 1975, bull trout were captured in Fall Creek, one of the tributaries of the reservoir, during IDFG electrofishing surveys at elevations of 4720 feet, 5680 feet, and 6040 feet (Partridge et al., 2000). In 1998, a radio tagged bull trout (code 151.054) was located in the Fall Creek bay of the reservoir and in Fall Creek just downstream of the HD 113 culvert from late May to late August (Partridge et al., 2000 p. 8). Recent surveys by BNF showed positive detections of bull trout eDNA at four sites in Fall Creek and its tributary Meadow Creek (Rocky Mountain Research Station [RMRS] eDNA rangewide website map; Young, 2019). Follow up electrofishing surveys have yet to be conducted, but these positive detections indicate the Fall Creek culvert is at least seasonally passable and may depend on elevation of the reservoir (BNF, 2019).

Limited surveys have not found bull trout in Lime and Deer creeks, the other major tributaries to Anderson Ranch Reservoir (Partridge et al., 2000). However, stream temperatures and climate modeling indicate there is a greater than 0.10 probability of bull trout occurrence in several patches of less 11°C in the headwaters (Isaak et al., 2015), indicating these two tributaries are good candidates for future eDNA surveys (Young et al., 2019).

Arrowrock Core Area

The Arrowrock Core Area includes Arrowrock Reservoir, the South Fork Boise River downstream of Anderson Rock Dam, Middle Fork Boise River, and North Fork Boise River.

Local populations of bull trout include Upper Crooked River, Bear River, Bear Creek, Lodgepole Creek, Upper North Fork Boise River, Cow Creek, Big Silver Creek, Johnson Creek, Blackwarrior Creek, Little Queens River, Queens River, Yuba River, Grouse Creek, Decker Creek, Buck Creek, Roaring River, Sheep Creek, and Rattlesnake Creek (USFWS, 2015b RUIP p.E-99). Genetic analysis shows bull trout in this core area differ in their colonization history, expressing a distinctly different genetic structure than bull trout of the Anderson Ranch Core Area that predates dam construction (Whiteley et al., 2003). Kirby

Dam on the Middle Fork Boise River noticeably reduced gene flow into the Yuba River (Whiteley et al., 2003) and a fish ladder was constructed to restore migratory connectivity and promote persistence of bull trout above the dam. Issues with operation of the ladder currently prevent full passage during the migration season and require resolution (Flatter et al., 2011).

Several radio-telemetry or passive integrated transponder (commonly referred to as PIT) tag studies conducted from 1999–2015 identified the migratory life history in 11 of the 18 local populations in the core area (Flatter, 1999; Salow, 2004; Stiefel, 2007; Maret and Schultz, 2013; Prisciandaro, 2015; MacCoy et al., 2017). Migrations to and from spawning areas occur in the Upper North Fork Boise River, Johnson Creek, Lodgepole Creek, and Crooked River in the North Fork Boise River and Queens River, Little Queens River, Blackwarrior Creek, Roaring River, and Yuba River in the Middle Fork Boise River (Flatter, 1999). Other migratory populations may be identified with additional geographic information system analysis of Reclamation's recently completed telemetry geodatabase (MacCoy et al., 2017) or with future telemetry studies. Many of the local populations also contain a resident life history component (USFWS 2015b, RUIP p. E-8). Thus, the Arrowrock Core Area conserves the full diversity of bull trout life histories in the expression of the resident, fluvial, and adfluvial forms.

In 2005, IDFG assessed the abundance of bull trout (>70 mm) across Idaho and estimated there were 53,028 bull trout in the Arrowrock Core Area (High et al., 2005). Average density across all stream sites where bull trout were present in the Southwest Idaho core areas was 2.7 bull trout per 100 meters (High et al., 2005). The abundance and densities of bull trout vary over the years and correlate with large-scale climatic conditions, with stream flow 3 and 4 years previous the most important index for bull trout in Idaho (Copeland and Meyer, 2011). Based on the currently available information, however, IDFG concluded that status and trend of bull trout in the core area is unknown (USFWS, 2015b RUIP; Meyer et al., 2014).

MIS monitoring documents shifting occupancy of suitable bull trout patches in Arrowrock and Anderson Ranch core areas (Mitchell and Roerick, 2013; Vuono, 2015). It appears bull trout populations remained stable between 2003 and 2013 but an updated analysis is not due until 2020. However, while more suitable patches are occupied and bull trout presence in that examined timeframe may be more robust than was initially thought (Mitchell and Roerick, 2013), recent monitoring indicates a declining trend in the North and Middle Fork Boise subbasin, based on absence in two previously occupied patches, including the local population in Bear Creek (USFS, 2018; Young, 2019).

Electrofishing at sites in the North Fork Boise River indicates lower levels of abundance in 2015 compared to 1999–2002 at several sites, with the exception of the Upper North Fork local population, which showed an increase in bull trout density to 6 fish/100 m (Vuono, 2015). Overall, the decrease is consistent with the effects of drought in the early 2000s compounded by the effects to bull trout during the valve replacement project at Arrowrock Dam (Salow, 2004; Copeland and Meyer, 2011). The numbers of migrating bull trout

captured at a weir on the North Fork Boise River from 1999 to 2006 and 2011 to 2013 show a similar pattern. In 2000, 434 bull trout were captured but only 47 were captured in 2006 (Reclamation, 2007). During 2011 to 2013, however, the number of bull trout increased to 105, indicating population numbers had stabilized and may be increasing (Reclamation, 2014).

In the Middle Fork Boise River, recent eDNA surveys in the Yuba River drainage detected bull trout at most stream sites sampled (Young, 2019). This indicates there may be more bull trout in the Yuba River, Decker Creek, and Grouse Creek local populations than suggested by limited previous electrofishing surveys.

Arrowrock Reservoir

Arrowrock Reservoir constitutes an important FMO area for migratory bull trout. Subadults and adults migrate into Arrowrock Reservoir from upstream local populations in tributaries of the North and Middle Forks of the Boise River (Salow, 2004; Monnot et al., 2008). The reservoir serves as FMO habitat for bull trout from October through late spring and early summer (Salow and Hostettler, 2004; Stiefel, 2007). Most detections of radio-tagged fish occurred in the upper portion of Arrowrock Reservoir, with the remainder distributed throughout the middle and lower portions of Arrowrock Reservoir and the arm extending up the South Fork Boise River drainage (Stiefel, 2007). Bull trout exhibited a three-stage pattern of movement in the reservoir, with a brief residence near the transition zone after arrival, then dispersal throughout the reservoir before returning to the original arrival location with prolonged residence prior to out-migration. Subadult dispersal was of short duration and less extensive than for adults. The majority of telemetry locations were in offshore areas, with movements in open water areas of the reservoir consistent with the behavior of a foraging piscivores, suggesting bull trout may benefit from maintenance of water surface elevations of at least 3106 feet (Stiefel, 2007).

More recent telemetry studies were conducted from 2011 through 2013 using tags with additional recording capabilities (Maret and Schultz, 2013), followed by another study through 2017 (MacCoy et al., 2017) and found little use of the lower reservoir, with most bull trout located in the Middle Fork Boise and South Fork Boise arms of the reservoir. Similar to previous studies, however, the South Fork Boise River was used throughout the year by migratory bull trout that then moved upriver out of Arrowrock Reservoir by early to mid-June. Telemetry locations indicated use of both open water and shoreline habitat with daily patterns of movements between both. Condition factor analysis for bull trout and prey species indicate prey across trophic levels is not limited in the reservoir under baseline conditions.

Many of the bull trout migrate out of Arrowrock Reservoir to upstream riverine areas from February through June where they find cooler water temperatures and available spawning habitat. This migratory component is very important to the recovery, overall health, and long-term persistence of this fish species to allow populations to reestablish in reaches where bull trout have been extirpated (Rieman and McIntyre, 1993; Rieman et al., 1997; Whiteley et al.,

2003). Some bull trout may remain in the reservoir and primarily use the mainstem South Fork Boise River downstream from Anderson Ranch Dam over the entire summer (Salow and Hostettler, 2004; Benjamin et al., 2020).

A mark/recapture study (during 1998) in Arrowrock Reservoir estimated that approximately 354 (95% CI = 131-575) bull trout longer than 300 mm (11.8 inches) were present in the reservoir (Flatter, 1999). A mark/recapture study (during 2011/2012) conducted by IDFG and Reclamation captured 96 bull trout during autumn in 2011, 66 bull trout during spring in 2012, and 102 bull trout during autumn of 2012; however, a sufficient number of recaptured fish was not obtained to update estimates of bull trout using the reservoir (IDFG, 2013; Reclamation, 2013).

South Fork Boise River

Bull trout use the South Fork Boise River downstream from Anderson Ranch Dam year-round as FMO habitat (Salow and Hostettler, 2004; Steifel, 2007; Maret and Schultz, 2013, Benjamin et al., 2020). Approximately 50% of bull trout that were radio-tagged in the Middle Fork Boise River and North Fork Boise River migrated into the South Fork Boise River each fall and resided there during at least part of the winter (Salow and Hostettler, 2004; Monnot et al., 2008). The total number of bull trout that use the South Fork Boise River is not known because recapture rates are too low for estimation, but IDFG incidentally captures between 5 and 15 bull trout ranging in size from 275 mm (10.8 inches) to 578 mm (22.7 inches) during their October transect surveys conducted for rainbow trout (IDFG, 2009, IDFG, 2011; IDFG, 2013). Warm winter and cold summer water temperatures in the river may influence bioenergetics and alternate year spawning strategies in females (Benjamin et al., 2020).

Bull trout spawning probably does not occur within the mainstem South Fork Boise River downstream of the dam, but a resident local population with a migratory life history component spawns in its tributary Rattlesnake Creek (Rieman et al., 1997).

3 Environmental Consequences

3.1 Methods for Evaluating Impacts

Potential habitat for listed T&E species and their critical habitat within the project area were analyzed. Expected presence of listed T&E species was based on habitat suitability, known or anticipated occurrence of individuals, and available literature. Identification of potential impacts to listed T&E species that may occur as a result of the action alternatives, and/or the no action alternative, focuses on areas temporarily or permanently disturbed by construction activities, new infrastructure both at the dam site or peripheral areas such as new bridges or campgrounds, all upstream and downstream (to and including Arrowrock Reservoir) waters to be directly or indirectly affected, and the extent to which noise and other activities associated with construction would occur.

Any identified shift from existing conditions (also referred to as baseline conditions under ESA consultation and used synonymously in this report) to anticipated conditions as a result of project alternatives, and operations and maintenance (O&M) activities that would be required once project construction is completed forms the basis of analyses. This includes all areas that would be affected by either the existing operation, proposed construction activities, or by future water operations and anticipated conditions related to any of the action alternatives.

Impacts to listed T&E species were determined relative to the following.

1. Potential suitable habitat is directly or indirectly removed, modified, disturbed, or destroyed due to implementation of project alternatives.
2. Designated critical habitat as identified by USFWS (75 FR 63897, 79 FR 54781, 79 FR 78321) is directly or indirectly removed, modified, disturbed, or destroyed due to implementation of project alternatives.
3. Implementation of project alternatives would be anticipated to directly or indirectly impact individual listed T&E species.

3.1.1 Assumptions

The following assumptions were used in the affected environment analysis.

- Data required for analyzing effects and making determinations (i.e., inundation models, reservoir levels, downstream flow releases, detailed project alternative descriptions) were provided by Reclamation.
- Reclamation provided prior biological assessments/BiOps and results of Reclamation-authored studies and models conducted to date.
- Reclamation provided species list from USFWS through the IPaC online tool that is part of the Environmental Online Conservation System.
- No field studies were conducted specifically for this analysis.

- Potential for suitable habitat and occurrence of species was based on the USFWS species list, previous Reclamation consultations, and other Reclamation-authored studies.
- Best available scientific data for listed T&E species in the project area was identified through a comprehensive data search and coordination with state and federal land management and regulatory agencies.
- Reclamation provided a list of Reclamation-authored projects (past, present, and foreseeable future) to be included in the cumulative effects evaluation.
- USFS and state of Idaho provided a list of USFS- and state of Idaho-authored projects (past, present, and foreseeable future) to be included in the cumulative effects evaluation.

3.1.2 Significance Criteria

Potential short-term impacts were identified if construction activities would temporarily displace T&E species. Long-term impacts were identified if project components and operational conditions could cause permanent displacement. Adverse impacts were identified if changes would cause T&E species mortality.

Impact Indicator	Significance Criteria
Population reduction	Result in the "take" of any listed T&E species to the extent that it would reduce existing populations to the extent that it would "jeopardize the continued existence" of that species.
Modify or destroy designated critical habitat	"Adversely modify or destroy designated critical habitat" (i.e., migration, breeding, rearing, forage, refuge, or other important life history stage or habitat requirement).

As defined under ESA, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct; may include significant habitat modification or degradation if it kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.

As defined under ESA, to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.

As defined under ESA, a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.

3.2 Direct, Indirect, and Cumulative Impacts

3.2.1 Alternative A – No Action

Current conditions would continue under Alternative A. There would be no additional short-term or long-term adverse effects on T&E resources resulting from Alternative A other than those that occur under existing conditions. No effect on YBCC, Canada lynx, North American wolverine, and whitebark pine would occur under the No Action Alternative.

Effects to bull trout in the project area under the No-Action Alternative and current water management strategies (USFWS, 2005 and USFWS, 2014) in Anderson Ranch Reservoir, South Fork Boise River, and Arrowrock Reservoir would remain relativelyconsistent with baseline conditions and have already been covered under prior ESA consultations. Current and ongoing effects related to habitat, water temperature, and passage would largely persist. However, the extent of these effects may be slightly exacerbated as a result of shifting hydrologic regimes due to climate change (see the Climate Variability Specialist Report in Appendix B).

Overall, the extent and quality of habitat for T&E resources would not change under Alternative A. There would continue to be effects (consistent with existing conditions) on bull trout because baseline conditions would be for the most part maintained. No significant impacts to listed T&E species under the No-Action Alternative would be anticipated to occur.

The current BiOps (USFWS 2005 and USFWS, 2014) identify specific criteria that that must be met to minimize adverse effects to bull trout. Under the No-Action Alternative, Reclamation would continue to minimize adverse effects to bull trout by implementing criteria specified under the current BiOps. The current BiOp provides incidental take coverage to Reclamation for the operations of existing facilities. Operation and maintenance activities would continue to have persistent long-term adverse effects on bull trout and their critical habitat as covered under the current incidental take statement granted by USFWS in 2005 and 2014 (USFWS, 2005 and USFWS, 2014). Upon expiration of coverage under the current BiOps (USFWS, 2005 and USFWS, 2014) it is expected Reclamation would reinitiate consultation.

Under Alternative A, no additional conservation measures or environmental commitments, other than those currently identified in existing BiOps (USFWS, 2005 and USFWS, 2014) would occur.

3.2.2 Alternative B – Anderson Ranch Dam Six-Foot Raise

Under Alternative B, short-term effects would occur from construction required to raise the dam 6 feet and from construction of other required infrastructure.

Canada Lynx and Whitebark Pine

Construction activities under Alternative B would have no significant effect on Canada lynx and whitebark pine.

No records of Canada lynx sightings are known for the project area (IDFG, 2019b). The project area does not provide habitat suitable for Canada lynx to use as core or denning habitat. No habitat exists for its main prey species (snowshoe hare and red squirrel). There is no suitable dispersal corridor habitat. No Canada lynx are expected to occur in the project area.

The elevation of the action area (less than 5000 feet asl) is well below the elevation at which whitebark pine are recognized to grow (7300 feet to 10,500 feet asl). No ecologically functional density of whitebark pine has been identified within the analysis area.

Furthermore, no whitebark pine are expected to occur in the action area, and there would be no effect to whitebark pine as a result of Alternative B.

Yellow-billed Cuckoo

Although YBCCs have been seen near the project area and may fly through it, they are unlikely to breed and nest there. Based on Google Earth imagery, there are approximately 75 acres of suitable habitat upstream and downstream of the Pine Bridge. The area provides habitat for foraging and may provide resting habitat during migration. Noise associated with construction has the potential to displace YBCC that may be using the area for forage or resting habitat during active construction periods or hinder use of the area by any individuals that may fly through the area. This however would not be anticipated to occur at a level that would significantly affect YBCC in the project area, and displacement of individuals or hinderance of use would not persist after construction is completed. If YBCC using the area during construction activities are displaced, similar proximate habitat exists upstream of the project area, within the South Fork Boise River drainage, that could be used by YBCC until construction activities are completed. The potential for short-term adverse effects to YBCC from construction activities is considered discountable, and effects that may occur would be anticipated to be minimal. YBCC would not be significantly affected as a result of construction activities under Alternative B.

North American Wolverine

North American wolverine are known to occasionally occupy habitat near the action area (IDFG, 2019d). Although not common, when North American wolverines are present in or near the project area, they may be disturbed by the noise and lights of construction activity. The road along the South Fork Boise River would see an increased level of traffic, including large construction vehicles, for several years as traffic is routed away from the dam. The action area does not support denning or rearing habitat. The action area may include migration corridors and dispersing juveniles or migrating adults would likely avoid construction areas during periods when activities are occurring or may pass through at night. Individuals that may move through the project area could encounter construction activity but not at a level that would be anticipated to result in adverse effects. A review of 72 IDFG records from 2017, 2018, and 2019 found 10 instances where North American wolverines were sighted crossing roads (including U.S. Highway 95 and U.S. Highway 12), four reported sightings in developed areas and no reports of road related mortality. These records indicate human activity and roadways with significant traffic may not completely deter North American wolverines from moving through the project area during construction and although unlikely, if North American wolverine were to occur in the project area during construction, mortality would not be anticipated. Impacts associated with the construction or O&M would be considered temporary, seasonal, and unmeasurable at a population-level scale or to habitat critical to the species; therefore, effects are considered discountable. North American wolverine would not be significantly affected as a result of construction activities under Alternative B.

Bull Trout and their Critical Habitat

In-water construction activities under Alternative B may affect bull trout and their critical habitat over the short term until construction is completed.

Underwater noise and vibration, release of sediment into live water, limited habitat access, and other effects associated with construction of the proposed dam raise and infrastructure (such as staging areas, roads, bridges, culverts and campgrounds) have the potential to adversely affect bull trout. Construction activities have the potential to displace fish, inhibit use of migratory corridors, limit access to forage habitat, and, although considered unlikely, result in direct mortality to bull trout that may occur in the construction area (including Anderson Ranch Reservoir, its tributaries, and slopes adjacent to the South Fork Boise River) during certain construction activities.

Conservation measures in place to reduce the potential for sediments and contaminants to enter live water, as well as mitigate underwater noise, would reduce the potential for significant adverse effects to life stages of bull trout or their critical habitat which may occur during the short term as a result of construction activities under Alternative B. Furthermore, isolated work areas would be restricted to the minimum footprint required and active construction below the ordinary high-water mark (including pile driving) will not occur during nighttime hours when bull trout are known to typically migrate.

Bull trout would be isolated from in-water work areas during construction activities, with the exception of coffering and coffer removal. Bull trout in the vicinity during periods of in-water construction activities would likely be displaced and move outside of the area on their own with the onset of noise-generating activities. If bull trout are not displaced immediately and remain in the area, short-term adverse effects as a result of noise and vibration may physically impact fish and limit access to foraging or migratory habitat while sound generating activities are occurring.

Sound waves generated in the water column (as a result of construction activities such as bridge and culvert work) can affect fish in several ways (altered behavior, physical injury, or mortality). These effects depend on the intensity and characteristics of the sound, the duration, the distance and location of fish in the water column relative to the sound source, the size and mass of the fish, and the fish's anatomical characteristics (Yelverton et al., 1975).

Pile driving would occur in the dry (which would likely attenuate noise and vibration considerably) and during the designated in-water work window which would reduce the potential effects of noise and vibration to fish associated with pile-driving activities. Regardless, fish that remain in the area with the onset of pile driving have the potential to experience lethal and/or non-lethal effects as a result of noise and vibration that is generated.

Direct effects as a result of underwater noise generated from construction would persist over the short term while construction is underway. Passage upstream of Pine Bridge would be maintained during construction, and no in-water construction or pile driving would occur during nighttime hours when bull trout may be migrating through the area. Movement through the area during daylight hours may be affected as a result of noise during construction (not to exceed 60 days).

Constructing cofferdams to isolate the work area at Anderson Ranch Dam would also reduce forage habitat for bull trout attempting to access the area during construction. At full pool Anderson Ranch Reservoir provides approximately 4772 acres of open water habitat. The extent of habitat made inaccessible to bull trout adjacent to the dam in Anderson Ranch

Reservoir during construction would not exceed 3000 square feet or 0.07 acre (which represents only 0.00144% of available reservoir habitat at full pool) located at the spillway crest, and the area would be inaccessible to bull trout for approximately 51 months. The timing of in-water construction and extent of other suitable habitat in the project area reduces the likelihood that bull trout would be adversely affected as a result of limited habitat access at the dam. Additionally, in-water work (anticipated to be 60 days of the total four month construction period) at the Pine Bridge would temporarily limit access to approximately 1800 square feet (.041 acre) of riverine habitat along the fringes of both banks of the South Fork Boise River. Passage through the area would be maintained throughout the 60 day in-water work period. Construction at Deer Creek and Fall Creek culverts would restrict access to bull trout moving up or downstream in Deer Creek and Fall Creek for a period of approximately 30 days in each instance and the total area of isolation required for each culvert would not exceed 16,000 square feet (0.37 acre). Dewatering and work area isolation would be conducted to reduce or eliminate the need for fish handling/salvage. Although neither of these tributaries provide suitable habitat for spawning, restricted passage for bull trout through the areas would limit access to forage either upstream into the creeks or downstream into the reservoir until construction is completed.

In-water construction activities will also release distinct pulses of sediment-laden water that may result in turbidity above background levels for brief periods of time. Increased sediment levels can have adverse effects on salmonids and their habitat. Turbidity may increase physiological stress, result in physical injury (such as gill abrasion), and potentially displace fish (Bisson and Bilby, 1982). Salmonid avoidance of turbid waters may be one of the most important effects of suspended sediments (Birtwell et al., 1984; Scannell, 1988). Although adult and larger juvenile salmonids can better tolerate higher concentrations of suspended sediments (Bjornn and Reiser, 1991), chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding et al., 1987; Lloyd, 1987; Servizi and Martens, 1991).

Water quality proximate to in-water work areas in Anderson Ranch Reservoir would be adversely affected over the short term primarily during the installation and removal of cofferdams used to isolate construction areas. Once coffered and dewatered, most of the sediment released from construction activities would be contained within isolated work areas. Isolation of in-water work areas in Anderson Ranch Reservoir, in conjunction with other conservation measures (See Environmental Commitments Section), will limit the release of sediment into live water (waters adjacent to isolated work areas and accessible to bull trout) during construction. Still, dam construction (including installing and removing coffering), roadway construction (including bridge and culvert work), and other infrastructure construction below the ordinary high-water mark will likely result in the release of small pulses of sediment into live water. Release of sediment is anticipated to be primarily contained in isolated areas and persist for a short time, reducing the adverse effects to bull trout or their prey base that may be in the area. Furthermore, sediment or turbidity released during construction activities in Anderson Ranch Reservoir waters would not be expected to exceed background levels beyond 600 feet of the isolated construction areas.

Effects from new road construction would also have the potential to extend to hillslopes downstream of the work area and adjacent to the South Fork Boise River while realigning the

new roadway to accommodate traffic that currently use the existing Cow Creek road. Required road construction, maintenance, and/or increased road activity adjacent to the South Fork Boise River is also likely to contribute to fugitive dust and release sediment downslope that could be transferred into live water. Effects to water quality as a result of construction activity along the South Fork Boise River would not be anticipated to occur greater than 600 feet downstream of construction footprints and no effects would extend to Arrowrock Reservoir downstream. Conservation measures implemented to reduce the transfer of sediment into water bodies in the project area will minimize these effects but not eliminate them completely.

The project will cause in short-term increases in turbidity, for a short distance within the water column. The duration, magnitude, and extent of turbidity and fine sediment from the proposed action (although minimized) may still result in adverse effects to bull trout in the project area, if they are present during construction. Sediment and noise generated as a result of these construction activities would not alter tributary connectivity; however, excess turbidity does have the potential to limit forage area for bull trout in the project area or reduce their access to prey while construction is occurring. Additionally, effects over the short term as a result of construction would also be anticipated to extend to general fisheries in the project area and may result in adverse effects to the prey base for bull trout, such as juvenile rainbow trout (*Oncorhynchus mykiss)*. Effects to the prey base for bull trout, however, would not be anticipated to occur at a level that would measurably affect bull trout populations in the project area, based on the diverse fish assemblages that occur in the project area and the extent of available habitat outside of areas that may be affected during construction. A more detailed description of effects to fisheries as a result of the proposed action occurs in the Fisheries Specialist Report in Appendix B. Adverse effects resulting from sediment and turbidity would occur for a short time and not be anticipated to occur at a level that would measurably shift existing conditions over the long term.

Hazardous spills will be reduced to the extent practicable by implementing the conservation measures described in the Environmental Commitments Section. To protect water quality from chemical contamination associated with the proposed action, uncured concrete would not contact flowing water; vehicles and other equipment would be refueled away from standing or flowing water; and spill containment equipment would be available during refueling. In turn, the risk of hazardous material to bull trout present in the project area during construction is considered negligible.

Potential short-term adverse effects related to activities to raise Anderson Ranch Dam and construct required infrastructure would occur at Anderson Ranch Dam and areas surrounding Anderson Ranch Reservoir (including entering tributaries) as well as along portions of the South Fork Boise River that may be influenced by road work and road use. These effects would occur over the short term when active construction is underway and until disturbed hillslopes and other lands have stabilized. Overall, the release of sediment and contaminants into live water would be small, and restricted habitat access would not limit migration or significantly inhibit access to foraging activity or the prey base for bull trout. In turn, no impacts as a result of construction activities under Alternative B would be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat in the project area.

Long-Term Impacts

No long-term significant effects to listed T&E species related to construction activities under Alternative B are anticipated.

Canada Lynx, North American Wolverine, and Whitebark Pine

No long-term impacts related to O&M under Alternative B have the potential to adversely affect listed terrestrial T&E species in the project area. Furthermore, no long-term significant impacts to listed terrestrial T&E species under Alternative B are anticipated to occur.

Yellow-billed Cuckoo

The primary cause for the decline of YBCC populations in the western United States is riparian habitat loss, degradation, and fragmentation. Western YBCC breed in large blocks of riparian habitat (larger than 212 acres and at least 328 feet wide), particularly woodlands with cottonwoods and willows (78 FR 61621). There are no riparian areas of this size in the project area. Although YBCCs have been observed near the project area and may fly through it, they are unlikely to breed and nest there. Of the approximate 75 acres of suitable foraging and migratory habitat, up to 30 acres of this habitat will be seasonally inundated at the proposed full pool elevation. Cottonwood and willow vegetation can withstand periods of inundation and may not be lost depending on the length of the inundation period. A large area of the suitable YBCC habitat below Pine Bridge is currently flooded for up to 16 days under current operations and has continued to persist and provide habitat after the full pool water subsides. Under Alternative B, the reservoir would be above the existing full pool elevation of 4196 for approximately 18 days at typical spring operations. This duration and magnitude of inundation is not expected to adversely affect YBCC habitat in the project area.

The loss of riparian habitat (as a result of inundation under future conditions), although expected to be small, has the potential to further degrade existing terrestrial habitat conditions over the long term and reduce available habitat to YBCC that may be migrating through the area. The area not inundated will continue to provide marginal suitable habitat after the project is constructed. The potential for long-term adverse effects to YBCC from construction is considered discountable, and effects to habitat as a result of future conditions would be anticipated to be minimal, if they were to occur. Lost habitat over the long term as a result of Alternative B would not be anticipated to occur at a level that would significantly affect YBCC in the action area, and similar proximate habitat farther up in the South Fork Boise River drainage would continue to be available to YBCC moving through the general vicinity.

Bull Trout and their Critical Habitat

Over the long term, O&M activities would remain consistent with current strategies (Reclamation, 2004 and Reclamation, 2013) and continue to have persistent long-term adverse effects on bull trout and their critical habitat as covered under the current incidental take statement granted by USFWS in 2005 and 2014 (USFWS, 2005 and USFWS, 2014). Additional long-term adverse effects outside of these O&M activities covered in previous consultations would not be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat. Continued adherence to required criteria in the BiOps

(USFWS, 2005 and USFWS, 2014) would occur under Alternative B, reducing the potential for long-term, adverse effects to bull trout or their critical habitat in the future.

Future conditions in Anderson Ranch and Arrowrock reservoirs throughout most of the year will continue to provide conditions important for the survival of bull trout. Seasonally, however, depending on climate patterns and water needs (see Water Operations and Hydrology Specialist Report and Climate Variability Specialist Report in Appendix B), the availability of bull trout habitat may continue to be limited under Alternative B. Yearly and seasonal fluctuations in water supply and irrigation demand will continue. However, an elevated pool in Anderson Ranch Reservoir and altered refill regime into Arrowrock Reservoir (via the South Fork Boise River) may improve temporal access to cold water refugia in the system and increase seasonal connectivity to tributaries entering Anderson Ranch and Arrowrock reservoirs. During annual periods of warm summer conditions and extreme drawdowns, migration corridors may provide improved access to more favorable conditions, compared to baseline conditions in unregulated portions of the watershed that do not provide ideal habitat conditions throughout the year.

Although limited long-term impacts to bull trout and their habitat would persist under Alternative B, they would not be anticipated to occur at or be elevated to a level of significance in the project area under Alternative B. Therefore, no long-term significant impacts to bull trout under Alternative B are anticipated,

Over the long term, beneficial effects from Alternative B may be realized as a result of an elevated pool in Anderson Ranch Reservoir, extended temporal connection with entering tributaries, and altered refill regime of waters into Arrowrock Reservoir (via the South Fork Boise River). In particular, beneficial effects for bull trout are anticipated as a result of regrading and construction activities at Deer Creek and Fall Creek culverts. Once completed the culverts will provide year-round passage into Deer Creek and Fall Creek that currently does not exist at pool elevations when the culverts are perched. Although this additional access to forage habitat in Deer Creek and Fall Creek, as well as other extended temporal access to tributaries entering Anderson Ranch Reservoir (as a result of higher pool elevations under certain conditions) are anticipated to benefit bull trout, these benefits would likely not measurably shift baseline conditions.

The Biological Assessment for Boise River Basin – Anderson Ranch Dam Raise (Reclamation, 2019) provides additional detail of anticipated effects from proposed construction activities and operation and maintenance of the system under Alternative B.

3.2.3 Alternative C – Anderson Ranch Dam Three-Foot Raise

Under Alternative C, short-term effects similar to described under Alternative B would occur from construction required to raise the dam 3 feet and from construction of other required infrastructure. However, because Pine Bridge would not be raised under Alternative C, effects associated with that work would not occur. Additionally, the duration of effects as a result of general construction noise and activities would be reduced as a result of the shorter project duration under Alternative C.

Canada Lynx and Whitebark Pine

Construction activities and anticipated effects to Canada lynx and whitebark pine under Alternative C would be the same as described under Alternative B and have no significant effect on Canada lynx and whitebark pine over the short-term.

Yellow-billed Cuckoo

Anticipated effects to YBCC as a result of construction activities under Alternative C would be the same as described under Alternative B. Therefore, the potential for short-term adverse effects to YBCC from construction activities is considered discountable, and effects that may occur under Alternative C would be anticipated to be minimal. YBCC would not be significantly affected over the short-term as a result of Alternative C.

North American Wolverine

Anticipated effects to North American wolverine as a result of construction activities under Alternative C would be the same as described under Alternative B. Therefore, the potential for short-term adverse effects to North American wolverine from construction activities is considered discountable, and effects that may occur under Alternative C would be anticipated to be minimal. North American wolverine would not be significantly affected over the short-term as a result of Alternative C.

Bull Trout and their Critical Habitat

Similar to Alternative B, general construction activities, including in-water work, under Alternative C may affect bull trout and their critical habitat over the short-term until construction is completed.

Underwater noise and vibration, release of sediment into live water, limited habitat access, and other effects associated with construction of the proposed dam raise and infrastructure under Alternative C have the potential to adversely affect bull trout in the same manner as described under Alternative B.

The primary difference in short-term effects under Alternative C, compared to Alternative B, is the absence of construction work at Pine Bridge under Alternative C. Therefore, bull trout would not experience hindered movement or be potentially displaced by noise or construction activity related to work on Pine Bridge as described under Alternative B. Additionally, under Alternative C, bull trout would not experience limited access to habitat along the fringes of the South Fork Boise River banks related to Pine Bridge work described under Alternative B.

Except for the difference in effects related to Pine Bridge construction, other short-term effects to bull trout and their critical habitat under Alternative C, would be the same as described under Alternative B. These effects would occur over the short term when active construction is underway and until disturbed hillslopes and other lands have stabilized. Overall, the release of sediment and contaminants into live water would be minimal, and restricted habitat access would not limit migration or significantly inhibit access to foraging activity or the prey base for bull trout. In turn, no short-term impacts as a result of Alternative C would be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat in the project area.

Long-Term Impacts

Similar to Alternative B, no long-term significant effects to listed T&E species related to construction activities under Alternative C are anticipated.

Canada Lynx, North American Wolverine, and Whitebark Pine

Similar to Alternative B, no long-term impacts related to O&M under Alternative C have the potential to adversely affect listed terrestrial T&E species in the project area. Furthermore, no long-term significant impacts to listed terrestrial T&E species under Alternative C are anticipated.

Yellow-billed Cuckoo

Most long-term impacts to YBCC under Alternative C would be the same as described under Alternative B. The one exception is that of the approximate 75 acres of suitable foraging and migratory habitat, up to 21 acres of this habitat will be seasonally inundated at the proposed full pool elevation under Alternative C, by an average of 9 additional days per year. This is less than the 30 acres that would be seasonally inundated by an average of 18 additional days per year under Alternative B. Consistent with Alternative B, the duration and magnitude of inundation is not expected to adversely affect YBCC habitat in the project area under Alternative C.

The loss of riparian habitat (as a result of inundation under future conditions), although expected to be small, has the potential to further degrade existing terrestrial habitat conditions over the long term and reduce available habitat to YBCC that may be migrating through the area. The area not inundated will continue to provide marginal suitable habitat after the project is constructed. The potential for long-term adverse effects to YBCC from construction is considered discountable, and effects to habitat as a result of future conditions would be anticipated to be minimal, if they were to occur at all. Lost habitat over the long-term as a result of Alternative C would not be anticipated to occur at a level that would significantly affect YBCC in the action area and similar proximate habitat further up in the South Fork Boise River drainage would continue to be available to YBCC moving through the general vicinity.

Bull Trout and their Critical Habitat

Under Alternative C, long-term O&M activities would remain consistent with current strategies (Reclamation, 2004 and Reclamation, 2013) and continue to have persistent long-term adverse effects on bull trout and their critical habitat as covered under the current incidental take statement granted by USFWS in 2005 and 2014 (USFWS, 2005 and USFWS, 2014). Additional long-term adverse effects outside of these O&M activities covered in previous consultations would not be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat. Continued adherence to required criteria in the BiOps (USFWS, 2005 and USFWS, 2014) would occur under Alternative C (similar to Alternative B), reducing the potential for long-term, adverse effects to bull trout or their critical habitat in the future.

Future conditions in Anderson Ranch and Arrowrock reservoirs throughout most of the year will continue to provide conditions important for the survival of bull trout. However, like

Alternative B, the availability of bull trout habitat may continue to be limited under Alternative C. Yearly and seasonal fluctuations in water supply and irrigation demand will continue. However, an elevated pool in Anderson Ranch Reservoir and altered refill regime into Arrowrock Reservoir (via the South Fork Boise River) may improve temporal access to cold water refugia in the system and increase seasonal connectivity to tributaries entering Anderson Ranch and Arrowrock reservoirs. During annual periods of warm summer conditions and extreme drawdowns, migration corridors may provide improved access to more favorable conditions, compared to baseline conditions in unregulated portions of the watershed that do not provide ideal habitat conditions throughout the year. This would however be anticipated to occur less frequently and for shorter durations than would be expected to occur under Alternative B.

Although limited long-term impacts to bull trout and their habitat would persist under Alternative C, they would not be anticipated to occur at or be elevated to a level of significance in the project area, the same as under Alternative B. Therefore, no long-term significant impacts to bull trout under Alternative C are anticipated.

Over the long term, beneficial effects from Alternative C may be realized as a result of an elevated pool in Anderson Ranch Reservoir, extended temporal connection with entering tributaries, and altered refill regime of waters into Arrowrock Reservoir (via the South Fork Boise River). These would occur less than with Alternative B due to a lower elevated pool and reduced storage capacity.

3.2.4 Cumulative Impacts

Cumulative effects are analyzed for the 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. Reclamation has identified two past projects: Pine Bridge replacement and the 4-foot Anderson Ranch Dam crest raise for security enhancement. Reclamation has also identified two potential future projects to be considered for the cumulative impact analysis: the 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 analysis boundary is the Boise River system. The Boise River Project would increase the area of inundation in Anderson Ranch Reservoir at maximum pool raise by as much as 146 acres (under Alternative B), and as much as 72 acres under Alternative C. This would increase aquatic habitat and reduce terrestrial habitat in the shoreline area under certain conditions. An elevated pool in Anderson Ranch Reservoir would essentially shift access to aquatic and terrestrial habitat along the shoreline, which would likely result in altered access to habitats that occur along the fringe of the shoreline and may be used by bull trout. No increased mortality would be anticipated to occur as a result of predation or any other factors that may occur during the approximately 18 additional days of inundation under Alternative B, nor during the approximately 9 additional days of inundation under Alternative C. Beneficial impacts to bull trout are anticipated to occur with increased habitat and extended

temporal connectivity with some tributaries entering Anderson Ranch Reservoir. Some adverse effects to listed terrestrial T&E-listed species, however, may occur from reduced or altered habitat quality during the inundation period. These impacts, while not expected to be significant, contribute to an overall trend of altered habitat within the region, and could exacerbate stresses on species using shoreline habitats.

The proposed action will have no effect on Canada lynx and whitebark pine, and therefore there would be no cumulative effects. The proposed action may affect but is not anticipated to significantly affect North American wolverine and YBCC. Past and present actions may also affect both species.

Past and present actions have reduced available YBCC nesting and foraging habitat through agricultural practices and loss of riparian habitat by providing water that supports grazing activity and removes water from the Boise River system for agricultural purposes. These activities will continue to affect the YBCC in the future. The Cat Creek Lease of Power Project and the South Fork Boise River Diversion Project may also affect YBCC if construction takes place near or removes YBCC habitat. Those projects are not yet designed to the point where impacts can be predicted. However, it is anticipated that either of those future projects could result in impacts to YBCC during the period of construction as a result of noise and activity. Neither of those projects though would be anticipated to result in a loss of habitat for YBCC over the long-term. Any impacts to YBCC as a result of the proposed action would be temporary and will cease following construction activities. Therefore, cumulative effects are not predicted for YBCC beyond those already occurring from past, and present actions.

Given the location of past and present actions, impacts to North American wolverines would not be anticipated and therefore not contribute to cumulative effects. Construction of both future actions could have similar construction related impacts as the proposed action. As with the proposed action alternatives, those impacts would likely be temporary and would not persist after completion of the alternative selected. There would be no cumulative effects on North American wolverine.

Bull trout in the analysis area have been impacted by decades of land use actions that have resulted in disconnected and degraded habitats and introduced competition from nonnative species. Adverse effects such as these will continue as a result of water use and land management in the area from existing activities and those that may occur in the future. The Cat Creek Lease of Power Project and the South Fork Boise River Diversion Project, if implemented, would be anticipated to further affect bull trout if they adversely affect water quantity or quality in the analysis area or introduce sediment, contaminants, or noise into the aquatic environment during construction or in association with operation and management of these projects once completed. For example, reduced flows during high water years in the South Fork River downstream of Anderson Ranch dam (that could result under either of these future alternatives) would be anticipated to reduce important ecological benefits such as scour and sediment transport that are important to healthy fisheries and bull trout habitat. Without specific project details it is difficult to ascertain the extent of these effects, however depending on the duration and extent of impacts the potential for significant effects to bull trout does exist.

Impacts as a result of construction activities from the proposed action alternatives are temporary and would not persist after construction is completed. Potential long-term benefits to water quality and quantity as a result of the dam raise would be anticipated after construction is completed. Any cumulative effects on bull trout, although not anticipated to be significant based on the details and analysis of the proposed action, would be dependent on activities developed for construction and operations of the Cat Creek Lease of Power Project and the South Fork Boise River Diversion Project.

3.2.5 Mitigation

Under the proposed action, adverse effects to biological resources and the environment (i.e. water quality) have the potential to occur as a result of construction activities. Conservation measures and environmental commitments would be implemented as necessary to minimize potential significant impacts to listed T&E species in the project area. Such measures for listed T&E species under Alternative B and Alternative C are described in detail in the Environmental Commitments Section.

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