Final Environmental Assessment

and

Finding of No Significant Impact

for the

Rio Chama Aquatic Habitat Project,

Rio Arriba County, New Mexico

October 2019

Prepared by

U.S. Army Corps of Engineers
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Finding of No Significant Impact

Rio Chama Aquatic Habitat Project,

Rio Arriba County, New Mexico

The U.S. Army Corps of Engineers (USACE), Albuquerque District has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Environmental Assessment (EA) dated 10 October 2019, for the Rio Chama Aquatic Habitat Project, Rio Arriba County, New Mexico addresses fish habitat and ecosystem restoration opportunities and feasibility in the Rio Arriba County, New Mexico.

The Final EA, incorporated herein by reference, evaluated various alternatives that would improve fish and wildlife habitat conditions on the Rio Chama, and support increasing sport fish and wildlife recreation in the study area. The recommended plan includes:

- Excavate 2.25 acres of in-channel pools
- Construct attached bars with excavated materials for a narrower thalweg
- Place approximately 1044 rock features to provide 0.2 acres of cover
- Place approximately 67 woody debris features to provide 0.04 acres of cover
- Construct a rock riffle upstream of the USGS weir
- Plant native vegetation though the riparian zone

In addition to a "no action" plan, four habitat management alternatives were evaluated. The alternatives included importing clean gravel fill for the attached bars, terrace lowering of the bankline, replacement of the downstream diversion structure, and extending the project downstream of the proposed project area. .

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the EA will be implemented, if appropriate, to minimize impacts. Best management measures (Section 5.12) include construction (November through February) to work at seasonally low flows and minimize effects to migratory breeding birds. Use appropriate fill materials excavated from the river channel. Clean and inspect all construction equipment to prevent the spread of invasive species, and manage fuels, lubricants, hydraulic fluids and other petrochemicals to avoid contamination of water and soils. Staging areas will be limited to minimum area required, located outside the active channel (flow of 1,800 cfs), and avoid sensitive riparian and cultural resources.

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	☐	☐	☒
Air quality	☐	☐	☒
Invasive species	☐	☐	☒
Historic properties	☒	☐	☐
Other cultural resources	☐	☐	☒
Floodplains	☒	☐	☐
Hazardous, toxic & radioactive waste	☐	☐	☒
Hydrology	☐	☐	☒
Land use	☐	☐	☒
Noise levels	☐	☐	☒
Public infrastructure	☐	☐	☒
Socio-economics	☐	☐	☒
Environmental justice	☐	☐	☒
Soils	☐	☐	☒
Tribal trust resources	☐	☐	☒
Water quality	☐	☐	☒
Climate change	☐	☐	☒

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, USACE determined that the recommended plan will have no effect on federally listed species or their designated critical habitat.

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, USACE determined that historic properties would not be adversely affected by the recommended plan.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Appendix D of the EA.

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the New Mexico Environmental Department by the New Mexico Department of Game and Fish. All conditions of the water quality certification shall be implemented in order to minimize adverse impacts to water quality.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Technical, environmental, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

11 October 2019
Date

Larry D. Caswell, Jr.
Lieutenant Colonel, U.S. Army
District Commander

FONSI ADOPTED BY: ANGELA KRALL Digitally signed by ANGELA KRALL Date: 2019.10.17 15:50:47 -06'00'

Angie Krall, West Zone Deputy District Ranger, Carson National Forest

FONSI ADOPTED BY: SANFORD HURLOCKER Digitally signed by SANFORD HURLOCKER Date: 2019.10.18 05:41:34 -06'00'

Sandy Hurlocker, Espanola District Ranger, Santa Fe National Forest

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Marc Jackson, Field Manager, Bureau of Land Management, Taos Field Office

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List of Acronyms

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
ACE	Annual Chance Exceedance
ac	Acres
AF	Acre-feet
AFY	Acre-feet per year
APE	Area of potential effect
ARMS	Archaeological Records Management System
BMP	Best Management Practices
BLM	U.S. Bureau of Land Management
BOR	U.S. Bureau of Reclamation
CE-SPA	USACE, Albuquerque District
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
cfs	Cubic feet per second referring to stream flow
CGP	Construction General Permit
CWA	Clean Water Act
ESRI	Environmental Systems Research Institute
FISRWG	Federal Interagency Stream Restoration Working Group
FWS	U.S. Fish and Wildlife Service
GCS	Grade control structure
GIS	Geospatial Information System
HTRW	Hazardous, toxic, and radioactive waste
ITA	Indian Trust Asset
LiDAR	Light detection and ranging (aerial laser used to develop topography)
MBTA	Migratory Bird Treaty Act
MRG	Middle Rio Grande
MRGCD	Middle Rio Grande Conservancy District
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMCRIS	New Mexico Cultural Resources Information System

NMDGF	New Mexico Department of Game and Fish
NMISC	New Mexico Interstate Stream Commission
NMED	New Mexico Environment Department
NMLO	New Mexico Land Office
NMSHPO	New Mexico State Historic Preservation Office
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
OSE	New Mexico Office of the State Engineer
PCEs	Primary constituent elements
PDT	Project development team
RED	Regional Economic Development
SHPO	State Historic Preservation Office/Officer
SJC	San Juan Chama
TCP	Traditional cultural property
THPO	Tribal Historic Preservation Office/Officer
TSP	Tentatively selected plan
URGWOPS	Upper Rio Grande Water Operations
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
U.S.C.	U.S. Code
USGS	U.S. Geological Survey
WRDA	Water Resources Development Act
WSEL	Water surface elevation

1 - INTRODUCTION

1.1 Background and Location

The New Mexico Department of Game and Fish (NMDGF) in cooperation with the U.S. Army Corps of Engineers (USACE), U.S. Bureau of Land Management (BLM), U.S. Forest Service (USFS), US Fish and Wildlife Service (FWS), and the State of New Mexico Land Office (NMLO), has prepared this environmental assessment (EA) to analyze potential effects that may result from the proposed Rio Chama Aquatic Habitat Restoration Project. The project would be located on the Rio Chama River, immediately downstream of Abiquiu Dam. The Abiquiu Dam and Reservoir is situated on the Rio Chama about 32 river miles upstream from its confluence with the Rio Grande. Lands on both sides of the Rio Chama in the project area are managed by USACE, BLM, USFS, and NMLO.

Partial funding for this project would be provided to NMDGF through a grant under the Wildlife and Sport Fish Restoration (WSFR) Program, administered by the Service. The WSFR program provides funds to the states and insular areas fish and wildlife agencies for projects to restore, conserve, manage, and enhance wild birds and mammals and their habitat. The program is authorized by the Wildlife Restoration Act (Pittman-Robertson PR) of 1937.

1.2 *Purpose and Need for Action

The purpose of the proposed action is to improve fish and wildlife habitat conditions on the Rio Chama, and support increasing sport fish and wildlife recreation by the public. Trout fishing is popular on the Rio Chama downstream of Abiquiu Dam (NMDGF 2016). Currently, the tailwater river channel immediately below Abiquiu Dam has limited aquatic habitat and structure for fish, and riparian vegetation providing leaf litter for aquatic insects.

Historically, the Rio Chama supported a resilient ecosystem with diverse aquatic and riparian habitat. The Rio Chama downstream of Abiquiu Dam has been affected by channel degradation and loss of riparian habitat following dam construction. The channel has become hardened with coarser sediment, reducing aquatic habitat complexity. Flood operations limit the safe channel capacity flow to levels lower than the existing terrace elevation downstream of the dam necessary to support native riparian vegetation recruitment. As a result of incision and other changes, areas of healthy native riparian habitat, including wetlands, are rare and scattered in the project area. Loss of riparian habitat is an important conservation issue in the arid Southwest.

The NMDGF released its most current iteration of the Statewide Wildlife Action Plan (SWAP) for New Mexico in 2016 (NMDGF 2016). This plan identifies species of greatest conservation need, threats to the status of those species, and potential management actions to conserve those species. The project area is located within the Colorado Plateau Ecoregion. While numerous species of conservation need are identified for this Ecoregion, only Rio Grande Chub and northern leopard frog are likely to be affected by this project. Riparian and aquatic habitat manipulation to favor native species of concern is identified in the SWAP as an important tool for conservation of native fish and amphibians. Modification of existing aquatic habitat within this reach can benefit both species via establishment of aquatic macrophytes, creation of low current refugia, and development of off channel ponding.

The New Mexico Wildlife Center uses the project area to conduct hands-on place-based experiential science education for students from numerous schools in the Española school district, as part of their River Class program. The program has collected water quality data and aquatic

macro-invertebrates, with a goal of providing baseline data that can be compared to future surveys to quantify post-project results.

The proposed aquatic habitat restoration project complies with the letter or intent of several Federal laws, executive orders, and treaties, with which the USACE must comply, concerning restoration and conservation efforts, which include:

- North American Waterfowl Management Plan. The project would increase the amount and quality of resting, breeding, and foraging habitat for waterfowl.
- Executive Order No. 11990 (Protection of Wetlands) and North American Wetlands Conservation Act of 1989. The restoration project would conserve a significant portion of the project area, which is largely considered wetland habitat under the Executive Order and Act.
- Executive Order No. 11988 (Floodplain Management). Through restoration efforts, the project would improve, and in most cases restore, critical functions that provide for the health of the floodplain.
- Endangered Species Act of 1973, as amended. The project would have no adverse effects on endangered species or their critical habitat.
- Bald and Golden Eagle Protection Act of 1940. The restoration would indirectly benefit the eagle from water quality and higher fish availability.
- Migratory Bird Treaty Act of 1918, Migratory Bird Conservation Act of 1929, and associated treaties. Habitat improvements and diversification would benefit resident and migratory birds using the Rio Chama. Habitat improvements would benefit neotropical migrants by providing essential feeding and resting habitats along the Rio Grande flyway.
- Taos BLM Resource Management Plan 2.1.3.1 Fish. The project would expand recreational fisheries while protecting native fish populations and their habitat by developing and enhancing partnerships. The resource plan seeks to develop and/or implement one project per year to conserve, enhance, or restore fish populations and habitats, based on survey results.
- Taos BLM Resource Management Plan 2.1.7.1 Riparian Vegetation. The project would manage riparian areas with an emphasis on protection and restoration and focus treatments on reestablishment of willows and cottonwoods, as well as other riparian vegetation, to stabilize stream banks and promote sinuosity and width/depth ratios appropriate to the site.

Recreation

In addition to restoration efforts, opportunities exist to improve passive recreation opportunities associated with the restored aquatic habitat. Historically, the Rio Chama has been used by recreationists for fishing, hunting, hiking, bird watching, and picnicking.

NMDGF conducts statewide harvest and use surveys of anglers on a regular basis. The two most recent surveys (2015-16 and 2016-17 license years) indicate the Rio Chama below the Dam supports about 10,000 anglers annually for a total of 30,000-40,000 angler days (NMDGF data). This estimate is not specific to the area immediately below the dam, but observations of NMDGF

biologists and game wardens indicate the majority of angler use in this reach (Abiquiu Dam downstream to the Rio Grande) occurs between the Dam and the Village of Abiquiu.

The NMDGF received numerous comments in response to angler surveys supporting the trout fishery, emphasizing catch and release regulations. NMDGF manages the Rio Chama below Abiquiu Dam as a Special Trout Water with a bag limit restriction of two trout per day. Management objectives for this section include development and maintenance of a "Quality" trout water. This entails obtaining an overall trout density of 400 trout/acre with five percent of the trout population greater than twelve inches in length (NMDGF 2016). This fishery is dependent on wild Brown Trout reproduction and recruitment, with supplemental stocking of 12,000 catchable sized (>10") Rainbow Trout (*Onchorhynchus mykiss*) annually.

The project area is open to hunting and is popular with waterfowl hunters in the fall. This section falls under Central Flyway regulations for waterfowl seasons and bag limits. Waterfowl hunting peaks in late October through November. Deer hunters also access public lands along County Road 162 on the south side of the Rio Chama.

1.3 Regulatory Compliance

This Environmental Assessment (EA) was prepared by the USACE, Albuquerque District, for project partners, including the BLM, USFS, FWS, and NMLO in compliance with all applicable Federal Statutes, Regulations, and Executive Orders, including the following:

- National Historic Preservation Act (16 U.S.C. § 470 *et seq*.)
- Archaeological Resources Protection Act (16 U.S.C. § 470 *et seq*.)
- Clean Water Act (33 U.S.C. § 1251 *et seq.*)
- Clean Air Act (42 U.S.C. 7401 § *et seq.*)
- Endangered Species Act (16 U.S.C. § 1531 *et seq*.)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 *et seq*.)
- Executive Order 11988, Floodplain Management
- National Environmental Policy Act (NEPA, 42 U.S.C. § 4321 *et seq*.)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 C.F.R. § 1500 *et seq*.)
- Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 *et seq*.)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 11990, Protection of Wetlands
- U.S. Army Corps of Engineers' Procedures for Implementing NEPA (33 C.F.R. § 230; ER 200-2-2)
- Farmland Protection Policy Act (7 U.S.C. § 4201 *et seq.*)
- Executive Order 13112, Invasive Species
- Federal Noxious Weed Act (7 U.S.C. § 2814)
- Migratory Bird Treaty Act (16 U.S.C. § 703 *et seq.*)
- Fish and Wildlife Coordination Act (48 Stat. 401; 16 USC § 661 *et. seq.*)
- Section 438 of the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140, § 438, 121 Stat. 1492, 1620)

- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance
- National Forest Management Act of 1976 (Pub. L. No. 94-588)

The New Mexico Office of the State Engineer (OSE) is charged with administration of all water in the State of New Mexico pursuant to NMSA 1978, § 72-2-1 (1978). In the Rio Grande basin, the OSE performs numerous activities, some of which will be affected by the Project. Those activities include, but are not limited to basic water rights administration under state law and OSE Rules and Regulations, Active Water Resource Management (AWRM), conducting annual accounting of native Rio Grande and San Juan Chama (SJC) Project water, and addressing state water resource policy issues that may impact the river system.

The New Mexico Interstate Stream Commission (NMISC) is charged with administration of all interstate water compacts for New Mexico, as well as protecting, conserving and developing the waters and stream systems of the State. NMSA 1978, § 72-14-3 (1943). In the Rio Grande basin, the NMISC performs numerous activities, some of which will be affected by the Project. Those activities include monitoring water operations of the USACE and the U.S. Bureau of Reclamation (BOR), conducting annual accounting of native Rio Grande and SJC Project water, coordinating with the OSE and water users on Rio Chama water administration and active water resource management (shortage sharing), assessing and determining Rio Grande Compact compliance, and addressing federal natural resource policy issues that may impact the river system.

This EA also reflects compliance with all applicable State and local regulations, statutes, policies, and standards for conserving the environment, such as water and air quality, endangered plants and animals, and cultural resources.

1.4 Abiquiu Dam and Reservoir

The USACE is responsible for operation and maintenance of Abiquiu Dam for flood risk management (flood control) on the Rio Chama (Figure 1). The primary purpose of Abiquiu Dam is flood and sediment control, with water supply and hydropower generation as authorized by Congress. Two BOR-operated facilities at Heron Reservoir and El Vado Dam upstream of Abiquiu Reservoir play important roles regulating tributary flow on the Rio Chama.

The Abiquiu Dam and Reservoir Project is situated on the Rio Chama about 32 river miles upstream from its confluence with the Rio Grande. The project was authorized for construction by the Flood Control Act of 1948, (Pub. L. No. 80-858) and the Flood Control Act of 1950 (Pub. L. No. 81-516). Construction of Abiquiu Dam was initiated by the USACE in 1956 and the project was completed and placed into operation in 1963. The dam is a rolled earthfill structure with a crest length of 1,800 feet, and the maximum height above the stream bed is approximately 341 feet. The drainage area contributing flow to Abiquiu Reservoir comprises 2,146 square miles.

Subsequent legislation added authority for water supply storage (specifically, San Juan-Chama (SJC) Project water storage). The reservoir's storage allocations include 502,000 AF (acre-feet) for flood control and 77,039 AF for sediment retention. At the end of 2009, an estimated 40,616 AF of the initial 77,039 AF sediment reserve space remained unfilled. Storage of SJC water occurs within the flood control space and unused portion of the sediment reserve space.

Rio Chama Flood Regulation

Under current operating procedures, natural Rio Grande basin flow and releases from El Vado Reservoir upstream are passed through Abiquiu Reservoir without regulation. The only situation in which the USACE would take any action would be to maintain the safe channel capacity downstream. Due to reach-specific safe channel capacity constraints, releases from Abiquiu Reservoir are restricted to 1,800 cfs directly below the dam. Flows are regulated so as not to exceed 3,000 cfs at the Chamita gage or 10,000 cfs at the Otowi gage.

Operation of Abiquiu Dam for flood control is coordinated with Cochiti, Galisteo, and Jemez Canyon dams, which are jointly operated for a channel capacity of 7,000 cfs at Albuquerque (Central Avenue Bridge). Flood regulation is initiated at Abiquiu Dam when flows into the reservoir exceed the capacity of the Rio Chama downstream from the Dam or when flows on the Rio Grande equal or exceed its channel capacity. Flood regulation at Abiquiu Reservoir can be expected from April through June. The maximum water storage to date was 402,258 AF (elevation 6,261.1 feet), which occurred in June 1987.

Figure 1 Map of the Rio Grande basin in New Mexico showing location of the four U.S. Army Corps of Engineers dams. USACE 2011.

Rio Chama Hydropower

A hydroelectric power facility was constructed downstream of Abiquiu Dam in 1991. The power plant was constructed and is currently owned and maintained by the incorporated County of Los Alamos. Effectively, all dam releases above 75 cfs are currently diverted through the power plant for generation of electricity. However, a written agreement between the County and the USACE prior to constructing the plant stipulates that no releases will be made specifically for the benefit of the power plant (USACE 1995). The plant is a run-of-the-river facility and has no impact on reservoir storage or releases.

San Juan Chama Water Storage

BOR's SJC Project diverts water from the Navajo, Little Navajo, and Blanco rivers, which are upper tributaries of the San Juan River (of the Colorado River basin), for use in the Rio Grande basin in New Mexico (USACE, BOR, ISC 2007). After being diverted through an underground tunnel, this water is stored at Heron Reservoir, upstream from Abiquiu Dam. BOR delivers SJC Project water to users in the upper Rio Grande basin based on contracts with various water-management entities. Delivery of SJC Project water is authorized for municipal, domestic, industrial, recreation, irrigation, and fish and wildlife purposes. The following statutory conditions must be met for use of SJC Project water:

- Must be consumptively and beneficially used in New Mexico.
- Must have a downstream destination.
- Must not harm native Rio Grande water.
- Is not subject to provisions of the Rio Grande Compact.

SJC Project water is released from Heron Reservoir by BOR to a specific user, who can use such water immediately or store it in other facilities for future use. In 1981, Pub. L. No. 97-140 authorized the Secretary of the Army to enter into agreements with entities that have contracted with the Secretary of the Interior for water from the SJC Project. The authorization allows for up to 200,000 AF of this water to be stored in Abiquiu Reservoir within the flood control space and unused portion of the sediment reserve space. The USACE has entered into agreements with the Albuquerque-Bernalillo County Water Utility Authority (ABCWUA) and other entities for SJC water storage (Table 1.1). Up to 180,338 AF (elevation 6,220 ft.) is currently stored pursuant to storage easements held by the ABCWUA[1]. When full, this pool creates a 4,100-surface-acre reservoir. The authorizing legislation stipulates that storage of this water shall not interfere with the authorized purposes of Abiquiu Reservoir (namely, flood and sediment control). Releases of SJC water from Abiquiu Reservoir represent individual decisions made by contractors to call for their water, without any discretionary action by the USACE. The USACE does ensure that such flows are passed in a manner that does not threaten the safety or structural integrity of flood control facilities.

[1] The upper limit of SJC storage is the 6,220-foot elevation, which corresponds to the vertical extent of ABCWUA's storage easements with surrounding landowners. The actual volume of allowable SJC storage decreases over time as sediment retention in the reservoir increases.

Table 1 San Juan-Chama Project storage allocations at Abiquiu Reservoir, 2011 (USACE 2011).

San Juan-Chama Project contractor	Allocation (AF)
Albuquerque.-Bernalillo County Water Utility Authority[1]	170,900
Middle Rio Grande Conservancy District	2,000
City of Santa Fe	4,732
City of Los Alamos	1,086
City of Española	905
Town of Bernalillo	362
County of Santa Fe	336
Twining Water & Sanitation District	14
Total	180,338

[1] BOR stores up to 20,000 AF of Supplemental Water within the ABCWUA's space.

In 1988, Pub. L. No. 100-522 authorized the storage of up to 200,000 AF of Rio Grande system water at Abiquiu Reservoir when space is no longer required for the storage of SJC Project water as authorized by Pub. L. No. 97-140. Presently, all water supply storage at Abiquiu Reservoir consists of SJC Project water; there are no agreements for storage of Rio Grande system water.

2 - DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

The NMDGF in cooperation with USACE, BLM, USFS, FWS, and the NMLO proposes to construct instream aquatic habitat features on the Rio Chama below Abiquiu Dam. The proposed action includes installation of instream fish habitat structures, two new boater access areas, and riparian vegetation improvements for wildlife. The proposed project area is about 58.7 acres through 2.7 miles of lands managed by NMDGF in cooperation with USACE, BLM, USFS, FWS, and the NMLO. The proposed project would construct instream aquatic habitat features for trout and other fish species and was designed by Riverbend Engineering based on techniques described in Cramer (2012) and the Federal Interagency Stream Restoration Working Group (FISRWG, 1998).

Limiting the project area to the active channel ensures that habitat features do not increase seepage or evaporative losses. Habitat designs emphasize in-channel features that reduce the wetted area with the substrate (wetted area) and the surface area with the atmosphere (surface area) over the range of flow volumes. Decreasing the wetted and surface areas for a flow volume (WSA:V), increases habitat depth for fish and provides more efficient water transport at flow less than 100 cfs than a wide, shallow wetted channel.

The proposed features (Figure 2) are designed to provide fish with low velocity refuge habitat at discharges between 50 and 1,800 cfs (USACE 1995). Several types of features are proposed to create different types of fish habitat. The features include: rock and wood sills, pools, rock grade control structures, rock habitat structures, rock deflectors, and riparian vegetation. Excavated substrate from pools would be redistributed along channel margins creating or expanding existing bank attached bars to form a narrower thalweg. The bed materials for the proposed features would require a determination of the size, gradation, and volume of bed material (Cramer 2012). An evaluation of the appropriate sized materials including channel slope, substrate size and gradation, and other hydraulic variables for each of the feature types would be conducted to ensure stability following construction.

A large rock riffle upstream of USGS weir would be excavated, and the rock moved upstream into a larger upstream grade control structure (GCS)/riffle. The new GCS would allow upstream fish passage and downstream boat passage. The GCS would be grouted to increase structure stability at higher flows. River gravel and crushed rock would be placed to form the boat access ramp from the access road to the river.

Pools are proposed for construction to create additional velocity refuge for fish (Cramer 2012). Placement of clean alluvial substrate is proposed along the margins of the channel to form shallow bank attached bars that incrementally increase water depth within the channel, with an increase in water velocity. The balanced cut-fill of substrate materials would maintain safe channel capacity (flow) in the project reach.

Rock habitat structures and deflectors are proposed to provide hydraulic roughness, habitat diversity, and velocity refuge for fish (Cramer 2012). The boulder rock structures would be partially buried within the bed to increase stability and maintain their location. The rock structures are distributed throughout the project area to provide velocity diversity under the range of flow conditions (50 cfs to 1,800 cfs).

Planting with native riparian vegetation along the bankline is proposed in selected areas primarily for allochthonous leaf litter inputs into the stream to support aquatic insects (Cramer 2012). The riparian vegetation would contribute to bank stability.

Boater access improvements would be made at two locations, one in the upper project reach adjacent to the exiting USACE recreational area and another in the lower project reach on USFS property. Access improvements would include constructing sloped concrete boat ramps (or compacted gravel), stream bank grading for vehicle access, and installing rip rap for structure protection. Boat ramps would be designed to accommodate access at most flows.

Construction of the proposed aquatic habitat features would require partial dewatering of the channel during construction (Cramer 2012). Construction would be scheduled during the non-irrigation season (November 1 to February 28), and coordinated with the BOR water deliveries to take advantage of consistent, lower winter flow downstream of Abiquiu Dam. The construction schedule is outside the irrigation season to support completion of the diversion structure for continued operation of the acequia, and outside breeding season for migratory birds that may use the project area.

In-channel work and habitat improvement structures would be constructed by utilizing heavy tracked and wheeled equipment. Excavators and back hoe loaders may be used for channel shaping and constructing large boulder habitat structures. Articulated dump trucks and loaders may be used to transport sediment for shaping the channel thalweg and point bar construction. A narrower thalweg would provide deeper habitat at the lower winter flows. Small graders and dozers may be used for point bar grading and shaping. End dump trucks may be used to transport large boulders and other rock materials. Wheeled water tank trucks may be used for dust control. Graders and dozers may be used for improving road and equipment access points. Small loaders, such as wheeled and tracked skid steers, may be used for grading smaller areas, equipment transportation, and tree replanting. Off-Highway Vehicles (OHVs) may be used for watering and transporting of seeding and tree plantings. Tractors and soil disk implements may be used for reseeding and topsoil placement.

All equipment would utilize existing roads where possible. Routine maintenance would be conducted on the existing roads within the project area to facilitate heavy equipment access and reduce adverse effects during construction. Maintenance would include grading, adding base course and gravel in a few locations, with installation of drainage culverts (minor improvements) at key locations to reduce erosion. All maintenance activities would occur within the existing road footprint. Access to river channel would be restricted to a few locations to reduce impacts to bank erosion. All immediate access points to the river channel would be temporary and only used during construction and would be reclaimed to pre-existing conditions post construction. Portions of the equipment access areas would be improved to control vehicular access. All Best Management Practices (e.g., refueling outside of riparian areas, sediment control devices deployed, minimizing destruction to native vegetation, etc.) would be used during construction.

2.2 The No Action Alternative

Under the no action alternative, the Rio Chama channel, bankline, adjacent riparian, and wetland vegetation would remain unchanged. The existing hardened, relatively smooth trapezoidal channel would continue to provide some instream fish habitat. There would be slower velocity flow in a relatively thin water layer adjacent to the cobble-boulder channel bed. The channel would have minimal roughness, and less area for fish to rest from the fast water velocities. The area of quality

habitat for fish would remain the same as the existing conditions. Fall spawning fish species would still be susceptible to having spawning beds desiccated during low flow periods.

2.3 Alternative Actions Evaluated

The following actions were considered as alternatives for inclusion as components of the proposed project. Each potential action is described briefly with an explanation why the action was not included in the proposed project.

Excavation of wetland features would increase plant and habitat diversity within the project area. Concerns communicated by the OSE (OSE, September 6, 2019) and NMISC (NMISC, September 6, 2019) regarding any new use of water must be offset pursuant to the Mesilla Valley Guidelines. Improvements to wetland habitat will be deferred until suitable offsets can be acquired and approved by OSE and NMISC.

Importing clean gravel and cobble fill could be placed to create a narrow thalweg at lower winter flows. The use of imported fill material would require additional hydraulic analysis to maintain safe channel capacity. Clean Water Act requirements for imported fill would result in extensive documentation. The use of imported material would increase transportation and construction costs. The use of imported fill would increase project costs without providing additional benefits or instream habitat above the proposed action.

Terrace lowering of the channel bankline could be implemented to provide fill material for placement to create a narrower thalweg at lower winter flows. The excavation of bankline materials would result in a balanced cut-fill that would maintain the current safe channel capacity. There would need to be additional Clean Water Act requirements for transferring sediment from the bankline into the river channel as fill. Terrace lowering would reduce riparian habitat adjacent to the river that would require mitigation. Terrace lowering would increase project costs without providing additional benefits or instream habitat above the proposed action.

Replacement of the downstream diversion structure with a more stable, fish friendly structure is being considered. NMDGF has coordinated with the downstream acequia association on possible replacement of the diversion structure. Replacement of the diversion structure would require additional engineering design and cultural resources consultation. The additional engineering and consultation activities would delay implementation of instream habitat construction, which may reduce project funding availability. Replacement of the diversion would also increase construction costs above the currently available funding. Replacement of the diversion structure remains under consideration for a subsequent phase of the project dependent on additional engineering design, cultural resources consultation, approval by the acequia association, and funding.

Construction of instream habitat downstream of the proposed project area was considered. The Santa Fe National Forest land adjacent to the Rio Chama extends further downstream from the project boundary. Lands on the opposite bank are privately owned. Coordinating habitat design with private landowners would increase cost and extend the compliance schedule. Extending the planning and compliance schedule may reduce project funding availability. The proposed project costs are within the anticipated budget.

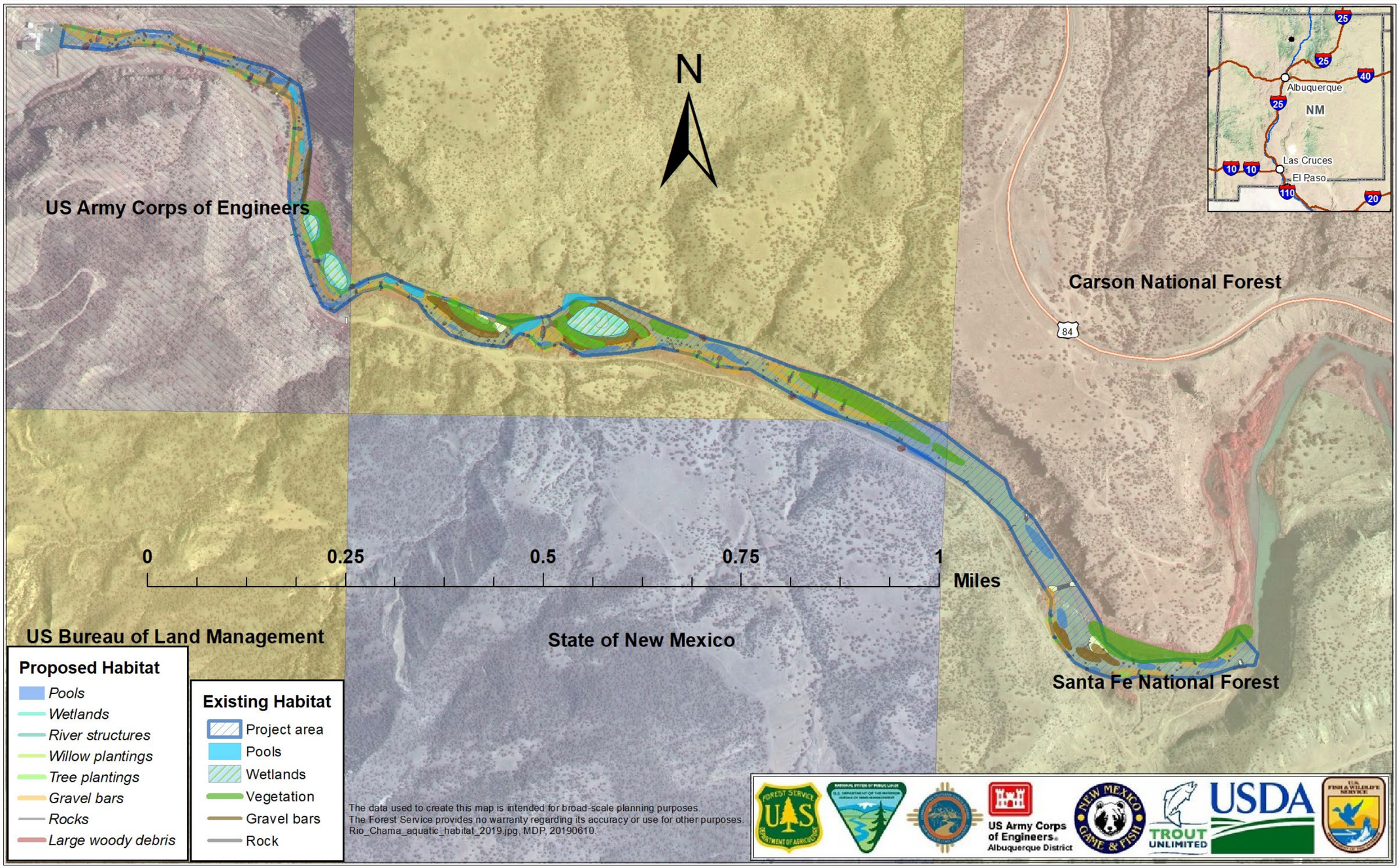

Figure 2 Proposed Rio Chama Aquatic Habitat Project area.

3 - EXISTING ENVIRONMENT AND FORESEEABLE EFFECTS

The following general summary of the physical environment of the Rio Chama downstream of Abiquiu Dam is sufficient for the purposes of analyzing the effects of habitat restoration.

The riparian areas downstream of Abiquiu Dam to the confluence with the Rio Grande were mapped in 2002–2003 for the Upper Rio Grande Water Operations (URGWOPs; USACE 2008). The Rio Chama downstream from Abiquiu Dam is characterized by a single-thread, coarse gravel-bed channel. Bank protection slows formation of in-channel habitat.

The water depth over the USGS weir for the Rio Chama below Abiquiu Dam, NM gage (USGS 2016) is between 1.5 and 5.0 feet.

This section describes the environmental resources in the project area. When necessary, mitigation measures are also proposed to avoid, reduce, minimize, or compensate for any significant effects.

3.1 Environmental Resources Not Considered in Detail

Initial evaluation of the effects of the project indicated that there would likely be little to no effect on several resources with implementation of the project. This analysis also considers the 'No Action' or 'without project' alternative where the proposed action is not implemented. These resources are discussed below to add to the overall understanding of the project area.

Regional geology

The project area lies within the Española Basin, a sediment-filled asymmetric west-tilted half-graben that formed as part of the Rio Grande Rift. The Rio Grande Rift created a series of north-south trending faults that resulted in uplifted mountains, widespread volcanism, and large sediment filled basins. The Española Basin is bounded by the Sangre de Cristo Mountains to the east, the Jemez Volcanic Field to the west, the San Luis Valley and Chama basins to the north, and the Albuquerque Basin to the south-southwest (USACE 2017).

The Rio Chama flows through a narrow canyon (~350 feet deep), varying in width from about 300 feet at the bottom to about 1,500 feet at the top (USACE 1987). The upper rim of the canyon is the Poleo Sandstone (Triassic age) underlain by the Abo formation (Permian age). Poleo Sandstone is dominantly white to buff colored, medium to coarse grained, quartzitic, well cemented, and highly jointed. Locally, there are thin seams and zones of conglomerate with cobbles up to four inches in diameter. All sand and gravel size material is well rounded. The upper Abo formation is a massive, red to brown mudstone with irregular lenses and masses of gray green sandy mudstone. The remainder of the Abo formation exposed at the dam site is a series of intermingled lenses of silty mudstone and silty sandstone. The dominant color is red-brown, but some units are purple to green. Implementation of the proposed action would not impact the geology of the project area.

Air Quality

The area is an attainment area for all criteria air pollutants. Non-criteria pollutants, such as those associated with Los Alamos National Laboratory and tailpipe emissions from increasing traffic will continue to be air quality issues. Bandelier National Monument is a Class I Federal air quality area. Future actions within the project area must account for and avoid potential degradation of the air quality at Bandelier.

There are no documented air quality non-attainment issues in Rio Arriba County, NM. The future air quality without project is expected to remain unchanged. Implementation of the proposed action would not impact the air quality of the project area.

Noise

The action area is located in Rio Arriba County, NM. The project area is generally quiet, rural settings, with only limited background noise from major highways, aircraft flyovers, sirens, or other urban noise. Background noise levels are not expected to change under the without project conditions.

Table 2 Points of Reference for Noise

dB (Decibels)	Activities
1	The softest sound a person can hear with normal hearing
9	normal breathing
29	soft whisper
40	quiet residential area
50	rainfall
60	normal conversation
70	freeway traffic
80	whistling kettle
85	heavy traffic, noisy restaurant
90	truck, shouted conversation
95-110	motorcycle
100	snowmobile
110	busy video arcade
110	car horn
112	personal cassette player on high
120	thunder
125	chain saw
130	stock car races
150	jet engine taking off
162	fireworks (at 3 feet)
170	shotgun

Source: LHH 2001

The lands adjacent to the reservoirs and rivers are relatively undeveloped, except where the river bisects established municipalities. Dominant sounds in the project area originate from natural sources: water, wind, and wildlife. Local traffic noise is generated by various highway crossings. Noise levels and patterns at developed recreation areas and frequently-used informal use areas are localized and typical of campground and day use recreational areas. Beyond these formal and informal recreation areas, the most conspicuous noise producers are power boats and jet skis on the reservoirs that allow these activities. Noise levels above 85 decibels (dB) will harm hearing over time. Noise levels above 140 dB can cause damage to hearing after just one exposure. Table

2 lists common noises and their decibel levels for reference. Implementation of the proposed action would have small, temporary impact on noise levels in the project area during construction.

Aesthetics

The NEPA and Council on Environmental Quality (CEQ) regulations identify aesthetics as one of the elements that must be considered in determining the effects of a project. Aesthetics include the presence and appearance of landforms, water surfaces, vegetation, and human created features relative to the surroundings and settings of the area. These features are primary characteristics of an area or project that determine visual character and the manner in which people view the setting. Aesthetics analysis considers the existing and future appearance, or perception of views, of the project site and areas surrounding the site, as well as viewer sensitivity. The existing condition for the aesthetics of the Rio Chama and adjacent riparian areas ranges from fair to good. Implementation of the proposed action would not impact the aesthetics of the project area.

Demographics

The project area and affected populations is in Rio Arriba County, NM. The population of Rio Arriba County has decreased slightly from 41,190 in 2000 (U.S. Census Bureau 2018). The majority of the surrounding project population is Hispanic/Latino followed by White (not Hispanic), Native American, Black and Asian (Table 3). New Mexico population projections were developed (Table 4) for the recently approved New Mexico State Water Plan to support regional water planning efforts (USACE 2006). Implementation of the proposed action would not impact the population trends of the project area.

Table 3 Demographic parameters by heritage and age for the project area (2017).

	Total Population	**White, not Hispanic**	**Hispanic / Latino**	**Native American**	**African American**	**Asian**
New Mexico	2,088,070	37.5%	48.8%	10.9%	2.5%	1.7%
Santa Fe County	148,750	43.0%	51.0%	4.3%	1.2%	1.6%
Los Alamos County	18,738	72.0%	17.8%	1.4%	1.2%	6.4%
Rio Arriba County	39,159	12.9%	71.3%	19.0%	0.8%	0.6%
United States	325,719,178	60.7%	18.1%	1.3%	13.4%	5.8%
	Total Population	**0-17 years**	**18-64 years**	**65 and over**	**Below poverty level**	
New Mexico	2,088,070	23.4%	59.7%	16.9%	19.7%	
Santa Fe County	148,750	18.4%	58.4%	23.2%	14.0%	
Los Alamos County	18,738	22.7%	59.9%	17.4%	4.0%	
Rio Arriba County	39,159	23.7%	57.6%	18.7%	22.5%	
United States	325,719,178	22.6%	61.8%	15.6%	12.3%	

Table 4 Projected County Population and Annual Average Growth Rate

2000 to 2040									
Counties/Key Municipalities	**Total County Population by Projection Year (5 year increments)**								
	2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
New Mexico Counties									
Rio Arriba	41,307	43,694	46,030	48,196	50,027	51,451	52,519	53,269	53,676
Los Alamos	18,359	18,722	19,122	19,122	20,099	20,565	20,866	21,034	21,224
Santa Fe	129,936	143,987	158,624	174,400	191,403	208,801	226,112	244,751	264,778

Socioeconomics

The leading employment sectors in Rio Arriba County (USACE 2017) are education, health care, and social services (20.9 percent), and public administration (16.4 percent). Agriculture employs about four percent of the county's workers, while hospitality services and construction, each employs more than ten percent of the workforce. Implementation of the proposed action would not adversely impact the socioeconomics of the project area. Increased recreational use may contribute to the local economy.

Land Use

Lands on both sides of the Rio Chama in the project area are managed by USACE, BLM, USFS, and the NMLO. Permits are issued by BLM and USFS for cattle grazing on lands adjacent to the river. Water gaps that provide limited livestock access to the river would be maintained. Immediately downstream of the project area, private agricultural lands occupy one or both sides of the Rio Chama. These agricultural lands use acequias that divert irrigation water from the river. Sixteen irrigation diversion structures exist on the Rio Chama between Abiquiu Dam and the confluence with the Rio Grande (USACE 1996). Implementation of the proposed action would not impact land use in the project area.

3.2 Climate*

This section provides information on the existing climate in the project area, and on projected changes in future climate conditions. A detailed discussion of regional climate and climate change, along with an assessment of climate impacts to regional hydrology, riparian and aquatic ecosystems can be found in (USACE 2017, Appendix G).

Existing Climate

The climate of the Española Valley ranges from semi-arid (approximately 10" of precipitation/year) along the Rio Grande to alpine (approximately 40" of precipitation/year) at the highest elevations of the surrounding mountain peaks. Mountain areas retain snow during the winter months, and melting of the snowpack in spring contributes significantly to spring runoff flows on the Rio Grande and Rio Chama.

A National Oceanic and Atmospheric Administration (NOAA) National Weather Service Cooperative Observer station with a relatively complete record is located at Alcalde (Station

290245), along the Rio Grande northeast of Ohkay Owingeh Pueblo. The period of record for this station is 1953 through October 2012. The climate at Alcalde is arid continental with large daily and seasonal temperature differences (USACE 2017, Appendix G). Summers tend to be hot and dry; winters tend towards cool and humid. Peak precipitation occurs during the late summer/early fall (July, August, September) during the peak of the North American Monsoon (monsoon), with a secondary peak in winter. Spring and fall tends towards warm and dry.

The monthly period of record temperature summary at Alcalde (USACE 2017, Appendix G) shows that monthly average daytime maximum temperatures (Tmax) are above freezing in all months. Winter Tmax averages 47.7°F, with few winter days with Tmax <=32°F. Monthly overnight minimum temperatures (Tmin) average 17.1°F in winter, but can reach as low as -34°F. In summer, Tmax averages 87.4°F. July is the hottest month, with an average of 16 days with temperatures above 90°F and occasional days where temperatures peak as high as 102°F. Monthly overnight low temperatures average 69.9°F in summer.

At Alcalde, precipitation averages 10.01” per year (USACE 2017, Appendix G). In most months, precipitation is 0.75” or less, but is higher during the monsoon season: July receives an average of 1.37”, August 1.89”, September 1.26”, and October 1.04”. Precipitation may fall as snow from October through April, with average monthly snowfall peaking in December at 2.8”.

Floods occur from April through October and are usually the result of rain alone, rain-augmenting snowmelt runoff, or in some rare cases, extremely high snowmelt runoff events. Local rain events caused by convective storms create flash floods on the tributaries, which accumulate in the Rio Grande’s channel. Many of the flood-producing storms on the main stem Rio Grande occur during the transitional periods between spring and summer and between summer and fall. During these periods, the strong intrusion of cool northern air interacts with the moist tropical air to produce the widespread storms over the watershed.

Topography significantly influences local climate in winter and summer. In winter, the dominant pattern is for storms to move into the region from the west or northwest; much of the precipitation falls over the western and central portions of the Jemez Mountains, and the amount declines rapidly moving east of the Sierra de los Valles and down slope to the Rio Grande. During the monsoon season, thunderstorm development is encouraged by daytime surface heating over the Pajarito Plateau and Sierra de los Valles. Daytime surface heating causes air to rise, initiating convection that can pull in air from lower areas to the southeast (Bowen 1996). This convection leads to the formation of thunderstorms over the plateau. Westerly winds in the upper atmosphere can push these storms east towards the Rio Grande as well as advect precipitation into the area. The Sangre de Cristo Mountains prevent moisture from the Plains from entering the region. The region effectively lies in the rainshadow of the Sangre de Cristo Mountains with respect to moisture transported northwestward from the Gulf of Mexico.

Wind direction is generally from the southeast in summer and from the west in winter, but varies greatly because of local topography and mountain and valley breezes. Los Alamos National Laboratory researchers have deduced a diurnal pattern of wind movement from observations in the various Pajarito Plateau Canyon systems. During the day, the winds tend to blow up-canyon from the east; at night, the winds tend to blow down-canyon from the west. Shear winds have also been noted across the canyons (Bowen 1996).

In recent decades, temperature increases have been observed regionally (USACE 2017, Appendix G). Annual temperatures in New Mexico warmed at an average rate of 0.219°F (0.10°C) per

decade from 1912 to 2011 but at the faster rate of 0.678°F (0.34°C) per decade since 1970 (Tebaldi et al. 2012). The same pattern of faster recent warming was also observed in annual average daytime maximum high temperature (Tmax) and annual average nighttime minimum temperature (Tmin). Higher rates of warming have been observed in high elevation areas, particularly in winter. There has been no detectable trend in precipitation.

In the vicinity of the project area, statistically-significant increases in temperature have been observed over the period 1971-2012, particularly in the months of January and March, and in the summer months from May through September. Daytime high temperatures have risen at about 1°F/decade from May through November in the Middle Rio Grande, and at approximately half that rate along the Rio Chama and Jemez River. Rates of warming have been slower in the Jemez Mountain stations. Only in March is there a significant, region-wide warming trend of approximately 1°F/decade.

Nighttime low temperatures have also risen significantly in many months, particularly in the period April through September when a warming trend of approximately 0.5°F/decade was observed. Increases in Tmin were particularly evident in the Jemez Mountains, with significant rates of increase in excess of >0.59°F/decade in all months except February and December. As a result of this warming, there has been a trend towards increasing numbers of late spring days with night time temperatures warmer than 32°F. Historic precipitation trends in the project area show little in the way of statistically significant trends. Implementation of the proposed action would not affect climate in the project area.

3.3 Water Resources

Hydrology

Water operations along the Rio Chama have four general purposes: flood control, irrigation supply, municipal and industrial supply, and environmental operations (USACE, USBR, NMISC 2007). Water operations also include downstream monitoring to ensure that desired flows are achieved. Little native Rio Grande flow is actually captured and stored in the major reservoirs in this system. On average, only 100,000 AF of native Rio Grande water (less than 10% of annual average flow at Otowi gage), is historically stored in El Vado Reservoir. Except for temporarily detained flows due to flood regulation, all of the water stored in Abiquiu Reservoir is imported SJC Project water. When Pub. L. No. 86-645 is triggered, Abiquiu Reservoir is required to retain carryover flood storage because no Rio Grande water may be withdrawn from storage after July 1 (exclusive of water from upstream storage) when the natural flow at the Otowi gage is less than 1,500 cfs. Rio Grande water that is locked into storage is not permanent: it must be released at the end of the irrigation season (November 1) and must be fully evacuated by March 31 of the following year.

Along the Rio Chama, Heron Reservoir manages imported SJC Project waters, passing all native Rio Grande flows (USACE, USBR, NMISC 2007). El Vado Reservoir regulates native Rio Grande waters for Prior and Paramount water needs and stores native Rio Grande water when allowed by the Rio Grande Compact for use by the Middle Rio Grande Conservancy District (MRGCD). When space is available, El Vado can also store SJC Project waters. Abiquiu Reservoir is Congressionally authorized for flood control, sediment control, and water supply storage of both SJC Project and native Rio Grande waters. However, Abiquiu Reservoir does not currently store native Rio Grande water except for flood control purposes.

Flood control operations adjust the rate of releases at Abiquiu Reservoir (USACE, USBR, NMISC 2007). Flood control operations are typically in effect during snowmelt runoff, when mountain snowpack is heavier than normal, and during unusually heavy summer monsoon seasons. Releases from Abiquiu reservoirs is adjusted to take into account flow from Cochiti, Galisteo, and Jemez Canyon reservoirs along the Rio Grande main stem and its tributaries. These four reservoirs are operated as a system to ensure that flows at critical downstream points are not exceeded.

The Rio Grande Compact, in effect, limits the amount of surface water than can be depleted in the Middle Rio Grande based upon the natural flow of the river measured at the Otowi gage downstream of the project area (Rio Grande Compact, 1939). In addition, the OSE has determined the Middle Rio Grande to be fully appropriated. Therefore, any increase in water use in one area of the river must be offset by a reduced use in another area of the river. The OSE requires that increases in water use from new habitat restoration projects must be offset by purchased or leased water rights. The New Mexico State Water Plan (OSE/NMISC 2003) further states "State Engineer permits are required for all habitat restoration activities that result in increased depletions of water."

Water Quality

New Mexico Environment Department (NMED) periodically monitors water quality within the state's waterbodies (i.e., lakes rivers, and streams) to determine whether attainment of water quality standards and supporting designated uses is occurring. The results of this assessment are used for reporting through the 303(d)/305(b) Integrated List and the development of total maximum daily load (TMDL) documents for each waterbody not meeting standards. The designated uses for the Rio Chama from Abiquiu Dam to the confluence with the Rio Grande include irrigation, livestock watering, wildlife habitat, coldwater fishery, warmwater fishery, and secondary contact (NMWCC 2017). The most recent survey for the project reach occurred between 2012 and 2014 (NMED 2015). From this assessment, it was determined that this reach fully supports the designated uses (NMED 2018). However, despite the previous exceedances in dissolved oxygen (DO) and pH (NMED 2004), neither discrete measurements nor the deployment of a multi-parameter sonde, which records diurnal variation in DO and pH and other water quality parameters (e.g., water temperature, turbidity, and salinity), did not occur during the most recent survey (NMED 2015). An additional identified gap in the most recent survey was the lack of diurnal temperature data during the summer, which was attributed to high-flow conditions that prevented sensor deployment and assessment during the hottest part of the year (NMED 2015).

The construction of Heron, El Vado, and Abiquiu dams, and the importation of Colorado River Basin water via SJC Project has had numerous effects on water quality in the Rio Chama watershed (Langman and Anderholm 2004). The coordinated storage and releases from the dams and the additional flows from the SJC Project decreased specific conductance and suspended-sediment concentration and increased pH (Langman and Anderholm 2004).The hypolimnetic release from Abiquiu Dam has impacted the thermal regime of the Rio Chama downstream. For example, during winter low-flow conditions, a negative water temperature gradient was observed, with values below the dam being the warmest and subsequently cooled in the downstream direction (Dudley and Platania 2001). The station below the dam also exhibited the least day-to-day variability (Dudley and Platania 2001). The trends observed on the Rio Chama below the single-point hypolimnetic withdrawal, which can artificially warm streams in the winter and dampen diurnal and daily variability throughout the year (Ward and Stanford 1979, Ward 1985). The two

stations further downstream (i.e., 3 and 27 miles) monitored by Dudley and Platania (2001) were less influenced by artificial warming from Abqiuiu Reservoir and likely responded to very cold ambient air temperature and low-flow riverine conditions that influence the thermal regime of rivers (Ward and Stanford 1979, Caissie 2006). A positive temperature gradient, where water temperature is the coldest below Abiquiu Dam and subsequently warms in the downstream direction, has not been documented during warmer months, but is likely given the hypolimnetic release, and has been observed downstream on the Rio Grande below Cochiti Dam (Dahm et al. 2013, Reale 2014). The hypolimnetic release from Abiquiu Reservoir can also influence the dissolved oxygen (DO) regime on the Rio Chama. For example, exceedances of the water quality standard for DO (6 mg L^{-1}; NMWCC 2017) occurred once during the summer and twice in the fall of 1999 (NMED 2004). The exceedances were attributed to documented summer stratification and formation of anoxic water within the hypolimnion (Davis and Joseph 1999, Davis 2007) that was subsequently released from the reservoir (NMED 2004). The hypolimnetic release, which dampens thermal regime downstream of the dam, may also facilitate elevated DO concentrations due to physical controls of the solubility of oxygen in water (Wetzel 2001).

It is unclear how the flow-through hydropower facility (See Section 1.4.2) impacts water quality on the Rio Chama downstream of Abiquiu Dam. However, it can be assumed the impacts are less severe than a typical hydroelectric peaking operation, where water is stored at night when electrical demand is relatively low and released through turbines during the day to satisfy demand, with considerable ecological effects downstream (Cushman 1985, Moog 1993, Friedl and Wüest 2002).

Rio Chama Aquatic Habitat

Aquatic habitat has been altered by the construction and operation of Abiquiu Dam. The hydrological alteration of flow have changed along with the channel morphology (Dudley and Platania 2001). The Rio Chama downstream from Abiquiu Dam is a canyon-bound, single-thread, gravel-bed channel, with coarse bed-material composed of cobbles and boulders (USACE 2007, Appendix K). The sediment supply at the upstream end of this reach was effectively eliminated by Abiquiu Dam, which has probably caused the coarsening of the bed material compared to pre-Abiquiu Dam conditions. The sediment supply derived from bank erosion has decreased over time due to the bank protection, slowing formation of in-channel habitat. The channel has hardened into a trapezoidal conveyance channel with little habitat diversity. Below the project reach, the Rio Chama exits the canyon and is influenced by erosion of alluvial fans transporting sand into the channel. These changes have modified the distribution and abundance of aquatic habitats available to native fish (Dudley and Platania 2001).

Most of the channel below Abiquiu Dam is characterized by intermittent riffles and runs with sizable pocket pools associated with large rocks in the channel. Substrate is characterized by a gravel, cobble bottom with accumulation of fines in back waters. About 1.7 miles downstream of the Dam, a large diversion structure bisects the channel and pools water for about 770 yards. Within this section, fines are the predominant substrate. Below the diversion structure, channel morphology is primarily riffle for the next half mile. Throughout the reach below Abiquiu Dam, fines are added to the system via numerous eroding washes and fill interstitial spaces within the cobble and gravel predominated substrate. Habitat variety and suitability for various fish species varies greatly seasonally due to large differences in discharge from Abiquiu Dam. Flows range from about 50 cfs (cubic feet per second) between January and February to over 1,000 cfs during much of the irrigation season (April through August). Notable deficiencies in fish habitat due to

these fluctuations are reduced spawning habitat for Brown Trout (*Salmo trutta*) from dewatering of suitable spawning gravels in the winter and a lack of low flow refugia for Rio Grande Chub during most flow regimes. The availability of deeper habitat at low flows and low velocity habitat is likely to change very slowly over time due to a lack of coarse substrate material inputs and the regulated hydrology from Abiquiu Dam.

3.4 Fish and Wildlife

The fish and wildlife species by taxa that potentially occur in Rio Arriba County (NMDGF, accessed September 20, 2018) are fish (33), amphibians (12), reptiles (28), birds (251), and mammals (89). The list of all wildlife potential species is provided in Appendix A.

Riverine Fish Community

Prior to the construction of Abiquiu Dam in 1963, the fish community consisted primarily of native species documented to include Rio Grande Chub (*Gila pandora*), Flathead Chub (*Platygobio gracilis*), Rio Grande Sucker (*Catostomus plebeius)*, Longnose Dace (*Rhinichthys cataractae*), and Fathead Minnow (*Pimephales promelas*) (USACE 2007). Since construction of Abiquiu Dam, the community has shifted towards more headwater type fauna (Platania et al. 1996). Native and non-native fish species occurring in the Rio Chama are summarized in Table 5. Some native minnows, which persisted following dam construction, are generally considered headwater species adapted to cool waters with relatively high velocities. Dudley and Platania (2001) documented River Carpsucker (*Carpoides carpio*), Black Bullhead (*Ameiurus melas)*, Western Mosquitofish (*Gambusia affinis*), and Smallmouth Bass (*Micropterus dolomeiui*).

Introduced Brown Trout are self-sustaining in the system, and Rainbow Trout occur, but are generally not self-sustaining. Hanson (1992) summarizes the findings of studies conducted from 1988 through 1991. Non-native species documented include Brown Trout, Rainbow Trout, White Sucker (*Catostomus commersoni*), Common Carp (*Cyprinus carpio*), and Green Sunfish (*Lepomis cyanellus*). Platania (1991) had similar results, with the exception of Brown Trout, which were not captured. Rainbow Trout are stocked periodically in the lower Rio Chama within the first 7.5 miles downstream of Abiquiu Dam.

Table 5 Rio Chama fish species.

Species	Common Name	Rio Chama
Oncorhynchus mykiss	Rainbow Trout	Non-native
Salmo trutta	Brown Trout	Non-native
Cyprinella lutrensis	Red Shiner	Native
Cyprinus carpio	Common Carp	Non-native
Gila pandora	Rio Grande Chub	Native
Pimephales promelas	Fathead Minnow	Native
Platygobio gracilis	Flathead Chub	Native
Rhinichthys cataractae	Longnose Dace	Native
Carpoides carpio	River Carpsucker	Native
Catostomus commersoni	White Sucker	Non-native
Catostomus plebeius	Rio Grande Sucker	Native
Ameiurus melas	Black Bullhead	Non-native
Ictalurus punctatus	Channel Catfish	Non-native
Gambusia affinis	Mosquitofish	Non-native

Species	Common Name	Rio Chama
Lepomis cyanellus	Green Sunfish	Non-native
Micropterus dolomeiui	Smallmouth Bass	Non-native
Micropterus salmoides	Largemouth Bass	Non-native
Pomoxis nigromaculatus	Black Crappie	Non-native
Perca flavescens	Yellow Perch	Non-native

Riverine habitat use criteria were developed for the URGWOPs (USACE 2007) using five representative aquatic species for the Rio Grande: Rio Grande Silvery Minnow (*Hybognathus amarus*), Flathead Chub, Longnose Dace, River Carpsucker, and Channel Catfish (*Ictalurus punctatus*) (Bohannan-Huston et al. 2004); for the Rio Chama, Brown Trout was substituted for the longnose dace. Platania et al. (1996) found that Brown Trout occupy a wide range of depths (20–110 cm) but are typically found in water less than 40 cm deep and in a wide range of velocities (0–140 cm/s) but mostly occur in water velocities less than 60 cm/s. Furthermore, the majority of Brown Trout (71.5%) were present over gravel or cobble substrates, with a small percentage (11%) occurring over sand and silt substrates. Turner (1982) conducted a study to determine instream flow requirements for fish species in this reach. The findings state that ideal flow for juvenile and fry Brown Trout is 200 cfs, with at least 65% of the maximum usable area occurring at flows between 50 and 1500 cfs. The ideal flow for adult Brown Trout is 1500 cfs, with at least 75% of the maximum usable area occurring at flows between 100 and 750 cfs.

NMDGF conducted an electrofishing survey of the Rio Chama below Abiquiu Dam on March 15, 2016 (Frey 2017). NMDGF surveyed two locations in 2016, consistent with previous surveys of this reach (Hansen et al. 2010). NMDGF personnel conducted a single electrofishing pass of 300-400 m reaches using four backpack electrofishers. Relative abundance was assessed and compared with catch per unit of effort (CPUE) (fish/hr) to assess the fish community. Salmonids were the predominant group captured. Rainbow Trout were detected in appreciable abundance due to implementation of stocking within the area in the mid 2000's. Overall fish CPUE was greater in 2016 (102 ±22 fish/hr) than in 2009 (39 ±2 fish/hr). Species captured in 2016 and not in 2009 were Green Sunfish, Fathead Minnow, and Rainbow Trout.

Terrestrial Wildlife

Avifauna that may be found in the Abiquiu Reservoir area include the American Kestrel (*Falco sparverius*), Prairie Falcon (*Falco mexicanus)*, Mourning Dove (*Zenaida macroura*), Great Horned Owl (*Bubo virginianus*), Common Nighthawk (*Chordeiles minor*), Cordilleran Flycatcher (*Empidonax occidentalis*), Horned Lark (*Eremophila alpestris*), Cliff Swallows (*Petrochelidon pyrrhonota*), Rock Wren (*Salpinctes obsoletus*), Canyon Towhee (*Melozone fusca*), House Finch (*Haemorhous mexicanus*), and Western Meadowlark (*Sturnella neglecta*). Flocks of cormorants and wintering Bald Eagles (*Haliaeetus leucocephalus*) utilize the shallow waters, and lands at lower elevations along portions of the northern shoreline. Bald Eagle winter roosting sites have been noted along the Rio Chama drainage, although not in the immediate vicinity of the dam or reservoir. Western Grebe (*Aechmophorus occidentalis*), Great Blue Heron (*Ardea herodias*), Common Merganser (*Mergus merganser*), and Mallard (*Anas platyrhynchos*) are among the most frequently observed waterfowl utilizing the river area.

The Rio Grande is a major migratory flyway for avian species (Yong and Finch, 2002). The peak nesting season for birds is April 15 through August 15. The Migratory Bird Treaty Act (MBTA)

(16 U.S.C. § 703 *et seq.*) is the primary legislation in the United States established to conserve migratory birds (USFWS 2004). The list of the species protected by the MBTA appears in Title 50, Section 10.13, of the Code of Federal Regulations (50 C.F.R. § 10.13). The MBTA prohibits taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. The USFWS and the Department of Justice are the Federal agencies responsible for administering and enforcing the statute.

More than 160 bird species, which are federally protected under the Migratory Bird Treaty Act, may be found in the Rio Chama valley. Since 2001, 152 bird species have been observed at the Los Luceros Important Bird Area (IBA, Audubon Society) on the Rio Grande. Hink and Ohmart (1984) recorded 277 species of birds in the bosque ecosystem. Highest bird densities and species diversity were found in edge habitat vegetation with a cottonwood overstory and an understory of Russian olive (*Elaeagnus angustifolia*) (Hink and Ohmart 1984). Emergent marsh and other wetland habitats also had relatively high bird density and species richness. Thirty of the forty-six species of breeding birds found in the bosque used cottonwood forest habitat. No bird species showed a strong preference for Russian olive stands (Hink and Ohmart 1984).

Mammals associated with the riparian corridors include raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus pallidus*), and Botta's pocket gopher (*Thomomys bottae actuosus*). Bobcat (*Lynx rufus*) and other large carnivores occur infrequently in the area due to disturbances by humans.

Most reptiles are found in areas adjacent to the reservoir, while amphibious species generally inhabit marginal lakeside habitats. Amphibian and reptilian species which may occur in the area include the Spadefoot Toads (*Spea multiplicata* and *S. bombifrons*), Northern Sagebrush Lizard (*Sceloporus graciosus*), and Plateau Fence Lizard (*Sceloporus tristichus*). Herptile abundance and diversity was found to be greatest in habitats that lacked dense canopy cover and that were characterized by sandy soils and sparse ground cover (Hink and Ohmart 1984). Many of the species found in the bosque were representative of drier upland habitats. Hink and Ohmart (1984) did describe a distinct assemblage of species associated with denser vegetation cover in mesic or hydric habitats. Common species included tiger salamander (*Ambystoma mavortium*), boreal chorus frog (*Pseudacris maculate*), bullfrog (*Lithobates catesbeianus*), northern leopard frog (*Lithobates pipiens*), many-lined skink (*Plestiodon multivirgatus*), black-necked garter snake (*Thamnophis cyrtopsis*), and western painted turtle (*Chrysemys picta*).

Special Status Species

Three agencies have a primary responsibility for the conservation of animal and plant species in New Mexico: the FWS, under the authority of the Endangered Species Act of 1973 (as amended); the NMDGF, under the authority of the Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act and 19.21.2 NMAC. In addition, the USFS and the BLM recognize species of concern for their management as well. Each agency maintains a list of animal and/or plant species that have been classified or are candidates for classification as endangered or threatened based on present status and potential threat to future survival and recruitment.

There are several Federal and State listed threatened or endangered species, species of concern, and rare plants that occur, or could potentially occur, in Rio Arriba County (BISON-M, accessed September 20, 2018); however, habitat is not present along the Rio Chama for these species. Seven

Federally listed species potentially may be present in or near the Rio Chama are listed in Table 6.

Table 6 Federally Threatened or Endangered Species that occur near the project area (USFWS iPaC accessed September 19, 2018).

Common Name	Scientific Name	Status	Present	Critical Habitat
Canada Lynx	*Lynx candensis*	E	N	N
New Mexico Meadow Jumping Mouse	*Zapus hudsonius luteus*	E	N	N
Interior Least Tern	*Sternula antillarum athalassos*	E	N	N
Mexican Spotted Owl	*Strix occidentalis lucida*	T	N	N
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	N	N
Western Yellow-Billed Cuckoo	*Coccyzus americanus*	T	N	N
Jemez Mountain Salamander	*Plethodon neomexicanus*	E	N	N

A Biological Assessment (BA 2019) for the USFS Española and El Rito Ranger Districts and the BLM evaluates the potential effects of the proposed action on all proposed, endangered, and threatened fish, wildlife, and plant species known or suspected to occur within or near the project area (Appendix B).

3.5 Floodplains and Wetlands

Executive Order 11988 (Floodplain Management) provides Federal guidance for activities within the floodplains of inland and coastal waters. Federal agencies are required to "ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management." Removal of the non-native vegetation may allow the active floodplain to expand. Preservation of the natural values of floodplains is of critical importance to the nation and the State of New Mexico. These natural values include preservation of wetlands.

Wetlands consist of marshes, wet meadows, and seasonal ponds that typically support hydrophytic plants such as cattails, sedges and rushes. Wetlands are a critical component of bosque diversity. Wet meadows were the most extensive wetland habitat type in the Rio Grande valley prior to irrigation. The construction of the MRGCD drains and ditches led to substantial decreases in wetland habitat: from 1918 to present, wetland-associated habitats have undergone a 93% reduction (Hink and Ohmart, 1984; Scurlock, 1998). Wetlands are an integral component of the bosque ecosystem, not only increasing its diversity, but also enhancing the value of surrounding plant communities for wildlife. Wetlands have experienced the greatest historical decline of any floodplain plant community. Among the greatest needs of the riparian ecosystem is the preservation of existing wetlands and expansion or creation of additional wetlands (Crawford et al. 1993).

Wetlands are lands transitional between terrestrial and aquatic ecosystems where the water table is at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Saturation with water determines the nature of soil development and, in turn, the types of plant and animals inhabiting these areas. Wetlands occurring within the riparian zone may be dominated by the same plant species common in the bosque; however, wetlands exhibit wetter soils and support many additional plant and animal species.

Jurisdictional wetlands (relative to Section 404 of the Clean Water Act) do occur in the Recommended Plan Area. Most wetlands within the floodway have developed in areas with a high

groundwater table. Those in shallow basins or relatively far from the river are likely seasonally or temporarily flooded; that is, inundated during the majority, or just a portion, of the growing season, respectively. Within the Rio Grande floodway, most islands, point bars, and side channels are periodically inundated by river flows and support marsh, meadow, or shrub wetland communities.

Scurlock (1998) has summarized trends for historic Rio Grande riparian communities over the last 150 years. The riparian ecosystem has changed with the decline of cottonwood gallery forest, encroachment of upland junipers, and invasion of salt cedar (*Tamarix ramosissima*), Russian olive, and Siberian Elm (*Ulmus pumila*).

3.6 Terrestrial Vegetation Communities

The Rio Chama downstream from Abiquiu Dam previously supported substantial growths of cottonwoods, willows, New Mexico olives, shrubs, and wetlands. The area has been mapped to classify vegetation, primarily through photo-interpretation from Abiquiu Dam to the confluence with the Rio Grande (USACE 2007). Classification of Rio Grande basin riparian vegetation relies on plant community designations developed by Hink and Ohmart (1984). Approximately 14 percent of the mapped riparian vegetation is composed of mature and mid-aged cottonwood forest, while over half of the mapped vegetation consists of intermediate and young stands of native trees with dense shrubby understory vegetation (Hink and Ohmart Types 3, 4, and 5; USACE 2017). These riparian forest areas are interspersed with about 20 percent openings vegetated with grasses, forbs, and 13 percent composed of brushy vegetation between 5 and 15 feet tall. Native species comprise almost 22 percent of the riparian vegetation of the Rio Chama Section, with areas dominated by non-native species like Russian olive and saltcedar accounting for about 60 percent.

The upland vegetation above the river corridor is typical of the Great Basin Conifer Woodland and Desert Scrub biotic communities (USACE 2017). One-seed juniper is prominent on the steeper slopes of dissected terraces or plateaus. Juniper and piñon pine are both prominent on the shallow, sandy soils found on outcroppings and foothills.

3.7 Noxious Weeds and Invasive Species

The majority of non-native species within the project area are plants. Though some non-native fish and other wildlife may exist, they are not of major concern. The invasive tree species of concern include salt cedar, Russian olive, and Siberian elm. These species outcompete the native species and can eliminate the native riparian bosque resulting in a drier, more upland habitat.

Executive Order 13112 directs Federal agencies to prevent the introduction of invasive (exotic) species and provides for their control to minimize the economic, ecological, and human health impacts that invasive species cause.

In addition, the New Mexico Department of Agriculture designates and lists certain weed species as being noxious (Nellessen 2000). “Noxious” in this context means plants not native to New Mexico that may have a negative impact on the economy or environment, and are targeted for management or control. Class C listed weeds are common, widespread species that are fairly well established within the state. Management and suppression of Class C weeds is at the discretion of the lead agency. Class B weeds are considered common within certain regions of the state, but are not widespread. Control objectives for Class B weeds are to prevent new infestations, and in areas where they are already abundant, to contain the infestation and prevent their further spread. Class A weeds have limited distributions within the state. Preventing new infestations and eliminating

existing infestations is the priority for Class A weeds. In order to prevent this, all equipment would be cleaned with a high-pressure water jet before leaving an area and entering a new area.

3.8 Recreation

The Rio Chama offers trout fishing below Abiquiu Dam on 2.7 miles of river through lands managed by USACE, BLM, USFS, and the NMLO. Local flow rates are important to the quality of fishing conditions (Hanson 1992). Other recreational activities may include camping, walking, biking, hiking, wildlife viewing, and picnicking.

3.9 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) [54 U.S.C. § 300101 *et seq.*] and its implementing regulations (36 C.F.R. § 800) require Federal agencies to take into account the effects of their undertakings (e.g., projects or permits) on historic properties.

Historic properties are legally considered to be those properties (cultural resources) eligible for listing on the National Register of Historic Places (NRHP). To be eligible for listing, a property must have "the quality of significance in American history, architecture, archeology, engineering, and culture" that can be "present in districts, sites, buildings, structures, and objects," must "possess integrity of location, design, setting, materials, workmanship, feeling, and association," and must meet at least one of a set of four criteria relating to (A) association with historical events; (B) historically significant people; (C) distinctive characteristics of a period or style; and/or (D) are likely to yield information important to prehistory or history. There are many possible examples of historic properties, including archaeological sites, historic buildings, traditional cultural properties (TCPs), and historic districts. As such, the identification and evaluation of historic properties (including archaeological sites, historic buildings, and other features constructed or modified by humans in the past) is an important component of this project.

The Section 106 process includes the identification of historic properties that might be affected by a project, the evaluation of those properties, determinations of effect on those properties, consultation with various parties (including the New Mexico State Historic Preservation Officer (NMSHPO), Tribes, local governments, and the public) about those effects, and resolution of any adverse effect on historic properties. Because the proposed project involves multiple agencies, both Federal and State, USACE has been designated as the lead Federal agency for purposes of making these determinations and conducting consultation under Section 106.

There is a long history of human occupation in the Chama Valley, extending from more than 10,000 years ago to the present day. The prehistory and history of the Chama are divided by archaeologists into the following periods, with associated dates:

- Paleoindian: c. 12,500-5500 BC
- Archaic: 5500 BC – AD 400/600
- Developmental Period: AD 400/600-1200
- Coalition Period: AD 1200-1325
- Classic Period: AD 1325-1540
- Historic Period: AD 1540-Present

Each of these periods is characterized by different lifeways, subsistence strategies, and technologies. These periods can be grouped into two major divisions: Prehistoric (dating before contact with Europeans), and Historic (dating after contact with Europeans).

Archaeological Surveys

The Area of Potential Effect (APE) is considered here to be the area encompassing the proposed restoration features themselves, any area around those features where mechanical equipment might be expected to operate, any areas where the proposed features might be expected to cause future changes in the surrounding landscape or flow of water, and any areas used for access routes or staging. The currently-defined APE for the proposed project is shown in Table 7 and is approximately 75 acres in size.

Two archaeological surveys were conducted in order to identify possible historic properties within the APE for the proposed project. NMDGF contracted with SWCA Environmental Consultants to conduct a survey of portions of the project area on USFS, BLM, and State-owned lands, and USACE archaeologists conducted a survey of the portion on USACE-owned land (Figure 3). Ten resources in total were documented within the APE (Table 7). SWCA documented a total of nine sites within or intersecting the project area. These nine include seven prehistoric artifact scatters, one Twentieth-Century railroad grade, and the Abeyta-Trujillo Acequia diversion structure and a segment of the irrigation ditch. Six of the nine sites have been recommended as eligible for listing on the National Register of Historic Places (NRHP). A single resource was documented on USACE land: HCPI 47037, a concrete weir constructed by USGS in 1961 (Table 7). Concurrent with the preparation of the Draft EA, these determinations of eligibility have been coordinated with the landowning agencies and will be submitted to NMSHPO for their consideration and concurrence. Section 106 consultation has been completed for the final EA and FONSI. Consultation documentation is included in Appendix B.

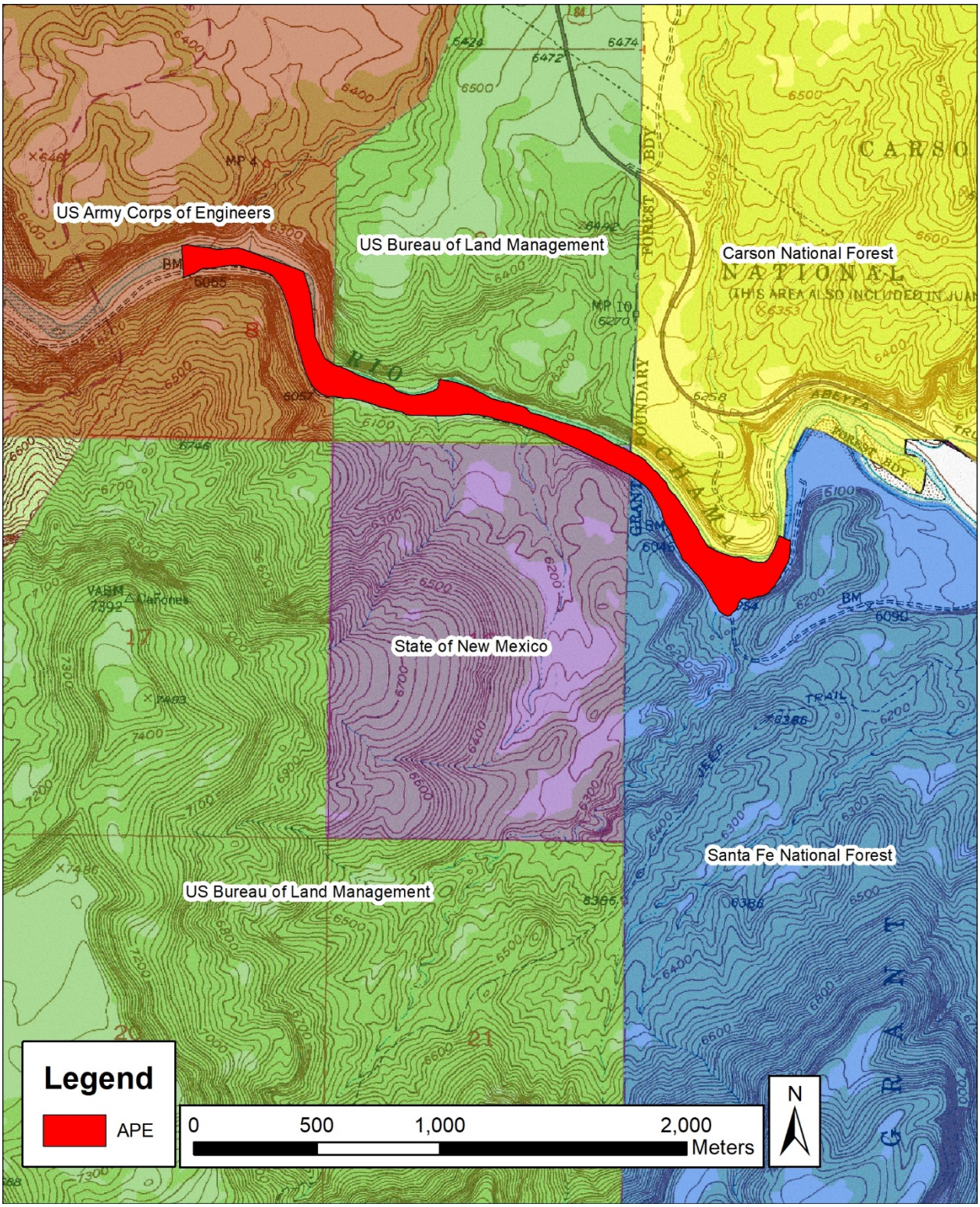

Figure 3 Area of Potential Effects (APE) for the proposed project, and land ownership.

Table 7 Historic Properties Documented within the APE.

Site/Historic Property Number	Site Type	Cultural Affiliation and Age	Land Owner	Eligibility Status	Eligibility Criteria
HCPI 47037	Concrete weir	Recent Historic (1961)	USACE	Not eligible	
LA 51720	Artifact scatter with feature	Unspecified Prehistoric	BLM	Eligible	D
LA 51721	Artifact scatter	Unspecified Prehistoric	BLM	Eligible	D
LA 75570	Railroad grade	Recent Historic (post-AD 1945)	SFNF	Not eligible	
LA 82827 / HCPI 33400	The Abeyta-Trujillo Acequia (diversion and irrigation system)	EuroAmerican/US Territorial; Pre-AD 1870	CNF	Eligible	A, C
LA 193665	Artifact scatter	Unknown Prehistoric	BLM	Not eligible	
LA 193666	Artifact scatter	Middle Archaic (5000-3000 BC)	BLM	Eligible	D
LA 193667	Artifact scatter	Unknown Prehistoric	BLM	Not eligible	
LA 193668	Artifact scatter	Late Archaic (1000 BC – AD 300) and Historic (AD 1821-1912)	CNF	Eligible	A, C, D
LA 193669	Artifact scatter	Unspecified Prehistoric	BLM	Eligible	D

BLM=Bureau of Land Management; CNF = Carson National Forest; SFNF = Santa Fe National Forest

3.10 Hazardous, Toxic, and Radioactive Waste (HTRW)

Due to the low potential of hazardous, toxic, or radioactive waste (HTRW) in the project area, a Phase I Environmental Site Assessment (ESA) was not conducted. If HTRW concerns arise prior to construction, an ESA will be completed following ASTM 2247-02. The results of an ESA will be incorporated into a supplemental EA.

Despite the low risk of encountering HTRW within the proposed project, a site visit was conducted by environmental professionals who regularly conducted ESAs to document the general existing conditions for this project (Appendix E). Solid waste, such as plastic bottles, bags, cups, and glass, was observed in low concentrations along the Rio Chama within the project area. The source waste was either aeolian or by the users of the trail and observation areas. The greatest density of solid was in close proximity to picnicking/wildlife viewing areas. Several hand-dug fire pits were observed adjacent to the river. Ash within may provide a de minimis source of metals (Cerrato et al. 2016) and other contaminants (Smith et al. 2011) if transported into the Rio Chama. Campfires in non-designated areas can also impact the aesthetics and the environment (Reid and Marion 2005). Vehicular traffic near the river along a non-marked two-track road was also observed. The road may provide a source of sediment, metals, and dissolved solids to the Rio Chama following

localized rain events that generate surface water runoff (Grayson et al. 1993, Lane and Sheridan 2002).

3.11 Environmental Justice

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (11 February 1994) was designed to focus the attention of Federal agencies on the human health and environmental conditions of minority and low-income communities. It requires Federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations and proposed actions. The 1995 Environmental Protection Agency (EPA) guidance document, Environmental Justice Strategy: Executive Order 12898, defines the approaches by which the EPA will ensure that disproportionately high environmental and/or socioeconomic effects on minority and low-income communities are identified and addressed. Further, it establishes agency-wide goals for all Native Americans with regard to environmental justice issues and concerns. These goals are designed to:

- Focus the attention of federal agencies on human health and general environmental conditions in minority and low-income communities with the goal of achieving environmental justice;
- Foster nondiscrimination in federal programs that could substantially affect human health or the environment; and
- Give minority and low-income communities greater opportunities for public participation on matters relating to human health and safety.

Environmental justice addresses the issue of disproportionate impacts on minority and/or low-income populations. Therefore, the locations of these populations must be known in order to evaluate potential environmental justice issues. For this analysis, populations with a high percentage of people of Hispanic origin, a high percentage of Native Americans, and a high percentage of low-income households or high poverty rates are identified. The locations of these identified populations are used to evaluate Environmental Justice concerns.

4 - FUTURE WITHOUT PROJECT

As discussed in chapter 3, without the project there would likely be little to no effect on regional geology, air quality, ambient noise, aesthetics, hazardous waste, demographics, socioeconomics, and land use.

4.1 Environmental Resources Not Considered in Detail

Initial evaluation of the effects of the project indicated that there would likely be little to no effect on regional geology, air quality, noise, aesthetics, demographics, socioeconomics and land use with the "without project" alternative.

4.2 Climate*

Recent overviews of climate change in the Southwestern United States have been provided (Garfin et al. 2013, NOAA 2013, Melillo et al. 2014), with important syntheses of climate change impacts to New Mexico (OSE 2006; BOR et al. 2013). These sources indicate that observed trends are likely to continue. Models project substantial warming over the 21st Century of 5-7°F by 2100 as compared to late 20th averages; warming may reach as much as 8.5 to 10°F by 2100 under plausible high emissions (large radiative forcing) scenarios. Even with no net changes in total precipitation, warming will affect regional hydrology through changes in the snowpack (Elias et al. 2015). Higher temperatures will delay the date at which precipitation falls as snow in the fall and cause a 4-6 week earlier shift in the date at which precipitation reverts to rain in the spring. The altitude at which a winter snowpack will develop is anticipated to rise. The combination of these trends is an overall reduction in snowpack volume to support ecologically-essential spring runoff flows, as well as reductions in baseflows during the remainder of the year. For the Rio Grande basin above Elephant Butte, declines in snow water equivalence, annual runoff, December-March runoff, and April-July runoff are all anticipated (BOR 2011). Increases in the frequency, intensity, and duration of both droughts and floods are expected (BOR et al. 2013).

Riparian and aquatic ecosystems along the Rio Chama are likely to be affected by changes in stream flow that alter water quantity, seasonal water availability, water quality, and increases in riparian evaporation. Projected reductions in annual maximum monthly flows are likely to reduce the spring runoff hydrograph, and, therefore, reduce the average amount and extent of spring runoff flooding of restoration measures on the floodplain. However, the amount of this projected reduction is small relative to the interannual variability, adding considerable uncertainty to estimates of ecological impacts. Projected impacts to the Middle Rio Grande riparian areas (Friggens et al. 2013) that are likely to be broadly applicable to northern New Mexico riparian areas include:

- Reduced riparian habitat due to decreased stream flows and longer drought;
- Decline in cottonwood gallery forests due to lower flows, more frequent wildfires, disease;
- Loss/reduction of native vegetation and replacement by invasive tree and grass species due to fire and lower water tables, and changes in spring runoff timing/volumes;
- Increasingly arid conditions would favor replacement of grassland and woodland habitats with scrubland, accompanied by reductions in vegetation cover; and

- Increased duration of drought, with increases in droughts lasting 5 years or more and increases in drought intensity.

There would be no change to the regional climate in the future without project.

4.3 Water Resources

Hydrology

The future without project would not change water management or hydrology in the project area.

Water Quality

If the project is not implemented, the potential short-term contribution of sediment to the Rio Chama during and after construction would be eliminated and the long-term water quality would remain unchanged. Nevertheless, water quality could be impacted under the No Action Alternative as a result of changing climate (Langman and Nolan 2005, Vörösmarty et al. 2000, Murdoch et al. 2000, Whitehead et al. 2009, and van Vliet et al. 2013). Lakes and reservoirs are considered sentinels, intergrators, and regulators of a changing climate (Williamson et al. 2009). For example, the El Niño Southern Oscillation, reservoir inflows, and reservoir oxygen content series oscillated in common periods and decreasing inflows reduced the oxygen content by 20% in a Mediterranean reservoir (Marcè et al. 2010). Stefan et al. (2001) quantified the potential reduction of habitat for cold and cool water fishes that is likely to become drastically reduced under conditions of atmospheric CO_2 concentration doubling in greater than 200 North American lakes. Other climate-mediated disturbances such as wildfire activity, which has increased in each of the last two decades in the southwestern U.S. (Westerling 2016), and impacted water quality of streams and rivers within the Rio Grande basin (Dahm et al. 2015, Reale et al. 2015, Sherson et al. 2015). Wildfires can also impact the physical, biological, and chemical processes in lake ecosystems, but has been less studied than flowing waters (McCullough et al.). However, the hypolimnetic release may dampen the impacts of a wildfire on water quality immediately downstream of the dam (Dahm et al. 2015).

Although important for recreation, tailwater fisheries such as the Rio Chama below Abiquiu Dam are also a form of thermal pollution (see Dodds and White 2010), differ substantially from the thermal regime of natural river systems (Vanicek and Kramer 1969, Krenkel et al. 1979, Ward and Stanford 1979, Ward 1985) and are often detrimental to native fish species (Neves and Angermeier 1990, Clarkson and Childs 2000). The current operation of Abiquiu Dam will likely result in continued thermal pollution on the Rio Chama downstream and potential impacts to the native fish community. Although, the hypolimnetic releases may reduce thermal impacts from a warming climate (Sherman et al. 2007, Hester and Doyle 2011), but would require coordination (e.g., scheduling of water releases to coincide with peak summer temperatures in the Rio Chama).

Rio Chama Aquatic Habitat

Under the No Action Alternative, there would be no potential improvement to aquatic habitat altered by Abiquiu Dam. The hydrological patterns of flow and water temperature along with the channel morphology would remain unchanged. The Rio Chama downstream from Abiquiu Dam would remain single-thread, gravel-bed channel, with coarse bed-material composed cobbles and boulders.

4.4 Fish and Wildlife

Riverine Fish Community

The aquatic habitat downstream of Abiquiu Dam would be unchanged with minimal low velocity habitat for fish during low winter flows, and few areas to avoid higher velocities during other times of the year. The channel would not have pools or boulders for fish refugial or resting areas.

Terrestrial Wildlife

There would be no changes to terrestrial wildlife or their habitat along the Rio Chama.

Special Status Species

There are no special status species that would benefit from the proposed Rio Chama aquatic habitat project at this time.

4.5 Floodplains and Wetlands

There would be no change to wetland habitat area. Loss of wetland habitat also would continue due to the reduction of inundation events.

4.6 Vegetation Communities

The Rio Chama corridor vegetation downstream from Abiquiu Dam would remain unchanged from the sparse riparian and upland trees and plants.

4.7 Noxious Weeds and Invasive Species

The few invasive tree species of concern, including salt cedar, Russian olive, and Siberian Elm, would not be removed. There would be no change to the invasive tree species in the project area.

4.8 Recreation

Recreational fishing below Abiquiu Dam, and other activities, including camping, walking, biking, hiking, wildlife viewing, and picnicking, are anticipated to continue at recent levels without the project.

4.9 Cultural Resources

Cultural and historic resources identified within the project area include ten resources as described in Section 3.9, including seven prehistoric artifact scatters, one Twentieth-Century railroad grade, one Twentieth-Century concrete weir, and the Abeyta-Trujillo Acequia diversion structure and a segment of the irrigation ditch. Six of the ten sites have been recommended as eligible for listing on the NRHP. None of these resources would be affected in any way in the absence of the proposed USACE project; in other words, the "future without project" condition of these resources would remain approximately constant and consistent with the current conditions.

4.10 Hazardous, Toxic, and Radioactive Waste (HTRW)

Given the future land use and enforcement within the project area, the current hazardous, toxic, and radiological waste is unlikely to change significantly in the future. Existing household waste

would remain and accumulate over time, and illegal dumping would likely continue in high-use and unrestricted areas.

4.11 Environmental Justice

The future without project would not result in any adverse environmental or socioeconomic effects on minority and low-income communities living near the project area.

4.12 Cumulative Impacts

There would be no cumulative impacts under the future without project alternative different from the existing conditions.

5 - FUTURE WITH PROJECT

As discussed in Section 3, with the Future with Project Alternative, there would likely be little to no effect on regional geology, air quality, ambient noise, aesthetics, hazardous waste, demographics, socioeconomics, and land use.

5.1 Climate*

There would be no change to the regional climate in the future with project. The rate of localized warming may change water operations at Abiquiu Dam reducing winter flows. The availability of deeper pool habitat would provide refugia for fish at lower flows.

5.2 Water Resources

Hydrology

The future with project would not change water management or hydrology in the project area. The balanced cut/fill approach for constructing the proposed features is designed to maintain current safe channel capacity during flood control operations, and produce a narrower, deeper channel at the lowest flows.

Water Quality

Short-term soil disturbance would result from the proposed actions (e.g., plantings). Denuded soils would be susceptible to erosion by wind and water. To minimize the discharge of pollutants including sediment in stormwater, the selected contractor and local sponsor will apply for coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). A Storm Water Pollution Prevention Plan (SWPPP) will be completed prior to earth disturbing activities and followed until coverage under the CGP is terminated. Short-term sediment disturbance would also result from the proposed actions (e.g., excavation of in-stream features, boulder placement, and rock habitat). To minimize the transport of soil and sediment from the project areas to the Rio Chama, down-gradient sediment controls (e.g., buffers, perimeter controls, exit controls, dewatering, and turbidity curtains) that control discharges from the initial activities that disturb soil or sediment will be designed, installed, and maintained until coverage under the CGP is terminated. During the excavation of water or near-water features the connections adjacent to the main channel of the Rio Chama would be completed last to provide a physical buffer and serve as perimeter control. Per the CGP, disturbed areas would be stabilized, with the exception of features that were designed to remain unvegetated or unstabilized (i.e., rip-rap, gravel habitat features). All stormwater controls at locations designed to remain unvegetated or unstabilized would be removed immediately following construction. Potential short-term contributions of sediment to the Rio Chama are possible during the removal of the physical buffers and following construction of water or near-water features.

Mechanical equipment, such as excavators or backhoes, could potentially leak oil, fuel, or hydraulic fluid, which could reach the Rio Grande and affect surface water quality. Spills of such materials could similarly contaminate surface water in the river or riverside drain. The SWPPP will identify locations where potential spills and leaks could occur that could contribute pollutants to stormwater discharges. Pollution prevention requirements (Section 2.3 of the CGP) including spill prevention and response procedures will be documented in the SWPPP and implemented until coverage under the CGP is terminated.

Section 404 of the Clean Water Act requires analysis under the EPA's 404(b)(1) Guidelines if USACE proposed to discharge fill material into a water or wetlands of the United States. The 404(b)(1) analysis will be completed by NMDGF for the Nationwide Permit 27 (Aquatic Habitat Restoration) for the proposed restoration measures listed above. All conditions under Nationwide Permit 27 would be adhered to during construction. State of New Mexico Section 401 Water Quality Certification is also required. NMED has provided conditional certification for USACE's 2017 Nationwide Permits (https://www.env.nm.gov/swqb/404/2017NWPcert.pdf). All applicable Best Management Practices (BMPs) provided by NMED will be included in project construction plans and specifications. USACE and non-federal sponsors will ensure the terms and conditions of the Section 401 permit are followed for the duration of construction.

There would be no change to long-term water quality within the reach if the project is implemented. Climate-mediated impacts to water quality (Section 4.2.2) would remain if the project is implemented.

Rio Chama Aquatic Habitat

Under the Future with Project Alternative, there would be temporary construction effects on the gravel-cobble substrate producing an increase in the quality of benthic aquatic habitat for sport and native fish along with aquatic insects and macro-invertebrates that comprise their food (Table 8). Reduced sediment on the cobble-gravel substrate and additional leaf litter from riparian trees would increase habitat quality for aquatic macro-invertebrates. Native riparian plants would benefit from supplemental vegetation plantings along the channel.

Table 8 Summary of proposed aquatic habitat features.

Habitat Feature	Approximate Area
River channel (existing)	36 acres(ac)
In-channel pools	2.25 ac
Woody debris	67 features providing 0.04 ac cover
Boulders	1044 features providing 0.2 ac cover
Other features	0.74 ac

5.3 Fish and Wildlife

Riverine Fish Community

Under the Future with Project alternative, the excavated pools, boulders and deflector structures would increase the range of fish habitat. The lower water velocity in the pools, and downstream of the boulders and deflector structures provides resting areas for fish. The reduced channel area at lower flows is expected to increase fine sediment transport improving the condition of spawning gravels and cobble habitats (for smaller fish). Increasing the adjacent bankline riparian vegetation would increase shading and organic material inputs to the Rio Chama. The combined increased bank vegetation and slow water refugia would increase habitat quality for the extant Rio Grande Chub population.

There would be a temporary effect on the Brown Trout population due to dewatering and sediment displacement during their spawning season and subsequent incubation period. The modified channel profile would result in a narrower and deeper thalweg. The narrower thalweg would increase the long term expectation of improved spawning success by reducing the probability of dewatering during winter low flow. Anticipated increase in sediment transport would improve the condition of spawning gravels (trout) and cobble habitats (for smaller fish). Improved bank vegetation and slow water refugia would be important to extant Rio Grande Chub population, increasing habitat quality for this species.

Terrestrial Wildlife

Under the Future with Project alternative, construction would occur from November through February, outside the breeding season for migratory birds. Overwintering migratory birds using the area would be able to move away from construction to avoid any disturbance. The effects of construction would be minor for overwintering birds, while the increase of riparian habitat would benefit birds that breed in the area during the spring and summer.

The formation of bank attached gravel bars along the margins of the Rio Chama would benefit terrestrial wildlife. The gravel bars would provide a gradual transition from the river banks to the water at lower flows. Increasing riparian habitat would provide additional food, cover, and structure for terrestrial wildlife. The proposed project would benefit terrestrial wildlife.

Special Status Species

There are no special status wildlife species that would benefit from the proposed Rio Chama aquatic habitat project at this time.

5.4 Floodplains and Wetlands

Existing delineated wetlands would be avoided to the maximum extent possible during construction. The existing wetland habitat would benefit terrestrial, amphibious, and aquatic animals. No wetlands would be created or modified until a water right is available to offset depletions.

5.5 Vegetation Communities

The Rio Chama corridor vegetation downstream from Abiquiu Dam would remain unchanged from the sparse riparian and upland trees and plants.

5.6 Noxious Weeds and Invasive Species

Invasive tree species including salt cedar, Russian olive, and Siberian Elm within the construction area would be removed from the construction footprint for habitat features. Construction BMPs include documented seed sourcing and construction equipment cleaning prior to arrival at staging areas to prevent introduction of noxious weeds and other invasive plant species.

5.7 Recreation

The effects of this project are expected to include better river access, with increased capability to meet public demand for sport fishing. Increasing the area of pools would provide more habitat to support an overall trout density of 400 trout/acre in the Rio Chama below Abiquiu Dam. It would improve the quality of the fishing experience of the anglers using the area, possibly leading to an increase in angler visits and duration of use. Improvements to both terrestrial and aquatic habitat

may also result in increased visits for camping, walking, biking, hiking, wildlife viewing, water sports, and picnicking.

5.8 Cultural Resources

The proposed project includes a wide variety of proposed measures, all of which would be constructed within the existing river channel. Three primary sources of potential impacts to these resources have been considered: direct impacts from construction; indirect impacts from potential changes in flow regime; and potential impacts from increased recreational use of the area. These are each discussed below.

Construction

The proposed project has been designed to avoid placement of any restoration measures within any of these sites, or in any area that might potentially impact these sites. The majority of the proposed restoration measures would be constructed within the active river channel itself, and would not directly impinge on any documented site.

During project planning, one possible restoration measure that was considered was the replacement of the diversion for the Abeyta-Trujillo Acequia. The Acequia is a historic property eligible for listing on the NRHP under criteria A (association with events that have made a significant contribution to broad patterns of our history, namely the history of agriculture in the Chama Valley and New Mexico) and C (embodying the distinctive characteristics of a type, namely traditional acequias). While this option will continue to be considered for future implementation, it is not currently part of the planned project. If, pending further study, alteration or replacement of the diversion is selected for a future phase of the project, Section 106 consultation would be completed, determinations of effect would be made, and any potential adverse effects to the acequia would be resolved before any work impacting the acequia would begin.

Staging will take place in already-developed areas outside of archaeological sites, and vehicle access will occur mostly using existing roads. Pathways for vehicle and equipment access to the channel for construction work will be selected to avoid all documented cultural resources.

Changes in water flow

The primary way that changes in water flow might impact most of these sites would be through affecting the stability or rate of bank erosion, or by increasing water levels beyond their current range of typical elevations. While many of the proposed measures would create small-scale local changes in water flow direction and speed, none of these are anticipated to lead to increased bank erosion or instability. By directing flow more toward the center of the channel, measures like construction of gravel bars and small rock deflectors may have the additional benefit of reducing bank erosion and thereby decreasing erosional risk to sites. No impacts on the integrity or function of the Abeyta-Trujillo Acequia are anticipated. No changes in flow regime are anticipated downstream of the project area.

Recreation

While one of the purposes of the proposed project is to enhance opportunities for recreation, especially fishing, any likely increases in recreational use are not expected to adversely affect these sites. The entire project area has been open to recreation for many years, and the proposed

enhancements should not substantially change the nature or range of recreational activities in the area. Increases in recreational use have the potential to increase foot traffic across these sites, but it is not expected that this would introduce substantially new or adverse impacts to them.

Given the above information, USACE has determined that the proposed project would have **no adverse effect** to historic properties from the proposed project. Section 106 consultation is ongoing; this determination was submitted to NMSHPO for their review and concurrence on August 14, 2019, and Section 106 consultation is ongoing with Tribes and with the Abeyta-Trujillo Acequia. NMSHPO concurrence was received on September 3, 2019.

5.9 Hazardous, Toxic, and Radioactive Waste (HTRW)

Given the proposed action, and no identified HTRW concerns within the project area, there are no anticipated changes to HTRW as result of this proposed project. If HTRW is encountered during construction, the Contractor will halt work and contact USACE. USACE and non-federal partners will verify the Contractor's claim and inform the local sponsor of the issue. Per Engineering Regulation (ER) 1165-2-132, for cost-shared projects such as the proposed, the local sponsor shall be responsible for ensuring that the development and execution of Federal, State, and/or Locally required HTRW response actions are accomplished at 100% non-project cost. No cost sharing credit will be given for the cost of response actions.

5.10 Environmental Justice

Implementation of the proposed project would improve habitat quality in the project area. The proposed project would increase recreational opportunities for local minority and low-income communities, but not result in any adverse environmental or socioeconomic effects on minority and low-income communities living near the project area.

5.11 Cumulative Impacts

The project proposed by NMDGF in cooperation with USACE, BLM, USFS, FWS, and the NMLO would improve about 58.7 acres of aquatic habitat through 2.7 miles of lands managed by USACE, BLM, USFS, and the NMLO (Figure 2). The instream aquatic habitat features for trout and other fish species were designed by Riverbend Engineering based on techniques described in Cramer (2012) and the FISRWG (1998). Proposed features are designed to provide several types of low velocity instream habitat for trout and other fish species at discharges between 50 and 1,800 cfs (USACE 1995). Features would include rock and wood sills, pools, rock grade control structures, rock habitat structures, rock deflectors, and riparian vegetation.

The large rock riffle upstream of USGS weir would be excavated and the rocks redistributed into a larger upstream grade control structure (GCS)/riffle for improving upstream fish passage. The GCS would be grouted to increase structure stability at higher flows. Rock habitat structures and deflectors would provide hydraulic roughness, habitat diversity, and velocity refuge for flows from 50 to 1,800 cfs throughout the project area for fish.

Pools are proposed for construction to create additional velocity refuge for fish. Placement of excavated clean alluvial substrate is proposed along the margins of the channel to form shallow bank attached bars that incrementally increase water depth within the channel, with an increase in water velocity at lower flow volumes. The balanced cut-fill of substrate materials would maintain

safe channel capacity (flow) in the project reach. Planting with native riparian vegetation along the bankline would contribute to bank stability.

All BMPs (e.g., refueling outside of riparian areas, sediment control devices deployed, minimizing destruction to native vegetation, etc.) will be used during construction. Construction would be scheduled during the non-irrigation season (November 1 to February 28), and coordinated with the BOR water deliveries to take advantage of consistent, lower winter flow downstream of Abiquiu Dam outside the breeding season for migratory birds that may use the project area. All equipment will utilize existing roads where possible. Access to river channel will be restricted to a few locations to reduce impacts to bank erosion. All immediate access points to the river channel will be temporary and only used during construction and will be reclaimed to pre-existing conditions post construction. Portions of the equipment access areas will be improved to control vehicular access.

5.12 Best Management Measures / Environmental Commitments

The following is a list of conservation measures and stipulations that would be complied with during construction of the proposed action to protect water resources and endangered species habitat from degradation:

1. Aquatic habitat construction would occur during the non-irrigation season (November through February). Adjacent terrestrial habitat construction may occur November through April 15th.
2. Work in the project area will not occur during migratory bird breeding season (approximately April 15 to August 15). Vegetation removal and clearing-and-grubbing activities would only be performed between September 1 and April 15.
3. Work would be performed below the elevation of the ordinary high water mark only during low-flow periods. No erodible fill materials would be placed below the elevation of the ordinary high water mark.
4. Cleaning of all equipment to prevent the spread of invasive species is required prior to entering the project area (National Invasive Species Council 2008).
5. All construction equipment and large trucks would limit engine noise levels to 60 dB or less.
6. Fuels, lubricants, hydraulic fluids and other petrochemicals would be stored outside the 1%-chance floodplain, if practical. At the least, staging and fueling areas would be located outside of the floodway, landward of the existing spoil bank alignment, and at least 100 feet from any surface water or channel. All storage areas would include spill prevention and containment features.
7. Construction equipment would be inspected daily to ensure that no leaks or discharges of lubricants, hydraulic fluids or fuels occur in the aquatic or riparian ecosystem. Any petroleum or chemical spills would be contained and removed, including any contaminated soil.
8. Equipment operators will be required to carry an oil spill kit or spill blanket at all times and must be knowledgeable in the use of spill containment equipment. The contractor will develop a spill contingency plan prior to initiation of construction. The plan will identify where storage and dispensing fuels, lubricants, hydraulic fluids, and other petrochemicals will be located outside the active channel at 1,800 cfs. The contractor will inspect construction equipment daily for petrochemical leaks. All spills will be contained

immediately and all contaminated media will be disposed of following the Resource Conservation and Recovery Act. If a reportable quantity is released, the contractor will notify NMED and U.S. EPA as soon as possible after learning of a discharge, but in no event more than twenty-four (24) hours thereafter.

9. The staging areas will be located outside the active channel at 1,800 cfs. The construction equipment will be parked outside the active channel at 1,800 cfs during periods of inactivity for an extended period or based on weather conditions. The equipment operators will place drip-pans underneath vehicles at the end of each work day.
10. All work and staging areas will be limited to the minimum amount of area required. Existing roads and right-of-ways and staging areas will be used to the greatest extent practicable to transport equipment and construction materials to the project site, and described in the USACE's project description. Designated areas for vehicle turn around will be provided and maneuvering conducted so as to protect cultural resources and riparian areas from unnecessary damage.
11. Cultural sites, riparian areas, and mature cottonwood trees will be protected from damage during clearing of non-native species or other construction activities using fencing, or other appropriate materials.
12. Local genetic stock will be used wherever possible in the native plant species establishment throughout the riparian area.
13. Only uncontaminated earth or crushed rock for backfills would be used.
14. Silt curtains, cofferdams, dikes, straw bales and other suitable erosion control measures would be employed to prevent sediment-laden runoff or contaminants from entering any watercourse.
15. Stormwater controls will be installed and maintained during excavation activities as appropriate for the NPDES Construction General Permit and Stormwater Pollution Prevention Plan. Silt fence will be installed adjacent to the riverbank where needed for stormwater control.

6 - CONCLUSIONS AND SUMMARY

The project proposed by NMDGF in cooperation with USACE, BLM, USFS, FWS, and the NMLO would have temporary construction effects to brown trout spawning and benthic aquatic habitat producing improved long-term habitat quality. The proposed project would increase low velocity habitat for trout, native fish species, and macro-invertebrates. Improving trout habitat would increase recreation opportunities for local and regional fishermen and women.

The proposed project would not change water management or hydrology in the project area. The balanced cut/fill approach for constructing the proposed features is designed to maintain current safe channel capacity during flood control operations, and produce a narrower, deeper channel at the lowest flows.

Best Management Practices shall be implemented during construction to avoid adverse effects to hydrology, water quality, native plants, terrestrial wildlife, cultural resources, and recreation. Invasive tree species would be removed from the construction footprint for habitat features. Disturbed terrestrial areas will be re-vegetated with native trees, shrubs, and wetland plants.

The proposed project would not affect regional geology, climate, hydrology, water management, air quality, noise, aesthetics, land use, local demographics, socioeconomics, and environmental justice. There would be no anticipated concerns with HTRW in the project area.

7 - PREPARATION, CONSULTATION, AND COORDINATION

7.1 Preparation

This environmental assessment was prepared by the USACE, Albuquerque District. Personnel primarily responsible for preparation include:

- Michael D. Porter, Fishery Biologist
- Jonathan Van Hoose, Archaeologist
- Justin Reale, Environmental Engineering

7.2 Quality Control

This Draft EA has been reviewed for quality control purposes. Reviewers include:

- Jessica Gisler, Archaeologist
- Summer Schultz, Biologist

7.3 Consultation and Coordination

NMDGF has coordination with USACE Regulatory Branch and NMED Surface Water Quality Bureau on CWA requirements. USACE has coordinated with NMSHPO on cultural resources.

7.4 Public Involvement

Scoping Letter

Letters were sent to the organizations and agencies below on November 15, 2018. Responses to the Scoping Letter are included in Appendix D.

Non-Governmental Organizations	**New Mexico State Agencies**
Audubon New Mexico	New Mexico Department of Agriculture
Center for Biological Diversity	New Mexico Department of Game and Fish
Defenders of Wildlife	New Mexico Energy, Minerals and Natural Resources Department
East Rio Arriba	New Mexico Environment Department
Ghost Ranch	New Mexico Interstate Stream Commission
Land of Enchantment Guides	New Mexico Office of State Engineer
Los Rios River Runners	
New Mexico Trout	
New Mexico Wilderness Alliance	**Federal Agencies**
Rio Arriba Concerned Citizens	U.S. Bureau of Land Management
Rio Arriba County	U.S. Bureau of Reclamation
Rio Chama Acequias Association	U.S. Environmental Protection Agency
Rio Grande Restoration	U.S. Fish and Wildlife Service
The Reel Life	U.S. Forest Service
Trout Unlimited	U.S. Geological Survey
Wild Watershed	USDA Natural Resources Conservation Service
WildEarth Guardians	

Summary of the Public Review and Comments

The Notice of Availability was sent to agencies and stakeholders for public review from August 16 to September 6, 2019. The public review was extended to September 19th by publication of the Notice of Availability in the Albuquerque Journal and the Santa Fe New Mexican. Comments received from the public review of the Draft Environmental Assessment are included in Appendix D.

The Draft Environmental Assessment was made available online at: http://www.spa.usace.army.mil/Missions/Environmental/EnvironmentalComplianceDocuments/EnvironmentalAssessmentsFONSI.aspx.

The public can also request a copy of the Draft Environmental Assessment from Michael Porter at Michael.D.Porter@usace.army.mil or 505-342-3264.

The NMED provided useful comments regarding air quality standards, ground and surface water protection, and solid waste management to protect the environment. Their comments will be incorporated into the appropriate documents for permitting.

The OSE and NMISC commented on water depletions by proposed wetland features. The proposed wetland features were removed from the proposed action until appropriate offsets can be obtained. Additional information regarding the role of the OSE and the NMISC was included during revision of the Environmental Assessment. A description of OSE and NMISC responsibilities was added to Section 1.3 Regulatory Compliance. A paragraph was added under Section 2.1 Proposed Action to clarify how limiting habitat features to the active channel would not result in increasing depletions. The discussion describes how reducing the wetted surface and water surface areas relative to volume provide more efficient water transport at flow less than 100 cfs compared to a wide, shallow wetted channel. Based on the concerns raised by OSE/NMISC, the proposed construction of depressional wetlands has been relocated from the area described in the Section 2.1 Proposed Action to the area described in Section 2.3 Alternative Actions Evaluated. A description of the limits of the Rio Grande Compact was added to the hydrology section under Section 3.3 Water Resources.

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Appendix A
RIO ARRIBA COUNTY WILDLIFE SPECIES OF CONCERN

US FOREST SERVICE

BUREAU OF LAND MANAGEMENT

BIOLOGICAL ASSESSMENT

Appendix B
STATE HISTORIC PRESERVATION OFFICE CORRESPONDENCE

Appendix C
Project Drawings

Appendix D
PUBLIC INVOLVEMENT

Appendix E
Hazardous, Toxic, and Radioactive Waste

Appendix F
404(B)(1) EVALUATION