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PUEBLO OF SANDIA
MANAGEMENT OF EXOTICS FOR
THE RECOVERY OF ENDANGERED SPECIES
HABITAT RESTORATION PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT

Prepared for

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1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The Pueblo of Sandia (Pueblo) plans to complete a large-scale habitat restoration project within the Pueblo of Sandia Subreach (POSSR) of the Middle Rio Grande (MRG). The project, termed the Pueblo of Sandia Management of Exotics for the Recovery of Endangered Species (MERES), proposes to apply several habitat restoration techniques within the POSSR to create and enhance habitat for Rio Grande silvery minnow (*Hybognathus amarus*; silvery minnow) and southwestern willow flycatcher (*Empidonax traillii extimus*; flycatcher). The primary objectives of the project are fourfold: to remove and control non-native vegetation; to increase breeding habitat for endangered southwestern willow flycatcher; to increase habitat availability for all life stages of endangered Rio Grande silvery minnow; and to improve general riparian functionality within the MRG. The Pueblo aims to incorporate both riverine and riparian restoration techniques into the project, which is considered an essential element for recovery and ongoing success of the species and the MRG ecosystem (U.S. Fish and Wildlife Service [USFWS] 2003).

Changes in natural riverine ecosystem processes and the consequent loss of habitat have been linked to declines in silvery minnow, the last of a guild of small, pelagic spawning minnows native to the Rio Grande (Sublette et al. 1990; Bestgen and Platania 1991). Threats to the species include dewatering, channelization, and regulation of river flow to provide for irrigation; diminished water quality caused by municipal, industrial, and agricultural discharges; and competition or predation by introduced non-native fish species (USFWS 1994). Due to significant declines in the population and habitat availability of the species, the silvery minnow was listed as endangered on July 20, 1994, under the Endangered Species Act of 1973, as amended (ESA) (USFWS 1994).

Altered riparian ecosystem functions due to habitat loss and encroachment of non-native vegetation have contributed to the decline of the flycatcher (Sogge et al. 1997) and have resulted in the reduction of flycatcher populations to an estimated 900 to 1,100 pairs (USFWS 2002). More specifically, habitat fragmentation (Marshall and Stoleson 2000), the disconnection of riparian areas from the Rio Grande (Tetra Tech 2004), an increase in brown-headed cowbird (*Molothrus ater*) brood parasitism (Brown 1994), water management practices (Finch and Stoleson 2000), and livestock grazing (Taylor 1986) have been attributed to declines in flycatcher populations. The spread of exotic saltcedar (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*) has also been implicated as a cause for flycatcher decline (DeLoach et al. 2000; Finch and Yong 2000; Marshall and Stoleson 2000). Due to large decreases in flycatcher populations and the continued loss of flycatcher habitat, the subspecies was listed as endangered on March 29, 1995 (USFWS 1995).

The proposed project incorporates two main components: riverine and bosque restoration and enhancement. The approach of the project will encourage the long-term sustainability of created, restored, and/or enhanced habitat. The purpose of the riverine aspect of the project is to plan, design, and construct egg retention, larval rearing, young-of-year, and over-wintering habitat for the silvery minnow using various habitat restoration techniques. The purpose of the riparian component of this project is to reduce non-native vegetation within the bosque, increase potential

flycatcher breeding habitat, promote the re-establishment of native vegetation, and reconnect the bosque with riverine hydrology.

The project is funded primarily by the USFWS (through the MERES program), with in-kind funds provided by the Pueblo. This Environmental Assessment (EA) has been completed to evaluate the impacts of the implementation of this habitat restoration and enhancement project on other resources and its relationship to other projects and undertakings. This EA is completed to ensure compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4331-4335).

1.2 PROPOSED ACTION

The Proposed Action involves the design, implementation, and maintenance of various habitat restoration/rehabilitation techniques to restore, enhance, and sustain aquatic and riparian habitat for the benefit of silvery minnow and flycatcher within the POSSR of the MRG (Figure 1.1 and Figure 1.2). The proposed riverine and riparian habitat restoration techniques were developed in conjunction with the March 2003 *U.S. Fish and Wildlife Service Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations, the U.S. Army Corps of Engineers' Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico* (2003 MRG BO; USFWS 2003), and as detailed in the MRG Collaborative Program's Habitat Restoration Plan for the Middle Rio Grande (Tetra Tech 2004). The proposed restoration area is located on the east side of the river channel, approximately 4 miles south of the U.S. Highway 550 bridge, between river mile (RM) 200 (upstream) and RM 199 (downstream), adjacent to the Corrales siphon and the Rio Rancho wastewater treatment plant (Figure 1.3).

The MERES project would incorporate multiple habitat restoration and planning components, leading to a large-scale, sustainable, and diverse habitat complex within the POSSR of the MRG. Restoration efforts would include the clearing of exotic, non-native plant species and subsequent re-vegetation of native herbaceous species on approximately 29 acres of bosque. In addition, in-channel modifications to an approximately 10-acre point bar and adjacent bankline will be completed (Figure 1.4).

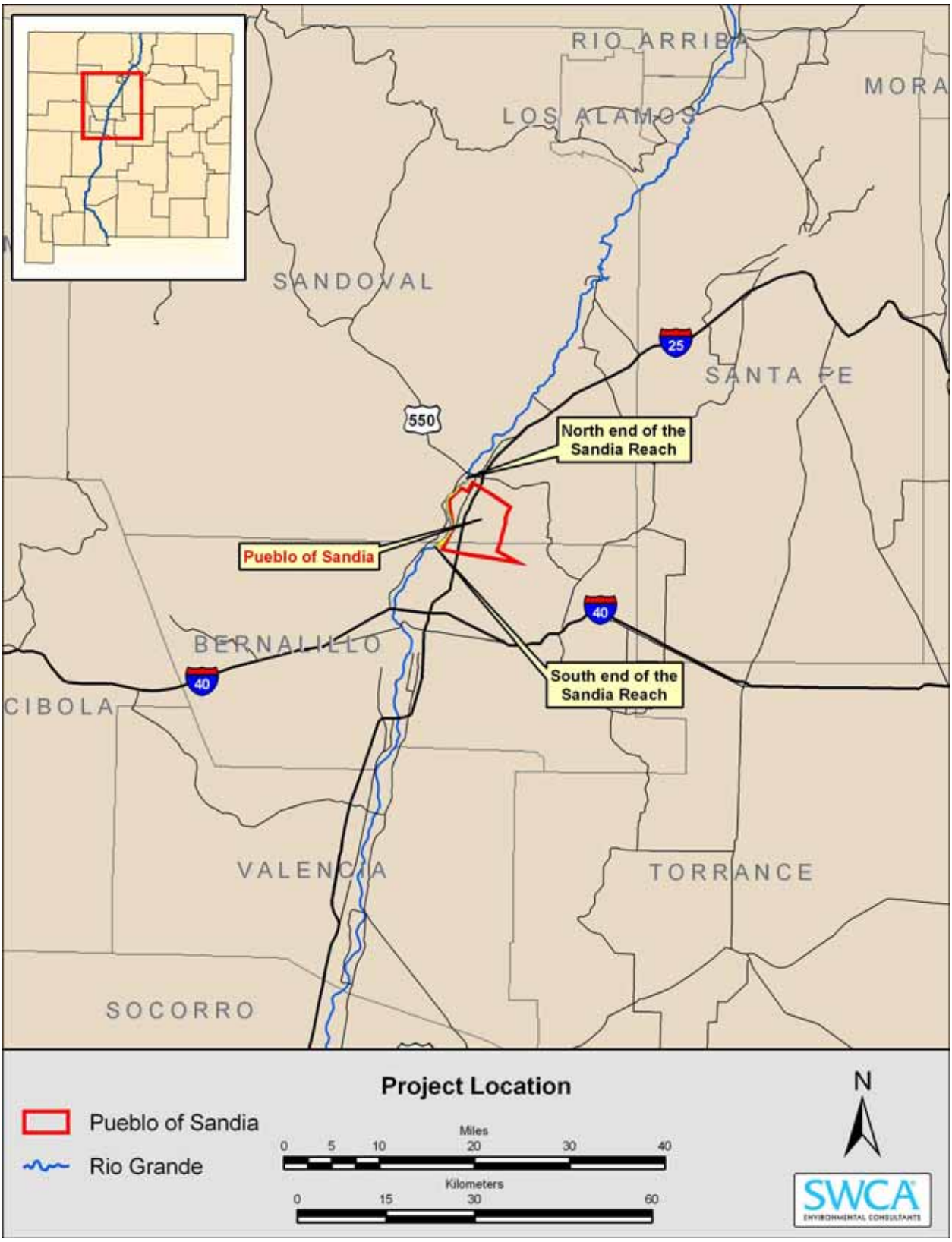

Figure 1.1. Project location map.

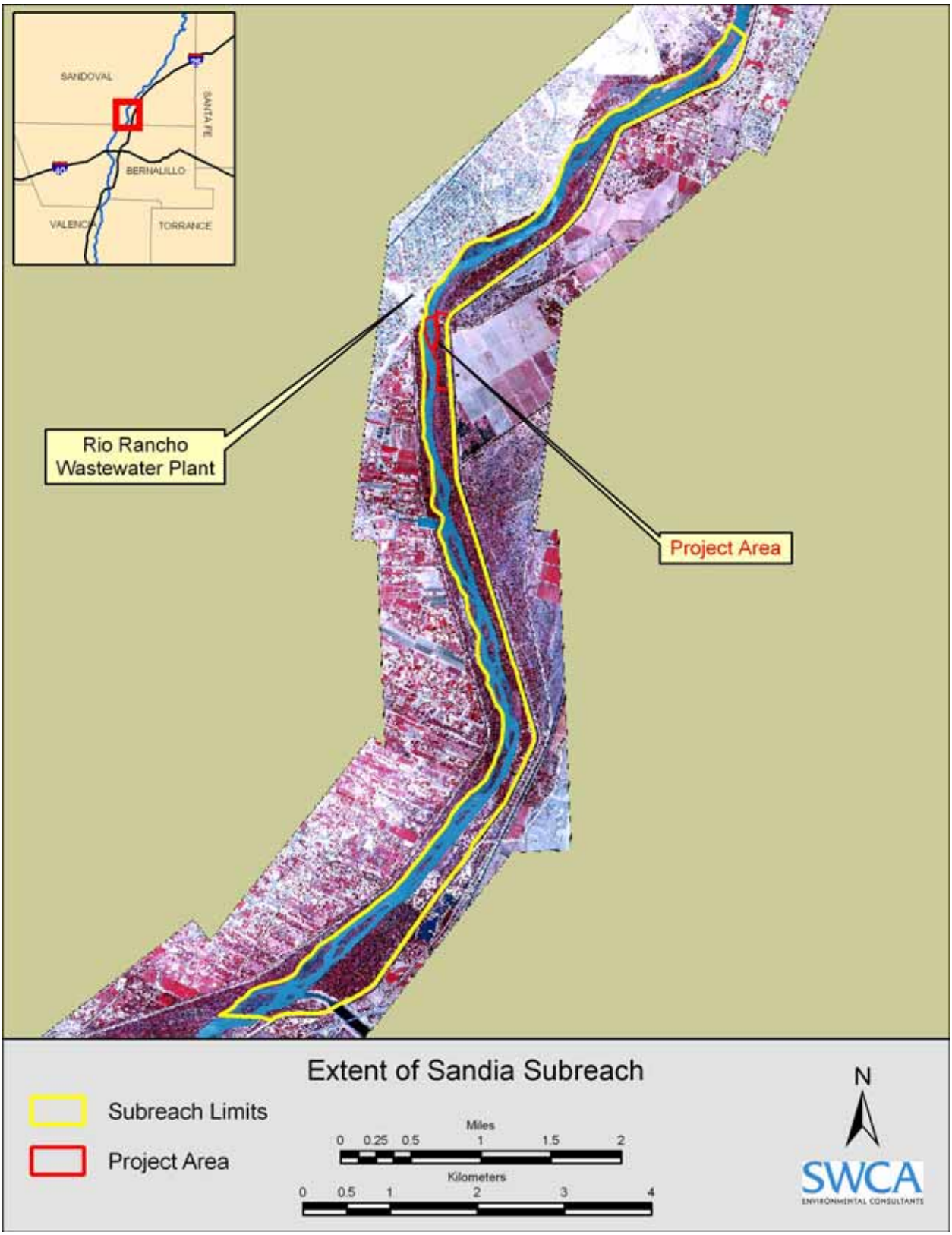

Figure 1.2. Sandia Subreach and project site.

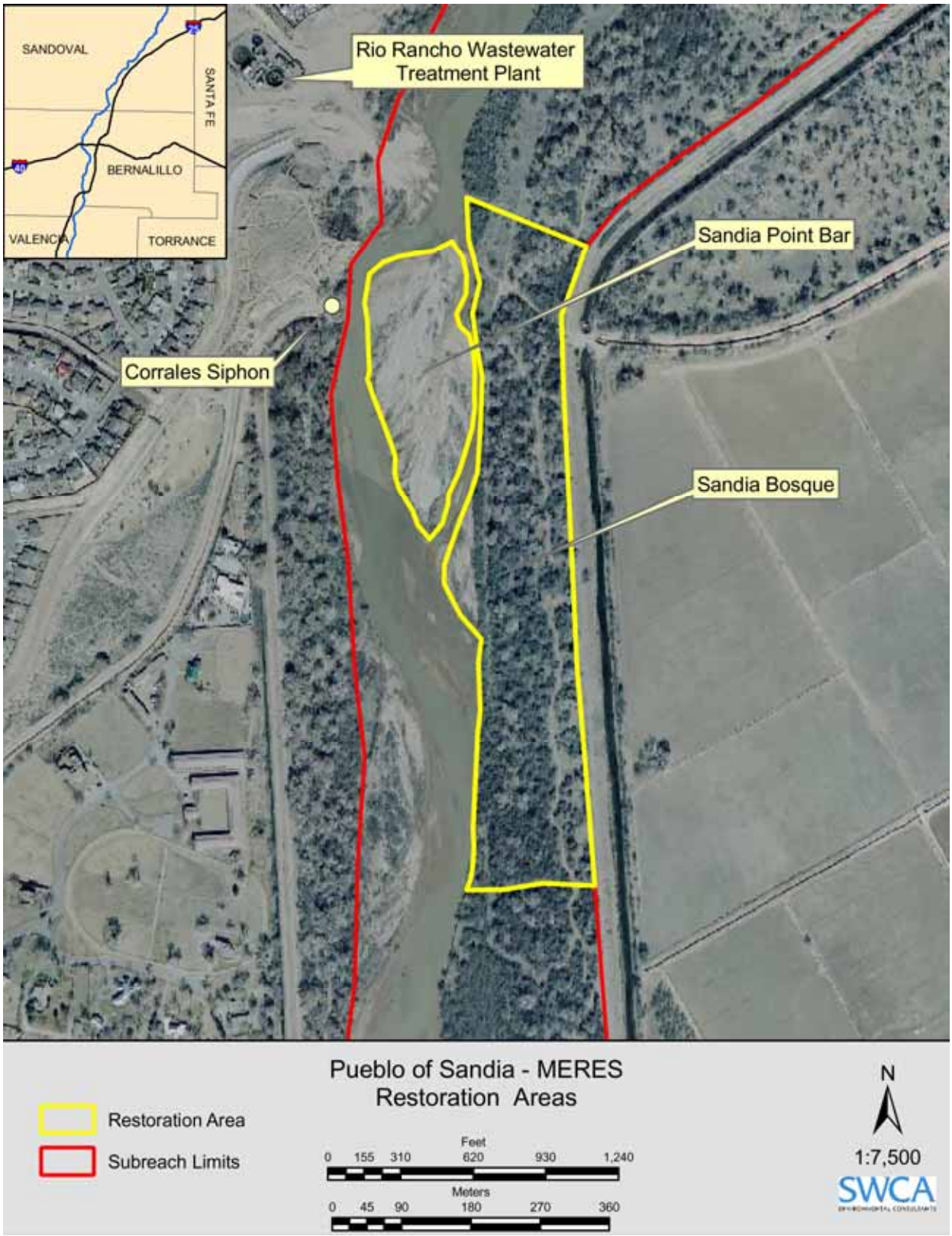

Figure 1.3. Pueblo of Sandia MERES project area.

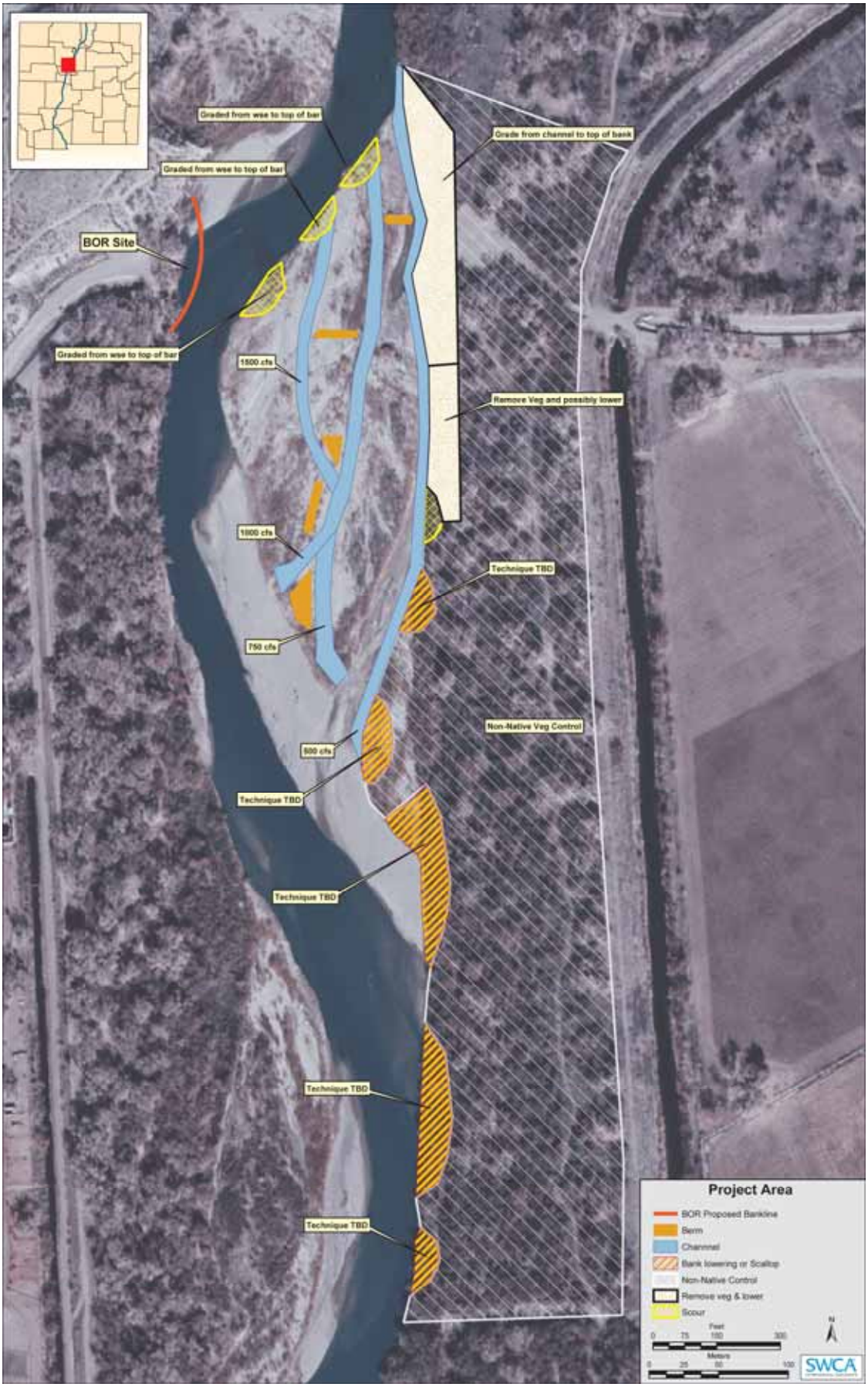

Figure 1.4. Conceptual habitat restoration design including techniques and target discharge for inundation.

The project would be completed in phases according to specific tasks. Channel restoration activities and non-native vegetation removal would take place outside of migratory bird nesting season, during a period of low flow between September 2007 and April 2008. Maintenance of in-channel restoration areas would take place during the fall and winter of 2008, and the treatment of re-established non-native vegetation would take place during the spring and summer of 2008. Re-vegetation with native herbaceous species through the application of native seed mix would coincide with the expected monsoon season in the late spring or early summer of 2008. It is estimated that 39.0 acres (15.8 hectares [ha]) of riverine and riparian habitat would be treated as a result of the Proposed Action, including more than 3,600 linear feet of channel modifications and 4 acres of bank/bar lowering, and bankline scallops would be completed following project implementation.

1.3 PURPOSE AND NEED

The purpose of the Proposed Action is to develop and construct rearing, young-of-year, and over-wintering habitat for silvery minnow, and to eliminate non-native vegetation, create open water habitat, re-vegetate the bosque with desirable native species, and create the conditions necessary for the successful establishment of native herbaceous and woody species for the benefit of the flycatcher.

The Proposed Action is needed to help conserve, increase, and improve suitable and potentially suitable habitat that will aid in the long-term recovery of both species. The project is intended to ultimately increase both species population stability within the MRG, as well as create and restore natural riparian function and processes for benefit of the ecosystem as a whole. All restoration activities are designed to promote ecosystem functionality and interconnectedness, and to protect, maintain, and aid in the recovery goals of both species as outlined in the species recovery plans.

1.4 ISSUES

Ecological Values

The Rio Grande floodplain, including the riparian corridor, or bosque, and river channel is highly valued by Pueblo of Sandia residents for its natural beauty, the recreational value of its natural areas, the importance of the area as a refuge for birds and other wildlife, and the presence of rare and protected species. The proposed project area is part of the 650 acres of riparian forest located within the Pueblo's lands. Conservation of the bosque's aesthetic, recreational, and ecological value is a high priority for the Pueblo. As a result, actions within the Rio Grande and its floodplain can be controversial.

Economic Commitments for Endangered Species Recovery

The project would be primarily funded by the USFWS through the MERES initiative, which is a funding program for management of exotic species to improve habitat for endangered species. This project is part of physical year 2006 federal funding for work in the MRG watershed.

Additional funding will be provided by the Pueblo. Total project cost is estimated to be $376,900, with a USFWS contribution of $277,000 and a Pueblo of Sandia contribution of $99,900. Funding spent toward habitat restoration would assist in avoiding jeopardy to the existence of silvery minnow and flycatcher and contribute to the recovery of these endangered species throughout the MRG.

2.0 ALTERNATIVES

2.1 INTRODUCTION

The Pueblo has considered several techniques for improving aquatic and riparian habitats for the benefit of silvery minnow and flycatcher within the POSSR of the MRG. Riverine and riparian habitat restoration techniques to be implemented are discussed in the Habitat Restoration Plan for the Middle Rio Grande (Tetra Tech 2004) and were developed specifically for compliance with the 2003 MRG BO (USFWS 2003). The specific sets of techniques that were considered and are proposed for this project are evaluated in this EA and summarized in Table 2.1 and Table 2.2. The objectives of these techniques vary, with most serving to improve multiple processes and functions of the riverine and riparian ecosystem. All techniques can be used to improve silvery minnow or flycatcher habitat (Tetra Tech 2004). Each of the restoration techniques incorporates both active and passive restoration elements, an approach that works with the river's natural hydrology to extend the life of created habitat restoration features. The adoption of passive restoration techniques provides the best opportunity for long-term success and should be considered whenever possible (Tetra Tech 2004).

2.2 ALTERNATIVES CONSIDERED

Two alternatives, the No Action Alternative and one Action Alternative, are analyzed in this EA. The Action Alternative serves as both the Proposed Action and the Preferred Alternative.

The Action Alternative includes the following seven habitat restoration techniques: (1) creation of flow-through ephemeral channels; (2) creation of low- and high-flow bankline embayments; (3) removal and control of exotic non-native vegetation; (4) removal of lateral confinements; (5) placement of large woody debris; (6) active restoration of riparian vegetation; and (7) passive restoration (Tetra Tech 2004) (Table 2.1). During the evaluation process the selected techniques have been developed further and, in some cases, have been combined with other selected techniques. Detailed descriptions of each technique are provided in Section 2.5. All techniques will incorporate the benefits of passive restoration. The large woody debris technique remains as described. The high-flow ephemeral channel technique is designated herein as ephemeral channel construction. High-flow bank-like embayments are referred to as bank scouring, or scours. Removal of lateral confinements will be achieved through non-native vegetation removal. Removal of non-native vegetation will be completed with the use of mastication and/or extraction equipment and hand crews combined with herbicide application.

2.3 OTHER ALTERNATIVES CONSIDERED BUT ELIMINATED

Eight additional techniques—arroyo connectivity, gradient control structures, sediment management, fish passage, main channel widening, terrace and bank lowering, river bar and island enhancement, and the destabilization of islands and bars—were reviewed and eliminated from consideration during the evaluation process (Table 2.2). Although these techniques may have positive habitat implications, they have been eliminated from this project due to cost and/or construction feasibility.

Table 2.1 Proposed Habitat Restoration Techniques

Technique	Description	Benefits of Technique
Passive restoration	Works in conjunction with constructed restoration features to increase lifespan and effectiveness of physically manipulated habitat	Allows for high-magnitude peak flows to accelerate natural channel-forming processes and improve floodplain habitat.
Removal of lateral confinements	Reduction or elimination of woody vegetation or structural features such as jetty-jacks.	Creates wider floodplain with more diverse channel and floodplain features, resulting in increased net-zero and low-velocity habitat for silvery minnow and flycatcher.
Ephemeral channel construction	Construction of ephemeral channels on islands and bars to carry flow from the main river channel during low- to high-flow events.	Seasonally dry, but creates shallow, ephemeral, low-velocity aquatic habitats important for silvery minnow egg and larval development during high-flow periods; aids in the establishment of native vegetation; provides open water habitat for flycatcher.
Bank scouring	Areas cut into banks where water enters, primarily during high-flow events including spring runoff and floods.	Intended to retain drifting silvery minnow eggs and to provide rearing habitat and enhanced food supplies for developing silvery minnow larvae; aids in the establishment of native vegetation; provides open water habitat for flycatcher.
Removal and control of exotics	Removal of exotic, woody vegetation; can use either mechanical techniques or hand crews; with or without herbicide. Maintenance activities during subsequent growing seasons would include the use of herbicide to ensure successful re-treatment.	Allows for native plant species to thrive, decreases the chance of catastrophic wildfire, and increases wildlife habitat heterogeneity.
Large woody debris	Placement of trees, root wads, stumps, or branches in the main river channel or along its banks.	Creates slow-water habitats for all life stages of silvery minnow, provides shelter from predators and winter habitat, and provides structure for periphyton growth to improve food availability for silvery minnow; aids in the establishment of native vegetation; provides open water habitat for flycatcher.
Active restoration of riparian vegetation	Direct seeding of native herbaceous vegetation, pole and whip planting of cottonwood and willow, planting of containerized stock.	Encourages more rapid development of vegetative structure needed for flycatcher breeding; gives native vegetation a “head start” over non-native vegetation.

Table 2.2 Techniques Eliminated from Further Study

Technique	Description	Benefits of Technique
Arroyo connectivity	Clearing of vegetation and/or excavation of pilot channels to bring stranded arroyos to grade with the mainstem Rio Grande.	Could re-establish eddies associated with the mouths of arroyos, which may help to retain silvery minnow eggs and larvae, and increases the supply of sediment to the river.
Gradient-control structures	Low head weirs constructed perpendicular to the channel with aprons to simulate natural riffles.	Creates aquatic habitat diversity by producing variable flow velocities and depths.
Sediment management	Increase sediment supply through mobilization behind dams, arroyo reconnection, or introduction of spoils.	Supports the observation that silvery minnow is most commonly found in areas where the bed is predominantly silt and sand.
Fish passage	Installation of fish passage structures at impoundments to improve longitudinal connectivity of river.	Allows upstream movement of silvery minnow and reduces habitat fragmentation.
Main channel widening	Excavation of banks and lateral expansion of active channel.	Intended to reduce average flow velocities and increase total area of lower-velocity, shallow habitat for young-of-year and adult silvery minnow.
Terrace and bank lowering	Removal of vegetation and excavation of soils adjacent to the main channel to create potential for overbank flooding.	Could provide for increased retention of silvery minnow eggs and larvae and increased open water habitat for flycatcher.
River bar and island enhancement	Elimination of channel maintenance and provisions to encourage island and bar formation.	Could improve aquatic habitat heterogeneity by creating backwaters, eddy zones, and shear zones to increase habitat for flycatcher and all life stages of silvery minnow.
Destabilization of islands and bars	Involves the physical disturbance (discing, mowing, root-plowing, raking) of islands or bars to remove vegetation and mobilize the features during high flows.	Creates more complex habitat for silvery minnow by reducing average channel depth, widening the channel, and increasing backwaters, pools, eddies, and runs of various depths and velocities.

2.4 NO ACTION ALTERNATIVE

The No Action Alternative assumes that no anthropogenic changes would occur to bars, shoreline environments, other riverine habitats, or riparian/floodplain habitats available to silvery minnow and flycatcher. In addition, no thinning and/or invasive species control would take place within the bosque in the POSSR at the proposed project location as a result of the proposed project. Current river operations and trends in riverine and riparian habitat quality, quantity, and function would remain unchanged under the No Action Alternative.

2.5 PREFERRED ALTERNATIVE

2.5.1 Description

The Preferred Alternative is the Action Alternative, which implements the seven restoration techniques described in Table 2.1, with the objective being the incorporation of both active and passive habitat restoration methods to achieve the goals of the project. The restoration techniques will be applied within the POSSR between RM 199.9 on the upstream end and RM 199.2 on the downstream end. Figure 1.3 above illustrates the locations of the project site within the subreach. Approximately 3,600 linear feet of low-flow and ephemeral channels and 4 acres of bank/bar lowering and scour habitat would be created during the construction phase of the Preferred Alternative. In addition, non-native vegetation would be removed from approximately 29 acres of bosque.

The Rio Grande is a dynamic system, constantly changing both spatially and temporally. An integrative and passive restoration approach would allow, to the extent possible, the development of naturally forming river and floodplain features, including ephemeral secondary channels and lateral migration of the river across the modified point bar. The application of each of the proposed restoration techniques will be used within the active channel or historic floodplain to work with current hydrologic processes. The proposed modifications would create conditions under which the Rio Grande could help to shape the features within the river. The ultimate outcome of the integrated approach would be greater mesohabitat diversity within the active channel and a variety of habitats that would benefit silvery minnow. The flycatcher would benefit from the Preferred Alternative through the creation of open water habitat, an increase in saturated soil conditions typically associated with breeding flycatcher habitat, the removal of non-native exotic vegetation that will decrease competition with native species, and the consequent increase in desirable flycatcher species composition and habitat structure.

In-channel modifications would be completed to create year-round habitat for all life stages of silvery minnow. Techniques to be used in the channel would include creating low-velocity side channels, bank scouring, removal of lateral confinements, and the placement of large woody debris (Tetra Tech 2004). Techniques to be used in the bosque would include the removal and control of exotic non-native vegetation and the restoration of native herbaceous riparian vegetation. All of the project components would be used to meet the overall purpose, objectives, and needs of the project.

Recent surveys completed by the USFWS New Mexico Fisheries Resource Office (NMFRO) and the Pueblo have concluded that the proposed project site regularly traps hundreds of silvery minnow in low-velocity side channels during periods of low flow (Alex Puglisi, personal communication 2007). Therefore, the proposed modifications would be designed to ensure that entrainment is minimized, leading to decreased mortality and greater population numbers of silvery minnow within the POSSR. The seven proposed modification techniques that are included in the Preferred Alternative are discussed in detail in the following sections.

2.5.2 Restoration Techniques

Passive Restoration

Passive restoration is the process of encouraging the hydrology of the river to work naturally with the environment to create the desired restoration effects (Tetra Tech 2004). Passive restoration can include both curtailing human actions that have a negative impact on the river and removing installations or symptoms of those installations that were part of earlier efforts to stabilize the channel and that have interfered with the river's natural flow. Passive restoration gives the river the opportunity to "heal" itself by allowing natural river processes, such as the displacement of sediment during flood events or the input of large woody debris, to occur without human intervention. The passive restoration techniques considered here would not cause a major shift in present river management practices in the MRG, but would utilize current management trends to help restore natural river processes.

Removal of Lateral Confinements

Non-native woody vegetation located on the bankline effectively eliminate the opportunity for the river to move laterally by armoring the bank, bar, or river islands. The removal of this non-native bankline vegetation would create the conditions necessary for the river to actively shape features within the floodway because the root-reinforcement provided by the vegetation would also be removed. The removal of this vegetation would allow for natural river processes to create a wider and more diverse channel and floodplain features, yielding increased low-velocity habitat for all life stages of the silvery minnow. Vegetation located along the bankline would be excavated and either masticated (smaller diameter) or used as large woody debris (larger diameter) in the active river channel.

Ephemeral Channel Construction

Ephemeral channels are low-velocity, flow-through channels that are often connected to the main river channel across bars and islands. Backwater habitats, ponds, and wetlands are considered variations of the ephemeral channel technique. These channels are often dry but carry high-discharge flow from the main channel, typically during spring snowmelt and summer storm events. The channels carry water at lower velocities than the main channel and may include mesohabitats such as pools and backwaters with little or no flow. These ephemeral channels create aquatic habitat that would be beneficial to silvery minnow and flycatcher. Ephemeral channels are not intended to provide for overbank flooding.

Construction of an ephemeral channel requires removal of existing vegetation and the disturbance of some sediment or soil. The channels would be cut through the project point bar to a depth that would allow water to flow at a variety of river flows ranging from 500 to 3,000 cubic feet per second (cfs). The design of ephemeral channels would consider the river flow at which water enters the channel, water retention times, and velocity relationships. The ephemeral channels would be able to accommodate flows to encourage silvery minnow recruitment each year using integrative passive techniques. Flycatchers would benefit from the development of ephemeral channels through the addition of open water habitat. The open water created through implementation of this technique would also encourage recruitment of native vegetation such as willows and cottonwood (*Populus deltoides*), which is also a benefit to flycatcher.

Ephemeral channels could provide sufficient periods of inundation for all life stages of silvery minnows. Channels designed for inundation during high-flow events would dry during lower flows and would not provide habitat for adult silvery minnow. Alternately, side channels designed for inundation during low-flows may provide adult silvery minnow habitat. While channels of this kind are proposed primarily for the benefit of silvery minnow, they also promote riparian functionality and hydrologic interconnectedness that benefits flycatcher and the riparian ecosystem as a whole.

Bank Scouring

Bank-line scours are areas cut into banks, islands, and bars where flow from the river channel enters and creates a low-velocity habitat. This technique primarily creates habitat during high-flow events; however, it can also be used to create habitat during lower flows. Bank scouring would be used to create areas where the thalweg meets the bank or bar edge, effectively widening the active channel.

Scours are different from ephemeral channels in that they exchange water with the main channel within a small area instead of along a linear bank line. The purpose of scours is to create lateral migration of the river and to restore natural meandering of the system (William Lettis & Associates 2003; Tetra Tech 2004). Created scours would also provide low-velocity habitat for silvery minnow larvae and drifting eggs, rearing habitat, and increased food availability (Porter and Massong 2003).

Bank-line scours would allow the river to erode banks on one side of the river and deposit material along the adjacent bank, inducing lateral migration of the river. Lateral migration is essential to the functionality of the river and contributes to the overall health not only of the silvery minnow but also of all species that use the Rio Grande riparian and floodplain areas. This technique would only be applied in areas where such action would not increase flood risk.

Removal and Control of Exotics

Removal and control of exotic non-native vegetation such as saltcedar, Russian olive, and Siberian elm (*Ulmus pumila*) can aid in the recovery of flycatcher by reducing the potential for wildfire within the bosque (Tetra Tech 2004). By reducing the density of non-native vegetation, competition with desirable native vegetation such as willow and cottonwood is also decreased. Multiple techniques have been developed for non-native vegetation control in the bosque, including mechanical, herbicide, and cut-stump treatments.

Mechanical treatment involves the use of heavy equipment to turn standing vegetation into mulch material. Rotary mulching heads are attached to either rubber tire or tracked equipment that can move through the bosque and target non-native vegetation while leaving desirable species undisturbed. The mulch layer that is left as a byproduct of mastication can be removed from the bosque or left on site to aid in moisture retention and erosion control. Alternately, heavy equipment with a modified hydraulic thumb can be used to extract target species from the soil. After extraction, vegetation is stacked in windrows away from other vegetation for later mastication or use as large woody debris within the river channel. This technique is desirable in that it requires minimal re-treatment with herbicide due to the high mortality rate from initial treatment.

Cut-stump treatment uses hand crews and chainsaws to remove unwanted vegetation. The use of hand crews allows for precise removal of undesirable vegetation and is particularly desirable in stands of mixed native/non-native vegetation. The cut-stump treatment is also beneficial when working on islands or other locations where heavy equipment access is limited. This technique is the least invasive but most expensive technique available (Tetra Tech 2004).

Herbicide application is used in combination with other control techniques. When using the cut-stump treatment, herbicide is applied with a backpack sprayer directly to the cut stump immediately after felling. Application with a backpack sprayer allows for precise application, minimizing potential application to non-target vegetation. Following mechanical treatment with mastication equipment, herbicide is applied as a re-treatment the growing season after mastication. Herbicide is applied to the foliar area of the re-sprouts of non-native vegetation. This combination is an effective control technique, often resulting in 99% effectiveness (Tetra Tech 2004). Four commonly used herbicides include triclopyr ester (e.g., Garlon 4), triclopyr amine (e.g., Garlon 3), imazapyr (e.g., Arsenal), and glyphosphate (e.g., RoundUp). All herbicide application should be used in strict accordance with the product label and under a State of New Mexico-approved pesticide application license.

Large Woody Debris

The large woody debris (LWD) technique involves the placement of root wads, trees, and branches in the main channel, near the inflow or outflow of side channels, or near the bankline to create aquatic habitats. LWD may be placed in the channel or anchored to the river bottom or bank. Anchored LWD tends to remain in place until decomposition sets in. LWD may be placed in high densities or dispersed throughout the project area. Introducing LWD would promote increased habitat diversity and food availability for silvery minnow.

Although LWD has been identified as suitable habitat for silvery minnow (USFWS 2003), no studies have yet been completed on the MRG to document the effects of LWD on silvery minnow habitat. Prior to the 1930s, conditions in the MRG provided significant quantities of LWD to the channel as stream banks eroded with seasonal floods and the river routinely migrated laterally across the floodplain, removing and transporting LWD from the riparian zone. Modification of the river channel with jetty-jacks, levees, and dams for flood control and water delivery is largely responsible for stabilizing the river and floodplain. These activities have also helped to create the monotypic cottonwood gallery found throughout much of the MRG valley. The resulting effects of river management include channel incision, which has essentially eliminated overbank flow in the Albuquerque Reach, reducing the amount of LWD in the river channel. For this technique, LWD would be placed in select locations. The objective is to increase the amount of LWD present in the subreach to enhance food availability and mesohabitats used by silvery minnow. LWD will also act to armor the inlets and outlets of newly constructed channels, increasing the life of these features.

Active Restoration of Riparian Vegetation

Replanting native riparian vegetation is a technique used to encourage the establishment of desired species during restoration efforts. Planting native vegetation can help to prevent the encroachment of noxious weeds and/or invasive species after they are removed (Tetra Tech 2004). The active replanting of riparian vegetation can be used to create habitat that will contain the necessary composition for flycatcher breeding habitat.

Common riparian vegetation replanting techniques include pole planting, whip planting, containerized stock planting, and direct seeding. Pole and whip planting is frequently used for willow and cottonwood planting. Poles and whips are straight, branch-like pieces of the desired species. Holes are dug to the low water table and the pole or whip is then inserted and the hole is backfilled. This technique takes advantage of the regenerative nature of the species. If favorable conditions persist, no maintenance is required for this technique. Planting containerized stock is similar to pole planting, with rooted vegetation grown in a greenhouse used in place of poles and whips. This is a highly successful technique, with a downside of increased cost. Direct seeding is often the desired technique for replanting herbaceous vegetation. Seed is broadcast mechanically or by hand to achieve the desired coverage. Alternatively, seed drills can be used to sow the seed beneath the soil surface. Placing the seed beneath the surface allows for protection from the elements and animals that may feed on the seed. All of the described techniques may be used in the proposed project.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the current condition of resources in the proposed project area that may be affected by the Proposed Action. Resources and related topics presented include geomorphology and soils, hydrology and hydraulics, water quality, cultural resources, air quality and noise, fish and wildlife, vegetation and wetlands, threatened and endangered species, socioeconomics, visual and aesthetic resources, net water depletions, environmental justice, and Indian trust assets.

3.2 GEOMORPHOLOGY AND SOILS

The project area lies within the MRG valley, an asymmetric, elongated valley along the Rio Grande rift (Chapin 1988; Hawley 1978). The Rio Grande rift valley is dominated by connected alluvial-filled sub-basins defined by normal faulted mountain ranges. The land flanking the Rio Grande Basin on the east is predominantly mountainous, with merging colluvial-alluvial fans and stream terraces sloping down and westward toward the Rio Grande. The geologic surface west of the river is ancestral Rio Grande alluvial deposits with isolated mountains and volcanoes. The Pueblo of Sandia is situated at the northern end of the Southern Rio Grande Rift Valley, located at the western base of the Sandia Mountains in the physiographic Basin and Range Province of North America (Hawley 1978). The Southern Rio Grande Rift Valley becomes broad in the vicinity of the Pueblo of Sandia, where the Rio Grande transitions from a region of steeper elevation gradients (~ 10 feet/mile) and narrow valleys (Rio Grande channel widths ~ 300 feet) and canyons to the north, to a more gradual grade (~ 5 feet/mile) over a broad valley (~ 400–500 feet wide channels) with historic flood plains to the south (U.S. Army Corps of Engineers [USACE], Albuquerque District, et al. 2006). The Sandia Subreach of the Rio Grande ranges in elevation above sea level from 5,047 feet at the north end to 5,005 feet at the south end, resulting in an overall elevation difference of 42 feet.

Historically, the shape and pattern of the Rio Grande channel have continuously redefined the spatial distribution of sediments throughout the floodplain. However, in the twentieth and twenty-first centuries, floodway constriction and channel stabilization projects have altered the natural course of the river. For example, flow regulation by dams, levees, and jetty-jacks have been used to control the location of the channel, preventing flow from reaching the historic floodplain and causing sediment to accumulate in some areas and scour in others (Mussetter Engineering, Inc. [MEI] 2003; Bauer 2004).

Sedimentology and fluvial geomorphology play an important role in describing the evolution of the Rio Grande and in influencing the spatial extent and species diversity of vegetation in riparian areas. The present-day channel is composed of clay, silt, sand, and gravel, similar to the composition of ancestral river deposits. In addition to the erosion and transportation of sediment through the main-stem channel, ephemeral tributary streams can contribute large volumes of sediment to the system. The historic floodplain has largely become disconnected from the river (MEI 2003).

The soils of the Rio Grande Valley floor are generally derived from recent alluvial deposits. They are highly stratified and are composed largely of clay-rich overbank deposits and sandy channel and channel bar deposits; their variable stratigraphy results from the lateral and vertical migrations of the Rio Grande. In 2003, the Pueblo of Sandia completed a comprehensive soils survey of riparian habitats on tribal lands. The results of the survey indicated a wide range of soil textures is common in the typical soil profile but that the soils are mostly characterized by a surface layer of loam, with sand, loamy sand, or sandy loam found in the subsurface horizons (Buscher 2003). Soil textures vary from poorly drained to well drained.

3.3 HYDROLOGY AND HYDRAULICS

The MRG is the portion of the Rio Grande that begins at the Colorado/New Mexico state line and flows southward to the headwaters of Elephant Butte Reservoir, and includes the Rio Chama watershed. Most of the annual flow and discharge that reaches the MRG is generated in the headwaters of the river basin in Colorado and in the Rio Chama in northern New Mexico.

The majority of the discharge volume of the Rio Grande is late spring snowmelt. Summer "monsoon" events produce significant runoff and temporarily alter the hydrograph of the river. These summer flows typically carry high sediment loads; however, the operations of Cochiti Dam since 1973, Galisteo Dam since 1970, and Jemez Dam since 1953 have reduced the total supply of sediment throughout the Albuquerque Reach by as much as 80% (Lagasse 1980; S.S. Papadopulos and Associates, Inc. [SSPA] 2004). Human activities have produced significant changes in the hydrology of the Rio Grande during the past century. The operation of upstream dams (Heron, El Vado, and Abiquiu Reservoirs on the Rio Chama; Jemez Dam on the Jemez River; Galisteo Dam on the Rio Galisteo; and Cochiti Dam on the Rio Grande) affects flows in the river by storing and releasing water in a manner that generally decreases the spring flood peaks and alters the timing of the annual hydrograph. Of the 100 greatest daily discharges since 1942 at the Central Gage (U.S. Geologic Survey [USGS] Gage 8330000), all have occurred prior to the construction of Abiquiu and Cochiti dams (USGS 2006). However, these operations do not cause significant changes in the annual total discharge of the system.

3.4 WATER QUALITY

Current information on water quality within the POSSR is available from the Pueblo of Sandia Environment Department, U.S. Geological Survey, the USACE, Bureau of Reclamation (Reclamation), the University of New Mexico (UNM), the New Mexico Environment Department, USFWS, and other sources. The Pueblo maintains regulatory authority for water quality standards within Sandia tribal lands. The Pueblo applied for "treatment as a state" status in 1988, gaining U.S. Environmental Protection Agency (EPA) approval in 1990. The Pueblo's water quality standards are more stringent than standards implemented by the State of New Mexico and prescribe acceptable levels for constituents including surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform.

Water quality of the Sandia subreach is largely contingent on the degree of both point source (PS) (discharges from a pipe) and non-point sources (NPS) (diffuse sources like fertilizer, pesticide application, and water diversion) of pollution. Wastewater treatment plants (WWTP) are the main PS pollutants on the Sandia subreach.

Sandia Pueblo Water Quality Standards:

A: Designated Uses: primary contact ceremonial, primary contact recreational, secondary contact recreational, agricultural, industrial

B: Standards:

1) Temperature = 32.2 º C, DO = 5 mg/L, pH = 6.0–9.0, As = 17.5 mg/L, fecal coliform = 100/100 mL, turbidity = 25 nephelometric turbidity units (NTU)

2) Narrative standards include:

    a. Stream Bottom Deposits–Surfacewaters shall be free from water contaminants from other than natural causes that may settle and have a deleterious effect on the aquatic biota or that will significantly alter the physical or chemical properties of the water or the bottom sediments.

    b. Salinity/Mineral Quality (TDS, chlorides, and sulfates)–Existing mineral quality shall not be altered by municipal, industrial, or instream activities or other water discharges so as to interfere with the designated or attainable uses for a water body. An increase of more than 1/3 over naturally-occurring levels shall not be permitted. Numeric criteria for chlorides at 230 mg/L, for sulfates at 250 mg/L and for TDS at 500 mg/L shall not be exceeded.

    c. Nuisance Conditions–Plant nutrients or other substances stimulating algal growth from other natural causes shall not be present in concentrations that produce objectionable algal densities or nuisance aquatic vegetation, or that result in a dominance of nuisance species instream, or that cause nuisance conditions in any fashion. Phosphorous and nitrogen concentrations shall not exceed 100 µg/L instream or 50 µg/L in lakes or reservoirs except waters laden with natural silts or color which reduce the penetration of light needed for photosynthesis, or in waters where it can be demonstrated that algal production will not interfere with or adversely affect designated and attainable uses.

3.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

3.5.1 Cultural History

Cultural resources include archaeological sites, sites eligible for the State Register of Cultural Properties (SRCP) and/or the National Register of Historic Places (NRHP), and properties of traditional religious or cultural importance (traditional cultural properties [TCPs]).

Archaeological resources that are listed on the NRHP, or are eligible for listing, are protected under the National Historic Preservation Act (NHPA) of 1974 (16 U.S.C. 470). To determine if any known cultural resources sites are listed on or are eligible for the NRHP within the project area, an Archaeological Records Management Section (ARMS) search was completed within the project area and coordination with the Pueblo of Sandia was conducted. Continued coordination with the New Mexico State Historic Preservation Office (SHPO) is currently underway and will be completed prior to project implementation.

3.5.2 Traditional Cultural Properties

USFWS has consulted with the Pueblo of Sandia to determine whether there are any TCPs that must be considered in the decision-making process. The consultation consisted of two meetings with representatives of the Pueblo of Sandia Environment Department. Additionally, the proposal for this project as well as this EA were presented to, and approved by, the Pueblo of Sandia Governor's office and Tribal Council. It was determined that no TCPs or sacred sites will be negatively impacted through the implementation of this project.

3.6 VEGETATION AND WETLAND RESOURCES

The riverbank community along the MRG consists of frequent open sand bars along the main channel. These areas were historically subject to frequent disturbance from erosion and flood events and typically contained little or no vegetation. However, due to the current hydrologic regime many bar and bank habitats have become populated with cottonwood, coyote willow (*Salix exigua*), tamarisk, Russian olive, and a variety of annual forbs. Since these areas experience regular scouring during flood events, the vegetation often does not mature. Like the river bar and bank vegetation, characteristics of vegetated islands within the river channel have changed significantly, frequently consisting of established riparian vegetation.

An increase in non-native vegetation has been identified as the most significant indicator of failing ecological health in the riparian ecosystem. Species such as tamarisk, Russian olive, and Siberian elm have more extensive reproductive cycles than native species, allowing them to out-compete native trees in many locations. The fact that flood peaks have been reduced and the river has incised through the Sandia subreach also factors in the transformation of riparian forests, since the non-native species are more tolerant of reduced floods and lower water tables.

Despite the considerable attention that has been devoted to the ecology and biodiversity of the bosque (Hink and Ohmart 1984; Crawford et al. 1993; Robert 2005), until recently little was known about the in-channel bars. These dynamic environments support young wetland and riparian vegetation and most of the natural regeneration of Rio Grande cottonwoods in the river corridor (Milford and Muldavin 2004). Perhaps due in part to the lack of flood peaks during the current drought, vegetated islands currently support upward of 18 percent of the vegetation throughout the Albuquerque Reach (Milford et al. 2003).

Milford et al. (2003, 2005) conducted an extensive survey and mapping effort for vegetation of sand bars and islands of the MRG, including the POSSR. They found that river bars account for 24% (517 acres) of the floodplain; upper terraces 62% (1,329 acres); and active channel 14% (309 acres) (Milford et al. 2005). Dominant vegetation types on the bars can be partitioned as

follows: 5% cottonwood/mixed woodland (8% of the overall total vegetation was woodland); 12% coyote willow/native shrubland and 17% Russian olive/coyote willow shrubland (69% of the total vegetation was shrubland); and 11% herbaceous wetland species (16% of the total vegetation was herbaceous). Shrubland vegetation was the dominant cover type in the north reach, however exotic-dominated bars accounted for 59% of this shrubland. The importance of this study was to establish the extent of river bars in the MRG basin and prioritize areas for restoration. Plant species diversity is higher on the river bars than in the adjacent mature cottonwood bosque (Milford and Muldavin 2004), highlighting their importance to riparian ecosystems.

A narrow band of herbaceous wetland plants dominated by inland saltgrass (*Distichlis spicata*) and Baltic rush (*Juncus balticus*) commonly occurs on the banks of the Rio Grande. Other species that occur in the floodplain include isolated stands of rabbitbrush (*Ericameria nauseosa*), common mullein (*Verbascum thapsus*), coyote willow, Russian olive, and tamarisk. Dominant plant species found in the bosque are Rio Grande cottonwood (*P. deltoides wislizenii*), tamarisk, and Russian olive. Within the Rio Grande, most in-channel islands and bars are periodically inundated by high flow and support some marsh, meadow, or shrub wetland communities. However, the areas targeted for the Proposed Action are dominated by non-native vegetation and contain limited wildlife habitat value for the species of concern (Figure 3.1).

3.7 FISH AND WILDLIFE

Changes in the river elevation relative to the floodplain, the hydrologic and sediment regime, as well as the introduction of predatory species (game fish) have affected the fauna of the Rio Grande. Historically, the riparian corridor of the MRG supported a wide diversity of terrestrial species. Prior to increased anthropogenic control, the river system periodically contributed water and nutrients to the floodplain and supported a number of aquatic species that no longer inhabit the area.

The Rio Grande drainage in New Mexico historically supported at least 21 and perhaps 24 native fish species, representing nine or 10 families (Propst 1999). Since the beginning of European settlement along the Rio Grande, this system has lost a larger proportion of its native fish fauna than any other major drainage in New Mexico. Shovelnose sturgeon (*Scaphirhynchus platorhynchus)*, longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), speckled chub (*Machrybopsis aestivalis aestivalis*), and Rio Grande shiner (*Notropis jemezanus*) have been extirpated from the Rio Grande in New Mexico, and blue catfish (*Ictalurus furcatus*), if it persists, occurs only in Elephant Butte Reservoir. Rio Grande bluntnose shiner (*Notropis simus simus*) and phantom shiner (*Notropis orca*) are extinct. Rio Grande silvery minnow is the only state and federally protected fish species currently inhabiting the Rio Grande, but Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) may warrant state protection (Propst 1999).

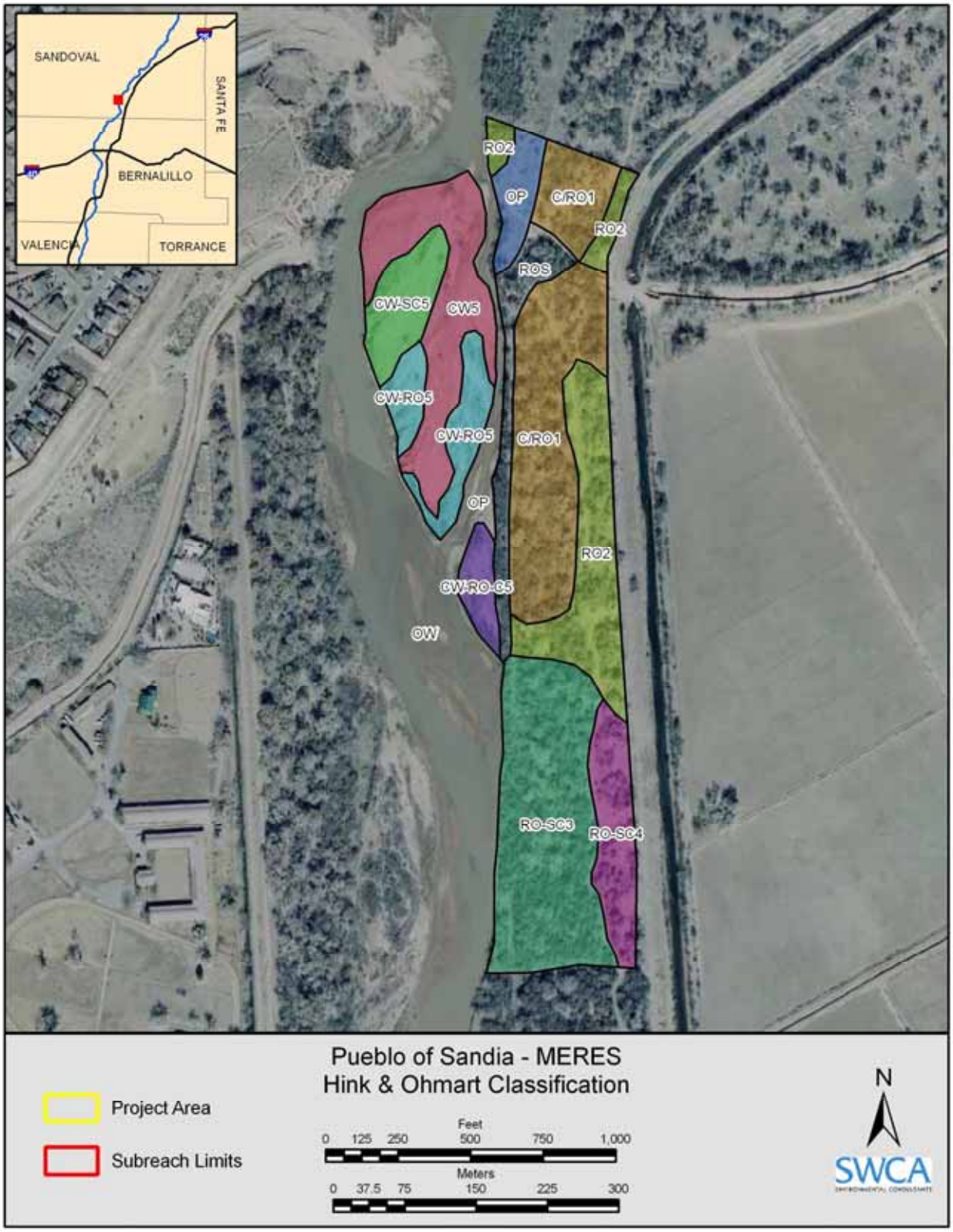

Figure 3.1. Pueblo of Sandia MERES vegetation map.

Common fish species of the MRG include river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), common carp (*Cyprinus carpio*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Platania 1993). Less common fish species present in the system are channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersoni*), and the silvery minnow. Western mosquitofish, white sucker, and common carp are introduced species that are now common throughout the MRG.

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many bird species. Hink and Ohmart (1984) recorded 277 species of birds within 163 miles of MRG bosque habitat. Stahlecker and Cox (1997) documented 126 species in the Rio Grande Nature Center State Park (RGNCSP) during the most comprehensive survey of the bosque in the Albuquerque reach, immediately south of the project area. The 10 most common species during the winter of 1996–1997 were dark-eyed junco (*Junco hyemalis*), American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), white-crowned sparrow (*Zonotrichia leucophrys*), American robin (*Turdus migratorius*), Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), mallard (*Anas platyrhynchos*), European starling (*Sturnus vulgaris*), and house finch (*Carpodacus mexicanus*). The 10 most common species in the bosque during the summer of 1997 were black-chinned hummingbird (*Archilochus alexandri*), red-winged blackbird, black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), brown-headed cowbird, mourning dove (*Zenaida macroura*), Bewick's wren (*Thryomanes bewickii*), black-capped chickadee (*Poecile atricapillus*), cliff swallow (*Petrochelidon pyrrhonota*), house finch, and European starling (Stahlecker and Cox 1997). The most abundant bird species found along the river in winter were mallard, Canada goose, and wood duck (*Aix sponsa*). Red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), western screech-owl (*Otus kennicottii*), and great-horned owl (*Bubo virginianus*) were also identified (Stahlecker and Cox 1997).

Hink and Ohmart (1984) also recorded 35 mammal species in their study of the MRG, and Campbell et al. (1997) observed 14 mammal species in their survey of the Albuquerque Reach. Based on both surveys, it is assumed that the most common small mammals in the proposed project area include white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), and house mouse (*Mus musculus*) (Hink and Ohmart 1984; Campbell et al. 1997). Less common small mammals include pocket gophers (Geomyidae) and rock squirrels (*Spermophilus variegates*). Mesomammals in the area include coyote (*Canis latrans*), common raccoon (*Procyon lotor*), American beaver (*Castor canadensis*), and common muskrat (*Ondatra zibethicus*). Several species of bats also utilize the MRG.

3.8 THREATENED, ENDANGERED, AND CANDIDATE SPECIES

The only agency with authority for the conservation of plant and animal resources on Sandia lands is the USFWS, under authority of the ESA. The USFWS maintains a list of plant and animal species that have been classified as Threatened or Endangered or are potential candidates for classification (Table 3.1). Protection from harassment, harm, or destruction of habitat is granted to these species protected under the ESA.

Table 3.1. Threatened (T), Endangered (E), and Candidate (C) Plant and Wildlife Species Known to Occur in Bernalillo County, New Mexico

Note: Animals and plants that could occur in the project area are shown in **boldface**.

Common Name (*Scientific name*)	Status		General Habitat
	FED	STATE	
Fish			
Rio Grande silvery minnow (*Hybognathus amarus*)	**E**	**E**	**Silt and sand substrates with slow backwaters**
Birds			
Yellow-billed cuckoo (*Coccyzus americanus*)	**C**	**–**	**Dense riparian shrub**
Southwestern willow flycatcher (*Empidonax traillii extimus*)	**E**	**E**	**Federal critical habitat designation along MRG; dense riparian groves of willow or salt cedar**
Mexican spotted owl (*Strix occidentalis lucida*)	T	–	Federal critical habitat designation made; mature mixed-conifer and pine-oak forests
Mammals			
Black-footed ferret (*Mustela nigripes*)	E	–	Prairies; associated with prairie dogs

Source: [BISON-M] Biota Information System of New Mexico. 2007. http://www.bison-m.org. Accessed 05/30/2007.

3.8.1 Fish

Rio Grande Silvery Minnow *(Hybognathus amarus)*

The silvery minnow is a moderate-sized, stout minnow reaching 3.5 inches in total length that spawns in the late spring and early summer, coinciding with high spring snowmelt flows (Sublette et al. 1990). Spawning also may be triggered by other high-flow events such as spring and summer thunderstorms. The species is a pelagic spawner, producing neutrally buoyant eggs that drift downstream with the current (Platania 1995). The eggs hatch in 2 to 3 days, and the larvae may continue to drift or become retained in backwaters or embayments. The species normally lives about 2 to 3 years in the wild. Natural flow regimes, movement within their limited remaining range, and habitat diversity are important to completion of the life cycle.

The silvery minnow was listed as Endangered by the USFWS in 1994 (Federal Register [FR] 1994). Historically, the silvery minnow was one of the most widespread and abundant fishes in New Mexico. The species has declined as a result of impacts from dewatering, channelization and flow regulation for irrigation, diminished water quality, and competition/predation by non-native species. The species is endemic to New Mexico, where it historically occupied large rivers with shifting sand substrates. In the Rio Grande, the silvery minnow ranged from the confluence of the Rio Chama near Española to the Gulf of Mexico, and in the Pecos River from near Santa Rosa to its confluence with the Rio Grande (Propst 1999). The silvery minnow currently occupies less than 10 percent of its historic range and is found only in the Rio Grande from Cochiti Reservoir downstream to Elephant Butte Reservoir (Propst 1999).

Natural habitat for the Rio Grande silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are lower than in the main channel. Areas with detritus

and algal-covered substrates are preferred. The lee sides of islands and debris piles often serve as good habitat. Stream reaches dominated by straight, narrow, or incised channels with rapid flows would not typically be occupied by the silvery minnow (Sublette et al. 1990; Bestgen and Platania 1991). Critical habitat for the silvery minnow was designated by the USFWS from Cochiti Dam, Sandoval County, NM, downstream to the utility line crossing the Rio Grande upstream of Elephant Butte Reservoir in Socorro County, NM. The silvery minnow critical habitat includes the Rio Grande and the riparian corridor up to existing levees. Critical habitat in areas without levees extends 300 feet into the riparian zone beyond the river banks at the bankfull stage level. The pueblo lands of Sandia, Santo Domingo, Santa Ana, and Isleta are excluded from the critical habitat designation because each pueblo tribe maintains independent management plans to protect the silvery minnow on their lands.

A Biological Opinion was released by the USFWS in 2003 covering Reclamation's water and river maintenance operations, the USACE's flood control operations, and Related Non-federal Actions on the MRG (USFWS 2003). The 2003 MRG BO requires habitat restoration projects on the MRG that will improve survival of all life stages of the endangered silvery minnow and other endangered species. The 2003 MRG BO identified the need for increased availability of low-velocity habitat and silt and sand substrates to provide food, shelter, and sites for reproduction for silvery minnow and thereby alleviate jeopardy to the continued existence of the species in the MRG. The Pueblo of Sandia has been working toward the conservation of silvery minnow in accordance with the 2003 BO and the Tribe's conservation goals for the last several years. A detailed description of the Tribe's efforts can be found in the Biological Assessment developed for this project (SWCA 2007).

3.8.2 Birds

Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

The yellow-billed cuckoo is a USFWS Candidate species that occurs locally along riparian corridors throughout New Mexico. Ideal habitat is dominated by a cottonwood canopy with a well-developed willow understory. Yellow-billed cuckoo diet consists mainly of caterpillars, but may also include various insects, some fruit, and the occasional lizard or frog (New Mexico Department of Game and Fish [NMDGF] 2004a). The breeding range of yellow-billed cuckoo extends from California and northern Utah north and east to southwestern Quebec and south to Mexico. In New Mexico, historical accounts indicate that the yellow-billed cuckoo was locally very common along the Rio Grande, but rare statewide (NMDGF 2004a). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported yellow-billed cuckoo as a nesting bird in the bosque of the MRG; however, no recorded instances of yellow-billed cuckoo have been recorded within the Pueblo of Sandia subreach.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher is considered Endangered by USFWS. The subspecies is restricted to dense riparian vegetation along select waterways in New Mexico, Arizona, western Texas, southern Utah, Nevada, and California. The decline of the species has been attributed to loss of riparian habitat, brood parasitism, and lack of adequate protective regulations. The historic range of southwestern willow flycatchers included riparian areas throughout Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Critical habitat was designated for

the flycatcher in 1997 (FR 1997) along 599 miles of streams and rivers in California, Arizona, and New Mexico, but was later withdrawn. In October 2004, the USFWS proposed a new designation of critical habitat for the flycatcher (FR 2004) that was approved in October 2005 (FR 2005). The current range of critical habitat in the MRG consists of four segments: Taos Junction Bridge to the northern boundary of the Ohkay Owingeh (San Juan Pueblo) (28.5 miles), the southern boundary of Isleta Pueblo to the northern boundary of Sevilleta National Wildlife Refuge (NWR) (44.2 miles), the southern boundary of Sevilleta NWR to the northern boundary of Bosque del Apache NWR (27.3 miles), and the southern boundary of Bosque del Apache NWR to Millagan Gulch at the northern end of Elephant Butte State Park (12.5 miles). The Pueblo of Sandia was excluded from designation as critical habitat due to actions being taken under the Pueblo's restoration program.

The southwestern willow flycatcher prefers dense riparian thickets, typically willows with a cottonwood overstory. Dense riparian woodlands adjacent to open water or moist soils are particularly important as breeding habitat. In New Mexico, the flycatcher occupies riparian habitat along the Rio Grande, Rio Chama, Zuni River, San Francisco River, and Gila River drainages and is generally found within 150 feet of a water source. During spring and fall migration the species occurs statewide, although migration patterns are not well understood. On the Rio Grande, the subspecies occurs near Velarde, Isleta, the Sevilleta NWR, the Bosque del Apache NWR, San Marcial, and Fort Selden. Pueblo of Sandia surveys conducted annually from 2000–2006 have found no flycatcher currently occupying the Sandia sub-reach. Protocol surveys within the project area are being undertaken and will be complete prior to project implementation.

3.9 SOCIOECONOMICS

This analysis does not focus on all aspects of economics within the proposed project area, but considers only the projected economic costs of the Preferred Alternative and economic statistics at the city, state, county, and local levels to describe the economic context of the project. In 2000, the Pueblo of Sandia had a per capita personal income (PCPI) of $11,240 (U.S. Census Bureau 2006a). The average PCPI for the State of New Mexico was $17,261, which was 80 percent of the national average, $21,587 (U.S. Census Bureau 2006b,c).

The proposed project location is in the Pueblo of Sandia, Bernalillo County, New Mexico. While the Pueblo of Sandia encompasses portions of both Bernalillo and Sandoval County, the project will take place entirely within Bernalillo County. According to the 2000 Census, Bernalillo County had a population of 556,678 persons, of which 344 reside within the defined Pueblo of Sandia boundary. Bernalillo County is approximately 1,166 square miles in area, with an average of 477 persons per square mile, and is considered urban in character.

Federal expenditures in the State of New Mexico accounted for $19.864 billion in 2004 (U.S. Census Bureau 2006c). State expenditures amounted to $224.1 million in 2002 (New Mexico Department of Finance and Administration 2002). The estimated cost of the Proposed Action is $376,900.

3.10 VISUAL AND AESTHETIC RESOURCES

The bosque area within the Pueblo of Sandia is valued for the cultural, visual, and aesthetic appeal of mature forest and flowing water in an arid landscape. The bosque and river are visible to tribal members from a variety of access roads, trails, and the surrounding community. These vistas of the river and bosque provide pueblo residents with a regular and important visual aesthetic experience. Motorized vehicles within the bosque are limited to maintenance and emergency vehicles (fire fighting) as well as access for recreation and tribal activities. This limited vehicle access makes an aesthetic experience for the tribal community one of a forest and riverside that is full of the sounds and sights of water and forest.

3.11 AIR QUALITY AND NOISE

The proposed project area and Bernalillo County fall within New Mexico's Air Quality Control Region No. 152. This area is in attainment for all priority pollutants (lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides) except carbon monoxide, which is presently in maintenance status. The closest Class I area (a national park or wilderness area) is Bandelier National Monument, 25 miles due north of the proposed project area. Air quality in the project area is considered good. Due to inversions and an increase in the use of wood-burning stoves, carbon monoxide and airborne particulates are occasionally high in the Rio Grande Valley during winter months. All vehicles involved in project activities would have emission control equipment in place. Best Management Practices (BMPs), such as wetting down disturbed areas to minimize dust, would be followed during project activities.

Noise levels are limited to 90 decibels A-weighted (dBA) averaged over an 8-hour day by the Occupational Safety and Health Administration (OSHA) (29 CFR 1910.95). No worker may be exposed to 115 dBA averaged over an 8-hour day without hearing protection.

3.12 ENVIRONMENTAL JUSTICE

Executive Order 12898 (FR 1994), Environmental Justice in Minority and Low-Income Populations, requires consideration of adverse impacts that would disproportionately affect minority and low income populations. Compared to demographics on the national level, the population of the Pueblo of Sandia has proportionately more persons of Native American background.

3.13 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interest in assets held in trust by the United States Government for Indian tribes or for Indian individuals. Some examples of ITAs are lands, minerals, water rights, hunting and fishing rights, titles, and money. ITAs cannot be sold, leased, or alienated without the express approval of the United States Government. Secretarial Order 3175 requires that USFWS assess the impacts of its projects on ITAs. An inventory of all ITAs within the proposed project area is required. If any ITAs are impacted, the mitigation or compensation for adverse impacts to these assets must be accomplished.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This EA uses scientific and analytic evaluation to compare the No Action and Proposed Action Alternatives. This chapter of the EA evaluates the direct, indirect, and cumulative impacts to all resources described in Chapter 3, Affected Environment. In addition, environmental commitments, which would provide ongoing guidance for the proposed project, are summarized.

4.2 GEOMORPHOLOGY AND SOILS

Under the No Action Alternative, the geomorphology of the Rio Grande would likely remain stable, though current drought conditions may cause the channels between islands to continue to narrow and deepen. In the absence of frequent high discharges, the river in this reach would continue to have high velocities and would have limited meandering capability, a process that is important in moving and redefining islands and bars. Islands and bars would be stabilized with increasingly mature vegetation, predominantly non-native species. The geomorphic trends produced under the No Action Alternative are unfavorable for the Rio Grande silvery minnow because of decreased capacity for egg retention and larval success and decreased presence of quality mesohabitat.

Under the Proposed Action, the project would incorporate multiple habitat restoration and planning components. Restoration efforts would include the clearing of exotic, non-native plant species and subsequent revegetation of native species on approximately 29 acres of bosque. In addition, in-channel modifications to an approximately 10-acre point bar would be completed for the benefit of silvery minnow and flycatcher. In doing so, the current local geomorphology is anticipated to change slightly. Under the Proposed Action there would be minimal to moderate soil disturbance levels associated with construction activities. The overall effects would be monitored, but are expected to be beneficial and completely within normal parameters for a sand-bed river system.

Before the initiation of construction activities, environmental protection measures would be reviewed at a pre-project meeting with the appropriate federal agencies. All activities would comply with tribal and federal regulations. To mitigate negative effects from erosion, native vegetation would be planted in specific disturbed areas.

4.3 HYDROLOGY AND HYDRAULICS

Under both the No Action and the Proposed Action Alternatives, there would be no change in the amount or duration of flow in the river. The Proposed Action would work with the existing hydrologic conditions to develop the desired habitat types.

4.4 WATER QUALITY

The No Action Alternative would likely result in water quality that continues to meet applicable standards for most physical constituents, such as surface water temperature, pH, turbidity, DO, conductivity/TDS, SSED, and fecal coliform.

Under the Proposed Action, no adverse impact to surfacewater or groundwater quality is anticipated. The Clean Water Act (CWA) provides protection for wetlands and waters of the United States from impacts associated with dredged or fill material in aquatic habitats, as defined under Section 404(b)(1). CWA compliance would be required for all aspects of the project that take place within the ordinary high-water mark, and since most work associated with the Proposed Action would be completed within jurisdictional areas, a 404 permit would be required. Compliance with the CWA would ensure that the Proposed Action would have no adverse effect on the water quality of the MRG. Water quality would be monitored and evaluated during the construction phase of the project.

The Proposed Action would result in temporary changes in the measures for physical constituents, particularly for turbidity and TDS, because of the movement and dispersal of sediments within the river channel. Short-term and localized adverse effects to water quality may occur but are not expected to exceed applicable standards.

4.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Under the No Action and Proposed Action Alternatives, no impacts to existing cultural resources or TCPs are anticipated.

4.6 VEGETATION AND WETLAND RESOURCES

Increased frequency of flooding within the project bar location is anticipated under the Proposed Action, compared to the No Action Alternative. Riparian vegetation is, by definition, subject to intermediate levels of disturbance from flooding. Reduced levels of annual maximum flows under the No Action Alternative have reduced these natural processes. Under the Proposed Action, some native and non-native vegetation would be disturbed by mechanical means during the implementation of the restoration techniques. Bar modification would require the removal of all vegetation within the footprint of the disturbance area. Non-native vegetation removal would, by the nature of the action, completely remove the target non-native vegetation and likely cause non-lethal disturbance to some non-target native vegetation.

The Rio Grande, including the proposed project locations, is a USACE jurisdictional waterway. Executive Order 11990 (Protection of Wetlands; FR 1977a) requires the avoidance of short-term and long-term adverse impacts associated with the destruction, modification, or other disturbance of wetland habitats. Compliance with Section 404 of the CWA would prevent net loss of wetlands due to project actions. As a result, the Proposed Action would not impact wetland communities in the project area. Executive Order 11988 (Floodplain Management; FR 1977b) provides federal guidance for activities within the floodplains of inland and coastal waters and

requires federal agencies to "ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management." The proposed modifications would not result in significant changes in flooding patterns outside the existing floodplain.

4.7 FISH AND WILDLIFE

Short-term adverse impacts to fish and wildlife resources would not occur under the No Action Alternative. Long-term adverse effects on breeding and foraging fish, avian species, and mammals may occur; however, they would be gradual and difficult to quantify under current riverine and riparian processes. Such effects would result from long-term alterations to riparian ecological processes, encroachment of non-native species, increased fire hazard, and increased depth of groundwater.

By comparison, the Proposed Action would produce short-term direct impacts on wildlife in the immediate area of disturbance and long-term beneficial effects on wildlife from improved ecological function and riparian aquatic habitat. To avoid direct impact to migratory birds protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703, et seq.), clearing and grubbing of woody vegetation would be scheduled between August 15 and April 15, outside of the normal breeding season for many migratory avian species. Should vegetation removal be implemented between April 15 and August 15, pre-construction nesting bird surveys should be conducted to identify potential MBTA issues. Any positive pre-construction survey results for migratory birds would be brought to the attention of the USFWS to determine methods of MBTA impact avoidance.

Other wildlife species that are likely inhabit the proposed project area, such as reptiles, mammals, and amphibians, would be temporarily displaced and could experience mortality during the implementation of the Proposed Action. These effects would be outweighed by the long-term benefits of a healthier ecosystem. No long-term adverse impacts on fish species are expected to occur under the Proposed Action. Long-term benefits from aquatic habitat creation and increased food abundance within mesohabitats are expected.

4.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

4.8.1 Rio Grande Silvery Minnow (*Hybognathus amarus*)

The No Action Alternative would have no impact on the current trends of silvery minnow populations in the Sandia subreach. The channel in the Sandia subreach is incised and degradation is expected to continue (Porter and Massong 2004). The Pueblo of Sandia has been heavily involved in silvery minnow augmentation efforts throughout the MRG. Increasing the amount and/or quality of suitable riverine habitat is essential for successful application of this supplemental augmentation.

The Proposed Action may affect and is likely to adversely affect silvery minnow during construction; and may affect but is not likely to destroy or adversely modify silvery minnow critical habitat. The primary objective of the project is to create habitat for the silvery minnow based on best available information. While Pueblo of Sandia lands are not included in the final

silvery minnow critical habitat designation, the project would provide long-term direct and indirect beneficial effects on silvery minnow and their habitat in the MRG, such as improved egg and larval retention, increased recruitment rates, and increased survival of both young-of-year and adults. The described techniques would be monitored for achievement of restoration goals. Short-term effects such as increased turbidity and water quality parameters may impact silvery minnow during and immediately following habitat restoration activities; these would result largely from the operation of heavy machinery and the removal of vegetation. However, the slow movement of the equipment, coupled with the sensitivity of silvery minnow to sound, their high swimming speed, and access to the water column around the equipment make it possible, but unlikely, that any silvery minnow would be physically harmed by the equipment. BMPs would be enforced to minimize impacts during periods of work.

4.8.2 Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

The No Action Alternative would not change the riparian habitats potentially used by this species, and no effects would occur.

The Proposed Action may affect but is not likely to adversely affect the western yellow-billed cuckoo. Noise generated by heavy machinery during construction could disturb cuckoo in the project area. Additionally, the removal of non-native vegetation could potentially decrease habitat availability for the species. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation would be scheduled between September and April. Should vegetation removal and construction be implemented during the breeding season (April–August), pre-construction breeding bird surveys would be conducted and monitoring performed to ensure avoidance of impacts. Any positive pre-construction survey results for migratory birds would be brought to the attention of the USFWS to determine methods of MBTA impact avoidance.

4.8.3 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The No Action Alternative would not disturb the riparian vegetation; therefore, this alternative would have no effect on the species.

The Proposed Action would take place outside of the breeding season for southwestern willow flycatcher and would not directly affect the species. The Proposed Action may affect but is not likely to adversely affect southwestern willow flycatcher. Pueblo of Sandia flycatcher surveys conducted annually from 2000–2006 have found no flycatcher to be occupying land along the Sandia subreach. Habitat restoration, however, would potentially improve habitat availability for the subspecies that have been located in neighboring reaches of the MRG. A careful review of the vegetation on each of the restoration sites indicates that some vegetation occurs with Hink and Ohmart structural type 1, which may have the height and structure used by flycatcher. However, the survey found that the habitats that would be affected by the project have lower plant densities than those associated with flycatcher habitats. Removal of these habitats would be temporary. Revegetation with native herbaceous species is planned for the project areas to supplement the natural regeneration process. Vegetation would be monitored as it re-establishes on the disturbed bar and bosque restoration areas. Dynamic succession characterizes riparian habitats, and because the restoration would bring much of the island and bar ground levels closer to groundwater, the

future potential for these areas would be improved for dense stands of native trees to develop, providing better support for flycatcher in the future.

Noise generated by heavy machinery during construction could disturb migrating flycatcher in the project area. Additionally, the removal of non-native vegetation could potentially decrease habitat availability for the species. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation would be scheduled between September and April. Should vegetation removal and construction be implemented during the breeding season (April 15–August 15), pre-construction breeding bird surveys would be conducted and monitoring performed to ensure avoidance of impacts. Any positive pre-construction survey results for migratory birds would be brought to the attention of the USFWS to determine methods of MBTA impact avoidance.

4.9 SOCIOECONOMICS

The long-term economic consequences of No Action are unknown at this time and difficult to assess.

The Proposed Action would not adversely affect current economic and socioeconomic conditions within Pueblo of Sandia lands. The cost of the Proposed Action would be $376,900. This amount is low in comparison with combined tribal and federal expenditures within the Pueblo of Sandia, and would not adversely affect current economic conditions.

Under the No Action and the Proposed Action Alternatives, there would likely be temporary increases in federal spending in Bernalillo County and the Pueblo of Sandia to conduct habitat restoration for the silvery minnow. Regardless of this Proposed Action, the 2003 MRG BO requires that aggressive measures be taken to improve and restore aquatic habitat for the silvery minnow, and that those measures be conducted in all areas of critical habitat and within tribal lands of cooperating tribes.

4.10 VISUAL AND AESTHETIC RESOURCES

The No Action Alternative would continue to provide long-term aesthetic value to Pueblo of Sandia residents and unimpeded vistas of the Rio Grande and the riparian forest. There would be no short-term changes in the visual and aesthetic experience associated with the project. Long-term impacts to the river and bosque from changes in the channel configuration would be so slow as to likely be imperceptible to the public.

The Proposed Action would likely produce long-term changes in the visual and aesthetic experience of the public from the riverside areas adjacent to the project area. The current condition of the bosque, with considerable non-native vegetation, is the only condition that many local residents have experienced. After the removal of non-native vegetation from the project sites, the bosque would be less densely vegetated, replicating historic conditions. While some of the tribal population may perceive the more natural look of the bosque as pleasing, others may consider the new look to be less aesthetically desirable than the current condition.

4.11 AIR QUALITY AND NOISE

The project area is in a natural area in which a quiet atmosphere is likely expected. The No Action Alternative would hold ambient noise levels to the current condition.

The Proposed Action is not anticipated to generate ambient noise that exceeds levels allowable by the Sandia tribal government. Construction equipment to be used during the Proposed Action would create temporary variable noise levels that would likely exceed allowable ambient noise of 80 dBa in the immediate vicinity of the restoration site. Construction sites are anticipated to be more than 500 feet from any sensitive noise receptors. Under the Proposed Action, noise impacts during heavy equipment use would be short term and occur during normal business hours to minimize noise disturbance to local residents. The Sandia Lakes Recreation Area is in the vicinity of the proposed site; however, impacts to recreationists are expected to be minimal since the riparian vegetation and levee would abate some of the noise generated by the equipment.

Construction equipment would temporarily generate fumes and air emissions under the Proposed Action. The level of air emissions is anticipated to be low and in compliance with local and federal air emission standards.

4.12 ENVIRONMENTAL JUSTICE

The Proposed Action complies with Executive Order 12898 (FR 1994), Environmental Justice in Minority and Low-Income Populations. The proposed project is located on the active floodplain of the Rio Grande, between the flood control levees within the Sandia Reach of the river. Outside of the levees, nearby land use along this reach is primarily agricultural.

There would be no disproportionately high or adverse human health or environmental effects on minority or low income populations due to either the No Action or Proposed Action Alternatives.

4.13 INDIAN TRUST ASSETS

Consultation has been conducted to identify any ITAs in the project area and to assess potential impacts, in accordance with Secretarial Order 3175. No ITAs were identified. Therefore, no impacts are anticipated from the No Action Alternative or the Proposed Action.

4.14 IRRETRIEVABLE COMMITMENT OF RESOURCES

The implementation of the project would result in the commitment of resources such as fossil fuels, construction materials, and labor. In addition, tribal and federal public funds would be expended for the completion of the proposed project.

4.15 CUMULATIVE IMPACTS

NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (42 U.S.C. 4331–4335). Cumulative environmental impacts associated with the Rio Grande, including islands and riparian areas, have been evaluated for the following projects relative to the Proposed Action.

Middle Rio Grande Endangered Species Act Collaborative Program

The Collaborative Program has solicited and funded multiple habitat restoration projects, including City of Albuquerque and USACE restoration projects near the Proposed Action (Reclamation 2002). Silvery minnow augmentation funded by the Collaborative Program should provide positive synergistic interactions with the habitat that will be created by this project.

Upper Rio Grande Water Operations (URGWOPS) Environmental Impact Statement

Currently, the USACE, the New Mexico Interstate Stream Commission (NMISC), and Reclamation are signatories of a Memorandum of Agreement to develop integrated water operations rules for several dams on the Rio Grande upstream of the project area (URGWOPS 1999).

City of Albuquerque San Juan–Chama Drinking Water Project

The City will begin construction of a diversion dam in the Rio Grande south of the Alameda Bridge to divert San Juan–Chama water for the City's drinking water supply. The City is currently constructing water intakes and a crossing of the Rio Grande at Campbell Road for that project. Several proposed habitat restoration projects are specified for the Albuquerque Reach as mitigation of adverse effects from the San Juan–Chama Project (Reclamation 2004).

NMISC Silvery Minnow Habitat Restoration Projects

Currently, the New Mexico Water Trust Board and the NMISC are conducting projects to improve silvery minnow habitat. These projects include increasing scientific knowledge of available food for aquatic species within the MRG and incorporating LWD for improved mesohabitat (Tetra Tech 2004). Phase I construction for the habitat restoration projects included modification of 37 acres within three subreaches in the Albuquerque Reach of the MRG using many of the techniques outlined in this EA. Phase II of that project will incorporate preliminary findings and information from Phase I to best plan and design treatments.

Bureau of Reclamation River Maintenance Projects

Reclamation has authority for river channel maintenance on the Rio Grande and regularly monitors changes in the channel to keep track of priority maintenance sites where there is concern about possible damage to riverside facilities. At the Bernalillo Priority Site, the planned maintenance action is to install bendway weirs, realign the main channel of the Rio Grande at the project site, and create a secondary channel to reduce erosion potential on the east bank.

Pueblo of Sandia Wildland Urban Interface (WUI) Project

The Pueblo of Sandia has restored approximately 250 acres of bosque from the Middle Rio Grande Conservancy District's Sandia Wasteway to the Pueblo's southern boundary. These activities were conducted for the purposes of wildfire fuels reduction, removal of non-native plant species, and restoration of riparian habitat for native plants and wildlife including the southwestern willow flycatcher and the Rio Grande silvery minnow.

Pueblo of Sandia–Corps of Engineers Bosque Wildfire Project

Bosque restoration of 186 acres has been completed in the immediate vicinity of the MERES project area (directly north and south of project area) for the purposes of fuels reduction, non-native species removal, and restoration of riparian habitat for native plants and wildlife including the southwestern willow flycatcher and the Rio Grande silvery minnow.

Pueblo of Sandia Middle Rio Grande ESA Collaborative Program Projects

The Pueblo of Sandia has restored approximately 106 acres of bosque through projects funded under the Middle Rio Grande Endangered Species Act Collaborative Program. One of those projects will involve the construction of a channel through the Sandia bosque in fall and winter 2007 to provide suitable peripheral habitat for the Rio Grande silvery minnow during various flow stages of the Rio Grande. Completed bosque restoration activities were conducted for the purposes of wildfire fuels reduction, removal of non-native plant species, and restoration of riparian habitat for native plants and wildlife including the southwestern willow flycatcher and the Rio Grande silvery minnow.

Friends of Rio Ranch Open Space–Rio Rancho Area Bosque Improvement Project

The purpose of this project is to restore and enhance the bosque and associated sandbars and wetlands located along the Rio Rancho Reach of the Middle Rio Grande. The project area is on Rio Rancho Open Space lands and includes about 102 acres of bosque and 96 acres of associated sandbars and wetlands located along approximately 2 miles of the Rio Grande between the towns of Bernalillo and Corrales, along the west side of the river. Initial clearing of non-native vegetation has been completed in the established bosque areas. This project will continue the non-native plant maintenance to inhibit re-growth of the non-native vegetation in the North Beach, Middle, and Willow Creek Bosque areas. It will also provide for clearing of non-native plant species from sandbars; follow-up maintenance in the cleared areas will also be performed.

4.15.1 Assessment of Cumulative Impacts

The cumulative effects of the Proposed Action plus the described related projects could produce short-term changes in several aspects of the existing hydrology, hydraulics, and fluvial geomorphology within the affected subreach. The Proposed Action could affect other specific downstream restoration projects by changing local fluvial geomorphology and hydrology. Other projects listed here could affect the Proposed Action by altering physical processes upon which the proposed techniques depend. Changes in upstream water operations could augment and improve or decrease the effectiveness of proposed project.

While all the parties to these various actions recognize the need for dramatic change in the riverine ecosystem to provide better support for the endangered silvery minnow and willow

flycatcher, the complex cumulative outcome of multiple actions would be unpredictable and potentially adverse to water quality and various indicators of the species' reproductive success. The only effective means of dealing with the complex cumulative effects would be to coordinate efforts among all parties. Sound scientific measurement of the baseline parameters most closely associated with silvery minnow and flycatcher success needs to be accomplished. Further development and approval of an adaptive management strategy so that it is in place early in the implementation phase of the Proposed Action would facilitate a rapid response to potentially adverse indicators.

4.16 SUMMARY OF EFFECTS AND SITE SUITABILITY

Different techniques considered for restoration would have short-term effects on some environmental resources but long-term beneficial effects on biological resources, including flycatcher and silvery minnow. The overall effects of the proposed restoration techniques are summarized in Table 4.1.

All proposed activities would take place within the Sandia Subreach. A site assessment completed to evaluate the project area included the collection of photographs and global positioning system data and geographic information systems analysis in the laboratory. Work at this location would create beneficial habitat for silvery minnow and flycatcher. All access would be through the existing levee roads and transmission line access roads. Proposed staging and access would be coordinated with the Pueblo of Sandia Environment Department.

4.17 ENVIRONMENTAL COMMITMENTS

All applicable permits would be obtained prior to implementation the project, including but not limited to:

- Pueblo of Sandia access permissions for contractors
- CWA, Section 404
- Pueblo of Sandia Water Quality Certificate under CWA, Section 401
- National Pollutant Discharge Elimination System Permit
- Storm Water Pollution Prevention Plans

Table 4.1. Environmental Consequences of Proposed Restoration Techniques on Environmental Resources under the Proposed Action and No Action Alternatives

Environmental Resources	Proposed Action	No Action
Geomorphology and Soils	Short-term adverse impact to geomorphology; long-term beneficial effects on the altered channel features	Development of channel features that are unfavorable for silvery minnow egg retention and for larval and adult success would continue
Hydrology and Hydraulics	Short-term minimal adverse impact to hydrology; long-term positive effect	No change in the amount or duration of flows in the Sandia Reach
Water Quality	Short-term effects within applicable water quality standards; no long-term adverse effects	No change in levels of constituents such as pH, dissolved oxygen, temperature, turbidity
Cultural Resources and Traditional Cultural Properties (TCPs)	No adverse effects on archaeological resources or TCPs	No change to cultural resources or TCPs
Vegetation and Wetlands	Limited short-term adverse effects on herbaceous vegetation; permanent removal of non-native woody vegetation; long-term beneficial effects on native vegetation	Continuation of current trends in vegetation such as increases in non-native species and woody vegetation
Fish and Wildlife	Short-term adverse impacts; long-term positive effect on fish and wildlife abundance and diversity from habitat improvements	Continued adverse trends toward decreased fish and wildlife abundance and diversity
Threatened, Endangered, and Special Status Species	Short term: likely to adversely affect Rio Grande silvery minnow; may affect/not likely to adversely affect yellow-billed cuckoo, and willow flycatcher; Long term: positive effects on silvery minnow and flycatcher	Continued adverse trend toward decreased habitat for silvery minnow and flycatcher
Socioeconomics	No adverse effects; the costs of implementing the project are within the annual range of variability for federal expenditures for Bernalillo County	No short-term change in socioeconomics anticipated
Visual and Aesthetic Resources	Short-term negative impacts; long-term positive effect	No long-term or short-term changes in the visual and aesthetic experience
Air Quality and Noise	Short-term adverse impact from increased ambient noise levels	No change in air quality or noise
Net Water Depletions	No adverse effects anticipated, further evaluation required	No change in net water depletions
Environmental Justice	No adverse effect	No change in environmental justice
Indian Trust Assets	No ITAs identified; no adverse effects	No change in ITAs

In addition to obtaining these permits, the following environmental commitments are to be undertaken:

- Avoiding construction or location of staging areas in jurisdictional wetlands.
- Avoiding impacts to birds protected by the MBTA by scheduling construction outside of the normal bird breeding and nesting season (April 15–August 15) for most avian species, or conducting pre-construction breeding bird surveys and monitoring if construction occurs during the breeding and nesting season and consultation with the USFWS if affected species are observed.
- Implementing specific mitigation measures to avoid impacts to threatened or endangered species and their habitats identified in the project area.
- Implementing measures to stop work and notify the USFWS and Pueblo of Sandia Environment Department in the event that prehistoric or historic remains, human burials, or other archaeological resources are discovered during construction or monitoring.
- Using silt curtains and fences to minimize any potential increases in turbidity in the river during and immediately after construction-related activities.

5.0 LIST OF PREPARERS

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6.0 CONSULTATION AND COORDINATION

Pueblo of Sandia

U.S. Fish and Wildlife Service

U.S. Bureau of Reclamation

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APPENDIX A
SITE PHOTOS

Figure A.1. Southeast section of point bar (east side of channel).

Figure A.2. Bosque area along river, south of point bar.

Figure A.3. Eastern side of point bar, looking south.

Figure A.4. Central section of bosque.

APPENDIX B
ACRONYMS

Acronyms

ARMS	Archaeological Records Management Section
BMPs	Best Management Practices
BO	Biological Opinion
cfs	Cubic Feet per Second
CWA	Clean Water Act
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
ha	Hectares
ITA	Indian Trust Assets
LWD	Large Woody Debris
MBTA	Migratory Bird Treaty Act
MERES	Management of Exotics for the Recovery of Endangered Species
MRG	Middle Rio Grande
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMDGF	New Mexico Department of Game and Fish
NMFRO	New Mexico Fisheries Resource Office
NMISC	New Mexico Interstate Stream Commission
NPS	Non-point Source
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
OSHA	Occupational Safety and Health Administration
PCPI	Per Capita Personal Income
Pueblo	Pueblo of Sandia
POSSR	Pueblo of Sandia Subreach
PS	Point Source
Reclamation	Bureau of Reclamation
RGNCSP	Rio Grande Nature Center State Park
RM	River Mile
SHPO	State Historic Preservation Office
SRCP	State Register of Cultural Properties
SSED	Suspended Sediments
TCP	Traditional Cultural Property
TDS	Total Dissolved Solids
UNM	University of New Mexico
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WWTP	Waste Water Treatment Plant