United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

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Memorandum

To: Acting Assistant Regional Director, Ecological Services, Region 2 U.S. Fish and Wildlife Service, Albuquerque, New Mexico

From: Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico

Subject: Intraservice Biological Opinion on the Effects of Actions Associated with the MERES Sandia Restoration Project

This document transmits the New Mexico Ecological Service's (NMESFO) intraservice biological opinion on the effects of the proposed Pueblo of Sandia Management of Exotics for the Recovery of Endangered Species Habitat Restoration Project (MERES). The project site is located on Sandia Pueblo in Sandoval County, New Mexico, north of the City of Albuquerque. The work area is located within the Rio Grande floodplain. The proposed project involves the implementation and maintenance of various habitat restoration/rehabilitation techniques to restore, enhance, and sustain aquatic and riparian habitat for the benefit of the Rio Grande silvery minnow and the southwestern willow flycatcher within the Pueblo of Sandia Subreach (POSSR) of the Middle Rio Grande (MRG). This biological opinion concerns the effects of the proposed action on the endangered Rio Grande silvery minnow (*Hybognathus amarus)* (silvery minnow), and southwestern willow flycatcher (*Empidonax traillii extimus)* (flycatcher). Designated critical habitat for the silvery minnow and flycatcher are not within the project area, therefore none will be affected. Your request for formal consultation, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 531 *et seq.*) was received September 26, 2007.

This biological opinion is based on information submitted in the September 2007 Pueblo of Sandia MERES Habitat Restoration Project Biological Assessment (Biological Assessment), and other sources of information available to the Service. A complete administrative record of this consultation is on file at the NMESFO.

The Biological Assessment has determined that the proposed project "may affect, but is not likely to adversely affect," the flycatcher. We concur with this determination for the following reasons:

The flycatcher is a migrant through this portion of the Rio Grande and may be present between April and June, and again in August and September. Suitable nesting habitat does not currently exist within the project area. No suitable riparian habitat will be disturbed by the project, and the proposal includes the planting of riparian native plants in newly created wetland areas that could eventually mature and create potentially suitable flycatcher habitat. Construction will not occur during the flycatcher breeding or migration season (April 15-September 15) to avoid noise impacts. No nesting occurs in the vicinity of the project area. The number of flycatcher territories in the Middle Rio Grande Management Unit has exceeded recovery goals (100 territories) for the past three years (Ahlers and Doster 2007). Additionally, flycatcher habitat restoration projects are occurring throughout the basin, improving conditions for the flycatcher. Given the small amount of disturbance expected from this project, the effects of this project on flycatcher are discountable.

The remainder of this biological opinion will deal with the effects of implementation of the proposed action on the silvery minnow.

Consultation History

On June 20, 2007, a Biological Assessment and intraservice Section 7 Biological Evaluation form was transmitted from the MERES Program to the NMESFO. Based on comments received, the Biological Assessment was subsequently revised and re-transmitted on September 26, 2007.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Biological Assessment provided for this project, contains a comprehensive description of the purpose and need for the proposed action and the project area, details on construction, non native vegetation removal, planting native vegetation, passive restoration, a description of environmental commitments, and effects determination for listed species and critical habitat. The material contained in the Biological Assessment is herein incorporated by reference (SWCA 2007). The following description of the proposed action is a summary of the material in the biological assessment and should not be considered as the complete description.

Purpose and Objective

The proposed project involves the implementation and maintenance of various habitat restoration/rehabilitation techniques to restore, enhance, and sustain aquatic and riparian habitat for the benefit of the Rio Grande silvery minnow and the southwestern willow flycatcher within the POSSR of the MRG. The project will incorporate multiple habitat restoration and planning components, leading to a large-scale, sustainable, and diverse habitat complex. The long-term project goal is to promote egg retention, larval rearing, young-of-year, and over-wintering habitat for silvery minnow and to create suitable riparian habitat for future use by the flycatcher.

Project Description

The project involves implementing various habitat restoration/rehabilitation techniques to restore riverine and riparian habitat for the benefit of the silvery minnow and flycatcher within the POSSR of the MRG. 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 199 (downstream), adjacent to the Corrales siphon and the Rio Rancho wastewater treatment plant. Specific rehabilitation and restoration activities will occur within the river floodway on a point bar and adjacent bankline and within the adjacent bosque. Site-specific project restoration techniques will be implemented for the benefit of the species and the riverine ecosystem as a whole. Restoration will include clearing exotic, non-native plant species and subsequently planting native species within approximately 29 acres of bosque, and performing in-channel modifications to approximately a 10-acres of point bar/island habitat within the active river channel.

Sandia Bar and Bankline

The point bar and bankline location is approximately a 10-acre area that will be modified to enhance habitat for all life stages of silvery minnow. The point bar is characterized by sparse native and non-native riparian vegetation, including coyote willow mixed with young tamarisk and Russian olive. An ephemeral channel that is currently active during flows of approximately 1,000 cubic feet/second (cfs) in the main-stem exists along the eastern edge of the point bar and separates this area from the neighboring bosque (Figure 1). The bankline vegetation along the perimeter of the point bar is dominated by opportunistic herbaceous vegetation, including western goldenrod (*Euthamia occidentalis*), barnyard grass (*Echinochloa crus-galli*), softstem bulrush (*Schoenoplectus validus*), and common threesquare (*Schoenoplectus pungens*).

Constructed silvery minnow habitat features will include adding five ephemeral side channels through the middle of the point bar, modifying the existing ephemeral channel along the eastern perimeter of the bar to ensure inundation at lower flows, and excavating two scours along the bar's northwestern edge (Figure 1). These created/modified aquatic features are intended to provide low-flow, mid-flow, and high-flow habitat capable of supporting multiple life stages for the silvery minnow. The newly created channels will be designed for inundation at a variety of flows (i.e., 750 cfs; 1,000 cfs; and 1500 cfs) and will have bankline scours excavated at their upstream end. Large woody debris (LWD) will be placed in these scours and will act to slow the velocity of water entering the channels, providing low-velocity habitat for silvery minnow. The existing channel will be designed for inundation at flows of 500 cfs or greater and will be armored with LWD at various locations along the channel. Overburden from excavating features will be used to create berms that will act to stabilize the channels during high flows to ensure that the features remain functional after high flows. Berm locations are shown in the conceptual habitat restoration design map provided in the Biological Assessment (Figure 1). The berm dimensions are not immediately known but will be based on the volume of fill available.

All fill material not used in construction of the berms will be transferred directly to BOR for construction activities associated with the Corrales Siphon Project (see Cons. # 22420-2007-F-0056). No fill materials will be stockpiled onsite.

Sandia Bosque

The bosque habitat restoration area encompasses approximately 29 acres of riparian forest. The bosque area is characterized by thick, mixed native and non-native shrubs and trees. The midstory vegetation was dominated by Russian olive, scattered tamarisk, and fourwing saltbush. Canopy vegetation, where present, was dominated by scattered Rio Grande cottonwood with occasional Siberian elm. Understory herbaceous vegetation is sparse in areas that have thick woody growth; however, in more open areas, alkali sacaton (*Sporobolus airoides*) and big sacaton (*Sporobolus wrightii*) dominate.

Non-native vegetation within the 29-acre bosque restoration area will be removed using extraction/mastication. This technique is used to pull the root crown of non-native vegetation from the ground with an excavator and then masticate the vegetative debris on-site. This technique ensures minimal disturbance to existing native vegetation and soil compared to root-raking or mastication of standing trees. All native vegetation will be left undisturbed during the extraction process, allowing native stock to naturally revegetate the project site with desirable woody vegetative types. In addition, a native herbaceous seed mix will be hand-broadcast within the treated bosque area following non-native vegetation removal. Establishing herbaceous vegetation will help prevent re-colonization of the project Area with non-native vegetation, decrease runoff, and increase habitat quality for wildlife in the area.

Bank lowering and bankline embayment features will also be incorporated along the length of the bosque restoration area (Figure 1). These aquatic features will be excavated and sloped from the water surface elevation to the top of the existing bank, resulting in the availability of aquatic habitat at a variety of flows and aiding in silvery minnow egg retention. Bank lowering will also increase the frequency of inundation during periods of above base flow discharge. The overbank areas will not remain flooded for significant periods and will not be intended to provide mesohabitat for adult silvery minnow, but will instead provide the necessary conditions for other processes that will result in residual habitat improvements and nursery habitats.

Modifications to the project sites will take place during the fall and winter of 2007/2008 outside of migratory bird nesting season and during a period of low flow that will allow for access to all project areas without crossing the wetted channel. A total of 39 acres (15.3 ha) will be treated during proposed project implementation, including creating 3,600 linear feet of low-flow and ephemeral channels, creating 4 acres of low-velocity scallop habitat and bank lowering, and removing non-native species from within 29-acres of bosque.

Restoration techniques will include passive restoration, ephemeral channel construction, bank scouring, removal and control of exotics, placement of LWD, and active restoration of riparian vegetation. Bank lowering and scouring techniques are intended to provide for over-bank flooding and to allow the river to create ephemeral nursery habitat for retention of silvery minnow eggs and larvae, with the added benefit of promoting new riparian vegetation.

Habitat Restoration Techniques

Technique 1: 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 will work to maintain and further manipulate areas of bank lowering and scallops/scours in addition to further shaping constructed channels.

Technique 2: Ephemeral Channels Construction

The restoration and/or creation of 2 acres for six ephemeral channels will take place on the Sandia bar. The locations proposed for treatments are channels that currently inundate, or flow, during high, sustained discharge events. These channels no longer function or function only during high periods of discharge, and are not inundated annually during spring runoff. 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 will be beneficial to silvery minnow and flycatcher. Ephemeral channels are not intended to provide for overbank flooding.

Constructing an ephemeral channel requires removing existing vegetation and disturbing some sediment or soil. The channels will be cut through bars and islands to a depth that will allow water to flow at a variety of river flows ranging from 500–1,000 cfs and above. When designing ephemeral channels, the river flow at which water enters the channel, water retention times, and velocity relationships will be considered. The ephemeral channels will be able to accommodate flows to encourage silvery minnow recruitment each year using integrative passive techniques. Total channel length constructed for the MERES project will be approximately 3600 linear ft, with an average width of approximately 25 feet.

Channels designed for inundation during high-flow events will dry during lower flows and will not provide habitat for adult silvery minnow. Alternately, side channels designed for inundation during low-flows may provide adult silvery minnow habitat.

Ephemeral channel construction may impact 0.10 acres of silvery minnow habitat, adjacent to the Sandia bar. This impact may occur where the constructed channels intersect with the Rio Grande.

Technique 3: Large Woody Debris (LWD)

The 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 high densities or dispersed throughout the project area. LWD will also act to armor the inlets and outlets of newly constructed channels, increasing the life of these features. All LWD used for the project will be placed in the constructed channel prior to inundation and will not be anchored to the river bed.

Although LWD has been identified as suitable habitat for silvery minnow (USFWS 2003), no studies have been completed on the MRG to document the effects of LWD on silvery minnow habitat. Before 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. Modifying the river channel with jetty jacks, levees, and dams for flood control and water delivery is largely responsible for stabilizing the river and floodplain and for helping to create the monotypic cottonwood gallery found throughout much of the MRG Valley. The resulting effect of river management includes channel incision, which has essentially eliminated overbank flow in the Albuquerque Reach, reducing the amount of LWD in the river channel.

Technique 4: Bank Scouring

Bank-line scours and bank lowering (or scallops) will be constructed along approximately 1.67 acres of riverbank at five sites. 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 predominantly creates habitat during high-flow events, but it can also be used to create habitat during lower flows. Bank scouring will be used to create areas where the thalweg meets the bank, effectively widening the active channel to create lateral migration of the river and to restore natural meandering of the system (William Lettis & Associates 2003; Tetra Tech 2004).

Bank-line scours will allow the river to erode banks on one bank 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 will only be applied in areas where such action will not increase flood risk. Scours are different than ephemeral channels in that they exchange water with the main channel within a small area instead of along a linear bank line.

Bank-line scours and bank lowering construction may impact 0.4 acres of silvery minnow habitat adjacent to the Sandia bar. This impact may occur on the outside edges of treatments where they intersect with the Rio Grande.

Technique 5: Removal and Control of Exotics

Removal of exotics will occur on 23.3 acres within the 29 acre project area. The removal of exotics will be directly adjacent to the Rio Grande. Mechanical treatment involves using 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 created as a byproduct of mastication will be left on site to aid in moisture retention and erosion control and will be maintained at a depth no greater than 4 inches.

Removal of exotics may impact 0.12 acres of silvery minnow habitat adjacent to the project area. This impact may occur either upstream of the Sandia bar where the removal of exotics will occur adjacent to the Rio Grande.

Technique 6: Active Restoration of Riparian Vegetation.

Direct seeding will be used for replanting herbaceous vegetation. Seed will be broadcast mechanically or by hand to achieve the desired coverage. Alternatively, seed drills may be used to sow the seed beneath the surface. Placing the seed beneath the surface allows for protection from the elements and animals that may feed on the seed.

General commitments for all locations and treatment areas include:

- All applicable permits, certifications, and authorizations will be in place before construction, including Clean Water Act (CWA) certifications, and NEPA compliance.
- Storm Water Pollution Prevention Plans will be completed, including appropriate silt-fencing and other erosion protection.
- Wetlands and dense native vegetation will be avoided during construction.

Equipment, Staging, and Access

Equipment, including bulldozers, excavators, and backhoes, used for the proposed construction at the MERES project sites will be able to access the proposed restoration sites from the shore. Equipment used for project construction will include Volvo EC330B crawler excavator, Caterpillar 953D Track loader, or similar equipment. Access to the Sandia Point Bar site will be during low flows in the Rio Grande through the eastern-most ephemeral channel which will allow for access without crossing the wetted channel. The point bar will be accessed during dry periods to ensure no disturbance to silvery minnow while accessing the bar. Conventional earth-moving construction equipment will cross the channel at the point of its lowest bank slopes. The construction contractor will be held to the following specifications:

- Before leaving contractor facilities, all equipment will be thoroughly inspected, and any leaky or damaged hydraulic hoses will be replaced.
- To avoid any potential impacts to silvery minnow or flycatcher habitat, all fuels, hydraulic fluids, and other hazardous materials will be stored outside the normal floodplain, and refueling will take place on dry ground with a spill kit ready. Extra precautions will be taken when refueling because of the environmentally sensitive location.
- An environmental specialist trained in spill prevention and spill clean up will be on site during all construction activities.
- All equipment will be steam-cleaned before arriving and departing the job site.
- A spill kit will be maintained on every rig near the river, with spill pans, containment diapers, oil booms, absorbent pads, oil mats, plastic bags, gloves, and goggles.
- Steel-mesh guards will cover all external hydraulic lines.

- Each individual operator will be briefed on and will sign off on local environmental considerations specific to the project tasks, including specific Storm Water Pollution Prevention Plans.
- Water quality testing will be conducted before entering the water and periodically during the operating day to ensure that Pueblo of Sandia water quality standards are being maintained.
- Water-quality parameters to be tested will include pH, temperature, dissolved oxygen (DO), and turbidity, both upstream and downstream of the work area.
- Changes in water-quality measures greater than the applicable standards will be addressed, including reporting the measurements to the New Mexico Environment Department/Surface Water Quality Bureau and returning equipment to the shore.
- The equipment will be operated in such a way that little or no displacement of submerged sediment will occur.

Staging areas and access points for the project sites will be from existing roads and access points on Sandia Tribal land. All construction will occur outside of the flycatcher-breeding season.

Mixing sediments with surface pools and runoff at the project sites could produce undesirable water-quality effects. Water quality parameters will be measured before working in any wetted portion of the river or the ephemeral side channel. If water were present in the ephemeral channel, temporary silt fencing will be placed downstream of the crossing location before crossing to minimize sediment disturbance. Silt fencing will be removed after suspended sediments have been allowed to settle out and water quality parameters, including DO, have returned to within 10 percent of the ambient condition.

Action Area

The action area is defined as the area from the Angostura Diversion Dam to the Isleta Diversion Dam and the entire width of the 100 year Rio Grande floodplain within that reach.

STATUS OF THE SPECIES

RIO GRANDE SILVERY MINNOW

Description

The silvery minnow currently occupies a 170-mile reach of the Middle Rio Grande, New Mexico, from Cochiti Dam, Sandoval County, to the headwaters of Elephant Butte Reservoir, Socorro County (U.S. Fish and Wildlife Service 1994). The silvery minnow is a stout minnow, with moderately small eyes, a small, sub-terminal mouth, and a pointed snout that projects beyond the upper lip (Sublette *et al.* 1990). The back and upper sides of the silvery minnow are silvery to olive, the broad mid-dorsal stripe is greenish, and the lower sides and abdomen are silver. Maximum length attained is about 3.5 inches (in). The only readily apparent sexual dimorphism is the expanded body cavity of ripe females during spawning (Bestgen and Propst 1994).

In the past, the silvery minnow was included with other species of the genus *Hybognathus* due to morphological similarities. Phenetic and phylogenetic analyses corroborate the hypothesis that it is a valid taxon, distinctive from other species of *Hybognathus* (Cook *et al.* 1992, Bestgen and Propst 1994). It is now recognized as one of seven species in the genus *Hybognathus* in the United States and was formerly one of the most widespread and abundant minnow species in the Rio Grande basin of New Mexico, Texas, and Mexico (Pflieger 1980, Bestgen and Platania 1991). Currently, *Hybognathus amarus* is the only remaining endemic pelagic spawning minnow in the Middle Rio Grande. The speckled chub (*Extrarius aestivalus*), Rio Grande shiner (*Notropis jemezanus*), phantom shiner (*Notropis orca*), and bluntnose shiner (*Notropis simus simus*) are either extinct or have been extirpated from the Middle Rio Grande (Bestgen and Platania 1991).

Legal Status

The silvery minnow was federally listed as endangered under the ESA on July 20, 1994 (U.S. Fish and Wildlife Service 1994). The species is also listed as an endangered species by the state of New Mexico. Primary reasons for listing the silvery minnow are described below in the Reasons for Listing section.

Designated critical habitat for the silvery minnow was designated on February 19, 2003 (68 FR 8088). The critical habitat designation extends approximately 157 miles from Cochiti Dam, Sandoval County, New Mexico downstream to the utility line crossing the Rio Grande, a permanent identified landmark in Socorro County, New Mexico. The critical habitat designation defines the lateral extent (width) as those areas bounded by existing levees or, in areas without levees, 300 feet (ft) or riparian zone adjacent to each side of the bank full stage of the Middle Rio Grande. Some developed lands within the 300 ft lateral extent are not considered critical habitat because they do not contain the primary constituent elements of designated critical habitat and are not essential to the conservation of the silvery minnow. Lands located within the lateral boundaries of the critical habitat designation, but not considered critical habitat include: developed flood control facilities, existing paved roads, bridges, parking lots, dikes, levees, diversion structures, railroad tracks, railroad trestles, water diversion and irrigation canals outside of natural stream channels, the Low Flow Conveyance Channel, active gravel pits, cultivated agricultural land, and residential, commercial, and industrial developments. The Pueblo lands of Santo Domingo, Sandia, Sandia, and Isleta within this area are not included in the critical habitat designation. Except for these Pueblo lands, the remaining portion of the silvery minnow's occupied range in the Middle Rio Grande in New Mexico is designated as critical habitat (68 FR 8088).

Habitat

The silvery minnow travels in schools and tolerates a wide range of habitats (Sublette *et al.* 1990); yet, generally prefers low velocity (<0.33 ft per second) areas over silt or sand substrate that are associated with shallow [< 15.8 inch (in)] braided runs, backwaters or pools (Dudley and Platania 1997). Habitat for the silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are low or reduced from main-channel velocities. Stream reaches dominated by straight, narrow, incised channels with rapid flows are not typically occupied by silvery minnow (Sublette *et al.* 1990, Bestgen and Platania 1991).

Adult silvery minnow are most commonly found in backwaters, pools, and habitats associated with debris piles; whereas, young of year (YOY) occupy shallow, low velocity backwaters with silt substrates (Dudley and Platania 1997). A study conducted between 1994 and 1996 characterized habitat availability and use at two sites in the Middle Rio Grande at Rio Rancho and Socorro. From this study Dudley and Platania (1997) reported that the silvery minnow was most commonly found in habitats with depths less than 19.7 in. Over 85 percent were collected from low-velocity habitats (<0.33 ft/sec) (Dudley and Platania 1997, Watts *et al.* 2002).

<u>Designated Critical Habitat</u>

The Service has determined the primary constituent elements (PCEs) of silvery minnow critical habitat based on studies on silvery minnow habitat and population biology (68 FR 8088). They include:

1. A hydrologic regime that provides sufficient flowing water with low to moderate currents capable of forming and maintaining a diversity of aquatic habitats, such as, but not limited to the following: backwaters (a body of water connected to the main channel, but with no appreciable flow), shallow side channels, pools (that portion of the river that is deep with relatively little velocity compared to the rest of the channel), and runs (flowing water in the river channel without obstructions) of varying depth and velocity – all of which are necessary for each of the particular silvery minnow life-history stages in appropriate seasons (e.g., the silvery minnow requires habitat with sufficient flows from early spring (March) to early summer (June) to trigger spawning, flows in the summer (June) and fall (October) that do not increase prolonged periods of low- or no flow, and relatively constant winter flow (November through February));

2. The presence of eddies created by debris piles, pools, or backwaters, or other refuge habitat within unimpounded stretches of flowing water of sufficient length (i.e., river miles) that provide a variation of habitats with a wide range of depth and velocities;

3. Substrates of predominantly sand or silt; and

4. Water of sufficient quality to maintain natural, daily, and seasonally variable water temperatures in the approximate range of greater than 1°C (35°F) and less than 30°C (85°F) and reduce degraded conditions (e.g., decreased dissolved oxygen, increased pH).

These PCEs provide for the physiological, behavioral, and ecological requirements essential to the conservation of the silvery minnow.

Life History

The species is a pelagic spawner that produces 3,000 to 6,000 semi-buoyant, non-adhesive eggs during a spawning event (Platania 1995, Platania and Altenbach 1998). The majority of adults spawn in about a one-month period in late spring to early summer (May to June) in association with spring runoff. Platania and Dudley (2000, 2001) found that the highest collections of silvery minnow eggs occurred in mid- to late May. In 1997, Smith (1999) collected the highest number of eggs in mid-May, with lower frequency of eggs being collected in late May and June. These data suggest multiple silvery minnow spawning events during the spring and summer, perhaps concurrent with flow spikes. Artificial spikes have apparently induced silvery minnow to spawn (Platania and Hoagstrom 1996). It is unknown if individual silvery minnow spawn more than once a year or if some spawn earlier and some later in the year.

Platania (2000) found that development and hatching of eggs are correlated with water temperature. Eggs of the silvery minnow raised in 30°C water hatched in approximately 24 hours while eggs reared in 20-24°C water hatched within 50 hours. Eggs were 0.06 in in size upon fertilization, but quickly swelled to 0.12 in. Recently hatched larval fish are about 0.15 in in standard length and grow about 0.005 per day during the larval stages. Eggs and larvae have been estimated to remain in the drift for 3-5 days, and could be transported from 134 to 223 mi downstream depending on river flows (Platania 2000). Approximately three days after hatching the larvae move to low velocity habitats where food (mainly phytoplankton and zooplankton) is abundant and predators are scarce. YOY attain lengths of 1.5 to 1.6 in by late autumn (U.S. Fish and Wildlife Service 1999). Age-1 fish are 1.8 to 1.9 in by the start of the spawning season. Most growth occurs between June (post spawning) and October, but there is some growth in the winter months. In the wild, maximum longevity is about 25 months, but very few survive more than 13 months (U.S. Fish and Wildlife Service 1999). Captive fish have lived up to four years (C. Altenbach, City of Albuquerque, *pers. comm.* 2003).

Platania (1995) suggested that historically the downstream transport of eggs and larvae of the silvery minnow over long distances was likely beneficial to the survival of their populations. This behavior may have promoted recolonization of reaches impacted during periods of natural drought (Platania 1995). The spawning strategy of releasing floating eggs allows the silvery minnow to replenish populations downstream, but the current presence of diversion dams (Angostura, Isleta, and San Acacia Diversion Dams) prevents recolonization of upstream habitats (Platania 1995). As populations are depleted upstream and diversion structures prevent upstream movements, isolated extirpations of the species through fragmentation may occur (U.S. Fish and Wildlife Service 1999). Adults, eggs and larvae are also transported downstream to Elephant Butte Reservoir. It is believed that none of these fish survive because of poor habitat and predation from reservoir fishes (U.S. Fish and Wildlife Service 1999).

The silvery minnow is herbivorous (feeding primarily on algae); this is indicated indirectly by the elongated and coiled gastrointestinal tract (Sublette *et al.* 1990). Additionally, detritus, including sand and silt, is filtered from the bottom (Sublette *et al.* 1990, U.S. Fish and Wildlife Service 1999).

Population Dynamics
Generally, a population of silvery minnow consists of only two age classes: YOY and Age-1 (U.S. Fish and Wildlife Service 1999). The majority of spawning silvery minnow is one year old. Two year old fish comprise less than 10 percent of the spawning population. High silvery minnow mortality occurs during or subsequent to spawning, consequently very few adults are found in late summer. By December, the majority (greater than 98 percent) of individuals are YOY (Age 0). This population ratio does not change appreciably between January and June, as Age 1 fish usually constitute over 95 percent of the population just prior to spawning.
Platania (1995) found that a single female in captivity could broadcast 3,000 eggs in eight hours. Females produce 3 to 18 clutches of eggs in a 12-hour period. The mean number of eggs in a clutch is approximately 270 (Platania and Altenbach 1998). In captivity, silvery minnow have been induced to spawn as many as four times in a year (C. Altenbach, City of Albuquerque, *pers. comm.* 2000). It is not known if they spawn multiple times in the wild. The high reproductive potential of this fish appears to be one of the primary reasons that it has not been extirpated from the Middle Rio Grande. However, the short life span of the silvery minnow increases the population instability. When two below-average flow years occur consecutively, a short-lived species such as the silvery minnow can be impacted, if not completely eliminated from dry reaches of the river (U.S. Fish and Wildlife Service 1999).

Distribution and Abundance
Historically, the silvery minnow occurred in 2,465 mi of rivers in New Mexico and Texas. They were known to have occurred from Española upstream from Cochiti Lake; in the downstream portions of the Chama and Jemez Rivers; throughout the Middle and Lower Rio Grande to the Gulf of Mexico; and in the Pecos River from Sumner Reservoir downstream to the confluence with the Rio Grande (Sublette *et al.* 1990, Bestgen and Platania 1991). The current distribution of the silvery minnow is limited to the Rio Grande between Cochiti Dam and Elephant Butte Reservoir, which amounts to approximately 5 percent of its historic range.

The construction of mainstem dams, such as Cochiti Dam and irrigation diversion dams have contributed to the decline of the silvery minnow. The construction of Cochiti Dam in particular has affected the silvery minnow by reducing the magnitude and frequency of flooding events that help to create and maintain habitat for the species. In addition, the construction of Cochiti Dam has resulted in degradation of silvery minnow habitat within the Cochiti Reach. Flow in the river at Cochiti Dam is now generally clear, cool, and free of sediment. There is relatively little channel braiding, and areas with reduced velocity and sand or silt substrates are uncommon. Substrate immediately downstream of the dam is often armored cobble (rounded rock fragments generally 3 to 12 in in diameter). Further downstream the riverbed is gravel with some sand material. Ephemeral tributaries including Galisteo Creek and Tonque Arroyo introduce sediment to the lower sections of this reach, and some of this is transported downstream with higher flows (U.S. Fish and Wildlife Service 1999, 2001). The Rio Grande downstream of Rio Rancho becomes a predominately sand bed river with low, sandy banks in the downstream portion of the reach. The construction of Cochiti Dam also created a barrier between silvery minnow populations (U.S. Fish and Wildlife Service 1999). As recently as 1978, the silvery minnow was collected upstream of Cochiti Lake; however surveys since 1983 suggest that the fish is now extirpated from this area (U.S. Fish and Wildlife Service 1999).

Silvery minnow catch rates declined two to three orders of magnitude between 1993 and 2004. Additionally, relative abundance of silvery minnow declined from approximately 50 percent of the total fish community in 1995 to about 5 percent in 2004. However, in 2004, the October density of silvery minnow was significantly higher ($p<0.05$) than in 2003 and autumnal catch rates increased by over an order of magnitude between those years. Silvery minnow catch rates in 2004 were comparable to those in 2001. Catch rates in 2005 were even higher. October catch rates in 2005 (3,899) increased nearly 50 times over catch rates for 2004 (78) (Dudley *et al.* 2005).

Augmentation, throughout this period, likely sustained the silvery minnow population. Approximately, 1,000,000 silvery minnow have been released (primarily in the Angostura Reach) since 2000 (see Environmental Baseline). Captively propagated and released fish supplemented the native adult population and most likely also took advantage of the good spawning conditions of 2004 and 2005.

Increased discharge in the Rio Grande during 2004 and 2005 contrasted with the extended low-flow conditions observed throughout the Middle Rio Grande during 2003 and 2002. Spring runoff in 2005 was significantly above average, leading to a peak of over 6,000 cfs at Albuquerque and sustained high flows (> 3,000 cfs) for more than two months. The timing of the 2004 and 2005 runoff flow was typical of a flow increase that will normally occur at the onset of the spring runoff period. Elevated and extended flows during these years likely resulted in more favorable conditions for the growth and survivorship of newly hatched silvery minnow larvae. It is possible that even low numbers of eggs and larvae could have resulted in greatly increased recruitment success because of the inundation of shoreline habitats, abandoned side channels, and backwaters. Low velocity and shallow areas provide the warm and productive habitats required by larval fishes to successfully complete their early life history.
These flows improved conditions for both spawning and recruitment. October 2005 monitoring indicated a significant increase in silvery minnow in the Middle Rio Grande, increasing to 3,899 total silvery minnow captured from 2 and 78 in 2003 and 2004, respectively.

In 2006, however, spring runoff was extremely low and although there were several peaks in the natural hydrograph in June, July, August, and September, only a small number of silvery minnow eggs were documented in June and July. October samples yielded only 166 silvery minnow. None of the silvery minnow collected were YOY, indicating poor recruitment, likely due to channel drying in June and July, after the late and minimal spawn (Dudley et al. 2006a). Sampling in October 2006 yielded a total of 166 silvery minnow, a more than 23 fold decrease from 2005 (Dudley, et al. 2006).

<u>Middle Rio Grande Distribution</u>

Since the early 1990s, the density of silvery minnow generally increased from upstream (Angostura Reach) to downstream (San Acacia Reach). During surveys in 1999, over 98 percent of the silvery minnow captured were downstream of San Acacia Diversion Dam (Dudley and Platania 2002). This distributional pattern has been observed since 1994 (Dudley and Platania 2002) and is attributed to downstream drift of eggs and larvae and the inability of adults to repopulate upstream reaches because of diversion dams.

However, in 2004 and 2005, Dudley *et al.* (2005 and 2006a) found that this pattern reversed. Catch rates were highest in the Angostura Reach and approximately equal in the Isleta and San Acacia reaches. The Angostura Reach yielded the most silvery minnow (n=2,226) in 2004, followed by the Isleta Reach (n=442), and San Acacia Reach (n=371). Routine augmentation of silvery minnow in the Angostura Reach (nearly 900,000 since 2000), and the transplanting of silvery minnow rescued from drying reaches (approximately 770,000 since 2003) explains this change in pattern. Additionally, good spawning conditions (i.e., high and sustained spring runoff) throughout the Middle Rio Grande during April and May followed by wide-scale drying in the Isleta and San Acacia reaches from June-September exacerbated the skew. High spring runoff and perennial flow in the Angostura Reach appeared to result in relatively high survival and recruitment of larval and juvenile silvery minnow compared to previous drought years (2002-2003). In contrast, large portions of the Rio Grande south of Isleta Diversion Dam were dewatered in 2004 and young silvery minnow in these areas were either subjected to poor recruitment conditions (i.e., lack of nursery habitats during low-flows) or they were trapped in drying pools where they perished.

Reasons for Listing/Threats to Survival
The silvery minnow was federally listed as endangered for the following reasons:

1. Regulation of stream waters, which has led to severe flow reductions, often to the point of dewatering extended lengths of stream channel;

2. Alteration of the natural hydrograph, which impacts the species by disrupting the environmental cues the fish receives for a variety of life functions, including spawning;

3. Both the stream flow reductions and other alterations of the natural hydrograph throughout the year can severely impact habitat availability and quality, including the temporal availability of habitats;

4. Actions such as channelization, bank stabilization, levee construction, and dredging result in both direct and indirect impacts to the silvery minnow and its habitat by severely disrupting natural fluvial processes throughout the floodplain;

5. Construction of diversion dams fragment the habitat and prevent upstream migration;

6. Introduction of nonnative fishes that directly compete with, and can totally replace the silvery minnow, as was the case in the Pecos River, where the species was totally

replaced in a time frame of 10 years by its congener the plains minnow (*Hybognathus placitus*); and

7. Discharge of contaminants into the stream system from industrial, municipal, and agricultural sources (U.S. Fish and Wildlife Service 1993b, 1994).

These reasons for listing continue to threaten the species throughout its currently occupied range in the Middle Rio Grande.

Recovery Efforts

The final recovery plan for the silvery minnow was released in July 1999 (U.S. Fish and Wildlife Service 1999). The Recovery Plan has been updated and revised and a draft revised Recovery Plan (U.S. Fish and Wildlife Service 2007) was released for public comment on January 18, 2007 (72 FR 2301).

The draft revised Recovery Plan describes recovery goals for the silvery minnow and actions to complete these (U.S. Fish and Wildlife Service 2007). The three goals identified for the recovery and delisting of the silvery minnow are:

1. Prevent the extinction of the silvery minnow in the middle Rio Grande of New Mexico.

2. Recover the silvery minnow to an extent sufficient to change its status on the List of Endangered and Threatened Wildlife from endangered to threatened (downlisting).

3. Recover the silvery minnow to an extent sufficient to remove it from the List of Endangered and Threatened Wildlife (delisting).

Downlisting (Goal 2) for the silvery minnow may be considered when three populations (including at least two that are self-sustaining) of the species have been established within the historic range of the species and have been maintained for at least 5 years.

Delisting (Goal 3) of the species may be considered when three self-sustaining populations have been established within the historic range of the species and they have been maintained for at least ten years (U.S. Fish and Wildlife Service 2007).

Under section 7(a)(2) of the ESA, when considering the effects of the action on federally listed species, we are required to take into consideration the environmental baseline. Regulations implementing the ESA (50 FR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation; and the impacts of State and private actions that are contemporaneous with the consultation in progress. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Drought, as an overriding condition of the last decade in the southwest, is an important factor in the environmental baseline. However, stream conditions in 2004 and 2005 improved over previous years. The United States Geological Survey (USGS) in Albuquerque, New Mexico reported that stream flow conditions in 2005 were well above average to significantly above average statewide leading to a peak of over 6,000 cfs at Albuquerque and sustained high flows (> 3,000 cfs) for more than 2 months. These flows improved conditions for both spawning and recruitment.

The 2006 spring runoff was well below average because of lower than normal snowpack. In May 2006, year to date precipitation was well below average with the snow pack at 20 percent of average in the Rio Grande Basin. Fortunately, a strong monsoon season led to the wettest period of record in July and August. Consequently, only 26.5 miles of river dried in the summer of 2006, the lowest amount since 2001. Despite this monsoonal precipitation, reservoir levels continued to be below average across the state. It is predicted that at least another year or two of well above average precipitation will be necessary to develop pre-drought reservoir conditions. The 2007 runoff was above average. Additionally, a one time deviation in Cochiti operations (Corps 2007) allowed managed releases of native flow during the spawn. Flows below Cochiti exceeded 3,000 cfs for 10 days in May.

Since 1996, Reclamation has relied heavily on leases of San Juan-Chama (SJC) water to provide supplemental water by the Middle Rio Grande Endangered Species Act Collaborative Program to implement the 2003 Middle Rio Grande Water Operations Biological Opinion. Supplemental water has been used to create spawning pulses and recruitment flows for the silvery minnow and to meet minimum flow requirements for silvery minnow and flycatchers. From 1996-2003, Reclamation leased an average of 46,318 acre-feet/year (afy) of SJC water from willing leasers.

Status of the Species within the Action Area

The population of silvery minnow in the Action Area and throughout the Middle Rio Grande has been highly variable over time (see Status of the Species). The 2007 October sample reported silvery minnow in the action area at an estimated density of 30.26 per 100 meters squared (m^2) (Dudley et al. 2007). Major threats to silvery minnow within the Action Area include changes in hydrology, channel morphology and reduced water quality. Channel drying does not typically occur in the Angostura Reach.

Other factors that influence the environmental baseline are water quality, the release of captively propagated silvery minnow; silvery minnow rescue efforts, on-going research efforts, and past projects in the Middle Rio Grande. Also of importance is the current drought, and how it may affect flow in the Rio Grande.

Changes in Hydrology

There have been two primary changes in hydrology as a result of the construction of dams on the Rio Chama and Rio Grande that affect the silvery minnow: Loss of water and changes to the magnitude and duration of peak flows.

Loss of Water

Prior to measurable human influence on the system, up to the fourteenth century, the Rio Grande was a perennially flowing, aggrading river with a shifting sand substrate (Biella and Chapman 1977). There is now strong evidence that the Middle Rio Grande first began drying up periodically after the development of Colorado's San Luis Valley in the mid to late 1800s (Scurlock 1998). After humans began exerting more influence on the river, there are two documented occasions when the river became intermittent; during prolonged, severe droughts in 1752 and 1861 (Scurlock 1998). The silvery minnow historically survived low-flow periods because such events were infrequent and of lesser magnitude than they are today. There were also no diversion dams to block repopulation of extirpated areas, the fish had a much greater geographical distribution, and there were oxbow lakes, cienegas, and sloughs associated with the Rio Grande that supported fish until the river became connected again.

Water management and use has resulted in a large reduction of suitable habitat for the silvery minnow. Agriculture accounts for 90 percent of surface water consumption in the Middle Rio Grande (Bullard and Wells 1992). The average annual diversion of water in the Middle Rio Grande by the Middle Rio Grande Conservation District (MRGCD) was 535,280 af for the period from 1975 to 1989 (U.S. Bureau of Reclamation 1993). In 1990, total water withdrawal (groundwater and surface water) from the Rio Grande Basin in New Mexico was 1,830,628 af, significantly exceeding a sustainable rate (Schmandt 1993). Water withdrawals have not only reduced overall flow quantities, but also caused the river to become locally intermittent and/or dry for extended reaches. Irrigation diversions and drains significantly reduce water volumes in the river. However, the total water use (surface and groundwater) in the Middle Rio Grande by the MRGCD may range from 28 – 37 percent (S.S. Papadopulos & Associates, Inc. 2000; U.S. Geological Survey 2002). A portion of the water diverted by the MRGCD returns to the river and may be re-diverted (in some cases more than once) (Bullard and Wells 1992; MRGCD, *in litt.* 2003).

Changes to Size and Duration of Peak Flows

Water management has also resulted in a loss of peak flows that historically initiated spawning. The reproductive cycle of the silvery minnow is tied to the natural river hydrograph. A reduction in peak flows and/or altered timing of flows may inhibit reproduction. Since completion of Elephant Butte Dam in 1916, four additional dams have been constructed on the Middle Rio Grande, and two have been constructed on one of its major tributaries, the Rio Chama (Scurlock 1998). Construction and operation of these dams, which are either irrigation diversion dams (Angostura, Isleta, San Acacia) or flood control and water storage dams (Elephant Butte, Cochiti, Abiquiu, El Vado), have modified the natural flow of the river. Mainstem dams store spring runoff and summer inflow, which will normally cause flooding, and release this water back into the river channel over a prolonged period of time. These releases depart significantly from natural conditions, and can substantially alter the habitat. In spring and summer, artificially low-flows limit the amount of habitat available to the species and may also limit dispersal of the species (U.S. Fish and Wildlife Service 1999).

Mainstem dams and the altered flows they create can affect habitat by preventing overbank flooding, trapping nutrients, altering sediment transport regimes, prolonging summer base flows, modifying or eliminating native riparian vegetation, and creating reservoirs that favor non-native fish species. These changes may affect the silvery minnow by reducing its food supply; altering its preferred habitat, preventing dispersal, and providing a continual supply of non-native fish that may compete with or prey upon them. Altered flow regimes may also result in improved conditions for other native fish species that occupy the same habitat, causing those populations to expand at the expense of the silvery minnow (U.S. Fish and Wildlife Service 1999).

In addition to providing a cue for spawning, flood flows also maintain a channel morphology to which the silvery minnow is adapted. The changes in channel morphology that have occurred from the loss of flood flows are discussed below.

<u>Changes in Channel Morphology</u>

Historically, the Rio Grande was sinuous, braided, and freely migrated across the floodplain. Changes in natural flow regimes, narrowing and deepening of the channel, and restraints to lateral channel migration (i.e., jetty jacks) adversely affected the silvery minnow. These effects result directly from constraints placed on channel capacity by structures built in the floodplain. These anthropogenic changes have and continue to degrade and eliminate spawning, nursery, feeding, resting, and refugia areas required for species' survival and recovery (U.S. Fish and Wildlife Service 1993a).

The active river channel within occupied habitat is being narrowed by the encroachment of vegetation, resulting from continued low-flows and the lack of overbank flooding. The lack of flood flows has allowed non-native riparian vegetation such as salt cedar and Russian olive to encroach on the river channel (U. S. Bureau of Reclamation 2001). These non-native plants are very resistant to erosion, resulting in narrowing of the channel. When water is confined to a narrower cross-section, its velocity increases and the ability to carry sediments is enhanced. Fine sediments such as silt and sand are carried away leaving coarser bed materials such as gravel and cobble. Habitat studies during the winter of 1995 and 1996 (Dudley and Platania 1996), demonstrated that a wide, braided river channel with low velocities resulted in higher catch rates of silvery minnow, and narrower channels resulted in fewer fish captured. The availability of wide, shallow habitats that are important to the silvery minnow is decreasing. Narrow channels have few backwater habitats with low velocities that are important for silvery minnow fry and YOY.

Within the current range of the silvery minnow, human development and use of the floodplain have greatly restricted the width available to the active river channel. A comparison of river area between 1935 and 1989 shows a 52 percent reduction, from 26,598 acres (10,764 ha) to 13,901 acres (5,626 ha) (Crawford *et al.* 1993). These data refer to the Rio Grande from Cochiti Dam downstream to the "Narrows" in Elephant Butte Reservoir. Within the same stretch, 234.6 mi of

levees occur, including levees on both sides of the river. Analysis of aerial photography taken by Reclamation in February 1992, for the same river reach, shows that of the 180 mi of river, only 1 mi, or 0.6 percent of the floodplain has remained undeveloped.
Development in the floodplain, makes it difficult, if not impossible, to send large quantities of water downstream that will create low velocity side channels that the silvery minnow prefers. As a result, reduced releases have decreased available habitat for the silvery minnow and allowed encroachment of non-native species into the floodplain.

Water Quality

Many natural and anthropogenic factors affect the quality of the middle Rio Grande. The water quality of the Rio Grande varies spatially and temporally throughout its course primarily because of inflows of ground water and from surface water discharges and tributary delivery to the river. Both point sources (pollution discharged from a pipe) and non-point sources (diffuse sources of pollution) affect the Middle Rio Grande. Major point sources are wastewater treatment plants (WWTPs) and feedlots. Major non-point sources include urban storm water run off, agricultural activities (e.g., fertilizer and pesticide application, livestock grazing), and mining (Ellis *et al.* 1993).

Effluents from WWTPs contain contaminants that may affect the water quality of the river. In the project area, the largest WWTP discharges are from the City of Albuquerque and Rio Rancho WWTP #2 (design flows are 80.4 and 2.5 cfs, respectively) (Bartolino and Cole 2002). Since 1998, total residual chlorine (chlorine) and ammonia, as nitrogen (ammonia), have been discharged unintentionally at concentrations that exceed protective levels for the silvery minnow or other aquatic life standards (http://www.epa-echo.gov/echo/).

Although we do not have complete records for the Rio Rancho WWTPs, in the summer of 2000, the Rio Rancho WWTP released approximately one million gallons of raw sewage into the Rio Grande. Chlorine treatment was maximized in an attempt to reduce the public health risk. Ammonia was reported at 37 mg/L on July 13, 2000, and at 17.1 mg/L on July 27, 2000 (City of Rio Rancho, *in litt.* 2000). Nonetheless, no violations of chlorine or ammonia effluent limits were recorded. This suggests that averaging measurements and/or the frequency of water quality measurements is insufficient to detect water quality situations that will be toxic to silvery minnow. The Rio Rancho WWTP now uses ultraviolet disinfection (Dee Fuerst, City of Rio Rancho, *pers. comm.* 2003). However, high concentrations of ammonia could still be discharged during an upset. Spills from the Rio Rancho City sewage system are treated with a chlorine-based disinfectant, which may lead to chlorine being flushed to the Rio Grande. Chlorine concentrations of 0.013 mg/L can be harmful to silvery minnow (Buhl 2002).

In addition to chlorine and ammonia, WWTP effluents may also include cyanide, chloroform, organophosphate pesticides, semi-volatile compounds, volatile compounds, heavy metals, and pharmaceuticals and their derivatives, which can pose a health risk to silvery minnow when discharged in concentrations that exceed the protective water quality criteria (J. Lusk, Service, *in litt.* 2005). Even if the concentration of a single element or compound is not harmful by itself, chemical mixtures may be more than additive in their toxicity to silvery minnow (Buhl 2002).

The long-term effects and overall impacts of chemicals on silvery minnow populations are not known.

Large precipitation events wash sediment and pollutants into the river from surrounding lands through storm drains and intermittent tributaries. Contaminants of concern to the silvery minnow that are frequently found in storm water include the metals aluminum, cadmium, lead, mercury, and zinc, organics such as oils, the industrial solvents trichloroethene and tetracholoroethene (TCE), and the gasoline additive methyl tert-butyl ether (U.S. Geological Survey 2001).

Harwood (1995) studied the North Floodway Channel (Floodway) of Albuquerque, which drains an urban area of about 90 square miles and crosses the Pueblo of Sandia. He found that storm water contributions of dissolved lead, zinc, and aluminum were significant and posed a threat to the water quality of the Rio Grande. Because the Floodway crosses the Pueblo of Sandia and enters their portion of the Rio Grande, they requested that the Environmental Protection Agency conduct toxicity tests on water in the Rio Grande collected below the Floodway. Aquatic crustaceans exposed to this water were found to have significant reproductive impairment and mortality when compared with controls. Additionally, larval fish also experienced significant mortality and/or narcosis when exposed to water and bed sediment collected from this same area on April 22, 2002 (http://www.epa.gov/region6/6wq/ecopro/watershd/monitrng/toxnet/nm.pdf). This study indicates that storm water runoff can impact the water quality of the Rio Grande and the aquatic organisms that live in the river.

Sediment is the sand, silt, organic matter, and clay portion of the river bed, or the same material suspended in the water column. Ong *et al.* (1991) recorded the concentrations of trace elements and organochlorine pesticides in suspended sediment and bed sediment samples collected from the Middle Rio Grande between 1978 and 1988. These data were compared to numerical sediment quality criteria (Probable Effects Criteria [PEC]) proposed by MacDonald *et al.* (2000). According to MacDonald *et al.* (2000) most of the PEC provide an accurate basis for predicting sediment toxicity to aquatic life and a reliable basis for assessing sediment quality in freshwater ecosystems. Although the PEC were developed to assess bed (bottom) sediments, they also provide some indication of the potential adverse effects to organisms consuming these same sediments when suspended in the water column.

Semi-volatile organic compounds are a large group of environmentally important organic compounds. Three groups of compounds, polycyclic aromatic hydrocarbons (PAHs), phenols, and phthalate esters, were included in the analysis of bed sediment collected by the USGS (Levings *et al.* 1998). These compounds were abundant in the environment, are toxic and often carcinogenic to organisms, and could represent a long-term source of contamination. The analysis of the PAH data by Levings *et al.* (1998) show one or more PAH compounds were detected at 14 sites along the Rio Grande with the highest concentrations found below Albuquerque and Santa Fe. Polycyclic aromatic hydrocarbons and other semi-volatile compounds affect the sediment quality of the Rio Grande and may affect silvery minnow behavior, habitat, feeding, and health.

Pesticide contamination occurs from agricultural activities, as well as from the cumulative impact of residential and commercial landscaping activities. The presence of pesticides in surface water depends on the amount applied, timing, location, and method of application. Water quality standards have not been set for many pesticides, and existing standards do not consider cumulative effects of several pesticides in the water at the same time. Roy *et al.* (1992) reported that DDE, a degradation product of DDT, was detected most frequently in whole body fish collected throughout the Rio Grande. He suggested that fish in the lower Rio Grande may be accumulating DDE in concentrations that may be harmful to fish and their predators.

In addition to the compounds discussed above, several other constituents are present and affect the water quality of the Rio Grande. These include nutrients such as nitrates and phosphorus, total dissolved solids (salinity), and radionuclides. Each of these also has the potential to affect the aquatic ecosystem and health of the silvery minnow. As the river dries, pollutants will be concentrated in the isolated pools. Even though these pollutants do not cause the immediate death of silvery minnow, the evidence suggests that the amount and variety of pollutants present in the Rio Grande, could compromise their health and fitness (Post 1987). Factors that are known to cause poor fish habitat include temperature changes, sedimentation, runoff, erosion, organic loading, reduced oxygen content, pesticides, and an array of other toxic and hazardous substance addition or alterations in the physical or biological integrity.

<u>Silvery Minnow Propagation and Augmentation</u>

In 2000, the Service identified captive propagation as an appropriate strategy to assist in the recovery of the silvery minnow. Captive propagation is conducted in a manner that will, to the maximum extent possible, preserve the genetic and ecological distinctiveness of the silvery minnow and minimize risks to existing wild populations.

Silvery minnow are currently housed at four facilities in New Mexico including: the Dexter Fish Hatchery; New Mexico State University Coop Unit (Las Cruces); the Service's New Mexico Fishery Resources Office (NMFRO), and the City of Albuquerque's propagation facilities. These facilities are actively propagating and rearing silvery minnow. Silvery minnow are also held in South Dakota at USGS, Biological Resources Division Lab, but there is no active spawning program at this facility.

Since 2000, approximately 1,000,000 silvery minnow have been propagated and released. Wild gravid adults are successfully spawned in captivity at the City's propagation facilities. Wild caught eggs are raised and released as larval fish. Marked fish have been released by the NMFRO since 2002 under a formal augmentation effort funded by the Collaborative Program. Silvery minnow have been released primarily into the Angostura Reach of the river near Alameda Bridge to ensure downstream repopulation. This ensures that an adequate number of spawning adults are present to repopulate the river after drying. While hatcheries continue to successfully spawn silvery minnow, wild eggs are collected to ensure genetic diversity within the remaining population.

Genetic Diversity

Genetic data have been collected for the silvery minnow. The data set includes information from eight generations: one generation that preceded the precipitous decline that occurred in the last decade (1987), three generations that preceded the augmentation program (1999, 2000, 2001; Alò & Turner, 2005), and four generations that were supplemented with captively spawned and/or captively reared stocks (2002-2005; Turner et al. 2005). The following information was derived from studies of this data set.

Overall, mitochondrial (mt) DNA gene diversity declined nearly 18 percent between 1987 and 2005. In addition, researchers have identified other changes:

- There have been two sharp declines in mitochondrial haplotype diversity in the "wild" silvery minnow population. The first occurred in 1999, the second in 2001. Each loss of diversity followed a sharp decline in abundance of silvery minnow: between 1995 and 1997, and again between 1999 and 2000, catch rates declined by an order of magnitude (Dudley et al. 2004). These declines in diversity coincided with extensive river drying in the San Acacia Reach of the Rio Grande.
- Microsatellite allelic diversity was less in 1999, but detected diversity was greater from 1999 to 2002. Although numerical abundance of the wild population continued to decline drastically after 2001, reaching extremely low levels in 2003, there was no substantial loss of allelic diversity over that time period.
- Declines in heterozygosity were recorded for the silvery minnow from 1987 to 1999 and between 2000 and 2002. However, heterozygosity increased between 2002 and 2005. Supplemental stocking with captively-reared wild caught-eggs between 2001 and 2003 may have temporarily alleviated loss of alleles and heterozygosity in the wild (Turner et al. 2004).

Permitted and/or Authorized Take

Take is authorized by section 10 recovery permits when there is a net conservation benefit to the species. Incidental take is permitted under section 7 of the ESA. These permits and/or authorizations are issued by the Service. Applicants for section 10 recovery permits must also acquire a permit from the State to "take" or collect silvery minnow. Many of the permits issued under section 10 allow take for the purpose of collection and salvage of silvery minnow and eggs for captive propagation. Eggs, larvae, and adults are also collected for scientific studies to further our knowledge about the species and how best to conserve the silvery minnow. Because of the population decline from 2002-2004, the Service has reduced the amount of take permitted for voucher specimens in the wild.

Incidental take of silvery minnow is authorized through section 7 consultation associated with the 2003 BO, the City of Albuquerque Drinking Water project (U.S. Fish and Wildlife Service 2004), the Isleta Island Removal Project, the Tiffany Plug Removal Project, and the Interstate Stream Commission's (ISC) Habitat Restoration Project. In 2005 the Service revised the incidental take statement for the 2003 BO using a formula that incorporates October monitoring data, habitat conditions during the spawn (spring runoff), and augmentation. Annual estimated take for the 2003 BO now fluctuates relative to the total number of silvery minnow found in

October across 20 population monitoring locations.

Factors Affecting Species Environment within the Action Area

On the Middle Rio Grande, the following past and present federal, state, private, and other human activities, in addition to those discussed above, have affected the silvery minnow and its designated critical habitat:

1. Release of Carryover Storage from Abiquiu Reservoir to Elephant Butte Reservoir: The Army Corps of Engineers (Corps) consulted with the Service on the release of water during the winter of 1995. Ninety-eight thousand af of water was released from November 1, 1995, to March 31, 1996, at a rate of 325 cfs. This discharge is above the historic winter flow rate. Substantial changes in the flow regime that do not mimic the historic hydrograph can be detrimental to the silvery minnow.

2. Corrales, Albuquerque, and Belen Levees: These levees contribute to floodplain constriction and habitat degradation for the silvery minnow.

3. Santa Ana River Restoration Project: Santa Ana Pueblo is engaged in multiple elements of river restoration in an area where the river channel was incising and eroding into the levee system. The project includes a Gradient Restoration Facility (GRF), channel re-alignment, bioengineering, riverside terrace lowering, and erodible bank lines. The GRFs are designed to: (1) store more sand sediments at a stable slope for the current sediment supply; (2) decrease the velocities and depths and increase the width in the river channel upstream; (3) be hydraulically submerged at higher flows while simultaneously increasing the frequency and duration of overbank flows upstream; (4) provide velocities and depths suitable for passage of the silvery minnow through the structure; and (5) halt or limit further channel degradation upstream of its location. The channel re-alignment involved moving the river away from the levee system and over the grade control structure, and excavation of a new river channel and floodplain. Another significant component of the Santa Ana Restoration project was riverside terrace lowering for the creation of a wider floodplain. The bioengineering and deformable bank lines also assisted in establishing the new channel bank and regenerating native species vegetation in the floodplain.

4. Creation of a Conservation Pool for Storage of Native Water in Abiquiu and Jemez Canyon Reservoirs and Release of a Spike Flow: The City created space (100,000 af) in Abiquiu Reservoir and the Corps created space in Jemez Canyon Reservoir to store Rio Grande Compact credit water for use in 2001, 2002, and 2003 for the benefit of listed species. The conservation pool was created with the understanding that the management of this water will be decided in later settlement meetings or during water operations conference calls. In addition, a supplemental release (spike) occurred in May 2001 to accommodate movement of sediment as a part of habitat restoration and construction on the Rio Grande and Jemez River on the Santa Ana Pueblo.

5. Programmatic Biological Opinions on the Effects of Actions Associated with the U.S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and non-federal Entities' Discretionary Actions Related to Water Management on the Middle Rio Grande: In 2001 and 2003, the Service issued jeopardy biological opinions on the effects of water operations and management activities in the Middle Rio Grande on the silvery minnow and flycatcher. In 2002, the Service issued a jeopardy biological opinion for the silvery minnow. The opinion analyzing current water operations was issued on March 17, 2003, and contains one RPA with multiple elements. These elements set forth a flow regime in the Middle Rio Grande and describe habitat improvements necessary to alleviate jeopardy to both the silvery minnow and flycatcher. For example, the elements require augmentation in the Rio Grande of an additional million silvery minnow over the life of the project and 1,600 acres of habitat restoration. Approximately 484 acres have been constructed to date.

6. Albuquerque Drinking Water Project: The Drinking Water Project, involves the construction and operation of: (1) A new surface diversion dam north of Paseo del Norte Bridge, (2), conveyance of raw water from the point of diversion to the new water treatment plant, (3) a new water treatment plant on Chappell Road NE, (4) transmission of treated (potable) water to residential and commercial customers throughout the Albuquerque metropolitan area, and (5) aquifer storage and recovery. This consultation covers through 2060. During typical operations, the project will divert a total of 94,000 afy of raw water from the Rio Grande (47,000 afy of City SJC water and 47,000 afy of Rio Grande native water) at a near constant rate of about 130 cfs. Diversions of native water will be reduced if flows above the new diversion site were less than 260 cfs and all diversions will cease at levels below 195 cfs. Peak diversion operations will consist of up to 103,000 afy being diverted at a rate of up to 142 cfs. Consultation on this project was completed in 2004. Construction is currently underway with operations likely to begin in 2010.

7. Silvery minnow salvage and relocation: During river drying, the Service's silvery minnow salvage crew captures and relocates silvery minnow. Since 1996, approximately 770,000 silvery minnow have been rescued and relocated to wet reaches, the majority of which were released in the Angostura Reach. Studies are being conducted to determine survival rates for salvaged silvery minnows and their contribution to the population.

8. Habitat Restoration Projects: Several habitat restoration projects have been completed in the Albuquerque reach through the Collaborative Program. These projects include woody debris installation projects to encourage the development of pools and wintering habitat, and a river bar modification project south of the I-40 Bridge designed to create side and backwater channels on an existing bar as well as modify the top surface of the bar to create habitat over a range of flows. In 2005, the ISC started a multi-year habitat restoration program that implements several island, bar, and bank line modification techniques throughout the Albuquerque Reach. Phase II (Spring 2007) included modifications to a vegetated island channel and braided ephemeral channel complex

immediately downstream of the Highway 550 Bridge to create silvery minnow nursery habitat. This project is now in its third Phase.

9. Bernalillo and Sandia Priority Site Projects: Reclamation's Bernalillo and Sandia Priority Site Projects are intended to protect the integrity of the east levee and canal system along the Albuquerque Reach of the Middle Rio Grande between the U.S. Highway 550 bridge and the northern boundary of the Pueblo of Sandia. The banks of the river have shifted close to the east levee and pose a potentially serious threat to project facilities and public health and safety. These projects create a secondary high flow channel, realign the main river channel, and install bendway weirs to reduce bank erosion threatening the levee. The Sandia Priority Site Project was not implemented as proposed. Isolated pools that were created during construction did not remain wet. Instead, these isolated areas dried. Approximately 25,000 silvery minnow were moved from these pools to adjacent flowing water. Of these, 750 died. These levels exceeded the amount of incidental take that was issued for the project in 2006 (Cons. #22420-2006-F-039)

10. Middle Rio Grande Conservation District: Improvements to physical and operational components of the irrigation system since 2001 have contributed to a reduction in the total diversion of water from the Rio Grande by the MRGCD. Prior to 2001, average yearly diversions were 630,000 af. They now average 370,000 af. The change was possible because of the considerable efforts of MRGCD to install new gages, automated gates at diversions, and scheduling and rotation of diversions among water users. The new operations reduce the amount of water diverted; however, this also reduces return flows that previously supported flow in the river. The river below Isleta Diversion Dam may be drier than in the past, but small inflows may contribute to maintaining flows.

11. Pilot Water Leasing Project: The City of Albuquerque and Albuquerque Bernalillo County Water Utility Authority, with six conservation groups, established a fund in February 2007 that will provide the opportunity to lease water from Rio Grande farmers and have that water remain in the river channel to support the silvery minnow. This program supports the need for reliable sources of water to support conservation programs as identified by the Middle Rio Grande Endangered Species Collaborative Program (2004).

Summary

The remaining population of the silvery minnow is restricted to approximately 5 percent of its historic range. The Angostura Reach represents less than 27% of the remaining occupied range. While river drying does not occur regularly in this reach, channelization, water withdrawals from the river and water releases from dams severely limit the survival of silvery minnow in this area. Augmentation of silvery minnow with captive-reared fish will continue to support the population within the Angostura Reach; however, continued monitoring and evaluation of these fish is necessary to obtain information regarding the survival and movement of these individuals.

The consumption of shallow groundwater and surface water for municipal, industrial, and irrigation uses, in the Angostura Reach, continues to reduce the amount of flow in the Rio Grande and eliminate habitat for the silvery minnow (U.S. Bureau of Reclamation 2003). Under state law, the municipal and industrial users are required to offset the effects of groundwater pumping on the surface water system. The City of Albuquerque, for example, has been offsetting their surface water depletions with 60,000 afy returning to the river from the WWTP (U.S. Bureau of Reclamation 2003). The effect of water withdrawals means that discharge from WWTPs and irrigation return flows will have greater importance to the silvery minnow and a greater impact on water quality. Lethal levels of chlorine and ammonia have been released from the WWTPs in the last several years. In addition, a variety of organic chemicals, heavy metals, nutrients, and pesticides have been documented in storm water channels feeding into the river and contribute to the overall degradation of water quality.

Various conservation efforts have been undertaken in the past and others are currently being carried out in the middle Rio Grande. Silvery minnow abundance has increased over 2002-2003 population levels. However, the threat of extinction for the silvery minnow continues because of increased reliance on captive propagation, the fragmented and isolated nature of currently occupied habitat, and the absence of silvery minnow in other parts of the historic range.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or designated critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, which will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Data from the long-term silvery minnow monitoring sites, located upstream and downstream of the project area indicates that silvery minnow are extremely likely to be present in the project area. Monitoring from October 2007 estimates that the density of silvery minnow at Hwy 550 and Angostura monitoring sites (River Miles 203.8 and 209.7) is 30.26 silvery minnow per 100 meters square (m^2) (Dudley *et al.* 2006).

Direct Adverse Effects

There are potential direct adverse effects to silvery minnow that may occur in the immediate project area during construction. Silvery minnow may be present when construction equipment is working along the bankline to create ephemeral channels, bankline scours or and/or when woody debris are placed in the wetted channel.

The proposed action is likely to have direct short-term adverse effects on silvery minnow during construction. During the construction of ephemeral channels, and the scouring and lowering of banklines, heavy equipment will move through the water. As the heavy equipment displaces water, any silvery minnow in the area will flee. Fleeing from the disturbance represents an expenditure of energy that the fish will not have without the project.

Equipment working at the bankline and the placement of materials such as large woody debris in the wetted channel may affect water quality. During construction, localized increases in turbidity and suspended sediments will likely occur. Direct effects from excess suspended sediments to a variety of fish include: alarm reaction, abandonment of cover, avoidance response, reduction in feeding rates, increase in coughing rate, increased respiration, physiological stress, poor condition, reduced growth, delayed hatching, and mortality (Newcombe and Jensen 1996).

The effects of sediment mobilization due to the use of heavy equipment in the channel, and placement of material into the wetted channel include the potential smothering and mortality of algae and aquatic invertebrates, depressed rates of growth, reproduction, and recruitment or reduced physiological function of invertebrates. Decreases in primary production are associated with increases in sedimentation and turbidity and produce negative cascading effects through depleted food availability to zooplankton, insects, mollusks, and fish.

Occasional adverse effects are still likely beyond the construction period. High flows may deposit sediment in or at the openings of constructed channels so that isolated pools containing silvery minnows would be formed. Silvery minnows may become stranded in these isolated pools and die.

Beneficial Effects

The project incorporates multiple habitat restoration and planning components, to create a large-scale, sustainable, and diverse habitat complex. Restoration efforts include clearing exotic, non-native plant species and subsequently revegetating native species within approximately 29 acres of bosque, and performing in-channel modifications to an approximately 10-acre point bar/island habitat within the active river channel. This area is expected to provide silvery minnow habitat at varying flows including nursery habitat for eggs and larvae.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act. Cumulative effects include:

- Increases in development and urbanization in the historic floodplain that result in reduced peak flows because of the flooding threat. Development in the floodplain makes it more difficult, if not impossible, to transport large quantities of water that will overbank and create low velocity habitats that silvery minnow prefer.

- Increased urban use of water, including municipal and private uses. Further use of surface water from the Rio Grande will reduce river flow and decrease available habitat for the silvery minnow.

- Contamination of the water (i.e., sewage treatment plants, runoff from small feed lots and dairies, and residential, industrial, and commercial development). A decrease in water quality and gradual changes in floodplain vegetation from native riparian species to non-native species (i.e., saltcedar) could adversely affect the silvery minnow and its habitat. Silvery minnow larvae require shallow, low velocity habitats for development. Therefore, encroachment of non-native species results in less habitat available for the silvery minnow.

- Human activities that may adversely impact the silvery minnow by decreasing the amount and suitability of habitat include dewatering the river for irrigation; increased water pollution from non-point sources; habitat disturbance from recreational use, suburban development, and removal of large woody debris.

- Wildfires and wildfire suppression in the riparian areas along the Rio Grande may have an adverse affect on silvery minnow. Wildfires are a fairly common occurrence in the bosque (riparian area) along the Rio Grande. Although fire retardant, which is toxic to aquatic species, is generally not used in close proximity to the Rio Grande, other fire suppression techniques, such as scooping water from the Rio Grande in large buckets, may harm silvery minnow. Silvery minnow could potentially be scooped up along with the water and dropped onto burning areas.

- The effect global warming may have on the silvery minnow is still unpredictable. However, mean annual temperature in Arizona increased by 1 degree per decade beginning in 1970 and 0.6 degrees per decade in New Mexico (Lenart 2005). In both New Mexico and Arizona the warming is greatest in the spring (Lenart 2005). Higher temperatures lead to higher evaporation rates which may reduce the amount of runoff, groundwater recharge, and consequently spring discharge. Increased temperatures may also increase the extent of area influenced by drought (Lenart 2003). The warming trend appears to have led to insect outbreaks in the Southwest with 1.9 million acres damaged in 2003 in Arizona and 860,000 acres affected in New Mexico (Lenart 2003). Increased numbers of dead trees can increase the risk and intensity of forest fires which could lead to increased impacts to watersheds, streams, and springs.

The Service anticipates that these conditions and types of activities will continue to threaten the survival and recovery of the silvery minnow by reducing the quantity and quality of habitat through the continuation and expansion of habitat degrading actions.

CONCLUSION

After reviewing the current status of the silvery minnow, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the Sandia Restoration Project, as proposed in the August 2007, Biological Assessment is not likely to jeopardize the continued existence of the silvery minnow or result in adverse modification of designated critical habitat. The Sandia Restoration Project will create short term adverse effects to silvery minnow and its food base, which are assumed to be present in the main channel construction zone, through the use of heavy equipment within the active channel, and placement of fill material in the wetted channel of the Rio Grande. This project will also create habitat for the silvery minnow within the Angostura Reach of the Rio Grande and over the long term, is expected to have beneficial effects on the population.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the MERES Program in the form of binding conditions of the grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The MERES Program has a continuing duty to regulate the activity covered by this incidental take statement. If the MERES Program (1) fails to assume and implement the terms and conditions or (2) fails to require adherence to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, The MERES Program must report the progress of the action and its impact on the species to the NMESFO as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

Amount or Extent of Take Anticipated

The NMESFO has developed the following incidental take statement based on the premise that the Sandia Restoration Project will be implemented as proposed. Take is expected in the form of harm and harass during construction through the use of heavy equipment at the bankline of the Rio Grande. Mortality may also occur if channel entrances or exits become blocked and silvery minnows become trapped.

The NMESFO anticipates that take in the form of harassment may affect up to 2,449 silvery minnows during project construction. We base this figure on the following assumptions. According to the Biological Assessment, disturbed wetted area will be approximately 2 acres.

The average density of silvery minnow in the project area has been reported as 30.26/100 m^2, therefore, approximately 2,449 silvery minnow will be harassed by construction, and LWD placement in the river. The Service does not expect any direct mortality to occur due to construction activities.

Additionally, the NMESFO anticipates that up to 770 silvery minnows may be taken in the six ephemeral channels that are created. Based on the project description we assume that 90,000 ft^2 of channel will be constructed. In the event that up to 90,000 ft^2 of isolated habitats form in the ephemeral channel, approximately 770 silvery minnow could be trapped if high flows recontour these channels, block entrances or exits, and strand silvery minnows within the constructed channels. If more than 770 silvery minnows are found dead in these channels, the level of anticipated take will have been exceeded.

The NMESFO notes that this number is only a best estimate of the amount of take that is likely under the proposed action. Thus, estimated incidental take may be modified from the above number should population monitoring information, data from silvery minnow rescue operations, or other research indicate substantial deviations from estimated values. In this case, further consultation, may be necessary.

Effect of the Take
The Service has determined that this level of anticipated take is not likely to result in jeopardy to the silvery minnow.

Reasonable and Prudent Measures
The Service believes the following Reasonable and Prudent Measures (RPMs) are necessary and appropriate to minimize impacts of incidental take of the silvery minnow due to activities associated with the proposed project.

1. Minimize take of silvery minnow due to construction.

2. Manage for the protection of water quality from activities associated with the project.

Terms and Conditions
Compliance with the following terms and conditions must be achieved in order to be exempt from the prohibitions of section 9 of the ESA. These terms and conditions implement the Sandia Restoration Project described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

To implement RPM 1, SWCA shall:

1.1 In coordination with the Service and the Pueblo of Sandia, develop a protocol to monitor presence/absence of silvery minnows in the ephemeral channel following high flows, and to determine whether channel maintenance is warranted.

1.2 Report findings of injured or dead silvery minnows to the NMESFO within 24 hours of observation.

1.3 The final restoration monitoring report (outlining the results and effectiveness of the side channel restoration) shall be provided to the NMESFO

To implement RPM 2, SWCA shall:

2.1 Deploy heavy equipment across at the bankline as few times as possible to minimize disturbance of sediments.

2.2 Monitor water quality, including turbidity and dissolved oxygen before, during, and after equipment operates in the river channel. Provide data in a bi-weekly report to the Pueblo of Sandia.

2.3 Within 24-hours of observance, consult with the Pueblo of Sandia whenever a water quality standard is exceeded.

2.4 Use information collected from Term and Condition 2.2 to develop new or modify existing BMPs to minimize the adverse effects of this project and future projects

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following conservation activities:

1. Encourage adaptive management of flows and conservation of water to benefit listed species.
2. Work to further conduct habitat/ecosystem restoration projects in the Middle Rio Grande to benefit the silvery minnow.
3. Monitor and maintain habitat restoration areas.

RE-INITIATION NOTICE

This concludes formal consultation on the action(s) described in the September 2007 biological assessment. As provided in 50 CFR § 402.16, re-initiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not considered in this biological opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat not considered in this biological opinion; (4) adaptive management that includes additional earth work is needed to repair or maintain the project after the initial construction phase; or (5) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

In future correspondence on this project, please refer to consultation number Cons. # 22420-2008-F-0004. If you have any questions or will like to discuss any part of this biological opinion, please contact Jennifer Parody of my staff at (505) 761-4710.

Wally Murphy

cc:
Director, Department of Natural Resources, Pueblo of Sandia, Sandia Pueblo, NM
(Attn: Alex Puglisi)
Regional Section 7 Coordinator, Region 2 (ES), U.S. Fish and Wildlife Service, Albuquerque, NM

Figure 1. Conceptual habitat restoration design map

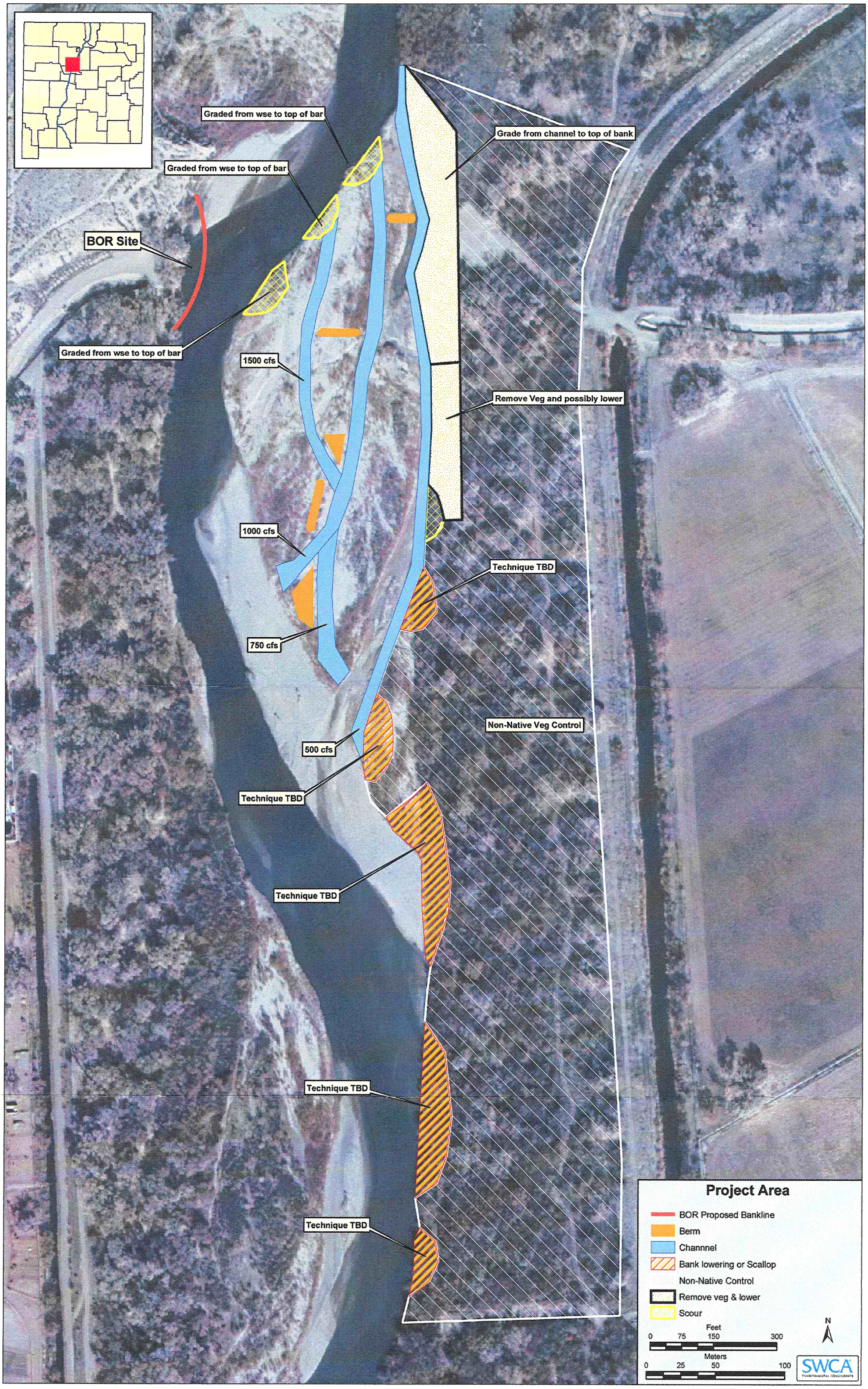

Figure 1.4. Conceptual habitat restoration design including techniques and target discharge for inundation.

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