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

February 12, 2009

Cons. # 22420-2009-F-0002

Memorandum

To: Area Manager, Albuquerque Area Office, Bureau of Reclamation, Albuquerque, New Mexico

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

Subject: U.S. Fish and Wildlife Service's Biological Opinion on the Effects of the Middle Rio Grande Isleta Reach Riverine Habitat Restoration Project

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) on the effects of the action described in the 2008 Biological Assessment (BA) for the Middle Rio Grande Isleta Reach Riverine Habitat Restoration Project funded by the Bureau of Reclamation (Reclamation). Restoration will be conducted by the New Mexico Interstate Stream Commission (ISC) and the Middle Rio Grande Conservancy District (MRGCD). This BO analyzes the effects of the action on the endangered Rio Grande silvery minnow, *Hybognathus amarus*, (silvery minnow) and its designated critical habitat, as well as on the endangered southwestern willow flycatcher, *Empidonax traillii extimus*, (flycatcher) and its designated critical habitat. The restoration projects will be located in two subreaches of the Isleta Reach, which extends from the Isleta Diversion Dam south to the San Acacia Diversion Dam. Request for formal consultation, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), was received on October 6, 2008.

This BO is based on information submitted in the October 2008 BA; conversations and communications between the Reclamation, the ISC, and the Service; and other sources of information available to the Service. A complete administrative record of this consultation is on file at the Service's New Mexico Ecological Services Field Office (NMESFO).

This BO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USDI Fish and Wildlife Service (CIV No. 03-35279) to complete the following analysis with respect to critical habitat. This consultation analyzes the effects of the action and its relationship to the function and conservation role of silvery minnow and flycatcher critical habitat to determine whether the current proposal destroys or adversely modifies critical habitat.

Southwestern Willow Flycatcher

Reclamation has determined the proposed project "may affect, but is not likely to adversely affect," the flycatcher or its designated critical habitat. We concur with this determination for the reasons described below.

The flycatcher is a migrant through this portion of the Rio Grande and may be present from April through August. Suitable nesting habitat does not currently exist within the project area, which occurs at a significant distance from any existing flycatcher nest sites. The closest nesting pairs have been observed to the north at Isleta Pueblo and to the south near La Joya, which represent distances of at least 10 and 20 miles, respectively. Migrating flycatchers could still be disturbed by construction activities and the clearing of woody vegetation in the action area. However, the risk of this disturbance is discountable because it would occur outside the flycatcher breeding season, or in areas where flycatchers are not expected to be present. The project proponents will not conduct activities between April 15 and August 15, with the exception of those activities conducted entirely in the dry and where (a) no possible flycatcher habitat (migratory or nesting) occurs within a 1/4-mile radius of that location, and (b) surveys are conducted, as appropriate, prior to starting work to ensure no flycatchers are present. If work is planned within two weeks before April 15 or after August 15, the ISC and the MRGCD will consult with the Service and Reclamation and conduct additional surveys, if warranted, to determine the presence of flycatchers in the action area. Thus, we expect direct effects on flycatchers are discountable.

Although long-term goals of the proposed action include improved flycatcher habitat, short-term indirect effects on flycatchers are possible from the removal of any vegetation that represents suitable migratory-stopover habitat. Loss of this vegetation will be temporary, and is expected improve the health of riparian vegetation and allow for seedling dispersal and recruitment of new vegetation. Indirect effects of vegetation removal are considered insignificant because the immediate action area does not currently support flycatcher territories, the vegetation in the action area does not currently have the structure to attract breeding flycatchers, and areas of potential disturbance have a lower twig density than is characteristic of flycatcher habitat. In addition, conservation measures will be implemented to minimize potential effects on vegetation in the action area. These include avoiding dense willow-dominated riparian vegetation, not removing mature native vegetation, using existing roads or trails and cleared staging areas, and operating equipment in the most open area available. Thus, indirect effects on flycatchers from removing vegetation are considered insignificant in the short-term, and beneficial through restoration of flycatcher habitat in the long-term.

The action area occurs within the geographic extent of designated critical habitat for the flycatcher. However, habitat in the action area does not contain the Primary Constituent Elements (PCEs) that comprise critical habitat (see 70 FR 60886; October 19, 2005). Thus, the proposed action is not expected to negatively impact the function or conservation role of flycatcher critical habitat.

Given the conservation measures in place during the proposed restoration project, anticipated effects to the flycatcher from the proposed action are insignificant and discountable. We do not expect the effects of the proposed action will appreciably alter the function and intended conservation role of flycatcher critical habitat. The remainder of this biological opinion will deal with the effects of implementation of the proposed action on the silvery minnow and its designated critical habitat.

Consultation History

The Service received a final BA on October 6, 2008. The Service requested additional information and clarification on the proposed action from Reclamation, which was received on December 18 and 19, 2008, and January 6, 22, and 26, 2009. The Service, Reclamation, and ISC conducted a site visit of the project location on December 19, 2008. This BO is tiered off the 2003 *Biological and Conference Opinions on the Effects of the Bureau's Water and River Maintenance Operations, Army Corps of Engineers' Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande* (March 2003 BO).

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

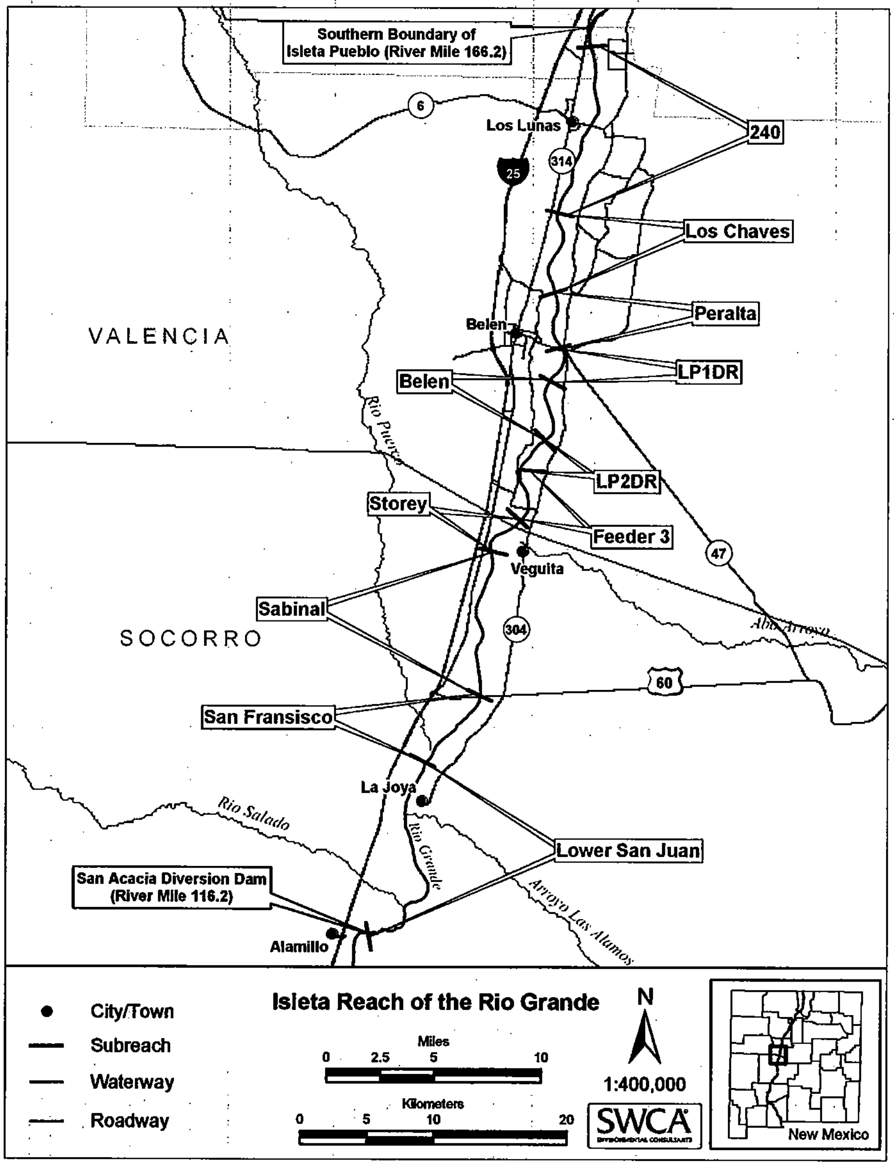
Overview

The Middle Rio Grande Isleta Reach Riverine Habitat Restoration Project will apply several habitat restoration techniques in the Isleta Reach to create or improve habitat for the silvery minnow. The long-term goals of the project include diversifying mesohabitat types, focusing on spawning, egg retention, larval fish, and young-of-year habitat; designing strategic inundation of disconnected bosque habitat to encourage and increase the extent of overbank inundation; and encouraging fluvial processes and river dynamics. These goals are in support of Element S of the Reasonable and Prudent Alternative (RPA) in the March 2003 BO.

The ISC plans to conduct habitat restoration work funded by Reclamation through the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP). Construction will begin in February 2009 and continue until a target completion date of April 15, 2009, with monitoring expected for at least one year. The proposed activities will not be conducted between April 15 and August 15, with the exception of activities conducted entirely in the dry where (a) no possible flycatcher habitat (migratory or nesting) occurs within a 1/4-mile radius of that location, and (b) surveys are conducted prior to starting work to ensure no flycatchers are present. None of the proposed activities in water or wetted areas will be conducted from April 15 to August 15.

The ISC will also work in collaboration with the MRGCD to implement post-fire restoration components of the proposed project funded through the U.S. Forest Service Collaborative Forest Restoration Program (CFRP), and expected to last four years. The goal of the post-fire restoration work is to restore landscape diversity and ecological integrity, and to enhance work implemented by the ISC through active vegetation management and restoring habitat. Activities will not be conducted during the timeframe from April 15 to August 15.

Figure 1. Subreaches in the Isleta Reach of the Middle Rio Grande (from October 2008 BA).



Project Locations

The proposed action will occur in two subreaches of the Isleta Reach located near Belen, New Mexico – (1) the Peralta and (2) the Lower Peralta #1 Riverside Drain (LP1DR) subreaches (see Figure 1). The Peralta subreach is approximately 2.9 miles (4.7 km) in length from the Peralta wasteway outfall at River Mile (RM) 152.5 to the north and the LP1DR wasteway outfall at RM 149.6 to the south. The LP1DR subreach is 1.9 miles (3.1 km) in length from the LP1DR outfall at RM 149.6 to the north and the Belen Riverside Drain outfall at RM 147.7 to the south. For both subreaches, overbank inundation currently occurs at ~5,000 cubic feet per second (cfs).

Treatment areas include specific sites throughout the project area (see Figures 3–5 on pages 44-46). Final site selection and design are based on hydraulic modeling (HEC-RAS, FLO-2D) built from LiDAR topographic data. A target of 25 days of inundation (6.8% exceedance value on the mean daily flow-duration curve) was used as a conservative estimate for providing habitat for the identified silvery minnow life stages. Individual flow duration curves were developed for dry, normal, and wet years, which were used to ensure some restored habitat will be available in most years in the project reaches. The 6.8% exceedance values are 2,290, 2,990, and 4,550 cfs for dry, normal, and wet years, respectively.

Outcomes from previous restoration projects were applied to the site selection and final design of specific habitat restoration projects proposed for this project. For all locations and treatment areas, as-built plans and profile maps will be developed after treatment but before high flows. All applicable permits will be obtained (e.g., 401 and 404 permits) and the proposed action will comply with all elements of the Clean Water Act (CWA) and National Pollutant Discharge Elimination System (NPDES) guidance, an NPDES permit, or Stormwater Pollution Prevention Plan (SWPPP).

Proposed Restoration Treatments

Specific restoration treatments will be implemented during the proposed action and monitored to inform future restoration work along the Middle Rio Grande. These include the creation of backwaters/embayments, bankline benches, ephemeral channels, island modification, placement of large woody debris, removal of lateral constraints, and bosque inundation. In addition, floodplain vegetation management will be conducted as part of the post-fire restoration project with MRGCD. Table 1 (next page) provides a summary of the restoration treatments in wetted and non-wetted areas, including number of sites, acreage affected, and duration of each treatment. Information in Table 1 is based on the October 2008 BA as well as subsequent information provided by Reclamation and the ISC.

During the proposed restoration treatments, sediments and woody debris will be placed within silt barriers 2 feet (0.6 m) from the wetted perimeter of the bank to prevent sediment from falling into the channel. Woody debris may be used for the creation of in-channel debris piles adjacent to the treatment area. Sediment spoils from in-channel work will be placed within an identified buffer zone and according to the guidelines of the applicable permits. For sediment spoils and debris placed in the river behind silt curtains, the upstream portion will be filled first and allow displaced water and fish to move out through a downstream opening. Sediment spoils on bankline features will be spread evenly to an uncompacted depth not to exceed 2 feet (0.6 m) and seeded with native grasses and forbs.

<u>Backwater/Embayment</u>. This treatment will be used to create backwater (i.e., no upstream inlet) and embayment areas that increase the amount of shallow, low-velocity habitat available for retaining drifting silvery minnow eggs and providing habitat for developing silvery minnow larvae. Riverbank and island vegetation will be removed and soils will be excavated to

Table 1. Proposed Restoration Treatments by Subreach and Area Affected

Restoration Treatment	Isleta Reach						Total Acres by Restoration Treatment
	Peralta			LP1DR			
Treatments in Wetted Areas	**Impact Area[1] (acres)**	**Duration (days)**	**# Sites**	**Impact Area[1] (acres)**	**Duration (days)**	**# Sites**	
Bankline Benches	9.6	11	6	5.17	6	4	14.77
Ephemeral Channels	1.54	2	1	1.79	3	2	3.33
Backwater/Embayments	15.59	17	9	9.3	9	4	24.89
Island/Bar Modification	5.49	6	3	0	--	0	5.49
Large Woody Debris	TBD[2]	--	--	TBD[2]	--	--	TBD[2]
Removal of Lateral Confinements	TBD[2]	--	--	TBD[2]	--	--	TBD[2]
Bosque Inundation[3]	NA	NA	NA	1.03	2	2	1.03
Subtotal Wetted	**32.22**	**36**	**19**	**17.29**	**20**	**12**	**49.51**
Treatments in Non-Wetted Areas							
Bosque Inundation[4]	NA	NA	NA	13.91	12	2	13.91
Floodplain Vegetation Management							
-Willow Swales	NA	NA	NA	6	--	TBD[5]	6
-Native Shrub Revegetation	NA	NA	NA	6	--	TBD[5]	6
-Native Tree Replanting	NA	NA	NA	18	--	TBD[5]	18
-Non-Native Species Control	NA	NA	NA	100	--	Entire Area	100
-Preserve Mature Trees/Snags	NA	NA	NA	100.00 [6]	--	~1/2 of Area	100.00 [6]
-Maintain Fuel Breaks	NA	NA	NA	25	--	TBD	25
Subtotal Non-Wetted				**100**			**100**

1 – Includes a 10% buffer zone to encompass disturbance for treatments conducted in wetted areas, and a 20% buffer for treatments conducted in non-wetted areas; 2 – These activities will occur within the footprint of, and concurrent with, other treatments listed in this table; 3 – Comprised of inlet for inundation channel and outlet for backwater; 4 – Comprised of construction of inundation channel and backwater area conducted completely in the dry; overlaps with Floodplain Vegetation Management area (100 acres total non-wetted area); 5 – number of sites for replanting and revegetation treatments depends on the natural regeneration of native species; 6 – Mature trees/snags are not expected to be present on all 100 acres of the project area. This treatment is expected to occur on a total of 50 acres throughout the entire 100-acre project area.

prescribed depths. Backwater areas will be constructed on the downstream end of large point bars, already low-velocity areas, and at a range of elevations to allow for inundation at various river flows. Backwater areas will slope slightly with the downstream end lower in elevation, and some backwaters will be terraced to create distinct target inundation discharges.

Bankline Benches. Bankline benches are intended to increase the frequency and duration of inundation and provide additional low-velocity habitat, resulting in improved egg retention and larval fish development during periods of high river flow. These areas will not remain flooded for significant periods of time and are not intended to provide habitat for adult silvery minnow. Constructing bankline benches will involve lowering the bank by removing bankline vegetation and excavating soils to increase the potential for overbank flooding. The target elevation for excavated and terraced banks will vary depending on the height of the bank, the bank-full level, and the target inundation discharge frequency and duration. Bankline benches will be created in areas where removal of the naturally-formed berms along the bankline could increase inundation in the overbank areas.

Ephemeral Channels. This treatment will be used to create aquatic habitat at target inundations to accommodate flows for larval development and refugia for young silvery minnows, as well as to help promote riparian function and interconnectedness. These side channels will dry during lower flows and are not designed to provide habitat for adult silvery minnows. Ephemeral channels will be constructed as low-velocity, flow-through channels connected to the main river channel across bars and islands. The channels may include mesohabitats such as pools and backwaters with little to no flow. Construction of the ephemeral channels will require removal of existing vegetation and will cause the disturbance of some sediment or soil.

Island Modification. Islands will be modified to help alleviate adverse changes to silvery minnow critical habitat and improve the quality and quantity of available habitat. This treatment will also help increase the potential for re-deposition of sediment in downstream subreaches of the Rio Grande. Island features to be modified include those that have become (or have the potential to become) permanent channel features – e .g., infrequently inundated, stabilized by vegetation, or otherwise armored and resistant to sediment mobilization. Modification will involve removing vegetation (e.g., mowing, root-plowing, raking), destabilizing soil and sediment (root-plowing, raking), and creating shelves inundated at a lower flows. Treated islands will be allowed to naturally expand or contract in response to flows and available sediment load. Sediment removed as a result of the modification may be placed in the river behind silt fences.

Large Woody Debris (LWD). This treatment involves placing LWD (root wads, trees, and large branches) in the main river channel or near the banks to create diverse aquatic habitats. LWD will be unanchored and placed on or near the riverbank or on islands and bars likely to be transported as flows increase. LWD may be placed in high-density, location-specific areas associated with backwaters and embayments to create scour flows, with the goal of preventing sedimentation on these features and increasing project longevity.

Removal of Lateral Constraints. Lateral constraints (e.g., jetty jacks and densely vegetated natural levees that form around them) will be removed to help increase connectivity between the river channel and floodplain. The goal is for natural river processes to then create wider and more diverse channel and floodplain features, yielding increased low-velocity habitat for all life stages of the silvery minnow. Removal of bankline jetty jacks running parallel to the channel are proposed in various locations in association with the creation of bankline benches and embayments. Jetty jack removal is proposed only in areas where levees will not be put at risk or river control activities will not be affected. Tie-back jetty jacks or those that run perpendicular to the river channel are not proposed for removal. Bankline jetty jacks will be removed by amphibious excavator and placed on the adjacent floodplain or bosque, then appropriately removed from the bosque shortly afterward via designated access routes. Remaining jetty jacks will be tied together with cable looped through the end jetty jacks and secured with cable clamps.

Bosque Inundation. The goals of the bosque inundation treatment are to maintain or restore the hydrologic connectivity of the floodplain to the river and provide additional low-flow habitat for the silvery minnow during peak spring runoff. The floodplain in the project area currently inundates at a discharge of approximately 4,000 to 4,500 cfs, which represents a mean daily exceedance of approximately eight days each year. Based on a 25-day exceedance goal, the target inundation discharge for the bosque inundation treatment is 3,000 to 3,500 cfs. Inundation will be achieved by creating an inlet from the main channel to form an inundation channel connecting abandoned flow channels. The inundation channel will be graded to direct the flow of water away from the levee and to minimize entrapment of silvery minnows. In addition, a backwater will be graded to the river channel to drain the area, minimize silvery minnow entrapment, and serve as slackwater habitat at flows less than 2,500 to 3,500 cfs.

Floodplain Vegetation Management (MRGCD). The floodplain vegetation management project will enhance work implemented by the ISC through active vegetation management and ongoing monitoring. Vegetation management will include controlling non-native species and restoring native cottonwood riparian gallery forests. Approximately 100 acres burned in this area in 2007, consuming most of the cottonwood canopy. The MRGCD has developed a restoration design for the post-burn riparian site, with the goal of creating a more resilient, sustainable, and fire-resistant landscape. The goal is for native trees, shrubs, and herbaceous vegetation to cover 80 percent of the site in a patchwork mosaic of differing ages and sizes to increase overall habitat diversity and availability for wildlife. Proposed activities include active revegetation, management, and control of non-native species; preservation of mature native trees and dead snags; and the creation and maintenance of fuel breaks.

All vegetative treatments and plantings will be performed in the dry. Active revegetation involves planting species representative of riparian gallery forests in the Middle Rio Grande. Dominant species include cottonwood, Goodding's willow (*Salix gooddingii*), and coyote willow. A number of riparian shrubs, such as New Mexico olive (*Forestiera pubescens*), skunkbush sumac (*Rhus trilobata*), false indigobush (*Amorpha fruticosa*), and seepwillow (*Baccharis salicifolia*) may be planted to increase diversity. Ground layer plantings may be focused on restoring and enhancing existing wetlands. Control of non-native species (e.g., saltcedar, Russian olive) will be accomplished through herbicide treatments. All herbicides will be applied according to the label and will be mixed within contained system to minimize spills and flows onto the ground. Application of herbicides will be conducted in such a manner to minimize runoff from the stem and flows onto the ground. Herbicides will not be applied when winds exceed 15 miles per hour or when rain is forecasted for the local area within 48 hours of application. In addition, herbicides will be applied no later than two months before the normal spring runoff and high water tables, or by March 15th. The herbicides planned for use by the MRGCD include Garlon-4, which will not be applied within a 20-ft buffer zone from areas where standing or flowing water is present; and Habitat, which will be applied as needed within that 20-ft zone.

Mature cottonwood and tree willow species will be preserved as well as a number of dead snags to create structural diversity and wildlife habitat. Finally, open areas with native grasses and yerba mansa will be maintained as open areas to create and maintain fuel breaks. Existing depressions will be enhanced (five to ten acres) to support the natural regeneration of cottonwoods, willow species, and herbaceous wetlands. A minimum of five acres will be planted as willow swales. Swales will be excavated with rows approximately eight feet apart with one willow stem planted every four feet. Swales will have roughly 1,000 willow stems per acre and will be located in areas with a maximum depth to groundwater less than four feet and located in proximity to the river channel.

All floodplain vegetation management activities will be scheduled between September 1 and April 15 to avoid impacts to nesting birds. A summary of proposed treatments includes:

1. Planting approximately 15 acres of native trees and shrubs per the restoration plan. Ten acres will be planted at a density of 50 shrubs/trees per acre, and 5 acres will be planted at 100 shrubs/trees per acre.
2. Removing and controlling non-native plants to achieve goals for native plant cover, and leaving selected non-native trees and shrubs for habitat until native trees provide adequate structure for wildlife (100 acres). The MRGCD will use Garlon 4 in the action area, but not within 20 feet of areas where standing or flowing water is present, applied as a basal bark treatment. Basal bark treatment involves treating cut stems (3-8 inches in height) with an herbicide solution consisting of 35% Garlon 4 and 65% vegetable oil with a blue marker dye. Within the 20-ft buffer zone of areas where standing or flowing water is present, MRGCD proposes to use Habitat. Herbicide application will not take place when winds exceed 15 miles per hour or when rain is forecasted for the local area within 48 hours of application. Care will be taken when mixing or applying to avoid runoff onto the ground.
3. Applying herbicides no later than two months before the normal spring runoff and high water tables, or by March 15th
4. Preserving mature native trees, removing dead trees and excess dead-and-downed wood, and retaining at least 3 snags and dead-and-downed logs >12 inches (30.5 cm) in diameter per acre for wildlife (100 acres).

5. Creating and maintaining fuel breaks with more open and sparse canopies in existing stands of native grasses and forbs (currently dominated by yerba mansa and saltgrass (*Distichlis spicata*)) on the site per the restoration plan (25–30 acres).
6. Avoiding obvious areas where runoff may occur in the event piles of removed vegetation are burned, and raking or dispersing the remnants of any burned piles.

Monitoring

Monitoring of habitat restoration treatments will occur at the Peralta and LP1DR subreaches; however, no detailed site-specific monitoring plan exists for the Isleta project. The ISC is developing a plan based on earlier restoration projects, and is proposing to monitor numerous sites in 2009 that cover all restoration techniques used during the proposed action. The primary objective of monitoring is to evaluate the success of the proposed project in the Isleta Reach, including whether constructed features improve silvery minnow habitat, as well as to determine the level of maintenance required to maintain an acceptable level of benefit from the project. In addition, monitoring will also evaluate the recolonization of vegetative communities and any geomorphic changes that may occur following disturbance from construction. A full suite of monitoring (e.g., biological, geomorphic, hydrological) will occur on most sites. Some restoration techniques, such as bank cuts to reduce lateral confinement of the river, can only be monitored for geomorphic changes. Monitoring will be reported to Reclamation within three months of the final monitoring event.

Equipment, Staging and Access

Equipment proposed for construction on point bars and banks that are accessible from the shore include a dozer, belly scraper, excavator, or backhoe. An amphibious Caterpillar 325 excavator will be used for access to islands and less accessible banks and bars. Personnel and other equipment will be transported using air boats. Work conducted in wetlands and other sensitive aquatic areas will require the use of low-impact amphibious equipment. The amphibious equipment is designed to disperse weight and minimize impact when operating in water. The amphibious excavator is about 18 feet (5.5 m) wide and 34 feet (10 m) long, and is equipped with a 60-foot (18-m) boom, allowing the machine to perform extensive work with a minimal footprint. The excavator exhibits a gross pressure of 1.7 pounds per square inch (psi) and maximum speeds of 1.2 mph (1.9 km per hour) on level ground and 1 mph in water.

Table 2. River Crossings During the Proposed Action (from October 2008 BA)

Reach	# Crossings	Excavator Width (ft)	Wetted Channel Width (ft)	Impact Area per Crossing (sq ft)	Total Impact Area (sq ft)
Peralta	10	18	230	4,140	41,400
LP1DR	2	18	205	3,690	7,380

Equipment and personnel staging and access locations are identified in the October 2008 BA, and anticipated river crossings are described in Table 2. All necessary permits for access points, staging areas, and study sites will be acquired by both the ISC and the MRGCD prior to any construction activity. ISC will coordinate access with the MRGCD. No new roads will be constructed, as designated access routes will be over existing roads and trails. No mature native vegetation will be removed, and access paths that minimize travel distances in wetted pools or flowing water will be predetermined. In addition, water quality parameters – primarily turbidity – will be measured prior to and after river crossing.

Conservation Measures

Measures will be implemented during the proposed action to help minimize or avoid adverse effects of the restoration projects and to successfully and safely implement all habitat restoration activities. The ISC and the MRGCD shall both have responsibility for complying with these measures, which include the following:

Timing of the Proposed Action

- The proposed activities will not be conducted between April 15 and August 15, with the exception of activities conducted entirely in the dry and where (a) no possible flycatcher habitat (migratory or nesting) occurs within a 1/4-mile radius of that location, and (b) surveys are conducted prior to starting work, as appropriate, to ensure no flycatchers are present. None of the proposed activities in water or wetted areas will be conducted during this timeframe.

Equipment and Operations

- Wherever possible, equipment will operate on the riverbanks, bars, and islands to avoid contact with silvery minnow habitats.
- All equipment will be steam-cleaned before arriving and departing the job site.
- Prior to 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 listed species or their 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 cleanup will be on site during all construction activities.
- A spill kit will be maintained on every rig in 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 SWPPPs.

Staging and Access

- Impacts to terrestrial habitats will be minimized by using existing roads and cleared staging areas. In general, equipment operation will take place in the most open area available, no mature native vegetation will be removed, and all efforts will be made to minimize damage to native vegetation and wetlands.

- Work will be scheduled to minimize crossing the river channel. Access paths that minimize travel distances in wetted pools or flowing water will be predetermined. In addition, water quality parameters – primarily turbidity – will be measured prior to and after river crossing.

Water Quality
- Equipment operation will minimize sediment displacement by river flow, including use of the amphibious excavator to reduce impacts on aquatic habitat. Silt fencing will be installed downstream of any site where equipment crossings take place, such as in canals, arroyos, or drains. River crossings will use the shortest path across wetted portions of the channel and avoid crossing during high flows. Water quality will be monitored by both the MRGCD and the ISC before silt fencing is installed, and the fencing will not be removed until water quality has returned to within 10 percent of the original measures.
- Water-quality testing will be conducted prior to entering the water and periodically during the operating day to ensure that standards are being maintained. Water-quality parameters to be tested include pH, temperature, dissolved oxygen, and turbidity, both upstream and downstream of the work area. Responses to changes in water-quality measures exceeding the applicable standards will include returning equipment to shore and reporting the measurements to the New Mexico Environment Department Surface Water Quality Bureau.
- Stormwater discharges under the proposed action will be limited to ground-disturbing activities outside the mean high water mark. All such activities will be evaluated for compliance with National Pollutant Discharge Elimination System (NPDES) guidance, an NPDES permit, or an SWPPP.

Other Measures
- All features regardless of location will be sloped toward the main river channel to minimize the potential for entrapment of silvery minnows as flows recede.
- ISC will not conduct any burning of vegetation piles. In the event the MRGCD burns piles of removed vegetation, obvious areas where runoff may occur will be avoided and the remnants of burned piles will be raked or distributed after burning. This will help avoid concentrated piles where runoff could introduce polycyclic aromatic hydrocarbons (PAHs) into silvery minnow habitat.
- MRGCD will not apply herbicides when winds exceed 15 miles per hour or when rain is forecasted for the local area within 48 hours of application. Herbicides will be applied no later than two months before the normal spring runoff and high water tables, or by March 15^{th}. Garlon-4 will be used, but not within a 20-ft buffer zone from areas where standing or flowing water is present; Habitat will be applied as needed within the 20-ft buffer zone.

Action Area

The action area includes all areas to be affected directly or indirectly by the proposed action (see 50 CFR §402.02). The proposed action will be conducted within the Isleta Reach of the Middle Rio Grande. Habitat restoration activities will be conducted specifically in two subreaches – the Peralta subreach, which extends for 2.9 miles (4.7 km), and the 1.9-mile (3.1-km) LP1DR subreach. For this consultation, the action area is defined as the entire width of the 100-year floodplain of the Rio Grande from river mile 152.5 to river mile 147.7, encompassing both the Peralta and LP1DR subreaches.

II. STATUS OF THE SPECIES

The proposed action considered in this biological opinion may affect the Rio Grande silvery minnow (*Hybognathus amarus*) provided protection as an endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.; ESA). In addition, the proposed action area overlaps designated critical habitat for the Rio Grande silvery minnow. A description of this species, its status, and designated critical habitat are provided below and inform the effects analysis for this biological opinion.

RIO GRANDE SILVERY MINNOW

Description

The silvery minnow currently occupies a 170-mile (275-kilometer) reach of the Middle Rio Grande, New Mexico, from Cochiti Dam in Sandoval County, to the headwaters of Elephant Butte Reservoir in 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 (90 millimeters). 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 in the genus *Hybognathus* due to morphological similarities. Phenetic and phylogenetic analyses corroborate the hypothesis that it is a valid taxon, distinct 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 (58 FR 36988; see 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. The Service designated critical habitat for the silvery minnow on February 19, 2003 (68 FR 8088). See description of designated critical habitat below.

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 $ft \cdot s^{-1}$ or 10 $cm \cdot s^{-1}$) areas over silt or sand substrate that are associated with shallow (< 15.8 in, 40 cm) 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 the silvery minnow (Sublette *et al.* 1990, Bestgen and Platania 1991).

Adult silvery minnows are most commonly found in backwaters, pools, and habitats associated with debris piles; whereas, young of year (YOY) fish 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 – one at Rio Rancho and the other at 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 (50 cm). Over 85 percent were collected from low-velocity habitats (<0.33 $ft \cdot s^{-1}$ or 10 $cm \cdot s^{-1}$) (Dudley and Platania 1997, Watts *et al.* 2002).

Designated Critical Habitat

The Service designated critical habitat for the silvery minnow on February 19, 2003 (68 FR 8088; see U.S. Fish and Wildlife Service 2003b). The critical habitat designation extends approximately 157 mi (252 km) from Cochiti Dam in Sandoval County, New Mexico, downstream to the utility line crossing the Rio Grande, which is 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 ft (91.4 m) of riparian zone adjacent to each side of the bankfull 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 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, Santa Ana, 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.

The Service determined the primary constituent elements (PCEs) of silvery minnow critical habitat based on studies on silvery minnow habitat and population biology. These PCEs 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 minnows 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.

The spawning strategy of releasing semi-buoyant eggs can result in the downstream displacement of eggs, especially in years or locations where overbank opportunities are limited. The presence of diversion dams (Angostura, Isleta, and San Acacia Diversion Dams) prevents the recolonization of upstream habitats (Platania 1995) and has reduced the species' effective population size (N_e) to critically low levels (Alò and Turner 2005, Osborne *et al.* 2005). Adults, eggs and larvae may also be 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).

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 inches in size upon fertilization, but quickly swelled to 0.12 in. Recently hatched larval fish are about 0.15 inches in standard length and grow about 0.005 inches per day during the larval stages. Eggs and larvae have been estimated to remain in the drift for three to five days, and could be transported from 134 to 223 mi downstream depending on river flows and availability of nursery habitat (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).

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 minnows consists of only two age classes: YOY and Age 1 fish (U.S. Fish and Wildlife Service 1999). The majority of spawning silvery minnows are one year in age, with two year-old fish and older estimated to 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 (i.e., 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.

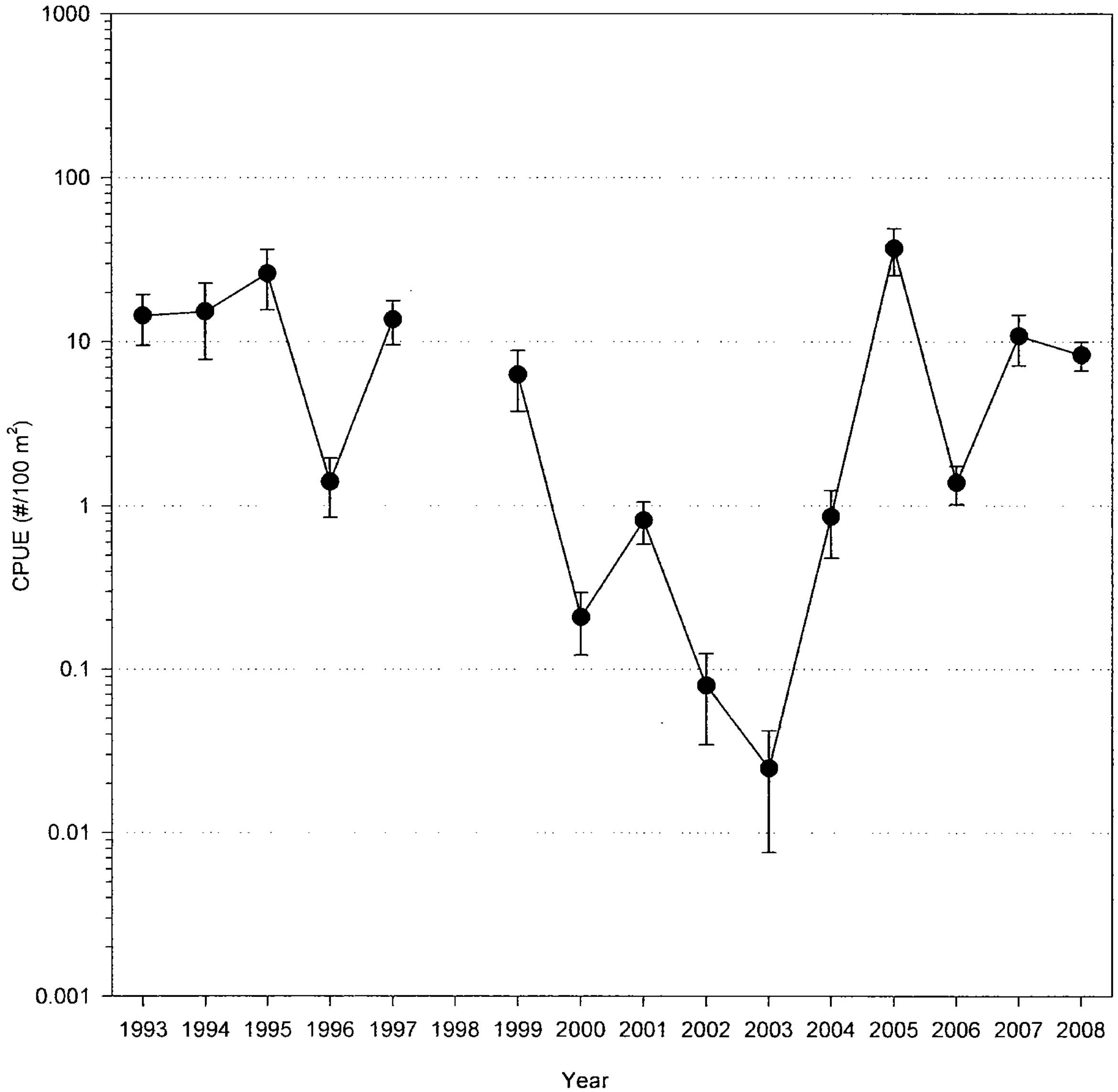
Platania (1995) found that a single female in captivity could broadcast 3,000 eggs in eight hours. Females produce 3 to 18 clutches of eggs in a 12-hour period. The mean number of eggs in a clutch is approximately 270 (Platania and Altenbach 1998). In captivity, silvery minnows have been induced to spawn 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 (3,967 km) of rivers in New Mexico and Texas. The species was known to have occurred upstream to Española, New Mexico (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 five 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 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. River outflow from 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 8 to 30 cm (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 2001, 1999). The Rio Grande below Angostura Dam 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; Torres *et al.* 2008).

Long-term monitoring for the Rio Grande silvery minnow and fish communities in the Middle Rio Grande began in 1993 and has continued annually, with the exception of 1998. This includes monitoring at river mile 151.5 within the action area, where the most recent data indicate a density of 3.18 silvery minnows per 100 square meters at this location in October of 2008 (Dudley and Platania 2008a). The long-term monitoring of silvery minnows has recorded substantial (order of magnitude increases and decreases) fluctuations in the population. Rio Grande silvery minnow catch rates declined two to three orders of magnitude between 1993 and 2004, but then increased three to four orders of magnitude in 2005 (Figure 2). Population size is highly correlated with hydrologic conditions, particularly the magnitude and duration of the spring runoff (Dudley and Platania 2007). The capacity of the species to respond to good hydrologic years (e.g. 2005) is dependent on a variety of factors including the previous year's survivorship and number of adults available to reproduce.

Figure 2. Rio Grande Silvery Minnow Population Trends 1993-2008 based on October CPUE data.



Augmentation, throughout this period, likely sustained the silvery minnow population throughout its range. Over 1,126,000 silvery minnows 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 prevented extinction during the extremely low water years of 2002 and 2003.

Middle Rio Grande Distribution

During the early 1990s, the density of silvery minnows 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 can be attributed to downstream drift of eggs and larvae and the inability of adults to repopulate upstream reaches because of diversion dams.

This pattern has changed in recent years. In 2004, 2005, and 2007, catch rates were highest in the Angostura Reach and lower the Isleta and San Acacia reaches. Routine augmentation of silvery minnows in the Angostura Reach (nearly 1,000,000 since 2000) and the transplanting of silvery minnows rescued from drying reaches (approximately 770,000 since 2003) may partially explain this pattern. Good recruitment 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 in these years, may also explain the shift. High spring runoff (>3,000 cfs for 7-10 days) and perennial flow lead to increased availability of nursery habitat and increased survivorship in the Angostura Reach. In contrast, south of Isleta and San Acacia Diversion Dams, large stretches of river (30+ miles) have been routinely dewatered and young silvery minnows in these areas were either subjected to poor recruitment conditions (i.e., lack of nursery habitats during low-flows) or were trapped in drying pools where they perished.

In 2006, the largest numbers of silvery minnows were again highest downstream of San Acacia. Spring runoff volumes were exceedingly low in 2006. Flows at the Albuquerque gage never exceeded 3,000 cfs in 2006 (M. Porter, *pers. comm.*) and likely very little nursery habitat was inundated during critical recruitment times.

Available reports for 2008 indicate high recruitment, with silvery minnows occurring at all 20 sampling sites along the Middle Rio Grande, and flow conditions (i.e., strong runoff over an extended duration from May to July) leading to elevated numbers of this species. The highest densities were noted to persist in the San Acacia Reach as of October 2008, and the lack of extensive river drying this year, combined with favorable spring flows, was likely an important factor in this distribution shift compared to 2007 (i.e., from Angostura to San Acacia Reaches)(Dudley and Platania 2008a).

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 also impact the species (U.S. Fish and Wildlife Service 1993, 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 Rio Grande 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 Rio Grande silvery minnow are:

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

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

Downlisting (Goal 2) for the Rio Grande 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 five 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).

Conservation efforts targeting the Rio Grande silvery minnow are also summarized in the draft revised Recovery Plan. These efforts include habitat restoration activities; research and monitoring of the status of the silvery minnow, its habitat, and the associated fish community in the Middle Rio Grande; and programs to stabilize and enhance the species, such as tagging fish and egg monitoring studies, salvage operations, captive propagation, and augmentation efforts. In addition, specific water management actions in the Middle Rio Grande valley over the past several years have been used to meet river flow targets and requirements for silvery minnows.

III. ENVIRONMENTAL BASELINE

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 already undergone formal or early section 7 consultation; and the impact of State and private actions that are contemporaneous with the consultation in process. The environmental baseline defines the effects of these activities in the action area on the current status of the species and its habitat to provide a platform to assess the effects of the action now under consultation.

Several activities have contributed to the current status of the silvery minnow and its habitat in the action area, and are believed to potentially affect the survival and recovery of silvery minnows in the wild. These include the current weather patterns, changes to the natural hydrology of the Rio Grande, changes to the morphology of the channel and floodplain, water quality, storage of water and release of spike flows, captive propagation and augmentation, silvery minnow salvage and relocation, ongoing research, and past projects in the Middle Rio Grande.

<u>Changes in Hydrology</u>

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: (1) loss of water and (2) 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 greater 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 upstream areas, the fish had a much broader 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 MRGCD was 535,280 af (65,839 hectare-meters) 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 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. Geologic Survey 2002). A portion of the water diverted by the MRGCD returns to the river and may be re-diverted, sometimes more than once (Bullard and Wells 1992; MRGCD, *in litt.* 2003). Although the river below Isleta Diversion Dam may be drier than in the past, small inflows may contribute to maintaining flows. Since 2001, improvements to physical and operational components of the irrigation system have contributed to a reduction in the total diversion of water from the Middle Rio Grande by the Middle Rio Grande Conservation District (MRGCD). Prior to 2001, average diversions were 630,000 afy and now average 370,000 afy. The change was possible because of the considerable efforts of MRGCD to install new gages, automated gates at diversions, and the 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. In February 2007, the City of Albuquerque and Albuquerque Bernalillo County Water Utility Authority with six conservation groups established a fund 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. The Pilot Water Leasing Project supports the need for reliable sources of water to support conservation programs as identified by the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP 2004).

River reaches particularly susceptible to drying occur immediately downstream of the Isleta Diversion Dam (river mile 169), a 5-mile (8-km) reach near Tome (river miles 150-155), a 5-mile (8-km) reach near the U.S. Highway 60 Bridge (river miles 127-132), and an extended 36-mile (58-km) reach from near Brown's Arroyo (downstream of Socorro) to Elephant Butte Reservoir. Extensive fish kills, including tens of thousands of silvery minnows, have occurred in these lower reaches when the river has dried. It is assumed that mortalities during river intermittence are likely greater than documented levels, for example due to predation by birds in isolated pools (J. Smith, NMESFO, *pers. comm.* 2003). From 1996 to 2007, an average of 32 miles of the Rio Grande has dried each year, mostly in the San Acacia Reach. The most extensive drying occurred in 2003 and 2004 when 60 and 68.7 miles, respectively, were dewatered. Most documented drying events lasted an average of two weeks before flows returned. In contrast, 2008 has been considered a wet year, with above average runoff and at least an average monsoon season. As a result, there was no river intermittency and no minnow salvage this year, which is the first time there has been no river drying since at least 1996.

Changes to Magnitude and Duration of Peak Flows
Water management has also resulted in a loss of peak flows that historically triggered the initiation of silvery minnow spawning. The reproductive cycle of the silvery minnow is tied to the natural river hydrograph. A reduction in peak flows 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 would normally cause flooding, and release this water back into the river channel over a prolonged period of time. These releases are often made during the winter months, when low-flows would normally occur. For example, release of carryover storage from Abiquiu Reservoir to Elephant Butte Reservoir during the winter of 1995-96 represented a substantial change in the flow regime. The Army Corps of Engineers (Corps) consulted with the Service on the release of water from November 1, 1995 to March 31, 1996, during which time 98,000 af (12,054 hectare-meters) of water was released at a rate of 325 cfs (9.8 cm). Such releases depart significantly from natural, historic winter flow rates, and can substantially alter the habitat for silvery minnows. In spring and summer, artificially low-flows may limit the amount of habitat available to the species and may also limit dispersal of the species (U.S. Fish and Wildlife Service 1999).

In the spring of 2002 and 2003, an extended drought raised concerns that silvery minnows would not spawn because of a lack of spring runoff. River discharge was artificially elevated through short duration reservoir releases during May to induce silvery minnow spawning. In response to the releases, significant silvery minnow spawning occurred and was documented in all reaches except the Cochiti Reach (S. Gottlieb, UNM, *in litt.* 2002; Dudley *et al.* 2005). Fall populations in 2003 and 2004 continued to decrease despite large spawning events, indicating a lack of recruitment.

By contrast, spring runoff in 2005 was 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. These flows improved conditions for both spawning and recruitment. October 2005 monitoring indicated a significant increase in silvery minnows in the Middle Rio Grande compared to 2003 and 2004. In 2006, however, October numbers declined again after an extremely low runoff period and channel drying in June and July (Dudley *et al.* 2006). October samples that year yielded no small silvery minnows, indicating poor recruitment in the spring. Runoff conditions in 2007 and 2008 were average or above average.

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 silvery minnows. 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.

Changes in Channel and Floodplain Morphology

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 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 1993).

The active river channel within occupied habitat is also 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 channel narrowing and a subsequent increases in water velocity. Higher velocities result in fine sediment such as silt and sand being 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 minnows, 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 (378 km) 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 (290 km) of river, only 1 mi (1.6 km), 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 would 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 water quality in the Middle Rio Grande, which varies spatially and temporally throughout its course primarily due to inflows of groundwater, as well as surface water discharges and tributary delivery to the river. 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 substances. Both point source pollution (e.g., pollution discharges from a pipe) and non-point source pollution (i.e., diffuse sources) affect the Middle Rio Grande. Major point sources include waste water treatment plants (WWTPs) and feedlots. Major non-point sources include agricultural activities (e.g., fertilizer and pesticide application, livestock grazing), urban storm water run-off, and mining activities (Ellis *et al.* 1993).

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. Geologic Survey 2001).

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 minnows, the evidence suggests that the amount and variety of pollutants present in the Rio Grande, could compromise their health and fitness (Rand and Petrocelli 1985).

Silvery Minnow Propagation and Augmentation

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 minnows 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 minnows are also held in South Dakota at the U.S. Geological Survey, Biological Resources Division Lab, but there is no active spawning program at this facility.

Since 2000, over 1,126,000 silvery minnows have been propagated and then released into the wild (J. Remshardt, Service, *pers. comm.* 2008). Wild gravid adults are successfully spawned in captivity at the City of Albuquerque's propagation facilities. 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 Middle Rio Grande Endangered Species Collaborative Program (Collaborative Program). Silvery minnows are released into the Angostura Reach of the river near Alameda Bridge to ensure downstream repopulation. Eggs left in the wild have a very low survivorship and this ensures that an adequate number of spawning adults are present to repopulate the river each year. While hatcheries continue to successfully spawn silvery minnow, wild eggs are collected to ensure genetic diversity within the remaining population.

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 minnows 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 fish.

Ongoing Research

There is ongoing research by the NMFRO and University of New Mexico (UNM) to examine the movement of silvery minnows. Augmented fish are marked with a visible fluorescent elastomer tag and released in large numbers in a few locations. Crews sample upstream and downstream from the release site in an attempt to capture the marked fish. Preliminary results indicate that the majority of silvery minnows disperse a few miles downstream. One individual was captured 15.7 mi (25.3 km) upstream from its release site (Platania *et al.* 2003). Monitoring within 48 hours after the release of the 41,500 silvery minnows resulted in the capture of 937 fish. Of these, 928 were marked and 927 were collected downstream of the release point. The farthest downstream point of recapture was 9.4 mi (15.1 km).

In 2002, a hybridization study involving the plains minnow and silvery minnow was conducted to determine the genetic viability of hybrids. Plains minnow are found in the Pecos River where reintroduction of the silvery minnow is being considered. The results are preliminary because the number of trials was low and because there is some question about the fitness of the females used in the experiments. The plains minnow and silvery minnow did spawn with each other and the hybrid eggs hatched. However, none of the larvae lived longer than 96 hours. The control larvae (non-hybrids) for both the plains minnow and silvery minnow lived until the end of the study (24 days) (Caldwell 2002).

Due to the increased efforts in captive propagation, recent studies by UNM have focused on the genetic composition of the silvery minnow. Several studies since 2003 have documented a significant decline in overall mitochondrial (mt)DNA and gene diversity in the silvery minnow (e.g., Osborne *et al.* 2005; Turner *et al.* 2006), which may correspond to an increased extinction risk. Research indicates that the net effective population size (N_e) (the number of individuals that contribute to maintaining the genetic variation of a population) of the silvery minnow in the wild is a fraction of the census size (Alò & Turner 2002, *cited in* U.S. Fish and Wildlife Service 2007; Turner *et al.* 2005). In addition, estimates of the current genetic effective size for silvery minnow have consistently fallen well below the values recommended to maintain the adaptive potential of the species. For example, Alò and Turner (2005) found that genetic data from 1999 to 2001 indicated the current effective population size of the largest extant population of silvery minnows is 78. Other estimates have ranged as low as 50 (for 2004 and 2005; *cited in* U.S. Fish and Wildlife Service 2007). It has been suggested that a N_e of 500 fish is needed to retain the long-term adaptive potential of a population (Franklin 1980). Because the number of wild fish in the river appears to be low, the addition of thousands of silvery minnows raised in captivity could impact the genetic structure of the population. For example, estimates of the effective population size for stocks that were reared from wild-caught eggs were consistently lower than for wild counterparts; in addition, stocks produced by captive spawning consistently show lower levels of allelic diversity than those reared from wild-caught eggs (Osborne *et al.* 2006). This indicates that samples collected and reared in captivity do not accurately reflect the allelic frequencies or diversity seen in the wild population (U.S. Fish and Wildlife Service 2007).

Results indicate that while captive propagation can be important for reducing the loss of some genetic markers (including microsatellite allelic diversity and heterozygosity) as seen in recent years, it cannot be relied upon to fully address declines in genetic diversity in the silvery minnow population.

Past Projects in the Middle Rio Grande

"Take" of ESA-listed species is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (see ESA section 3(19)). Take of silvery minnows has been permitted or authorized during prior projects conducted in the Middle Rio Grande. The Service has issued permits authorizing take for scientific research and enhancement purposes under ESA section 10(a)(1)(A), and incidental take under section 7 for actions authorized, funded, or carried out by Federal agencies. Applicants for ESA section 10(a)(1)(A) permits must also acquire a permit from the State of New Mexico to "take" or collect silvery minnows. Many of the section 10 permits issued by the Service allow take for the purpose of collection and salvage of silvery minnows 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.

The Service has conducted numerous section 7 consultations on past projects in the Middle Rio Grande. Within the Isleta Reach, the Service consulted on the U.S. Army Corps of Engineers' (Corps) Isleta Island Removal Project in 2005, which involved construction activities and the removal of islands below the Isleta Diversion Dam. Each year over the ten years covered by this consultation, the Service anticipated the mortality of up to 150 silvery minnows due to entrapment in isolated pools, as well as additional harm of silvery minnows due to loss of habitat.

In 2001 and 2003, the Service issued jeopardy biological opinions resulting from programmatic section 7 consultation with Reclamation and the Corps, which addressed water operations and management on the Middle Rio Grande and the effects on the silvery minnow and the southwestern willow flycatcher. Incidental take of listed species was authorized associated with the 2001 programmatic biological opinion (2001 BO), as well as consultations that tiered off that opinion. For example, the Los Lunas Habitat Restoration Project tiered off the 2001 biological opinion, and was intended to partially fulfill RPA requirements associated with the 2001 BO to benefit the silvery minnow and southwestern willow flycatcher. Approximately 37 acres of native riparian and 40 acres of aquatic habitat have been created by this project. This project included side-channels with increased inundation frequency to cause the inundation of the area at flows greater than or equal to 2,500 cfs. A variety of substrate elevations were intended to allow inundation of some areas during flows less than 2,500 cfs.

The 2003 jeopardy biological opinion (2003 BO) was issued on March 17, 2003, is the current programmatic biological opinion on Middle Rio Grande water operations, 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 southwestern willow flycatcher. In 2005, the Service revised the ITS for the 2003 BO using a formula that incorporates October monitoring data, habitat conditions during the spawn (spring runoff), and augmentation. Incidental take of silvery minnows is authorized with the 2003 BO (with 2005 revised ITS), and now fluctuates on an annual basis relative to the total number of silvery minnows found in October across the 20 population monitoring locations. Incidental take is authorized through consultations tiered off this programmatic BO and on projects throughout the Middle Rio Grande.

Summary of the Environmental Baseline
The remaining population of the silvery minnow is restricted to approximately seven percent of its historic range. With the exception of the current year (2008), every year since 1996 has exhibited at least one drying event in the river that has negatively affected the silvery minnow population. The species is unable to expand its distribution because poor habitat quality and Cochiti Dam prevent upstream movement and Elephant Butte Reservoir blocks downstream movement (U.S. Fish and Wildlife Service 1999). Augmentation of silvery minnows with captive-reared fish has been ongoing, and monitoring and evaluation of these fish provide information regarding the survival and movement of individuals.

Water withdrawals from the river and water releases from dams severely limit the survival of silvery minnows. The consumption of shallow groundwater and surface water for municipal, industrial, and irrigation uses continues to reduce the amount of flow in the Rio Grande and eliminate habitat for the silvery minnow (U.S. Bureau of Reclamation 2003). However, under New Mexico 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 its 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 discharges 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 compared to 2002–2003 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 minnows in other parts of their historic range.

IV. EFFECTS OF THE ACTION

Regulations implementing the ESA (50 FR 402.02) define the *effects of the action* as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or 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. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification; interdependent actions are those that have no independent utility apart from the action under consideration.

Effects on Silvery Minnow

As described earlier, the action area for this consultation is defined as the entire width of the 100-year floodplain of the Rio Grande from the upstream boundary of the anticipated disturbance zone (river mile 152.5) to the downstream boundary at river mile 147.7, encompassing both the Peralta and LP1DR subreaches. Monitoring data are available from river mile 151.5 within the action area, and indicate that silvery minnows are likely to occur during habitat restoration activities and may be affected by the proposed action. The most recent monitoring data (October 2008) indicate a density of 3.18 silvery minnows per 100 m^2 in the action area (Dudley and Platania 2008a). Given an estimated monthly survival rate of 70 percent (J. Remshardt, Service, *pers. comm.* 2008), the catch rate of silvery minnows in the action area adjusted for the start date of February 2009 would be 0.76 silvery minnows per 100 m^2.

The Service reviewed the proposed action, including measures implemented to reduce risk to listed species. We determined that any burning of removed vegetation on site will not pose a significant risk to silvery minnows (e.g., due to runoff through post-burn areas containing concentrations of polycyclic aromatic hydrocarbons (PAHs)), given that materials will be raked or distributed post-burn and obvious areas where runoff could occur will be avoided. In addition, we determined the potential effects from application of herbicides will be insignificant for the silvery minnow. Toxicity information in the Material Safety Data Sheet (MSDS) for Garlon-4 (Triclopyr Butoxy Ethyl Ester, kerosene) indicates this substance is categorized as a Class 2 or 3 in the Service's Southwest Region guidelines on protective measures for application (see White 2004). Accordingly, Garlon-4 will be used only in dry locations and not within 20-feet of areas where standing or flowing water is present. Within the 20-ft buffer zone, Habitat will be applied as needed. MSDS information on Habitat (Imazapyr) indicates classification as a Class 0 substance in White (2004); thus no protective buffer is required. Application will not be conducted in significant winds, or within 48 hours of forecast rainfall. Given the timing and manner of application, as well as the buffer zone to be used, the risk of effects on silvery minnow from application of this herbicide during the proposed action are insignificant.

The proposed action is expected to have beneficial effects on silvery minnows in the long-term by establishing diverse mesohabitats that support the species. Such habitat is expected to benefit silvery minnows through improved egg and larval retention, increased recruitment rates, and increased survival of both YOY and adult minnows. In the long-term, the project is anticipated to contribute to improving the status of this species into the future.

However, we also expect the proposed action may generate adverse effects on silvery minnows as a result of several different activities: (1) construction of the proposed restoration treatments in wetted areas, (2) proposed river crossings by equipment to access restoration sites; and (3) indirect effects beyond the construction period due to potential stranding of silvery minnows in restored features.

Short-term adverse effects on silvery minnows are expected due to disturbance during construction and river crossings. We expect silvery minnows will be present during these activities and will be harassed as a direct effect of the proposed action. The Service has defined take by harassment as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (see 50 CFR 17.3). Minnows are expected to exhibit an avoidance response to construction activities and river crossings. Avoidance behavior, or fleeing from the disturbance, represents a disruption in normal behaviors and an expenditure of energy that an individual silvery minnow would not have experienced in the absence of the proposed action. However, this form of harassment is expected to be short in duration, with pre-exposure behaviors to resume after fleeing the disturbance. The potential number of silvery minnows affected within the immediate vicinity of the equipment is minimized, as we expect an initial flight response at the onset of activities, and sustained avoidance during the short duration of construction work for each restoration activity. In addition, the applicable work window will avoid adverse effects on pre-spawn and spawning adult silvery minnows, as well as YOY during early growth (i.e., until large enough for sufficient mobility and resilience). Given the mobility of silvery minnows, the limited area affected over a short duration, and the proposed work window, we do not expect the avoidance response – or the timing of that response relative to the species' life history – will lead to any long-term significant effects on silvery minnow behaviors such as breeding, feeding, or sheltering.

Adverse effects on silvery minnows may also occur due to sediment disturbance by equipment and placement of materials in the channel. These activities may affect water quality, causing localized increases in turbidity and suspended sediments. Direct effects from excess suspended sediments on a variety of fish species have included alarm reactions, abandonment of cover, avoidance responses, reduction in feeding rates, increased respiration, physiological stress, poor condition, reduced growth, delayed hatching, and mortality (Newcombe and Jensen 1996). In addition, indirect effects from sediment mobilization in the channel are possible, including 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 also associated with increased sedimentation and turbidity and can produce negative cascading effects through depleted food availability for zooplankton, insects, mollusks, and fish. We expect silvery minnows will exhibit an avoidance response to construction activities as described earlier. Conservation measures will help minimize the risk due to dispersal of suspended sediments (e.g., silt fences or barriers during placement of sediments and woody debris, as well as during river crossings; water quality monitoring); therefore, beyond the initial avoidance response to activities, we do not expect suspended sediments will result in significant direct effects on silvery minnows. Those same conservation measures are also expected to reduce the risk of indirect effects on silvery minnows from these activities.

Indirect effects on silvery minnows may also result from the proposed restoration treatments. Beyond the construction period, harassment and mortality of silvery minnows may occur due to potential stranding of fish in restored features. Although the restoration treatments will be sloped toward the main river channel to minimize the potential for entrapment of silvery minnows as flows recede, high flows may still deposit sediment in or at the openings of constructed channels resulting in isolated pools containing silvery minnows. We expect silvery minnows may become stranded in these isolated pools and die.

Given our assessment of anticipated effects on silvery minnows, and the available information on disturbance zones for each activity (see Tables 1 and 2), we expect silvery minnows will be affected by restoration treatments in wetted areas over a total area of 49.51 acres (0.2 km^2). We also expect river crossings will affect silvery minnows over a total area of 48,780 ft^2 (4,532 m^2), and potential entrapment and stranding of silvery minnows in restored features could lead to take of this species over an area of 17.24 acres (69,768 m^2). Given a density of 0.76 silvery minnows per 100 m^2 in the action area, these disturbance areas translate into the harassment of 1,558 silvery minnows due to construction and river crossings, as well as the harassment and mortality of 533 silvery minnows due to indirect effects from stranding.

Effects on Critical Habitat

Direct and indirect effects of the proposed action are likely to result in a beneficial impact on several primary constituent elements (PCEs) of silvery minnow critical habitat. Restoration treatments are expected to provide habitat types included as PCEs for critical habitat, including backwaters, shallow side channels, pools, and runs of varying depth and velocity; substrates of predominantly sand or silt; and the presence of eddies created by debris piles, pools, or backwaters, or other refuge habitat within unimpounded stretches of flowing water of sufficient length that provide a variation of habitats with a wide range of depth and velocities. The proposed action contributes to these PCEs, which provide for the physiological, behavioral, and ecological requirements essential to the conservation of the silvery minnow.

However, construction activities during the proposed action may adversely affect PCEs of silvery minnow critical habitat. Specifically, the proposed action will disturb sediment due to equipment operation and placement of materials in the channel. This may temporarily adversely affect water quality within the anticipated disturbance zone. However, conservation measures in place during the proposed action are expected to restrict this disturbance and minimize the risk to the water quality PCE of critical habitat. These include the use of silt fences or barriers during placement of sediments and woody debris, as well as during river crossings; water quality monitoring to ensure standards are maintained during the proposed action; and the measures implemented during pile burning and application of herbicides to minimize risk of any effects on water quality.

As a result, we find that the effects of the proposed action on the function and conservation role of silvery minnow critical habitat relative to the entire designation are not significant because the effects will be temporary and occur over a very small area relative to the overall critical habitat designation. In addition, the proposed action is intended to have beneficial effects and contribute to the PCEs that form critical habitat. Therefore, we conclude that the primary constituent elements of silvery minnow critical habitat will continue to serve the intended conservation role for silvery minnows with implementation of the proposed action.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur within the action area considered in this biological opinion (50 FR 402.02). 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 ESA.

The Service expects the natural phenomena in the action area will continue to influence silvery minnows as described in the *Environmental Baseline*. The Service also expects the continuation of habitat restoration projects and research to benefit silvery minnows, for example projects funded and carried out by the State of New Mexico, City of Albuquerque, the Pueblos, and other groups. In addition, we expect cumulative effects to include the following:

- 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 would overbank and create low velocity habitats that silvery minnows prefer. Development also reduces overbank flooding favorable for the silvery minnow.

- 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 urban areas, 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 (e.g., saltcedar), as well as riparian clearing and chemical use for vegetation control and crops 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 will result in a reduction of 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.

The Service anticipates the continued and expanded degradation of silvery minnow habitat as a result of these types of activities. Effects from these activities will continue to threaten the survival and recovery of the species by reducing the quality and quantity of minnow habitat.

V. CONCLUSION

After reviewing the current status of the silvery minnow, the environmental baseline for the action area, the anticipated effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Isleta Reach Riverine Habitat Restoration Project, as proposed in the October 2008 BA, is not likely to jeopardize the continued existence of the silvery minnow. We expect the level and type of take associated with this project is unlikely to appreciably diminish the population in the Isleta Reach, or the species as a whole. We expect harassment of minnows may occur, but the duration and intensity of this effect will be short-term, with no long-term significant effects on silvery minnow behaviors such as breeding, feeding, or sheltering. Any risk of more serious effects or repeated harassment is minimized due to measures employed during the proposed action. Limited mortalities may occur due to stranding in restored sites as peak flows recede; however, we do not expect this to result in any significant long-term effects on the population in the Isleta Reach or for the species as a whole.

We found that the proposed action has the potential to cause adverse effects to designated critical habitat. However, we anticipate that these effects on critical habitat will be short-term, will not affect the function and intended conservation role of critical habitat relative to the overall designation, and therefore will not result in the adverse modification of silvery minnow critical habitat. The conservation measures included in the BA and provided by Reclamation during subsequent correspondence to the Service are expected to help minimize adverse effects to the silvery minnow and its designated critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA 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 ESA 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 Reclamation so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation (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, Reclamation must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR §402.14(i)(3)).

Amount or Extent of Take Anticipated

The Service has developed the following incidental take statement based on the premise that the Isleta Reach Riverine Habitat Restoration Projects will be implemented as proposed. Take of silvery minnows is expected in the form of harassment and limited mortality due to the proposed habitat restoration activities, and is restricted to the action as proposed. If actual incidental take meets or exceeds the predicted level, Reclamation must reinitiate consultation.

The Service anticipates that take in the form of harassment may affect up to 1,558 silvery minnows due to proposed construction and river crossings, as well as the harassment and mortality of up to 533 silvery minnows due to potential stranding in restored features after peak flows recede. We base these figures on the best available information on minnow density in the area disturbed by the proposed activities.

Effect of Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the silvery minnow. The restoration project is likely to have adverse effects on individual silvery minnows but those effects are not anticipated to result in any long-term consequences on the population. Incidental take will result from harassment of minnows during construction activities and limited mortality of any individuals that may become stranded in restoration features (e.g., ephemeral channels) after peak flows recede.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the silvery minnow resulting from the proposed action:

1. Minimize take of silvery minnows due to habitat restoration activities.

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

3. Work collaboratively with the Service on the Middle Rio Grande Endangered Species Collaborative Program.

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

Reasonable and Prudent Measures described above. These terms and conditions are non-discretionary.

To implement RPM 1, Reclamation shall:

1. Ensure that all restoration treatment work is conducted prior to the initiation of silvery minnow spawning, i.e., within the timeframes described in this biological opinion (not after April 15 or before August 15 for any activities conducted in water or wetted areas).
2. Ensure that conservation measures described in this biological opinion are implemented, including those pertaining to equipment and operations, staging and access, water quality, and others.
3. Monitor presence/absence of silvery minnows at construction sites, and use adaptive management to modify activities and minimize adverse effects.
4. Report to the Service when a detailed site-specific monitoring plan becomes available.
5. Report to the Service the results and effectiveness of all restoration treatments.
6. Report to the Service findings of injured or dead silvery minnows.
7. Monitor the implementation of RPM1 and associated Terms and Conditions.

To Implement RPM 2, Reclamation shall:

1. Ensure that conservation measures described in this biological opinion are implemented, including those pertaining to water quality monitoring, equipment and operations, and staging and access.
2. Schedule, to the extent possible, river crossings during dry or frozen soil conditions.
3. Report to the Service the water quality measurements taken before, during, and after construction activities, as required in the Clean Water Act, Section 404/401 certification obtained by the New Mexico Interstate Stream Commission.
4. Report to the Service any significant spills of fuels, hydraulic fluids, and other hazardous materials.

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.

RE-INITIATION NOTICE

This concludes formal consultation on the action described in the October 2008 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 critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this BO; or (4) 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 22420-2009-F-0002. If you have any questions or would like to discuss any part of this biological opinion, please contact Jen Bachus of my staff at (505) 761-4714.

Wally Murphy

cc:
Assistant Regional Director (ES), Region 2, U.S. Fish and Wildlife Service, Albuquerque, NM
Regional Section 7 Coordinator (ES), Region 2, U.S. Fish and Wildlife Service, Albuquerque, NM

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Figure 3. Proposed Peralta subreach restoration sites (from October 2008 BA)

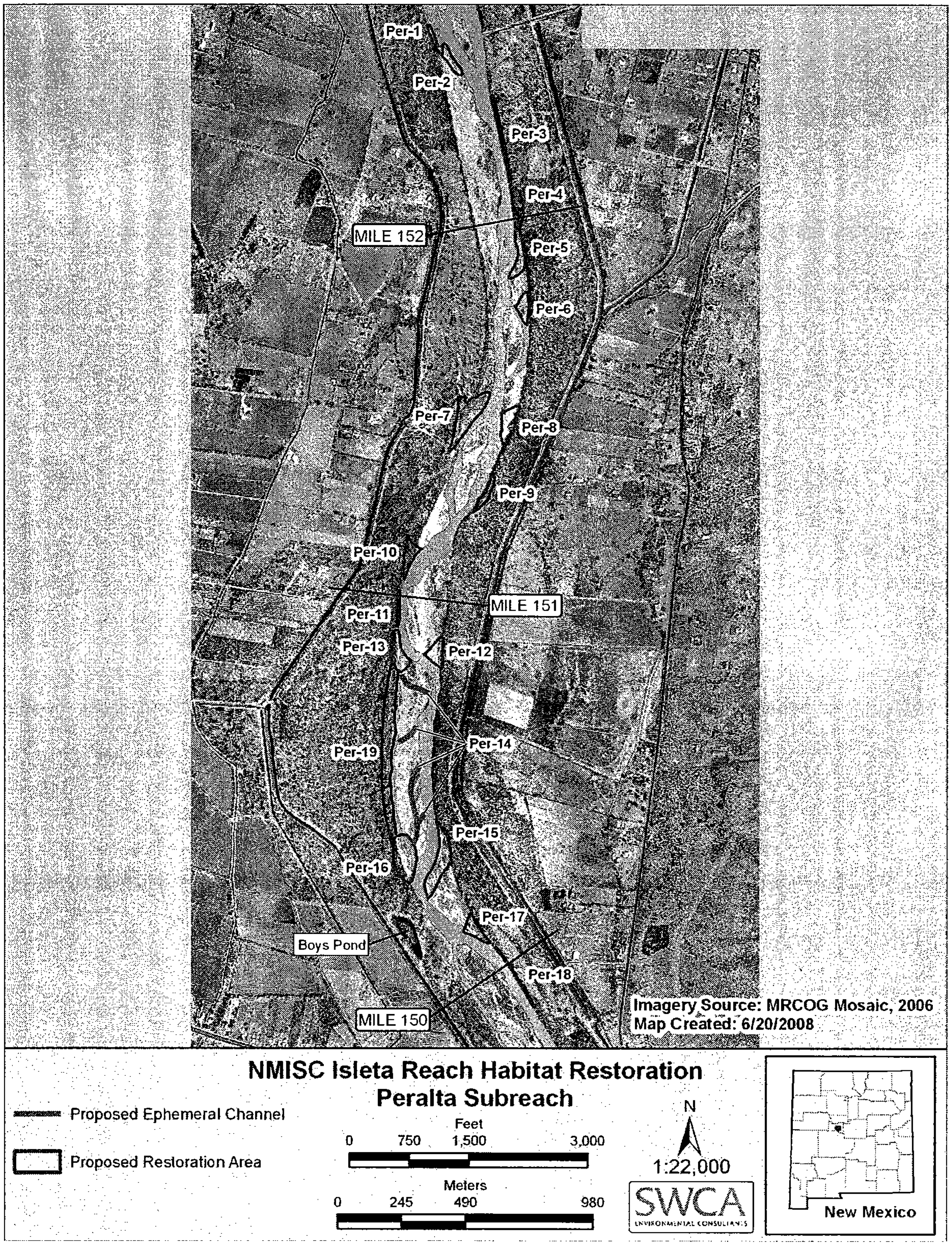

Figure 4. Proposed LP1DR subreach restoration sites (from October 2008 BA)

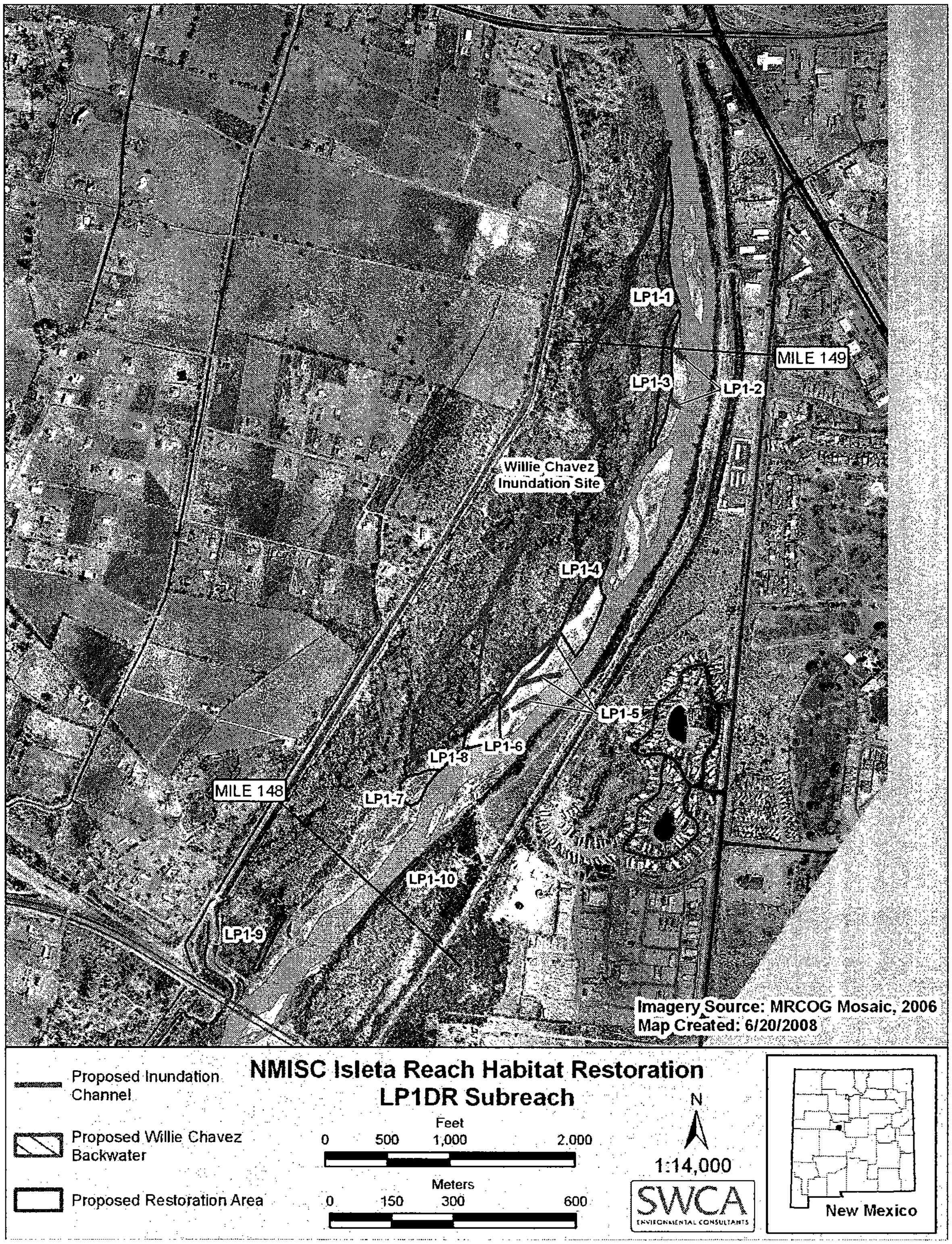

Figure 5. Proposed boundary of Floodplain Vegetation Management, MRGCD (from October 2008 BA)