# United States Department of the Interior

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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 Pueblo de San Felipe Priority Sites Phase I Project, Middle Rio Grande Proposed by the Bureau of Reclamation

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) on the effects of the action described in the Biological Assessment (BA) for the Proposed Pueblo de San Felipe Priority Sites Phase I Project (Project) in the Middle Rio Grande, and in subsequent information provided by the Bureau of Reclamation. The project is proposed by the Bureau of Reclamation (Reclamation) as part of its river channel maintenance activities, and will occur at four priority sites identified by Reclamation at the Pueblo of San Felipe in Sandoval County, New Mexico. This BO analyzes the effects of the action on the endangered Rio Grande silvery minnow, *Hybognathus amarus*, (silvery minnow) and its designated critical habitat. 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 September 4, 2009.

This BO is based on information submitted in the BA dated September 2009; conversations and communications between Reclamation 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 critical habitat to determine whether the current proposal destroys or adversely modifies critical habitat.

**Consultation History**
The Service received a final BA and request for formal consultation on this proposed project on September 4, 2009. The Service requested additional information and clarification on the proposed action from Reclamation, which was received on November 3 and 17, 2009. 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

**Background**
The Bureau of Reclamation has authority for river channel maintenance on the Rio Grande between Velarde, New Mexico, and the headwaters of Caballo Reservoir. Regular monitoring of changes in the river channel and evaluation of channel and levee capacity help identify river maintenance priority sites where there is concern about possible damage to riverside facilities. Priority sites are those where ongoing bank erosion has the potential to negatively affect existing infrastructures (e.g., roads, drains, irrigation ditches). Four priority sites identified within the Pueblo de San Felipe (Pueblo) are designated for river maintenance work in the Phase I project addressed by this biological opinion. The purpose of the proposed action is to eliminate bank erosion and migration through bankline improvements.

**Description of Priority Sites**
Four priority sites will be targeted by the proposed river maintenance project. These occur at River Miles (RM) 215.5, 213.7, 213.4, and 212.0 on the Rio Grande. These sites are located approximately 0.5, 2, 2.5, and 3.5 miles (0.8, 3.2, 4, and 5.6 km) downstream of the Bureau of Indian Affairs (BIA) Highway 85 Bridge. A map of the project area and four priority sites can be found in Figure 1 of the September 2009 BA.

Geomorphic investigations have been completed for these four sites and the September 2009 BA describes the sources of river maintenance concern at each location.

- *RM 215.5* – This site is located on the west side of the Rio Grande. Flows during the recent high water season resulted in extensive erosion and bank cutting in the project area. The concern at this site is the proximity to Pueblo residences and a road within the Pueblo located directly adjacent to the bank (within 20 feet (6 m) in some locations).
- *RM 213.7* – This site is located on the east side of the Rio Grande. Growth of a mid-channel bar has forced the majority of flows into the eastern side channel, creating greater bank erosion. Proximity of the eastern bank to the levee protecting the Algodones Riverside Drain is the concern at this site.
- *RM 213.4 and RM 212.0* – These sites are located on the west side of the Rio Grande. For both sites, the high rate of bank erosion and proximity of the western bank to the levee protecting the Southwest Felipe Ditch are of concern.

For all sites, the project purposes would be accomplished while meeting the bioengineering component specified in the March 2003 BO.

**Table 1. Summary of River Maintenance Activities at Each Priority Site (*from September 2009 BA*)**

| Priority Site | Description |
|---|---|
| RM 215.5 | Middle channel bar and bank attached bar removal with a modified bio-engineered bank protection erosion control |
| RM 213.7 | Stair stepped erosion control along east bank |
| RM 213.4 | Stair stepped erosion control along west bank |
| RM 212.0 | West bank stabilization with hard lined protection at the critical location with stair stepped protection elsewhere with opening the middle channel bar |

## Proposed Action

The proposed river maintenance project involves installation of bioengineered bank protection with riprap toe protection. Rock for all four sites would be hauled from existing stockpiles on the Pueblo, with a small amount of rock hauled from off-site stockpile location. The approach will vary slightly at each site, including the use of willow trenches, removal of bar features, construction of pedestrian access ramps, or a hard-lined bank portion. Table 1 depicts the proposed river maintenance work at each of the priority sites. Table 2 shows the estimated area affected during the proposed action due to construction activities and river crossings by equipment.

**Table 2. Area Affected During the Proposed Action (*from H.Garcia, Reclamation*)**

| Site | Upstream Berm (acres) | River Crossings (acres)[1] | Platforms for Construction (acres)[2] | Wetted Area (Acres)[3] | Number of Days of Work[4] |
|---|---|---|---|---|---|
| RM 215.5 | 0.4 | 15.2 | 2.2 | 8 | 70 |
| RM 213.7 | 0.4 | 0 | 1.4 | 1.8 | 40 |
| RM 213.4 | 0.45 | 0 | 1.4 | 6.9 | 40 |
| RM 212.0 | 0.25 | 18.4 | 1.7 | 12.9 | 60 |

1-Calculated assuming a 20-ft wide path, multiplied by the width of the channel at each site and the estimated number of crossings; 2-Area was delineated in AutoCad, which allows for a calculation of area in square feet, and then converted to acres. This area is the expected footprint of the constructed bankline; 3-Area was delineated in AutoCad, which allows for a calculation of area in square feet, and then converted into acres. This area is not the project footprint, but the area within the channel where work will take place; 4-The temporal duration to raise the bank protection above the water surface was calculated by assuming a riprap placement rate of 40 ft/day and a dirt placement rate of 200 ft/day. One day was added to this timeframe to account for the creation of the diversion berm.

*Vegetation and Jetty Jack Removal*
This activity will occur at all four sites. Only the vegetation required to accomplish the proposed action will be removed. Removal of existing cottonwoods and other native species will be minimized while removal of any noxious weeds would be maximized. Any non-vegetatively reproducing vegetation that is removed will be mulched and spread out (2- to 3- inch thickness) within the project site. Where appropriate, large woody debris from any large cottonwood trees requiring removal may be incorporated into the project to improve habitat on bars or islands or installed along the bank to act as bendway weirs. If jetty jacks are encountered in the area during construction, they would be removed and disposed of off-site.

*Vegetation Planting*
Revegetation plans are a large component of the overall site improvements. At RM 212.0, 213.4, 213.7, native vegetation will be planted throughout the disturbed area of the project. Coyote willow poles will be planted along the bioengineered bankline at a density of one pole per foot. Above the bioengineered bankline, Rio Grande cottonwood poles and/or Gooddings willow poles will be planted. At RM 213.7, a double willow trench will also be built at the north end of the bioengineered bankline to provide additional protection against river flanking. All temporary use areas utilized during construction will be reseeded with an upland seed mix (blue grama, inland saltgrass, squirreltail, streambank wheatgrass, galleta, Indian ricegrass, alkali sacaton, and four-wing saltbush) to encourage upland habitat around the project area. Containerized plantings will be used in the staging areas. A sterile tritisecale will also be added to the upland seed mix to help stabilize the soil and provide opportunity for native seed establishment. Shrubs will also be planted, both among the pole plantings and in the seeded upland areas. Shrub species will include indigo bush, seep willow, New Mexico olive, pale wolfberry, squaw bush, wild rose, and golden currant.

At RM 215.5, native vegetation will also be planted throughout the disturbed area of the project. However, vegetation planting will be significantly less dense at this priority site than at the other three sites. Coyote willow poles will be planted along the bioengineered bank at a density of one pole per foot. A secondary willow bankline, consisting of coyote willows placed in a double row, will be planted along the newly established east bank, to help stabilize that bank after the bar is removed.

*Temporary Culvert Placement*
Access at RM 213.4 and 212.0 may include crossing the San Felipe Drain, which is not currently in use and only carries water during rain events. If the project engineer and construction crew deem it necessary a temporary culvert may be placed in the drain at each of these two priority sites to make site access easier and safer. The culverts will be removed at the conclusion of the project.

*Construction Operations*
At the four priority sites, diverting river flows away from the bankline will be necessary to construct both hard-lined bank protection and bioengineered banklines. Prior to this river maintenance work, a temporary berm will be built at each site to divert flows around the opposite side of a mid-channel bar and away from the project area. At no time during the proposed action will the entire river be closed off. Site-specific information on berm construction is provided below:

- At RM 215.5, diverting river flows away from the northern portion of the project area will be accomplished by constructing a temporary berm to divert flows around the eastern side of a mid-channel bar. The temporary berm will extend from the northern end of the bioengineered bankline to the mid-channel bar, and is designed to withstand a flow of 2,000 cfs with 2 feet (0.6 m) of freeboard. The berm will be composed of approximately 8,000 $y^{d3}$ (6,116 $m^3$) of native earth fill, excavated from this site or another site on the Pueblo. The berm will have a 25-ft (7.6-m) top width, 3H:1V side slopes, and a length of approximately 380 ft (116 m).

- At RM 213.7, diverting river flows away from the east bankline will be necessary to construct the bioengineered bankline. The temporary berm will extend from approximately 100 ft (30 m) upstream of the northern key for the bioengineered bankline and extend to the mid-channel bar, and is designed to withstand a flow of 2,000 cfs with 2 feet (0.6 m) of freeboard. The berm will be composed of approximately 3,500 $yd^3$ (2,676 $m^3$) of native earth fill, excavated from this site or another site on the Pueblo. The berm will have a 25-ft (7.6-m) top width, 2H:1V side slopes, and a length of approximately 325 ft (99 m). If flows cannot be accommodated along the west side of the mid-channel bar, portions of the bar may be reworked. Upon completion of river maintenance work at this site, the berm will be removed and the bar will be returned to a more uniform elevation.

- At RM 213.4, diverting river flows away from the west bankline will be necessary to construct the bioengineered bankline. The temporary berm will extend from approximately 50 ft (15 m) upstream from the upstream end of the bankline to the mid-channel bar, and is designed to withstand a flow of 2,000 cfs with 2 feet (0.6 m) of freeboard. The berm will be composed of approximately 4,000 $yd^3$ (3,058 $m^3$) of native earth fill, excavated from this site or another site on the Pueblo. The berm will have a 25-ft (7.6-m) top width, 2H:1V side slopes, and a length of approximately 375 ft (114 m). If flows cannot be accommodated along the east side of the mid-channel bar, portions of the bar may be reworked. Upon completion of river maintenance work at this site, the berm will be removed and the bar will be returned to a more uniform elevation.

- At RM 212.0, diverting river flows away from the west bankline will be necessary to construct both the hard-lined bank protection and the bioengineered bankline at this site. To construct the temporary berm, debris and sediment will first be removed from the upstream end of the river channel that flows to the east of the mid-channel bar. This will

force more flow into that channel and naturally increase its capacity. The temporary berm will extend from the west bank to the mid-channel bar, and is designed to withstand a flow of 2,000 cfs with 2 feet (0.6 m) of freeboard. The berm will be composed of approximately 1,900 $yd^3$ (1,453 $m^3$) of native earth fill, excavated from this site or another site on the Pueblo. The berm will have a 25-ft (7.6-m) top width, 2H:1V side slopes, and a length of approximately 200 ft (61 m). Upon completion of river maintenance work at this site, the berm will be removed.

At all four priority sites, construction of the new bankline during river maintenance work will require a working platform constructed within the channel. A ramp will be created extending from the bankline to the water surface, and cut into the existing bankline material. The ramp may be capped with smaller riprap or gravel to provide a suitable driving surface for construction equipment, which will use the ramp for access and to place the riprap toe. The riprap toe will also form a working platform in the channel. This working platform will be built starting at the upstream end of the project area and in the downstream direction. As the platform grows in length, riprap will be dumped in the channel or on the platform and then pushed into the channel. Larger rocks may also be positioned with the excavator bucket to allow a more stable working platform. Once the working platform is above flow level, the work behind the platform on the banklines will be conducted in the dry.

*Bar Removal*

To reduce the amount and velocity of flows near the priority site banklines, bar removal activities will occur at RM 215.5, 213.4, and 212.0. At RM 215.5, a mid-channel bar located near the upstream end of the site and a bank-attached bar near the downstream end of the site will be removed. It is estimated that 9,100 $yd^3$ (6,957 $m^3$) of material will be removed from the bars while excavating to the water surface. It may be necessary to excavate below the water surface to facilitate the removal of these features during higher flow events. To minimize channel crossings, the mid-channel bar (closest to the west bank) will be accessed from the west bank. Similarly, the bank-attached bar is on the east side of the river channel and will be accessed from the east side of the river.

At RM 213.4, the mid-channel bar will be reshaped to further reduce pressure on the west bank. It is estimated that 2,400 $yd^3$ (1,835 $m^3$) of material will be removed from this bar, excavating to the water surface. It may be necessary to excavate below the water surface to facilitate the removal of these features during higher flow events. And at RM 212.0, the middle portion of the mid-channel bar will be removed. Some of the removed material may be used to construct the temporary diversion berm, and some may be used as backfill for both the bioengineered bankline and the hard-lined bank protection. It is estimated that 7,400 $yd^3$ (5,658 $m^3$) of material would be removed from these bars at RM 212.0, excavating to the river surface. It may be necessary to excavate below the water surface to facilitate the removal of these features during higher flow events. Approximately 10,100 $yd^3$ (7,722 $m^3$) will be utilized at this project sites. If there is excess bar material it may be used at other sites that require additional fill or would be stockpiled off-site for use by the Pueblo.

*Hard-lined Bank Protection*
At RM 212.0, a critical location with the greatest rate of erosion will be moved approximately 20 feet (6.1 meters) to the east into the channel and hard lined with riprap. Compacted fill excavated from this project will be used to realign the 560 feet (171 meters) of bank. If necessary, low spots within the channel will be filled in with excavated material prior to placing riprap. The riprap at the critical location will extend to the predicted water surface elevation for the 25-year peak flow (9,715 cubic feet per second (cfs) based on post-Cochiti Dam data from the San Felipe Gage on the Rio Grande). Riprap will be placed at a 2H:1V slope. Project design specifies a 16-in (41-cm) diameter riprap; sorting, mixing, or reduction of oversize stored material will be performed at the staging areas. A volume or rock equal to 1.5 times the volume calculated for placement below the thalweg to the 25-year scour depth will be placed directly on the river bottom. At the top of the rock, a 4-ft (1.2-m) by 2-ft (0.6-m) wide trench will be excavated. This trench will be filled with riprap and serve to key the bank protection into the bankline. In addition, at the downstream and upstream ends, the riprap will be keyed into the existing bank to prevent flanking of the hard-lined bank protection. This key will extend approximately 40 feet (12.1 meters) into the bank.

*Bioengineering Bank Stabilization*
Due to progression of bankline erosion at the priority sites, river maintenance work will include reconstruction of banklines using bioengineering techniques. At RM 215.5, this includes approximately 2,100 ft (640 m) of bankline. At RM 213.7, approximately 1,300 ft (396 m) of bankline will be reconstructed, with low spots in the eastern side of the river channel filled in to aid in riprap placement. At RM 213.4, approximately 1,150 ft (m) of bankline will be reconstructed using this technique, with low spots in the western side of the river channel potentially filled in to aid in riprap placement. And at RM 212.0, approximately 1,200 ft (366 m) of bankline will be reconstructed.

The bioengineered bankline will consist of a riprap toe and three lifts of coir fabric encapsulated soil. Willow poles will be placed between the lifts at a density of one per linear foot. The bottom elevation of riprap will be the same as the existing channel. At RM 213.7, 213.4 and 212.0 the top of the riprap will be at the modeled two year water surface elevation (corresponding flow rate of 5,040 cfs); whereas at RM 215.5 protection against flows greater than the two year peak was desired due to proximity of houses and threat to public safety at this location. Therefore, at RM 215.5, exposed riprap will extend to the modeled water surface elevation for the mean daily flow at San Felipe U.S. Geological Survey (USGS) gage that has a 90 percent chance of being equaled or exceeded on any given day (corresponds to a flow of 480 cfs). This riprap will be inundated the majority of the time. To increase the level of protection for the bank, buried riprap will extend to a higher water surface elevation, set as high as possible at pedestrian access ramps while still allowing a minimum of 1 ft (0.3m) of soil cover over the riprap in the vicinity of access ramps. Along the remainder of the new bankline at RM 215.5, the top of the buried riprap will extend to the two year peak flow water surface elevation (5,040 cfs).

Similar to the hard-lined bank protection, the river bed will not be excavated to place rock as scour protection below the thalweg. Instead of disturbing the armored bed, a volume of rock

equal to 1.5 times the volume calculated for placement below the thalweg to the 25-year scour depth will be placed directly on the river bottom in a trapezoidal shape. The rock will have a 2H:1V side slope in the river channel, and a 1.5H:1V side slope on the bank side, which will be filled with excavated material. At RM 212.0, the upstream end of the bioengineered bankline will be keyed into the existing bankline to prevent river flanking. At RM 215.5, 213.7 and 213.4, both the upstream and downstream ends will be keyed into the existing bankline. The riprap will extend between approximately 20 ft (6 m) to 80 ft (23 m) into the bank, depending on the priority site, and will be buried and not visible. For this bank stabilization, project design specifies a 9-in (23-cm) diameter riprap for RM 215.5, 213.4, and 212.0, and a 12-in (30-cm) diameter riprap for RM 213.7. Sorting, mixing, or reduction of oversize stored material will be performed at the staging areas.

*Pedestrian Access Ramps*
The priority site at RM 215.5 occurs immediately adjacent to the Pueblo and is accessed for ceremonial and other purposes. River maintenance work will accommodate pedestrian access to the river by installing up to six pedestrian access ramps during construction.

**Equipment Staging and Access**
All of the access routes and construction sites are located on the Pueblo. The main access into the Pueblo would be from BIA Highway 85. The staging areas for temporarily storing construction materials and equipment are included in the maximum disturbed areas for each site as described in this section.

Access to RM 215.5 and RM 212.0 will be from both the east and west sides of the Rio Grande. Access to RM 215.5 is primarily on paved roads, with the last half mile of the eastern access route on dirt roads. Access to RM 212.0 is on dirt roads. Access to RM 213.4 will occur from the west side of the Rio Grande, while access to RM 213.7 will be from the east side. Both of these sites will be accessed using dirt roads. Access to stockpile locations will also be along dirt roads.

If necessary to ensure safe access, road improvements (e.g., blading, widening, gravel cap placement, etc.) may be made to the dirt roads. Vegetation along the roads may also be trimmed to ensure vehicle clearance and for safety concerns. If dust becomes a safety concern while hauling riprap from the stockpile areas to the priority sites, roads will be wetted with water. During irrigation season (March through October), water will be pumped from the irrigation system (i.e., nearby drains) and not directly from the Rio Grande. During non-irrigation season, water will be pumped from the Rio Grande. To minimize entrainment of aquatic organisms, the opening to the intake hose will be covered with 0.25-in (0.64-cm) mesh screen. A minimal amount of water is expected to be used for dust abatement.

**Project Timing**
Site preparation work consisting of blading roads, trimming and mulching vegetation, and preparing the staging and stockpiling area would begin December 2009. Actual construction would start in January 2010, at the southern sites (RM 212.0 and 213.4) and proceed north to the

two additional sites. Work may be conducted concurrently at multiple priority sites. The proposed work is estimated to take one year to complete for all four priority sites with completion estimated by spring 2011.

The proposed action will follow a timeline that includes constructing berms and working platforms before spring runoff, and working in the dry through the summer (i.e., from the working platforms). No work will be done in wetted areas during spring runoff (i.e., May and June). The site at RM 215.5 will be prioritized for completion during the summer of 2010.

The anticipated design life of all structural components of the proposed action is a 25 years. To ensure goals of the project are being met, monitoring of engineered features and vegetation establishment success will occur several times per year for up to five years post-construction.

**Conservation Measures**
Reclamation will implement several measures during the proposed activities to help minimize or avoid adverse effects of the river maintenance work. These include the following:

- Reclamation will obtain all applicable permits prior to implementation of the project. CWA Section 404 and 401 permit compliance will be required because much of the work will occur within aquatic areas. Applications have been submitted to the Corps and U.S. Environmental Protection Agency. Reclamation will comply with conditions of these permits.
- To minimize potential for spills into or contamination of aquatic habitat:
    - Hydraulic lines will be checked each morning for leaks and periodically throughout each work day.
    - All fueling will take place outside the active floodplain. Fuel may be stored on site overnight, but not near the river or any location where a spill could affect the river.
    - All equipment will undergo high-pressure spray cleaning and inspection prior to initial operation in the project area.
    - Equipment will be parked on pre-determined locations on high ground away from the project area overnight, on weekends, and holidays.
    - Spill protection kits will be on site, and operators will be trained in the correct deployment of the kits.
- Reclamation will monitor for water quality at the areas below the temporary berms before and during the work day, and work in the river will only occur when flows permit. Once working platforms are constructed, work will occur in the dry.
- To allow fish time to leave the area before excavation begins, the bucket will initially enter the water slowly when beginning excavation and placing rock for the platform in the river channel.
- In water work (i.e., toe trench and riprap placement) will be fairly continuous during works days, so that fish are less likely to return to the area once work has begun.
- Working platforms will be placed in a manner such that no isolated pools of water are formed where fish could become trapped.
- Riprap to be placed in the water will be reasonable clean to the extent possible. If there are

large clumps of soil bigger than 1 ft within the riprap, those clumps will be set aside during the loading or placing operations.

- Reclamation will seek to avoid impacts to birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703) by periodically conducting breeding bird surveys during the normal breeding and nesting season (approximately April 15 to August 15) for most avian species. Vegetation trimming, required for each project site, will be completed after September 1, 2009, and before April 1, 2010. Work after April 1, 2010, will be accompanied by appropriate surveys. Reclamation will coordinate monitoring and work activities with the Service, as appropriate, if bird nests are found.
- If water is needed for dust abatement on roads, no water will be pumped directly from the Rio Grande during irrigation season. Water will be pumped from the irrigation drains. During non-irrigation season, a minimal amount of water from the Rio Grande may be used, and will be pumped using a 0.25-in (0.64-cm) mesh screen at the opening to the intake hose to minimize entrainment of aquatic organisms.

**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 Cochiti Reach of the Middle Rio Grande in Sandoval County, New Mexico. River maintenance activities will be conducted specifically at four priority sites extending from RM215.5 to RM212.0, located between 0.5 and 3.5 miles (0.8 and 5.6 km) downstream of the Bureau of Indian Affairs (BIA) Highway 85 Bridge. For this consultation, the action area is defined as the entire width of the 100-year floodplain of the Rio Grande encompassing these four priority sites.

# 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 was also introduced into the Rio Grande near Big Bend, Texas, in December 2008 as an experimental, non-essential population under section 10(j) of the ESA. 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/Threats to Survival* 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 1ºC (35ºF) and less than 30ºC

(85ºF) 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 1995a, 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 1995a) 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 30ºC water hatched in approximately 24 hours while eggs reared in 20-24ºC 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 miles 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.

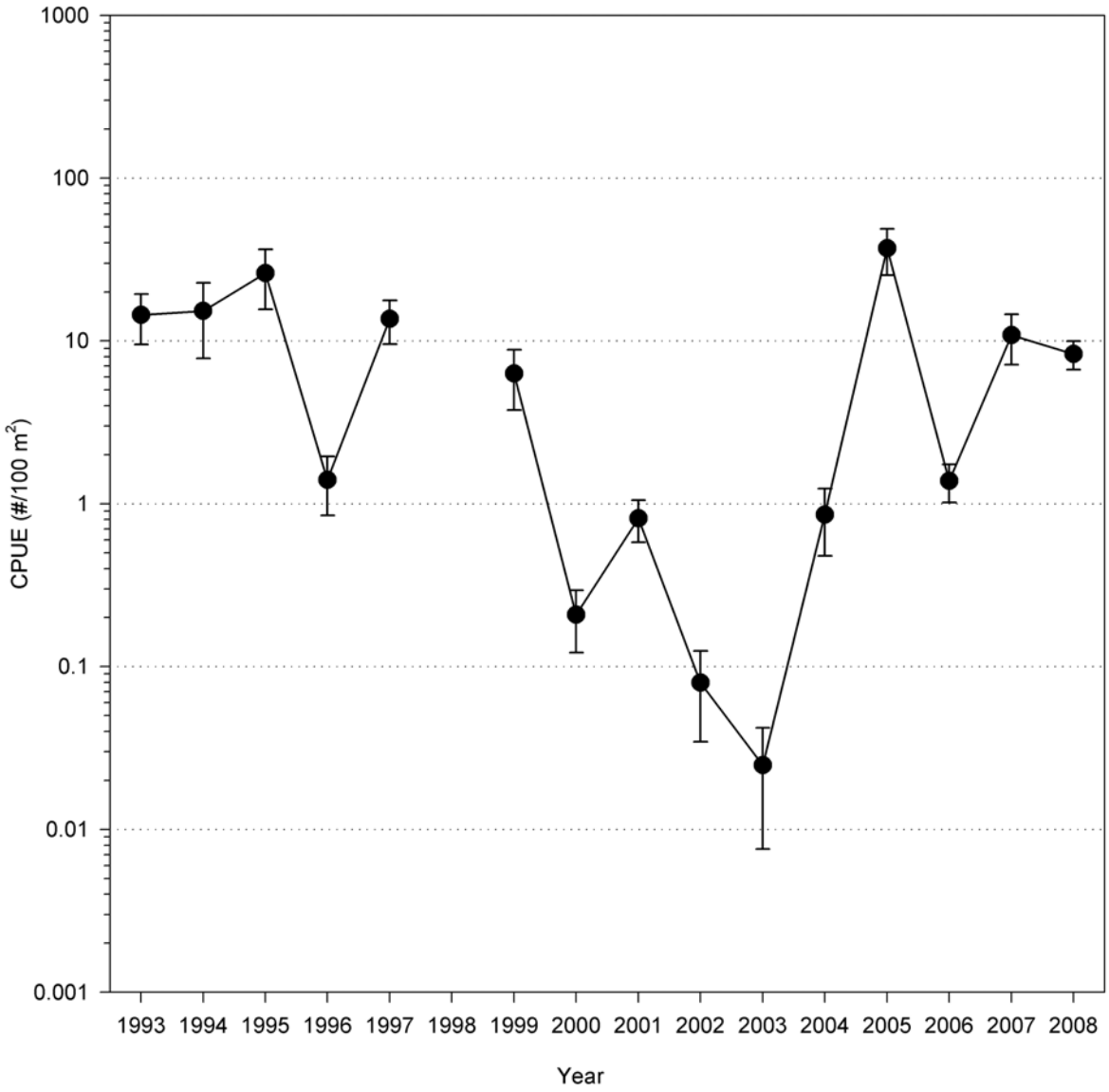
Platania (1995a) found that a single female in captivity could broadcast 3,000 eggs in eight hours. Females produce 3 to 18 clutches of eggs in a 12-hour period. The mean number of eggs in a clutch is approximately 270 (Platania and Altenbach 1998). In captivity, silvery minnows have been induced to 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 seven percent of its historic range. The action area occurs in the Cochiti Reach of the Middle Rio Grande (defined as the reach between Cochiti Dam and the Angostura Diversion Dam). The silvery minnow has not been documented in the Cochiti Reach since 1994 (Platania 1995b), but recent systematic survey data are not available in this location. The reach is considered part of the current range of the silvery minnow, which may be present at low densities.

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

**Figure 1. Rio Grande Silvery Minnow Population Trends 1993-2008 based on October CPUE data.**




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 that 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 and the majority of 2009. However, no recent survey data are available from the Cochiti Reach, which encompasses the action area for this consultation. 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 1; page 15). Population size is highly correlated with hydrologic conditions, particularly the magnitude and duration of the spring runoff (Dudley and Platania 2008b). 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.

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 Patterns

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, densities 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 2007a) 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 2007a). 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 2007a).

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.

Changes in Hydrology

There have been two primary changes in hydrology as a result of the construction of dams on the Rio Chama and Rio Grande that affect the silvery minnow: (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 that 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 several facilities in New Mexico including the Dexter Fish Hatchery, the Service's New Mexico Fish and Wildlife Conservation Office (FWCO)[1], 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, and in New Mexico at the New Mexico State University Coop Unit (Las Cruces) and the ISC Los Lunas Refugium; however, there are no active spawning programs at these facilities.

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 FWCO since 2002 under a formal augmentation effort funded by the Middle Rio Grande ESA 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 New Mexico FWCO 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

[1] Formerly the New Mexico Fishery Resources Office (NMFRO)

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 2007a; 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 2007a). 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 2007a). 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.

<u>10(j) Experimental Population</u>

In December 2008, silvery minnows were introduced into the Rio Grande near Big Bend, Texas as a nonessential, experimental population under section 10(j) of the ESA (73 FR 74357). Preliminary monitoring is being conducted to determine the success of that reintroduction.

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.

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 (U.S. Fish and Wildlife Service 2001, 2003a). 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.

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.

The Service has conducted numerous section 7 consultations throughout the Middle Rio Grande basin that evaluated impacts to the silvery minnow. Examples of recent consultations within the Cochiti Reach include the following:

- In 2009, 2008, 2007, and 2006 the Service consulted with Reclamation on four different habitat restoration projects located on the Santo Domingo Pueblo. In all four consultations, the Service concurred with Reclamation's determination that the project "may affect, is not likely to adversely affect" the silvery minnow. No "take" of listed species was expected.
- In 2008, the Service consulted with the Bureau of Indian Affairs (BIA) on a bridge rehabilitation project on the Pueblo of San Felipe (Bridge M101 on BIA Route SP85).

The Service concurred with Reclamation's determination that the project "may affect, is not likely to adversely affect" the silvery minnow. No "take" of listed species was expected.

- In 2007, the Service completed consultation with Reclamation on a bosque restoration project located on the Pueblo of San Felipe. The Service concurred with Reclamation's determination that the project "may affect, is not likely to adversely affect" the silvery minnow. No "take" of listed species was expected.
- In 2007, the Service consulted with Reclamation on a river maintenance project (Cochiti Priority Site Project) located on the Pueblo of Cochiti, and concurred with a determination of "may affect, not likely to adversely affect." No "take" of listed species was expected.
- In 2005, the Service consulted with the BIA on a bridge replacement project on the Pueblo of Santo Domingo. The Service concurred with Reclamation's determination that the project "may affect, is not likely to adversely affect" the silvery minnow. No "take" of listed species was expected.

**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 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 regulation 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 the silvery minnow in other parts of its 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 encompassing all four priority sites (located at RM 215.5, 214.7, 214.3, and 212.0). The silvery minnow has not been documented in the Cochiti Reach since 1994 (Platania 1995b), which includes the action area for this consultation. Recent population data are not available at or near the action area; however, the reach is considered part of the current range of the silvery minnow, and the species is expected to be present at low densities during the proposed action given the temporal and spatial scale of the proposed in-water work.

We expect the proposed action may generate adverse effects on silvery minnows as a result of construction of the proposed river maintenance structures, and proposed river crossings by equipment to access work sites. Although post-construction monitoring will be conducted several times per year for up to five years, this monitoring will be conducted in the dry and no effects on the silvery minnow are expected. If any in-water work is needed during monitoring efforts, further consultation may be necessary.

Short-term adverse effects on silvery minnows are expected due to disturbance during construction and river crossings. Conservation measures implemented during the construction and river crossings – including BMPs for equipment operation, re-fueling, and spill prevention measures – are expected to minimize the risk of effects on silvery minnows. However, we expect silvery minnows may be present during these activities and 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, and given the operating speed of equipment we do not expect fish will be directly injured or their movement impeded by the equipment. 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 should be minimized, as we expect an initial flight response at the onset of activities, and sustained avoidance during the duration of construction work at each priority site. We expect the sustained avoidance response will also minimize the risk of repeated harassment of individuals at each treatment site over the course of construction, especially given the limited area and the presence of berms and working platforms that will divert flows and minimize in-water work during construction. In addition, the applicable work window with no in water activities in May and June (runoff) will help minimize adverse effects on pre-spawn and spawning adult silvery minnows, as well as YOY during early growth. Given the mobility of silvery minnows, the limited area affected, and the timing of the proposed in-water activities, 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, reduced 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., water quality monitoring). In addition, the increase in turbidity is expected to be a small contribution relative to the sediment load the river already carries. For example, placement of the temporary berm will generate a localized impact to water quality; however, the effects due to increased turbidity will be localized, will diffuse rapidly downstream, and can be considered similar in scale to ongoing arroyo or bankline erosion (H. Garcia, Reclamation pers. comm.). As a result, 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.

Given our assessment of anticipated effects on silvery minnows, and the available information on in-water area disturbed for each activity (see Table 2), we expect silvery minnows will be affected by river maintenance construction over a total area of 29.6 acres (119,787 $m^2$). We also expect river crossings will affect silvery minnows over a total area of 33.6 acres (135,974 $m^2$).

Given the lack of population survey data in this reach, the number of silvery minnows that may be harassed due to construction and river crossings cannot be determined, but is expected to be low based on our expectation that minnows occur in low densities in this reach.

**Effects on Critical Habitat**

Some of the primary constituent elements of silvery minnow critical habitat will be adversely affected by the proposed action. Specifically, the proposed action maintains a bankline which has confined the channel, increased water velocities and prevented the formation of backwaters, embayments and other slow velocity habitat in the project area. This habitat is necessary for development and hatching of eggs and the survival of the species from larvae to adult. Low-velocity habitat provides food, shelter, and sites for reproduction, which are essential for the survival and reproduction of Rio Grande silvery minnow. In addition, the proposed action may temporarily affect water quality within the anticipated disturbance zone. Specifically, the proposed action will disturb sediment due to equipment operation, river crossings, and placement of materials in the channel. This may temporarily adversely affect water quality within the anticipated disturbance zone.

However, 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. The area affected is expected to be minimized due to project design and conservation measures in place during the proposed action (e.g., water quality monitoring, construction BMPSs) that will restrict this disturbance and minimize the risk to PCEs of 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 Pueblo de San Felipe Priority Sites Phase I Project in the Cochiti Reach of the Middle Rio Grande, as proposed by Reclamation in the September 2009 BA and subsequent correspondence, 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 Cochiti 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 activities.

We found that the proposed action has the potential to cause adverse effects to designated critical habitat for the silvery minnow. 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 consultation with 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 the applicant so that they become binding conditions of any Federal 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 Reclamation's Pueblo de San Felipe Priority Sites Phase I Project in the Cochiti Reach will be implemented as proposed. Take of silvery minnows is expected in the form of harassment due to the proposed river maintenance activities, and is restricted to the action as proposed. If actual incidental take meets or exceeds the predicted level, Reclamation must reinitiate consultation.

Based on the best available information concerning the silvery minnow, the habitat needs of this species, the project description, and information furnished by Reclamation, take is considered likely for the silvery minnow during the proposed action. Nevertheless, because of the low density of this species in the action area, the lack of recent data on species presence, the difficulty of detecting harassment of a small fish underwater, and the expectation that no other form of take will occur (e.g., no mortalities or injuries that might be more detectable), it is not possible to estimate the number of individuals that will be taken with implementation of this

project. Based upon the proposed project, it is estimated that harassment of silvery minnows will occur in occupied habitat over a footprint of approximately 63.2 acres (255,761 $m^2$). Although we expect a low likelihood of minnow presence due to low densities in the action area, we anticipate that some individual silvery minnows will be taken in the form of harassment within this footprint.

The Service notes that this represents a best estimate of the extent of take that is likely during the proposed action. Thus, estimated incidental take may be modified from the above should population monitoring information or other research indicate substantial deviations from the estimated extent of incidental take, or if it allows for a calculation of the amount of take that will occur. In this case further consultation may be necessary.

**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 river maintenance 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.

**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 the proposed river maintenance activities.

2. Continue to work collaboratively with the Service on the Middle Rio Grande Endangered Species Act 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 (RPMs) described above. These terms and conditions are non-discretionary.

To implement RPM 1, Reclamation shall:

1. Ensure that all river maintenance work is conducted within the timeframes described in this biological opinion, including no in-water work during spring runoff (May and June).
2. Ensure that conservation measures described in this biological opinion are implemented, including those pertaining to equipment and operations, staging and access, dust abatement, 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 findings of injured or dead silvery minnows.

5. Report to the Service the results of all monitoring efforts, including the results of fisheries and vegetation monitoring.
6. Monitor the implementation of RPM1 and associated Terms and Conditions.

To Implement RPM 2, Reclamation shall:

1. Work to further conduct habitat/ecosystem restoration projects in the Middle Rio Grande to benefit the silvery minnow.

## 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. Pursue population surveys for silvery minnow in the Cochiti reach
2. Encourage adaptive management of flows and conservation of water to benefit listed species.
3. 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 September 2009 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-0089. 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.

for Wally Murphy

cc:
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