United States Department of the Interior

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Memorandum mike:

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 Wally

Subject: U.S. Fish and Wildlife Service's Biological Opinion and Conference on the Effects of the Albuquerque Bernalillo County Water Utility Authority's San Juan-Chama Drinking Water Environmental Mitigation Project

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) on the effects of the action described in the biological assessment (BA) for the San Juan-Chama Drinking Water Environmental Mitigation Project within the Albuquerque Reach of the Middle Rio Grande. The project is proposed by the Albuquerque Bernalillo County Water Utility Authority (Water Utility Authority), and was identified as a conservation measure in the 2004 BO issued to the U.S. Bureau of Reclamation (Reclamation) for the City of Albuquerque Drinking Water Project (Cons. # 22420-2003-F-0146). Reclamation is the lead federal agency for this proposed project and the Water Utility Authority is its non-federal representative. This BO analyzes the effects of the action on the endangered Rio Grande silvery minnow, *Hybognathus amarus,* (silvery minnow) and its designated critical habitat, the endangered southwestern willow flycatcher, *Empidonax traillii extimus*, (flycatcher), and the candidate yellow-billed cuckoo, *Coccyzus americanus*, (cuckoo). The restoration project will be located along 1.5 miles (2.41 km) of the Rio Grande in northwest Albuquerque, directly upstream and downstream of the Paseo del Norte Bridge crossing in Bernalillo County, New Mexico. 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 July 24, 2012.

This BO is based on information submitted in the BA dated July 2012; conversations and communications between Reclamation, the Water Utility Authority, 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.

Yellow-Billed Cuckoo

Reclamation has determined the proposed project is "not likely to jeopardize" the yellow-billed cuckoo. We concur with this determination for the reasons described below.

The cuckoo is a migrant through this portion of the Rio Grande and may be present from April through August. Suitable nesting habitat does not currently exist within the project area, and despite regular surveys, nesting has not been observed within the Albuquerque Reach of the Rio Grande since 1997 when cuckoos were documented in the Rio Grande State Park (Stahlecker and Cox 1997). Migrating cuckoos could still be disturbed by construction activities, the clearing of woody vegetation, planting of native vegetation, and mechanized seeding in the action area; however, construction, planting, and vegetation clearing will not occur during the timeframe when cuckoos could be present (April 15 to August 15), and mechanized seeding will not occur if breeding cuckoos are present. If vegetation planting in anticipated within this timeframe, the Water Utility Authority and Reclamation will coordinate with the Service ahead of time to avoid any impacts to cuckoos. Thus, as suitable nesting habitat does not currently exist within the project area, and construction activities will not occur during cuckoo migration, we expect that direct effects on cuckoos are discountable.

Although long-term goals of the proposed action include improved cuckoo habitat, short-term indirect effects on cuckoos are possible from the removal of any vegetation that represents suitable migratory-stopover habitat. Loss of this vegetation will be temporary, however, and restoration efforts are expected to facilitate improved cuckoo habitat in the future. Indirect effects of vegetation removal are considered insignificant because vegetation in the action area does not currently support cuckoo breeding territories. In addition, conservation measures will be implemented to minimize potential effects on vegetation in the action area. These include avoiding the clearance of dense woody vegetation, efforts to minimize damage to native vegetation, and using existing roads and cleared staging areas. Thus, indirect effects on cuckoos from removing vegetation are considered insignificant in the short-term, and beneficial through restoration of cuckoo habitat in the long-term. No take of cuckoos is expected from the proposed project, however please refer to the Incidental Take Statement and Reinitiation Triggers for this project for additional information once this species is listed.

Southwestern Willow Flycatcher

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

The flycatcher is a migrant through this portion of the Rio Grande and may be present from April through August. Suitable nesting habitat does not currently exist within the project area, and although migrating flycatchers could still be disturbed by construction activities, the clearing of woody vegetation, planting of native vegetation, and mechanized seeding in the action area, construction, vegetation clearing, and planting will not occur during the timeframe when flycatchers could be present (April 15 to August 15), and mechanized seeding will not occur if breeding flycatchers are present. If vegetation planting is anticipated within this timeframe, the Water Utility Authority and Reclamation will coordinate with the Service ahead of time to avoid any impacts to flycatchers. Thus, as suitable nesting habitat does not currently exist within the project area, and construction activities will not occur during flycatcher migration, we expect that direct effects on flycatchers are discountable.

Although long-term goals of the proposed action include improved flycatcher habitat, short-term indirect effects on flycatchers are possible from the removal of any vegetation that represents suitable migratory-stopover habitat. Loss of this vegetation will be temporary, however, and restoration efforts are expected to facilitate improved flycatcher habitat in the future. Indirect effects of vegetation removal are considered insignificant because vegetation in the action area does not currently support flycatcher territories and there has been extensive mortality of willow vegetation within the last year. In addition, conservation measures will be implemented to minimize potential effects on vegetation in the action area. These include avoiding the clearance of dense woody vegetation, efforts to minimize damage to native vegetation, and using existing roads and cleared staging areas. Thus, indirect effects on flycatchers from removing vegetation are considered insignificant in the short-term, and beneficial through restoration of flycatcher habitat in the long-term.

Given the conservation measures in place during the proposed restoration project, anticipated effects to the cuckoo and flycatcher from the proposed action are insignificant and discountable. There is no designated critical habitat for the flycatcher within the action area. The remainder of this biological opinion will deal with the effects of implementation of the proposed action on the silvery minnow and its designated critical habitat.

Consultation History

On February 13, 2004, the Service issued a biological opinion to Reclamation on the *Effects of Actions Associated with the Programmatic Biological Assessment (BA) for the City of Albuquerque Drinking Water Project* (2004 BO) (U.S. Fish and Wildlife Service 2004). The 2004 BO concurred with the determination that the proposed action may affect, is not likely to adversely affect the bald eagle and the flycatcher, and concluded that the proposed action is not likely to jeopardize the continued existence of the silvery minnow and will not adversely modify its critical habitat. The 2004 BO contains several conservation measures to minimize adverse effects to the silvery minnow, which include the creation and restoration of habitat within the vicinity of the project area, to be implemented by the Water Utility Authority. Coordination meetings between the Water Utility Authority and the Service regarding the implementation of these habitat restoration conservation measures were held on March 18, 2010, August 12, 2010, and March 23, 2012.

On July 24, 2012, the Service received a final BA from Reclamation on a proposed habitat restoration project to address some of the conservation measures in the 2004 BO. The BA requested formal consultation on the effects of the project on silvery minnow and flycatcher and also a conference on effects to the cuckoo. On August 29, 2012, the Service sent a letter to Reclamation requesting additional information needed to initiate formal consultation and conference. Reclamation responded with the required information on September 21, 2012 and changed the effects determination for the flycatcher to a 'not likely to adversely affect" determination and request for informal consultation. On November 16, 2012, the Service provided a draft BO to Reclamation for review. This BO is tiered off Reclamation's 2004 BO on the *Effects of Actions Associated with the Programmatic Biological Assessment (BA) for the City of Albuquerque Drinking Water Project*.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

Overview

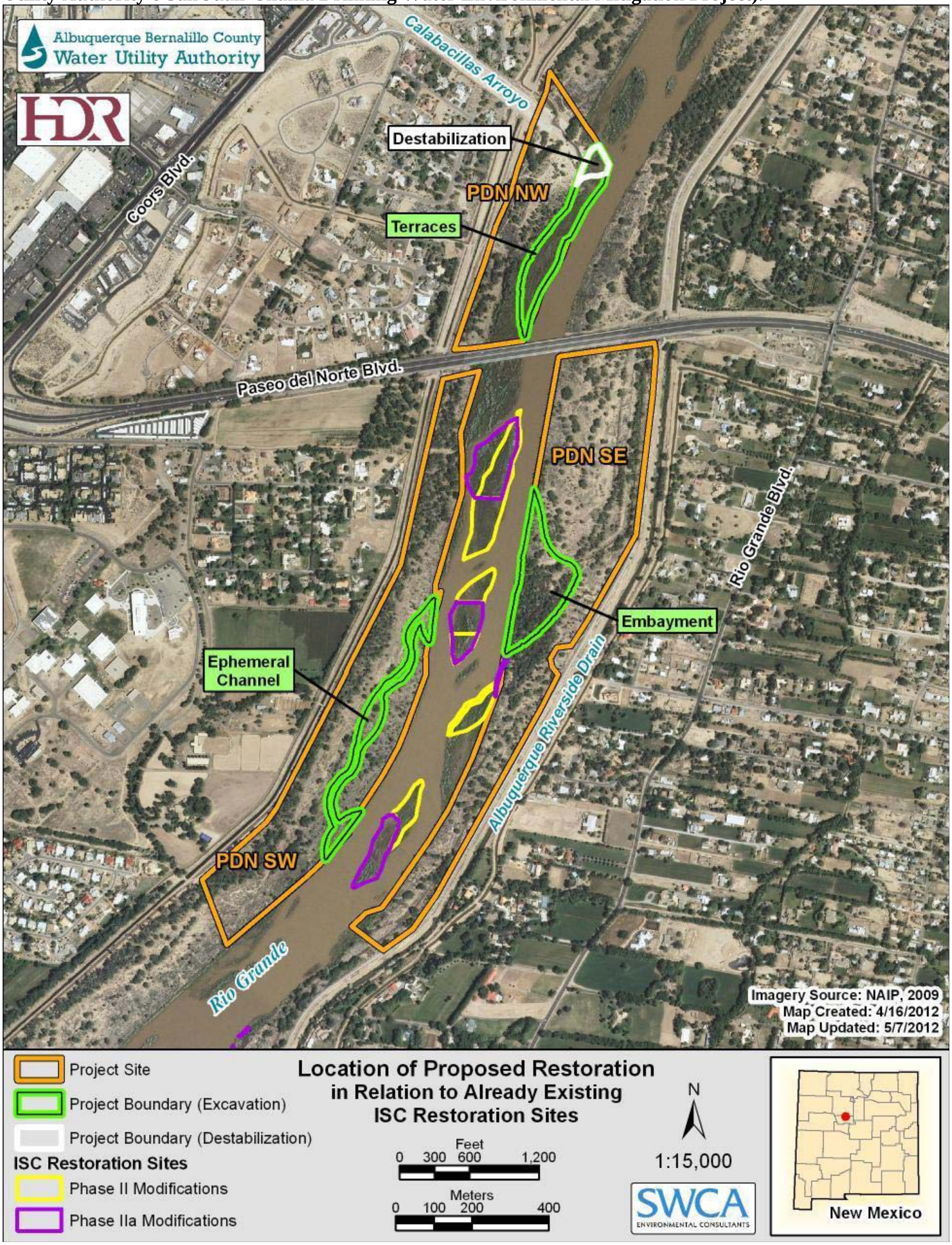
The San Juan-Chama Drinking Water Environmental Mitigation Project would apply habitat restoration techniques within the Albuquerque Reach of the Middle Rio Grande at three sites collectively referred to as the Paseo del Norte (PDN) Site Grouping. The PDN Site Grouping represents the Water Utility Authority's selection of preferred sites to meet the conservation measures detailed in the 2004 BO for the City of Albuquerque Drinking Water Project, and to meet the environmental mitigation requirements stipulated in Reclamation's National Environmental Policy Act (NEPA) Record of Decision for the City of Albuquerque Drinking Water Project. The proposed action consists of habitat restoration treatments designed to mechanically promote inundation of designed river features to provide habitat for all life stages of the silvery minnow, with a secondary goal of improving riparian habitat for the flycatcher.

The Water Utility Authority plans to implement the habitat restoration work, with a federal nexus established through authorization from Reclamation. Construction is expected to begin in the fall of 2012 (or once environmental compliance is completed) and is expected to be completed by April 2014. Post-construction revegetation activities will continue through completion by December 2015. Monitoring of project performance and success is expected for five years following construction. The proposed activities, with the exception of seeding, will not be conducted between April 15 and August 15 of any year.

Project Location

The proposed action will occur at three treatment sites located in the northwest quadrant of Albuquerque immediately upstream and downstream of the Paseo del Norte Bridge crossing in Bernalillo County, New Mexico (see Figure 1, next page). These sites are approximately 0.81 miles (1.30 km) downstream of the San Juan-Chama Drinking Water Project. The project area encompasses approximately 161.29 acres and extends 1.5 miles along the Middle Rio Grande between River Miles (RM) 189.8 and 191.3. The three treatment sites are named for their location relative to the Paseo del Norte Bridge crossing: PDN NW, PDN SW, and PDN SE. The selection of the PDN site grouping builds upon previous restoration projects implemented by other entities in the project area, including the New Mexico Interstate Stream Commission's Middle Rio Grande Riverine Restoration Project Phase I (completed in April 2006), Phase II (completed in April 2007), and Phase IIa along the PDN subreach.

Figure 1. Proposed restoration sites (source: July 2012 BA for the Albuquerque Bernalillo County Water Utility Authority's San Juan-Chama Drinking Water Environmental Mitigation Project).



Proposed Restoration Treatments

The conservation measures identified in the 2004 BO for the City of Albuquerque Drinking Water Project include goals and objectives for non-native vegetation clearing; floodplain expansion through removal of jetty jacks, channel widening and destabilization; terrace lowering to re-establish floodplain hydraulic connectivity; and construction of ephemeral (high flow) side channels. The treatments proposed for this habitat restoration project are intended to meet all of these goals and objectives. Specifically, these proposed treatments involve the destabilization of the mouth of Calabacillas Arroyo through saltcedar removal using an excavator to mechanically remove vegetation including root wads, the modification of an attached bank south of Calabacillas Arroyo on the west side of the river to create a terrace, the widening of the river channel and enhancement of habitat heterogeneity at lower flows through the creation of terraces, the construction of one ephemeral channel with embayments at the inlet and outlet downstream of the Paseo del Norte Bridge on the west side of the river, the construction of an embayment at the mouth of an old, inactive wastewater channel on the east side of the river, and the removal of non-native vegetation especially where the embayment will be constructed on the east side of the river. Treatment areas are represented in Figure 1. The execution of the proposed restoration techniques are expected to promote silvery minnow egg retention, provide nursery habitat for developing larvae, create refugial habitat for silvery minnow, increase flycatcher, cuckoo, and migratory bird breeding and migratory habitat, increase diversity of the riparian ecosystem, and enhance the hydrologic connectivity between the floodplain and river channel. Table 1 provides a summary of the restoration treatments in wetted areas and includes the acreage affected and duration of restoration treatments. Information in Table 1 is based on the July 2012 BA and subsequent correspondence from Reclamation.

Table 1. Proposed Restoration Treatments by Site and Wetted Area Affected (from July 2012 BA).

Wetted Restoration Treatments	Impact Area (acres)[1]	Duration
PDN NW		
-Terraces (2)	4.4 acres	5 days
PDN SW		
-Ephemeral channel	2.475 acres	3 days
-Backwater embayments (3)*	0.825	2 days
PDN SE		
-Backwater embayment	4.4 acres	5 days
-Removal of lateral confinements**	4.4 acres	5 days
Total	**12.1 acres**	

1- Wetted impact acreage includes a 10% buffer to encompass the anticipated disturbance zone.
* Embayments at the PDN SW site are located at the inlet, outlet, and interior of the ephemeral channel feature.
** Removal of lateral confinements will be conducted in the footprint of the backwater/embayment treatment at the PDN SE site, therefore this acreage (4.4 acres) is not reflected in the total wetted impact area.

Terraces

This restoration technique involves lowering the river bank through the removal of vegetation and the excavation of soils to increase the potential for overbank flooding along banklines and bank-attached bars. Bankline terraces would be created in areas where the removal of naturally formed berms would increase inundation in the overbank areas. The terraces created would provide for inundation at flows of 1,500 and 2,500 cfs, increasing the frequency and duration of inundation, and will be constructed with a slight slope towards the river, allowing water to drain back to the river and minimizing entrapment of silvery minnows. A barrier berm will be utilized by leaving a portion of the bankline intact so that construction can take place mostly in the dry. Wetted construction will only occur during the removal of the barrier berm along the water's edge to connect the feature to the river channel. These features are expected to provide additional low-velocity habitat for the silvery minnow, resulting in improved egg retention and larval fish development during periods of high flow.

Ephemeral Channels

Ephemeral channels are low-velocity, flow-through channels that are connected to the main river channel. These channels are normally dry but can carry moderate to high discharge flow from the main channel during spring snowmelt and summer monsoon events. These channels carry water at lower velocities than the main channel and may include mesohabitats such as pools and backwaters, with little to no flow. The construction of these features requires the removal of existing vegetation and a cut through the existing river bank, bar, or island to a depth that would allow water to flow at moderate to high flows. For this project, the channel will be constructed with a slight slope towards the river, allowing water to drain back to the river and minimizing entrapment of silvery minnows. A barrier berm will be utilized by leaving a portion of the bankline intact so that construction can take place mostly in the dry. Wetted construction will only occur during the removal of the barrier berm along the water's edge to connect the feature to the river channel. Ephemeral channel construction is expected to create aquatic habitat that is beneficial to the silvery minnow, allowing for egg retention and the development of larvae during periods of moderate to high flows. Ephemeral channels can provide sufficient periods of inundation for larval development and refugia for young silvery minnow, and also promote riparian functionality and interconnectedness.

Backwaters/Embayments

The creation of low to moderate flow backwater and embayment areas would involve the removal of riverbank vegetation and the excavation of soils to prescribed depths. The backwater and embayment areas would slope slightly, with the downstream ends lower in elevation than the upstream ends, serving to increase the amount of habitat opportunities at a range of river flows and allowing water to drain back to the river to minimize the entrapment of silvery minnows. For this project, the backwater feature at the PDN SE site will be terraced, allowing for inundation from 1,000 to 1,500 cfs, and at 2,500 cfs. At both the PDN SW and PDN SE sites, barrier berms will be utilized by leaving a portion of the bankline intact so that construction can take place mostly in the dry. Wetted construction will only occur during the removal of the barrier berms along the water's edge to connect the features to the river channel. This restoration technique is being utilized to increase the amount of shallow, low-velocity habitat areas available to the silvery minnow and is intended to retain drifting silvery minnow eggs, provide nursery habitat for developing silvery minnow larvae during spring runoff, and to create refugial habitat.

Removal of Lateral Confinements (Jetty Jacks)

Concurrent with the creation of the backwater/embayment at the PDN SE site, jetty jacks will be removed in the proposed excavation area to facilitate construction and maintenance. The parallel, bankline jetty jacks will be removed at the mouth of the embayment and one perpendicular, tie-back jetty jack line will also be removed. Removal of these structures will enable the embayment feature to achieve and maintain the inundation targets and function as silvery minnow habitat.

Mechanical Vegetation Removal

Vegetation removal at the mouth of Calabacillas Arroyo would involve the use of an excavator fitted with an extraction bucket to mechanically remove vegetation including root wads. This restoration treatment is being utilized to destabilize the mouth of the arroyo as the vegetation that is present is hardening the bankline and narrowing the river channel. The anticipated benefits of this technique include improving the geomorphic conditions through widening the channel (by allowing fluvial processes to redistribute sediment), and creating habitat heterogeneity for the silvery minnow to provide for shallow water habitat at river discharges greater than 1,500 cfs.

In addition to the destabilization at the mouth of Calabacillas Arroyo, non-native vegetation removal would be conducted throughout the remainder of the project area, including inside the excavation footprint of the other restoration treatments (terraces, ephemeral channel, and backwater/embayments). Non-native vegetation removal will consist of removing saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolia*), Siberian elm (*Ulmus pumila*), and any other non-native species encountered. Within excavation footprints, the vegetation may be removed using an excavator fitted with an extraction bucket to mechanically remove vegetation including root wads or bull-dozed over during excavation. Outside the excavation footprint, mechanical means will be employed to remove all biomass, or mastication will be used to grind up and chip standing biomass. Mechanical methods may involve root-plowing/raking using a bulldozer, mowing, chainsaw, or extraction. The root-plowing/raking method would be limited to areas where on-site sediment disposal is expected to take place. Vegetation that is removed via the extraction or root-plowing/raking methods will be hauled off-site. Any chipped or masticated material will be removed or scattered at a depth not to exceed 3 inches.

Revegetation

Any disturbance areas outside of the excavation footprint will be revegetated. Poles and stem cuttings will be planted during the dormant season (January – March). Coyote willow (*Salix exigua)* stems may be planted while excavating the embayment using an excavator to dig a trench and backfilling, or by using a hand power auger. This species is also expected to establish itself through natural regeneration processes. Cottonwood (*Populus deltoides ssp wizlenii*) and tree willow species such as Gooddings willow (*Salix gooddingii)* may be planted using a tractor, backhoe, front-end loader, or similar, equipped with a 10’ hydraulic auger. Other riparian shrubs may be planted using a hydraulic or hand auger, or by hand. Planting is planned for outside of the migratory bird season (April 15 – August 15), however if any planting is anticipated between April 15 and August 15, the Water Utility Authority and Reclamation will coordinate with the Service ahead of time to avoid any impacts to migratory birds, including flycatchers and cuckoos. All planting in excavated areas will occur in the dry, prior to inundation.

A mix of native grasses, forbs, and sedges will also be seeded. Seeding would involve the use of mechanized equipment to stabilize sediment disposal sites, which will be bare of vegetation. Seeding may be done by hand, however it is labor intensive and does not usually yield satisfactory results over large areas. Planting large acreages is more efficient and effective if a mechanized planting method is used, such as an imprinter, seed drill, or broadcast seeder that are towed with a tractor. Seeding in the arid southwest is best completed in early summer, just prior to the onset of the monsoon season. As mechanized seeding is anticipated to occur between April 15 and August 15, the Water Utility Authority and Reclamation will ensure a migratory bird survey is conducted to avoid impacts to breeding migratory birds, including flycatchers and cuckoos. The survey will be conducted immediately prior to seeding in the areas used for access, seeding, and any other areas that could be impacted by the seeding activity. No mechanized seeding activity will take place if breeding birds are detected.

Equipment, Staging, and Access

The equipment that is necessary for construction may include, but is not limited to, land-based equipment such as graders, scrapers, loaders, excavators with extraction buckets, bulldozers and dump trucks. The use of low-impact amphibious equipment is not proposed as land-based equipment will be used to excavate strictly in the dry behind barrier berms along the water's edge. Work conducted in the wet will be associated with the removal of the barrier berms to connect the feature to the river channel. Cut material, sediment spoils, and debris will be hauled away for commercial use or to the nearest landfill, or spread and graded evenly outside of the construction footprint, in open areas not susceptible to overbank flooding at flows of up to 6,000 cfs. Access routes for construction and maintenance for all three treatment sites are readily available through existing levee roads and therefore would not require any improvement. No river crossings are anticipated. Efforts will be made to minimize damage to native vegetation and construction would occur outside the flycatcher breeding season. In addition, the following safety precautions and construction specifications will be followed to ensure that all habitat restoration activities are safely implemented.

- Equipment operation would minimize sediment displacement by river flow.
- Dirt berms, straw bales, silt fences, silt curtains or other appropriate material will be placed at strategic topographic locations to prevent discharge of storm water runoff to the river in accordance with the NPDES storm water permit and plan.
- Each individual operator will be briefed on and will sign off on local environmental considerations specific to the Project tasks, including specific Stormwater Pollution Prevention Plans (SWPPPs).
- The use of silt fencing or other erosional controls, the use of properly inspected construction equipment clean and free of leaks or defects and others identified as needs, will be enforced to minimize potential impacts to silvery minnow from direct construction impacts and erosional inputs in to the river during construction periods.
- An onsite environmental monitor will be used during all construction activities to insure compliance.

- Prior to leaving contractor facilities, all equipment would be thoroughly inspected, and any leaky or damaged hydraulic hoses would be replaced. Hydraulic lines will be checked each morning for leaks and periodically throughout each work day.
- All fueling will take place outside the active floodplain. All fuels, hydraulic fluids, and

other hazardous materials will be stored outside the active floodplain.

- 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 river overnight, on weekends, and holidays.
- Spill protection kits will be onsite, and operators will be trained in the correct deployment of the kits.
- Steel-mesh guards will cover all external hydraulic lines.
- Water quality parameters will be monitored at and below areas of river work before and during the work day (see Water Quality on pages 13-14).
- Vegetation removal during the proposed action will be done using mechanical techniques. No herbicides or chemicals will be applied during the project.

Monitoring and Maintenance

In addition to the environmental commitments above, the Water Utility Authority also commits to monitoring project performance and success for a period of five consecutive years following construction. Project performance and success will be assessed using three types of monitoring similar to other habitat restoration projects on the Middle Rio Grande. The first type of monitoring is geomorphic, and pre-construction geomorphic surveys (cross-sections) have already been completed by the Water Utility Authority. During construction, project plans will be annotated regularly to reflect changes. When construction is complete, the planform and cross sections will be mapped prior to inundation. Post-construction mapping of cross-sections will then be completed each year following the spring flood season. Mapping will not be to construction survey standards, but will provide adequate data to monitor geomorphic changes. The second type of monitoring is hydrologic, during which the depth of water in the side channels will be measured during the spring flood season (April through early June). The extent of inundation along the modified bankline will also be monitored during the spring flood season by measuring distance to the waterline from a static point in the floodplain. The third type of monitoring will consist of characterizing vegetation species cover and abundance within the project area and an assessment of planting success. Vegetative transects will be used to characterize species cover and abundance, including re-vegetated areas, measuring the age classes and species of trees, and measuring the understory species and abundance. Assessments of woody plantings (e.g. coyote willow and cottonwood) will include estimating the number of surviving stems following the first growing season and again following the second growing season. Two seasons should be sufficient for assessing planting success.

In addition, the Water Utility Authority, or appropriate ESA permit holder, will conduct monitoring for potential entrapment post-construction at the high flow channel, terraces, and backwater/embayment created. After two years, it may be determined in coordination with the Service that further monitoring is unnecessary. A thorough visual examination of the sites will be conducted to look for the presence of isolated pools. This includes isolated pools of any depth where potential entrapment may have occurred. The following protocol will be used:

1. Monitoring for silvery minnow entrapment in restored features will occur following peak/secondary runoff, and after large rainfall/monsoons and related runoff events.

2. Monitoring at restored features will start when discharge on the descending limb of the hydrograph approaches 0-300 cfs, or 10% of a site-specific target inundation.
3. Monitoring at restored features will be done a minimum of twice weekly. Best judgment will be used to determine the appropriate frequency above this minimum, as well as the appropriate time of day to conduct monitoring based on conditions at the restored feature.
4. Monitoring will be conducted until such time as (a) the site is dry, (b) all silvery minnows are removed from the isolated pool, or (c) flows increase such that the isolated pool becomes reconnected to the main channel.
5. If isolated pools occur at restored features that may contain silvery minnows, a permitted fisheries biologist will lead the effort to seine these pools and determine (a) the presence or absence of silvery minnows, and (b) the potential number present. Seining will only be conducted in these isolated pools, and not in areas that have the potential to become isolated but are not yet disconnected from the river. Silvery minnows collected during seining of isolated pools will then be released into continuous parts of the river.
6. Species identification, standard length, reproductive condition, and health condition of fish will be recorded to the extent possible. Species counts will be maintained for all collections separately for each pool. A handheld global positioning system (GPS) unit with sub-meter accuracy will be used to record pool locations. Any dead silvery minnows will be initially preserved in 10% formalin and then transferred to a 5% buffered solution for eventual museum accession.
7. The findings from this monitoring program for the Water Utility Authority's mitigation project will be reported to Reclamation within three months of the final yearly monitoring event, and will then be submitted to the Service once a year, including all accounts of silvery minnows found in isolated pools (whether dead or alive) and their condition.
8. If silvery minnow take is met or exceeded in these isolated pools at the restored features, the Service will be contacted before continuing with further silvery minnow monitoring activities.

Post construction monitoring will also determine the need for maintenance of the restoration features, specifically the inlet and outlet of the side channels. There is also some likelihood that repeat treatment of exotics may be required, which would involve mowing of any non-native species. Any maintenance work that is required will be conducted during the work window between August 15 and April 15. Any maintenance work for wetted restoration features will be conducted in the dry during the work window when the channels are not connected to the main channel.

Project Implementation Timing and Sequencing

Project implementation will commence once compliance is obtained and continue through December 2015. Specifically, construction activity (excavation and vegetation removal) will proceed from the fall of 2012 (or when compliance is completed) to April 15, 2013. If all 3 sites cannot be completed by the April 15 deadline, then work would resume the following fall with final completion expected no later than April 2014. The expected length of construction for the

PDN NW site is 3.5 weeks, 6 weeks for the PDN SE site, and 4 weeks for the PDN SW site. An additional 1.5 weeks is expected for the removal of barrier berms created to minimize any wetted construction. Overall, construction time for the entire project is not expected to last beyond 15 weeks. No excavation activity or vegetation removal would occur between April 15 and August 15 of any year. If vegetation is removed 2 weeks prior to April 15 or 2 weeks after August 15 of any year, the Water Utility Authority will coordinate with the Service and conduct additional migratory bird surveys. Revegetation will take place at the appropriate time to ensure maximum planting success and may continue until December 2015. Pole and stem cutting planting techniques, commonly used for cottonwood, Gooddings willow, and coyote willow, must be completed during the dormant season, generally before March 15. Potted material, such as riparian shrubs, may be planted throughout the spring or in early fall. Planting of potted material is planned for outside of the migratory bird season (April 15 – August 15), however if any planting is expected to occur between April 15 and August 15, the Water Utility Authority and Reclamation will coordinate with the Service ahead of time to avoid any impacts to migratory birds. Areas to be seeded with grasses and forbs will have the greatest chance of success if planted in late June – early July at the onset of the monsoon season as this offers the greatest likelihood of adequate precipitation required for germination and seedling survival. As mechanized seeding is anticipated to occur between April 15 and August 15, the Water Utility Authority and Reclamation will ensure a migratory bird survey is conducted to avoid impacts to breeding migratory birds. The survey will be conducted immediately prior to seeding in the areas used for access, seeding, and any other areas that could be impacted by the seeding activity.

Environmental Commitments

Measures will be implemented during the proposed action to help minimize or avoid adverse effects of the restoration projects and to successfully and safely implement all habitat restoration activities. These include the following:

Timing of the Proposed Action

- To avoid direct impacts to migratory birds protected by the Migratory Bird Treaty Act, including the flycatcher and cuckoo, construction, clearing of vegetation, and native vegetation planting will be scheduled between August 15 and April 15, outside the normal breeding season for most avian species. If any planting is expected to occur between April 15 and August 15, the Water Utility Authority and Reclamation will coordinate with the Service ahead of time to avoid any impacts to migratory birds. Seeding of non-vegetated areas during the monsoon season will take place only after breeding bird surveys have been conducted immediately prior. No seeding activities will occur if breeding birds are detected.
- To reduce potential short-term construction impacts to the flycatcher, clearing of dense woody vegetation will be avoided and conducted only between August 15 and April 15. Should vegetation removal be required within two weeks before April 15 or within two weeks after August 15, the Service will be consulted and additional surveys will be conducted if warranted to determine the presence of breeding flycatchers or other breeding birds.

Equipment and Operations

- Best management practices (see pages 9-10) will be followed to minimize potential impacts to silvery minnow from direct construction impacts and erosional inputs into the river during construction periods:
  - Equipment operation would minimize sediment displacement by river flow.
  - Dirt berms, straw bales, silt fences, silt curtains or other appropriate material will be placed at strategic topographic locations to prevent discharge of storm water runoff to the river in accordance with the NPDES storm water permit and plan.
  - Each individual operator will be briefed on and will sign off on local environmental considerations specific to the Project tasks, including specific Stormwater Pollution Prevention Plans (SWPPPs).
  - The use of silt fencing or other erosional controls, the use of properly inspected construction equipment clean and free of leaks or defects and others identified as needs, will be enforced to minimize potential impacts to silvery minnow from direct construction impacts and erosional inputs in to the river during construction periods.
  - An onsite environmental monitor will be used during all construction activities that have the potential for adverse impacts in order to ensure compliance. Also, an environmental monitor will regularly assess other activities to ensure compliance.
  - Prior to leaving contractor facilities, all equipment would be thoroughly inspected, and any leaky or damaged hydraulic hoses would be replaced. Hydraulic lines will be3 checked each morning for leaks and periodically throughout each work day.
  - All fueling will take place outside the active floodplain. All fuels, hydraulic fluids, and other hazardous materials will be stored outside the active floodplain.
  - 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 river overnight, on weekends, and holidays.
  - Spill protection kits will be onsite, and operators will be trained in the correct deployment of the kits.
  - Steel-mesh guards will cover all external hydraulic lines.
  - Water quality parameters will be monitored at and below areas of river work before and during the work day (see Water Quality below).
  - Vegetation removal during the proposed action will be done using mechanical techniques. No herbicides or chemicals will be applied during the project.

Staging and Access

- Impacts to terrestrial habitats will be minimized by using existing roads and cleared staging areas. In general, equipment operation will take place in the most open area available, and all efforts will be made to minimize damage to native vegetation.
- All necessary permits for access points, staging areas, and study sites would be acquired prior to construction activity. Access coordination has begun with the City of Albuquerque Open Space Division. Additional coordination with the Middle Rio Grande Conservancy District, the Albuquerque Metropolitan Arroyo Food Control Authority, and

the New Mexico Department of Transportation will occur as necessary.

Water Quality

- Silt fencing will be installed downstream of work in the water interface. Water quality parameters will be monitored before silt fencing is installed, and the fencing will not be removed until water quality has returned to within 10% of its original measures.
- Water-quality parameters to be tested include pH, temperature, dissolved oxygen, and turbidity, both upstream and downstream of the work area.
- Responses to changes in water-quality measures exceeding the applicable standards would include reporting the measurements to the New Mexico Environment Department (NMED) Surface Water Quality Bureau and returning equipment to shore.
- Clean Water Act compliance is required of all aspects of the project, and since most work associated with the Proposed Action would be completed within aquatic and riparian areas regulated by this law, a 404 permit is required. A state water quality certification permit under Section 401 of the Clean Water Act may also be required, including consultation with the Pueblo of Sandia and the Pueblo of Isleta. The 404 and 401 permitting processes will be completed prior to commencement of the proposed action.
- Stormwater discharges under the Proposed Action will be limited to ground-disturbing activities outside the mean high water mark. All such activities would be evaluated for compliance with National Pollutant Discharge Elimination System (NPDES) guidance, and NPDES permit, or a Stormwater Pollution Prevention Plan.

Dust Abatement

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, if the water levels in the irrigation drains are sufficient for pumping, then the drains will be the source of water for dust abatement. As a last option, 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. This water would likely be pumped at a rate between 1.8 and 2.2 cfs for four to eight minutes to fill a water truck. This equates to a decrease in flows of approximately 0.2% for river flows of 1,000 cfs and approximately 0.1% for river flows of 1,500 cfs for four to eight minutes. A typical project may use four to six truckloads per day and, at a maximum, 18 truckloads per day. This project is expected to use the typical amount (four to six truckloads) or less.

Other Measures

- During construction, project plans will be annotated regularly to reflect any changes. When construction is complete, the planform and cross sections will be mapped prior to inundation. Mapping will not be to construction survey standards, but will provide adequate data to monitor geomorphic changes.
- No herbicides or chemicals will be used to remove/control vegetation.
- All treatment and control areas will be monitored for five years following construction to determine the effectiveness of the proposed restoration work and identify and project-related hydrologic and geomorphic alterations. Long-term monitoring and adaptive

management will be coordinated with the Service.

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 Albuquerque Reach of the Middle Rio Grande. Habitat restoration activities will be conducted specifically in the northwest quadrant of Albuquerque, immediately upstream and downstream of the Paseo del Norte Bridge crossing between RM 189.8 and RM 191.3. For this consultation, the action area is defined as the entire width of the 100-year floodplain of the Rio Grande from RM 189.8 to RM 191.3.

II. STATUS OF THE SPECIES

The proposed action considered in this biological opinion may affect the Rio Grande silvery minnow (*Hybognathus amarus*), which is 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 Rio Grande silvery minnow is one of seven species in the genus *Hybognathus* that is found in the United States (Pflieger 1980). The silvery minnow currently occupies a 280 km (174 mi) stretch 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). This includes a small section of the lower Jemez River, a tributary to the Rio Grande north of Albuquerque. The silvery minnow's current habitat is limited to approximately seven percent of its former range, and is split into four discrete reaches by three river-wide dams. 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). Live specimens are light greenish-yellow dorsally and light cream to white ventrally. The fins are moderate in length and variable in shape, with the dorsal and pectoral fins rounded at the tips. The body is fully scaled, with breast scales slightly embedded and smaller. The scales about the lateral line are sometimes outlined by melanophores, suggesting a diamond grid pattern. The eye is small and orbit diameter is much less than gape width or snout length (Bestgen and Propst 1996). Maximum length attained is about 90 mm (3.5 in) in standard length (SL)[1]. The only readily apparent sexual dimorphism is the expanded body cavity of ripe females during spawning (Bestgen and Propst 1996).

[1] Standard length, or SL, is measured from the tip of the snout to the base of the tail whereas total length or TL, is measured from the tip of the snout to the end of the tail

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 1996). 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 (19 NMAC 33.1), the State of Texas (sections 65.171 – 65.184 of Title 31 T.A.C), and the Republic of Mexico (Secretaria de Desarrollo Social 1994). Primary reasons for listing the silvery minnow are later described 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 (< 40 cm or 15.8 in) braided runs, backwaters, embayments, eddies formed by debris piles, or pools (Dudley and Platania 1997, Watts et al. 2002, Remshardt 2007). 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).

Passively drifting eggs and larvae are found throughout all habitat types, whereas adult silvery minnows are most commonly found in backwaters, pools, and habitats associated with debris piles, and 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 50 cm (19.7 in). Over 85 percent were collected from low-velocity habitats (<10 $cm \cdot s^{-1}$ or 0.33 $ft \cdot s^{-1}$) (Dudley and Platania 1997, Watts et al. 2002). Habitat use also varies seasonally, with preferred summer habitat including pools and backwaters, while preferred winter habitat is found in or adjacent to instream debris piles and associated with deeper water (Dudley and Platania 1996, 1997).

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 252 km (157 mi) from Cochiti Dam in Sandoval County, New Mexico, downstream to the utility line crossing the Rio Grande, a permanent identified landmark in Socorro County, New Mexico just north of Elephant Butte Reservoir and River Mile 62.1. The critical habitat designation defines the lateral extent (width) as those areas bounded by existing levees or, in areas without levees, 91.4 m (300 ft) 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 because specific management plans for the Rio Grande silvery minnow were developed for these Pueblos prior to critical habitat designation (68 FR 8088). 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

Prior to Federal listing, little was known of the life history and ecology of the silvery minnow (Sublette et al. 1990). Most of the following information has been derived from studies undertaken since the mid-1990s and in the Middle Rio Grande where habitat degradation and loss has occurred.

The species is a pelagic spawner that produces 3,000 to 6,000 semi-buoyant, non-adhesive eggs during a spawning event that passively drift while developing (Platania 1995b, 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). In captivity, silvery minnow have been induced to spawn as many as four times a year (C. Altenbach, City of Albuquerque, *pers. comm.* 2000); however, it is unknown if individual silvery minnow spawn more than once per year in the wild or if multiple spawning events suggested during spring and summer represent the same or different individuals.

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 1995b) 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 1.6 mm (0.06 in) in size upon fertilization, but quickly swelled to 3.0 mm (0.12 in). Recently hatched larval fish are about 3.7 mm (0.15 in) in standard length and grow about 0.013 mm (0.005 in) 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 216 to 359 km (134 to 223 mi) downstream depending on river flows and availability of nursery habitat (Platania 2000). Approximately three days after hatching the larvae move to low velocity habitats where food (mainly phytoplankton and zooplankton) is abundant and predators are scarce. YOY (Age-0) attain lengths of 38.1 to 40.64 mm (1.5 to 1.6 in) by late autumn (U.S. Fish and Wildlife Service 2010). Age-1 fish are 45.72 to 48.26 mm (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, the maximum longevity documented is about 30 months for wild fish inferred from length-frequency, and up to 3 years based on preliminary findings from a study of otolith and scale examinations (Horwitz et al. 2011). Based on estimated length groups for assigning an age class, it is possible that some individuals in the wild survive to be Age-3 fish; however >95% of the population in any given year is estimated to comprise Age-0 and Age-1 fish (U.S. Fish and Wildlife Service 2010). In comparison to longevity in the wild, it is not uncommon for captive silvery minnows to live beyond two years, especially at lower water temperatures. (U.S. Fish and Wildlife Service 1999). The U.S. Geological Survey's (USGS) Columbia Environmental Research Center in Yankton, South Dakota has documented several silvery minnows in captivity with a maximum age of 11 years, ranging in size from 46 to 73 (± 8.1) mm SL (Buhl, *pers. comm. as cited in* U.S. Fish and Wildlife Service 2010).

The ecological aspects of silvery minnow movement are not fully understood, however the inherent downstream dispersal of eggs and larvae in a pelagic spawning species requires some upstream movement to recolonize upstream reaches (Bestgen et al. 2010). This type of movement has been described as a necessary adaptation of small-bodied fish in arid streams of western North America to repopulate intermittently dried upstream areas (Bestgen et al. 2003). Recent research by the New Mexico FWCO and University of New Mexico (UNM) has been conducted to examine the movement of silvery minnows. Augmented fish marked with a visible fluorescent elastomer tag and released in large numbers in a few locations are sampled upstream and downstream from the release site in an attempt to capture the marked fish. Results indicate that the majority of silvery minnows disperse a few miles downstream. One individual was captured 15.7 mi (25.3 km) upstream from its release site (Platania et al. 2003). Monitoring within 48 hours after the release of the 41,500 silvery minnows resulted in the capture of 937 fish. Of these, 928 were marked and 927 were collected downstream of the release point. The farthest downstream point of recapture was 9.4 mi (15.1 km). The New Mexico FWCO also recently concluded a study using Passive Integrated Transponder (PIT) tags to examine silvery minnow movement and use of the fishway at the Albuquerque Bernalillo County Water Utility Authority's drinking water diversion site near the Alameda Bridge in Albuquerque. Results indicated use of the fishway and both upstream and downstream movement of minnows in that location.

The silvery minnow is primarily herbivorous, feeding mainly on algae, which is indicated indirectly by the elongated and coiled gastrointestinal tract (Sublette et al. 1990). Silvery minnow are also opportunistic feeders, filtering detritus, including sand and silt, from the bottom (Sublette et al. 1990, U.S. Fish and Wildlife Service 1999, Magaña 2007), and the presence of sand and silt in the gut of wild-captured minnows suggest that epepsammic algae (algae growing on the surface of sand) is an important food. Silvery minnow reared in the laboratory have also been directly observed to graze on algae in the aquaria (Platania 1995a, Magaña 2007).

Population Dynamics

Generally, a population of silvery minnows consists of mainly two age classes: YOY (Age-0) 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 (U.S. Fish and Wildlife Service 2010). 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. 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. A recent study by Horwitz et al. (2011) examined both scales and otoliths taken from 158 specimens of wild Rio Grande silvery minnow (83 collected fall 2009 and 75 collected spring 2010) to assign ages to fish. The authors found that the size and age structure of the Rio Grande silvery minnow is similar to that of other *Hybognathus* species (Horwitz et al. 2011). Horwitz et al. (2011) demonstrated Rio Grande silvery minnow live up to 3 years in the wild, with Age 3 fish being extremely rare and not appearing in every sample. The study found that 82% of the fish in the fall sampling were Age 0 and 1, and 96% of the fish were Age 1 and 2 in the spring (Horwitz et al. 2011).

Platania (1995b) 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 3,967 km (2,465 mi) of rivers in New Mexico and Texas and was one of the most abundant and widespread species in the Rio Grande basin. 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). Silvery minnow were considered to have been extirpated from the Pecos River as a result of competition with the non-native plains minnow (*H. placitus*), or possibly due to hybridization, which these species have the potential for (Caldwell 2002).

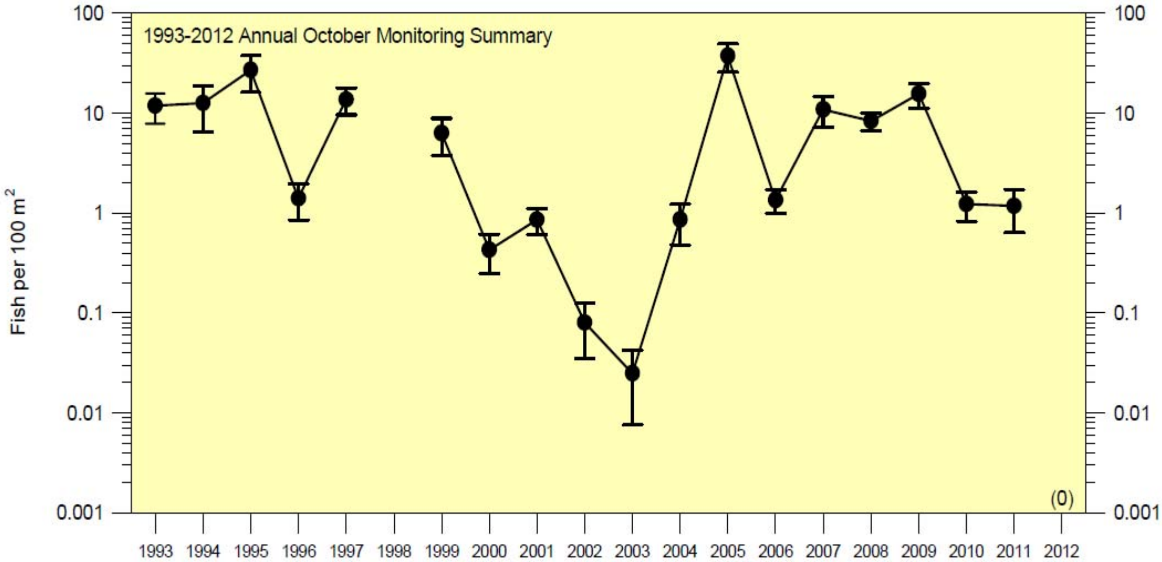
The current distribution of the silvery minnow is limited to the Rio Grande between Cochiti Dam and Elephant Butte Reservoir, which amounts to approximately seven percent of its historic range. In December 2008, silvery minnows were introduced into the Rio Grande near Big Bend, Texas as a nonessential, experimental population under section 10(j) of the ESA (73 FR 74357). Monitoring of this population, including genetics and reproduction, began in May 2009 and is ongoing. In 2010, the Service found evidence of successful reproduction with the detection of silvery minnow eggs, larval and juvenile fish. Success of the Big Bend 10(j) population will continue to be evaluated and relevant information incorporated into the assessment for potential reintroductions in additional locations.

The Rio Grande, prior to widespread human influence, was a wide, perennially flowing, aggrading river characterized by a shifting sand substrate. The river freely migrated across a wide floodplain and was limited only by valley terraces and bedrock outcroppings. Throughout much of its historic range, the decline of the Rio Grande silvery minnow can be attributed in part to destruction and modification of its habitat due to dewatering and diversion of water, water impoundment, and modification of the river (channelization). The construction of mainstem dams (Cochiti, Angostura, Isleta, and San Acacia) have fragmented the Rio Grande, isolating the population and making it vulnerable to natural and human-caused threats which further increase the risk of extinction. The construction of Cochiti Dam in particular, negatively affected the silvery minnow by reducing the magnitude and frequency of flooding events that help to create and maintain habitat for the species. In addition, the construction of Cochiti Dam has resulted in degradation of silvery minnow habitat within the Cochiti Reach. River outflow from Cochiti Dam is now generally clear, cool, and free of sediment. There is relatively little channel braiding, and areas with reduced velocity and sand or silt substrates are uncommon. Substrate immediately downstream of the dam is often armored cobble (rounded rock fragments generally 8 to 30 cm (3 to 12 in) in diameter). Further downstream the riverbed is gravel with some sand material. Ephemeral tributaries including Galisteo Creek and Tonque Arroyo introduce sediment to the lower sections of this reach, and some of this is transported downstream with higher flows (U.S. Fish and Wildlife Service 1999, 2001). 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 Population Monitoring

Long-term monitoring for the Rio Grande silvery minnow began in 1993 and has continued annually, with the exception of 1998 and a majority of 2009. The area monitored for silvery minnows is the Middle Rio Grande from Cochiti Dam downstream to Elephant Butte Reservoir. Currently, 20 sites are sampled monthly, which includes monitoring at River mile 183.4 (at the Central Avenue Bridge crossing) and River Mile 200 (at the Rio Rancho Wastewater Treatment Plant) near the action area. The most recent data from both of these sites indicate a density of 0.0 minnows per 100 square meters within the action area in October of 2012 (Dudley et al. 2012d).

Figure 2. Rio Grande silvery minnow population trends 1993-2012 based on October CPUE data.



The long-term monitoring of silvery minnows has recorded substantial fluctuations (order of magnitude increases and decreases) 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 (see Figure 2 above). Population size is highly correlated with hydrologic conditions, particularly the magnitude and duration of the spring runoff (Dudley and Platania 2008a). 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.

The 20 sampling sites for long-term population monitoring include monitoring at RM 200.0 (at the Rio Rancho Wastewater Treatment Plant, Rio Rancho, site #2), which is approximately 8.7 miles upstream from the action area, and also at RM 183.4 (at the Central Avenue Bridge crossing, Albuquerque, site #3), which is 6.4 miles downstream from the action area. Recent data from these sites indicate that silvery minnow densities have been very low over the past two years (e.g., 2011-2012 for fall sampling represented here by September and October data, and 2011-2012 for spring sampling represented here by April, May, and June data). These years represent dry year flow conditions. Table 2 shows the catch rates recorded at each site over this time frame (Dudley and Platania 2011b, d, c, e, f, Dudley et al. 2012a, c, b, e, d).

Table 2. Catch rates at silvery minnow population monitoring sites #2 and #3 during fall (2011-2012) and spring (2011-2012).

Site	Month	# of RGSM	Effort (m^2)	CPUE (per 100 m^2)
Site 2 (RM 200)	April 2011	3	504.4	0.59
	May 2011	1	385.3	0.26
	June 2011	5	483.6	1.03
	September 2011	6	553.8	1.08
	October 2011	0	488.3	0.0
	April 2012	3	394.8	0.76

	May 2012	1	474.6	0.21
	June 2012	0	463.7	0.0
	September 2012	2	430.3	0.46
	October 2012	0	582.6	0.0
Site 3 (RM 183.4)	April 2011	4	519.5	0.77
	May 2011	0	388.5	0.0
	June 2011	0	505.2	0.0
	September 2011	28	502.8	5.57
	October 2011	3	480.5	0.62
	April 2012	5	469.4	1.07
	May 2012	2	446.6	0.45
	June 2012	1	517.8	0.19
	September 2012	0	497.4	0.0
	October 2012	0	528.9	0.0
Average CPUE = 0.65				

Augmentation of the Silvery Minnow Population

Augmentation has likely sustained the silvery minnow population throughout its range. Close to 1.6 million silvery minnows have been propagated and then released into the Middle Rio Grande from 2002 through the fall of 2012 (U.S. Fish and Wildlife Service 2012, T. Archdeacon, Service, *pers. comm*. 2012). Captively propagated and released fish supplement the native adult population, most likely prevented extinction during the extremely low water years of 2002 and 2003, and allowed for quicker and more robust population responses in all reaches due to improved water conditions observed in recent years. Since 2001, the Albuquerque Reach has been the focus of augmentation efforts; however, beginning in 2008, augmentation shifted focus to the Isleta and San Acacia Reaches only (J. Remshardt, Service, *pers. comm.* 2010). To accurately determine the success of these efforts and the continued effects of these releases, a period of five years (2008-2012) without intensive stocking in the Albuquerque Reach is being evaluated. If the overall catch rate for the Albuquerque Reach drops to below 0.1 fish per 100 m^2 during September population monitoring, then augmentation will be re-initiated for this reach the following year (Remshardt 2008a, T. Archdeacon, Service, *pers. comm*. 2012). The catch rate in the Albuquerque Reach for September 2012 was 0.17 fish per 100 m^2, therefore no augmentation of the Albuquerque Reach will occur in the fall of 2012.

Middle Rio Grande Distribution Patterns

During the early 1990s, the density of silvery minnows generally increased from upstream (Albuquerque 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 Albuquerque Reach and lower in the Isleta and San Acacia Reaches. Routine augmentation of silvery minnows in the Albuquerque Reach (the focus of augmentation efforts starting in 2001) may partially explain this pattern. Organized transplanting of silvery minnows rescued from drying reaches (approximately 768,458 individuals through 2012) has also occurred since 2001; however, it is not possible to quantify the effects of those efforts on silvery minnow distribution patterns (J. Remshardt, Service, *pers. comm.* 2010). 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 Albuquerque Reach. In contrast, south of the 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 (U.S. Geological Survey 2010) and likely very little nursery habitat was inundated during critical recruitment times.

Distribution patterns for silvery minnows shifted again in 2007 and again in the recent years of 2008 and 2009. In 2007, population monitoring of silvery minnow densities indicated the highest densities occurred in the Albuquerque Reach. Available reports for 2008 indicated 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. Sampling in October 2009 also indicated high recruitment, with silvery minnows present at 19 of the 20 sampling sites. The highest densities were noted to persist in the San Acacia Reach during the population monitoring census in October of both 2008 and 2009, and the lack of extensive river drying these years, combined with favorable spring flows, was likely an important factor in this distribution shift compared to 2007 (i.e., from highest densities in the Albuquerque Reach in 2007 to highest densities in the San Acacia Reach in 2008 and 2009) (Dudley and Platania 2008b, 2009).

During October 2010, Rio Grande silvery minnow were collected in low numbers at the 20 sampling sites, with densities that were significantly lower than in recent years (e.g., 2007, 2008, and 2009). And in 2011, silvery minnow were collected at only eight of the 20 sampling sites in October; catch rates were generally low at all sites, with a few exceptions in the southern portion of the San Acacia Reach (Dudley and Platania 2011e). Recruitment success throughout the Middle Rio Grande was fairly low in 2011 given the poor spring runoff and low flows during the remainder of the summer (Dudley and Platania 2011e). The pattern of highest densities occurring in the San Acacia Reach and the lowest in the Albuquerque Reach continued in both 2010 and 2011 (Dudley and Platania 2011a, e). Silvery minnow densities continued to decline in 2012 and during the October 2012 monitoring effort, no silvery minnow were detected at any of the 20 monitoring sites (Dudley et al. 2012d). This represents the lowest silvery minnow densities seen since monitoring began in 1993.

Reasons for Listing/Threats to Survival

The 1994 listing package (59 FR 36988) described numerous threats to the Rio Grande silvery minnow. Originally identified threats to the species, along with additional threats identified since the silvery minnow was federally listed as endangered are presented here:

Listing Factor A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Dewatering and Diversion

- Annual dewatering of a large percentage of the species' habitat
- Risk of two consecutive below-average flow years, which can affect short-lived species
- Increase in non-native and exotic fish species
- Increase in contamination concentrations during flow years, which may exacerbate other stresses
- Entrainment of eggs and young-of-year in diversion structures
- Fragmented habitat

Water Impoundment

- Altered flow regimes
- Prevention of overbank flooding
- Trapped nutrients
- Altered sediment transport regimes
- Prolonged summer base flows
- Reduced food supply
- Altered preferred habitat
- Prevention of species' dispersal
- Creation of reservoirs and altered flow regimes that favor non-native fish species that may compete with or prey upon the species
- Stored spring runoff and summer inflow, which would normally cause flooding
- Reduced flows, which may limit the amount of preferred habitat and limit dispersal of the species
- Lack of suitable habitat for young-of-year
- Fragmented habitat

River Modification

- Confined flood flows
- Trapped sediment
- Establishment of stabilizing vegetation
- Elimination of meanders, oxbows, and other components of historic aquatic habitat
- Replacement of preferred sand and silt substrate with gravel and cobble
- Reduction of floodplain areas where young can develop
- Geomorphological changes to the river channel

Water Pollutants

- Poor water quality caused by agriculture and urbanization in the Rio Grande River basin, especially during low flows and storm events

Listing Factor B. Overutilization for commercial, recreational, scientific, or educational purposes.

- Possible over-utilization through scientific collection
- Licensed commercial bait dealers possibly selling bait minnows
- Incidental utilization of species during legal collection of bait minnows for personal use

Listing Factor C. Disease or predation.

Disease

- Risk of stress and disease when Rio Grande silvery minnow are confined to pools during periods of low flow
- Increased risk of stress-induced disease outbreaks possibly exacerbated when high levels of pollutants or other stresses are present

Predation

- Predation by non-native fishes, as well as by birds and mammals
- Competition for space and food with non-native fish during low flows

Listing Factor D. The inadequacy of existing regulatory mechanisms.

- No protection of habitat under State law
- Inability to acquire instream water rights for the benefit of fish and wildlife
- Inadequate regulations to restrict the use of bait fish, illegal use of bait fish, introduction of non-natives via bait bucket, and introduction of disease or parasites by importation of bait fish

Listing Factor E. Other natural or manmade factors affecting its continued existence.

- Reduced population numbers and potential loss of genetic diversity
- Introduction and subsequent competition from non-native fish
- Climate change

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 was updated and revised, and the First Revision of the Rio Grande Silvery Minnow Recovery Plan was finalized and issued on February 22, 2010 (75 FR 7625). The revised Recovery Plan describes recovery goals for the Rio Grande silvery minnow and actions to complete these (U.S. Fish and Wildlife Service 2010). 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 the criteria have been met resulting in three populations (including at least two that are self-sustaining) that have been established within the historical range of the species and have been maintained for at least five years.

Delisting (Goal 3) of the species may be considered when the criteria have been met resulting in three self-sustaining populations that have been established within the historical range of the species and have been maintained for at least ten years (U.S. Fish and Wildlife Service 2010).

Conservation efforts targeting the Rio Grande silvery minnow are also summarized in the 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 March 2003 BO 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. Many of these activities are broader than the action area but have effects that extend into the action area. These include changes to the natural hydrology of the Rio Grande, changes to the morphology of the channel and floodplain, current weather patterns including climate change, 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 in minnow habitat and (2) changes to the magnitude and duration of peak flows.

Loss of Water in Minnow Habitat

Prior to the large-scale influence of humans on the watershed, the Rio Grande ecosystem was a highly dynamic fluvial system with channel dimension, planform and profile reflective of the natural basin hydrology, sediment regime, and site-specific geological and local controls (U.S. Fish and Wildlife Service 2010). It is believed that a significant portion of the river was a wide, braided, sand-bedded system with an extensive active floodplain composed of numerous secondary channels, floodplain lakes and marshes, and woody debris. The Rio Grande River has undergone considerable change in the last 150 years and is no longer the highly dynamic system it once was. Several large dams and irrigation diversions have been built on the river, and the entire system (U.S. Fish and Wildlife Service 2010). 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 at that time 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 Middle Rio Grande Conservancy District (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, Bartolino and Cole 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 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 Collaborative Program (Middle Rio Grande Endangered Species Act Collaborative Program 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 (U.S. Fish and Wildlife Service 2010). 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 was 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. During the 2012 irrigation season, approximately 51 total unique miles dried in both the San Acacia (31.8 m) and Isleta (19.2 mi) Reaches (T. Archdeacon, Service, *pers. comm*. 2012), and the maximum duration of intermittency was approximately 6 weeks in the San Acacia Reach and 15 weeks in the Isleta Reach.

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, 2008, and 2009 were average or above average, however conditions since 2009 have been progressively poorer, with 2010, 2011, and 2012 all exhibiting dry flow year conditions. In 2010, the maximum spring peak flow through Albuquerque (measured at the Central Avenue Bridge gage) had a mean daily discharge of 4,900 cfs, due in part to the Army Corps of Engineers' release of stored water for overbank flooding. The maximum duration of these sustained high flows however, only lasted for 10 days (U.S. Geological Survey 2012). October 2010 monitoring indicated reduced recruitment success of silvery minnow in all 3 reaches (Dudley and Platania 2010). In 2011, the maximum spring peak flow had a mean daily discharge of only 1,330 cfs (U.S. Geological Survey 2012). During October 2011 population monitoring, no larval silvery minnow were collected, and recruitment success throughout the Middle Rio Grande was fairly low given the poor spring runoff and low flows seen during the summer (Dudley and Platania 2011e). USGS gage data for 2012 is still provisional, however the spring runoff conditions were again very poor. During the September 2012 monitoring effort, only 3 adult and 2 larval silvery minnows were collected, and no silvery minnow were collected during October 2012 sampling. These low numbers again indicate very poor recruitment given poor spring runoff conditions and extensive drying during the irrigation season (Dudley et al. 2012e).

Mainstem dams and the altered flows they create can affect habitat by preventing overbank flooding, trapping nutrients, altering sediment transport regimes, reducing and dewatering main channel habitat, 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 and U.S. Army Corps of Engineers 2001). These non-native plants are very resistant to erosion, resulting in channel narrowing and a subsequent increase 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.

Climate Change

"Climate" refers to an area's long-term average weather statistics (typically for at least 20- or 30-year periods), including the mean and variation of surface variables such as temperature, precipitation, and wind. "Climate change" refers to a change in the mean and variability of climate properties that persists for an extended period (typically decades or longer), whether due to natural processes or human activity (IPCC 2007a). Although changes in climate occur continuously over geological time, changes are now occurring at an accelerated rate. For example, at continental, regional, and ocean basin scales, recent observed changes in long-term trends include: a substantial increase in precipitation in eastern parts of North American and South America, northern Europe, and northern and central Asia, and an increase in intense tropical cyclone activity in the North Atlantic since about 1970 (IPCC 2007a); and an increase in annual average temperature of more than 1.1 °C (2 ^{o}F) across U.S. since 1960 (Karl et al. 2009).

The IPCC used Atmosphere-Ocean General Circulation Models and various greenhouse gas emissions scenarios to make projections of climate change globally and for broad regions through the 21st century (Meehl et al. 2007, Randall et al. 2007), and reported these projections using a framework for characterizing certainty (Solomon et al. 2007). Examples include: 1) it is virtually certain there will be warmer and more frequent hot days and nights over most of the earth's land areas; 2) it is very likely there will be increased frequency of warm spells and heat waves over most land areas, and the frequency of heavy precipitation events will increase over most areas; and 3) it is likely that increases will occur in the incidence of extreme high sea level (excluding tsunamis), intense tropical cyclone activity, and the area affected by droughts (IPCC 2007b, Table SPM.2). More recent analyses using a different global model and comparing other emissions scenarios resulted in similar projections of global temperature change across the different approaches (Prinn et al. 2011).
All models (not just those involving climate change) have some uncertainty associated with projections due to assumptions used, data available, and features of the models; with regard to climate change this includes factors such as assumptions related to emissions scenarios, internal climate variability and differences among models. Despite this, however, under all global models and emissions scenarios, the overall projected trajectory of surface air temperature is one of increased warming compared to current conditions (Meehl et al. 2007, Prinn et al. 2011). Climate models, emissions scenarios, and associated assumptions, data, and analytical techniques will continue to be refined, as will interpretations of projections, as more information becomes available. For instance, some changes in conditions are occurring more rapidly than initially projected, such as melting of Arctic sea ice (Comiso et al. 2008, Polyak et al. 2010), and since 2000 the observed emissions of greenhouse gases, which are a key influence on climate change, have been occurring at the mid- to higher levels of the various emissions scenarios developed in the late 1990's and used by the IPCC for making projections (Raupach et al. 2007, Figure 1, Pielke et al. 2008, Manning et al. 2010, Figure 1). The best scientific and commercial data available indicates that average global surface air temperature is increasing and several climate-related changes are occurring and will continue for many decades even if emissions are stabilized soon (Meehl et al. 2007, Gillett et al. 2011, Church et al. 2010).

Changes in climate can have a variety of direct and indirect impacts on species, and can exacerbate the effects of other threats. Rather than assessing "climate change" as a single threat in and of itself, we examine the potential consequences to species and their habitats that arise from changes in environmental conditions associated with various aspects of climate change. For example, climate-related changes to habitats, the quality, availability, and timing of prey to developing fish and wildlife, predator-prey relationships, disease and disease vectors, or conditions that exceed the physiological tolerances of a species, or that alter the rate of metabolic and biochemical processes within organisms, the occurring individually or in combination, may affect the status of a species. Vulnerability to climate change impacts is a function of sensitivity to those changes, exposure to those changes, and adaptive capacity (IPCC 2007a, Glick et al. 2011).

While projections from global climate model simulations are informative and in some cases are the only or the best scientific information available, various downscaling methods are being used to provide higher-resolution projections that are more relevant to the spatial scales used to assess impacts to a given species (see Glick et al. 2011). With regard to the area of analysis for the silvery minnow, the following downscaled projections are available.

The New Mexico Office of the State Engineer (2006) made the following observations about the impact of climate change in New Mexico:

1. warming trends in the Southwest exceed global averages by about 50 percent;
2. modeling suggests that even moderate increases in precipitation would not offset the negative impacts to the water supply caused by increased temperature;
3. temperature increases in the Southwest are predicted to continue to be greater than the global average;
4. there will be a delay in the arrival of snow and acceleration of spring snow melt, leading to a rapid and earlier seasonal runoff; and
5. the intensity, frequency, and duration of drought may increase.

Most of the upper Rio Grande basin is arid or semiarid, generally receiving less than 25 cm (10 in) of precipitation per year (Reclamation 2011). In contrast, some of the high mountain headwater areas receive on average over 100 cm (40 in) of precipitation per year. Most of the total annual flow in the Rio Grande basin results, ultimately, from runoff from mountain snowmelt (Reclamation 2011). In the Middle Rio Grande, there is expected earlier peak streamflows, reduced total streamflows, and more water lost to evaporation (Hurd and Coonrod 2007).

Climate change predicts four major impacts on silvery minnow habitat: 1) increased water temperature; 2) decreased streamflow; 3) a change in the hydrograph; and 4) an increased occurrence of extreme events (fire, drought, and floods). These impacts may reduce the amount and quality of silvery minnow habitat, may affect silvery minnow physiology and phrenology (the timing and availability of resources necessary for silvery minnow growth to maturity), may affect the density, type and seasonal availability of prey available to developing larvae and maturing silvery minnow, as well as the amount of primary productivity and oxygen saturation, and may affect biological interactions with other aquatic and terrestrial species. Decreased streamflow may result in the river becoming more intermittent, and fish isolated in pools may be subject to increased stress and predation. And changes to the hydrograph during spring runoff would affect the reproductive success of the silvery minnow that is dependent on river flow pulses to spawn. As such, the slivery minnow may be adversely affected by impacts due to climate change. Overall, the predicted effects of climate change are expected to result in degradation of the remaining silvery minnow habitat, with potential adverse consequences on species viability.

Water Quality

Many natural and anthropogenic factors affect water quality in the Middle Rio Grande, including the action area. Water quality in the Middle Rio Grande 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).

Effluents from WWTPs contain contaminants that may affect the water quality of the river. It is anticipated that WWTP effluent may be the primary source of perennial flow during extended periods of intermittency in the lower portion of the Albuquerque Reach. For that reason, the water quality of the effluent is extremely important. Near the Project area, the largest WWTP discharges are from Albuquerque, followed by two WWTPs in Rio Rancho, and Bernalillo (mean annual discharge flows are 80.4, 2.5, 0.9, and 0.7 cfs, respectively) (Bartolino and Cole 2002). Since 1998, total residual chlorine (chlorine) and ammonia, as nitrogen (ammonia), have been discharged unintentionally at concentrations that exceed protective levels for the silvery minnow. In addition to chlorine and ammonia, WWTP effluents may also include cyanide, chloroform, organophosphate pesticides, semi-volatile compounds, volatile compounds, heavy metals, and pharmaceuticals and their derivatives, which can pose a health risk to silvery minnows when discharged in concentrations that exceed the protective water quality criteria (J. Lusk, Service, *in litt*. 2003). Even if the concentration of a single element or compound is not harmful by itself, chemical mixtures may be more than additive in their toxicity to silvery minnows (Buhl 2002). The long-term effects and overall impacts of chemicals on the silvery minnow are not known.

Large precipitation events wash sediment and pollutants into the river from surrounding lands through storm drains and intermittent tributaries. Constituents of concern that are commonly found in stormwater include petroleum hydrocarbons (from oil spills, parking lot runoff, illicit dumping, roadways); the metals aluminum, cadmium, lead, nickel, copper, chromium, mercury, and zinc; nutrient runoff (phosphates, nitrogen compounds, potassium, trace elements); pesticide runoff (herbicides, insecticides, fungicides, termiticides); solid waste; sedimentation, erosion, and salts (which reduce oxygen content in water and alter habitat); toxics such as PCBs and controlled substances; the industrial solvents trichloroethene and tetracholoroethene (TCE); and the gasoline additive methyl tert-butyl ether (U.S. Geological Survey 2001, NMED 2010; J. Lusk, Service, *pers. comm*. 2010). Harwood (1995) studied the North Floodway Channel (Floodway) of Albuquerque, which drains an urban area of about 90 square miles and crosses Pueblo of Sandia lands. He found that storm water contributions of dissolved lead, zinc, and aluminum were significant and posed a threat to the water quality of the Rio Grande. Because the Floodway crosses lands of the Pueblo of Sandia and enters their portion of the Rio Grande, they requested that the Environmental Protection Agency conduct toxicity tests on water in the Rio Grande collected below the Floodway. Aquatic crustaceans exposed to this water were found to have significant reproductive impairment and mortality when compared with controls. Additionally, larval fish also experienced significant mortality and/or narcosis when exposed to water and bed sediment collected from this same area on April 22, 2002 (EPA 2003). This study indicates that storm water runoff can impact the water quality of the Rio Grande and the aquatic organisms that live in the river.

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

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

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

Preliminary results from a recent Rio Grande silvery minnow health study (Lusk et al. 2012) have indicated that temperature and dissolved oxygen (DO) may also be factors affecting the health of the silvery minnow. Water temperature is thought to be responsible for the elevated frequency of physical anomalies seen in silvery minnows, and there is a positive relationship between water temperature and the number of silvery minnows infected with bacteria. Reduced DO in the Middle Rio Grande is associated with storm events, which may result in chronic or behavioral effects on silvery minnows and the avoidance of low DO environments.

Chemical Spills

Based on information reported in the National Response Center (NRC) database (http://www.nrc.uscg.mil), seven incidents involving spills possibly released into the Rio Grande have occurred in Bernalillo County since 1991. Substances released or spilled included hydrochloric acid, lubricating oil, unknown oil, and fuel. Of these, most were either in the downstream direction from the action area or at a substantial distance from the action area such that effects in the action area for this consultation would not be expected. There is concern about the potential adverse effects of chemical spills for the silvery minnow and its critical habitat. Fuels such as diesel that are carried by pipelines have documented toxicity due to polycyclic aromatic hydrocarbons (PAHs), which are known to persist after spills, pass readily into tissues, are potent carcinogens, and are toxic to fish (Eisler 1987, Schein et al. 2009; Lee and Grant 1981 as cited in Eisler 1987). A break in a pipeline if it were to release fuel into the river has the potential for lethal effects on minnows as well as adverse effects downstream on critical habitat (e.g., water quality; J. Lusk, Service, *pers. comm.* 2010). However, no incidents are known of such releases to the river from these pipelines that would have affected the action area for this consultation. No available information indicates any past adverse effects to silvery minnows or their critical habitat from spills at these pipelines.

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 three facilities in New Mexico that conduct captive propagation of the species, including the Dexter Fish Hatchery and Technology Center (Dexter), the City of Albuquerque’s BioPark (BioPark) propagation facility, and the New Mexico Interstate Stream Commission (ISC) Refugium in Los Lunas, New Mexico. These facilities are actively propagating and rearing silvery minnow. Silvery minnows are also held at the Service’s New Mexico Fish and Wildlife Conservation Office (FWCO) and at the U.S. Geological Survey Biological Resources Division Lab in Yankton, South Dakota; however, there are no active spawning programs at these facilities.

From 2002 through the fall of 2012, almost 1.6 million silvery minnows have been released in the Middle Rio Grande (U.S. Fish and Wildlife Service 2012, T. Archdeacon, Service, *pers. comm*. 2012). Wild-caught silvery minnows are successfully spawned in captivity at the BioPark's and Dexter's propagation facilities. Eggs are raised and released as juvenile fish. Marked fish have been released into the Middle Rio Grande by the FWCO since 2002 under a formal augmentation effort funded by the Collaborative Program. Eggs left in the wild have a very low survivorship and this helps ensure 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 and larvae are collected to maximize genetic diversity within the remaining population (Turner and Osborne 2004).

Silvery Minnow Salvage and Relocation

Every year since 2001, with the exception of 2008, the Service has conducted organized salvage activities for the silvery minnow on intermittent sections of the Middle Rio Grande. Through 2012, approximately 768,458 silvery minnows have been rescued and relocated to wet reaches. (U.S. Fish and Wildlife Service 2007a, b, Remshardt 2008b, Remshardt 2010, Remshardt and Archdeacon 2011, 2012, T. Archdeacon, Service, pers. comm. 2012). Prior to 2007, the majority of salvaged silvery minnows were released in the Albuquerque Reach. In 2007, the salvage protocol was modified so that all silvery minnows are released into wetted areas within the same reach as they were salvaged. Several studies have been conducted to determine survival rates for salvaged fish. Caldwell et al. (2010) reported on studies that assessed the physiological responses of wild silvery minnows subjected to collection and transport associated with salvage. The authors examined primary (plasma cortisol), secondary (plasma glucose and osmolality), and tertiary indices (parasite and incidence of disease) and concluded that the effects of stressors associated with river intermittency and salvage resulted in a cumulative stress response in wild silvery minnows. Caldwell et al. also concluded that fish in isolated pools experienced a greater risk of exposure and vulnerability to pathogens (parasites and bacteria), and that the stress response and subsequent disease effects were reduced through a modified salvage protocol that applied specific criteria to determine which wild fish are to be rescued from pools during river intermittency (Caldwell et al. 2010).

Ongoing Research

Genetic research and monitoring of the silvery minnow in the Middle Rio Grande has been ongoing since 1999. Because a stable long-term genetic monitoring program has been implemented, which uses consistent methodologies (sample collection and laboratory methods including genetic markers) (Wilson 2012), genetic patterns (spatial and temporal) for the silvery minnow are known. A recent report reviewing 12 years of past genetic information (1999-2010) is summarized below with the following key findings (Osborne et al. 2012):

- Populations depend on genetic variation for their adaptive evolutionary potential. Risk of extinction is heightened as a species ability to adapt and respond to environmental changes is reduced.
- Reductions in population size, loss of genetic variation, and increased inbreeding lead to reduced adaptive potential, viability and reproductive capability.

- Genetics management is essential for managing the silvery minnow, including genetic effects of augmentation on the wild population, as well as guarding against catastrophic loss of genetic diversity that would severely compromise recovery and long-term persistence of the species in the wild.
- For silvery minnow, the genetic metrics monitored are important indicators of the long-term adaptive potential and extinction vulnerability of this species.
- Monitoring results for genetic diversity show that:
  - MtDNA diversity and richness declined 48 percent between 1987 and 2000, but since augmentation started in 2003 this has stabilized.
  - Sharp declines in microsatellite diversity in the wild population have been seen following sharp declines in species abundance. An increase in inbreeding was also noted.
  - Trends in heterozygosity have been variable. Declines were seen between 1987 and 1999, and from 2000–2002, but increases occurred between 2002 and 2005. Augmentation from captively reared wild-caught eggs is thought to have alleviated loss of allelic diversity in the wild population by serving as a substitute for the upstream movement between reaches. Heterozygosity again declined 2007-2009, but slightly increased in 2010.
  - No significant genetic differences exist across reaches; however, local spawning aggregations (a subset of the adult breeding population) are slightly genetically divergent from one another within a reach.
  - Stability of genetic diversity in a reach coincides with stability of flows and reduced frequency of drying.
  - Genetic effective population size of the silvery minnow is low (recent N_e values are well below 500 and often below 100), several orders of magnitude less than the census size, and indicate that genetic consequences of small N_e cannot be ruled out. The low N_e is largely caused by high variance in reproductive success due to high and differential mortalities of offspring.

Monitoring the genetics of a population provides insights into demographic and evolutionary processes in both wild and captive populations that otherwise could not be obtained, and continues to be important given the highly variable conditions of the Middle Rio Grande, the current unknowns about silvery minnow genetics patterns, and continued significant reliance on captive rearing to sustain the silvery minnow population in the Middle Rio Grande. Osborne et al. (2012) suggest that source–sink dynamics occur in the Middle Rio Grande, where captive stocks of silvery minnow form a genetically diverse source, and the wild population behaves as a genetic sink. Nevertheless, the authors found that the overall genetic diversity of the silvery minnow has been maintained over the last decade, and this is attributed to appropriate genetics and captive propagation management.

<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). The Service released approximately 445,000 silvery minnows in 2008, approximately 509,000 in 2009 and approximately 488,000 in 2010. In 2011, over 304,000 silvery minnows were released in Big Bend, bringing the total to over 1.7 million silvery minnows released in this portion of the species' historic range in Texas (U.S. Fish and Wildlife Service 2012). The four release sites are distributed across Federal, State, and private lands: one in Big Bend Ranch State Park; two within Big Bend National Park; and one on the Adams Ranch del Carmen, a privately-owned and managed conservation area. The silvery minnows came from the Service's Dexter National Fish Hatchery and Technology Center and the City of Albuquerque's Rio Grande Silvery Minnow Rearing and Breeding Facility.

Monitoring has been conducted since 2009 to determine the success of the Big Bend reintroduction effort, and the results have been positive. It is expected to take years of monitoring to fully evaluate if the species is established and will remain viable in this river reach. However, post-release monitoring of silvery minnows in proximity to the four release sites has found silvery minnows. In 2010, the Service detected successful breeding of silvery minnows in the Big Bend reach for the first time since releases began, including documentation of eggs, larval fish, and juvenile fish. This indicates that silvery minnows are successfully breeding in Big Bend and that wild born silvery minnows are surviving to be recruited into the population and hopefully will contribute to future reproduction. In 2011, silvery minnows were detected up to 70 miles downstream and 15 miles upstream from the nearest release sites. These are significant milestones in working toward the recovery of the silvery minnow. Management of this population currently includes continued augmentation and tracking the progress of the population through 2012. The need for further augmentation will be analyzed and determined following the last scheduled release in November 2012. The Big Bend 10(j) population will continue to be monitored and evaluated for five more years following this last scheduled release to determine success. Relevant information from this effort will be incorporated into the assessment for potential reintroductions in additional locations.

Past Projects in the Middle Rio Grande

"Take" of ESA-listed species is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (see ESA section 3(19)). Take of silvery minnows has been permitted or authorized during prior projects conducted in the Middle Rio Grande. The Service has issued permits authorizing take for scientific research and enhancement purposes under ESA section 10(a)(1)(A), and incidental take under section 7 for actions authorized, funded, or carried out by Federal agencies. Applicants for ESA section 10(a)(1)(A) permits must also acquire a permit from the State of New Mexico to "take" or collect silvery minnows. Many of the section 10 permits issued by the Service allow take for the purpose of collection and salvage of silvery minnows and eggs for captive propagation. Eggs, larvae, and adults are also collected for scientific studies to further our knowledge about the species and how best to conserve the silvery minnow. Because of the population decline from 2002-2004, the Service has reduced the amount of take permitted for voucher specimens in the wild.

The Service has conducted numerous section 7 consultations on past projects in the Middle Rio Grande. In 2001 and 2003, the Service issued jeopardy biological opinions resulting from programmatic section 7 consultation with Reclamation and the U.S. Army Corps of Engineers (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 Incidental Take Statement (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.

Within the Albuquerque Reach of the Middle Rio Grande, the Service has conducted numerous section 7 consultations on past projects, including the following:

- In 1999, the Service consulted with Reclamation on a restoration project on the Santa Ana Pueblo in an area where the river channel was incising and eroding into the levee system. The second phase of this Rio Grande Restoration Project at Santa Ana Pueblo underwent consultation in 2008, and the Service anticipated that up to 36,688 silvery minnow would be harassed by construction, fill placement in the river, and movement of equipment; no mortality was expected.
- In 2003, the Service completed consultation with the City of Albuquerque on its Drinking Water Project, which involved the construction and operation of a new surface diversion north of the Paseo del Norte Bridge, conveyance of raw water to a new treatment plant, transmission of treated water to customers throughout the Albuquerque metropolitan area, and aquifer storage and recovery. The Service anticipated that up to 20 silvery minnows would be killed or harmed during construction, up to 25,000 eggs would be entrained each year at the diversion, and up to 7,000 larval fish would be harmed, wounded, or killed during operational activities.
- The Service consulted on habitat restoration projects on the Rio Grande near Albuquerque, including the 2005 Phase I, the 2007 Phase II, and the 2009 Phase IIa projects. Biological opinions addressing this prior habitat restoration work reviewed the effects on silvery minnows. Incidental take authorized included 190 silvery minnows in 2005 due to harm or harassment, in 2007 the harassment of up to 3,365 minnows and mortality of up to 341 minnows, and in 2009 the harassment of up to 4,094 minnows and mortality of up to 187 silvery minnows.

- In 2006 and 2007, the Service consulted with Reclamation on the Bernalillo Priority Site Project and the Sandia Priority Site Project for river maintenance activities. The Bernalillo project was anticipated to kill no more than 42 silvery minnows due to channel modification, berm removal, dewatering, and sediment deposition in the river. The most recent consultation on the Sandia Priority Site River Maintenance project concluded that direct take of up to 539 silvery minnows, and harassment of 53,853 silvery minnows would occur due to construction activities.
- In 2007, the Service determined through consultation with the Corps on the Rio Grande Nature Center Habitat Restoration Project, that up to 10 silvery minnows would be harassed during construction and that up to 154 silvery minnows would be killed due to entrapment in constructed channels.
- In 2007, consultation on the Corrales Siphon River Maintenance Project concluded that the harassment of up to 244 silvery minnows would occur during construction, fill placement in the river, and movement of equipment.
- In 2008, the Service concluded an intra-Service consultation on the Pueblo of Sandia Management of Exotics for the Recovery of Endangered Species (MERES) Habitat Restoration Project. The Service anticipated that up to 2,449 silvery minnows would be harassed due to construction, and up to 770 killed due to potential entrapment in channels.
- In 2009, the Service concluded a consultation with the Bureau of Reclamation on the Pueblo of Sandia Bosque Rehabilitation Project, which concluded that up to 85 silvery minnows would be harassed during the proposed restoration activities, and up to 269 would be killed due to potential entrapment in a restored channel.
- In 2010, the Service consulted with the Bureau of Reclamation for a habitat restoration project located on the Pueblo of Sandia. The Service anticipated that take in the form of harassment may affect up to 36,318 silvery minnow due to proposed construction and river crossings, as well as the harassment and mortality of up to 6 silvery minnows due to potential stranding in restored features after peak flows recede.
- In 2011, the Service consulted with the Army Corps of Engineers on the Middle Rio Grande Bosque Restoration Project located in Bernalillo County. The Service anticipated that up to 6,988 silvery minnows would be harassed due to the proposed construction, and up to 8,471 silvery minnow would be harassed or killed due to potential stranding in restored habitat features.
- In 2011, the Service consulted with the U.S. Environmental Protection Agency (EPA) on its issuance of an NPDES Permit for the City of Albuquerque urbanized area stormwater discharge (MS4 NPDES Permit NMS000101). The Service expected that no more than 195 (15 mortalities and 180 harassment) silvery minnows would be taken due to the discharge of stormwater pushing low dissolved oxygen (DO) into the Rio Grande. In addition, the Service anticipated low DO events from stormwater would result in a total take due to harm of 1,528 silvery minnows.
- In 2011, the Service consulted with the USDA Forest Service on a New Mexico State Land Office Albuquerque Reach riverine restoration project. The Service anticipated that up to 96 silvery minnows would be taken due to harassment during construction, and up to 9 silvery minnows would be harassed and killed due to potential stranding in restored

features. Stranding of eggs and larvae in restored features was also expected, but was not quantifiable.

- In 2012, the Service consulted with the Army Corps of Engineers on its authorization of the Albuquerque Metropolitan Arroyo Flood Control Authority’s (AMAFCA's) plan to widen the North Diversion Channel embayment outfall into the Rio Grande. The Service anticipated that no more than 5,670 silvery minnows would be adversely affected by entrapment and confinement during dewatering activities, with mortalities of no more than 847 of those silvery minnows prior to their rescue due to confinement stress and water quality degradation.
- In 2012, the Service consulted with Reclamation on a habitat restoration project implemented by the Pueblo of Santa Ana located in Sandoval County. The Service anticipated that up to 174 silvery minnows would be harassed and killed due to potential stranding in restored features. Stranding of eggs and larvae in restored features was also expected, but was not quantifiable.

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 and U.S. Army Corps of Engineers 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 and U.S. Army Corps of Engineers 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. And the overall predicted effects of climate change are expected to result in degradation of the remaining silvery minnow habitat, with potential adverse consequences on species viability.

Various conservation efforts have been undertaken in the past and others are currently being carried out in the Middle Rio Grande for the benefit of the silvery minnow. Current data however, show catch rates are lower than levels at the time of the silvery minnow’s listing as an endangered species in 1994, and the October 2012 catch rates are the lowest since monitoring began in 1993. The threat of extinction for the silvery minnow continues because of increased reliance on captive propagation to supplement the wild population, the fragmented and isolated nature of currently occupied habitat, and the absence of the silvery minnow throughout most 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. The following section describes the anticipated effects on silvery minnow and its designated critical habitat resulting from the proposed action.

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 the disturbance zone boundaries from RM 189.8 to RM 191.3, which is located immediately upstream and downstream of the Paseo del Norte Bridge crossing in the Albuquerque Reach. Monitoring data are available from RM 200 (at the Rio Rancho Wastewater Treatment Plant, Rio Rancho, site #2), which is approximately 8.7 miles upstream from the action area, and from RM 183.4 (at the Central Avenue Bridge crossing, Albuquerque, site #3), which is approximately 6.4 miles downstream from the action area. These data indicate that silvery minnows are likely to occur during habitat restoration activities and afterward during inundation of the restored features (i.e., during the spring peak), and therefore the species may be affected by the proposed action. Recent monitoring data (CPUE) at these two closest sites (September and October, 2012) indicate an average density of 0.115 minnows per 100 m^2, which is being used as the expected silvery minnow density within the action area during the proposed action.

The Service reviewed the proposed action, including measures implemented to reduce risk to listed species.

The proposed action is expected to have beneficial effects on silvery minnows and their critical habitat in the long-term by increasing silvery minnow residential habitat heterogeneity over a range of river discharges through increasing lateral floodplain/channel connectivity at a lower discharge and by providing low to intermediate flow silvery minnow recruitment habitat. Such habitat is expected to benefit silvery minnows through improved egg and larval retention, increased recruitment rates, and increased survival of both YOY and adult silvery minnows. In the long-term, the project is anticipated to contribute to improving the status of this species into the future through improved habitat availability and function.

However, we also expect the proposed action may generate adverse effects on silvery minnows as a result of several different activities: (1) construction of the proposed restoration treatments in wetted areas; and (2) indirect effects beyond the construction period due to potential stranding of silvery minnows in constructed ephemeral high flow channels, backwater embayments, and in bankline terraces. Take by trapping, capturing and collecting silvery minnows for the purposes of removing them from isolated pools (should they become stranded in those pools) is intentional take that is covered through the ESA section 10(a)(1)(A) permit held by Reclamation (or other permitted biologists, as applicable). The proposed entrapment monitoring protocol will help identify any minnows that are entrapped, and it will also serve to relocate surviving fish to the main river, giving them a chance to avoid mortality and thus minimize the adverse effects of the proposed action.

Short-term adverse effects on silvery minnows are expected due to construction, including in-water disturbance during construction of the ephemeral channel, embayments and bankline terraces. We expect silvery minnows will be present during these activities and will be harassed as a direct effect of the proposed action. The Service has defined take by harassment as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (see 50 CFR 17.3). Minnows are expected to exhibit an avoidance response to construction activities, and sustained avoidance during the short duration of construction work for each restoration activity (e.g., 2 to 5 days per individual site). Avoidance behavior, or fleeing from the disturbance, represents a disruption in normal behaviors and an expenditure of energy that an individual silvery minnow would not have experienced in the absence of the proposed action. However, this form of harassment is expected to be short in duration, with pre-exposure behaviors to resume after fleeing the disturbance. The potential number of silvery minnows affected within the immediate vicinity of the equipment is minimized, as we expect an initial flight response at the onset of activities. The placement of silt curtains when constructing shallow water habitat along the perimeter of the wetted channel will exclude silvery minnow, minimizing the possibility of trapping, injuring, or causing mortality. Conservation measures used during the proposed action will help to minimize disturbance, for example by installing silt fencing downstream of work in the water interface which would allow for silvery minnow to escape the treatment area. In addition, the applicable work window (i.e., not during April 15 to August 15) to avoid impacts to migratory birds will also avoid adverse effects on pre-spawn and spawning adult silvery minnows, as well as YOY during early growth (i.e., until large enough for sufficient mobility and resilience). Conservation measures and best practices in place for operation of equipment also minimize risk of adverse effects due to accidental introduction of hydrocarbon contaminants such that we expect it to be discountable. As a result, given the mobility of silvery minnows, the limited area and duration where effects are expected, and the proposed work window, we do not expect the anticipated avoidance response to construction – 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 the removal of barrier berms to connect constructed features to the river channel. These activities may affect water quality, causing localized increases in turbidity and suspended sediments. Direct effects from excess suspended sediments on a variety of fish species have included alarm reactions, abandonment of cover, avoidance responses, reduction in feeding rates, increased respiration, physiological stress, poor condition, reduced growth, delayed hatching, and mortality (Newcombe and Jensen 1996). In addition, indirect effects from sediment mobilization in the channel are possible, including the potential smothering and mortality of algae and aquatic invertebrates, depressed rates of growth, reproduction, and recruitment or reduced physiological function of invertebrates. Decreases in primary production are also associated with increased sedimentation and turbidity and can produce negative cascading effects through depleted food availability for zooplankton, insects, mollusks, and fish. We expect silvery minnows will exhibit an avoidance response to construction activities as described earlier. Conservation measures will help minimize the risk due to dispersal of suspended sediments (e.g., use of silt fences; water quality monitoring) and restrict the effects of suspended sediments to within the action area. Therefore, beyond the initial avoidance response to activities, we do not expect suspended sediments will result in significant direct effects on silvery minnows. Those same conservation measures are also expected to reduce the risk of indirect effects on silvery minnows from these activities.

Water use for dust abatement during the irrigation season will not use any water from the river channel, so we do not expect risk of adverse effects. However, water use during the non-irrigation season has the potential to use river water and therefore remove water from silvery minnow habitat. During non-irrigation season, water use for dust abatement will prioritize using water from drains where it has already been diverted. In the event dust abatement during the proposed action would remove water from the river during the non-irrigation season, it therefore has the potential to cause adverse effects on the silvery minnow through reduction in available habitat. However, given the time of year (non-irrigation season when demands on the river are reduced), the minimal amount of water that would be used (0.1 to 0.2 percent of river flows), and the short duration of each episode where the river would be affected (four to eight minutes), the available information indicates that such water use would exhibit insignificant effects on minnow habitat and we do not expect adverse effects resulting in take would occur. Any risk of direct effects on silvery minnow through uptake in the pumps is minimized, given the mesh size to be used on the pumps and the size of silvery minnow at the time of year this activity could occur. We expect this mesh would exclude silvery minnows and, therefore, adverse effects on silvery minnow directly from pumping are discountable.

Indirect effects on silvery minnows may also result from the proposed restoration treatments. Beyond the construction period, harassment and mortality of silvery minnows may occur due to potential stranding of fish in restored features. For example, high flows may deposit sediment in or near restored features resulting in isolated pools containing silvery minnows, particularly in ephemeral channels. We expect silvery minnows may become stranded in these isolated pools and die. Entrapment has also been noted to occur in other types of restored features on an infrequent basis (e.g., bankline scallop features similar to the proposed bankline terracing). Therefore, we cannot discount the probability that some entrapment mortality may occur as an indirect effect of the proposed action. The Water Utility Authority will construct these features with a slight slope towards the river, allowing water to drain back to the river and minimizing entrapment of silvery minnows.

Given our assessment of anticipated effects on silvery minnows, and the available information on disturbance zones for each activity (see Table 1), we expect silvery minnows will be harassed by construction activities related to habitat restoration treatments in wetted areas over a total area of 12.1 acres (48,966.96 m^2). The best available information on silvery minnow density in the action area for this consultation indicates 0.115 silvery minnows per 100 m^2. Therefore, we expect that up to 57 silvery minnows (juveniles and adults) would be harassed during construction. Given the timeframe for construction, we do not expect any eggs or larval silvery minnows will be harassed or otherwise taken during construction. Potential entrapment and stranding of silvery minnows in restored features is expected to result in take of this species due to harassment and mortality. Although entrapment has been noted to occur in other features on an infrequent basis (e.g., bankline scallops - similar to the proposed bankline terracing and embayment), we expect the majority of risk for entrapment of silvery minnows as flows recede will occur in the ephemeral channel. Thus, we assume the calculation of incidental take for entrapment in the ephemeral channel will encompass all entrapment-related take in both the ephemeral channel and other wetted features during the proposed action. In addition to the potential entrapment of juveniles and adults, during and immediately following the silvery minnow spawning period, there is potential for silvery minnow eggs and larvae to be entrained and stranded. Given a total impact area of 5.42 acres (21,933.96 m^2) for the ephemeral channel, divided by 3 as we do not expect the entire area would become an isolated pool, we expect take of up to 9 silvery minnows (juveniles and adults) in the form of harassment and mortality due to indirect effects from stranding. Any minnows that are located alive in isolated pools, seined, and relocated to the main river channel as part of the entrapment monitoring protocol would serve to minimize the adverse effects on silvery minnows by the proposed action. In addition, we expect an unquantifiable amount of silvery minnow eggs and larvae will be taken in the form of harassment and mortality due to indirect effects from stranding. We expect the extent of this harassment and mortality would encompass the project area over the same footprint that applies to stranding of juvenile and adult silvery minnows. We expect any take of eggs and larvae would be small in relation to the natural mortality of these life stages.

The Service notes that this represents a best estimate of the amount and extent of take that is likely during the proposed action. Thus, estimated incidental take may be modified from the above should the timeframe for construction be delayed, if research or early life stage monitoring indicated substantial deviations from the estimated extent of incidental take, or if it allows for a calculation of the amount of take of young life stages. In this case further consultation may be necessary.

Effects on Silvery Minnow Critical Habitat

The action area for this project occurs within designated silvery minnow critical habitat. Direct and indirect effects of the proposed action are likely to result in a beneficial impact on several primary constituent elements (PCEs) of silvery minnow critical habitat. PCEs for critical habitat include backwaters, shallow side channels, pools, and runs of varying depth and velocity;

substrates of predominantly sand or silt; and the presence of eddies created by debris piles, pools, or backwaters or other refuge habitat within unimpounded stretches of flowing water of sufficient length that provide a variation of habitats with a wide range of depth and velocities. The proposed action is expected to contribute to these PCEs, which provide for the physiological, behavioral, and ecological requirements essential to the conservation of the silvery minnow.

However, construction activities during the proposed action may have short-term adverse effects on PCEs of silvery minnow critical habitat. Specifically, there is risk of adverse effects on water quality due to equipment fueling and leakage or accidental spills as well as from turbidity. We expect the conservation measures and best management practices (e.g., cleaning of equipment, inspection, storage and refueling requirements, spill kit readiness, and protection of hydraulic lines from punctures) will reduce this risk such that it is extremely unlikely to occur and is therefore discountable. The proposed action will also disturb sediment due to equipment operation and the removal of barrier berms to connect constructed features to the river channel, which is expected to adversely affect water quality in designated critical habitat within the applicable disturbance zone. However, conservation measures in place during the proposed action are expected to restrict this disturbance and minimize the risk to the water quality PCE of critical habitat. These include the use of silt fences during placement and/or disturbance of sediments; water quality monitoring to ensure standards are maintained during the proposed action; and compliance with the CWA permitting processes and SWPPP. In addition, the temporary disturbance to critical habitat would result in adverse effects to water quality over a very small area relative to the overall critical habitat designation, which extends approximately 157 mi (252 km) from Cochiti Dam in Sandoval County, New Mexico, downstream to the utility line crossing the Rio Grande in Socorro County, New Mexico.

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

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur within the action area considered in this biological opinion (50 FR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The Service expects the natural phenomena in the action area will continue to influence silvery minnows as described in the *Environmental Baseline*. The Service also expects the continuation of habitat restoration projects in the Middle Rio Grande and research that will benefit silvery minnows in the action area, 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.

- Increased urban use of water, including municipal and private uses. Further use of surface water or further groundwater withdrawals that reduce surface water from the Rio Grande will reduce river flow and decrease available habitat for the silvery minnow.
- Contamination of 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., salt cedar), 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 point and 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 San Juan-Chama Drinking Water Environmental Mitigation Project authorized by the Bureau of Reclamation and as proposed in the July 2012 BA and subsequent correspondence with the Service during this consultation, 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 Albuquerque Reach of the Middle Rio Grande, or the species as a whole. We expect harassment of minnows may occur, but the duration and intensity of this effect will be short-term, with no long-term significant effects on silvery minnow behaviors such as breeding, feeding, or sheltering. Any risk of more serious effects or repeated harassment is minimized due to measures employed during the proposed action. A small number of mortalities may occur due to stranding in restored sites as peak flows recede; however, we anticipate that the increased availability of nursery habitat will improve overall survival of early life stages, and we do not expect these incidental mortalities to result in any significant long-term effects on the population in the Albuquerque Reach or for the species as a whole. We expect harassment and mortalities of minnows may occur due to stranding in restored features as peak flows recede; however, we do not expect this to result in any significant long-term effects on the population in the Albuquerque Reach or for the species as a whole. We expect any take of eggs and larvae would be small in relation to the natural mortality of these life stages.

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

INCIDENTAL TAKE STATEMENT

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

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

Amount or Extent of Take Anticipated

The Service has developed the following incidental take statement based on the premise that the San Juan-Chama Drinking Water Environmental Mitigation Project will be implemented as proposed. Take of silvery minnows is expected in the form of harassment and mortality due to the proposed habitat restoration activities, and is restricted to the action as proposed. If actual incidental take meets or exceeds the predicted level, Reclamation must reinitiate consultation.

The Service anticipates that take in the form of harassment may affect up to 57 silvery minnows due to proposed construction, as well as the harassment and mortality of up to 9 silvery minnows (juveniles and adults) due to potential stranding in restored features after peak flows recede. We base these figures on the best available information on minnow density in the area to be disturbed by the proposed activities during the next 3 years of project implementation. We also expect mortality of silvery minnow eggs and larvae that may become stranded in restoration features after flows recede; however, it is not possible to estimate the number of eggs and larvae that would be taken. We expect the extent of this take would encompass the project area over the same footprint that applies to stranding of juvenile and adult silvery minnow. We expect any take of eggs and larvae would be small in relation to the natural mortality of these life stages.

Any adverse effects to silvery minnow associated with the entrapment monitoring protocol, including those from seining and relocating silvery minnow to the main river channel, are the intended purpose of those activities, and this take is attributed to the applicable ESA section 10(a)(1)(A) permit. Therefore, this aspect of the proposed action is not considered incidental take and is not covered by Reclamation's incidental take statement for the San Juan-Chama Drinking Water Environmental Mitigation Project.

Effect of Take

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

Reasonable and Prudent Measures

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

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

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

Terms and Conditions

Compliance with the following terms and conditions must be achieved in order to be exempt from the prohibitions of section 9 of the ESA. These terms and conditions implement the Reasonable and Prudent Measures described above. These terms and conditions are non-discretionary. Reclamation must report to the Service's New Mexico Ecological Services Field

Office (NMESFO) on the implementation of these terms and conditions.
To implement RPM 1, Reclamation shall:

1. Ensure that all restoration treatment work is conducted during low flow periods and avoiding the silvery minnow spawning period, by working within the timeframes described in this biological opinion (not between April 15 and August 15 of each year).
2. Ensure that conservation measures described in this biological opinion are implemented, including those pertaining to equipment and operations, staging and access, water quality, dust abatement, and others.
3. Ensure that the presence/absence of silvery minnows is visually monitored at construction sites by a permitted biologist, and use adaptive management to modify activities and minimize adverse effects.
4. Report to the Service the results and effectiveness of restoration treatments.
5. Report to the Service findings of injured or dead silvery minnows.
6. Implement the project-specified monitoring, including entrapment monitoring, as proposed and report results annually to the Service.
7. Monitor the implementation of RPM 1 and its associated Terms and Conditions.

To implement RPM 2, Reclamation shall:

1. Ensure that conservation measures described in this biological opinion are implemented, including those pertaining to water quality monitoring, equipment and operations, and staging and access.
2. Ensure that all restoration treatment work is conducted during low flow periods, minimizing water quality impacts, by working within the timeframes described in this biological opinion (not between April 15 and August 15 of each year).
3. Report to the Service any significant spills of fuels, hydraulic fluids, and other hazardous materials.
4. Monitor the implementation of RPM 2 and its associated Terms and Conditions.

In the accompanying biological opinion and conference, the Service determined that the proposed action is not likely to result in jeopardy of the candidate species, yellow-billed cuckoo (*Coccyzus americanus*) nor will the proposed action incidentally take this candidate species. Once listed, the Service has determined the proposed action may affect, but is not likely to adversely affect, the cuckoo. Therefore, no potential incidental take exemptions are included in this Incidental Take Statement for the cuckoo, once listed. This is based on the proposed action being implemented as proposed, and none of the re-initiation triggers being met as described specific to the cuckoo below.

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. Evaluate the effectiveness of habitat restoration techniques implemented in the Middle Rio Grande for ESA-listed species, including an evaluation of site longevity and benefits provided to species.
2. Implement recovery actions identified in the southwestern willow flycatcher and Rio Grande silvery minnow recovery plans.
3. Evaluate entrapment risk in restored features (for the silvery minnow), including compilation of data available from prior projects. Work to develop guidelines or requirements for construction of features that minimize that risk.

RE-INITIATION NOTICE

This concludes formal consultation on the action described in the July 2012 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.

Reclamation may ask the Service to confirm the conference determination contained in this document if the cuckoo is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference determination that the proposed action is not likely to adversely affect the yellow-billed cuckoo and no further section 7 consultation will be necessary. Should critical habitat be designated for the yellow-billed cuckoo, further consultation with the Service may be necessary. In addition, after listing of the yellow-billed cuckoo, Reclamation shall request reinitiation of this consultation if: (1) the amount or extent of incidental take is exceeded (for this proposed action, that would be any incidental take of the cuckoo greater than zero); (2) new information reveals effects of the agency action that may affect the cuckoo or its critical habitat in a manner or to an extent not considered in this conference; (3) the agency action is subsequently modified in a manner that causes an effect to the cuckoo or its critical habitat that was not considered in this conference; or (4) a new species is listed or critical habitat designated (including cuckoo critical habitat) that may be affected by the action.

In future correspondence on this project, please refer to consultation number 02ENNM00-2-12-F-0091. If you have any questions or would like to discuss any part of this biological opinion and conference, please contact Stacey Kopitsch of my staff at (505) 761-4737.

Wally Murphy

cc:
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