



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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August 19, 2011

Cons. # 22420-2011-F-0035

Corbin L. Newman, Jr., Regional Forester  
USDA Forest Service  
333 Broadway SE  
Albuquerque, NM 87102

Dear Mr. Newman:

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 New Mexico State Trust Land Riverine Restoration Project (Project) within the Albuquerque Reach of the Middle Rio Grande. The project is proposed by the New Mexico State Land Office (State Land Office) and is partially funded by the USDA Forest Service (Forest Service). This BO analyzes the effects of the action on the endangered Rio Grande silvery minnow, *Hybognathus amarus*, (silvery minnow) and its designated critical habitat, as well as on the endangered southwestern willow flycatcher, *Empidonax traillii extimus*, (flycatcher). The restoration project will be located along 0.8 miles (1.3 km) of the Rio Grande in the South Diversion Channel Subreach in Bernalillo County, New Mexico. The project will be located immediately north of the recent MRG Riverine Habitat Restoration Project Phase IIA implemented by the New Mexico Interstate Stream Commission and will complement that project. 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 February 9, 2011.

This BO is based on information submitted in the BA dated November 2010; conversations and communications between the Forest Service, the State Land Office, 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.

**Southwestern Willow Flycatcher**

The Forest Service 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, which occurs at more than 5 miles (8 km) from existing flycatcher nest sites. Migrating flycatchers could still be disturbed by construction activities and the clearing of woody vegetation in the action area; however, these activities will not occur during the timeframe when flycatchers could be present (April 15 to August 15). If work is planned within two weeks before April 15 or after August 15, the State Land Office will consult with the Service and conduct additional surveys, if warranted, to determine the presence of flycatchers in the action area and minimize the risk of exposing the species to proposed activities. Should breeding flycatchers also become established in the action area, the State Land Office will cease any education and outreach activities in the action area during the timeframe when breeding flycatchers could be present (April 15 to August 15). However, 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 it does not have the structure to attract breeding flycatchers. In addition, conservation measures will be implemented to minimize potential effects on vegetation in the action area. These include avoiding dense willow-dominated riparian vegetation, using all efforts to minimize damage to native vegetation, using existing roads and cleared staging areas, and operating equipment in the most open area available. Thus, indirect effects on flycatchers from removing vegetation are considered insignificant in the short-term, and beneficial through restoration of flycatcher habitat in the long-term.

Given the conservation measures in place during the proposed restoration project, anticipated effects to the 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**

The Service received a final BA from the State Land Office and request for formal consultation on this proposed Middle Rio Grande Riverine restoration project on November 22, 2010. The Service received a letter from the Forest Service on February 3, 2011 designating the State Land Office as their non-Federal representative. An additional letter was received from the Forest Service on February 9, 2011 requesting formal consultation and concurrence with a not likely to adversely affect determination for the flycatcher. The Service met with the State Land Office on

March 24, 2011 to discuss additional information needed on the proposed action, which was received on March 24, 2011, and April 15, 2011. The Service conducted site visits with State Land Office representatives on May 23, 2011 and June 3, 2011. On July 22, 2011, the Service provided a draft BO to the Forest Service and State Land Office for review.

## **BIOLOGICAL OPINION**

### **I. DESCRIPTION OF THE PROPOSED ACTION**

#### **Overview**

The Forest Service's Southwest Region is working cooperatively with the State Land Office to accomplish river ecosystem restoration on State Trust Land along a 0.8 mile stretch of the Rio Grande in Bernalillo County, New Mexico. The State Land Office has been designated as the non-Federal representative for the Forest Service and has prepared the BA analyzing the effects to ESA-listed species and their designated critical habitat. Many of the project descriptions used in the BA (restoration techniques, affected species, effects, and environmental commitments) are identical to those of the New Mexico Interstate Stream Commission's Middle Rio Grande Riverine Habitat Restoration Phase IIa Biological Assessment (SWCA Environmental Consultants 2008). The State Land Office will conduct the Middle Rio Grande Riverine Restoration Project, primarily funded by the River Ecosystem Restoration Initiative (RERI), with partial funding from the Forest Service. The project will apply several restoration techniques in the Albuquerque Reach of the Middle Rio Grande with objectives to restore natural structure and function to the bosque riparian ecosystem by reintroducing native mid-story vegetation, eliminating exotic species, and restoring the hydrologic connection between the floodplain and the river, as well as continuing existing education and outreach. In addition, the creation and improvement of silvery minnow habitat is expected through the construction of over-wintering, egg-retention and larval-rearing habitat. The project will be implemented in a phased approach between September 2011 and April 2013, to include post construction monitoring. No restoration activities will be conducted from April 15 through August 15. Should this project be expected to extend beyond April 2013, the State Land Office will contact the NMESFO.

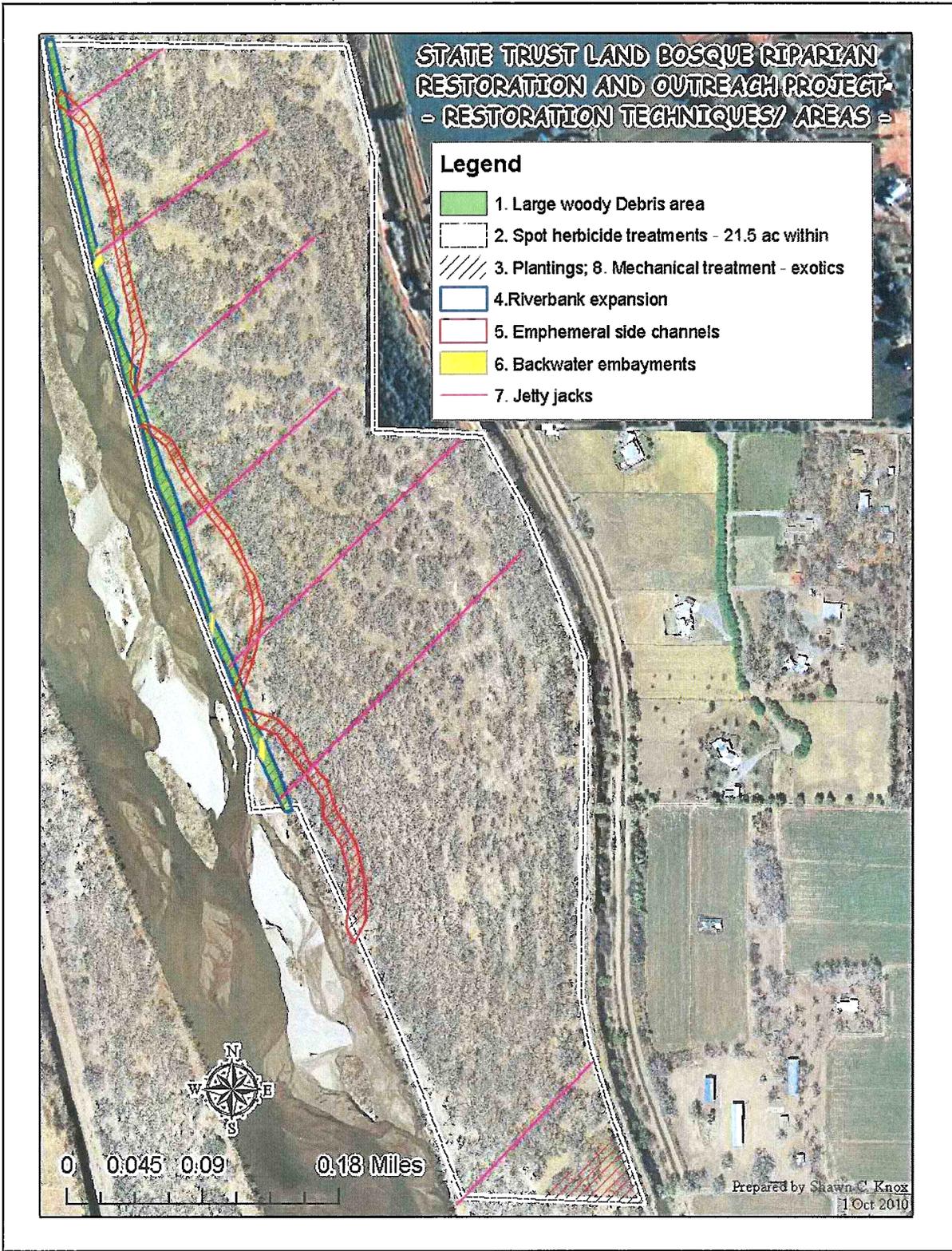
#### **Project Location**

The proposed action will occur in the South Diversion Channel (SDC) Subreach of the Albuquerque Reach located in Bernalillo County, New Mexico (see Figure 1, next page). The project area encompasses approximately 21.5 acres and extends 0.8 miles along the Middle Rio Grande between River Miles (RM) 172.6 and 173.4, which is just north of the Phase IIa MRG Riverine Habitat Restoration Project implemented by the Interstate Stream Commission in 2009.

#### **Proposed Restoration Treatments**

Specific restoration treatments will be implemented during the proposed action and are designed to create and improve habitat for the silvery minnow and flycatcher. The first goal of the proposed action is to improve riparian habitat quality and heterogeneity, and the second goal is to

Figure 1. Locations of Restoration Treatments (source: New Mexico State Trust Land Biological Assessment for the Riverine Restoration Project within the Albuquerque Reach of the Middle Rio Grande , Prepared by New Mexico State Land Office, 2010.)



restore natural dynamic fluvial processes. For the first goal, the following modifications are proposed: mechanical removal of non-native vegetation along the riverbank, placement of large woody debris into the main river channel or along its banks to create slow-water habitats, mechanical removal and herbicide treatment of non-native vegetation in the floodplain, and re-vegetation in the floodplain with native plant species. For the second goal, the following modifications are proposed: riverbank expansion/terracing to allow for overbank flooding, creation of high-flow side channels with water catchment swales to allow periodic inundation and saturation of the floodplain, creation of backwaters to facilitate inundation during high-flow events, and the removal of jetty jacks perpendicular to the bank line. Treatment areas are represented in Figure 1. The execution of the restoration techniques are expected to facilitate lateral migration of the river across the riverbank during a variety of flow stages, promote egg retention, larval rearing, and provide young-of-year and over-wintering habitat for the silvery minnow. Moreover, enhancement of the native riparian vegetation community has the potential to increase suitable habitat for the flycatcher and other migratory birds. Table 1 provides a summary of the restoration treatments in both wetted and dry areas and includes the acreage affected and duration of restoration treatments. Information in Table 1 is based on the November 2010 BA (New Mexico State Land Office 2010) and subsequent correspondence from the State Land Office.

**Table 1. Proposed Restoration Treatments and Areas Affected (from November 2010 BA and State Land Office)**

<b><i>Wetted Restoration Treatments</i></b>	<b><i>Impact Area (acres)<sup>1</sup></i></b>	<b><i>Duration</i></b>
-Large woody debris	0.44 acres *	4 days
-Riverbank expansion/terracing	3.3 acres	3 days
-Ephemeral channels (up to 3)	0.55 acres	1 day
-Backwater embayments (3)	0.44 acres	1.5 days
-Removal of lateral confinements	0.88 acres	1 day
-Mechanical treatment of exotics	0.72 acres	1.5 days
<b>Total</b>	<b>5.89 acres</b>	<b>12 days</b>
<b><i>Dry Restoration Treatments</i></b>	<b><i>Impact Area (acres)<sup>2</sup></i></b>	<b><i>Duration</i></b>
-Herbicide treatment of exotics	23.1	4 days
-Planting of native vegetation	7.66	8 days
<b>Total</b>	<b>30.76 acres</b>	<b>12 days</b>

1- Wetted riverbank acreage includes a 10% buffer to encompass the anticipated disturbance zone

2 - Dry riverbank and floodplain acreage includes a 10% buffer to encompass the anticipated disturbance zone

\* Large woody debris placement will be conducted in the footprint of the riverbank expansion/terracing treatment, therefore this acreage (0.44 acres) is not reflected in the total wetted impact area.

### **Wetted Restoration Treatments**

#### *Large Woody Debris*

This proposed treatment involves the placement of root wads, trees, and branches into the main channel or near the bank to create aquatic habitats. Large woody debris will be placed in selected

locations along the riverbank modification areas only, and may be anchored to the river bottom or bank so that it remains in place until decomposition sets in. Anchoring would involve the excavation of a cylinder shape approximately the diameter of the tree, placement of the lower  $\frac{1}{4}$  of the tree into the depression, and then backfilling with existing excavated material. The objective of this restoration technique is to enhance food availability and the mesohabitats utilized by the silvery minnow.

#### *Riverbank Expansion/Terracing*

This restoration technique involves the removal of bank line vegetation, excavation of soils, and where applicable, the removal of lateral confinements (i.e., jetty jacks) to increase the potential for lateral movement of the river and overbank flooding. Bank lowering will be performed in areas where the river channel is deeply incised and the potential for overbank flooding is currently minimal. The areas where banks are lowered and terraced would be inundated during different stages of moderate to high flows (inundation targets of 1000 cfs, 1500 cfs, and 2000 cfs) and would increase the frequency and duration of inundation. Lateral migration and overbank flooding are intended to create ephemeral nursery habitat for retention of silvery minnow eggs and larvae.

#### *Ephemeral Channels*

Ephemeral channels are features that carry high-discharge flow from the river main channel, characteristically 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, creating aquatic habitat that would be beneficial to the silvery minnow. The channels would extend from the riverbank into the floodplain and would accommodate flows to encourage silvery minnow recruitment. The ephemeral channels will have a high point roughly in the middle of the channel, allowing river water to drain to the river when levels drop. Water catchment swales will also be constructed adjacent to the ephemeral channels in order to provide moist soil depressions to encourage natural recruitment of native vegetation. Both of these features will be constructed with a 1% to 2% slope to allow water to drain back to the river when flow levels drop.

#### *Riverbank Backwater Channels and Embayments*

The creation of moderate to high-flow backwater channels and embayment areas would involve the removal of riverbank vegetation and the excavation of soils to prescribed depths, and these features would have targeted inundation levels of 1000 cfs, 1500 cfs, and 2000 cfs. This restoration technique is being utilized to increase the amount of low-flow and no-flow habitat areas available to the silvery minnow. These areas are intended to retain drifting silvery minnow eggs, provide silvery minnow rearing habitat, and to provide shallow, low-velocity habitats with abundant food supplies for developing silvery minnow larvae. These features will also be constructed with a 1% to 2% slope designed to allow water to drain back to the river when flow levels drop.

#### *Removal of In-Channel Lateral Confinements*

Lateral jetty jacks within the floodplain area will be extracted using a backhoe with thumb attachment. The removal of in-channel jetty jacks may also be completed on an as-needed basis within selected treatment areas associated with the riverbank expansion/terracing technique. Removal of these confinements is intended to allow for natural river processes to create wider

and more diverse channel and floodplain features, resulting in increased low-velocity habitat areas for all life stages of the silvery minnow. Should it be necessary to remove jetty jacks from the main channel, this will be done via terrestrial equipment such as a backhoe and in coordination with the appropriate agencies.

#### *Mechanical Treatment of Exotic Plants*

This restoration technique involves the use of chain saws and hand crews to manually remove exotic vegetation. Mid and large-diameter trees such as salt cedar (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), Siberian elm (*Ulmus pumila*), and Tree-of-heaven (*Ailanthus altissima*), will be cut in certain locations throughout the project area, and the woody material removed. Specifically, these treatments will be focused along the riverbank in areas where bank line modification is not occurring, and on a stand of mature Siberian elm trees located along one of the proposed high-flow channels.

#### **Dry Restoration Treatments**

##### *Herbicide Treatment of Exotic Species*

The herbicides Habitat© or Polaris AQ© will be applied to portions of both the riverbank and the floodplain area. On the riverbank, herbicide will be applied to the stumps of mature Russian olive and salt cedar trees that have been manually cut by hand crews. Within the floodplain area, foliar applications will be used for mostly immature Russian olive and salt cedar trees that have re-sprouted from previous mechanical and chemical treatments, along with kochia (*Bassia prostrata*) and Tree-of-heaven plants. Herbicide will also be applied to the stumps of Siberian elm trees within the floodplain that have been manually cut by hand crews. Stands of kochia and Russian thistle (*Salsola kali*) located within both the floodplain and riverbank area will also be treated with Habitat© or Polaris AQ©.

Habitat© and Polaris AQ© both contain the active ingredient Imazapyr, and do not require a protective buffer from wetted areas (standing or flowing water). Application of any herbicide however, will not take place when winds exceed 10 miles per hour or when rain is forecasted for the local area within 48 hours of application. Care will be taken when mixing or applying any herbicide to avoid runoff onto the ground, and application will be in accordance with product label directions.

##### *Planting of Native Grasses, Forbs, Shrubs and Trees*

Vegetation plantings will occur mainly along the constructed high-flow channels and along the riverbank where bank line modification is occurring. Species planted will consist of willow (*Salix gooddingii* and *Salix exigua*) cuttings, cottonwood (*Populus deltoids wislizeni*) poles, and long-stem containerized native shrub plantings including, but not limited to, New Mexico olive (*Forestiera neomexicana*), screwbean mesquite (*Prosopis pubescens*), and golden currant (*Ribes aureum*). Grasses and forbs will be broadcast seeded and sown in all areas disturbed from mechanical equipment operations. Some planting may occur in the floodplain and will be located along the newly created high-flow side channel and associated catchment swales, as well as surrounding the backwater embayments and in an existing disturbed portion within the southern project area. The same native species noted above will also be planted within the floodplain areas, though wetland species will only be located in areas that receive sustained, periodic inundation at intervals long enough to support them.

### **Equipment, Staging, and Access**

The equipment that is necessary for construction may include, but is not limited to, an excavator, backhoe, root plow, dozer, dump truck and a belly scraper. The use of low-impact amphibious equipment is not proposed as terrestrial machines will be used to excavate strictly in the existing floodplain. The corresponding fill will be removed and hauled via dump truck and will not be placed in the river. Access to the bank line area targeted for treatments will be from an already established access road on the southern edge of the project area. No river crossings are anticipated. No mature native vegetation will be removed for staging activities 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.

- Prior to leaving contractor facilities, all equipment would be thoroughly inspected, and any leaky or damaged hydraulic hoses would be replaced.
- To avoid any potential impacts to silvery minnow critical habitat or flycatcher proposed critical habitat, all fuels, hydraulic fluids, and other hazardous materials would be stored outside the normal floodplain, and refueling would take place on dry ground with a spill kit ready. Extra precautions would be taken when refueling because of the environmentally sensitive location.
- An environmental specialist trained in spill prevention and spill cleanup would be on site during all construction activities.
- All equipment would be steam-cleaned before arriving and departing the job site.
- A spill kit would be maintained on every rig in the river, with spill pans, containment diapers, oil booms, absorbent pads, oil mats, plastic bags, gloves, and goggles.
- Steel-mesh guards would cover all external hydraulic lines.
- Each individual operator would be briefed on and would sign off on local environmental considerations specific to the Project tasks, including specific SWPPPs.
- Water-quality testing would be conducted prior to entering the water and periodically during the operating day to ensure that standards are being maintained.
- Silt fencing will be placed prior to the beginning of excavation and will remain in place until water quality has returned to within 10% of the 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.
- Equipment operation would minimize sediment displacement by river flow.

### **Monitoring and Maintenance**

Monitoring of project performance and success will be conducted for five consecutive years following construction. Project performance and success will be assessed using three types of monitoring. The first type of monitoring is geomorphic, and pre-construction geomorphic surveys (cross-sections) have already been completed by State Land Office staff. Additional transects (cross-sections and longitudinal) will be completed by a contractor. Post-construction surveys will then be completed each year following the spring flood season. 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 vegetative transects, during which a contractor will characterize vegetative species cover and abundance in the riverbank area, measure the age classes and species of trees in the riverbank area, inner floodplain, and outer floodplain, and measure the understory species and abundance in each of the riverbank, inner, and outer floodplain areas.

In addition, the State Land Office, or appropriate ESA permit holder, will conduct monitoring for potential entrapment post-construction at the high flow channels and backwaters created and any other restored features that may form isolated pools as flows recede. After two years, it may be determined in coordination with the Service that further monitoring is unnecessary. A thorough visual examination for the sites will be conducted to look for the presence of silvery minnows. 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 any other high flow events that could introduce water into an area and then result in isolated pool(s) as water recedes.
2. Monitoring at restored features will start when discharge on the descending limb of the hydrograph approaches 0-500 cfs, or 10% of a site-specific target inundation.
3. When monitoring is started once flows are receding, 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 (or if seining is not feasible, then other net gear may be substituted) these pools and determine (a) the presence or absence of silvery minnows, and (b) the potential number present. Fish monitoring 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 from isolated pools will then be released nearby into continuous parts of the river.
6. Species identification, standard length, reproductive condition, and health condition of fish; and pool depth, dimensions and water quality information will be recorded to the extent possible. Health information includes whether fish exhibit signs of compromised health due to disease (e.g., fungus, *Lernia*, hemorrhagic lesions), anemia (i.e., emaciation), or physical deformity. 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 preserved and transferred to the Museum of Southwestern Biology.

7. The findings of this monitoring program for the State Land Office MRG Riverine Restoration project will be reported to the Service once per year in December, 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 (based on State Land Office MRG Riverine Restoration Project Incidental Take Statement) 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. 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 when the channels are not connected to the main channel. If side channel maintenance or vegetative treatment is required past April 2013, the State Land Office will request an additional consultation.

### **Project Implementation Timing and Sequencing**

This project will be implemented in a phased approach, with restoration activities conducted between September 2011 and April 2013. The first phase of the project will consist of planning, compliance, and the initial treatment of exotic vegetation. Phase II is the construction period and will involve the construction of all the wetted restoration features, additional exotic vegetation treatments, and planting efforts. This will begin with mechanical vegetation removal (cut-stumps treatments) and jetty jack removal along the bankline in early September 2011. Mechanical and herbicide treatment of exotics in the floodplain is planned throughout the month of September, 2011 and then construction of the ephemeral side channels, riverbank expansion/terracing, and embayments would occur in late September to early October, 2011. Placement of large woody debris and embayment construction would occur concurrently with the riverbank expansion/terracing. Following the construction work, Phase III will be implemented in the spring of 2012 and fall of 2012 and will involve the final exotic vegetation treatments and vegetation plantings. Phase IV will consist of post construction monitoring.

### **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 (16 United States Code [USC] 703, et seq.), construction and clearing of vegetation would be scheduled between August 15 and April 15, outside of the normal breeding season for most avian species.
- To mitigate potential short-term construction impacts to the flycatcher, clearing of dense woody vegetation would be avoided and conducted only between August 15 and April 15.

- No activities of any sort (e.g., education workshops, site tours, etc.) would occur during the flycatcher breeding and nesting season between April 15 and August 15, should the project site become suitable breeding habitat.
- Qualified biologists with the State Land Office will periodically conduct flycatcher surveys using the Service protocol.

### *Equipment and Operations*

- Best management practices (see page 8) would be enforced to minimize potential impacts to silvery minnow from direct construction impacts and erosional inputs into the river during construction periods:
  - Prior to leaving contractor facilities, all equipment would be thoroughly inspected, and any leaky or damaged hydraulic hoses would be replaced.
  - To avoid any potential impacts to silvery minnow critical habitat or flycatcher proposed critical habitat, all fuels, hydraulic fluids, and other hazardous materials would be stored outside the normal floodplain, and refueling would take place on dry ground with a spill kit ready. Extra precautions would be taken when refueling because of the environmentally sensitive location.
  - An environmental specialist trained in spill prevention and spill cleanup would be on site during all construction activities.
  - All equipment would be steam-cleaned before arriving and departing the job site.
  - A spill kit would be maintained on every rig in the river, with spill pans, containment diapers, oil booms, absorbent pads, oil mats, plastic bags, gloves, and goggles.
  - Steel-mesh guards would cover all external hydraulic lines.
  - Each individual operator would be briefed on and would sign off on local environmental considerations specific to the Project tasks, including specific Stormwater Pollution Prevention Plans (SWPPPs).
  - Water-quality testing would be conducted prior to entering the water and periodically during the operating day to ensure that standards are being maintained.
  - Silt fencing will be placed prior to the beginning of excavation and will remain in place until water quality has returned to within 10% of the 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.
  - Equipment operation would minimize sediment displacement by river flow
- Additional evaluation of the net depletion effects of each proposed technique would be included in the monitoring of Project elements. Restoration techniques that are determined to add significant levels of depletion to the surface waters of the Rio Grande would be curtailed.

- Wetlands and dense native vegetation will be avoided whenever possible during construction.
- Silt fencing will consist of a geotextile fabric combined with a poultry fence to provide structure, supported by metal t-posts that hold the silt fence in the desired location. No fill material from the excavation of the side channel or bankline modification will be placed in the active river channel. However, since there is a chance that sediment will escape into the river channel, silt fencing will be placed around the work area. Specifically, the silt fence is placed in the river at the upstream boundary of the work area, connected to the river bank. The silt fence extends into the river 1-2 feet from the river bank and then extends parallel to the river bank for the length the work area. The fencing has an opening at the downstream end to allow escape of silvery minnow and other organisms.
- Upstream gages will be monitored and equipment will be removed from the channel in the event of high storm surges detected at upstream gages.

#### *Staging and Access*

- Impacts to terrestrial habitats would be minimized by using the existing road and cleared staging area. In general, equipment operation would take place in the most open area available, and all efforts would be made to minimize damage to native vegetation.
- No mature native vegetation will be removed for staging activities and construction would occur outside the flycatcher breeding season. In addition, best management practices will be followed to ensure that all habitat restoration activities are safely implemented.
- Once at the construction site, equipment will operate on the riverbanks, bars, and islands to avoid contact with aquatic habitat wherever possible.
- Construction materials will be placed in a manner such that no isolated pools of water are formed where fish could become trapped.

#### *Permitting*

- CWA compliance is required of all aspects of the Project, and since most work associated with the Proposed Action would be completed within aquatic areas regulated by this law, a 404 permit is required. A state water quality certification permit under Section 401 of the CWA may also be required. The 404 and 401 permitting processes would be completed prior to commencement of the Proposed Action.
- Stormwater discharges under the Proposed Action would 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, an NPDES permit, or an SWPPP.

- 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, and the MRGCD.

#### *Herbicide Treatments*

- Herbicide application will not take place when winds exceed 10 miles per hour.
- Herbicide application will not take place when rain is forecasted for the local area within 48 hours of application.
- Care will be taken when mixing or applying herbicide to avoid run-off onto the ground.
- Herbicide application will be in accordance with label directions.

#### *Water Quality Monitoring*

- Water quality would be monitored before silt fencing is installed, and the fencing would not be removed until water quality has returned to within 10% of the original measures.
- Water-quality testing will be conducted periodically during the operating day to ensure that standards are being maintained. Water-quality parameters to be tested include pH, temperature, dissolved oxygen, and turbidity, both upstream and downstream of the work area.
- Responses to changes in water-quality measures exceeding the applicable standards will include reporting the measurements to the New Mexico Environment Department (NMED) Surface Water Quality Bureau and returning equipment to shore.

#### *Other*

- An as-built plan and profile maps will be developed after treatment but before high flows.
- If water is needed for dust abatement on roads, water will be pumped from irrigation drains or using other sources, not the river.
- No burning of piles of removed vegetation will be conducted. In the event burning piles of removed vegetation is necessary, obvious areas where runoff may occur will be avoided and the remnants of burned piles will be raked or distributed after burning. This will help avoid concentrated areas where runoff could introduce polycyclic aromatic hydrocarbons (PAHs) into silvery minnow habitat.

#### **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 downstream portion of the South Diversion Channel Subreach between RM 172.6 and RM 173.4. For this consultation, the action area is defined as the entire width of the 100-year floodplain of the Rio Grande from RM 172.6 to RM 173.4.

## 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)<sup>1</sup>. The only readily apparent sexual dimorphism is the expanded body cavity of ripe females during spawning (Bestgen and Propst 1996).

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 jemezianus*), phantom shiner (*Notropis orca*), and bluntnose shiner (*Notropis simus*

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<sup>1</sup> 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

*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 (SDS 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 ( $< 0.33 \text{ ft}\cdot\text{s}^{-1}$  or  $10 \text{ cm}\cdot\text{s}^{-1}$ ) areas over silt or sand substrate that are associated with shallow ( $< 40 \text{ cm}$  or  $15.8 \text{ in}$ ) 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 ( $< 10 \text{ cm}\cdot\text{s}^{-1}$  or  $0.33 \text{ ft}\cdot\text{s}^{-1}$ ) (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 1°C (35°F) and less than 30°C (85°F) and reduce degraded conditions (e.g., decreased dissolved oxygen, increased pH).

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

### **Life History**

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 1995a, Platania and Altenbach 1998). The majority of adults spawn in about a one-month period in late spring to early summer (May to June) in association with spring runoff. Platania and Dudley (2000, 2001) found that the highest collections of silvery minnow eggs occurred in mid-to late May. In 1997, Smith (1999) collected the highest number of eggs in mid-May, with lower frequency of eggs being collected in late May and June. These data suggest multiple silvery minnow spawning events during the spring and summer, perhaps concurrent with flow spikes. Artificial spikes have apparently induced silvery minnows to spawn (Platania and Hoagstrom 1996). 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 1995a) and has reduced the species' effective population size ( $N_e$ ) to critically low levels (Alò and Turner 2005, Osborne *et al.* 2005). Adults, eggs and larvae may also be transported downstream to Elephant Butte Reservoir. It is believed that none of these fish survive because of poor habitat and predation from reservoir fishes (U.S. Fish and Wildlife Service 1999).

Platania (2000) found that development and hatching of eggs are correlated with water temperature. Eggs of the silvery minnow raised in 30°C water hatched in approximately 24 hours while eggs reared in 20-24°C 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 ( $\pm 8.1$ ) mm SL (Buhl, pers. comm. as cited in U.S. Fish and Wildlife Service 2010).

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, Magana 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 1995b and Magana 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. 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 of age determination using scales and otoliths indicates that the age range of silvery minnows is 0-3 years. Most individuals collected in the autumn are Age-0 and Age-1, and most individuals collected in the spring are Age-1 and Age-2, with a small number of Age-3 individuals also collected in the spring (Horwitz *et al.* 2011).

Platania (1995a) found that a single female in captivity could broadcast 3,000 eggs in eight hours. Females produce 3 to 18 clutches of eggs in a 12-hour period. The mean number of eggs in a clutch is approximately 270 (Platania and Altenbach 1998). In captivity, silvery minnows have been induced to spawn as many as four times in a year (C. Altenbach, City of Albuquerque, pers. comm. 2000). It is not known if they spawn multiple times in the wild. The high reproductive potential of this fish appears to be one of the primary reasons that it has not been extirpated from the Middle Rio Grande. However, the short life span of the silvery minnow increases the population instability. When two below-average flow years occur consecutively, a short-lived species such as the silvery minnow can be impacted, if not completely eliminated from dry reaches of the river (U.S. Fish and Wildlife Service 1999).

### **Distribution and Abundance**

Historically, the silvery minnow occurred in 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). 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 2001, 1999). The Rio Grande below Angostura Dam becomes a predominately sand bed river with low, sandy banks in the downstream portion of the reach. The construction of Cochiti Dam also created a barrier between silvery minnow populations (U.S. Fish and Wildlife Service 1999). As recently as 1978, the silvery minnow was collected upstream of Cochiti Lake; however surveys since 1983 suggest that the fish is now extirpated from that area (U.S. Fish and Wildlife Service 1999; Torres *et al.* 2008).

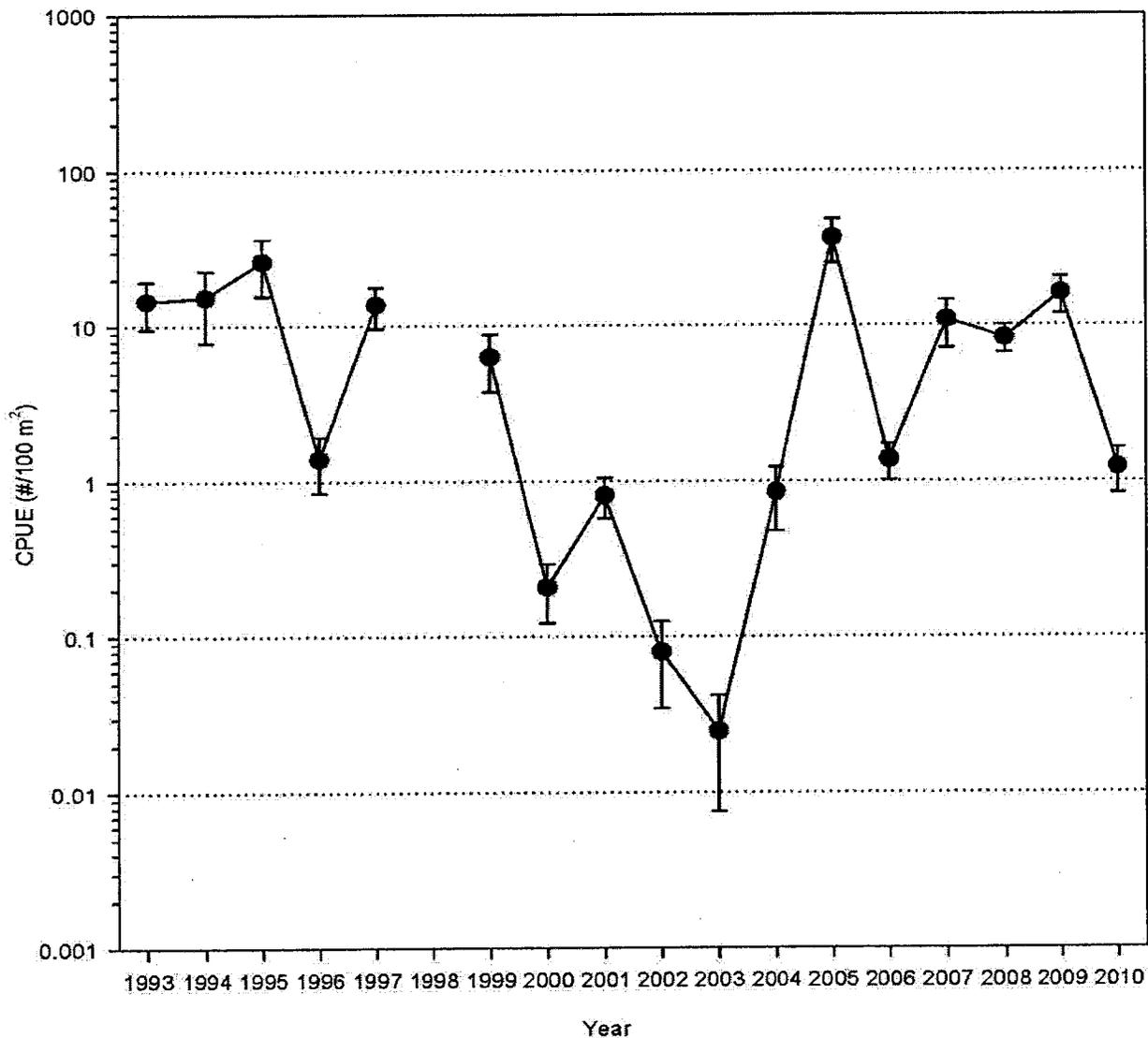
#### Long-term Population Monitoring

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 178.3 (at the Rio Bravo Boulevard bridge crossing) near the action area. The most recent data from this site indicate a density of 0.4 minnows per 100 square meters within the action area in October of 2010 (Dudley and Platania 2011).

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). Population size is highly correlated with hydrologic conditions, particularly the magnitude and duration of the spring runoff (Dudley and Platania 2008b). The capacity of the species to respond to good hydrologic years (e.g. 2005) is

dependent on a variety of factors including the previous year's survivorship and number of adults available to reproduce.

Figure 2. Rio Grande Silvery Minnow Population Trends 1993-2010 based on October CPUE data



Augmentation has likely sustained the silvery minnow population throughout its range. Over 1.25 million silvery minnows have been propagated and then released into the wild since 2002 (J. Remshardt, Service, *pers. comm.* 2011). 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 Angostura 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 is being evaluated. If the overall catch rate for the Angostura Reach drops to below 0.1 fish per 100 m<sup>2</sup> during October

population monitoring, then augmentation will be re-initiated for this reach the following year (Remshardt 2008).

#### Middle Rio Grande Distribution Patterns

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

This pattern has changed in recent years. In 2004, 2005, and 2007, catch rates were highest in the Angostura Reach and lower in the Isleta and San Acacia Reaches. Routine augmentation of silvery minnows in the Angostura Reach (the focus of augmentation efforts starting in 2001) may partially explain this pattern. Transplanting of silvery minnows rescued from drying reaches (approximately 812,368 individuals through 2010) has also occurred since 2003; 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 Angostura 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. Geologic 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 Angostura 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 Angostura Reach in 2007 to highest densities in the San Acacia Reach in 2008 and 2009) (Dudley and Platania 2008a, 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). The highest densities occurred in the San Acacia Reach and the lowest were in the Angostura Reach (Dudley and Platania 2011).

### **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:

### **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. These include the current weather patterns, changes to the natural hydrology of the Rio Grande, changes to the morphology of the channel and floodplain, water quality, storage of water and release of spike flows, captive propagation and augmentation, silvery minnow salvage and relocation, ongoing research, and past projects in the Middle Rio Grande.

### Changes in Hydrology

There have been two primary changes in hydrology as a result of the construction of dams on the Rio Chama and Rio Grande that affect the silvery minnow: (1) loss of water in minnow habitat and (2) changes to the magnitude and duration of peak flows.

### *Loss of Water in Minnow Habitat*

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

Water management and use has resulted in a large reduction of suitable habitat for the silvery minnow. Agriculture accounts for 90 percent of surface water consumption in the Middle Rio Grande (Bullard and Wells 1992). The average annual diversion of water in the Middle Rio Grande by the 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. Papadopoulos & Associates, Inc. 2000; U.S. Geologic Survey 2002). A portion of the water diverted by the MRGCD returns to the river and may be re-diverted, sometimes more than once (Bullard and Wells 1992; MRGCD, *in litt.* 2003). Although the river below Isleta Diversion Dam may be drier than in the past, small inflows may contribute to maintaining flows. Since 2001, improvements to physical and operational components of the irrigation system have contributed to a reduction in the total diversion of water from the Middle Rio Grande by the MRGCD. Prior to 2001, average diversions were 630,000 afy and now average 370,000 afy. The change was possible because of the considerable efforts of MRGCD to install new gages, automated gates at diversions, and the scheduling and rotation of diversions among water users. The new operations

reduce the amount of water diverted; however, this also reduces return flows that previously supported flow in the river. In February 2007, the City of Albuquerque and Albuquerque Bernalillo County Water Utility Authority with six conservation groups established a fund that will provide the opportunity to lease water from Rio Grande farmers and have that water remain in the river channel to support the silvery minnow. The Pilot Water Leasing Project supports the need for reliable sources of water to support conservation programs as identified by the Middle Rio Grande Endangered Species Collaborative Program (Collaborative Program)(MRGESCP 2004).

River reaches particularly susceptible to drying occur immediately downstream of the Isleta Diversion Dam (river mile 169), a 5-mile (8-km) reach near Tome (river miles 150-155), a 5-mile (8-km) reach near the U.S. Highway 60 Bridge (river miles 127-132), and an extended 36-mile (58-km) reach from near Brown's Arroyo (downstream of Socorro) to Elephant Butte Reservoir. Extensive fish kills, including tens of thousands of silvery minnows, have occurred in these lower reaches when the river has dried. It is assumed that mortalities during river intermittence are likely greater than documented levels, for example due to predation by birds in isolated pools (J. Smith, NMESFO, *pers. comm.* 2003). From 1996 to 2007, an average of 32 miles of the Rio Grande has dried each year, mostly in the San Acacia Reach. The most extensive drying occurred in 2003 and 2004 when 60 and 68.7 miles, respectively, were dewatered. Most documented drying events lasted an average of two weeks before flows returned. In contrast, 2008 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.

#### *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.

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 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.

#### 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 Angostura 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 tetrachloroethene (TCE); and the gasoline additive methyl tert-butyl ether (U.S. Geologic Survey 2001; J. Lusk, Service, *pers. comm.* 2010; New Mexico Environment Department 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 ([http://oaspub.epa.gov/enviro/pcs\\_det\\_report.detail\\_report?npdesid=NM0022250](http://oaspub.epa.gov/enviro/pcs_det_report.detail_report?npdesid=NM0022250)). 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 2011) 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.

### Pipelines

Based on information reported in the National Response Center (NRC) database (<http://www.nrc.uscg.mil>), one spill incident involving crude oil has occurred in Sandoval County near the city of Bernalillo, New Mexico just upstream from the action area for this consultation. In April 1999, a 16-inch (41-cm) transmission pipeline fitting was ruptured by a backhoe, releasing crude oil into the water and soil; reports indicate it may have entered the Rio Grande. Accordingly, this spill may have negatively affected silvery minnow in the action area. There is concern about the potential adverse effects of spills from these pipelines. 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 (Schein *et al.* 2009; Eisler 1987; and 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). No available information on the spill indicates the extent of past adverse effects to silvery minnows from this incident.

### 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 two facilities in New Mexico that conduct captive propagation of the species, including the Dexter Fish Hatchery and Technology Center and the City of Albuquerque's BioPark propagation facilities. 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), the Interstate Stream Commission (ISC) Refugium in Los Lunas, New Mexico, 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.

Since 2002, over 1.25 million silvery minnows have been propagated and then released into the wild (J. Remshardt, Service, *pers. comm.* 2011). Wild-caught silvery minnows are successfully spawned in captivity at the City of Albuquerque's propagation facilities. Eggs are raised and released as larval fish. Marked fish have been released 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 ensures that an adequate number of spawning adults are present to repopulate the river each year. While hatcheries continue to successfully spawn silvery minnow, wild eggs and larvae are collected to maximize genetic diversity within the remaining population (Turner and Osborne 2004).

### Silvery Minnow Salvage and Relocation

During river drying, the Service's silvery minnow salvage crew captures and relocates silvery minnow. Through 2009, approximately 802,700 silvery minnows have been rescued and relocated to wet reaches, the majority of which were released in the Angostura Reach. Studies are being conducted to determine survival rates for salvaged fish. Caldwell et al. (2009) 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. 2009).

### Ongoing Research

There is ongoing research by the New Mexico Fish and Wildlife Conservation Office (FWCO) and University of New Mexico (UNM) to examine the movement of silvery minnows. Augmented fish are marked with a visible fluorescent elastomer tag and released in large numbers in a few locations. Crews sample upstream and downstream from the release site in an attempt to capture the marked fish. Preliminary results indicate that the majority of silvery

minnows disperse a few miles downstream. One individual was captured 15.7 mi (25.3 km) upstream from its release site (Platania *et al.* 2003). Monitoring within 48 hours after the release of the 41,500 silvery 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). Studies are also currently underway by New Mexico FWCO 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. Preliminary results indicate use of the fishway and both upstream and downstream movement of minnows in that location.

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

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

#### 10(j) Experimental Population

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. 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.

Preliminary monitoring is currently being conducted to determine the success of the Big Bend reintroduction effort. It is expected to take years of monitoring to fully evaluate if the species is established and will remain viable in this river reach. Monitoring is expected to continue on a quarterly basis to document the success of the stocking program. Post-release monitoring of silvery minnows in proximity to the four release sites began in May 2009. Seven adult silvery minnows were found during monitoring in May, indicating at least some and likely many of the fish released in December 2008 survived over the winter. No silvery minnows were found during monitoring efforts conducted in August or October 2009. In February 2010, 84 silvery minnows were found during monitoring efforts, which includes detection at three of the four monitoring locations. During spring 2010 monitoring, the Service documented the presence of Rio Grande silvery minnow eggs at two of the monitoring sites, indicating spawning activity within the 10(j) population. February 2011 monitoring captured silvery minnow at 3 of the 6 sites. Future monitoring efforts in the summer of 2011 will be expanded to document dispersal and density.

#### 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 (see U.S. Fish and Wildlife Service 2005, 2007b, 2009) 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 and Sandoval Counties. 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.

### **Summary of the Environmental Baseline**

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

Water withdrawals from the river and water regulation severely limit the survival of silvery minnows. The consumption of shallow groundwater and surface water for municipal, industrial, and irrigation uses continues to reduce the amount of flow in the Rio Grande and eliminate habitat for the silvery minnow (U.S. Bureau of Reclamation 2003). However, under New Mexico State law, the municipal and industrial users are required to offset the effects of

groundwater pumping on the surface water system. The City of Albuquerque for example, has been offsetting its surface water depletions with 60,000 ac-ft returning to the river from the WWTP (U.S. Bureau of Reclamation 2003). The effect of water withdrawals means that discharges from WWTPs and irrigation return flows will have greater importance to the silvery minnow and a greater impact on water quality. Lethal levels of chlorine and ammonia have been released from the WWTPs in the last several years. In addition, a variety of organic chemicals, heavy metals, nutrients, and pesticides have been documented in storm water channels feeding into the river and contribute to the overall degradation of water quality.

Various conservation efforts have been undertaken in the past and others are currently being carried out in the Middle Rio Grande for the benefit of the silvery minnow. Population monitoring indicates that densities of this species have increased compared to extremely low levels seen in 2002–2003. However, current data show catch rates are currently lower than levels at the time of its listing as an endangered species in 1994. The threat of extinction for the silvery minnow continues because of increased reliance on captive propagation, the fragmented and isolated nature of currently occupied habitat, and the absence of the silvery minnow 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 172.6 to RM 173.4, which is located in the downstream portion of the Albuquerque Reach. Monitoring data are available from river mile 178.3, which is the closest monitoring site to the action area, and indicate that minnows are likely to occur during habitat restoration activities and may be affected by the proposed action. Recent monitoring data (October 2010) indicate a density of 0.4 minnows per 100 m<sup>2</sup> at that monitoring location (Dudley and Platania 2010), which we use here as the expected density during the proposed action.

The Service reviewed the proposed action, including measures implemented to reduce risk to listed species. We determined the potential effects from application of herbicides will be insignificant for the silvery minnow. Toxicity information in the Material Safety Data Sheets (MSDS) for Habitat© and Polaris AQ© (Isopropylamine salt of imazapyr) indicates these substances are categorized as a Class 0 in the Service's Southwest Region guidelines on protective measures for application (see White 2004). Accordingly, no protective buffer is

required for application during the proposed action. Application will not be conducted in significant winds, or within 48 hours of forecast rainfall. Given the timing and manner of application, the risk of effects on silvery minnow from application of this herbicide during the proposed action are insignificant.

The proposed action is expected to have beneficial effects on silvery minnows and their critical habitat in the long-term by establishing diverse mesohabitats that support the species. Such habitat is expected to benefit silvery minnows through improved egg and larval retention, increased recruitment rates, and increased survival of both YOY and adult 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 and associated catchment swales, backwater embayments, and in restored bankline features.

Short-term adverse effects on silvery minnows are expected due to construction, including in-water disturbance during placement of large woody debris, construction of the high flow channels, embayments and riverbank terracing, removal of lateral confinements and during mechanical treatment of exotic vegetation. 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., 1 to 4 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 will exclude silvery minnow, minimizing the possibility of trapping, injuring, or causing mortality during modification of the bankline and construction of ephemeral channels. Conservation measures used during the proposed action will help to minimize disturbance, for example the use of low-impact amphibious equipment; by installing silt fencing to allow for silvery minnow escapement as sediment placement begins in the upstream portion. In addition, the applicable work window (i.e., not during April 15 to August 15) will avoid adverse effects on pre-spawn and spawning adult silvery minnows, as well as YOY during early growth (i.e., until large enough for sufficient mobility and resilience). 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 placement of materials in the channel. These activities may affect water quality, causing localized increases in turbidity and suspended sediments. Direct effects from excess suspended sediments on a variety of fish species have included alarm reactions, abandonment of cover, avoidance responses, reduction in feeding rates, increased respiration, physiological stress, poor condition, reduced growth, delayed hatching, and mortality (Newcombe and Jensen 1996). In addition, indirect effects from sediment mobilization in the channel are possible, including the potential smothering and mortality of algae and aquatic invertebrates, depressed rates of growth, reproduction, and recruitment or reduced physiological function of invertebrates. Decreases in primary production are also associated with increased sedimentation and turbidity and can produce negative cascading effects through depleted food availability for zooplankton, insects, mollusks, and fish. We expect silvery minnows will exhibit an avoidance response to construction activities as described earlier. Conservation measures will help minimize the risk due to dispersal of suspended sediments (e.g., 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.

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. Also, some of the catchment swales proposed for construction will have the potential to become inundated and strand silvery minnow in isolated pools. 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 State Land Office will construct these features with a 1% to 2% slope designed to facilitate water draining back to the river when flow levels drop. The ephemeral channels will have a high point roughly in the middle of the channel, allowing river water to drain to the river when levels drop. Monitoring of similar features at other habitat restoration sites during normal river recession has shown little to no entrapment of silvery minnow (New Mexico Interstate Stream Commission 2010; U.S. Army Corps of Engineers 2009).

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 5.89 acres (23,836 m<sup>2</sup>). The best available information on silvery minnow density in the action area for this consultation indicates 0.4 silvery minnows per 100 m<sup>2</sup>. Therefore, we expect that 96 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 embayments), we expect the majority of risk for entrapment of silvery minnows as flows recede will occur in ephemeral channels and catchment swales. Thus, we assume the calculation of incidental take for entrapment in ephemeral channels and water catchment swales (the swales with a connection to the river) will encompass all entrapment-related take in both ephemeral channels and other 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 0.55 acres (2,226 m<sup>2</sup>) for ephemeral channels and associated catchment swales connected to the river, we expect take of 9 silvery minnows (juveniles and adults) in the form of harassment and mortality due to indirect effects from stranding. 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.

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 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. We expect the conservation measures and best management practices (e.g., cleaning of equipment, inspection, storage and refueling requirements, spill kit readiness, and guards on external hydraulic lines) 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 placement of materials in the 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 252 km (157 mi) 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 New Mexico State Trust Land Riverine Restoration Project, funded by the Forest Service and as proposed in the November 2010 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.

### INCIDENTAL TAKE STATEMENT

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

The measures described below are non-discretionary, and must be undertaken by the Forest Service so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require adherence to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest Service 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 New Mexico State Trust Land Riverine Restoration Project within the Albuquerque Reach of the Middle Rio Grande 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, the Forest Service must reinitiate consultation.

The Service anticipates that take in the form of harassment may affect up to 96 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 2 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.

#### **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, swales, backwaters, bankline terraces) 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. The Forest Service 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, the Forest Service 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, 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. As appropriate, 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, the Forest Service 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.

### **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.

### RE-INITIATION NOTICE

This concludes formal consultation on the action described in the November 2010 Biological Assessment. As provided in 50 CFR § 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

In future correspondence on this project, please refer to consultation number 22420-2011-F-0035. If you have any questions or would like to discuss any part of this biological opinion, please contact Stacey Kopitsch of my staff at (505) 761-4737.



Wally Murphy

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