United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Memorandum

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

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

Subject: U.S. Fish and Wildlife Service's Biological Opinion on the Effects of the Middle Rio Grande Riverine Habitat Restoration Phase II Project proposed by the Interstate Stream Commission

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the action described in the Biological Assessment (BA) for the Middle Rio Grande Riverine Habitat Restoration Phase II Project for the Albuquerque Reach of the Rio Grande in Bernalillo County, New Mexico. The duration of this action is from the issuance of this biological opinion through December 2007. This biological opinion concerns the effects of the action on the endangered Rio Grande silvery minnow (*Hybognathus amarus)* (silvery minnow), the endangered southwestern willow flycatcher (*Empidonax traillii extiums)* (flycatcher), and the threatened bald eagle (*Hailiaeetus leucocephalus)* (eagle*)*. Your request for formal consultation, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 531 *et seq*.), was received on August 1, 2006. The U.S. Bureau of Reclamation (Reclamation) is the lead federal agency in this consultation. The New Mexico Interstate Stream Commission (ISC) is the applicant. An applicant is defined as any entity who requires formal approval or authorization from a Federal agency as a prerequisite to conducting the action [50 CFR §402.2].

This biological opinion is based on information submitted in the BA received August 1, 2006 and revised on December 21, 2006; meetings between Reclamation, the ISC and the Service; and other sources of information available to the Service. A complete administrative record of this consultation is on file at the Service's New Mexico Ecological Services Field Office (NMESFO).

Reclamation determined that the proposed project may affect, is not likely to adversely affect, the bald eagle and the flycatcher and its critical habitat. We concur with these determinations for the following reasons:

Bald Eagle
1) The proposed action will not impact potential roosting and perching structures because no large trees or snags will be removed.

2) The proposed project includes requirements that if an eagle is observed within 0.25 mi upstream or downstream of the active project site in the morning before project activity starts, or following breaks in project activity, the contractor will suspend all activity until the bird leaves of its own volition, or a project biologist, in consultation with the Service, determines that the potential for harassment is minimal. If an eagle arrives during construction activities or is beyond that distance, construction need not be interrupted. If eagles are found consistently in the immediate project area during the construction period, the project biologist will contact the Service to determine whether formal consultation is necessary. It is expected that implementation of these actions will reduce effects to the eagle to an insignificant level.

Flycatcher and its critical habitat
1) The entire proposed project is outside of the designated critical habitat.

2) Impacts to terrestrial habitats will be minimized by using existing roads and cleared staging areas. In general, equipment operation will take place in the most open areas available, and all efforts will be made to minimize damage to native vegetation.

3) The project sites were evaluated (vegetation analysis) and determined not to be suitable nesting habitat for flycatchers. However, to lessen the effect to migrating flycatchers, clearing of dense woody vegetation will be avoided and other vegetation removal will be conducted between August 15 and April 15.

4) If vegetation removal is required during the migration and breeding season, pre-construction breeding bird surveys will be conducted. Construction will cease in the project location if a flycatcher is observed between April 15 and August 15, and the Service will be notified.

5) The Service recognizes the potential for short-term indirect negative effects to migrating flycatchers by the removal of vegetation. However, flooding on bars and islands frequently disturbs the vegetation type that will be removed at project sites, and since the project proposes to replant native willow in disturbed areas, there should be no long-term adverse effects.

6) The project includes planting of native riparian/wetland vegetation and increased inundation to areas which can be beneficial to the flycatcher.

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

Consultation History
The Service issued a final Biological Opinion to Reclamation for Phase I of this project on November 22, 2005. A final BA for Phase II was received on August 1, 2006. This Biological Opinion is tiered off the 2003 Biological and Conference Opinions on the Effects of the Bureau of Reclamation's Water and River Maintenance Operations, Army Corps of Engineers' Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande (March 2003 BO).

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

OVERVIEW
The Middle Rio Grande Riverine Habitat Restoration Phase II Project (Project) proposes to apply several habitat restoration techniques in the Albuquerque Reach of the Middle Rio Grande (MRG) (Figure 1) to create or improve habitat for the silvery minnow. The long-term goal of the Project is to promote egg-retention, larval rearing, young-of-year (YOY), and over-wintering habitat for silvery minnow within four subreaches of the Albuquerque Reach in support of Element S of the RPA in the March 2003 BO. Habitat restoration techniques include several types of island modifications, bank scouring, and installation of woody debris for improving aquatic habitats.

A phased approach would be applied to restoration activities, with a set of techniques applied to selected areas, monitoring and evaluation of the outcomes, and the results incorporated into subsequent planned activities to increase treatments that are most effective in meeting the habitat needs of the silvery minnow. Phase I construction was completed in April 2006, and Phase II is scheduled to begin in November 2006 and end in December 2007. Subsequent phases will continue through 2009. Seven restoration/rehabilitation techniques were selected for Phase II and are listed in Table 1.

Project Locations and Phase II Treatments
Four subreaches of the Albuquerque Reach are proposed for application of restoration/rehabilitation techniques (Figure 2). The subreaches include (1) from U.S. Highway 550 approximately 1,200 meters (m) downstream (550 Subreach); (2) from Paseo del Norte to Montaño Road (PDN Subreach); (3) from Interstate 40 (I-40) to Central Avenue (I-40 Subreach); and (4) from the South Diversion Channel to I-25 (SDC Subreach).

As shown in Table 2, treatment areas include specific sites on vegetated islands, bars, and riverbanks. For all locations and treatment areas, as-built plans and profile maps will be developed after treatment but before high flows. All applicable permits, certifications, and authorizations will be obtained prior to construction, including Clean Water Act (CWA) Section 404 and 401 permits, as well as CWA Section 402 Storm Water Pollution Prevention Plans.

Table 1. Restoration Techniques and Potential Benefits of Proposed Techniques

Restoration Technique	Description	Benefits of Technique
Passive restoration	No disturbance of river channel. Allows for higher-magnitude peak flows to accelerate natural channel-forming process and improve floodplain habitat.	Increases sinuosity and allows for development of complex and diverse habitat, including bars, islands, side channels, sloughs, and braided channels.
Evaluation and modification of islands and bars	Physical disturbance (discing, mowing, root-plowing, raking) of islands or bars to remove vegetation, allowing for the mobilization of island features during periods of high flow	Creates more complex habitat for silvery minnow by reducing average channel depth, widening the channel, and increasing backwaters, pools, eddies, and runs of various depths and velocities. Increased inundation would benefit native riverine vegetation, potentially increasing flycatcher habitat.
High-flow ephemeral channels	Construction of ephemeral channels on inlands and islands to carry flow from the main river channel during high-flow events	Creates shallow, ephemeral (normally dry), low-velocity aquatic habitats important for silvery minnow egg and larval development during high flows. Increased inundation would benefit native vegetation, potentially increasing flycatcher habitat.
High-flow bank-line backwater channels and embayments	Cutting areas into banks where water enters, primarily during high-flow events, including spring runoff and floods	Intended to retain drifting silvery minnow eggs and to provide rearing habitat and enhance food supplies for developing silvery minnow larvae. Increased inundation would benefit native vegetation, potentially increasing flycatcher habitat.
Terrace and bank lowering	Removal of vegetation and excavation of soils adjacent to the main channel to create potential for overbank flooding	Could provide for increased retention of silvery minnow eggs and larvae. Increased inundation would benefit native vegetation, potentially increasing flycatcher habitat.
Removal of lateral confinements	Reduction or elimination of structural features and maintenance practices that decrease bank erosion potential.	Creates wider floodplain with more diverse channel and floodplain features, resulting in increased net-zero and low-velocity habitat for silvery minnow.
Woody debris	Placement of trees, root wads, stumps, or branches in the main river channel or along its banks.	Creates slow-water habitats for all life stages of silvery minnow, provides shelter from predators and winter habitat, and provides structure for periphyton growth to improve food availability for silvery minnow.

Wetlands and dense native vegetation will be avoided whenever possible during contruction in all treatment areas.

Table 2. Phase II Restoration Technique Treatment Areas, by Subreach

Restoration Technique	Phase II Action Sites (2006–2007)	Phase II Acres Treated				Total Acres by Restoration Technique
		U.S. 550	*Paseo del Norte*	*I-40/ Central*	*South Diversion Channel*	
Vegetated Island Modification and Evaluation	16 islands	0.0	25.19	2.38	10.5	**38.07**
*Technique #1**	*3 islands*	*0.0*	*1.64*	*0.0*	*0.3*	***1.94***
*Technique #2**	*1 island*	*0.0*	*2.02*	*0.0*	*0.0*	***2.02***
*Technique #3**	*4 islands*	*0.0*	*12.46*	*0.0*	*0.9*	***13.36***
*Technique #4**	*8 islands*	*0.0*	*9.07*	*2.38*	*9.3*	***20.75***
Riverbank Expansion/Terracing	11 sites	0.0	3.25	20.82	7.98	**32.05**
Ephemeral Channels	2 sites	3.34	0.0	0.0	0.0	**3.34**
Drain Enhancement	1 site	0	0.0	7.10	0.0	**7.10**
Backwater Channels	1 site	0	0.0	1.93	0.0	**1.93**
Embayment Area	2 sites	0.0	0.0	0.58	0.0	**0.58**
Jetty Jack Removal	2 sites	0.0	0.3	0.0	0.2	**0.50**
Large Woody Debris	TBD	TBD	TBD	TBD	TBD	**TBD**
Total Acres by Action Site	**TBD**	**3.34**	**28.74**	**32.81**	**18.68**	**83.57**

*Acres of created low-flow habitats to be determined in the field.

U.S. Highway 550 Subreach

Within this subreach, one ephemeral channel through a vegetated island and one ephemeral braided channel complex are planned in the 550 Subreach.

Paseo Del Norte to Montaño Subreach

Within the PDN Subreach, eight sites for vegetated island evaluation and modification, two locations for bank modification, and one in-channel jetty jack removal are planned.

I-40 to Central Subreach

Within the I-40 subreach, one site for vegetated island evaluation and modification, five locations for bank modification, one backwater channel, and one existing drain enhancement (intake, control structures, outfall) are planned.

South Diversion Channel Subreach

In the area between the Rio Bravo Bridge and the South Diversion Channel (SDC), treatments to six islands are planned. In addition, four bank modification sites, and one in-channel jetty jack removal action would be completed in this subreach.

In-channel and Vegetated Island Modification and Evaluation

A total of 38.07 acres of island modification is planned for Phase II. Several methods of modification are planned for the 16 islands in the four subreaches. Each method involves recontouring a pre-determined portion of the surface area of the selected island, removing sediment and vegetation with a root-plow attachment on an amphibious caterpillar. These treatments would generate woody debris and sediment that would be used on-site. Placement of these materials on the islands would further disturb vegetation and raise their elevation, reducing opportunities for saturation and inundation. Therefore, new low elevation habitat would be created adjacent to the island using the excess sediment and woody debris generated from island modification techniques.

The location of all treatment areas, including newly created low-flow habitat, will be mapped on as-built drawings and monitored for change relative to the island. All treatment and control areas will be monitored for two years to determine the effectiveness of the various methods and the hydrologic and geomorphic changes. Long-term monitoring (up to ten years) and adaptive management will be a coordinated effort with the Collaborative Program to assess the regenerating ability of restoration treatments. Following monitoring and natural reshaping, islands void of native vegetation will be replanted with appropriate native species to stabilize the contours to the extent possible.

In-Channel Jetty Jack Extraction

Jetty Jacks will be removed in two approximately 0.5 acre areas adjacent to island treatment sites (see Figure 8). The jetty jacks will be removed from the channel by an amphibious excavator and placed along the bank to be removed from the bosque shortly thereafter. The jetty jacks will be removed to reduce the number of structural features that decrease lateral migration potential over in-channel bar and island features. Their removal will allow natural river processes and create wider and more diverse channel and floodplain features.

Riverbank and Historic Channel Modification

Artificial riverbed expansion and bank lowering and terracing would be accomplished with an amphibious caterpillar along approximately 32.05 acres of riverbank at 11 sites. Riverbed expansion would be completed by excavating the bank to the depth of the riverbed, sloping the modified area from the toe (nearest the river) toward the top of the treatment area. This modification technique would help to ensure that shallow, low-velocity habitat would be provided from low river flows (200 to 400 cubic feet per second (cfs)) to higher river flows (1,000 cfs) and could increase the potential of lateral migration in the active river channel. Created bank terrace features would allow flows of 1,000 to 3,000 cfs to overtop and inundate the constructed terrace, ultimately producing lower-velocity shallow water habitat areas. Constructed scours and scallops along the walls of the terrace would increase the number of backwaters, embayments, and eddy areas.

Ephemeral Side and Backwater Channels

Restoration and/or creation of 3.34 acres of ephemeral side channels and 1.93 acres of backwater channels will take place on islands, point bars, and inland areas. Many of the locations proposed for treatment are historic channels that are no longer functioning or that function only during very high flows. The side channels will be constructed with the amphibious caterpillar at prescribed locations to create low-velocity habitats. Construction of side and backwater channels will involve the removal of vegetation and sediment along the proposed channel at the prescribed depth. Woody debris generated in the treatment area may be used for the creation of in-channel debris piles in adjacent areas.

Existing Atrisco Diversion Restoration

Restoration of the Atrisco Diversion Channel includes approximately 6.1 acres of drain restoration, including overbank area, and 5.8 acres of bank lowering. Planning and design will include a detailed topographic survey for accurate grade control and placement of water control structures. Civil engineering (grading, cuts and fills, excavation disposal areas, etc.), structural engineering (water control structures), and river geomorphology engineering would be performed as part of the project design. Restoration of the channel will reconnect the access and bypass channel portions of the diversion and wasteway system to the Rio Grande to create an ephemeral side channel to the river. The reconnection of the drain will require excavation and structural reconstruction. A second channel will be added by removing sandy sediment between the existing unlined channel and the thalweg of the river to allow connection with the river during low flow-periods. A number of the habitat restoration techniques shown in

Table 1 will be evaluated for use in completion of this work.

Equipment, Staging, and Access

Equipment

Equipment used for construction on point bars and banks that are accessible from the shore include a dozer, belly scraper, excavator, backhoe, and a root plow of standard width. An amphibious Caterpillar 325 excavator will be used for access to islands and less accessible banks and bars. Work conducted in wetlands and other sensitive aquatic areas will require the use of low-impact amphibious equipment. Personnel and other equipment will be transported using an amphibious personnel carrier. The amphibious equipment is designed to minimize impact of the treads when operating in water. For all habitat restoration activities, the construction contractor will implement the safety precautions and construction specifications identified on page 29 of the Biological Assessment for the Middle Rio Grande Riverine Habitat Restoration Phase II Project.

Staging and Access

Figures 21 through 24 identify the equipment and personnel staging and access locations for the four subreaches. Prior to implementation, permission from the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), the Middle Rio Grande Flood Control Authority, the Pueblo of Sandia, Reclamation, the Middle Rio Grande Conservancy District (MRGCD), and other interested entities would be obtained.

No mature native vegetation will be removed. Also, to prevent the mixing of sediment with surface pools and runoff in each of the subreaches, access paths will be predetermined to minimize travel distances in wetted pools or flowing water. Water quality parameters will be measured prior to crossing the wetted portions of the diversion channels, and temporary silt fencing will be placed downstream of the crossing until suspended sediment has settled and water quality parameters have returned to within 10 percent of the ambient conditions or parameters outlined by the New Mexico Environment Department (NMED).

Conservation Measures

The applicant has included conservation measures as part of the proposed action as a means of minimizing adverse effects to silvery minnows within the action area. Environmental commitments include:

1) Silvery minnow critical habitat encompasses the entire project area (FR 2003) in the river channel. Best management practices would be enforced to minimize potential impacts to silvery minnow from direct construction impacts and erosional inputs into the river during construction periods.

2) The shortest path would be used to cross the South Diversion Channel, or any other arroyos or drains, and silt fencing would be installed downstream of the crossing. 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 percent of the original measured parameters.

3) Clean Water Act (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, including consultation with the Pueblo of Sandia and the Pueblo of Isleta. The 404 and 401 permitting processes would be completed prior to commencement of the Proposed Action.

4) Storm water 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 a Stormwater Pollution Prevention Permit (SWPPP).

5) 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.

6) All necessary permits for access points, staging areas, and study sites would be acquired prior to construction activity. Access will be coordinated with the City of Albuquerque Open Space Division, the MRGCD, AMAFCA, and the Pueblo of Sandia.

ACTION AREA

The action area is defined as the area from the Angostura Diversion Dam to the Isleta Diversion Dam and the entire width of the 100 year floodplain within that reach. Silvery minnows that are present during island modification, bank scouring, and ephemeral channel enhancement are likely to be affected by the presence and operation of construction equipment when vegetation and sediment are mobilized below the water line, and during the placement of sediment and woody debris for improving aquatic habitats.

II. STATUS OF THE SPECIES

RIO GRANDE SILVERY MINNOW

Description

The silvery minnow currently occupies a 170-mile (275 km) reach of the Middle Rio Grande, New Mexico, from Cochiti Dam, Sandoval County, to the headwaters of Elephant Butte Reservoir, Soccorro County (U.S. Fish and Wildlife Service 1994). The silvery minnow is a stout minnow, with moderately small eyes, a small, sub-terminal mouth, and a pointed snout that projects beyond the upper lip (Sublette *et al.* 1990). The back and upper sides of the silvery minnow are silvery to olive, the broad mid-dorsal stripe is greenish, and the lower sides and abdomen are silver. Maximum length attained is about 3.5 inches (90 millimeters [mm]). The only readily apparent sexual dimorphism is the expanded body cavity of ripe females during spawning (Bestgen and Propst 1994).

In the past, the silvery minnow was included with other species of the genus *Hybognathus* due to morphological similarities. Phenetic and phylogenetic analyses corroborate the hypothesis that it is a valid taxon, distinctive from other species of *Hybognathus* (Cook *et al.* 1992, Bestgen and Propst 1994). It is now recognized as one of seven species in the genus *Hybognathus* in the United States and was formerly one of the most widespread and abundant minnow species in the Rio Grande basin of New Mexico, Texas, and Mexico (Pflieger 1980, Bestgen and Platania 1991). Currently, *Hybognathus amarus* is the only remaining endemic pelagic spawning minnow in the Middle Rio Grande. The speckled chub (*Extrarius aestivalus*), Rio Grande shiner (*Notropis jemezanus*), phantom shiner (*Notropis orca*), and bluntnose shiner (*Notropis simus simus*) are either extinct or have been extirpated from the Middle Rio Grande (New Mexico Game and Fish Department 1998b, Bestgen and Platania 1991).

<u>Legal Status</u>

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

Critical habitat was proposed for the silvery minnow on June 6, 2002 (67 FR 39205) and was finalized on February 19, 2003 (68 FR 8088). The critical habitat designation extends approximately 157 mi (252 km) from Cochiti Dam, Sandoval County, New Mexico downstream to the utility line crossing the Rio Grande, a permanent identified landmark in Socorro County, New Mexico. The critical habitat designation defines the lateral extent (width) as those areas bounded by existing levees or, in areas without levees, 300 ft (91.4 meters) or riparian zone adjacent to each side of the bankfull stage of the Middle Rio Grande. Some developed lands within the 300 ft lateral extent are not considered critical habitat because they do not contain the primary constituent elements of critical habitat and are not essential to the conservation of the silvery minnow. Lands located within the lateral boundaries of the critical habitat designation, but not considered critical habitat include: developed flood control facilities, existing paved roads, bridges, parking lots, dikes, levees, diversion structures, railroad tracks, railroad trestles, water diversion and irrigation canals outside of natural stream channels, the Low Flow Conveyance Channel, active gravel pits, cultivated agricultural land, and residential, commercial, and industrial developments. The Pueblo lands of Santo Domingo, Santa Ana, Sandia, and Isleta within this area are not included in the critical habitat designation. Except for these Pueblo lands, the remaining portion of the silvery minnow's occupied range in the Middle Rio Grande in New Mexico is designated as critical habitat (68 FR 8088).

Habitat

The silvery minnow travels in schools and tolerates a wide range of habitats (Sublette *et al*. 1990); yet, generally prefers low velocity (<0.33 ft per second, 10 centimeters/second [cm/sec]) areas over silt or sand substrate that are associated with shallow (< 15.8 inches, 40 cm) braided runs, backwaters or pools (Dudley and Platania 1997). Habitat for the silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are low or reduced from main-channel velocities. Stream reaches dominated by straight, narrow, incised channels with rapid flows are not typically occupied by silvery minnow (Sublette *et al*. 1990, Bestgen and Platania 1991).

Adult minnows are most commonly found in backwaters, pools, and habitats associated with debris piles; whereas, YOY occupy shallow, low velocity backwaters with silt substrates (Dudley and Platania 1997). A study conducted between 1994 and 1996 characterized habitat availability and use at two sites in the Middle Rio Grande at Rio Rancho and Socorro. From this study Dudley and Platania (1997) reported that the silvery minnow was most commonly found in habitats with depths less than 19.7 inches (50 cm). Over 85 percent were collected from low velocity habitats (<0.33 ft/sec, 10 cm/sec) (Dudley and Platania 1997, Watts *et al*. 2002).

<u>Critical Habitat</u>

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

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

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

3. Substrates of predominantly sand or silt; and

4. Water of sufficient quality to maintain natural, daily, and seasonally variable water

temperatures in the approximate range of greater than 1ºC (35ºF) and less than 30ºC (85ºF) and reduce degraded conditions (e.g., decreased dissolved oxygen, increased pH).

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

Life History

The species is a pelagic spawner that produces 3,000 to 6,000 semi-buoyant, non-adhesive eggs during a spawning event (Platania 1995, Platania and Altenbach 1999). 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 (1999b) collected the highest number of eggs in mid-May, with lower frequency of eggs being collected in late May and June. These data suggest multiple silvery minnow spawning events during the spring and summer, perhaps concurrent with flow spikes. Artificial spikes have apparently induced silvery minnows to spawn (Platania and Hoagstrom 1996). It is unknown if individual silvery minnows spawn more than once a year or if some spawn earlier and some later in the year.

Platania (2000) found that development and hatching of eggs are correlated with water temperature. Eggs of the silvery minnow raised in 30ºC water hatched in approximately 24 hours while eggs reared in 20-24ºC water hatched within 50 hours. Eggs were 0.06 inches (1.6 mm) in size upon fertilization, but quickly swelled to 0.12 inches (3 mm). Recently hatched larval fish are about 0.15 inches (3.7 mm) in standard length and grow about 0.005 inches (0.15 mm) in size per day during the larval stages. Eggs and larvae have been estimated to remain in the drift for 3-5 days, and could be transported from 134 to 223 miles (216 to 359 km) downstream depending on river flows (Platania 2000). Approximately three days after hatching the larvae move to low velocity habitats where food (mainly phytoplankton and zooplankton) is abundant and predators are scarce. YOY attain lengths of 1.5 to 1.6 inches (39 to 41 mm) by late autumn (U.S. Fish and Wildlife Service 1999). Age-1 fish are 1.8 to 1.9 inches (45 to 49 mm) by the start of the spawning season. Most growth occurs between June (post spawning) and October, but there is some growth in the winter months. In the wild, maximum longevity is about 25 months, but very few survive more than 13 months (U.S. Fish and Wildlife Service 1999). Captive fish have lived up to four years (C. Altenbach, City of Albuquerque, *pers. comm.* 2003).

Platania (1995) suggested that historically the downstream transport of eggs and larvae of the silvery minnow over long distances was likely beneficial to the survival of their populations. This behavior may have promoted recolonization of reaches impacted during periods of natural drought (Platania 1995). The spawning strategy of releasing floating eggs allows the silvery minnow to replenish populations downstream, but the current presence of diversion dams (Angostura, Isleta, and San Acacia Diversion Dams) prevents recolonization of upstream habitats (Platania 1995). As populations are depleted upstream and diversion structures prevent upstream movements, isolated extirpations of the species through fragmentation may occur (U.S. Fish and Wildlife Service 1999). Adults, eggs and larvae are also transported downstream to Elephant

Butte Reservoir. It is believed that none of these fish survive because of poor habitat and predation from reservoir fishes (U.S. Fish and Wildlife Service 1999).

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

Population Dynamics
Generally, a population of silvery minnows consists of only two age classes: YOY and Age-1 (U.S. Fish and Wildlife Service 1999). The majority of spawning silvery minnows are one year old. Two year old fish comprise less than 10 percent of the spawning population. High silvery minnow mortality occurs during or subsequent to spawning, consequently very few adults are found in late summer. By December, the majority (greater than 98 percent) of individuals are YOY (Age 0). This population ratio does not change appreciably between January and June, as Age 1 fish usually constitute over 95 percent of the population just prior to spawning.

Platania (1995) found that a single female in captivity could broadcast 3,000 eggs in eight hours. Females produce 3 to 18 clutches of eggs in a 12-hour period. The mean number of eggs in a clutch is approximately 270 (Platania and Altenbach 1998). In captivity, silvery 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 the dry reaches of river (U.S. Fish and Wildlife Service 1999).

Distribution and Abundance
Historically, the silvery minnow occurred in 2,465 mi (3,967 km) of rivers in New Mexico and Texas. They were known to have occurred from Española upstream from Cochiti Lake; in the downstream portions of the Chama and Jemez Rivers; throughout the Middle and Lower Rio Grande to the Gulf of Mexico; and in the Pecos River from Sumner Reservoir downstream to the confluence with the Rio Grande (Sublette *et al.* 1990, Bestgen and Platania 1991). The current distribution of the silvery minnow is limited to the Rio Grande River between Cochiti Dam and Elephant Butte Reservoir, which amounts to approximately 5 percent of its historic range.

The construction of mainstem dams, such as Cochiti Dam and irrigation diversion dams have contributed to the decline of the silvery minnow. The construction of Cochiti Dam in particular has affected the silvery minnow by reducing the magnitude and frequency of flooding events that help to create and maintain habitat for the species. In addition, the construction of Cochiti Dam has resulted in degradation of silvery minnow habitat within the Cochiti Reach. Flow in the river at Cochiti Dam is now generally clear, cool, and free of sediment. There is relatively little channel braiding, and areas with reduced velocity and sand or silt substrates are uncommon. Substrate immediately downstream of the dam is often armored cobble (rounded rock fragments generally 8 to 30 cm (3 to 12 inches) in diameter). Further downstream the riverbed is gravel with some sand material. Ephemeral tributaries including Galisteo Creek and Tonque Arroyo introduce sediment to the lower sections of this reach, and some of this is transported downstream with higher flows (U.S. Fish and Wildlife Service 2001, 1999). The Rio Grande below Angostura Dam becomes a predominately sand bed river with low, sandy banks in the downstream portion of the reach. The construction of Cochiti Dam also created a barrier between silvery minnow populations (U.S. Fish and Wildlife Service 1999). As recently as 1978, the silvery minnow was collected upstream of Cochiti Lake; however surveys since 1983 suggest that the fish is now extirpated from this area (U.S. Fish and Wildlife Service 1999).

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

Augmentation, throughout this period, likely sustained the silvery minnow population. Nearly 900,000 silvery minnows have been released (primarily in the Angostura Reach) since 2000 (see Environmental Baseline). Captively propagated and released fish supplemented the native adult population that could take advantage of the good spawning conditions of 2004 and 2005.

The silvery minnow was the most abundant taxon in October 2005 captures; it comprised about 72 percent of the total catch (Dudley *et al.* 2005). The species was nearly twice as abundant as the next most-abundant taxon (western mosquitofish). The increase in abundance of silvery minnow in 2005 has been comparable to previous years with above average precipitation (e.g., mid 1990s) (Dudley *et al.* 2005). These monitoring results from 2005 indicate that the status of the species improved markedly compared to fall of 2004.

Increased discharge in the Rio Grande during 2004 contrasted with the extended low-flow conditions observed throughout the Middle Rio Grande during 2003 and 2002. The timing of the 2004 runoff flow was typical of a flow increase that would normally occur at the onset of the spring runoff period. Elevated and extended flows during 2004 likely resulted in more favorable conditions for the growth and survivorship of newly hatched silvery minnow larvae. It is possible that even low numbers of eggs and larvae could have resulted in greatly increased recruitment success because of the inundation of shoreline habitats, abandoned side channels, and backwaters. Low velocity and shallow areas provide the warm and productive habitats required by larval fishes to successfully complete their early life history.

Spring runoff in 2005 was also 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 monitoring indicated a significant increase in silvery minnows in the Middle Rio Grande, increasing to 3,899 total silvery minnows captured from 2 and 78 in 2003 and 2004, respectively. In 2006, however, October numbers declined to 2,499 (Dudley et al. 2006) after an extremely low spring runoff and extensive drying in June and July. October samples yielded no small silvery minnows, indicating poor recruitment in the spring.

Middle Rio Grande Distribution

Since the early 1990's, 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 minnows captured were downstream of San Acacia Diversion Dam (Dudley and Platania 2002). This distributional pattern has been observed since 1994 (Dudley and Platania 2002) and is attributed to downstream drift of eggs and larvae and the inability of adults to repopulate upstream reaches because of diversion dams.

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

Sampling in early 2006 indicates populations are again higher downstream. Of the 6,143 silvery minnows caught in March 2006, 33 were found in Angostura, 2,445 were found in the Isleta Reach, and 3,665 were caught in the San Acacia Reach. Silvery minnow catch rates were an average of 22.35 per 100 m^2 in the Angostura reach.

Reasons for Listing/Threats to Survival

The silvery minnow was federally listed as endangered for the following reasons:

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

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

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

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

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

6. Introduction of nonnative fishes that directly compete with, and can totally replace the silvery minnow, as was the case in the Pecos River, where the species was totally replaced in a time frame of 10 years by its congener the plains minnow (*Hybognathus placitus*); and

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

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

Recovery Efforts
The final recovery plan for the silvery minnow was released in July 1999 (U.S. Fish and Wildlife Service 1999) and is currently undergoing revision. The primary objectives for recovery are to increase numbers of the silvery minnow, enhance its habitat in the Middle Rio Grande valley, and to reestablish the species in at least three other areas of its historic range.

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

Drought, as an overriding condition of the last decade in the southwest, is an important factor in the environmental baseline. The Rio Grande basin has received below normal precipitation, only adding to the long-term moisture deficits. The wet fall and early winter of 2002 provided some drought relief; however, long term moisture deficits averaging 9 inches over the past three years and deficits as high as 15 inches over the past 5 years contribute to current drought conditions in northern New Mexico, an area that supplies water to the Rio Grande basin (National Weather Service 2003a).

Stream conditions in 2004 and 2005 were improved over previous years. The United States Geological Survey (USGS) in Albuquerque, New Mexico reported that stream flow conditions in 2005 were well above average to significantly above average statewide leading to a peak of over 6,000 cfs at Albuquerque and sustained high flows (> 3,000 cfs) for more than two months. These flows improved conditions for both spawning and recruitment. Despite good runoff, reservoir levels continue to be below average across the state. It will take a least another year or two of well above average precipitation to reach pre-drought reservoir conditions.

The 2006 spring runoff was well below average because of lower than normal snowpack. In May 2006, year to date precipitation was well below average with the snowpack at 20 percent of average in the Rio Grande Basin. Fortunately, a strong monsoon season led to the wettest period of record in July and August. Consequently, only 26.5 miles of river dried in the summer of 2006 the lowest amount since 2001.

Status of the Species Within the Action Area

Past actions have eliminated and severely altered habitat conditions for the silvery minnow. These actions can be broadly categorized as changes to the natural hydrology of the Rio Grande and changes to the morphology of the channel and floodplain. Other factors that influence the environmental baseline are water quality, the release of captively propagated silvery minnows, silvery minnow rescue efforts, on-going research efforts, and past projects in the Middle Rio Grande. Also of importance is the current drought, the expected weather pattern for the near future, and how it may affect flow in the Rio Grande. Each of these topics is discussed below.

<u>Changes in Hydrology</u>

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

Loss of Water

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

Water management and use has resulted in a large reduction of suitable habitat for the silvery minnow. Agriculture accounts for 90 percent of surface water consumption in the Middle Rio Grande (Bullard and Wells 1992). The average annual diversion of water in the Middle Rio Grande by the MRGCD was 535,280 af (65,839 hectare-meters) for the period from 1975 to 1989 (U.S. Bureau of Reclamation 1993). In 1990, total water withdrawal (groundwater and surface water) from the Rio Grande Basin in New Mexico was 1,830,628 af, significantly exceeding a sustainable rate (Schmandt 1993). Water withdrawals have not only reduced overall flow quantities, but also caused the river to become locally intermittent and/or dry for extended reaches. Irrigation diversions and drains significantly reduce water volumes in the river. However, the total water use (surface and groundwater) in the Middle Rio Grande by the

MRGCD may range from 28 – 37 percent (S.S. Papadopulos & Associates, Inc. 2000; U.S. Geological Survey 2002). In addition, a portion of the water diverted by the MRGCD returns to the river and may be re-diverted (in some cases more than once) (Bullard and Wells 1992; MRGCD, *in litt*. 2003).

River reaches particularly susceptible to drying are 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 (C. Shroeder, Service, *pers. comm.* 2002). Since 1996, an average of 32 miles of the Rio Grande has dried, mostly in the San Acacia Reach. The most extensive drying has 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.

Predatory birds have been seen hunting and consuming fish from isolated pools during river intermittence (J. Smith, NMESFO, *pers. comm.* 2003). Although the number of fish present in any pool is unknown, it must be assumed that many of the fish preyed upon in these pools are silvery minnows. Thus, while some dead silvery minnows were collected during the shorter drying events, it is assumed that many more mortalities occurred than were documented.

Changes to Size and Duration of Peak Flows

Water management has also resulted in a loss of peak flows that historically initiated spawning. The reproductive cycle of the silvery minnow is tied to the natural river hydrograph. A reduction in peak flows and/or improper 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. The releases depart significantly from natural conditions, and can substantially alter the natural habitat. At other times, 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, there was concern that silvery minnow would not spawn because of a lack of spring runoff due to an extended drought. River discharge was artificially elevated through short duration reservoir releases during May to induce silvery minnow spawning. In response to the releases, significant spawning occurred and was documented in all reaches except the Cochiti Reach (S. Gottlieb, UNM, *in litt.* 2002; Dudley *et al*. 2004). Fall populations in 2003 and 2004 continued to decrease despite large spawning events, indicating a lack of recruitment.

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

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

<u>Changes in Channel Morphology</u>

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

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

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 miles (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 miles (290 km) of river, only 1 mile (1.6 km), or 0.6 percent of the flood plain has remained undeveloped.

Development in the flood plain, 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

Both point (pollution discharges from a pipe) and non-point (diffuse sources of pollution) sources affect the Middle Rio Grande. Major point sources are waste water treatment plants (WWTPs) and feedlots. Major non-point sources include agricultural activities (e.g., fertilizer and pesticide application, livestock grazing), storm water run off, and mining activities.

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 in the lower portion of the Angostura Reach during extended periods of intermittency. For that reason the water quality of the effluent is extremely important. In the project area, the largest WWTP discharges are from Albuquerque, followed by Rio Rancho (2 WWTP) 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.

Albuquerque WWTP effluent discharge records show that during November 1999, the monthly maximum chlorine concentration in the outfall was 0.49 milligrams per liter (mg/L). Additionally, on February 23, 2003, the concentration of chlorine in the outfall was reported to be 0.70 mg/L (C. Abeyta, Service, *in litt.* 2003; D.S. Dailey, City, *in litt*. 2003). Chlorine concentrations of 0.013 mg/L can be harmful to the silvery minnow. Records also show that the monthly maximum concentration of ammonia during July 2001 was 14 mg/L. At pH 8 and water temperature of 25 °C, ammonia concentrations as low of 3.1 mg/L can be harmful to larval fathead minnow (U. S. Environmental Protection Agency 1999). The fathead minnow has been suggested as a surrogate to evaluate the effects of various chemicals on the silvery minnow (Buhl 2002).

Although we do not have complete records for the other WWTPs, in the summer of 2000, the Rio Rancho WWTP released approximately one million gallons of raw sewage into the Rio Grande. Chlorine treatment was maximized in an attempt to reduce the public health risk. Ammonia was reported at 37 mg/L on July 13, 2000, and at 17.1 mg/L on July 27, 2000 (City of Rio Rancho, *in litt.* 2000). Nonetheless, no violations of chlorine or ammonia effluent limits were recorded. This suggests that averaging measurements and/or the frequency of water quality measurements is insufficient to detect water quality situations that would be toxic to silvery minnows. The Rio Rancho WWTP now uses ultraviolet disinfection (Dee Fuerst, City of Rio Rancho, *pers. comm.* 2003) so the release of chlorine should no longer occur. However, high concentrations of ammonia could still be discharged during an upset. Spills from the Rio Rancho City sewage system are treated with chlorine, which may lead to chlorine being flushed to the Rio Grande. The Bernalillo WWTP is still operating under a permit issued in 1988 that does not restrict the discharge of lethal concentrations of chlorine to the Rio Grande. The extent of impact from this discharge to the Rio Grande is unknown. A new permit is under review that will regulate chlorine and ammonia discharges, although the risk of accidental discharges would remain.

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

Harwood (1995) studied the North Floodway Channel (Floodway) of Albuquerque, which drains an urban area of about 90 square miles and crosses 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_reports. 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 the Cities of Albuquerque and Santa Fe. Polycyclic aromatic hydrocarbons and other semi-volatile compounds affect the sediment quality of the Rio Grande and may affect silvery minnow behavior, habitat, feeding, and health.

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

In addition to the compounds discussed above, several other constituents are present and affect the water quality of the Rio Grande. These include nutrients such as nitrates and phosphorus, total dissolved solids (salinity), and radionuclides. Each of these also has the potential to affect the aquatic ecosystem and health of the silvery minnow. As the river dries, pollutants will be concentrated in the isolated pools. Even though these pollutants do not cause the immediate death of silvery minnows, the evidence suggests that the amount and variety of pollutants present in the Rio Grande, could compromise their health and fitness (Rand and Petrocelli 1985).

Silvery Minnow Propagation and Augmentation

In 2000, the Service identified captive propagation as an appropriate strategy to assist in the recovery of the silvery minnow. Consistent with Service policy (65 FR 183), captive propagation is conducted in a manner that will, to the maximum extent possible, preserve the genetic and ecological distinctiveness of the silvery minnow and minimize risks to existing wild populations.

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

Since 2000 approximately 900,000 silvery minnow have been propagated using both adult wild silvery minnows and wild caught eggs and then released into the wild. Wild gravid adults are successfully spawned in captivity at the City of Albuquerque's propagation facilities. Eggs are raised and released as larval fish. Marked fish have been released by the NMFRO since 2002 under a formal augmentation effort funded by the Collaborative Program. Silvery minnows are released into the Angostura Reach of the river near Alameda Bridge to ensure downstream repopulation. Eggs left in the wild have a very low survivorship and this ensures that an adequate number of spawning adults are present to repopulate the river each year. While hatcheries continue to successfully spawn silvery minnow, wild eggs are collected to ensure genetic diversity within the remaining population.

Ongoing Research

There is ongoing research by the NMFRO and University of New Mexico (UNM) to examine the movement of silvery minnow. 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 miles (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.

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 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. This research indicates that the net effective population size (Ne) (the number of individuals that contribute to maintaining the genetic variation of a population) of the silvery minnow in the wild is between 60-250 fish (T. Turner, UNM, *pers. comm*. 2003). It has been suggested that a Ne of 500 fish is needed to retain the long-term adaptive potential of a population (Franklin 1980). No significant genetic differences have been found in populations isolated in the different reaches of the Rio Grande (D. Alo UNM, *pers. comm*. 2002). 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. The propagation effort should be sufficient to maintain 100,000 to 1,000,000 fish in the wild (T. Turner, UNM, *pers. comm.* 2003). For instance if it were determined that 50,000 silvery minnow were in the wild, a minimum of 50,000 adult fish should be in propagation facilities. We do not know how many fish are in the wild so it is difficult at this time to determine the exact number needed in propagation facilities. However, to insure against a catastrophic event where most wild fish are lost, it is suggested that 100,000 to 1,000,000 silvery minnow should be kept in propagation facilities to maintain a sufficient amount of genetic variability for propagation efforts (T. Turner, UNM, *pers. comm*. 2003). Approximately 300,000 silvery minnows are currently being maintained in captivity (M. Ulibarri, USFWS *pers. comm.* 2005).

Permitted and/or Authorized Take

Take is authorized by section 10, and incidental take is permitted under section 7. These permits and/or authorizations are issued by the Service. Applicants for section 10 permits must also acquire a permit from the State to "take" or collect silvery minnows. Many of the permits issued under section 10 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. Since 2000, the Service has reduced the amount of take permitted for voucher specimens as a result of the increasingly precarious status of the species in the wild.

Incidental take of silvery minnows is authorized through section 7 consultation associated with the March 2003, programmatic biological opinion on water operations and maintenance in the Middle Rio Grande, the City of Albuquerque Drinking Water project, the Isleta Island Removal Project, the Tiffany Plug Removal Project, the Interstate Stream Commission's (ISC) Habitat Restoration Project, and Reclamation's river realignment projects at the Bernalillo and Sandia Priority sites.

Factors Affecting Species Environment within the Action Area

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

1. Release of Carryover Storage from Abiquiu Reservoir to Elephant Butte Reservoir: The Army Corps of Engineers (Corps) consulted with the Service on the release of water during the winter of 1995. Ninety-eight thousand af (12,054 hectare-meters) of water was released from November 1, 1995 to March 31, 1996, at a rate of 325 cfs (9.8 cm). This discharge is above the historic winter flow rate. Substantial changes in the flow regime that do not mimic the historic hydrograph can be detrimental to the silvery minnow.

2. Corrales, Albuquerque, and Belen Levees: These levees contribute to floodplain constriction and habitat degradation for the silvery minnow. Levees at these sites result in a reduction in the amount and quality of suitable habitat for the silvery minnow.

3. Santa Ana River Restoration Project: In August 1999, Reclamation consulted with the Service on a restoration project located on Santa Ana Pueblo in an area where the river channel was incising and eroding into the levee system. This project included a Gradient Restoration Facility (GRF), channel re-alignment, bioengineering, riverside terrace lowering, and erodible bank lines. The primary component of the Santa Ana Restoration Project is the GRF, which should control river hydraulics upstream of its location and also river bed control. The GRF was designed to: (1) store more sand sediments at a stable slope for the current sediment supply; (2) decrease the velocities and depths and increase the width in the river channel upstream; (3) be hydraulically submerged at higher flows while simultaneously increasing the frequency and duration of overbank flows upstream; (4) provide velocities and depths suitable for passage of the silvery minnow through the structure; and (5) halt or limit further channel degradation upstream of its location. The channel re-alignment involved moving the river away from the levee system and over the grade control structure, and involves excavation of a new river channel and floodplain. Another significant component of the Santa Ana Restoration project is riverside terrace lowering for the creation of a wider floodplain. The bioengineering and deformable bank lines also assist in establishing the new channel bank and regenerating native species vegetation in the floodplain.

4. Creation of a Conservation Pool for Storage of Native Water in Abiquiu and Jemez Canyon Reservoirs and Release of a Spike Flow: The City of Albuquerque created space

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

5. Programmatic Biological Opinion on the Effects of Actions Associated with the U. S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and non-federal Entities' Discretionary Actions Related to Water Management on the Middle Rio Grande: The Service completed this biological opinion on March 17, 2003, determining the effects of water management by the applicants on the silvery minnow and flycatcher. This biological opinion had one RPA with several elements. These elements set forth a flow regime in the Middle Rio Grande and described habitat improvements necessary to alleviate jeopardy to both the silvery minnow and flycatcher.

6. Albuquerque Drinking Water Project: The Drinking Water Project, involves the construction and operation of: (1) A new surface diversion dam north of Paseo del Norte Bridge, (2), conveyance of raw water from the point of diversion to the new water treatment plant, (3) a new water treatment plant on Chappell Road NE, (4) transmission of treated (potable) water to residential and commercial customers throughout the Albuquerque metropolitan area, and (5) aquifer storage and recovery. During typical operations, the project will divert a total of 94,000 acre-feet per year (afy) of raw water from the Rio Grande (47,000 afy of City San Juan-Chama water and 47,000 afy of Rio Grande native water) at a near constant rate of about 130 cubic-feet per second (cfs) (3.68 cms). Peak diversion operations will consist of up to 103,000 afy being diverted at a rate of up to 142 cfs (4.02 cms). A new water treatment plant with a normal operating rate of 84 million gallons per day (mgd) (381.9 million liters per day [mld]) and a peak capacity of about 92 mgd (418.2 mld) or 142 cfs (4.02 cms) will be constructed as part of the proposed action. Consultation on this project was completed in October, 2003. Construction is currently underway.

7. Los Lunas Habitat Restoration Project: On February 6, 2002, the Service completed this consultation, which tiered from the programmatic biological opinion on water management on the Middle Rio Grande issued June 29, 2001. This project is intended to partially fill element J of the Reasonable and Prudent Alternative from the programmatic biological opinion to conduct habitat/ecosystem restoration projects in the Middle Rio Grande to benefit the silvery minnow and flycatcher. Approximately 37 acres of native riparian and 40 acres of aquatic habitat have been created by this project. This project includes side-channels resulting in increased inundation frequency and will result in inundation of the area at flows greater than or equal to 2,500 cfs. A variety of substrate elevations will also allow inundation of some areas when flows are less than 2,500 cfs.

8. Temporary Channel to Elephant Butte: This Reclamation project involves the

construction of a temporary channel through the delta area of Elephant Butte Reservoir to increase the efficiency of sediment and water conveyance. An additional project goal was to initiate some degradation of the river bed through the San Marcial Reach to increase overall channel capacity and potentially allow for higher peak releases from Cochiti dam during subsequent spring runoff periods.

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

10. <u>Habitat Restoration Projects:</u> Several habitat restoration projects have been completed in the Albuquerque reach through the Collaborative Program. These projects include two woody debris installation projects to encourage the development of pools and wintering habitat, and a river bar modification project south of the I-40 Bridge designed to create side and backwater channels on an existing bar as well as modify the top surface of the bar to create habitat over a range of flows. Additionally, in 2005, the ISC started a multi-year habitat restoration program that implements several island, bar, and bank line modification techniques throughout the Albuquerque Reach. Approximately 24 acres of habitat were restored in the Phase I.

Summary

The remaining population of the silvery minnow is restricted to approximately 5 percent of its historic range. Every year since 1996, there has been at least one drying event in the river that has negatively affected the silvery minnow population. The population is unable to expand its distribution because poor habitat quality and Cochiti Dam prevent upstream movement and Elephant Butte Reservoir blocks downstream movement (Service 1999). Augmentation of silvery minnows with captive-reared fish will continue, however, continued monitoring and evaluation of these fish is necessary to obtain information regarding the survival and movement of individuals.

Water withdrawals from the river and water releases from dams severely limit the survival of silvery minnows. The consumption of shallow groundwater and surface water for municipal, industrial, and irrigation uses continues to reduce the amount of flow in the Rio Grande and eliminate habitat for the silvery minnow (Reclamation 2002). However, under state law, the municipal and industrial users are required to offset the effects of groundwater pumping on the surface water system. The City of Albuquerque, for example, has been offsetting their surface water depletions with 60,000 af per year (Reclamation 2002). The combined effect of water withdrawals and the drought mean that discharge from WWTPs and irrigation return flows will have greater importance to the silvery minnow and a greater impact on water quality. Lethal levels of chlorine and ammonia have been released from the WWTPs in the last several years. In addition, a variety of organic chemicals, heavy metals, nutrients, and pesticides have been documented in storm water channels feeding into the river and contribute to the overall degradation of water quality.

Although various conservation efforts have been undertaken in the past and others are currently being carried out in the middle Rio Grande, and abundance in recent years is increasing, the threat of extinction for the silvery minnow continues because of the high probability of continued drought, the increased reliance on captive propagation, the fragmented and isolated nature of currently occupied habitat, and the absence of silvery minnows in other parts of the historic range. The increased abundance of silvery minnow in 2004 and 2005 is a positive sign. Nevertheless, the threats that endanger this species are still prevalent.

IV. EFFECTS OF THE ACTION

'Effects of the Action' refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, which will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Silvery minnow are currently abundant in the Albuquerque Reach (Dudley et al. 2006) and are expected to be present within the Action Area. The primary adverse effects of the proposed action on the silvery minnow result from the presence of heavy equipment in the water during island modification, bank scouring, jetty jack removal, and ephemeral channel enhancement, as well as the deposition of sediment woody debris into the river. Adverse effects may also result from the mobilization of disturbed sediment and associated contaminants. Although short-term adverse effects are likely to occur, the proposed action is anticipated to have a long-term beneficial effect on the silvery minnow and its habitat.

Direct Effects
The proposed action is likely to have a direct adverse effect on silvery minnows during the modification of islands, banks, and ephemeral channels, as well as jetty jack removal. The operation of heavy equipment in the river channel poses a risk of harassment to the species. In shallow waters (less than 3 feet), the slow speed and sound of the amphibious equipment may disturb or harass silvery minnows and result in their temporary movement out of the affected area. However, silvery minnows are capable of swimming faster (up to 70.8 m/minute) than the average speed of the Caterpillar 325 (26 m/minute), allowing them to avoid the excavator as it moves through the water. Silvery minnows are likely to avoid construction equipment in water more than 3 feet deep for the Caterpillar 325 would be in full flotation and not impede fish movement. Fleeing the disturbance represents an expenditure of energy that the fish would not have without the project. However, this form of harassment would be short in duration and the potential number of individuals within the immediate vicinity of the equipment affected would be relatively low.

During the creation of low-flow habitats, silvery minnows may be harassed as sediment and woody debris are placed directly adjacent to the island. A silt curtain will be used to contain sediment and allow displaced water and fish to move out through a downstream opening. The flow and depth of the channel is adequate to disperse the sediment and debris into locations during high flows, which benefits silvery minnows by creating suitable habitat for the species. Although, adverse effects are expected to be limited to small isolated areas for a brief period of time, the potential exists for silvery minnows to be displaced during this process.

Over the long-term, constructed habitats are expected to have beneficial effects (see below), however occasional adverse effects are still likely beyond the construction period. High flows may deposit sediment in or at the openings of constructed channels so that isolated pools containing silvery minnows would be formed. Silvery minnows may become stranded in these isolated habitats and die.

Indirect Effects

Indirect effects to silvery minnows may occur from reduced water quality. As construction equipment travels to in-channel treatment areas, hydrocarbon contaminants may enter the water from fuel and fluids. Subsurface sediments in the river channel may also be disturbed, increasing turbidity and lowering water quality. During access to the project site, equipment may cross wetted portions of the river channel, creating the potential for disturbed sediment and associated contaminants to disperse downstream and affect water quality. Sediment disturbance may also occur as amphibious equipment moves through the river channel, during jetty jack removal, and in areas adjacent to islands where new low-flow habitat is being created. When in shallow water, equipment may disturb the water-sediment interface (U.S. Bureau of Reclamation 2005).

The applicant has committed to take the shortest path through wetted portions of the channels, avoid crossing during high flows, and install silt fences to reduce downstream dispersal of sediment and allow sediment to resettle before they are removed. The proposed action also includes the protection of hydraulic lines to avoid punctures during operation, and all fueling activities will take place outside of the active floodplain reducing the likelihood of contamination from equipment fueling, leakage, or accidental spills. Further, direct access into the channel will be from dry banks, thus reducing the transfer of contaminated sediments on equipment tracks. Water quality, including turbidity and dissolved oxygen, will be monitored before, during, and after equipment operates in the river channel. Suspended sediment is expected to settle quickly and have a minimal impact to silvery minnows. They can move to adjacent areas to avoid short-term decreases in water quality. These commitments help to minimize indirect effects to silvery minnows from reduced water quality.

Beneficial Effects

The proposed action is expected to establish diverse mesohabitats that support silvery minnows. Such habitat benefits the species through improved egg and larval retention, increased recruitment rates, and increased survival of both YOY and adult minnows. In the short term, the proposed action may adversely affect silvery minnows in the affected area; yet, in the long term, the Project is anticipated to have a beneficial effect on the silvery minnow and its habitat, contributing to the improvement of their status into the future.

Critical Habitat Analysis

This biological opinion 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 critical habitat to determine whether the proposed action destroys or adversely modifies critical habitat.

The entire action area of the proposed restoration project encompasses designated critical habitat for the silvery minnow from the Angostura Diversion Dam to the Isleta Diversion Dam, excluding Santa Ana and Sandia Pueblo lands. Direct and indirect effects of the proposed action are likely to have a positive impact on three of the four PCEs of critical habitat for the silvery minnow. Island modification, bank scouring, and ephemeral channel enhancement provides habitat types included as primary constituent elements of silvery minnow critical habitat. Such habitat types 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 (i.e., river miles) that provide a variation of habitats with a wide range of depth and velocities. The proposed restoration project contributes to the PCEs, which provide for the physiological, behavioral, and ecological requirements essential to the conservation of the silvery minnow.

Cumulative Effects

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

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

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

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

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

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

V. CONCLUSION

After reviewing the current status of the silvery minnow, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that Phase II of the Middle Rio Grande Riverine Habitat Restoration Project, as proposed in the July 2006 biological assessment, is not likely to jeopardize the continued existence of the silvery minnow, and is not likely to destroy or adversely modify designated critical habitat. Recent sampling data have shown significant increases in numbers of silvery minnow. The restoration project is likely to have a short-term adverse effect on individual silvery minnows, which may be present in the Action Area, but impacts will be minimal. In addition, the proposed action is anticipated to have a long-term positive impact on the species through improvements to quality and availability of suitable habitat.

Island modification, bank scouring, and ephemeral channel enhancement are expected to have a positive impact on designated critical habitat for the silvery minnow. These activities restore habitat consistent with the PCEs of silvery minnow critical habitat. The short-term impacts to critical habitat do not affect the ability of the PCEs to serve the intended function and conservation role of silvery minnow critical habitat. Therefore, the Service concludes that the proposed action is not likely to destroy or adversely modify designated critical habitat for the silvery minnow.

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.

Amount or Extent of Take Anticipated

The Service has developed the following incidental take statement based on the premise that Phase II of the Middle Rio Grande Riverine Habitat Restoration Project will be implemented as proposed. Take of silvery minnows is expected in the form of harm and harass during: 1) island modification, bank scouring, and ephemeral channel enhancement; 2) removal and placement of sediment and woody debris adjacent to islands; and 3) the post construction period if isolated pools form in constructed habitats following high flows.

The Service anticipates that take in the form of harassment may affect up to 3,365 silvery minnows during habitat construction. Currently, the average density of silvery minnows in the project area is 2.53/100 m^2. Silvery minnows occupying up to 32.87 acres of wetted habitat area may be temporarily displaced during construction. Harassment is likely to occur as silvery minnows are temporarily displaced by construction activities associated with island modification, bank scouring, and ephemeral channel enhancement, as well as by the placement of sediment and woody debris in water adjacent to islands.

Additionally, the Service anticipates that up to 341 silvery minnows may be taken in the event that up to 3.34 acres of isolated habitats form in ephemeral and backwater channels. High flows may recontour these channels, block entrances or exits and strand silvery minnows within the constructed channel. If more than 341 silvery minnows are found dead in these channels, the level of anticipated take will have been exceeded.

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

Effect of Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the silvery minnow. Monitoring data have shown significant increases in the abundance of silvery minnow in the past few years. The restoration project is likely to have minimal short-term adverse effects on individual silvery minnows and long-term (1-7 years) beneficial effects to silvery minnow and its habitat.

Reasonable and Prudent Measures

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

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

1. Minimize take of silvery 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 Middle Rio Grande Riverine Habitat Restoration Project described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

To implement RPM 1, the ISC shall:

1. Monitor for the presence/absence of silvery minnows during construction and use adaptive management to modify island restoration, scouring and scalloping to minimize the adverse effects.
2. In coordination with the Service, develop a protocol to monitor for the presence/absence of silvery minnows in ephemeral channels following high flows, and to determine whether channel maintenance is warranted.
3. The results and effectiveness of all treatment islands and reference sites shall be reported to the Service in a timely manner.
4. Report findings of injured or dead silvery minnows to the Service.

To implement RPM 2, the ISC shall:

1. Schedule, to the extent possible, river crossings during dry or frozen soil conditions.
2. Report to the Service and the Pueblo of Sandia, water quality measurements taken before, during, and after construction activity, required by Reclamation's Clean Water Act 401 certification.

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 FWS recommends the following conservation activities:

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

RE-INITIATION NOTICE

This concludes formal consultation on the actions described in the July 2006 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 biological opinion; (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 biological opinion; 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 22420-2006-F-160. If you have any questions or would like to discuss any part of this biological opinion, please contact Jennifer Parody of my staff at (505) 761-4710.

Sincerely,

Wally Murphy
Field Supervisor

cc: Assistant Regional Director, Region 2 (ES)
Regional Section 7 Coordinator, Region 2 (ES)

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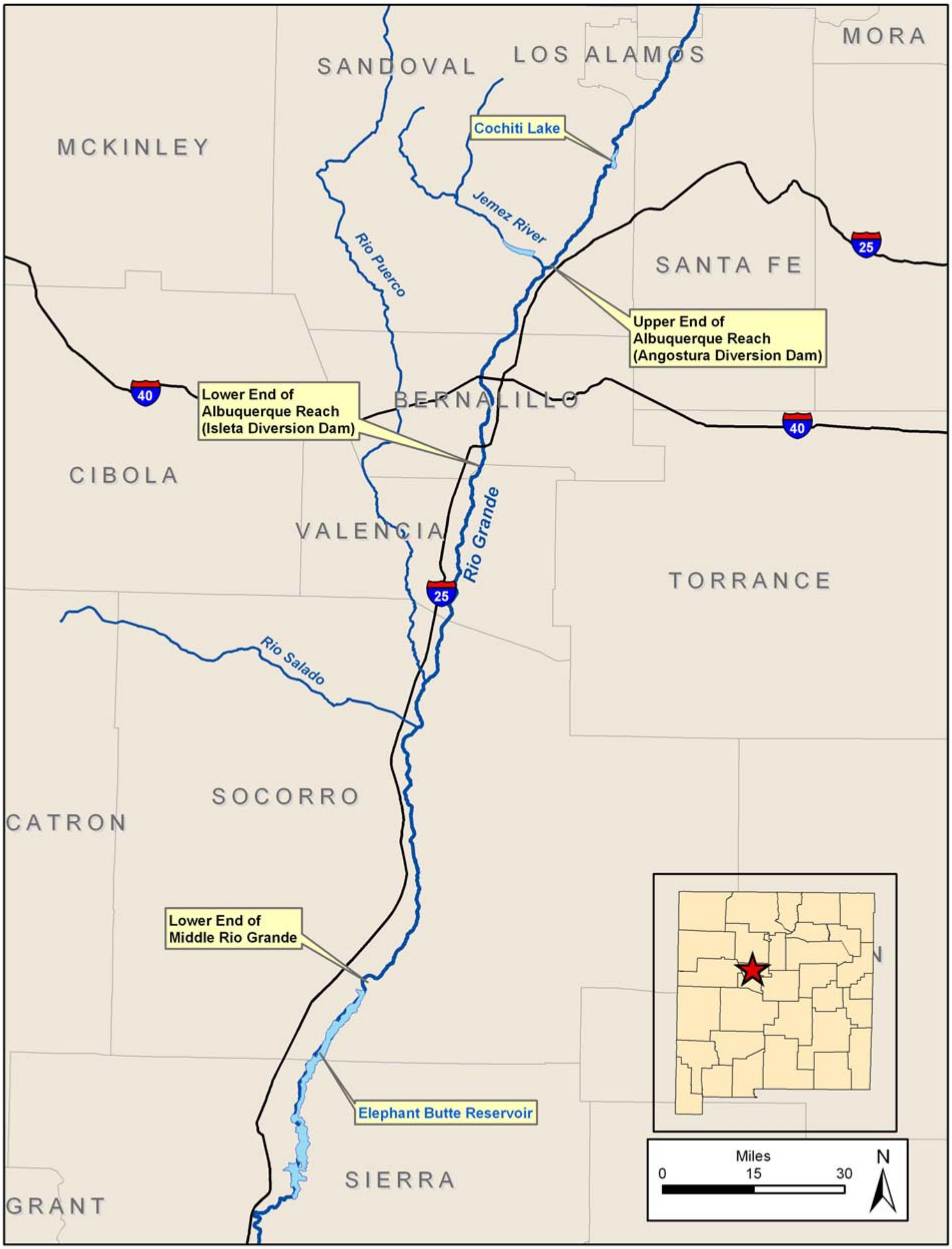

Figure 1. Albuquerque Reach of the Middle Rio Grande.

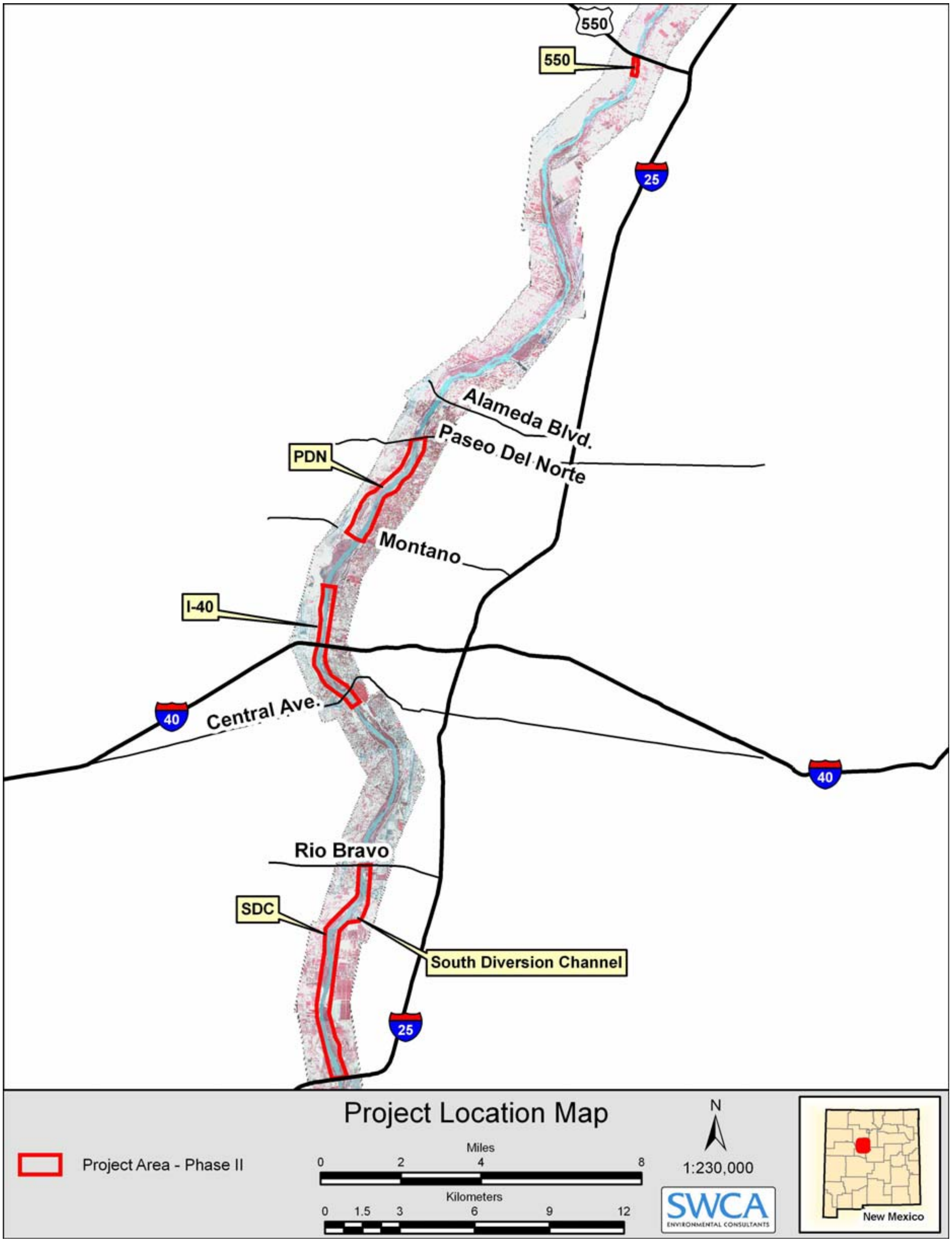

Figure 2. Middle Rio Grande Riverine Habitat Restoration Phase II subreaches.

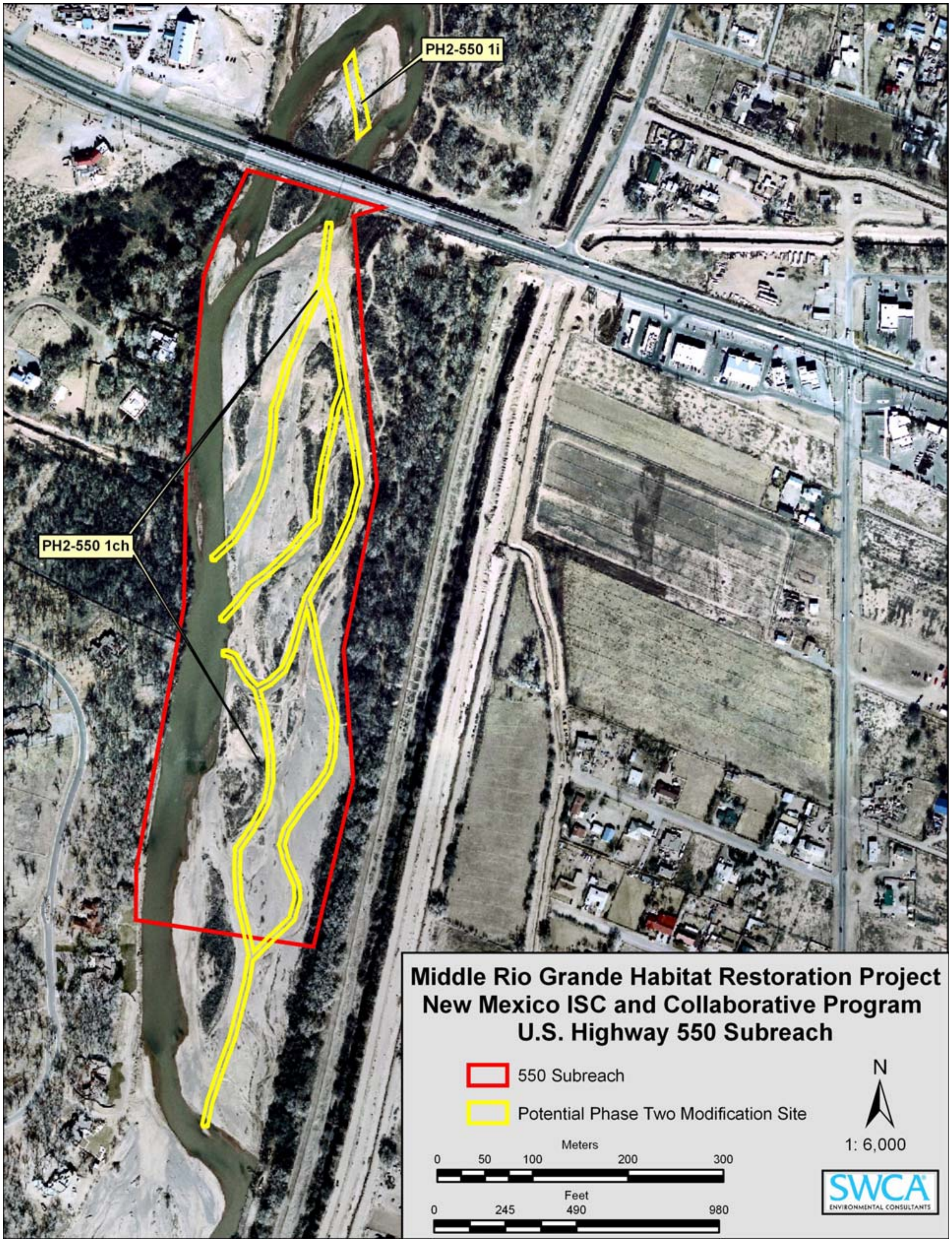

Figure 3. U.S. Highway 550 Subreach treatment locations.

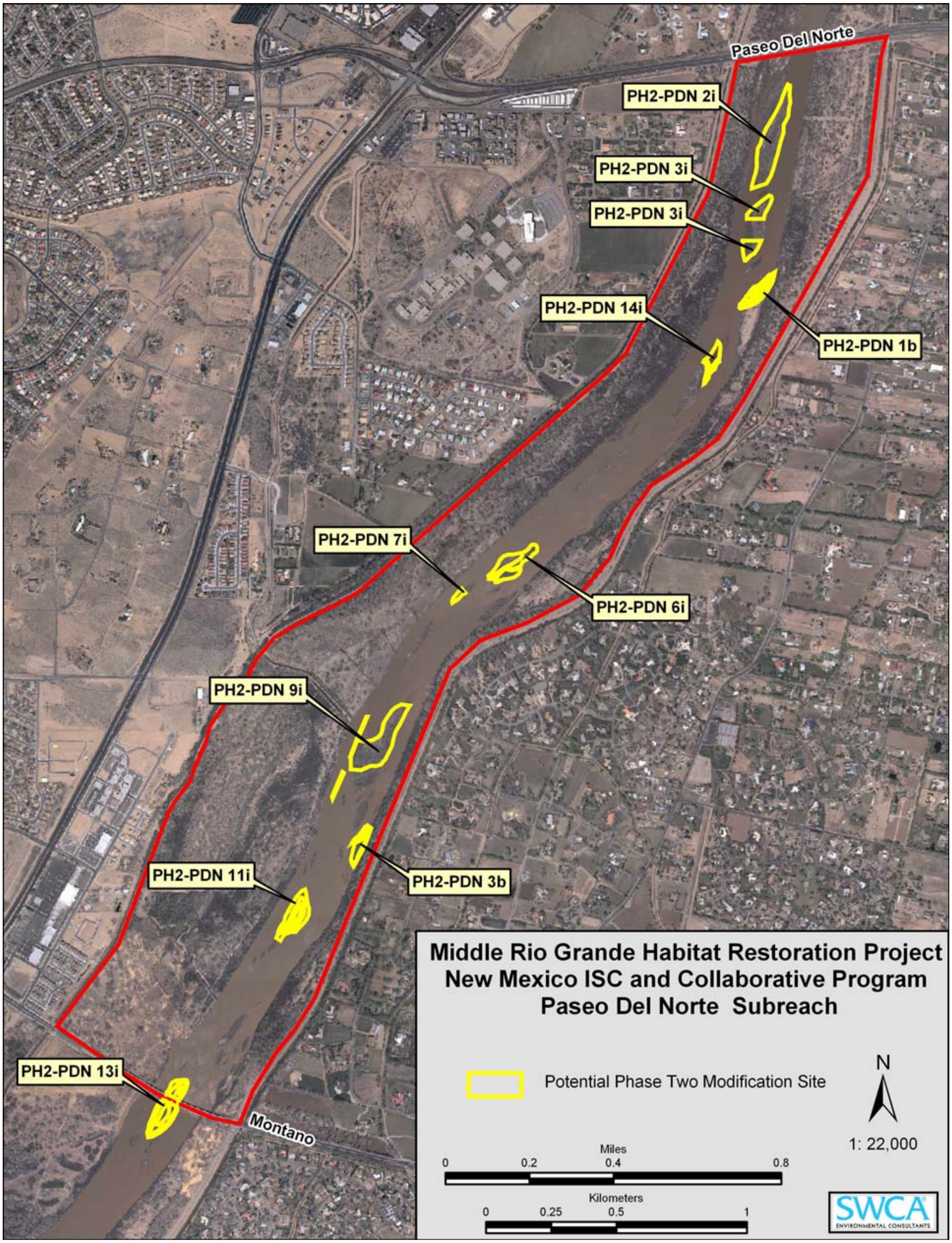

Figure 4. Paseo del Norte Subreach treatment locations.

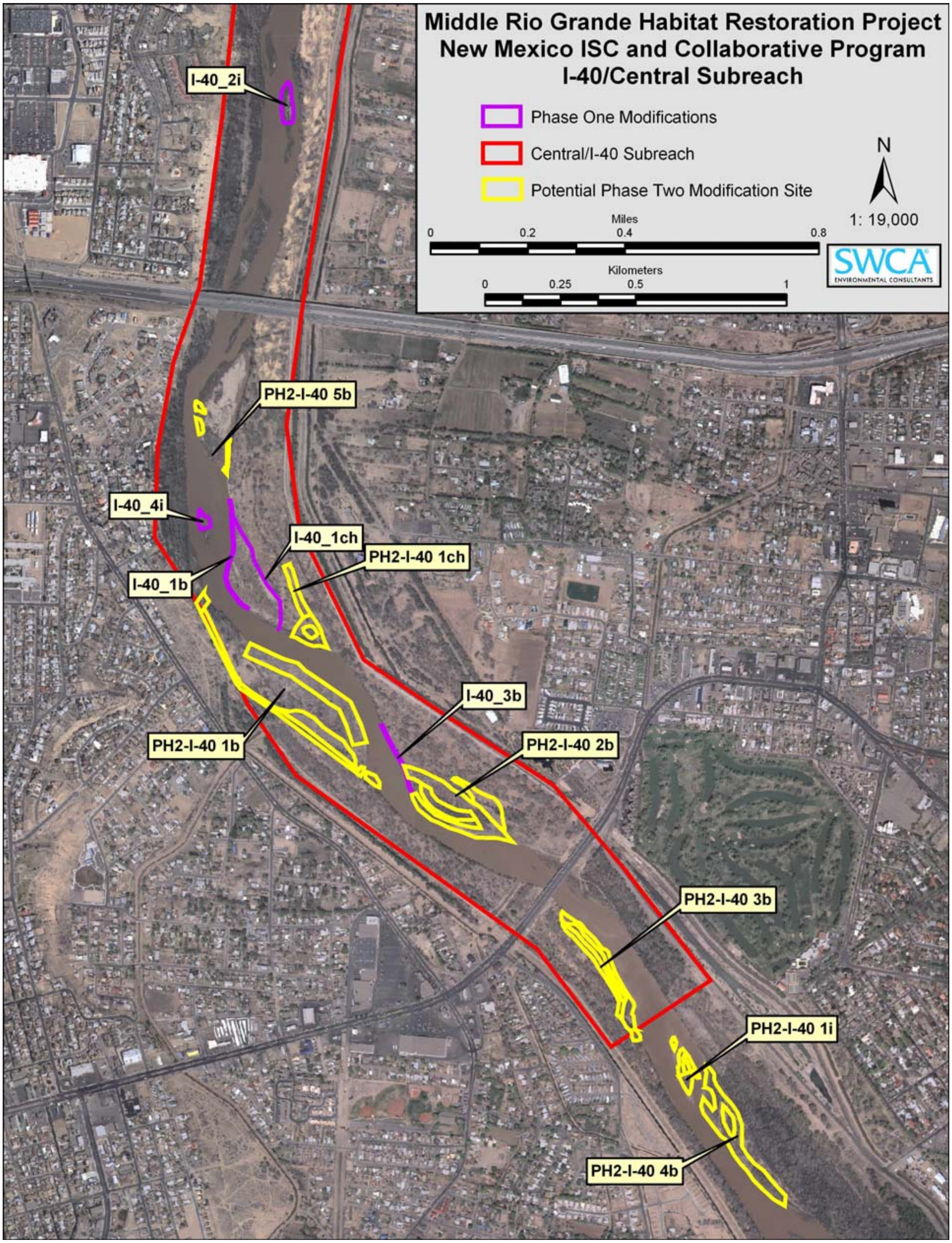

Figure 5. I-40 Subreach treatment locations.

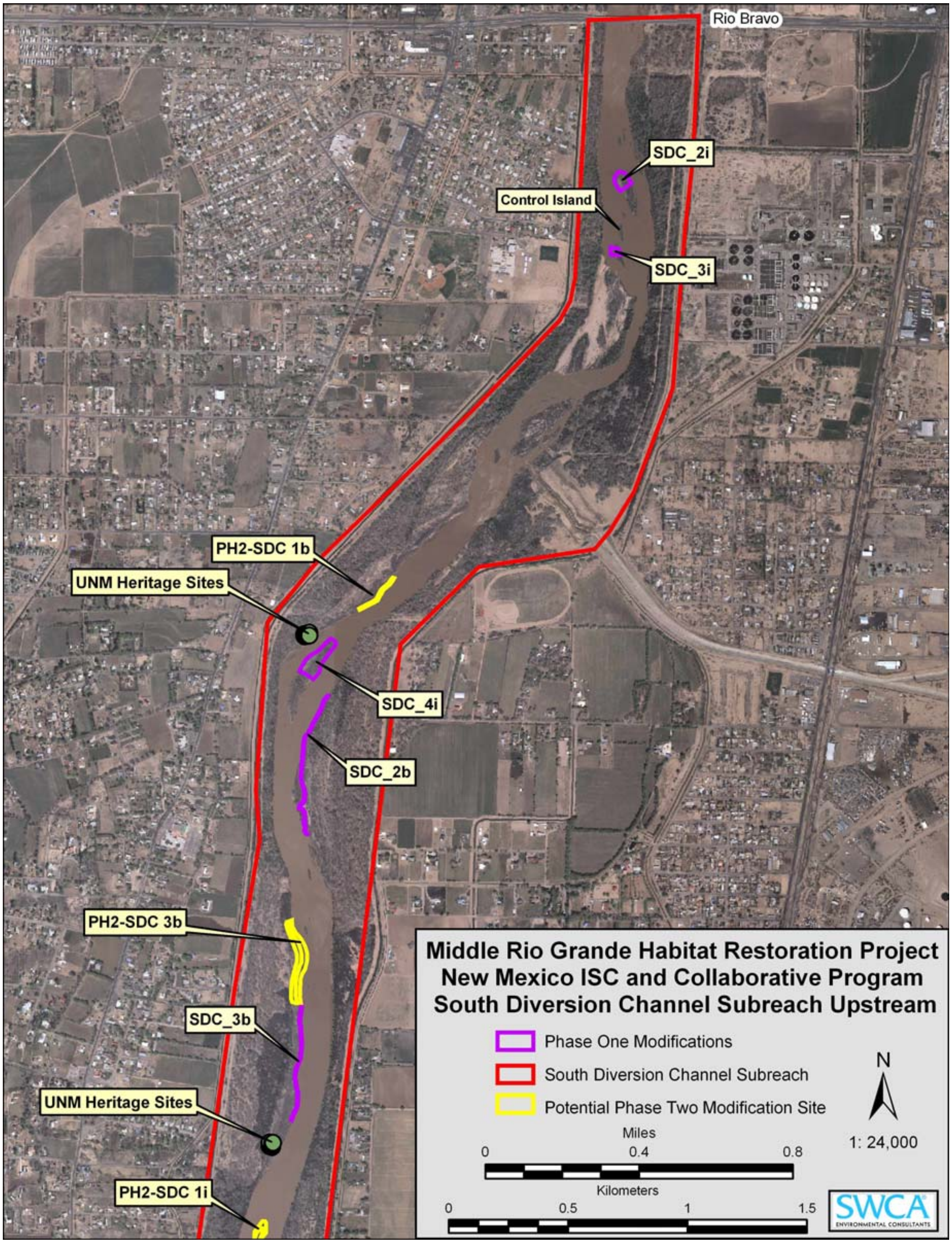

Figure 6. South Diversion Channel Subreach treatment locations, north section.

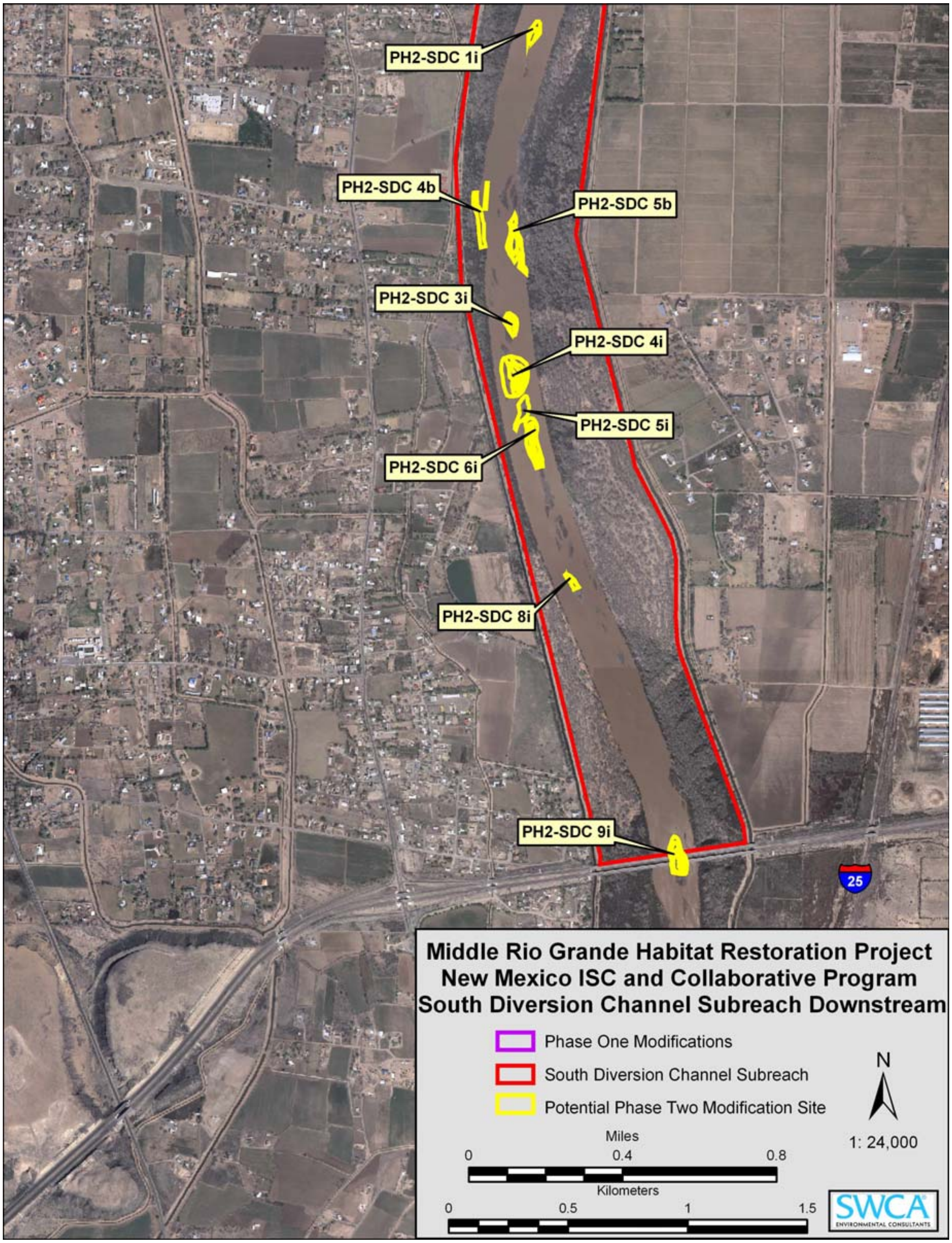

Figure 7. South Diversion Channel Subreach treatment locations, south section.

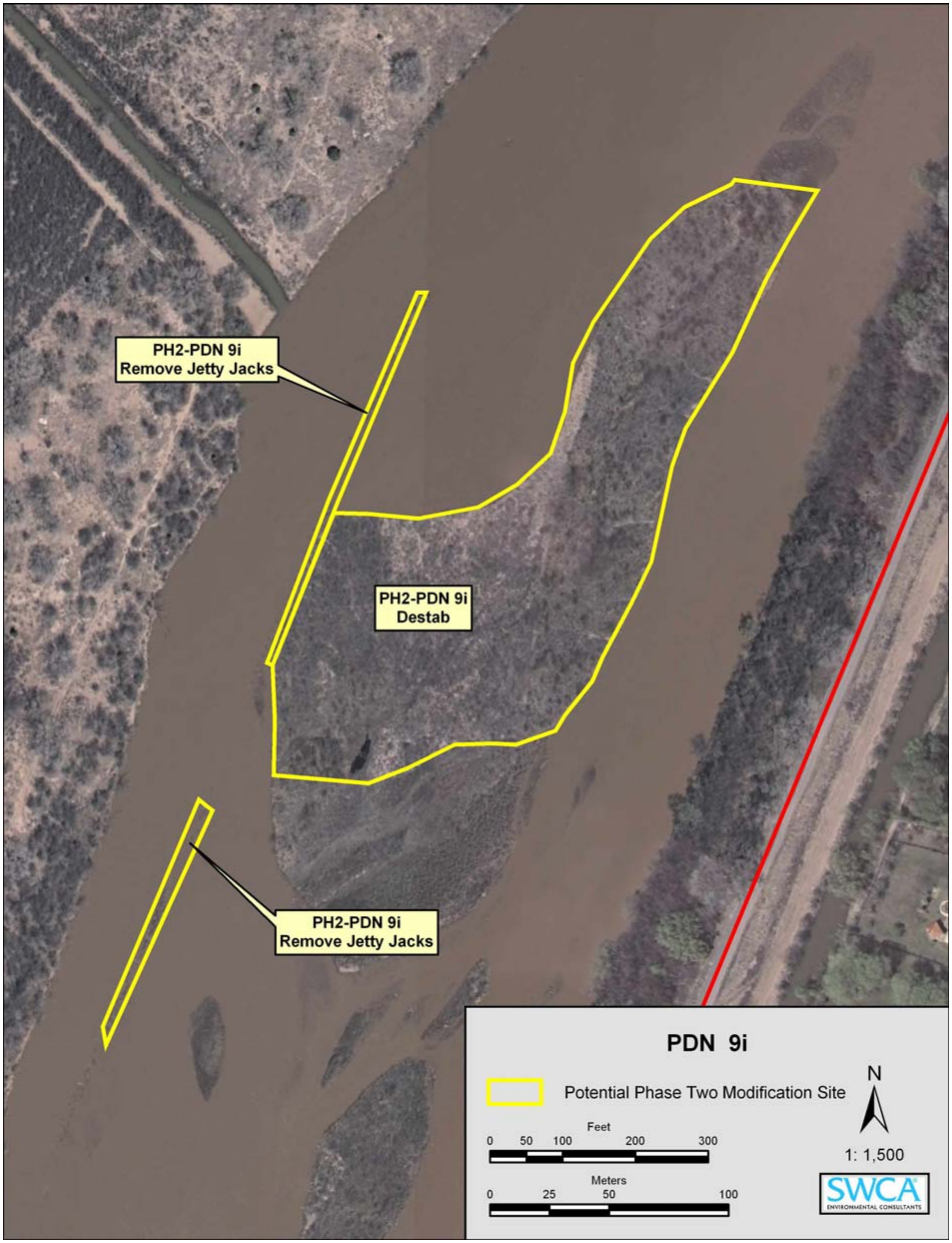

Figure 8. In-channel jetty jack extraction detail.

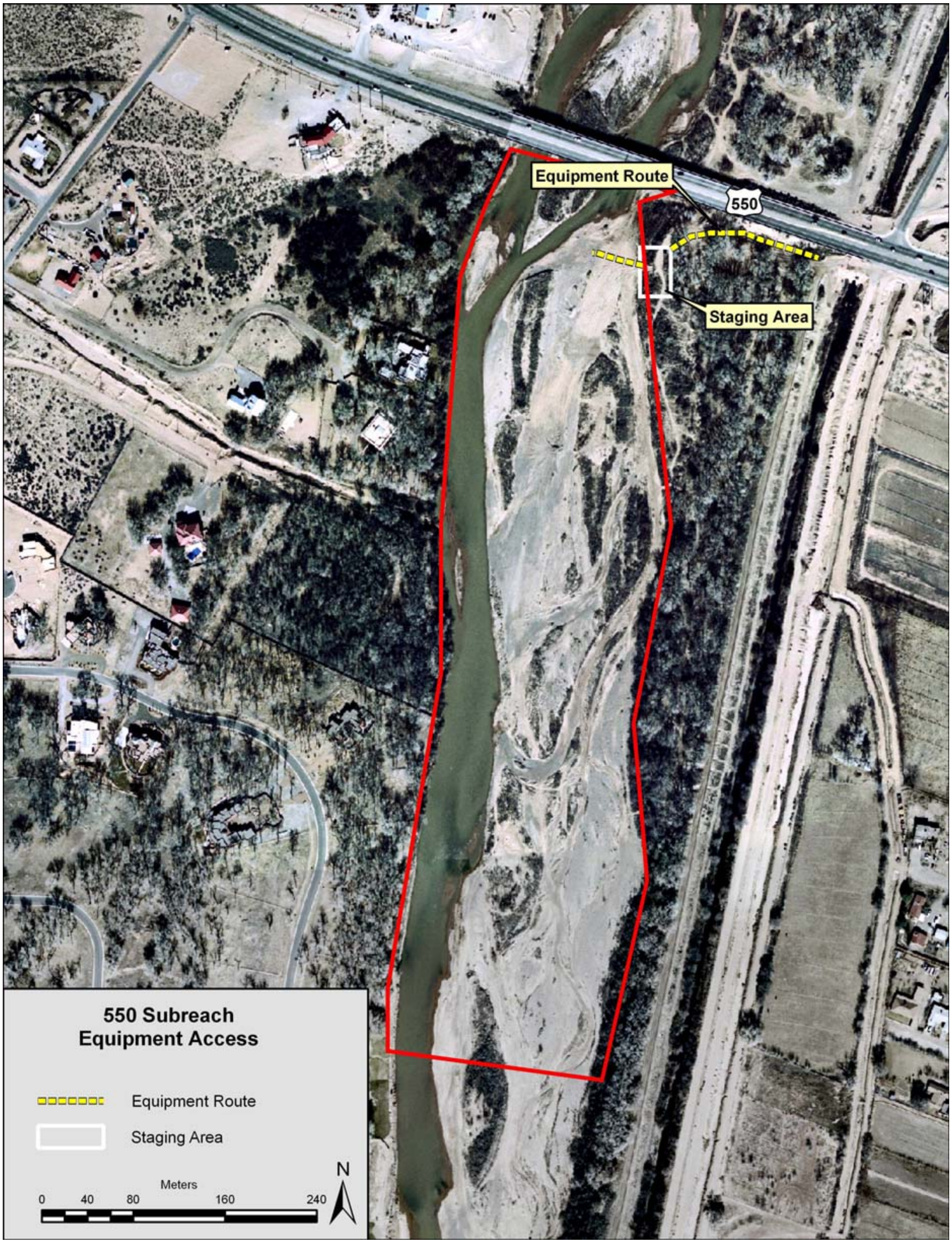

Figure 9. U.S. Highway 550 Subreach staging and access areas.

Figure 10. Paseo del Norte Subreach staging and access areas.

Figure 11. I-40/Central Subreach staging and access areas.

Figure 12. South Diversion Channel Subreach staging and access areas.