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United States Department of the Interior

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Cons. # 22420-2008-F-0017

Memorandum

To: Area Manager, Albuquerque Area Office, U.S. 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 Actions Associated with the Biological Assessment for the Elephant Butte Reservoir Temporary Channel Maintenance Project

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the proposed Elephant Butte Reservoir Temporary Channel Maintenance Project (Temporary Channel Project). The project area begins at river mile RM 57.8 and continues to the mouth of the Elephant Butte Reservoir (Reservoir). This biological opinion concerns the effects of the proposed action on the endangered Rio Grande silvery minnow (*Hybognathus amarus*) (silvery minnow), the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher), and critical habitat for each. 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 October 1, 2007.

This biological opinion is based on determinations made in your cover letter for the Biological Assessment for the project, information submitted in the October 1, 2007, "Elephant Butte Reservoir Temporary Channel Maintenance Biological Assessment" (BA), meetings between Reclamation and the Service, supplemental information provided in December and January via e-mail, 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).

Consultation History

The first and second phases of the temporary channel to the Reservoir were previously consulted on in October – December 1996 and May – August 2000 for silvery minnow and flycatcher (Cons. #2-22-97-I-053). In 2002 and 2004, Reclamation made a determination of 'no effect' for both species for additional construction in the lower portion of the temporary channel.

In December 2005, silvery minnow were documented throughout the temporary channel prompting the need for re-initiation. In the fall of 2006, Reclamation and the Service agreed to implement protective measures for the fish until survey reports and a Biological Opinion (BO) could be provided. The previous BA for the temporary channel determined that the project may affect, and is not likely to adversely affect the flycatcher. A BA for maintenance of the existing channel and additional extensions of the channel into the Reservoir pool was received on October 1, 2007.

This BO 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

DESCRIPTION OF PROPOSED ACTION

The BA contains a comprehensive description of the purpose and need for the proposed action, details on the construction and maintenance project, a description of the environmental commitments, and effects determination for listed species and critical habitat. The following description of the proposed action is a summary of the material in the biological assessment and should not be considered the complete description.

Purpose and Objective

Reclamation, in cooperation with the New Mexico Interstate Stream Commission (ISC), has constructed and maintains a temporary channel to facilitate delivery of water and sediment from RM 57.8 of the Rio Grande to Elephant Butte Reservoir. The proposed action includes maintenance of the temporary channel for the next five and a half years (from January 1, 2008 to July 1, 2013) and new construction of the lower channel. The description of the proposed action is separated by reaches (upper, middle and lower), and by activities such as ongoing non-channel enhancement features (i.e. groundwater pond and RM 78 channel widening), maintenance operations, future temporary channel construction, and widening and realignment of the existing temporary channel.

Project Locations

Work in the temporary channel will occur in three reaches (see Figure 1): the upper reach (RM 57.8-51.2) with a total channel width of approximately 300 feet and a maximum construction footprint of 475 feet, the middle reach (RM 51.2 to 40.7) with a total channel width of approximately 200 feet, and a construction footprint width of 390 feet, and the lower reach (RM 40.7 to reservoir) which begins at RM 40.7 and extends below the area called "the narrows" into the Reservoir pool. The length of the lower reach varies from year to year, based on the fluctuating reservoir level, and as of this date 3.3 miles have been constructed. As Reservoir levels rise, some or all of this lower reach will become inundated, and portions of the constructed channel may be obliterated, resulting in a need for reconstruction after the reservoir recedes again. Appendix A provides estimated areas of in water disturbance by reach, including active excavation (maintenance work), the movement of excavators throughout the channel, and airboat activity.

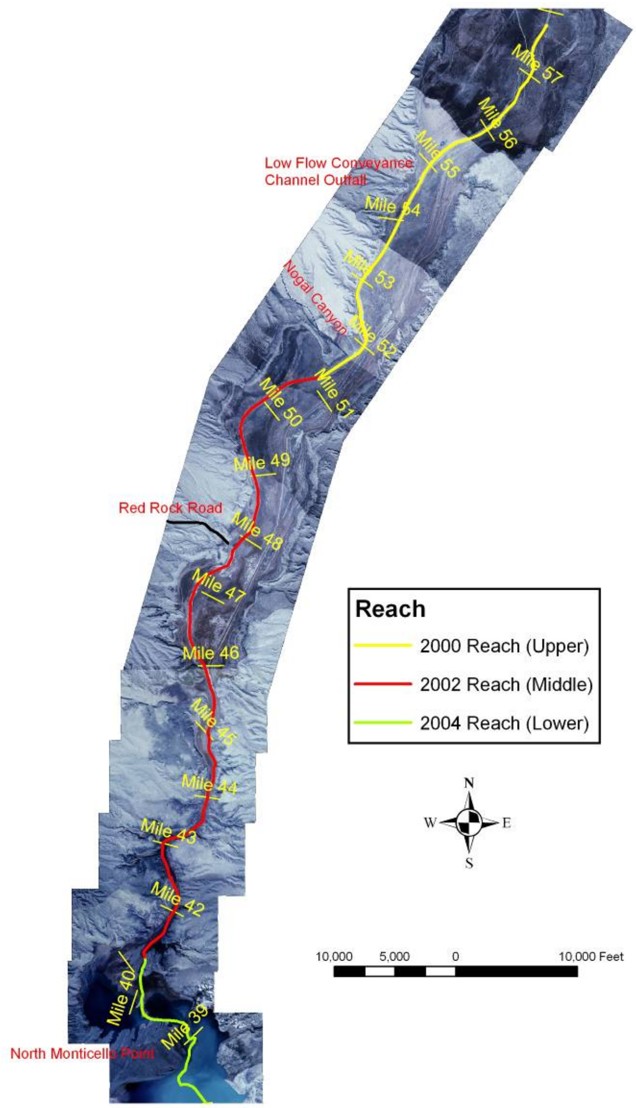

Figure 1. Location of temporary channel reaches along the Middle Rio Grande in New Mexico.

Temporary Channel Maintenance Operations

Channel maintenance work on all reaches generally consists of removal of sediment deposits within the channel and repair of damage to berms. Berm damage may occur in several ways including erosion of inside berm slopes or overtopping of berms due to high flows within the channel or saturation of berm material or overtopping of berms due to arroyo flows. Typical channel maintenance procedures involve removal of sediment from within the channel and placement of the material on the berms.

In-water maintenance work is performed by amphibious excavators and bulldozers which work on the berms pushing material deposited by excavators into place for berm repairs. Dozers may also work on the elevated floodplain within the 250-foot wide channel of the upper reach. Maintenance work includes the removal of vegetation from berm slopes and point bars for all reaches, and from the floodplain surfaces of the 250-foot wide channel in the upper reach. Vegetation removal may be accomplished by excavators or dozers.

Amphibious excavators are conventional tracked excavators mounted on pontoons to allow operation on very soft ground. Excavators generally work in the channel, often in water, and also move between work sites within the channel. At a work site they are typically set up in a stable position for performing work within a radius of approximately 40 feet. When work within that radius is complete, the excavator moves and begins excavation from the new setup location. When work in the general area is complete the excavator moves to the next work site.

Typical excavator operation involves removal of accumulated sediment from the channel and placement of the material on berms. In some cases the berms have been eroded and have vertical banks on the river side. Berms are reconstructed using material from the channel. The excavators move material from the channel to the berm in three ways. Working from the channel, the excavator scoops up a bucket of channel material, often mixed with water, and dumps the bucket on the berm. Working from the channel the excavator pushes material from the channel up the slope of the berm with the back of the bucket. Working from the berm, the excavator pulls material up the slope of the berm with the bucket.

Channel maintenance activities for all reaches will be confined to the area within the original construction footprint (see Appendix A). Channel maintenance may be performed throughout the year. However in-water work will not be performed during the period of May 1 to June 15 with the exception of emergency channel and berm repairs that may be necessary during a high runoff year. Reclamation expects that this type of emergency work event would occur once in a five year period for a period of two weeks near the end of runoff. Road maintenance may be performed throughout the year.

Maintenance Support Operations

Airboat Transport: Equipment operators and fuel for the equipment will be transported from equipment launching areas to work areas via airboats while maintenance work is in progress. Additionally, airboats cover the entire length of the temporary channel an average of eight times per year (four round trips) for channel inspections. Channel inspections are typically conducted with two airboats traveling together.

Refueling: Amphibious excavators will often be fueled while in the water. Fuel will be transported to them by airboat or by amphibious fuel transport, which is also on tracked pontoons. Excavators are equipped with spill kits, which include booms designed to contain spilled fuel and absorbent pads. Operators are trained and knowledgeable on how to deal with spills should they occur.

Pumping Water from River: Water will be pumped from the river at times for wetting of road surfaces to facilitate grading, and for dust abatement during high traffic periods to insure safe conditions and reduce environmental impacts. Pumping sites will be at or near existing equipment launching areas, requiring no new ground disturbance. Pump intake pipes will be placed directly in the channel, and will be screened to prevent fish from entering the pipes.

Draining Ponded Water in Lower Reach: In the lower reach, within what is now the Reservoir's delta area (where there is no vegetation); there are areas adjacent to the channel that accumulate water. To reduce evaporation losses and increase deliveries to the reservoir for Rio Grande Compact deliveries, excavation of secondary channels may be performed in the lower reach.

Maintenance of Groundwater Pond

A groundwater pond was constructed in 2005 in the upper reach, to provide waterfowl habitat, and will be maintained to insure continuation of environmental benefits. The pond has a surface area of 0.9 acres with an island in the middle. It is located on the west side of the temporary channel, at RM 55.4. Basic maintenance will include fencing repairs as needed to prevent cattle from damaging the pond, vegetation control of undesirable species such as cattails, maintaining flows through the pond, and maintaining the berms around the pond.

Future Temporary Channel Construction

Site Access and Staging Areas: Access to the new channel construction will be by existing roads that will be improved or extended and new staging areas will be constructed. Limitations on road extensions and new staging areas will be in accordance with existing permits, including the existing Section 404 Permit, which has specific limitations as follows:

- Width of road extensions will not exceed 24 feet.
- No more than four new staging and equipment launching areas will be developed at: 1. Three Sisters Point; 2. Long Point North; 3. Long Point South; 4. Elephant Butte Lake State Park headquarters area.
- Dimensions of new staging areas will be limited to 100 feet by 200 feet.

Construction of New Channel South of the Narrows: If the recession of the Reservoir continues, it will be necessary to construct new channel to continue the connection between the existing temporary channel and the Reservoir pool. It may also be necessary to reconstruct a portion or all of the existing 3.3 miles of channel in a new alignment if the existing channel becomes obliterated by Reservoir inundation. It is assumed that six miles of new channel will be constructed, beginning at the end of the existing channel (RM 38 to RM 31.4) and that three miles of the existing channel (RM 40.7 to RM 38) will be reconstructed in a new alignment following inundation by the Reservoir pool. New channel will be constructed using the same typical cross-section as was used for the existing lower reach.

New channel construction may also include excavation of secondary channels extending a short distance from the main channel, for the purpose of reconnecting isolated side pools or side channels. These secondary channels will extend a distance of no more than ½ mile from the main channel.

Reservoir recession may expose cottonwood and salt cedar snags that will be removed during channel construction. Prior to removal of such snags, a biological evaluation will be conducted to determine their significance for raptor use. The channel alignment will be adjusted to avoid removal of significant snags when possible.

Equipment Operations and Channel Disturbance: The new channel will be constructed in wet conditions, with amphibious excavators, in the same general manner as described for maintaining the existing channel. Material will be excavated to form the channel, and used to form berms along the side of the new channel.

Action Area

The Service has defined the Action Area to include the area from the San Acacia Diversion Dam to Elephant Butte Reservoir, and the entire width of the 100 year Rio Grande floodplain within that reach. The Action Area was defined as larger than the project area for reasons that will be discussed in the "Effects of the proposed action" section of this consultation.

STATUS OF THE SPECIES

RIO GRANDE SILVERY MINNOW

Description

The silvery minnow currently occupies a 170-mile reach of the Middle Rio Grande, New Mexico, from Cochiti Dam, Sandoval County, to the headwaters of Elephant Butte Reservoir, Socorro County (U.S. Fish and Wildlife Service 1994). The silvery minnow is a stout minnow, with moderately small eyes, a small, sub-terminal mouth, and a pointed snout that projects beyond the upper lip (Sublette *et al.* 1990). The back and upper sides of the silvery minnow are silvery to olive, the broad mid-dorsal stripe is greenish, and the lower sides and abdomen are silver. Maximum length attained is about 3.5 inches (in). 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 (Bestgen and Platania 1991).

Legal Status

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 are described below in the Reasons for Listing section.

Designated critical habitat for the silvery minnow was designated on February 19, 2003, (68 FR 8088). The designated critical habitat designation extends approximately 157 miles 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 designated critical habitat designation defines the lateral extent (width) as those areas bounded by existing levees or, in areas without levees, 300 feet (ft) or riparian zone adjacent to each side of the bank full stage of the Middle Rio Grande. Some developed lands within the 300 ft lateral extent are not considered designated critical habitat because they do not contain the primary constituent elements of designated critical habitat and are not essential to the conservation of the silvery minnow. Lands located within the lateral boundaries of the designated 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) areas over silt or sand substrate that are associated with shallow [< 15.8 inch (in)] 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 silvery minnow are most commonly found in backwaters, pools, and habitats associated with debris piles; whereas, young of year (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 in. Over 85 percent were collected from low-velocity habitats (<0.33 ft/sec) (Dudley and Platania 1997, Watts *et al*. 2002).

Designated Critical Habitat

The Service has determined the primary constituent elements (PCEs) of silvery minnow designated 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 1998). The majority of adults spawn in about a one-month period in late spring to early summer (May to June) in association with spring runoff. Platania and Dudley (2000, 2001) found that the highest collections of silvery minnow eggs occurred in mid- to late May. In 1997, Smith (1999) collected the highest number of eggs in mid-May, with lower frequency of eggs being collected in late May and June. These data suggest multiple silvery minnow spawning events during the spring and summer, perhaps concurrent with flow spikes. Artificial spikes have apparently induced silvery minnow to spawn (Platania and Hoagstrom 1996). It is unknown if individual silvery minnow spawn more than once a year or if some spawn earlier and some later in the year.

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 in in size upon fertilization, but quickly swelled to 0.12 in. Recently hatched larval fish are about 0.15 in in standard length and grow about 0.005 in 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 mi 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 in by late autumn (U.S. Fish and Wildlife Service 1999). Age-1 fish are 1.8 to 1.9 in by the start of the spawning season. Most growth occurs between June (post spawning) and October, but there is some growth in the winter months. In the wild, maximum longevity is about 25 months, but very few survive more than 13 months (U.S. Fish and Wildlife Service 1999). Captive fish have lived up to four years (C. Altenbach, City of Albuquerque, *pers. comm.* 2003).

Platania (1995) suggested that historically the downstream transport of eggs and larvae of the silvery minnow over long distances may have been 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 minnow consists of only two age classes: YOY and Age-1 (U.S. Fish and Wildlife Service 1999). The majority of spawning silvery minnow 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 minnow have been induced to spawn as many as four times in a year (C. Altenbach, City of Albuquerque, *pers. comm.* 2000). It is not known if they spawn multiple times in the wild. The high reproductive potential of this fish appears to be one of the primary reasons that it has not been extirpated from the Middle Rio Grande. However, the short life span of the silvery minnow increases the population instability. When two below-average flow years occur consecutively, a short-lived species such as the silvery minnow can be impacted, if not completely eliminated from dry reaches of the river (U.S. Fish and Wildlife Service 1999).

Distribution and Abundance

Historically, the silvery minnow occurred in 2,465 mi 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 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 3 to 12 in in diameter). Further downstream the riverbed is gravel with some sand material. Ephemeral tributaries including Galisteo Creek and Tonque Arroyo introduce sediment to the lower sections of this reach, and some of this is transported downstream with higher flows (U.S. Fish and Wildlife Service 2001, 1999). The Rio Grande below Angostura Dam becomes a predominately sand bed river with low, sandy banks in the downstream portion of the reach. The construction of Cochiti Dam also created a barrier between silvery minnow populations (U.S. Fish and Wildlife Service 1999). As recently as 1978, the silvery minnow was collected upstream of Cochiti Lake; however surveys since 1983 suggest that the fish is now extirpated from this area (U.S. Fish and Wildlife Service 1999).

Silvery minnow catch rates declined two to three orders of magnitude between 1993 and 2004. Additionally, relative abundance of silvery minnow 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 minnow 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 minnow have been released (primarily in the Angostura Reach) since 2000 (see Environmental Baseline). Captively propagated and released fish supplemented the native adult population and most likely also took 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 has 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 minnow in the Middle Rio Grande, increasing to 3,899 total silvery minnow captured from 2 and 78 in 2003 and 2004, respectively.

In 2006, however, spring runoff was extremely low and although there were several peaks in the natural hydrograph in June, July, August, and September, only a small number of silvery minnow eggs were documented in June and July. October samples yielded only 166 silvery minnow. None of the silvery minnow collected were YOY, indicating poor recruitment, likely due to channel drying in June and July, after the late and minimal spawn (Dudley et al. 2006).

<u>Middle Rio Grande Distribution</u>

Since the early 1990s, the density of silvery minnow generally increased from upstream (Angostura Reach) to downstream (San Acacia Reach). During surveys in 1999, over 98 percent of the silvery minnow captured were downstream of San Acacia Diversion Dam (Dudley and Platania 2002). This distributional pattern 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). Routine augmentation of silvery minnow in the Angostura Reach (nearly 900,000 since 2000), and the transplanting of silvery minnow rescued from drying reaches (approximately 770,000 since 2003) explains this change in pattern. Additionally, 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 exacerbated the skew. 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 minnow caught in March 2006, 33 were found in the Angostura Reach, 2,445 were found in the Isleta Reach, and 3,665 were caught in the San Acacia 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 (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). The Recovery Plan has been updated and revised and a draft revised Recovery Plan (U.S. Fish and Wildlife Service 2007) was released for public comment on January 18, 2007 (72 FR 2301).

The draft revised Recovery Plan describes recovery goals for the Rio Grande silvery minnow and actions to complete these (U.S. Fish and Wildlife Service 2007). The three goals identified for the recovery and delisting of the Rio Grande silvery minnow are:

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

2. Recover the Rio Grande silvery minnow to an extent sufficient to change its status on the List of Endangered and Threatened Wildlife from endangered to threatened (downlisting).

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

Downlisting (Goal 2) for the Rio Grande silvery minnow may be considered when three populations (including at least two that are self-sustaining) of the species have been established within the historic range of the species and have been maintained for at least five years.

Delisting (Goal 3) of the species may be considered when three self-sustaining populations have been established within the historic range of the species and they have been maintained for at least ten years (U.S. Fish and Wildlife Service 2007).

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. However, stream conditions in 2004 and 2005 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, with sustained high flows (over 3,000 cfs) for more than 2 months. These flows improved conditions for both silvery minnow recruitment and flycatcher habitat. Despite these gains, 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.

SILVERY MINNOW

Status of the Species within the Action Area

Surveys of the temporary channel were conducted by the Service in August 2005 and 2006 and in the winter of 2005/2006. Silvery minnows were found from Ft. Craig to Monticello Bay where the channel entered the headwaters of the Reservoir. Silvery minnow densities were comparable to those found at San Acacia reach long-term monitoring sites (Dudley et al. 2006). The average density of silvery minnow in the temporary channel, based on the most recent data (August 2006) is estimated to be 15/100 m^2. These densities are confined to suitable habitat (shorelines, backwaters, pools) and do not extend past the inflow to the Reservoir (Remshardt, Service, *pers. comm.* 2008), the location of which varies with lake levels.

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 minnow; 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.

<u>Loss of Water</u>

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 associated with the Rio Grande that supported fish until the river became connected again.

Water management and use has resulted in a large reduction of suitable habitat for the silvery minnow. Agriculture accounts for 90 percent of surface water consumption in the Middle Rio Grande (Bullard and Wells 1992). The average annual diversion of water in the Middle Rio Grande by the Middle Rio Grande Conservation District (MRGCD) was 535,280 af for the period from 1975 to 1989 (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). 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-mi reach near Tome (river miles 150-155), a 5-mi reach near the U.S. Highway 60 Bridge (river miles 127-132), and an extended 36-mi reach from near Brown's Arroyo (downstream of Socorro) to Elephant Butte Reservoir. Extensive fish kills, including silvery minnow, have occurred in these lower reaches when the river has dried. Since 1996, an average of 32 mi of the Rio Grande has dried, mostly in the San Acacia Reach. The most extensive drying occurred in 2003 and 2004 when 60 and 68.7 mi, respectively, were dewatered. Most documented drying events lasted an average of two weeks, before flows returned.

<u>Changes to Size and Duration of Peak Flows</u>

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 altered timing of flows may inhibit reproduction. Since completion of Elephant Butte Dam in 1916, four additional dams have been constructed on the Middle Rio Grande, and two have been constructed on one of its major tributaries, the Rio Chama (Scurlock 1998). Construction and operation of these dams, which are either irrigation diversion dams (Angostura, Isleta, San Acacia) or flood control and water storage dams (Elephant Butte, Cochiti, Abiquiu, El Vado), have modified the natural flow of the river. Mainstem dams store spring runoff and summer inflow, which would normally cause flooding, and release this water back into the river channel over a prolonged period of time. These releases are often made during the winter months, when low-flows would normally occur. The releases depart significantly from natural conditions, and can substantially alter the habitat. In spring and summer, artificially low-flows may limit the amount of habitat available to the species and may also limit dispersal of the species (U.S. Fish and Wildlife Service 1999).

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 them. Altered flow regimes may also result in improved conditions for other native fish species that occupy the same habitat, causing those populations to expand at the expense of the silvery minnow (U.S. Fish and Wildlife Service 1999).

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

Changes in Channel Morphology

Historically, the Rio Grande was sinuous, braided, and freely migrated across the floodplain. Changes in natural flow regimes, narrowing and deepening of the channel, and restraints to lateral channel migration (i.e., jetty jacks) adversely affected the silvery minnow. These effects result directly from constraints placed on channel capacity by structures built in the floodplain. These anthropogenic changes have and continue to degrade and eliminate spawning, nursery, feeding, resting, and refugia areas required for species' survival and recovery (U.S. Fish and Wildlife Service 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 (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 and the ability to carry sediments is enhanced. 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 minnow, and narrower channels resulted in fewer fish captured. The availability of wide, shallow habitats that are important to the silvery minnow is decreasing. Narrow channels have few backwater habitats with low velocities that are important for silvery minnow fry and YOY.

Within the current range of the silvery minnow, human development and use of the floodplain have greatly restricted the width available to the active river channel. A comparison of river area between 1935 and 1989 shows a 52 percent reduction, from 26,598 acres (10,764 ha) to 13,901 acres (5,626 ha) (Crawford *et al.* 1993). These data refer to the Rio Grande from Cochiti Dam downstream to the "Narrows" in Elephant Butte Reservoir. Within the same stretch, 234.6 mi of levees occur, including levees on both sides of the river. Analysis of aerial photography taken by Reclamation in February 1992, for the same river reach, shows that of the 180 mi of river, only 1 mi, or 0.6 percent of the floodplain has remained undeveloped.

Development in the floodplain, makes it difficult, if not impossible, to send large quantities of water downstream that would create low velocity side channels that the silvery minnow prefers.

As a result, reduced releases have decreased available habitat for the silvery minnow and allowed encroachment of non-native species into the floodplain.

<u>Water Quality</u>

Many natural and anthropogenic factors affect the quality of the middle Rio Grande. The water quality of the Rio Grande varies spatially and temporally throughout its course primarily because of inflows of ground water and from surface water discharges and tributary delivery to the river. Both point sources (pollution discharged from a pipe) and non-point sources (diffuse sources of pollution) affect the Middle Rio Grande. Major point sources are wastewater treatment plants (WWTPs) and feedlots. Major non-point sources include urban storm water run off, agricultural activities (e.g., fertilizer and pesticide application, livestock grazing), and mining (Ellis *et al.* 1993).

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

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

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

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

In addition to the compounds discussed above, several other constituents are present and affect the water quality of the Rio Grande. These include nutrients such as nitrates and phosphorus, total dissolved solids (salinity), and radionuclides. Each of these also has the potential to affect the aquatic ecosystem and health of the silvery minnow. As the river dries, pollutants will be concentrated in the isolated pools. Even though these pollutants do not cause the immediate death of silvery minnow, the evidence suggests that the amount and variety of pollutants present in the Rio Grande, could compromise their health and fitness (Post 1987). Factors that are known to cause poor fish habitat include temperature changes, sedimentation, runoff, erosion, organic loading, reduced oxygen content, pesticides, and an array of other toxic and hazardous substance addition or alterations in the physical or biological integrity.

Silvery Minnow Propagation and Augmentation

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

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

Since 2000 approximately 1,000,000 silvery minnow have been propagated using both adult wild silvery minnow 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 minnow 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 minnow disperse a few miles downstream. One individual was captured 15.7 mi upstream from its release site (Platania *et al*. 2003). Monitoring within 48 hours after the release of the 41,500 silvery minnow resulted in the capture of 937 fish. Of these, 928 were marked and 927 were collected downstream of the release point. The farthest downstream point of recapture was 9.4 mi.

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 minnow 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 150,000 silvery minnow are currently being maintained in captivity (M. Ulibarri, Service, *pers. comm*. 2007).

<u>Permitted and/or Authorized Take</u>

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 minnow. Many of the permits issued under section 10 allow take for the purpose of collection and salvage of silvery minnow and eggs for captive propagation. Eggs, larvae, and adults are also collected for scientific studies to further our knowledge about the species and how best to conserve the silvery minnow. Because of the population decline from 2002-2004, the Service has reduced the amount of take permitted for voucher specimens in the wild.

Incidental take of silvery minnow in the Action Area is authorized through section 7 consultation associated with the 2003 BO, the Tiffany Plug Removal Project and various Federal government projects. In 2005 the Service revised the ITS for the 2003 BO using a formula that incorporates October monitoring data, habitat conditions during the spawn (spring runoff), and augmentation. Annual estimated take due to river drying and flood control operations now fluctuates relative to the total number of RGSM found in October across 20 population monitoring locations.

Factors Affecting Species Environment within the Action Area

On the Middle Rio Grande in the Action Area, 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 designated 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 of water was released from November 1, 1995 to March 31, 1996, at a rate of 325 cfs. 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. Creation of a Conservation Pool for Storage of Native Water in Abiquiu and Jemez Canyon Reservoirs and Release of a Spike Flow: The City 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.

3. Programmatic Biological Opinions 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: In 2001 and 2003, the Service issued jeopardy biological opinions on the effects of water operations and management activities in the Middle Rio Grande on the silvery minnow and flycatcher. In 2002, the Service issued a jeopardy biological opinion for the silvery minnow. The current opinion, issued on March 17, 2003, contains a Reasonable and Prudent Alternative to jeopardy with multiple elements. These elements set forth a flow regime in the Middle Rio Grande and describe habitat improvements necessary to alleviate jeopardy to both the silvery minnow and flycatcher. For example, the elements

require augmentation in the Rio Grande of silvery minnow and 1,600 acres of habitat restoration.

4. Temporary Channel to Elephant Butte: This project began in 1997 and involved 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. At the time the channel was constructed, habitat ranged from a dry channel to a broad expanse of sheet flows. The area was effectively an extension of the reservoir and did not provide suitable habitat for silvery minnow. Surveys conducted prior to the first phase of temporary channel construction did not detect silvery minnow in the headwaters of Elephant Butte (Reclamation 1996). The temporary channel created a riverine environment that supports silvery minnows. Surveys in 2005 detected silvery minnows throughout the temporary channel (Remshardt, Service, *pers. comm.* 2008). At the same time, the headcut and streambed degradation associated with the temporary channel has increased channel incision and prevented the formation of backwaters and slackwaters.

5. Silvery minnow salvage and relocation: During river drying, the Service's silvery minnow salvage crew captures and relocates silvery minnow. Since 1996, approximately 770,000 silvery 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.

6. Middle Rio Grande Conservation District: Improvements to physical and operational components of the irrigation system since 2001 have contributed to a reduction in the total diversion of water from the Rio Grande by the MRGCD. Prior to 2001, average diversions were 630,000 afy and now average 370,000 afy. The change was possible because of the considerable efforts of MRGCD to install new gages, automated gates at diversions, and scheduling and rotation of diversions among water users. The new operations reduce the amount of water diverted; however, this also reduces return flows that previously supported flow in the river. The river below Isleta Diversion Dam may be drier than in the past, but small inflows may contribute to maintaining flows.

7. Pilot Water Leasing Project: The City of Albuquerque and Albuquerque Bernalillo County Water Utility Authority with six conservation groups established a fund in February 2007 that will provide the opportunity to lease water from Rio Grande farmers and have that water remain in the river channel to support the silvery minnow. This program supports the need for reliable sources of water to support conservation programs as identified by the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP, 2004).

8. Tiffany Plug Removal: Reclamation has, on a recurring basis, cut a pilot channel through an instream sediment plug in the Rio Grande upstream of the bridge at San Marcial. The

purpose of this project is to protect the levee from failure by directing water and sediment through the main channel rather than allow it to overbank into the adjacent floodplain. This action reduced the amount of overbank flooded habitat for the minnow.

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 (U.S. Fish and Wildlife Service 1999). Augmentation of silvery minnow 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 minnow. 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 2003). 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 afy returning to the river from the WWTP (U.S. Bureau of Reclamation 2003). The effect of water withdrawals means 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.

Various conservation efforts have been undertaken in the past and others are currently being carried out in the middle Rio Grande. Silvery minnow abundance has increased since lows observed in 2002-2003. However, the threat of extinction for the silvery minnow continues because of increased reliance on captive propagation, the fragmented and isolated nature of currently occupied habitat, and the absence of silvery minnow in other parts of the historic range.

SOUTHWESTERN WILLOW FLYCATCHER

Throughout this document the terms territory and site are used to help describe flycatcher population biology. A territory is the area occupied by a single male or pair of flycatchers throughout the breeding season. Territories are the unit of measurement used by the Service in determining population numbers. Flycatchers tend to cluster their territories. A flycatcher site may include a single territory or a cluster of territories.

Species and Habitat Description

The flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches in height. It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark, and the lower is light yellow grading to black at the tip. The song is a sneezy "fitz-bew" or a "fit-a-bew" and the call is a repeated "whitt"(Howell and Webb 1995).

The flycatcher is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historic breeding range of the flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987). The flycatcher breeds in dense riparian habitat from sea level in California to approximately 8,500 feet in Arizona and southwestern Colorado. Historical egg/nest collections and species descriptions throughout its range describe widespread use of willow (*Salix* spp.) for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987). Currently, flycatchers primarily use Geyer willow (*Salix geyeriana*), coyote willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*), boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolia*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). Saltcedar is an important component of nesting and foraging habitat in Arizona and other parts of the species range. During 2001 in Arizona 323 of the 404 (80 percent) known flycatcher nests (in 346 territories) were in saltcedar (Smith *et al*. 2002). Four habitat types have been described for the flycatcher, monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge *et al.* 1997).

Flycatcher habitat is dynamic and can change rapidly; nesting habitat can mature beyond habitat suitable for nesting, suitable saltcedar habitat can develop in five years, heavy runoff can reduce/remove suitable habitat in a day, or river characteristics may change. Flycatcher use of habitat in different successional stages may also be dynamic. For example, over-mature or young habitat not suitable for nest placement can be occupied and used for foraging and shelter by migrating, breeding, dispersing, or non-territorial individuals (McLeod *et al.* 2005, Cardinal and Paxton 2005). That same habitat may subsequently grow or cycle into habitat used for nest placement. Flycatcher habitat can quickly change and vary in suitability, location, use, and occupancy over time (Finch and Stoleson 2000).

Listing, Critical Habitat, and Primary Constituent Elements

The final rule listing the flycatcher as endangered was published on February 27,1995 (60 FR 10694). At that time, the final designation of critical habitat was deferred, pursuant to 16 U.S.C. 1533(b)(6)(C), citing issues identified in public comments, new information, and the lack of the information necessary to perform an economic analysis. On July 22, 1997, a final critical habitat designation was made for the flycatcher, along 964 river km (599 river mi), in AZ, CA, and NM, was published (62 FR 39129). As a result of a suit from the New Mexico Cattlegrower's Association initiated in March 1998, the 10th Circuit Court of Appeals on May

11, 2001, vacated the designation of critical habitat, citing a faulty economic analysis, and instructed the Service to issue a new critical habitat designation.

A final recovery plan for the flycatcher was signed by the U.S. Fish and Wildlife Service's Region 2 Director on August 30, 2002, and was released to the public that year (Service 2002). The plan describes the reasons for endangerment, current status of the flycatcher, addresses important recovery actions, includes detailed issue papers on management issues, and provides recovery goals. Recovery is based on reaching numerical and habitat related goals for each specific management unit established throughout the subspecies range and establishing long-term conservation plans (Service 2002).

A proposal for the designation of critical habitat was published in the Federal Register on October 12, 2004 (69 FR 60706), with a final rule published October 19, 2005 (70 FR 60886). A total of 737 river miles in southern California, Arizona, New Mexico, southern Nevada, and southern Utah were included in the final designation. The lateral extent of critical habitat includes areas within the 100-year floodplain. The primary constituent elements (PCEs) of critical habitat include riparian plant species in a successional riverine environment (for nesting, foraging, migration, dispersal, and shelter), specific structure of this vegetation, and insect populations for food. A variety of river features such as broad floodplains, water, saturated soil, hydrologic regimes, elevated groundwater, fine sediments, etc. help develop and maintain these PCEs (Service 2005).

The critical habitat designation includes the following sections of the Middle Rio Grande in New Mexico in the project action area. Between the Taos junction bridge in Taos County and the north boundary of San Juan Pueblo in Rio Arriba County, from the south boundary of the Pueblo of Isleta in Valencia County to the north boundary of Sevilleta NWR in Socorro County, from the south boundary of Sevilleta NWR to the north boundary of Bosque del Apache NWR in Socorro County, and from the south boundary of Bosque del Apache NWR to the powerline crossing of the Rio Grande near Milligan Gulch, immediately north of the pool of Elephant Butte Reservoir in Socorro County.

As discussed in the final rule (70 FR 60886), the Pueblos of San Juan, Santa Clara, San Ildenfonso, and Isleta were excluded from the critical habitat designation, as were the City of Albuquerque (Rio Grande State Park), Sevilleta NWR, and Bosque Del Apache NWR.

The Service designated stream "segments" as critical habitat for the southwestern willow flycatcher (Service 2005). The designated segments provide for flycatcher habitat, (nesting, foraging, migration, dispersal, and shelter), and allow for changes in habitat locations or conditions from those that presently exist. The actual riparian habitat in these areas is expected to expand, contract, or change as a result of flooding, drought, inundation, and changes in floodplains and river channels, as discussed in the Final Recovery Plan (USFWS 2002: 18, D-13 to 15), that result from current flow management practices and priorities. Stream segments include breeding sites with high connectivity and other essential flycatcher habitat components needed to conserve the subspecies. Those other essential components of flycatcher habitat (foraging habitat, habitat for non-breeding flycatchers, migratory habitat, regenerating habitat, streams, elevated groundwater tables, moist soils, flying insects, and other alluvial floodplain habitats, etc.) adjacent to or between sites, along with the dynamic process of riparian vegetation succession and river hydrology, provide current and future habitat for the flycatcher which is dependent upon vegetation succession.

All river segments designated as flycatcher habitat are within the geographical area occupied by the species and contain at least one of the PCEs (Service 2005). These PCEs, especially the vegetation components, are acknowledged to be dynamic in their occurrence and may not serve all life history functions (nesting, foraging, migration dispersal, and shelter) at any given time due to unsuitability caused by age of the vegetation, hydrology, soil conditions, etc. (Service 2005). The PCEs are the result of the dynamic river environment that develops, maintains, and regenerates the riparian forest and provides food for breeding, non-breeding, dispersing, territorial, and migrating southwestern willow flycatchers. Anthropogenic factors such as dams, irrigation ditches, or agricultural field return flow can assist in providing conditions that support flycatcher habitat. Because the flycatcher exists in disjunct breeding populations across a wide geographic and elevation range, and is subject to dynamic events, critical habitat river segments are essential for the flycatcher to maintain metapopulation stability, connectivity, gene flow, and protect against catastrophic loss (Service 2005).

<u>The PCEs listed in the final rule for the flycatcher are:</u>
(1) Riparian habitat in a dynamic successional riverine environment that comprises:

(a) Trees and shrubs that include Gooddings willow (*Salix gooddingii*), coyote willow (*S. exigua*), Geyers willow (*S. geyerana*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), yewleaf willow (*S. taxifolia*), pacific willow (*S. lasiandra*), boxelder (*Acer negundo*), saltcedar (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus occidentalis*), cottonwood (*Populus fremontii*), stinging nettle (*Urtica dioica*), alder (*Alnus rhombifolia*, *A. oblongifolia*, *A. tenuifolia*), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus ursinus*), seep willow (*Baccharis salicifolia*, *B. glutinosa*), oak (*Quercus agrifolia*, *Q. chrysolepis*), rose (*Rosa californica*, *R. arizonica*, *R. multiflora*), sycamore (*Platinus wrightii*), false indigo (*Amorpha californica*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis arizonica*), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans hindsii*).

(b) Dense riparian vegetation with thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle- and lower elevation riparian forests;

(c) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub level, or as a low, dense tree canopy;

(d) Sites for nesting that contain a dense tree and/or shrub canopy (the amount of cover provided by tree and shrub branches measured from the ground) (i.e., a tree or shrub canopy with densities ranging from 50 percent to 100 percent);

(e) Dense patches of riparian forests that are interspersed with small openings of open water or marsh, or shorter/sparser vegetation that creates a mosaic that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac); and

(2) A variety of insect prey populations found within or adjacent to riparian floodplains or moist

environments, including: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies/moths and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

It is important to recognize that the PCEs, (PCE 1a and 2), are present throughout the river segments selected, but the specific quality of riparian habitat for nesting (PCE 1b, 1c, 1d, 1e), migration (PCE 1), foraging (PCE 1 and 2), and shelter (PCE 1) will not remain constant in their condition or location over time due to succession (i.e., plant germination and growth) and the dynamic environment in which they exist (Service 2005).

In our effects analysis for critical habitat (i.e., the determination whether an action destroys or adversely modifies critical habitat) the Service evaluates whether the loss, when added to the environmental baseline, is likely to appreciably diminish the capability of the critical habitat to satisfy essential requirements of the flycatcher. In other words, activities that may destroy or adversely modify critical habitat include those that alter the PCEs (defined above) to an extent that the value of the critical habitat for both the survival and recovery of the flycatcher is appreciably reduced (50 CFR 402.02).

Rangewide Distribution and Abundance

There are currently 275 known flycatcher breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 to 2005 where a resident flycatcher has been detected) holding an estimated 1,214 territories (Durst *et al*. 2006). Currently, rangewide population stability is believed to be largely dependent on the presence of four large populations (Cliff/Gila Valley, New Mexico; Roosevelt Lake, Arizona; San Pedro/Gila River confluence, Arizona; Middle Rio Grande, New Mexico) where approximately 50 percent of the 1,214 territories currently exist. Therefore, the result of catastrophic events or losses of significant populations either in size or location could greatly change the status and survival of the species. Conversely, expansion into new habitats or discovery of other populations will improve the known stability and status of the flycatcher.

Since listing in 1995, at least 155 Federal agency actions have undergone (or are currently under) formal section 7 consultation to address effects to the species. Many activities continue to adversely affect the distribution and extent of all stages of flycatcher habitat throughout its range (development, urbanization, grazing, recreation, native and non-native habitat removal, dam operations, river crossings, ground and surface water extraction, etc.). Stochastic events also continue to change the distribution, quality, and extent of flycatcher habitat.

Table 1. Rangewide population status for the southwestern willow flycatcher based on 1993 to 2006 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas, (There is no recent survey data or other records to know the current status and distribution within the state of Texas.), (Durst *et al.* 2006).

State	Number of sites with WIFL territories As of 2006	Percentage of sites with WIFL territories as of 2006	Number of territories as of 2006	Percentage of total territories as of 2006
Arizona	123	43.3 %	482	38.2 %
California	96	33.8 %	190	15.1 %
Colorado	11	3.9 %	58	4.6 %
Nevada	13	4.6 %	82	6.5 %
New Mexico	38	13.4 %	443	35.1 %
Utah	3	1.1 %	7	0.6%
Total	284	100 %	1262	100 %

Total territory numbers recorded are based upon the most recent years survey information from that site between 1993 and 2006.

<u>New Mexico Distribution and Abundance</u>

Unitt (1987) considered New Mexico as the state with the greatest number of flycatchers remaining. After reviewing the historic status of the flycatcher and its riparian habitat in New Mexico, Hubbard (1987) concluded, "[it] is virtually inescapable that a decrease has occurred in the population of breeding flycatchers in New Mexico over historic time. This is based on the fact that wooded sloughs and similar habitats have been widely eliminated along streams in New Mexico, largely as a result of the activities of man in the area." Unitt (1987), Hubbard (1987), and more recent survey efforts have documented very small numbers and/or extirpation in New Mexico on the San Juan River (San Juan County), near Zuni (McKinley County), Blue Water

Creek (Cibola County), and the Rio Grande (Doña Ana County and Socorro County).
In New Mexico, surveys and monitoring in 2007 documented approximately 514 flycatcher territories and 403 nests (Service and Reclamation preliminary data). During the 2003 survey season two new sites were detected in New Mexico, both were in the upper reaches of the Canadian River drainage, one in Colfax County and one in Mora County. Two more new sites were detected during the 2005 survey season, one in Mora County and one near the Mimbres River in Grant County. In 2007 a new site was found on the San Francisco River in Catron County. Flycatchers have been observed at a total of 40 sites in New Mexico along the Rio Grande, Chama, Canadian, Gila, San Francisco, San Juan, and Zuni drainages.

ENVIRONMENTAL BASELINE

SOUTHWESTERN WILLOW FLYCATCHER

Status of the Species Within the Action Area

Habitat Characteristics
Development of a flycatcher habitat suitability model was initiated in 1998 for the Middle Rio Grande Basin and continues to be refined based on changes in hydrology and updated vegetation maps. Riparian vegetation in the Middle Rio Grande Basin between San Acacia Diversion Dam and Elephant Butte Reservoir had been classified using the Hink and Ohmart (1984) classification system through a cooperative effort with the U.S. Forest Service. This system identifies vegetation polygons based on dominant species and structure. Plant community types are classified according to the dominant and/or codominant species in the canopy and shrub layers. During the summer and fall of 2002, as part of the ESA Collaborative Program, Reclamation personnel updated vegetation maps from Belen to San Marcial using a combination of ground truthing and aerial photo analysis. During the summer of 2004, the conservation pool of Elephant Butte Reservoir was again aerially photographed (true color) and vegetation heights were remotely-sensed using Light Detection and Ranging (LIDAR) methods. The area was ground truthed again during the summer of 2005. These data are currently being processed and will be used to update the current flycatcher habitat model.

Riparian habitat within all these reaches includes dense stands of willows and cottonwoods adjacent to or near the river channel. The Cochiti and Angostura Reaches in the Middle Rio Grande support local areas of suitable flycatcher habitat; however, no birds have been documented establishing territories. The Isleta and San Acacia Reaches also contain dense stands of saltcedar. Flycatchers (and many other species of neotropical migrant landbirds) use the Rio Grande riparian corridor as stop-over habitat during migration. Studies have shown that during the spring and fall migration, flycatchers are more commonly found in willow habitats than in other riparian vegetation types, including the narrow band of coyote willows that line the low flow conveyance channel (LFCC) (Finch and Yong 1997). Recent presence/absence surveys during May have detected migrating flycatchers throughout the project area in vegetation types that are classified as “low suitability” for breeding habitat (Ahlers and White 1997).

Habitat Availability in the Action Area

Vegetation within the reach was mapped using the Hink and Ohmart classification system through a cooperative effort with the U.S. Forest Service. Breeding habitat suitability was refined by identifying all areas that are within 100 meters of existing watercourses, ponded water, or in the zone of peak inundation. The 5 categories of flycatcher habitat that lie within 100 meters of water are defined as:

Highly Suitable Native Riparian - Stands dominated by willow and/or cottonwood.

Suitable Mixed Native/Non-native Riparian - Includes stands of natives mixed with non-natives.

Marginally Suitable Non-native Riparian - Stands composed of monotypic saltcedar or stands of saltcedar mixed with Russian olive.

Potential with Future Riparian Vegetation Growth and Development - Includes stands of very young sparse riparian plants on river bars that could develop into stands of adequate structure with growth and/or additional recruitment. Reclamation believes this category requires regular monitoring to ascertain which areas contain all the parameters to become flycatcher habitat.

Low Suitability - Includes areas where native and/or non-native vegetation lacks the structure and density to support breeding flycatchers, or exceeds the hydrologic parameter of greater than 100 meters from water. The presence of low suitability habitats may be important for migration and dispersal in areas where riparian habitats have been lost (i.e. agricultural and urban areas).

Currently, the Service groups the first three categories listed above as equally suitable habitat for the flycatcher, because a large number of sites are currently occupied in all three categories. At this time, it is not accurate to define those suitable habitats with non-native vegetation as being less suitable than native habitat for flycatchers.

The Rio Grande in the San Acacia Reach supports a high value riparian ecosystem. The native riparian trees and shrubs are interspersed with stands of nonnative riparian plants, primarily saltcedar and Russian olive. There is native desert habitat on both sides of the floodplain. This area is unique on the Rio Grande because of the lack of agricultural and urban development on the outside edges of the floodplain. This area represents a relatively unfragmented landscape with associated high biological values.

<u>Flycatcher Populations in the Action Area</u>

Within the Rio Grande, flycatchers were reported at Elephant Butte State Park in the 1970s; the majority nesting in saltcedar although the exact location of the sightings was not reported (Hundertmark 1978, Hubbard 1987). In recent years, breeding pairs have been found within the Middle Rio Grande from Elephant Butte Reservoir upstream to the vicinity of Taos, on both the mainstem Rio Grande and on the Rio Grande de Rancho, a tributary to the upper Rio Grande.

From 1999 to 2007 a total of 997 flycatcher nests have been monitored along the Middle Rio Grande from Highway 60 south to Elephant Butte Reservoir. In 2007 there were 232 nests in the middle Rio Grande with the majority of those nests located near San Marcial. Ninety- seven of those nests were in saltcedar and 129 in *Salix* substrate. One hundred eighty of the nests were found in plant communities dominated by native vegetation and only five were found in plant communities dominated by exotic species. Saltcedar and *Salix* dominated territories are defined as greater than 90 percent saltcedar or *Salix*, respectively. Mixed-dominance occurs when a dominant vegetation type is not obvious. In considering nest success for these situations, flycatcher nests in *Salix*-dominated (59.4%) areas were no more successful than those placed in saltcedar-dominated (60%) or mixed-dominance areas (43.5%).

Addling or removal of brown-headed cowbird (BHCO) eggs from parasitized flycatcher nests is a practice that was begun in 2002 and continued through 2005. Of the 79 flycatcher nests parasitized during that period with known outcomes, BHCO eggs were addled or removed from 38 nests, 7 of which successfully fledged flycatcher young (18.4 percent success). Parasitized nests over the past six seasons in the Middle Rio Grande that were unaltered were as successful. Of 41 parasitized nests monitored, 32 failed, 8 successfully fledged young, and 1 BHCO egg was built-over by the adult flycatchers and subsequently fledged young (a 22 percent success rate).

<u>San Marcial</u>
In 1994, 11 flycatcher territories were detected in the San Marcial area, all above the San Marcial Railroad Bridge (Mehlhop and Tonne 1994). Survey results show that this area continues to support an increasing amount of habitat and associated number of territories over the years and is the most productive flycatcher population along the Rio Grande.

Reclamation's surveys in the San Marcial Reach, from the railroad bridge to below the narrows, the territories have been detected in the following numbers; 2000 = 23, 2001 = 25, 2002 = 63, 2003 = 86, 2004 = 113, 2005 = 107, 2006 = 179. In 2003, there were 86 territories at this site and nest monitoring was conducted where nesting pairs were detected. Nests were monitored for success rates, productivity, and brown-headed cowbird parasitism. Of the 98 nests at this site at least 127 flycatcher fledglings were produced. In 2004, there were 113 territories at this site and nest monitoring was conducted where nesting pairs were detected. Nests were monitored for success rates, productivity, and brown-headed cowbird parasitism. Of the 153 nests at this site at least 187 flycatcher fledglings were produced. In 2007, there were 197 nests at this site where nests were monitored for success rates, productivity, and brown-headed cowbird parasitism.

Factors Affecting Species and Critical Habitat within the Action Area
In the Middle Rio Grande past and present Federal, State, and private activities that may affect the flycatcher include irrigated agriculture, river maintenance, flood control, dam operation, water diversions, and downstream Rio Grande Compact deliveries. The Rio Grande and associated riparian areas are a dynamic system in constant change. Without this change, the riparian community will decrease in diversity and productivity. Sediment deposition, scouring flows, inundation, base flows, and channel and river realignment are processes that help to maintain and restore the riparian community diversity. Habitat elements for the flycatcher are provided by thickets of riparian shrubs and small trees and adjacent surface water, or areas where such suitable vegetation may become established.

The Rio Grande historically had highly variable annual and seasonal discharge patterns (Platania

1993). Since 1973, flows in the Middle Rio Grande have been determined mainly by regulation of dam facilities and irrigation diversions. The highest flows generally result from snow-melt (April-May), irrigation water releases from the upstream reservoirs, and variable thunderstorms. Lowest flows generally occur from July to October, when most of the available river flow is diverted for irrigation. Summer monsoons can elevate river flows during this time period depending on their frequency and intensity. Water and sediment management have resulted in a large reduction of suitable habitat for the flycatcher, as a result of the reduction of peak flows that helped to create and maintain habitat for this species.

Overbank flooding is needed to create shallow, low velocity backwaters, and to maintain and restore native riparian vegetation for flycatcher habitat. Overbank flooding is also currently restricted by the safe channel capacity at the San Marcial Railroad Bridge. There are three houses in the floodplain at Socorro, and a new residential development in the floodplain 0.25 mile (0.15 km) downstream of Bernalillo. These urban developments are not protected by levees.

Levees have greatly restricted the floodplain width and have functionally disconnected the river from most of the floodplain. A comparison of river habitat changes between 1935 and 1989 shows a 49 percent reduction of river channel habitat from 22,023 acres (8,916 ha) to 10,736 acres (4,347 ha) (Crawford *et al.* 1993). Between Cochiti Dam and Elephant Butte Reservoir headwaters, there are 235 miles (378 km) of levees (includes distances on both sides of the river).

The Middle Rio Grande channel width has narrowed over the last century. The trend can be attributed to reduced peak flows, channelization, and reduced sediment below Cochiti Dam. Channelization is primarily responsible for the elimination of thousands of acres of the shallow, low velocity habitats required by the flycatcher. Flow regulation below Abiquiu Reservoir and Cochiti Dam has further decreased channel capacity and reduced peak flows. A channel-forming discharge has never been released from Cochiti Dam. The lack of large peak flows combined with the effects of channelization contributes significantly to channel narrowing and the elimination of overbank flooding. These factors severely limit the development of backwater habitats essential to the survival of the flycatcher.

<u>Temporary Channel Construction</u>
Since 1996 Reclamation constructed and has maintained a temporary channel through the delta area of the Reservoir to increase the efficiency of sediment and water conveyance. Suitable habitat for flycatchers did not exist (Reclamation 1996). If the temporary channel had not been constructed, and the lake continued to recede, suitable flycatcher habitat may have established in the delta area where the river transitioned to sheet flow. Similarly, if the temporary channel had not been constructed above the narrows, suitable flycatcher habitat may have become established and supported a greater number of flycatchers than is currently observed. However, a substantial amount of flycatcher habitat has developed in the time since the temporary channel was constructed. The flycatcher population in the San Marcial Reach has grown from 11 to 197 pairs since 1996. A majority of these flycatchers is supported by water from the LFCC, which after outfalling at RM 60 flows along the west side of the Reservoir. It is difficult to determine the

extent to which habitat formation was precluded by the presence of the temporary channel. By minimizing sheet flow and confining the river to a defined channel, the temporary channel likely limited the amount of suitable flycatcher habitat in this reach.

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. Historically, this has been an aggrading reach of river in most years, meaning that the river bed elevation increased due to sediment accumulation. In the past few years, this trend has reversed with a large amount of degradation observed just upstream of the Temporary Channel. This degradation was initiated by a headcut that formed in the vicinity of rangeline EB-28 (River Mile 58) in 2003. This headcut grew and moved rapidly upstream during the high flows of the 2005 spring runoff. The primary driver for formation of the headcut was lowering of the reservoir, brought on by the drought. It is also probable that construction of the Temporary Channel encouraged formation of the headcut and allowed it to travel upstream more quickly than would have been the case without a constructed channel. It is impossible to accurately determine the amount of degradation that is directly attributable to temporary channel construction and maintenance.

Flycatchers in the vicinity of RM 58 (survey sites DL-03 and DL-04) have been diminishing in number over the past few years. In 2004, 16 pairs were located in these two survey sites adjacent to the Rio Grande/Temporary Channel, 11 pairs in 2006, but these numbers dropped to only three pairs in 2007. The exact reasons for this are not known, but it is suspected that a lowering of the water table and subsequent stress to some of the willows in the area may have contributed to the loss of pairs from this area. In the RM 60 area, the thalweg of the river channel dropped almost nine feet after the 2005 spring runoff event. Though not specifically investigated, this lowering of the thalweg of the river likely resulted in a lowering of the groundwater table in the riparian zone immediately adjacent to the river. Goodding's willow in the area exhibit signs of water stress, including mortality.

While this breeding cluster of flycatchers has all but disappeared, the overall number of flycatchers in Elephant Butte has been growing substantially with the number of flycatcher territories in the San Marcial reach at 197 in 2007 (compared to 82 in 2003 and 113 in 2004). Many of the newly-established flycatcher territories in Elephant Butte are just a short distance (less than 1 km) to the west of sites DL-03 and DL-04, along the waters flowing along the west side of the Reservoir. The population of nesting flycatchers in this area is the largest in the state of New Mexico and probably the largest rangewide. Further upstream, where critical habitat for the species has been designated, there currently (as of 2007) was one territorial flycatcher below the railroad bridge at San Marcial and upstream of this point were three nesting pairs and a single unpaired, territorial male.

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 flycatcher and its critical habitat:

1. <u>Tiffany Plug Removal</u>: Reclamation has, on a recurring basis, cut a pilot channel through

an instream sediment plug in the Rio Grande upstream of the bridge at San Marcial. The purpose of this project is to protect the levee from failure by directing water and sediment through the main channel rather than allow it to overbank into the adjacent floodplain. This action reduced the amount of overbank flooded habitat for the flycatcher.

2. <u>Creation of a Conservation Pool for Storage of Native Water in Abiquiu and Jemez Canyon Reservoirs and Release of a Spike Flow</u>: 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.

3. <u>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</u>: The Service completed this biological opinion on 17 March 2003, determining the effects of water management by the applicants on the silvery minnow and flycatcher. This biological opinion had one Reasonable and Prudent Alternative (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.

Importance of the Action Area to the Survival and Recovery of the Species
The flycatcher recovery plan identifies five Recovery Units, the Basin and Mojave, Lower Colorado River, Upper Colorado River, Gila River, and Rio Grande. Flycatcher populations are not distributed evenly throughout these Recovery Units, with the majority of individuals found in the Coastal California, Lower Colorado, Gila, and Rio Grande Recovery Units (Service 2002).

The Rio Grande Recovery Unit contains the eastern most population of flycatchers, and currently has approximately 21 percent of known territories (Durst *et al*. 2006). The Rio Grande Recovery Unit covers a major portion of the flycatcher's previous range. In order to be well protected against disease and catastrophe, the species should be well distributed geographically. The survival and recovery of the flycatcher is dependent on healthy, self sustaining populations of birds, which are able to exchange genetic information on occasion, and act as a source population should one area suffer significant losses (Soule 1986). The loss or reduction of a major population within a Recovery Unit could have potentially significant effects to the surrounding Recovery Units if genetic information is lost or if a source population which has been supporting other sites is significantly reduced.

Summary
In the Middle Rio Grande, riparian habitat restoration efforts for the benefit of the flycatcher,

pursuant to the Reasonable and Prudent Alternative S from the 2003 BO, have resulted in a minimum of 450 restored acres through 2007. As Elephant Butte Reservoir receded, areas that were previously inundated have since become suitable for vegetation growth and now provide substantial flycatcher habitat. Water from the LFCC that flows to the west side of the Reservoir also provides standing water where willows have grown and suitable flycatcher habitat is abundant. The flycatcher population in the San Marcial Reach is currently the largest in the state and probably the largest rangewide.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or designated 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.

RIO GRANDE SILVERY MINNOW

Direct Effects

The proposed action is likely to have direct short-term adverse effects on silvery minnow. Channel excavation, and the movement of excavators and airboats throughout the channel will displace water and/or soil causing silvery minnow in the area to flee. Fleeing from the disturbance represents an expenditure of energy that the fish will not have without the project. This expenditure could depress survivorship and future reproductive ability. Harassment during winter, when fish concentrate in deep pools and are slow to move, may be particularly adverse. Channel maintenance activity during the spawning season may result in mortality of eggs and larvae, which cannot escape.

Equipment working in the wetted channel may also affect water quality. During channel excavation and berm construction, localized increases in turbidity and suspended sediments will likely occur. Direct effects from excess suspended sediments to a variety of fish include: alarm reaction, abandonment of cover, avoidance response, reduction in feeding rates, increase in coughing rate, increased respiration, physiological stress, poor condition, reduced growth, delayed hatching, and mortality (Newcombe and Jensen 1996).

The effects of sediment mobilization due to the use of heavy equipment in the channel, and placement of material into the wetted channel include the potential smothering and mortality of algae and aquatic invertebrates, depressed rates of growth, reproduction, and recruitment or reduced physiological function of invertebrates. Decreases in primary production are associated with increases in sedimentation and turbidity and produce negative cascading effects through depleted food availability to zooplankton, insects, mollusks, and fish.

Pumping of water from the river may also adversely affect silvery minnow eggs, larvae and young-of-year. Screens will exclude adult fish, but smaller and non-mobile individuals will be harmed.

If the temporary channel were not maintained, silvery minnow habitat in the headwaters of Elephant Butte reservoir would likely be lost. Silvery minnows are confined to suitable habitat (shorelines, backwaters, pools) within the temporary channel and do not extend past the inflow to Elephant Butte. Upstream of the narrows, if lake levels remain low, habitat for minnows would likely be improved by cessation of maintenance activities. The temporary channel, and associated streambed degradation, maintains a steep bankline which confines the channel, increases water velocities, and prevents the formation of backwaters, embayments and other slow velocity habitat that are necessary for silvery minnow reproductive success.

Effects to Designated Critical Habitat

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of designated critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to designated critical habitat for the silvery minnow.

Some of the primary constituent elements of silvery minnow critical habitat will be adversely affected by the proposed action. Specifically, the proposed action maintains a steep bankline which confines the channel, increases water velocities, and prevents the formation of backwaters, embayments and other slow velocity habitat. This habitat is necessary for development and hatching of eggs and the survival of the species from larvae to adult. Low-velocity habitat provides food, shelter, and sites for reproduction, which are essential for the survival and reproduction of Rio Grande silvery minnow.

SOUTHWESTERN WILLOW FLYCATCHER

Direct Effects

River bed degradation has occurred due to a head-cut in the temporary channel. Lowering the riverbed can lower the water table adjacent to the channel and adversely affect suitable and occupied flycatcher habitat. Observations by Reclamation in areas where channel degradation occurred conclude that it appears to result in adverse impacts to vegetation, such as Goodding's willow (*Salix gooddingii*), which is dependent on a shallow groundwater table for survival.

Channel maintenance and excavation work is expected to create additional riverbed degradation that may continue to the northern boundary of the Bosque del Apache NWR. Reclamation will monitor the channel and the river upstream of RM 61, in areas of designated critical habitat and other areas on Bosque del Apache NWR to assess if additional riverbed degradation occurs upstream of the proposed activity. Although not anticipated, new channel excavation could have this same result, though the areas where a new channel might be constructed do not currently contain suitable habitat for flycatchers.

If the temporary channel were not maintained, areas above the lake and below the narrows could be expected to fill with sediment, forming backwaters and slackwaters that could develop into flycatcher habitat over time. The maintained channel prevents the formation of backwaters and shallow marshes that provide foraging habitat, and potential nesting areas when vegetation becomes established. During the five year consultation, it is not expected that vegetation would grow into suitable flycatcher habitat and become colonized.

In the area between currently occupied areas (RM 56) to the narrows, potentially suitable flycatcher habitat exists. Migrants have been observed in these areas in the past several years. It is not known whether these areas are unoccupied because of temporary channel effects on habitat. If the channel were not maintained, in the next five years, and sediment deposition allowed backwaters and shallow water habitats to be formed, this habitat might be improved sufficiently to support new flycatcher territories.

Flycatchers have high site fidelity and will return to areas where vegetation may be stressed or dead. This will cause the birds to use energy to find new habitat and could impact breeding success. Flycatcher habitat is ephemeral. Areas which are currently occupied may not be suitable in future years as the trees mature and the habitat begins to thin. Having areas of riparian vegetation along the Rio Grande that are maturing into suitable habitat while other areas are reaching a maturity level that makes them unsuitable for flycatchers is crucial to the long-term survival of the species.

The largest nesting population of flycatchers is located in an area along the west side of the Reservoir that is wetted by the water from the LFCC which will not be affected by the temporary channel maintenance. BOR analyses suggest that channel degradation will not adversely affect vegetation in the areas along the west side of the Reservoir. Water levels in this area will be monitored and coordination with the Service will occur if pumping from the LFCC to the river is impacting the wetted area.

Direct effects to flycatchers may occur as a result of airboat noise. Daily movements of airboats could produce brief periods of noise disturbance audible to flycatchers should any birds establish and occupy territories in habitat adjacent to the temporary channel. As of the 2007 breeding season, the closest that flycatchers had located near the channel were an apparent non-breeding pair near RM 47. This pair was found approximately 160 feet west of the temporary channel berm. Noise may interrupt flycatcher behavior (feeding, sheltering and breeding). Reclamation has committed to avoid suitable/occupied flycatcher habitat by utilizing the annual survey results. These effects are therefore expected to be minimized to an insignificant and discountable level.

Effect to Designated Critical Habitat

Channel degradation, as described in the BA, may reduce the quantity and quality of suitable flycatcher habitat up to the north boundary of the Bosque del apache NWR. Furthermore, the overall functionality (foraging, breeding, and sheltering) of the entire patch to flycatchers may be reduced. The degradation and loss may also result in the reduction of the extent and density of the habitat, which will open up the habitat to predators and reduce its functionality for both nesting and sheltering. Opening up the habitat will make any nests constructed in this area more vulnerable to nest parasitism by brown-headed cowbirds (*Molothrus ater*), which is a known risk factor to flycatcher reproduction.

It is difficult to predict whether future conditions resulting from maintenance of the temporary channel will alter designated flycatcher critical habitat in this reach because additional channel degradation and corresponding impacts to vegetation via groundwater level reductions are largely tied to long-term climate patterns. If drought continues and Elephant Butte Reservoir continues to drop, the lowering of the lake could contribute to additional channel incision upstream into areas with critical habitat. Given this scenario, there could be habitat lost in areas where trees can no longer reach the water table. However, should additional water return to the Rio Grande system and result in a rise in Elephant Butte lake levels, channel incision could be reversed and river bed aggradation could result. This change in riverbed elevation could occur in the reach of the Rio Grande below the north boundary of Bosque del Apache NWR. Upstream, it is thought that the riverbed has greater stability and may be less influenced by lake levels.

Primary Constituent Elements

To the extent that degradation occurs, there will be some effects on Primary Constituent Elements.

PCE 1 (a-e): The action area where critical habitat has been delineated contains several of the plant species identified above, notably Gooddings and coyote willows, Russian olive, saltcedar, seepwillow, Siberian elm, and cottonwood. These plant species often occur within the project area with sufficient density, structure, and patch size to support flycatchers. A significant degradation of the river channel would likely not adversely affect those species which are more drought tolerant (i.e. saltcedar, Russian olive), and could have a more significant adverse effect on those that are not (i.e. Goodding's willow and coyote willow). However, it is impossible to determine whether the degradation would be gradual or occur in a single hydrologic event. The more gradual the potential degradation, the less adverse impacts to native vegetation would be expected. Also, the magnitude, or degree of degradation, would obviously be a determining factor in the severity of potential impacts. Due to the relatively low potential degradation during the 2007-2012 period (i.e. 0-3 ft), compared to 2004-2007 period (0-13 ft), it is assumed that the greatest zone of influence to riparian vegetation would be in relatively close proximity to the Rio Grande. The vast majority of flycatcher territories are found within 100m of surface water within this reach. In areas where an aggrading channel is predicted, overbank flooding is more likely to occur and is considered beneficial to flycatcher habitat under most conditions.

PCE 2: The insect fauna that exists within the action area contains members of the insect orders described above as the second primary constituent element of flycatcher critical habitat. The above actions may have an effect on these insect populations by reducing the chance of overbank flooding, and producing ground-disturbances through river maintenance. River maintenance activities are often temporary in nature and the degree to which they will adversely impact the riparian insect fauna can be minimal. The channel degradation could reduce the habitat for the insect prey base, but the effects are expected to be insignificant and discountable.

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 draft 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 Act. 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 will overbank and create low velocity habitats that silvery minnow prefer and that create habitat for flycatchers.

- 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 and flycatcher.

- 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.

- Wildfires and wildfire suppression in the riparian areas along the Rio Grande may have an adverse affect on silvery minnow. Wildfires are a fairly common occurrence in the bosque (riparian area) along the Rio Grande. Although fire retardant, which is toxic to aquatic species, is generally not used in close proximity to the Rio Grande, other fire suppression techniques, such as scooping water from the Rio Grande in large buckets, may harm silvery minnow. Silvery minnow could potentially be scooped up along with the water and dropped onto burning areas. In recent time, fire size and frequency has increased within Middle Rio Grande. The increase has been attributed to increasingly dry, fine fuels and ignition sources. The spread of the highly flammable plant, saltcedar, and drying of river areas due to river flow regulation, water diversion, lowering of groundwater tables, and other land practices is largely responsible for these fuels. Wildfires have the potential to destroy flycatcher habitat.

- The removal of non-native vegetation, such as salt cedar and Russian olive can adversely affect the amount of available flycatcher habitat in the short term. In areas where non-native trees are removed and replaced with native vegetation as part of a restoration project, habitat may be created. Where phreatophyte removal is not followed by restoration, habitat for the flycatcher is lost.

- The effect global warming may have on the silvery minnow and flycatcher is still unpredictable. However, mean annual temperature in Arizona increased by 1 degree per decade beginning in 1970 and 0.6 degrees per decade in New Mexico (Lenart 2005). In both New Mexico and Arizona the warming is greatest in the spring (Lenart 2005). Higher temperatures lead to higher evaporation rates which may reduce the amount of runoff, groundwater recharge, and lateral extent of rivers such as the Rio Grande. Increased temperatures may also increase the extent of area influenced by drought (Lenart 2003).

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

CONCLUSION

After reviewing the current status of the silvery minnow and flycatcher and their designated critical habitat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects; it is the Service's biological opinion that the Elephant Butte Reservoir Temporary Channel Maintenance Project, as proposed in the September 2007, BA is not likely to jeopardize the continued existence of the silvery minnow or flycatcher or result in adverse modification of designated critical habitat. The temporary channel, represents a small subset of the occupied range, and provides marginal habitat. Sampling data indicate a substantial improvement in numbers of silvery minnow and flycatchers since 2000. The level of take associated with this project is unlikely to appreciably diminish the silvery minnow population in the San Acacia Reach. The flycatcher population near the LFCC is at the highest level recorded and may currently be the largest population in the species' range. We find that the effects to the function and conservation role of critical habitat relative to the entire designation are not significant because the impacts occur in a small area relative to the overall critical habitat designation for silvery minnow. While critical habitat for the flycatcher may be adversely affected, the Service realizes that flycatcher habitat is ephemeral and areas that are not currently suitable habitat may become habitat in the future. Therefore, we conclude that the primary constituent elements of flycatcher critical habitat will serve the intended conservation role for the species with implementation of the proposed action.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act 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 Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Rio Grande Silvery Minnow

The Service has developed the following incidental take statement based on the premise that the Temporary Channel Project will be implemented as proposed. Take is expected in the form of harm and harass as excavators push and scoop sediment from the channel, as excavators move along the wetted channel, and as airboats transverse the channel for refueling or inspection. Adult fish are expected to escape channel activity, but direct mortality of eggs and larvae will occur when channel maintenance or construction activities occur during the spawning season.

The population of silvery minnow and the length of channel maintenance/construction will vary annually. Therefore estimated incidental take will change for each year of the five-year for which this BO is issued. Take should be estimated using the following formula:

Adult Harassment = Disturbance * RGSM/100 m^2 in winter surveys

We assume approximately half of the temporary channel provides suitable habitat for silvery minnows, therefore, we estimate "disturbance" as the area (in 100 m^2) that will be subject to channel excavation and disturbance from the movement of excavators each year divided by 50 percent. We further assume that new construction will not result in the take of silvery minnows as construction will move through sediment. However, any new channel miles, once constructed should be added to the total area disturbed annually.

"RGSM/100 m^2 in winter surveys" is defined as the number of silvery minnows observed using protocols established by Remshardt (2008).

The amount of harassment due to airboat activity cannot be estimated. We expect most airboat activity to occur in the deeper portions of the channel where silvery minnows are scarce. When airboats access the river using side channels and backwaters, silvery minnows will be harassed. We expect this disturbance to be substantial yet short in duration.

The number of egg and larval silvery minnows that may be taken due to channel maintenance cannot be determined. Channel maintenance activities are expected to occur once in five years for a two week period during spawning. Similarly, the number of eggs or larvae that may be affected by pumping from the channel cannot be determined. We assume any eggs or larvae that are scooped, pumped or crushed will die.

2008 Take

The Service anticipates up to 324,153 silvery minnows may be harassed during channel maintenance and construction in 2008. We base this figure on the following assumptions: disturbance (as defined above) will be approximately 534 acres in 2008 (Disturbance = (113 acres + 955 acres) ÷ 2; see Appendix A). "RGSM/100 m^2 in winter surveys" has been most recently (Remshardt, Service, *pers. comm.* 2008) reported as 15/100 m^2. Therefore, approximately 324,153 silvery minnow will be harassed by construction within the wetted channel in 2008.

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.

Southwestern Willow Flycatcher

The Service has developed the following incidental take statement based on the premise that the Temporary Channel Project will be implemented as proposed. Take is expected in the form of harassment in the areas where channel degradation has and will continue to occur. It is assumed that the current degradation near the railroad bridge area will continue to stress willows that depend on shallow groundwater. It is also projected that the channel degradation may continue to the north boundary of the Bosque del Apache NWR. Take is expected for all territories north of RM 61, to the northern border of the refuge; excluding birds that occupy the area along the west side of the Reservoir. In 2007, there were 12 pairs of flycatchers and three unpaired territorial birds that could be taken in the form of lost territories, due to habitat decline, as a result of channel degradation.

EFFECT OF THE TAKE

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the silvery minnow or flycatcher, because the number that may be taken is small compared to the number currently present within the occupied range. The conservation measures included in Reclamation's 2007 BA, including the maintenance of habitat features within the channel will be implemented to minimize or avoid effects to the silvery minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Minimize take of silvery minnow due to channel maintenance activities.
2. Manage for the protection of water quality from activities associated with the project.
3. Minimize take of flycatchers in the form of harassment during breeding and nesting season.
4. Minimize take of flycatchers in the form of loss of habitat due to channel degradation.
5. Restore and establish flycatcher habitat outside of the occupied area along the west side of the Reservoir.

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 Temporary Channel Project described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

To implement RPM 1, Reclamation shall:

1.1 Whenever possible, operate airboats through the center of the channel to minimize disturbance to silvery minnows.

1.2 From May 1 through July 1, avoid pumping directly from the channel to minimize the number of eggs and larvae that may be entrained. Use sumps adjacent to the channel whenever feasible.

1.3 In coordination with the Service, fund a program to monitor presence/absence of silvery minnows in the temporary channel. This program may consist of the addition of monitoring sites to the ongoing silvery minnow population monitoring program or a continuation of temporary channel studies conducted by the Service.

1.4 Support Collaborative Program efforts to prioritize and implement habitat restoration projects in the San Acacia Reach pursuant to the Long-Term Plan (MRGESCP, 2006). The Middle Rio Grande Endangered Species Collaborative Program (MRGESCP) is projected to spend $6 million on habitat restoration in the San Acacia Reach over the life of this consultation (2008-2012; MRGESCP Long Term Plan, 2006). Implementation of these projects will improve habitat conditions for the silvery minnow in the Action Area.

To implement RPM 2, Reclamation shall:

2.1 Excavate an area as few times as possible to minimize disturbance of sediments. When excavating within the wetted channel, use the following practices to minimize disturbance of sediments; minimize movement of excavator tracks and minimize excavator bucket contact with river bed.

2.2 Monitor water quality (once or twice weekly during maintenance/construction work), including turbidity and dissolved oxygen before, during, and after equipment operates in the river channel.

2.3 Use information collected from Term and Condition 2.2 to coordinate with the Service and to develop new or modify existing BMPs to minimize the adverse effects of this project and future projects.

To implement RPM 3, Reclamation shall:

3.1 Use current flycatcher monitoring data and avoid work within 0.25 miles of an active nest.

To implement RPM 4, Reclamation shall:

4.1 Monitor vegetation health and incorporate vegetation mapping.
4.2 Monitor ground water levels from the north boundary of the BDA refuge, along the temporary channel, and the west side of the Reservoir, as needed.
4.3 Monitor the riverbed and movement of the headcut.

To implement RPM 5, Reclamation shall:

5.1 Work with the Service to plan and implement a specific restoration project that will establish flycatcher habitat on the Rio Grande, outside of the San Marcial Reach. Planning shall be completed within one calendar year of this BO. Project implementation must be completed by July 2013.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following conservation activities:

1. Encourage adaptive management of flows and conservation of water to benefit listed species.

2. Work to secure long-term water sources to support habitat restoration activities in the Middle Rio Grande.

3. Work to further conduct habitat/ecosystem restoration projects in the Middle Rio Grande to benefit the silvery minnow and flycatcher in the San Acacia Reach.

4. Monitor, maintain, and expand habitat restoration areas.

RE-INITIATION NOTICE

This concludes formal consultation on the action(s) described in the September 2007 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 designated

In future correspondence on this project, please refer to consultation number 22420-2008-F-0017. 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.

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LITERATURE CITED

Ahlers, D. and R. Doster. Southwestern Willow Flycatcher Surveys and Nest Monitoring. Presentation and abstract given at the Middle Rio Grande Endangered Species Act Collaborative Program Second Annual Spring Symposium, April 16-17, 2007.

Bartolino, J.R. and J.C. Cole, 2002. Ground-Water Resources of the Middle Rio Grande Basin, New Mexico. U.S. Geological Survey Circular 1222. 132 pp.

Bestgen, K. and S.P. Platania. 1991. Status and Conservation of the Rio Grande Silvery Minnow, *Hybognathus amarus*. Southwestern Naturalist 26(2):225–232.

Bestgen, K. and D.R. Propst. 1994. Redescription, Geographic Variation, and Taxonomic Status of the Rio Grande Silvery Minnow, *Hybognathus amarus* (Girard, 1856). Contribution 69. Larval Fish Laboratory, Colorado State University.

Biella, J., and R. Chapman (eds.). 1977. Archeological Investigations in Cochiti Reservoir, New Mexico. Vol. 1: A Survey of Regional Variability. Report submitted to the National Park Service, Santa Fe, for the U.S. Army Corps of Engineers, Albuquerque, New Mexico.

Browning, M.R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). *Western Birds* 24:241-257.

Buhl, K. J. 2002. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (*Hybognathus amarus*) and Fathead Minnow (*Pimephales promelas*) in a Water Quality Simulating that in the Rio Range, New Mexico. Final Report to the U.S. Fish and Wildlife Service, Study No. 2F33 9620003. U.S. Geological Survey, Columbia Environmental Research Center, Yankton Field Research Station, Yankton SD.

Bullard, T.F., and S.G. Wells . 1992. Hydrology of the Middle Rio Grande from Velarde to Elephant Butte Reservoir, New Mexico. U.S. Department of the Interior, U.S. Fish and Wildlife Service Research Publication 179.

Caldwell, C. 2002. Hybridization Potential and Spawning Behavior of Rio Grande silvery Minnow (*Hybognathus amarus*) and Plains Minnow (*Hybognathus placitus*). Interim report submitted to U.S. Fish and Wildlife Service Ecological Services Field Office, September 2002. 18 pp.

CH2MHill.2003. Hydrologic Effects of the Proposed City of Albuquerque Drinking Water Project on the Rio Grande and Rio Chama Systems: Updated for New Conservation and Curtailment Conditions. Technical Report. Prepared for City of Albuquerque Public Works Department Water Resources Strategy Implementation.

CH2MHill.2005. Evaluation of Hydrologic Effects on Native Rio Grande Flows by Operation of the Buckman Water Diversion Project: Response to USFWS Issues Raised Relative to Possible Impacts on Rio Grande Silvery Minnow. 4th Draft, Technical Report. Prepared for Sandy Hurlocker (USFS) and Proponents of Buckman Direct Diversion Project.

Cook, J.A., K.R. Bestgen, D.L. Propst, and T.L. Yates. 1992. Allozymic Divergence and Systematics of the Rio Grande Silvery Minnow, *Hybognathus amarus* (Teleostei: Cyprinidae). Copeia 1992(1): 36–44.

Crawford, C., A. Cully, R. Leutheuser, M. Sifuentes, L. White, and J. Wilber. 1993. Middle Rio Grande Ecosystem; Bosque Biological Management Plan. Middle Rio Grande

Dudley, R.K., S.P. Platania, and S. J. Gottlieb. 2004. Rio Grande Silvery Minnow Population Monitoring Program Results from 2003. Report to Middle Rio Grande Endangered Species Collaborative Program. 176pp

Dudley, R.K., and S.P. Platania. 1996. Rio Grande Silvery Minnow Winter Population Habitat Use Monitoring Project, April 1996. Summary of four trips (December 1995–March 1996). Report to the U.S. Army Corps of Engineers, Albuquerque. 12 pp.

Dudley, R.K., and S.P. Platania. 1997. Habitat Use of the Rio Grande Silvery Minnow Report to U.S. Bureau of Reclamation, Albuquerque, New Mexico. 88 pp.

Dudley, R.K., and S.P. Platania. 2002. Summary of Population Monitoring of Rio Grande Silvery Minnow (1994–2002). Report to New Mexico Ecological Services Field Office, September 10, 2002, Albuquerque, New Mexico. 14pp.

Dudley, R.K., S.P. Platania, and S.J. Gottlieb. 2005. Summary of the Rio Grande Silvery Minnow Population Monitoring Program Results from December 2005. American Southwest Ichthyological Research Foundation, Albuquerque, New Mexico.

Durst, S.L., M.K. Sogge, H.C. English, S.O. Williams, B.E. Kus, and S.J. Sferra. 2006. Southwestern willow flycatcher breeding site and territory summary – 2005. U.S. Geological Survey, Colorado Plateau Research Station, Flagstaff, AZ.

Finch, D.M. and S.H. Stoleson, eds. 2000. Status, ecology, and conservation of the southwestern willow flycatcher. Gen. Tech. Rep. RMRS-GTR-60. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 131 p.

Franklin, I. R. 1980. Evolutionary Change in Small Populations. Pages 135 – 148 in M. E. Soulé and B. A. Wilcox (editors) Conservation Biology: an evolutionary-ecological perspective. Sinauer Associates, Inc. Sunderland, Massachusetts.

Harwood, A.K. 1995. The Urban Stormwater Contribution of Dissolved Trace Metal from the North Floodway Channel, Albuquerque, NM, to the Rio Grande. University of New Mexico, Water Resources Program, Professional Project Report.

Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, New York. 851 pp.

Hubbard, J.P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Sante Fe, New Mexico. 29 pp.

Levings, G.W., D.F. Healy, S.F. Richey, and L.F. Carter. 1998. Water Quality in the Rio Grande Valley, Colorado, New Mexico, and Texas, 1992-95. U.S. Geological Survey Circular 1162. Http://water.usgs.gov/pubs/circ1162 (viewed on May 18, 1998) .

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Toxicology and Chemistry 39:20–31.

McLeod, M.A., T.J. Koronkiewicz, B.T. Brown, and S.W. Carothers. 2005. Southwestern willow flycatcher surveys, demography, and ecology along the lower Colorado River and tributaries. Annual report submitted U.S. Bureau of Reclamation, Boulder City, NV, by SWCA Environmental Consultants, Flagstaff, AZ.

Middle Rio Grande Endangered Species Act Collaborative Program. 2004. Program Water Acquisition Final Position Paper. Water Acquisition and Management Subcommittee. July 12, 2004.

National Weather Service. 2002. West Gulf River Forecast Center, 2002 water supply forecast. Issued as of April1, 2002. Http://www.srh.noaa.gov/wgrfc/watersupply/wgrfc_APR_espfwr_2002.txt (viewed on April 9, 2002).

New Mexico Department of Game and Fish. 1998. Rio Grande Silvery Minnow Monitoring in 1997. Santa Fe, New Mexico.

Ong, K., T.F. O'Brien, and M.D. Rucker. 1991. Reconnaissance Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Middle Rio Grande and Bosque del Apache National Wildlife Refuge in New Mexico 1988–89: U.S. Geological Survey Water-Resources Investigations Report 91-4036, Albuquerque, New Mexico.

Peterson, R.T. 1990. A field guide to western birds. Third edition. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Pflieger, W. 1980. *Hybognathus nuchalis* Agassiz. *In* D. lee, C. Gilbert, C. Hucutt, R. Jenkins, McCallister, and J. Stauffer, eds., Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History, Raleigh, North Carolina. 177 pp.

Phillips, A.R. 1948. Geographic variation in *Empidonax traillii*. *The Auk* 65:507-514.

Platania, S.P. 1995. Reproductive Biology and Early Life-history of Rio Grande Silvery Minnow, *Hybognathus amarus*. U.S. Army Corps of Engineers, Albuquerque, New Mexico. 23 pp.

Platania, S. P. 2000. Effects of Four Water Temperatures Treatments On Survival, Growth, and Developmental Rates of Rio Grande Silvery Minnows, *Hybognathus amarus*, Eggs and Larvae. Report to U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Platania, S.P., and C. Altenbach. 1998. Reproductive Strategies and Egg Types of Seven Rio Grande Basin Cyprinids. Copeia 1998(3): 559–569.

Platania, S.P., and R. Dudley. 2000. Spatial Spawning Periodicity of Rio Grande Silvery Minnow during 1999, http://www.uc.usbr.gov/progact/rg/rgsm2002/egg_salvage/ wrg/aop/rgo/progact/rg/rgsm2002/progact/rg/rgsm2002/index.html.

Platania, S.P., and R. Dudley. 2001. Summary of Population Monitoring of Rio Grande Silvery Minnow (21–27 February 2001). Report to the Bureau of Reclamation and Corps of Engineers. Albuquerque. 7pp.

Platania, S.P., and R. Dudley. 2005. 2004 Summary of Population Monitoring of Rio Grande Silvery Minnow. Report to the Bureau of Reclamation and Corps of Engineers. Albuquerque. 193pp.

Platania, S.P., and C.W. Hoagstrom. 1996. Response of Rio Grande Fish Community to and Artificial Flow Spike: Monitoring Report Rio Grande Silvery Minnow Spawning Peak Flow. New Mexico Ecological Services State Office, Albuquerque, New Mexico.

Platania, S.P., Michael A. Farrington, W. Howard Brandenburg, Sara J. Gottlieb, and Robert K. Dudley 2003. Movement Patterns Of Rio Grande Silvery Minnow *Hybognathus amarus*, in the San Acacia Reach of the Rio Grande During 2002 Final Report. 38 pp.

Porter, M.D. and T.M. Massong 2004b. Analyzing changing river channel morphology using GIS for Rio Grande Silvery Minnow habitat assessment. In Proceedings of the Second International Symposium on GIS/Spatial Analysis in Fishery and Aquatic Sciences, 3-6 September, 2002, University of Sussex, Brighton, U.K. Nishida, T., Kailola, P.J., Hollingworth, C.E. (Editors): 433-448.

Rand, G.M., and Petrocelli, S.R. 1985. Fundamentals of Aquatic Toxicology – Methods and Applications. Hemisphere Publishing Corporation, New York. 666 pp.

Remshardt, J. A. 2008. Monitoring for Rio Grande silvery minnow downstream of Ft. Craig, New Mexico, in the Elephant Butte Temporary Channel and Elephant Butte Reservoir, 2005-2006. New Mexico Fisheries Resources Office, Albuquerque, New Mexico.

Ridgely, R.S. and G. Tudor. 1994. The birds of South America: Suboscine Passerines. University of Texas Press, Austin, Texas.

Roy, Richard, T.F. O'Brien, and M. Rusk-Maghini. 1992. Organochlorine and Trace Element Contaminant Investigation of the Rio Grande, New Mexico. U.S. Fish and Wildlife Service, New Mexico Ecological Services Office, Albuquerque, NM. 39 pp.

S.S. Papadopulos & Associates, Inc. 2000. Middle Rio Grande Water Supply Study. Boulder, CO: August 4, 2000.

Schmandt, J. 1993. Water and Development in the Rio Grande/Río Bravo Basin. University of Texas Press, Austin, Texas.

Scurlock, D. 1998. From the Rio to the Serria: An Environmental History of the Middle Rio Grande Basin. USDA Rocky Mountain Research Station, Fort Collins, Colorado, 80526.

Smith, J.R. 1999b. Summary of Easy Egg Catching in the LFCC in the 9 Mile Study Reach during Spring 1998 Operation. U.S. Fish and Wildlife Service Report Submitted to the U.S. Bureau of Reclamation, Albuquerque, New Mexico on April 28, 1999.

Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Research Station/Northern Arizona University Technical Report NRTR-97/xx.

Stiles, F. G., and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Sublette, J., M. Hatch, and M. Sublette. 1990. The Fishes of New Mexico. Univ. New Mexico Press, Albuquerque, New Mexico. 393 pp.

Unitt, P. 1987. *Empidonax traillii extimus*: an endangered subspecies. *Western Birds* 18:137-162.

U.S.D.A. Forest Service Southwest Region and U.S.D.I Bureau of Land Management. 2004. Draft Environmental Impact Statement for the Buckman Water Diversion Project. Santa Fe National Forest and Taos Field Office, New Mexico.

U.S. Bureau of Reclamation. 1993. Final Supplement to the Final Environmental Impact Statement-River Maintenance program for the Rio Grande-Velarde to Caballo Dam-Rio Grande and Middle Rio Grande projects, New Mexico. 140 pp.

U.S. Bureau of Reclamation. 1996. Final biological assessment of the Elephant Butte temporary channel project for the Rio Grande silvery minnow and southwestern willow flycatcher. Albuquerque Area Office, Albuquerque, NM.

U.S. Bureau of Reclamation. 2001. U.S. Bureau of Reclamation's Discretionary Actions Related to Water Management, U.S. Army Corps of Engineers Water Operations Rules, and Non-Federal Actions Related to Ordinary Operations on the Middle Rio Grande, New Mexico: June 30, 2001, through December 31, 2003. June 8, 2001.

U.S. Bureau of Reclamation. 2003. Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations, Army Corps of Engineers' Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, March 1, 2003 – February 28, 2013. February 19, 2003.

U.S. Bureau of Reclamation. 2005a. Middle Rio Grande Riverine Habitat Restoration Project Biological Assessment.

U.S. Bureau of Reclamation. 2006. 2006 Middle Rio Grande Annual Operating Plan Report. Albuquerque Area Office, Water Management Division. June 2006. Albuquerque, New Mexico.

U.S. Environmental Protection Agency. 1999. Update of Ambient Water Quality Criteria for Ammonia. Washington, D.C. 153pp.

U.S. Fish and Wildlife Service. 1993a. Proposal Rule to List the Rio Grande Silvery Minnow as Endangered, with Critical Habitat. 58 Federal Register 11821-11828.

U.S. Fish and Wildlife Service. 1993b. Notice of 12-month Petition Finding/Proposal to List *Empidonax traillii extimus* as an Endangered Species, and to Designate Critical Habitat. Federal Register 58:39495–39522..

U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Final Rule to list the Rio Grande Silvery Minnow as an Endangered Species. Federal Register 59:36988–37001.

U.S. Fish and Wildlife Service. 1999. Rio Grande Silvery Minnow (*Hybognathus amarus*) Recovery Plan. Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 138 pp.

U.S. Fish and Wildlife Service. 2001. 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, New Mexico, June 29, 2001.

U.S. Fish and Wildlife Service. 2002. Southwestern willow flycatcher recovery plan, Region 2, Albuquerque, NM.

U.S. Fish and Wildlife Service. 2003. Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of 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, New Mexico. March 17, 2003. Southwest Region, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 2004. Biological Opinion on the Effects of Actions Associated with the Programmatic Biological Assessment (BA) for the City of Albuquerque Drinking Water Project. February 13, 2004. New Mexico Ecological Services Field Office. Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*). Federal Register 70:60935–60984.

U.S. Fish and Wildlife Service. 2007. Rio Grande Silvery Minnow (*Hybognathus amarus*) Draft Revised Recovery Plan. January 2007. Southwest Region, Albuquerque, New Mexico.

U.S. Geologic Survey. 2002. Ground-water resources of the Middle Rio Grande basin, New Mexico. Circular 1222.

U.S. Geologic Survey. 2001. Selected Findings and Current Perspectives on Urban and Agricultural Water Quality by the National Water-Quality Assessment Program, FS-047- http://water.usgs.gov/pubs/FS/fs-047-01//pdf/fs047-01.pdf

Watts, H.E., C.W. Hoagstrom, and J.R. Smith. 2002. Observations on Habitat Associated with Rio Grande Silvery Minnow, *Hybognathus amarus* (Girard). Submitted to U.S. Army Corps of Engineers, Albuquerque District and City of Albuquerque Water Resources Division, June 28, 2002.

Appendix A: Estimated In-Water Area of Disturbance per Year Construction of New Channel (9 miles)				
	Amphibious Tracked Machines		Airboats	
	Channel Construction	Movement in Channel	Construction Support	Inspection Trips
	(acres)	(acres)	(miles)	(miles)
Crew #3				
(a) In-channel maintenance work: 100% of channel area	82			
(b) Movement of excavators (30' wide path): 3 excavators @ 2.5 x 9 miles		245		
(c) Fueling, Amphibious Transporter (22' wide path): 144 miles per year		384		
(d) Personnel Transport			432	144
Totals	**82 acres**	**629 acres**	**432 miles**	**144 miles**
	(0.33 km^2)	(2.55 km^2)		

Area Computation Details:

<u>Crew #1 (Reclamation):</u> This crew will cover maintenance of the northern 9.0 miles of existing channel (7.0 miles of Upper Reach and 2.0 miles of the Middle Reach). It was assumed that two excavators will work 4 months per year and a third excavator will work 1 month per year. The first two excavators will cover the entire 9 miles and the third excavator will be brought in only where extensive work is needed. It was assumed that two different launching areas will be used, to reduce distance from equipment work areas. This pertains to movement of equipment to work areas, transport of operators to excavators each day, and fueling of excavators.

The largest excavator has pontoons that are each 6 feet in width, with a distance from outside to outside of pontoons of 23.5 feet. Areas in table are computed based on a disturbance width of 30 feet for each excavator. For disturbance area due to excavators moving from work sites, it was assumed excavators will cover 2.5 times the distance of channel being maintained. This accounts for moving excavators to each worksite from the launching area, as well as other incidental movement required.

Fueling of excavators and transport of operators, from launching areas to equipment, will typically be performed by airboat. It was assumed that fueling will be performed every other day and transport of operators every day.

<u>Crew #2 (Contractor):</u> This crew will cover maintenance of the southern 12.4 miles of existing channel (9.1 miles of Middle Reach and 3.3 miles of Lower Reach). It was assumed that two excavators will work 4 months per year and a third excavator will work 1 month per year. The first two excavators will cover the entire 12.4 miles and the third excavator will be brought in only where extensive work was needed. It was assumed that two different launching areas will be used, to reduce distance from equipment work areas. This pertains to movement of equipment to work areas, transport of operators to excavators each day, and fueling of excavators.

The largest excavator has pontoons that are each 6 feet in width, with a distance from outside to outside of pontoons of 23.5 feet. Areas in table are computed based on a disturbance width of 30 feet for each excavator. For disturbance area due to excavators moving from work sites, it was assumed excavators will cover 2.5 times the distance of channel being maintained. This accounts for moving excavators to each worksite from the launching area, as well as other incidental movement required.

Fueling of excavators will typically be performed by a tracked amphibious transporter, with pontoon widths of 4 feet and a total width, from outside of pontoons, of 16 feet. Areas in table are computed based on a disturbance width of 22 feet for the fuel transporter. It was assumed that the transporter will fuel excavators every 3 working days.

Transport of excavator operators, from launching areas to equipment work areas, will occur every work day, by airboat.

<u>Crew #3 (Contractor):</u> This crew will cover construction of new channel (9 miles). It was assumed that 3 excavators will work 4 months per year. It was assumed that two different launching areas will be used, to reduce distance from equipment work areas. This pertains to movement of equipment to work areas, transport of operators to excavators each day, and fueling of excavators.

The largest excavator has pontoons that are each 6 feet in width, with a distance from outside to outside of pontoons of 23.5 feet. Areas in table are computed based on a disturbance width of 30 feet for each excavator. For disturbance area due to excavators moving from work sites, it was assumed excavators will cover 2.5 times the distance of channel being constructed. This accounts for moving excavators to each worksite from the launching area and, as well as other incidental movement required.

Fueling of excavators will typically be performed by a tracked amphibious transporter, with pontoon widths of 4 feet and a total width, from outside of pontoons, of 16 feet. Areas in table are computed based on a disturbance width of 22 feet for the fuel transporter. It was assumed that the transporter will fuel excavators every 3 working days.

Transport of excavator operators, from launching areas to equipment work areas, will occur every work day, by airboat.