United States Department of the Interior
FISH AND WILDLIFE SERVICE
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Cons. # 2-22-02-F-608

Memorandum

To: Area Manager, Albuquerque Area Office, U. S. Bureau of Reclamation

From: Regional Director, Region 2

Subject: Biological Opinion and Conference Report on U.S. Bureau of Reclamation's Amended Water Management Operations on the Middle Rio Grande through December 31, 2002

This is in response to your August 30, 2002, request for formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act). This document transmits the Service's conference and biological opinion (BO) based on our review of your proposed amendment to Water Management Operations on the Middle Rio Grande in New Mexico. This BO is an amendment to the June 29, 2001, programmatic BO (Appendix I), which addresses Water Management Operations on the Middle Rio Grande through 2003. This amendment covers Reclamation's water management actions through December 31, 2002. All non-water management activities in the June 29, 2001, programmatic BO remain in effect and are not superseded by this Amendment. This includes activities related to the implementation of Elements E – N of the Reasonable and Prudent Alternative (RPA) identified in that BO. On January 1, 2003, all provisions of the June 29, 2001, BO go back into effect.

Because of the results of the September 9, 2002, hearing in Rio Grande Silvery Minnow v. Keys, this BO will not be in effect until the U.S. Bureau of Reclamation (Reclamation) informs the Service of its intention to modify operations in accordance with the August 30, 2002, proposed action (this is not expected to occur prior to the September 16, 2002, court proceeding). Until that time, the June 29, 2001, programmatic BO remains in effect.

You have submitted with your request a description of the proposed action and analysis of effects dated August 30, 2002. You have determined that the proposed amendment to Water Management Operations on the Middle Rio Grande is "likely to adversely affect" the endangered Rio Grande silvery minnow (*Hybognathus amarus*)(silvery minnow) and its proposed critical habitat.

This BO is based on information provided in your August 30, 2002, letter; analyses for the June 29, 2001, programmatic BO; and other information available to the Service. A complete administrative record of this consultation is on file in the Service's New Mexico Ecological Services Field Office. Please refer to the June 29, 2001, programmatic BO for information regarding consultation history.

BIOLOGICAL OPINION

I. Description of Proposed Action

The proposed action is a temporary modification to Reclamation's water operations on the Middle Rio Grande in response to drought conditions and low water levels in the river. Lower than average snowpack and precipitation over the past year have led to a severe drought condition in the Middle Rio Grande Valley and surrounding areas that rivals the worst droughts in recorded history. The drought, plus many other factors, have contributed to the low flow conditions of 2002. Throughout the past several months, Reclamation has continually adjusted its projections for inflow into the reservoirs to reflect the hydrological reality of the system. Although Reclamation has worked to maintain flows in the river commensurate with the June 29, 2001, programmatic BO, and has implemented elements of the RPA outlined in that BO, it has become clear that they will not be able to maintain flows as specified in the BO as a result of below average snowpack and monsoonal precipitation. Based on this information, Reclamation proposes to temporarily amend their water operations from the date this BO is finalized through December 31, 2002, at which time water operations will revert to the actions described in the June 29, 2001, programmatic BO.

Reclamation proposes to direct supplemental water management to the Albuquerque Reach (Angostura Diversion Dam to Isleta Diversion Dam) to eliminate the requirement to pass flows downstream of Isleta Diversion Dam. Reclamation anticipates that this will require an average release of 300 cfs (from Abiquiu Reservoir) and, if implemented immediately, should maintain perennial flows in the Cochiti (Cochiti Dam to Angostura Diversion Dam) and Albuquerque Reaches through most of September 2002. Should additional supplemental water become available, Reclamation would likely be able to extend its ability to maintain supplemental flows through the Albuquerque Reach until October 31, 2002. As in the past, the six Pueblos receive prior and paramount water deliveries through November 15, 2002. After November 15, 2002, the only action proposed by Reclamation is the potential storage of water in El Vado Reservoir to ensure future deliveries of prior and paramount water for the six Middle Rio Grande Pueblos.

On July 2, 2002, Article VII of the Rio Grande Compact became effective because the amount of Usable Water in storage in Elephant Butte and Caballo Reservoir's (Rio Grande Project storage) fell below 400,000 acre-feet (ac-ft)(65,839 hectare-meters). Article VII of the Compact prohibits increasing storage of native Rio Grande water in reservoirs built after 1929 in New Mexico (this includes El Vado, Abiquiu, Cochiti, Nichols, McClure, and Jemez Canyon Reservoirs) until the Usable Water in Rio Grande Project storage is 400,00 ac-ft or greater. However, Article XVI of the Compact states that, "Nothing in this Compact shall be construed as

affecting the obligations of the United States of America to Mexico under existing treaties, or to the Indian Tribes, or as impairing the rights of the Indian Tribes."

Due to probable increased river drying in the Isleta and San Acacia Reaches as a result of drought conditions and this proposal, Reclamation proposes to support a concerted effort to capture and transport silvery minnows to a location designated by the Service and will ramp-down flows to facilitate silvery minnow rescue. Pumping from the Low Flow Conveyance Channel (LFCC) in the San Acacia Reach will continue as anticipated in the June 29, 2001, BO as water is available. Reclamation anticipates that it is possible that pumping will need to be curtailed within a few weeks of September 7, 2002, when the Middle Rio Grande Conservancy District (MRGCD) irrigation releases ended. Reclamation will closely monitor flows in the Albuquerque Reach to allow managers to adjust upstream releases, if possible, to conserve supplemental water and postpone drying of this reach. Also, should any supplemental water arrive at Isleta Diversion Dam, Reclamation will pass flows to the river below the dam. Reclamation believes that this proposed action would increase the efficiency of water use while limiting the adverse effects on silvery minnows during these extreme drought conditions.

The release from storage, delivery of, and diversion of prior and paramount water for the six Middle Rio Grande Pueblos is part of this proposed action. As in the past, the six Pueblos receive prior and paramount water deliveries through November 15, 2002. The delivery of this water is similar to what was considered in the June 29, 2001, BO, but in the absence of full MRGCD irrigation operations. Prior and paramount water will be delivered primarily through Middle Rio Grande Project facilities while supplemental water will be managed in the river channel. Prior and paramount water deliveries are not dependent on, and are not expected to affect, supplemental water deliveries. Reclamation will continue its operations, consistent with current agreements, to store water in El Vado Reservoir and ensure delivery of the prior and paramount water rights of the six Middle Rio Grande Pueblos.

Reclamation did not include the use of water stored in Heron Reservoir as part of proposed action. Nonetheless, during this consultation, the Service has examined the potential use of this water to benefit the silvery minnow during the remainder of 2002. Although this water could help supplement flows in the river now, its use could result in adverse effects to water storage and availability of water in the future if drought conditions persist. In 2002, through Reclamation's efforts to comply with the requirements of the June 29, 2001, programmatic BO, critical life stages (spawning, recruitment, etc.) of the silvery minnow have been facilitated. In evaluating alternative approaches for the long-term survival of the silvery minnow, the Service needs to look at the life cycle of the fish and its habitat needs. First, for a short-lived fish such as the silvery minnow it is crucial that the species has a successful reasonable spawn in late May and/or early June. This was achieved in 2002 through the pulse flow that was released on May 13, 2002 by the U.S. Army Corps of Engineers. Approximately 750,000 silvery minnow eggs were collected and transported for hatching in captivity to ensure the highest level of successful hatching. If drought conditions persist, an artificial pulse flow using water from Heron Reservoir may need to be released in 2003 to induce spawning. Given the Article VII Compact restrictions on storage, the prediction of a continued drought, and the extreme biological

importance of annual spawning in the short life cycle of the silvery minnow, the Service believes it is more prudent to reserve the water in Heron Reservoir until, and only until, the use of that water becomes absolutely necessary to ensure a spawn in the river.

II. Status of the Species/Critical Habitat and Environmental Baseline

Regulations implementing the Act (50 CFR 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. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress. This section defines the current status of the silvery minnow and its habitat in the action area to help determine effects of the proposed action.

Rio Grande Silvery Minnow

a. Species Description

The silvery minnow was federally listed as endangered under the Act on July 20, 1994 (U.S. Fish and Wildlife Service 1994). The species is listed by the State of New Mexico as an endangered species. Primary reasons for listing the silvery minnow involve a number of factors, described in the Status and Distribution section (e), that contributed to a collapse of population numbers throughout its historic range. The final recovery plan for the silvery minnow was released in July 1999 (U.S. Fish and Wildlife Service 1999c). The primary objectives are to increase numbers of the silvery minnow, enhance its habitat in the Middle Rio Grande valley, and expand its range by reestablishing the species in at least three other areas in its historic range.

The silvery minnow is a stout minnow, with moderately small eyes, a small, subterminal mouth, and a pointed snout that projects beyond the upper lip (Sublette *et al.* 1990). The back and upper sides of the silvery minnow are silvery to olive, the broad mid-dorsal stripe is greenish, and the lower sides and abdomen are silver. Maximum length attained is about 3.5 inches (90 mm). The only readily apparent sexual dimorphism is the expanded body cavity of ripe females during spawning (Bestgen and Propst 1994).

The silvery minnow has had a confused taxonomic history, and in the past 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*) have gone extinct or have been extirpated

from the Middle Rio Grande (New Mexico Department of Game and Fish 1998b, Dudley and Platania 1999). Given the loss of the other four pelagic spawning endemic minnow species, it is reasonable to presume that this species would likely be the next fish to be extirpated (Dudley and Platania 1997).

b. Critical Habitat Description

Critical habitat was designated for the silvery minnow on July 6, 1999 and included the Rio Grande from the New Mexico Highway 22 Bridge, immediately downstream of Cochiti Dam, to the railroad bridge near San Marcial, New Mexico, representing 163 miles (262 kilometers [km]) of stream channel. The designated critical habitat for the silvery minnow was challenged in the consolidated cases of *MRGCD, State of New Mexico, and Forest Guardians v. Bruce Babbitt*. On November 21, 2000, the District Court of New Mexico ordered the Service to complete a new proposal to re-designate critical habitat and prepare an environmental impact statement within 120 days. The Court ordered that the previous critical habitat designation remain in effect until March 21, 2001, at which time the critical habitat designation expired. On June 6, 2002, the Service proposed that the Middle Reach of the Rio Grande, from Cochiti Reservoir to Elephant Butte Reservoir Dam and the Jemez River from Jemez Canyon Reservoir to its confluence with the Rio Grande, be designated as critical habitat for the silvery minnow. Proposed critical habitat also includes the area of bankfull width plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge (i.e., the flow at which water begins to leave the channel and move into the floodplain)(Rosgen 1996).

Developed lands within the 300-foot lateral extent are not considered critical habitat because they either do not contain the primary constituent elements or they are not essential to the conservation of the silvery minnow. Lands located within the exterior boundaries of the proposed critical habitat designation, but not considered critical habitat include: Existing paved roads, bridges, parking lots, dikes, levees, diversion structures, railroad tracks, railroad trestles, water diversion canals outside of natural stream channels, active gravel pits, cultivated agricultural land, and residential, commercial, and industrial developments. These developed areas do not contain any of the primary constituent elements and do not provide habitat or biological features essential to the conservation of the silvery minnow, and generally will not contribute to the species' recovery. However, some activities in these areas, like activities in other areas not included within the designation (if federally funded, authorized, or carried out), may affect the primary constituent elements of the proposed critical habitat and, therefore, may be affected by the critical habitat designation, as discussed later in this BO.

The Service determined the primary constituent elements of critical habitat for the silvery minnow based on studies on their habitat and population biology. The proposed primary constituent elements of critical habitat for the silvery minnow 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: 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), eddies (a pool with water moving opposite to that in the river channel), and runs (flowing water in the river channel without obstructions) of varying depth and velocity which are necessary for each of the particular silvery minnow life-history stages (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 a relatively constant winter flow (November to February), in appropriate seasons);

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

3. Substrates of predominantly sand or silt; and

4. Water of sufficient quality to maintain natural, daily, and seasonally variable water temperatures in the approximate range of greater than 1°C (35°F) and less than 30°C (85°F) and reduce degraded water quality conditions (decreased dissolved oxygen, increased pH, etc.).

The primary constituent elements identified above provide a qualitative description of those physical and biological features necessary to ensure the conservation of the silvery minnow. The first primary constituent element provides water of sufficient flows to reduce the formation of isolated pools. This element is essential to the conservation of the silvery minnow because the species cannot withstand permanent drying (loss of surface flow) of long stretches of river. Water is a necessary component for all silvery minnow life-history stages and provides for hydrologic connectivity to facilitate fish movement. The second primary constituent element provides habitat necessary for development and hatching of eggs and the survival of the silvery minnow from larvae to adult. Low velocity habitat provides food, shelter, and sites for reproduction, and are essential for the survival and reproduction of silvery minnow. The third primary constituent element provides appropriate silt and sand substrates (Dudley and Platania 1997; Watts *et al.* 2002), which we and other scientists conclude are important in creating and maintaining appropriate habitat and life requisites (e.g., food and cover). The final primary constituent element provides protection from degraded water quality conditions. We conclude that when water quality conditions degrade (e.g., increasing water temperatures, pH, decreasing dissolved oxygen, etc.), silvery minnows will likely be injured or die.

The following analysis (i.e., the determination whether an action destroys or adversely modifies proposed critical habitat) for this BO will evaluate 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 silvery minnow. In other words, activities that may destroy or adversely modify critical habitat include those that alter the primary constituent elements

(defined above) to an extent that the value of the critical habitat unit for both the survival and recovery of the silvery minnow is appreciably reduced (50 CFR 402.02).

c. Life History

The silvery minnow travels in schools and tolerates a wide range of habitats (Sublette *et al.* 1990), but generally prefers low velocity (less than 0.33 feet per second, 10 centimeters/second [cm/sec]) areas over silt or sand substrate that are associated with shallow (less than15.8 inches [40 cm]) braided runs, backwaters or isolated pools (Bestgen and Platania 1991, Platania and Dudley 1997). Adults are most commonly found in shallow and braided runs over sand substrate; whereas, young-of-year occupy shallow, low velocity backwaters with sand-silt substrates (Bestgen and Platania 1991, Platania and Dudley 1997, Dudley and Platania 1997). Young-of-the-year and adults are seldom found concurrently in the same habitat. A recent habitat study conducted between 1994 and 1996 characterized habitat availability and use at two sites in the Middle Rio Grande at Rio Rancho and Socorro (Dudley and Platania 1997). Dudley and Platania (1997) reported that this fish species was most commonly found in habitats with depths less than 7.9 inches (20 cm) or between 12.2 to 15.8 inches (31 to 40 cm), and were not found in habitats with water depths greater than 19.7 inches (50 cm). Over 85 percent were collected from low velocity habitats (less than 0.33 feet/sec [10 cm/sec]) (Dudley and Platania 1997, Watts et al. 2002). 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. Areas with detritus and algal-covered substrates are preferred. The lee sides of islands and debris piles often serve as good habitat. Stream reaches dominated by straight, narrow, incised channels with rapid flows are not typically occupied by the silvery minnow (Sublette *et. al.* 1990, Bestgen and Platania 1991).

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). Adults spawn in about a one-month period in late spring to early summer (May to June) in response to spring runoff. 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 (Platania and Dudley 2002a, b). These data suggest multiple spawning events and it appears likely that the silvery minnow spawns multiple times during the summer, perhaps concurrently with flow spikes. An artificial flow spike of 1,800 cfs (51 cubic meters/second) for 24 hours was released from Cochiti Dam on May 19, 1996. This flow spike apparently stimulated a spawning event and resulted in the collection of 49 silvery minnow eggs by researchers at Albuquerque on May 22, the day after the spike passed (Platania and Hoagstrom 1996). A late spawn was documented in the Isleta and San Acacia Reaches on July 24, 25, and 26, 2002, following a high flow event produced by a thunderstorm. This spawn was smaller than the typical spawning event in May, but a significant number of eggs were collected (N = 496) in two hours of effort (J. Smith, NMESFO, pers. comm. 2002). In 2002, small spawning events of a few eggs have been documented in all reaches except the Cochiti Reach as late as August 7 (J. Smith, NMESFO, pers. comm. 2002).

Platania (1995, 2000) found that development and hatching of eggs are correlated with water

temperature. Eggs of the silvery minnow raised in 30°C water hatched in about 24 hours while eggs reared in 20 – 24°C water hatched within 50 hours. Eggs were 0.06 inches (1.6 millimeters [mm]) in size upon fertilization, but quickly swelled to 0.12 inches (3 mm). Recently hatched larval fish are about 0.15 inches (3.7 mm) in standard length and grow about 0.005 inches (0.15 mm) in size per day during the larval stages. Eggs and larvae can remain in the drift for 3-5 days, and may be transported from 134 to 223 miles (216 to 359 km) downstream depending on river flows. About three days after hatching the larvae move to low velocity habitats where food (mainly phytoplankton and zooplankton) is abundant and predators are scarce. Young-of-the-year attain lengths of 1.5 to 1.6 inches (39 to 41 mm) by late autumn. Age 1 fish are 1.8 to 1.9 inches (45 to 49 mm) by the start of the spawning season. Most growth occurs between June (post spawning) and October, but there is some growth in the winter months. Maximum longevity is about 25 months, but very few survive more than 13 months. Captive fish have lived until Age 4**.**

Platania (1995) indicated that historically the downstream transport of eggs and larvae of the silvery minnow over long distances was 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. 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.

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, Bestgen and Platania 1991).

d. Population Dynamics

Comparison of fish surveys between 1986 and 1996 in the Middle Rio Grande indicated a continued decline in silvery minnow abundance (Bestgen and Platania 1991, Platania 1993, Platania and Dudley 1997). Data collected during the summer of 2000 indicated a near-absence of young-of-the-year (Age 0) silvery minnows in the Middle Rio Grande, suggesting that the population may have dramatically decreased, even since the period of 1996 to 1999 (Chris Hoagstrom, New Mexico Fishery Resource Office (NMFRO), *in litt.*, August 14, 2000). However, data collected during 2001 indicated that there was a slight increase in silvery minnow abundance in the Albuquerque, Isleta, and San Acacia Reaches (Appendix II, Figure 1). Age 0 silvery minnows were collected just below Angostura Diversion Dam through October of 2001 (Dudley and Platania 2001). The reason for this slight increase is unknown but may be attributable to the release of captive reared larval and juvenile silvery minnows in the spring and summer 2000 coupled with an average spring run off in 2001.

Preliminary data from 2002 indicates that total catch rate for silvery minnows increases downstream by reach (Appendix II, Figure 2). The Cochiti Reach was not sampled. Catch rates were lowest in the Albuquerque Reach (approximately 0.47 silvery minnows/100 meters square (m^2)). Catch rates were approximately 1.5 and 2.4 silvery minnows/100 m^2 in the Isleta and San Acacia Reaches, respectively (R. Dudley, University of New Mexico, pers. comm. 2002). These data are preliminary and subject to change. The preliminary data indicate that the Isleta Reach catch rates are similar to those of the San Acacia Reach and the second highest of the three reaches. The catch rate decreased in a downstream direction within the Isleta and San Acacia Reaches (Appendix II, Figures 3 and 4). Most fish were captured in areas immediately below the diversion dam, with the catch rate incrementally decreasing downstream of the diversion dam and the least amount of fish being caught at the locations farthest away from the diversion dam. This decrease in numbers of individual fish from upstream to downstream has also been observed during salvage operations in 2002 (J. R. Smith, NMESFO, pers. comm. 2002).

The majority of spawning fish are Age 1. Age 2 fish comprise less than 10 percent of the spawning population. 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. 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 population instability. If a sufficient level of successful reproduction does not occur for two or more successive years, the species may not survive.

High silvery minnow mortality occurs during or subsequent to spawning. Very few adults are found in late summer. By December, the majority (>98 percent) of individuals are Age 0. This population ratio does not change appreciably between January and June, as Age I fish usually constitute over 95 percent of the population just prior to spawning. Generally, the population consists of only two age classes (Platania 1997).

e. Status and Distribution

Historical populations of the silvery minnow were known to have occurred from Española upstream from Cochiti Reservoir; 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 silvery minnow currently occurs in 170 miles (274 km) of the Rio Grande, from Cochiti Dam downstream to Elephant Butte Reservoir, comprising five percent of its historic range. Surveys by Bestgen and Platania (1991) indicate a continued decline of silvery minnows in the entire reach during surveys from 1986 to 1989. In 1997, it is estimated that 70 percent of the silvery minnow population was found in the reach below San Acacia Diversion Dam, the downstream most diversion dam (Dudley and Platania 1997). During surveys in 1999, over 95 percent of the silvery minnows captured were downstream of San Acacia Diversion Dam to the San Marcial Railroad Bridge (Dudley and Platania and Dudley

1999a, Smith and Jackson 2000). This area represents 28 percent of the total length of the Middle Rio Grande from Cochiti Dam to the San Marcial Railroad Bridge. Probable reasons for the documented distribution include:

1. The species' reproductive strategy (buoyant eggs spawned during the spring and early summer high flows), resulting in downstream transport of eggs and larval fish;

2. Diversion dams that prevent the movement of mature fish into upstream reaches; and

3. Reduction in the amount of available habitat due to the effects of Cochiti Dam, such as streambed degradation, reduction in side-channel habitat, and the narrowing and incising of the stream channel.

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

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

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

III. Environmental Baseline

Past actions have eliminated and severely altered habitat conditions for the silvery minnow. Changes in natural flow regimes, narrowing and deepening of the channel, and restraints to channel migration adversely affect the silvery minnow. These effects result directly from constraints placed on channel capacity by structures built in the floodplain. These environmental changes have and continue to degrade and eliminate spawning, nursery, feeding, resting, and refugia areas required for species survival and recovery (U.S. Fish and Wildlife Service 1993a). The active river channel width that flowing water can occupy in the Middle Rio Grande has been severely reduced. Potentially suitable habitat for the silvery minnow has decreased by 49 percent between 1935 and 1989 (Crawford *et al.* 1993).

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). In general, the river was slightly sinuous, braided, and freely migrated across the floodplain. 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). Prior to this, there were only two documented occasions when the river became intermittent; during prolonged, severe droughts in 1752 and 1861. Conversely, over the past century the Middle Rio Grande has been frequently dewatered, particularly in the Isleta and San Acacia Reaches.

Water management and use has resulted in a large reduction of suitable habitat for the silvery minnow. Lack of water is the single most important limiting factor for the survival of the species. Agriculture accounts for 90 percent of the water consumption in the Middle Rio Grande (Bullard and Wells 1992). The average annual diversion of water in the Middle Rio Grande by the MRGCD was 535,280 for the period from 1975 to 1989 (Reclamation 1993). The silvery minnow historically survived low flow periods because such events were infrequent, of lesser magnitude, and there were no diversion dams to restrict free movement of silvery minnows in the river. The present situation (low population numbers, 70 to 90 percent of the population is present below the Isleta Reach) is so severe that additional water withdrawals could result in the extinction of the species in the wild.

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. In addition, water losses associated with riparian vegetation demand also impacts water levels in the river (Papadopulos 2000). Reaches particularly susceptible to these conditions, as documented during the spring and summer of 1996 by the Service, are immediately downstream of the Isleta Diversion Dam (river mile 169), a 5-mile (8-km) reach near Tome (river miles 150-155), a 5-mile (8-km) reach near the U.S. Highway 60 Bridge (river miles 127-132), and an extended 36-mile (58-km) reach from near Brown Arroyo (downstream of Socorro) to Elephant Butte Reservoir. Massive fish kills, including tens of thousands of silvery minnows, have occurred in these lower reaches when the river has dried. In 1996, at least 36 river miles in the San Acacia Reach were dry for 128 days and the San Marcial Gauge, located at the lower end of this reach, had 0 cfs reading for 180 days. In 1997, at least 16 river miles were dry for approximately five to seven days.

Approximately 16 river miles were dry for 28 days in 1998. The river was dry in 1999 for four to five days for at least 28 river miles. Drying occurred in 2000 for less than a week in late July. Approximately 8 to 10 miles of river dried in 2001, with the period of intermittency usually lasting less than two days (U.S. Fish and Wildlife Service 2002b). While some dead silvery minnows were collected during the shorter drying events, it is assumed that many more mortalities occurred than were documented.

Drying occurred during the 2002 irrigation season in the Isleta and San Acacia Reaches. Between June and August, 2002, approximately 25 miles of river in the San Acacia Reach and 14 miles in the Isleta Reach dried. These reaches of river have dried and re-wetted several times due to rainstorm events. During these drying events, the salvage crews have captured and relocated over 3,000 adult silvery minnows to the Albuquerque and Isleta Reaches, and documented 248 dead silvery minnows that count toward the Incidental Take Statement in the June 29, 2002, programmatic BO, as clarified in an August 1, 2002, memo to Reclamation. Approximately 98 percent of the salvaged silvery minnows were released at Central Bridge in Albuquerque, with the remainder released in the upper portions of the Isleta Reach. Re-wetting from storm runoff and the subsequent drying of the river in areas that were previously dry has lead to the death of additional silvery minnows (<100). These silvery minnows are not considered as take under the June 29, 2001, programmatic BO because an "act of nature" caused the river to re-wet and subsequently dry, rather than the actions of Federal agencies.

During the past few years, the City of Albuquerque and other San Juan-Chama (SJC) project contractors allowed the use of their SJC water in areas that would have otherwise been intermittent for the purpose of providing flows in the river that were crucial for the silvery minnow population in the San Acacia reach. The City of Albuquerque intends to fully utilize its SJC water in the future for municipal uses; therefore, this water may not be available for future activities involving conservation of silvery minnow populations (John Stomp, City of Albuquerque, pers. comm. 1998).

Water in the active river channel has been reduced with the construction of drains along both banks of the Rio Grande. The majority of the Middle Rio Grande valley has drains paralleling the river. The west side of the Rio Grande has 160 miles (258 km) of drains, including the LFCC, in a 180-mile (290 km) stretch between Cochiti Dam and the Narrows at Elephant Butte Reservoir. This represents 89 percent of the total length between Cochiti Dam and Elephant Butte Reservoir. The east-side drains also parallel the river to San Acacia Diversion Dam for a distance of 100.5 miles (162 km).

The LFCC that parallels the river for up to 75 miles (121 km) was designed to expedite delivery of Rio Grande Compact water to Elephant Butte Reservoir. Water was diverted to the LFCC from the Rio Grande from 1959 to 1985. Built to more efficiently deliver water to Elephant Butte Reservoir during low-flow conditions, the LFCC has a capacity of approximately 2,000 cfs. If natural flow is 2,000 cfs or less, the LFCC can dewater the Rio Grande from the San Acacia Diversion Dam south to Elephant Butte Reservoir. The LFCC has not been fully operational since 1985, because of outfall problems at Elephant Butte Reservoir. In 1997, 1998,

and 2001 experimental operations occurred in the upper 10 miles of the LFCC for sedimentation studies; however, the diverted flows were returned to the Rio Grande through a temporary outfall near Escondida. Because the LFCC is at a lower elevation than the river bed, there is seepage from the river to the LFCC. This causes a significant loss of surface flows in the river channel. It is estimated that 67 percent of the flow in the Rio Grande is lost to seepage in the project area, with much of this water seeping into the LFCC (J. Wilber, Reclamation, pers. comm. 1999).

In 2000, a program was initiated to pump water from the LFCC back into the river. The initial pumping program had a total of three stations in the San Acacia Reach. These pumps augmented flows throughout the reach within and below Bosque del Apache National Wildlife Refuge (BANWR). This program reduced the amount of intermittency in the river in 2000 and 2001. In 2002, the pumping was expanded to five stations located in the San Acacia Reach from about 3 miles upstream of US 380 to near Old Fort Craig. The pumping stations at the southern boundary of BANWR and Fort Craig have created approximately 16 miles of flowing water. A new pumping station located approximately 4 miles north of the southern boundary of BANWR will provide approximately 4 miles of additional flowing water (when water is available in the LFCC). With these pumping stations, flow can be maintained for approximately 20 continuous miles of river, from near the middle of Bosque del Apache, to Elephant Butte. However, if the pumps fail, the river may become intermittent. Reclamation has contractors that check the pumps, but mechanical failures can go unchecked for several hours. Unexpected disasters such as engine fires (one occurred in mid-July of 2002) can severely affect the ability of the pumps to deliver water (R. Garret, Reclamation, pers. comm. 2002).

The active river channel through the reaches where the silvery minnow persists is being narrowed by the encroachment of vegetation, resulting from continued low flows and the lack of overbank flooding. Newly formed river channels in the flood plain are often straighter and lack the meanders that were present in historic times. The availability of wide, shallow habitats that are important to the silvery minnow are decreasing in the historically extensive range of the species. This channel configuration produces fewer backwater habitats with low velocities that are important for silvery minnow eggs, fry, and juveniles. Habitat studies during the winter of 1995 and 1996 (Dudley and Platania 1996), demonstrated that a wide, braided river channel with low velocities resulted in higher catch rates of silvery minnows, and narrower channels resulted in fewer fish captured.

Where the silvery minnow now persists, human development and use of the floodplain have greatly restricted the width available to the active river channel. A comparison of river area between 1935 and 1989 shows a 52-percent reduction, from 26,598 acres (10,764 ha) to 13,901 acres (5,626 ha)(Crawford *et al.* 1993). These data refer to the Rio Grande from Cochiti Dam downstream to the "Narrows" in Elephant Butte Reservoir. Within the same stretch, 234.6 miles (378 km) of levees occur, including levees on both sides of the river. Analysis of aerial photography taken by Reclamation in February 1992, for the same river reach, shows that of the 180 miles (290 km) of river, only 1 mile (1.6 km), or 0.6 percent of the flood plain has remained undeveloped. Development in the flood plain, makes it difficult, if not impossible, to send large quantities of water downstream that would create low velocity side channels that the silvery

minnow prefers. For example, the railroad bridge at San Marcial is so low, flow releases from Cochiti Dam have been reduced to avoid damage to the bridge. The construction of houses in the flood plain on the east side of the river at Socorro requires that releases from Cochiti Dam are limited to prevent damage to these homes. Limiting these releases decreases the available habitat for the silvery minnow.

Water management has also resulted in a loss of peak flows that historically initiated spawning. The reproductive cycle of the silvery minnow is tied to the natural river hydrograph. A reduction in peak flows and/or improper timing of flows may inhibit reproduction. Lack of a peak flow was especially severe in the spring and summer of 1996 because of drought. The Service was concerned that reproduction might not occur or would be seriously reduced. A moderate flow spike was coordinated with the cooperation of the City of Albuquerque. River and habitat conditions prior, during, and following the spike were monitored. This spike was successful in triggering a spawn and temporarily improved habitat conditions (Platania and Hoagstrom 1996, Platania and Dudley 1999, Platania and Dudley 2000).

Again in the spring of 2002, there was concern that silvery minnows would not spawn because of a lack of spring runoff due to an extended drought. Runoff for the year was predicted to be the lowest in 100 years at around 2 percent of normal at San Marcial. Water was released (1850 cfs) from Cochiti Reservoir on May 13, 2002, to provide a cue for silvery minnow spawning. In response to the release, a significant spawning event occurred in all reaches except the Cochiti Reach. Over 750,000 silvery minnow eggs were collected for captive propagation on May 18 and 19, 2002 (Platania 2002c). These eggs were transported to captive propagation units where they were raised to sub-adults and adults for release back into the wild.

Despite efforts to manage water resources to benefit the silvery minnow, periods of intermittency have and continue to occur. Due to the severity and extent of dewatering prior to the moderate flow spike in 1996, the Service conducted an emergency salvage of silvery minnows trapped in drying pools downstream of Isleta Diversion. Approximately 10,000 silvery minnows were salvaged, transported, and released in a perennial reach of the Rio Grande near Albuquerque. Mortality of silvery minnows from dewatering downstream of San Acacia Diversion Dam has been documented as recently as 1999 (Dudley and Platania 1999b) and several additional salvages of silvery minnows have occurred between 1997 and 2002.

Mortality of silvery minnows was documented in both 1996 and 1997 in specific isolated pools during river intermittency (Smith and Hoagstrom 1997, Smith 1999). These studies focused on both the relative size of the pool (i.e., estimated surface meters and maximum depth) in relation to pool longevity (i.e., number of days pool existed) and fish community of the isolated pools. Smith (1999) found that the typical isolated pools found during intermittent conditions usually only lasted 48 hours. Those that persisted longer lost greater than 81 percent of their estimated surface area and more than 26 percent maximum depth in 48 hours. Because of poor water quality (high water temperatures, low dissolved oxygen) and exposure to predators, mortality of silvery minnows is expected when drying exceeds 48 hours.

Water quality can also impact the silvery minnow. Fish surveys in the Rio Grande through the City of Albuquerque and immediately downstream showed a depauperate fish fauna that may be caused by poor water quality (Bestgen and Platania 1991). Other inputs from toxic sources can also occur, such as sewage spills, runoff from construction, and livestock feedlots. Poor water quality also impacts the silvery minnow indirectly by stressing the fish. Stress can make fish susceptible to disease and reduce their reproductive fitness. Other fish species may be better adapted to certain water quality parameters and therefore may be more abundant.

Propagation of silvery minnows began in 2000 to determine the potential of raising large numbers of silvery minnows to augment wild populations. Adult wild silvery minnows from the San Acacia Reach and eggs from San Marcial were collected for a pilot propagation and augmentation program. Wild gravid adults were successfully spawned in captivity at the City of Albuquerque Biological Park. Approximately 500 silvery minnows were induced to spawn producing approximately 203,600 eggs. These eggs were raised for 2 to 3 days and released as larval fish at Bernalillo (91,600) and Los Lunas (112,000)(Platania and Dudley 2001). The estimated survivorship for these larval fish to adulthood is estimated to be one to five percent, which would equate to net augmentation ranging between 916 to 4,580 and 1,120 to 5,600 adult fish in the Albuquerque and Isleta Reaches, respectively.

In 2000, an estimated 41,498 silvery minnow eggs were collected in 3 days just below San Marcial railroad trestle (Smith 2000). The eggs were transported to the Albuquerque Biological Park propagation facility where they were raised to adulthood. The eggs had an estimated 5 to 10 percent survivorship resulting in approximately 2,075 to 4,150 adult silvery minnows. However, since this project was only anticipated to rear 1,000 adult silvery minnows from 10,000 eggs, approximately 2,500 juvenile silvery minnows were released to the Albuquerque Reach of the Rio Grande in July of 2000.

In late 2001, 11,900 silvery minnow were released by the University of New Mexico (UNM) into the San Acacia Reach. These fish were marked with visible implant flourescent elastomer tags in two colors. The objective of this study was to determine the movement of silvery minnows in the wild. Results of this study should be available in late 2002 or early 2003 (R. Dudley and S. Platania, UNM, pers. comm. 2002)

During experimental propagation activities it was discovered that individual silvery minnows can spawn multiple times in one year. In some instances, adult silvery minnows have been induced to spawn as many as four times a year (C. Altenbach, City of Albuquerque, pers. comm. 2000). The significance of this finding is that silvery minnows can be spawned multiple times and produce many more eggs than was expected. This reduces the number of silvery minnows that need to be collected from the wild to maintain a brood stock. In April of 2002, the Albuquerque Biological Park spawned silvery minnows in captivity for the first time without the use of hormones (C. Altenbach, City of Albuquerque, pers. comm. 2002).

In the fall of 2000, the Service began collecting wild silvery minnow adults to supplement the existing captive broodstock. This collection usually occurred in the fall and spring of each year

with approximately 250 adults being collected each time. Silvery minnows were collected from the Albuquerque, Isleta, and San Acacia Reaches. The 2000 broodstock came exclusively from the San Acacia Reach, while silvery minnows were collected from the Albuquerque, Isleta, and San Acacia Reaches in 2001. These fish are held in captive propagation; their progeny will be used in river augmentation (J. Brooks, NMFRO, pers. comm. 2001).

Silvery minnow eggs were salvaged from the Rio Grande in 2001 to supplement the captive population. During spring runoff in mid-May, approximately 150,000 wild eggs were collected near the headwaters of Elephant Butte Reservoir. These eggs were transported to the Albuquerque Biological Park where they were raised for future broodstock. Silvery minnows were also spawned artificially using hormones throughout 2001 and into early 2002. These silvery minnows were used to increase the existing number held in propagation (J. Brooks, NMFRO, pers. comm. 2002).

Silvery minnows are currently being propagated at five facilities in New Mexico and one in South Dakota; one more New Mexico facility will come on-line in 2002. The New Mexico facilities are: Dexter National Fish Hacthery and Technology Center; Mora National Fish Hatchery and Technology Center; New Mexico State University Coop Unit; Santa Rosa State Fish Hatchery; and the Albuquerque Biological Park. These facilities are actively propagating and rearing silvery minnows or are available for propagation. The total combined capacity of these facilities is unknown at this time, but is estimated at 500,000 silvery minnows. The South Dakota facility is at the U. S. Geological Survey, Biological Resources Division (USGS-BRD) Lab; there is no active spawning program at this facility. Currently, there are approximately 150,000 - 200,000 silvery minnows held in captivity (J. Brooks, NMFRO, pers. comm. 2002).

In 2002, hybridization studies between the plains minnow and silvery minnow were conducted to determine the genetic viability of hybrids. These studies are on-going and results should be available in late 2002 (C. Caldwell, USGS-BRD, pers. comm. 2002).

Due to the increased efforts in controlled propagation, recent studies have been developed by UNM on the genetic composition of the silvery minnow. The primary objective of these studies is to determine an adequate refugial population size without losing genetic material. Results from these studies are still preliminary but estimates indicate that a minimum of 100,000 silvery minnows are needed to maintain a genetically healthy broodstock and that 1,000,000 would be optimal (T. Turner, UNM, pers. comm. 2001).

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

1. Release of Carryover Storage from Abiquiu Reservoir to Elephant Butte Reservoir: The U.S. Army Corps of Engineers (Corps) consulted with the Service on the release of water during the winter of 1995. Ninety-eight thousand ac-ft (12,054 hectare-meters) of water was released from November 1, 1995, to March 31, 1996, at a rate of 325 cfs (9.8 cm).

This flow rate 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. For example, during the winter release habitat study, Dudley and Platania (1996) observed an apparent increase in flow between two winter sampling trips, January 19 – 26, 1996, and February 3 – 5, 1996, resulting in a decrease in low-velocity and side-channel habitats favored by silvery minnows.

2. Corrales, Albuquerque, and Belen Levees: These levees contribute to floodplain constriction and habitat degradation for the silvery minnow. Levees at these sites contribute to the degradation of the environmental baseline by reducing the amount and quality of suitable habitat for the silvery minnow.

3. Water Management in the Middle Rio Grande by the Corps and Reclamation: Flood control operations at dams on the Rio Chama and Rio Grande have greatly reduced peak flows in the Rio Grande. The natural hydrograph sustained native vegetation and ecosystem processes that previously maintained habitat for the silvery minnow. Without peak flows, especially during spring, natural reproductive processes are disrupted and can be completely eliminated. These two combined impacts result in: (1) Changes in the channel dimension, pattern and profile; (2) disruption of spawning, could lead to severe silvery minnow population declines or extinction; and (3) a proliferation of non-native vegetation.

Water management has also resulted in adverse effects to silvery minnow habitat. Low quality habitat is created by the lack of peak and permanent flows, restriction of the floodplain by levees, and by the invasion of non-native vegetation. Dewatering miles of silvery minnow habitat causes direct mortality to the fish and fragments the habitat. Each life stage of the silvery minnow has specific requirements at precise times during the year. Water releases from dams often do not mimic the flows required to sustain each life stage. For example, if natural flows are reduced, then shallow water habitat that occurs near river fringes can become dewatered. This could result in only high-velocity habitats that will not support earlier life stages. If one life stage is adversely impacted, then the population as a whole is effected.

Because of the change in vegetation in the Rio Grande flood plain to salt cedar and the change in the water regime (e.g., dewatered river channel, lower flows, lack of high flows, improper timing), the wetted river channel will become narrower and deeper. Within the action area, open channel habitat, including the river and adjacent cleared areas, has been reduced from 7,648 acres (3,059 hectares) in 1935, to 3,352 acres (1,340 hectares) in 1989 (Crawford et al. 1993). This has resulted in a 56 percent reduction in suitable and potentially suitable habitat for the silvery minnow.

The continual loss of water from the river channel to the LFCC will result in further mortality of silvery minnows. Water management has resulted in dewatered habitat, causing direct mortality, and the resulting isolated pools have caused silvery minnow

mortality due to poor water quality (e.g., low dissolved oxygen and high temperatures) and predation from other fish and predators (e.g., birds, raccoons, etc.). The Rio Grande in the action area was severely dewatered in 1996. This represented about 34 miles (58 km) of dewatered habitat out of the 56 miles (90 km) from San Acacia Diversion Dam to Elephant Butte Reservoir. In 1997, water flows ceased at the south boundary of the BANWR, dewatering 14 miles (22.5 km) of habitat. In 1998, the Rio Grande was discontinuous within the BANWR, dewatering about 20 miles (32 km) of habitat. In 1999, flows ceased about one mile upstream of the BANWR boundary, dewatering about 24 miles (39 km) of habitat. A similar event occurred in 2000 but not to the extent of the 1999 drying. Silvery minnows residing in the reaches that dried were killed.

A regulated flow regime can preclude the spike in flows that may stimulate spawning. If peak flows occur at the wrong time, then suboptimal water temperatures could reduce egg and fry survival. Recruitment of fish will continue to be poor because eggs drift downstream to Elephant Butte Reservoir or to habitats that are consistently dewatered.

4. Low Flow Conveyance Channel Experimental Operations: In December 1994, Reclamation submitted a biological assessment addressing the diversion of water from the Rio Grande into the LFCC to study the effects of channel gradient and sedimentation on water delivery. The Federal action evaluated the alternative of installing a temporary outfall to the river and diverting water during spring runoff for three consecutive years. Experimental diversions into the LFCC began in May 1997 and continued through June 1997. Experimental diversions began again in early March 1998, and continued until the end of spring runoff. This resulted in the entrainment of silvery minnow eggs and subsequent recruitment of silvery minnow adults into the LFCC. Experimental operations began again on May 20, 2001. Since then, no entrainment of silvery minnows has been documented. This lack of entrainment has led to speculation that there was little or no spawning occurring in the upstream reaches.

5. Tiffany Plug Removal: This Reclamation project cut a pilot channel in the Rio Grande upstream of the bridge at San Marcial. The purpose of this project was to direct water flow through the excavation, rather than allow the water to flow into the adjacent floodplain, resulting in a straighter, narrower, and deeper channel. This caused the narrowing of the river channel which reduced the hydrologic diversity needed by the silvery minnow.

6. Temporary Channel to Elephant Butte Reservoir: This Reclamation project 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.

Measures were implemented to minimize impacts on the silvery minnow and flycatcher and their associated habitats and to enhance local riparian conditions. These environmental actions included: Adding sinuosity to the temporary channel; constructing the channel with variable width; constructing low water crossings along the temporary channel to allow overbank flows to inundate existing native riparian vegetation and encourage native revegetation; a channel widening project in the southern reach of the BANWR to improve aquatic and riparian habitat; and creation of an inflow channel to a portion of the eastern floodplain north of Black Mesa to encourage sediment deposition and new habitat creation.

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

8. Cochiti Fish Screens: This Corps project involved the repair of fish screens located on the headworks of the Sile and Cochiti Eastside Main Canals in the stilling basin of Cochiti Dam in November 1999. The repair work took approximately six hours per work day for four days and involved reducing outflow from Cochiti Dam to approximately 100 cfs during the six hours of work each day. Conditions that had to be met for the work to progress included: (1) A minimum 700 cfs release prior to and following the release reduction to 100 cfs for repairs; (2) the release reduction could not occur before 9:00 AM and could last for a maximum duration of six hours; (3) drawdown to 100 cfs for six hours could be undertaken only for two consecutive days, and additional repair and release reduction would be deferred to no more than two consecutive days the following week if needed; and (4) all repairs had to be completed prior to December 1, 1999, to minimize disturbance of bald eagles.

9. Silvery Minnow Augmentation: The Service completed an intra-Service section 7 consultation on the salvage and controlled propagation of silvery minnow in 2000. This consultation covered the collection of free floating silvery minnow eggs below the San Marcial Railroad Bridge and the collection of wild adult silvery minnows for spawning. This consultation set forth measures to limit silvery minnow mortality during collection and rearing.

10. Salvage of Silvery Minnows: The Service completed an intra-Service section 7 consultation of the salvage of silvery minnows from isolated pools in 2000. This consultation set forth measures to limit silvery minnow mortality during collection.

11. Creation of a Conservation Pool for Storage of Native Water in Abiquiu and Jemez Canyon Reservoirs and Release of a Spike Flow: The Conservation Water Agreement authorized storage of up to100,000 ac-ft in Abiquiu and Jemez Canyon Reservoirs to store native Rio Grande water that, if not stored, would otherwise have flowed downstream to Elephant Butte Reservoir and contributed to New Mexico's compact deliveries, 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.

12. Bosque del Apache National Wildlife Refuge Water Management Plan: BANWR completed an intra-Service section 7 consultation in May 2001, for the use of 869 ac-ft of their consumptive appropriation water right of 7,409 ac-ft from the Rio Grande for the years 2001 through 2004 to aid in maintenance of habitat for the silvery minnow if: (1) BANWR is presented with data indicating that the addition of limited Refuge water will foster survival of the species; (2) an equal or greater percentage of water by other water users in the Middle Rio Grande Valley is also contributed; and (3) legal permitting from the Office of the State Engineer is obtained prior to the emergency transfer request.

13. Programmatic Biological Opinion on the Effects of Actions Associated with the U. S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and non-Federal Entities' Discretionary Actions Related to Water Management on the Middle Rio Grande: The Service completed this BO on June 29, 2001, determining the effects of water management by the applicants on the silvery minnow and southwestern willow flycatcher. This BO had one RPA with several elements. These elements set forth a flow regime in the Middle Rio Grande and described many habitat improvements necessary to alleviate jeopardy to both the silvery minnow and flycatcher. This BO amendment temporarily modifies the June 29, 2001, programmatic BO.

There are 18 federally-recognized Indian Pueblos in the action area: Taos, Picurís, San Juan, Santa Clara, San Ildefonso, Pojoaque, Nambé, Tesuque, Jemez, Zia, Acoma, Laguna, Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia, and Isleta. The Pueblos hold and claim aboriginal, time immemorial, reserved, and in some instances contract water rights that are recognized and protected under Federal law. With respect to the six Middle Rio Grande Pueblos (Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia, and Isleta), a certain portion of their water rights is statutorily recognized under the Act of March 13, 1928, 42 Stat. 312, and the Act of August 27, 1935, 49 Stat. 887. These Acts of Congress do not establish the full extent of the water to which these Pueblos are entitled. In addition, the Navajo Nation and certain Navajo allottees hold aboriginal, time immemorial, or reserved water rights within the action area.

The Jicarilla Apache Nation (Nation) has existing uses of water rights in the Rio Grande Basin, including rights under a Federal settlement contract and legislation and a partial final decree in the Rio Chama adjudication. The Nation received a Congressionally authorized and approved perpetual contract for the diversion and depletion of 6,500 ac-ft per year of SJC Project water as part of the settlement of its water rights claims in 1992. The Nation became entitled to those rights in April 1999, when the conditions of the settlement contract were fulfilled. Beginning in 1997, this water has been consumptively used through exchanges with the MRGCD by Reclamation with the Nation's consent.

In the Rio Chama Basin, the Nation also has adjudicated water rights for historic and existing uses on Reservation lands. The Nation's reserved water rights for historic and existing uses total an annual diversion of 65.14 ac-ft or the quantity of water necessary to supply an annual depletion of 40.32 ac-ft, whichever is less, and a net evaporation of 1,786.85 ac-ft. The Nation's water rights for historic and existing uses perfected under state law and located within the lands proclaimed as part of the Reservation on September 13, 1988, total an annual diversion of 1,492.93 ac-ft or a quantity of water necessary to supply an annual depletion of 1,095.01 ac-ft, whichever is less, and a net evaporation of 765.74 ac-ft.

In summary, the remaining population of the silvery minnow is restricted to five percent of its historic range. Every year since 1996, there has been at least one drying event in the river that has further reduced the silvery minnow population. Mortality estimates for the April 1996, dewatering event have been as high as two-thirds of the silvery minnows present in the San Acacia Reach, which would represent 47 percent of the total range-wide population. The consequences of the 1996 mortality event are currently unknown, but the species' near-term status, and likely long-term recovery potential were adversely affected. Dead silvery minnows have been documented in a dry riverbed in 1999, 2000, 2001, and 2002 (Platania and Dudley 1999; J. Smith, NMESFO, pers. comm. 2002; U.S. Fish and Wildlife Service 2002).

Data collected during the summer of 2000 indicate a near-absence of Age 0 silvery minnows in the Middle Rio Grande, suggesting that the population has dramatically decreased since 1999 (Smith and Jackson 2000, Hoagstrom and Brooks 2000). There was a slight increase in silvery minnow abundance in the Albuquerque and Isleta Reaches in 2001. The population is unlikely

to naturally expand its distribution, because three diversion dams currently block upstream movement. Augmentation in the Albuquerque Reach has improved minnow distribution in upstream reaches and augmentation activities are scheduled to continue. Water withdrawals from the river and water releases from dams severely limit the survival of silvery minnows. The consumption of 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 2002a). 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 ac-ft per year (City of Albuquerque, *in litt*., 2002).

IV. EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that 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.

Direct Effects on the Species

The proposed action is to manage water, in light of current drought conditions, in the most effective and efficient manner to benefit the silvery minnow without precluding water management options in the future should drought conditions persist. It is estimated that the proposed action will dewater a total of approximately 105 river miles in the San Acacia and Isleta Reaches from its inception until approximately October 1, 2002. After October 1, an additional 23 river miles may become dewatered in the Albuquerque Reach until late 2002. The amount of river dewatering after October 1, depends on precipitation and the ability of the action agencies to lease available supplemental water. Without precipitation or supplemental water, the proposed action will dewater 128 river miles out of the approximately 180 river miles of the currently occupied range of the silvery minnow. This equates to dewatering approximately 71 percent of currently occupied habitat.

In the Albuquerque Reach after October 1, it is likely that, without supplemental water or precipitation, flowing water will only reach to just above the U.S. 550 crossing near the town of Bernalillo. The Biological Assessment states that river flow would then resume below the City of Albuquerque wastewater return, south of the Rio Bravo Bridge, and would likely reach Isleta Diversion Dam. This would result in only about 21 of 40 miles in the Albuquerque Reach having flowing water.

Therefore, the proposed action is likely to impact a significant portion of the remaining wild population of silvery minnows in the Middle Rio Grande. This conclusion is based on the fact that since the mid-1990s, silvery minnows have only been collected in the Albuquerque, Isleta, and San Acacia Reaches of the Middle Rio Grande. Silvery minnows have not been collected in

the Cochiti Reach since 1994 (Platania 1995), because there has not been access to the Tribal lands north of the Angostura Diversion Dam to permit adequate sampling. Silvery minnows are assumed to exist within this short reach of river (22.9 river miles); however, no recent information is available to determine the exact status of the species in the Cochiti Reach. All recent available information on the silvery minnow population is from the Albuquerque, Isleta, and San Acacia Reaches, where the fish will be more adversely affected under the proposed action than the Cochiti Reach. Although no conclusive population estimates for the silvery minnow can be calculated at this time, it can be estimated through long-term population monitoring that the majority of the silvery minnow population persists below San Acacia Diversion Dam (Dudley and Platania 1997).

In 2002, over 5,500 silvery minnows were released into the Albuquerque Reach by the Service (J. Brooks, NMFRO, pers. comm. 2002, J. Smith, NMESFO, pers. comm. 2002). Approximately 2,500 of these were marked fish from propagation facilities and 3,000 of these were silvery minnows salvaged during drying events in the Isleta and San Acacia Reaches. It is likely that these individuals may again be stranded in isolated pools after October 1. Therefore, they may need to be salvaged and moved to flowing water. With repeated capture and release, these fish may become less likely to survive and reproduce in the wild after the implementation of the proposed action.

Indirect Effects on the Species

The primary indirect effect of the proposed action is that, due to the likelihood of dewatering the Albuquerque, Isleta, and San Acacia Reaches, augmentation of silvery minnows from propagation units to any reach will not be possible until March or April of 2003, at the earliest. Releases by the Service were planned to occur in fall 2002. Augmentation will likely be postponed until the snowpack/runoff prediction is made for spring 2003. If runoff conditions are similar to those of winter 2002, no silvery minnows will be released into the Middle Rio Grande until after spring 2003, further postponing augmentation.

Effects on Proposed Critical Habitat

The proposed action will adversely affect three of the four primary constituent elements of proposed critical habitat for the silvery minnow. These three elements require water to provide the essential habitat necessary to ensure the conservation of the silvery minnow. The first primary constituent element provides water of sufficient flows to reduce the formation of isolated pools. The second primary constituent element provides low velocity habitat necessary for development and hatching of eggs and the survival of the silvery minnow from larvae to adult. The fourth primary constituent element provides protection from degraded water quality conditions, such as, the increasing water temperatures, pH, or decreasing dissolved oxygen found in isolated pools during river drying events.

Under the proposed action, up to 128 river miles will be dewatered out of the 212 river miles proposed as critical habitat. However, proposed critical habitat is described in the proposed rule as ending at the headwaters of Elephant Butte, a location that regularly changes with reservoir levels. Currently, there are approximately 180 river miles of proposed critical habitat. This means that approximately 71 percent of proposed critical habitat will lack 3 of the 4 primary constituent elements for up to 100 days that provide the essential habitat necessary to ensure the conservation of the silvery minnow. Furthermore, the effects of this action may not be readily apparent or quantifiable within the duration of this action and may extend beyond rewetting of the proposed critical habitat. Such effects may include, but are not limited to: Reduction in the productivity of the dewatered and rewet reaches, which may limit or severely reduce food for the silvery minnow; alteration or elimination of debris piles or other habitat structures necessary to the silvery minnow during the winter; and possible lowering of the ground water table, necessitating increased quantities of water for rewetting the dewatered reaches and recovery of continuous flow.

V. Conclusion

Current severe drought conditions in the Middle Rio Grande Valley and surrounding areas rival that of the worst droughts in recorded history. Throughout the past several months, Reclamation has had to continually modify its projections for inflow into the reservoirs. Although Reclamation has worked to maintain flows in the river commensurate with the June 29, 2001, programmatic BO, and has implemented elements of the RPA outlined in that BO, it has become clear that they will not be able to maintain flows as planned due to below average snowpack and monsoonal precipitation. After reviewing the current status of the silvery minnow, the environmental baseline for the action area, the effects of the proposed water operations, and the cumulative effects, and in light of the existing severe drought conditions, it is the Service's biological opinion that water operations of the Middle Rio Grande, as proposed, are likely to jeopardize the continued existence of the silvery minnow.

The silvery minnow now occupies less than five percent of its historic range and the entire extant population exists within the action area. Dam operations result in reduced sediment and water temperatures that cause habitat degradation and loss. Dewatering of river reaches traps and subsequently kills silvery minnows in isolated pools. Dewatering decreases water quality and quantity and availability of forage items and removes shelter. Under the proposed action, the majority of the Isleta and San Acacia Reaches could be dewatered, killing a significant number of silvery minnows. Without any additional supplemental water, approximately 128 of 180 miles (71 percent) of river may dry after October 1, subsequently trapping silvery minnows in isolated pools and killing them. Under the proposed action, river drying could occur to an extent that could result in the loss of all silvery minnows within the Isleta and San Acacia Reaches.

Based on our analysis, the Service has determined that the effects of the proposed water operations and the cumulative effects are likely to adversely modify the proposed critical habitat for the silvery minnow. While the Act does not preclude an agency from taking an action with

such adverse effects on proposed critical habitat, if the critical habitat is designated prior to the completion of the action, or while the agency still maintains discretionary authority relative to the action, they may be required to modify or suspend the action at that time pending resolution of the formal consultation under section 7.

Based upon the information provided by Reclamation, our own information, and the information provided by interested parties to this consultation regarding the status of the silvery minnow, we find ourselves in a position seldom, if ever, encountered by the Service in evaluating a project under the Act.

Since the Service released its June 29, 2001 programmatic BO, which was upheld by the Federal District Court on April 19, 2002, Reclamation has operated the Middle Rio Grande Project in compliance with that BO. The minor deviation from flows that occurred in June were within Reclamation's management prerogative so long as the incidental take authorized was not exceeded. It was not. Therefore, the analysis must be directed at evolving conditions that have exacerbated habitat management in the river and have created circumstances that, barring unexpected precipitation, preclude continued adherence to the June 29, 2001, BO.

Snowpack and precipitation were very low this year; thus, throughout the summer Reclamation has continually had to modify its projections for inflow into the reservoirs because this drought has apparently surpassed the dire times of 1956, which is considered the historic drought of record. On August 30, 2002, Reclamation submitted a request for reinitiation due to these unique circumstances resulting from the prevailing drought conditions. The Service recognizes that water management and biological opinions are a prediction into the future. Earlier this year, meteorologists were stating that the normal circumstance following a very dry winter was an early onset of the monsoon season. Based on these meterological predictions, we expected the monsoon season to provide flows to the middle and lower stretches of the river through runoff and more inflow into the upstream reservoirs that would have made it possible to continue to operate under the June 29, 2001, programmatic BO. Instead, we have been faced with perhaps the worst drought in recorded history.

Due to the current drought conditions, Reclamation is unable to meet the flow requirements in the June 29, 2001, programmatic BO with its acquired supplemental water. According to Reclamation, the only remaining substantial pools of water are those in Heron Reservoir and the permanent pool in Cochiti Reservoir. It is the Service's understanding that the pool in Cochiti Reservoir is not legally available for use as supplemental water to benefit the silvery minnow. Thus, according to Reclamation, it will run out of its purchased supplemental water supplies by mid or late September, unless either: (1) Additional sources of supplemental water are acquired or used to benefit the silvery minnow, or (2) Reclamation uses the water in Heron Reservoir. According to Reclamation, there is little to no available supplemental water owned by entities from which Reclamation could acquire, save for water owned by the City of Albuquerque and stored in Abiquiu Reservoir.

The Service does not believe that the use of water in Heron Reservoir to benefit the silvery minnow during the remainder of this 2002 drought year is in the best interest of the long-term survival and recovery of the silvery minnow. According to information provided by Reclamation, models indicate that even a one time use of 20,000 ac-ft of water out of Heron Reservoir could result in the drying of Heron Reservoir within 10 years if weather conditions are analogous to the drought period of 1946 to 1956 (Reclamation 2002b). Meteorological predictions appear to indicate that we are actually entering a dry weather cycle, not a wet one. The Service is concerned that the use of water from Heron Reservoir this year, combined with another dry year in 2003, could result in severe river conditions in the future that might call for massive fish salvage from the Rio Grande if significant portions of the river go dry.

The potential for severe river conditions in 2003 is compounded by the Rio Grande Compact of 1938 between the States of Colorado, New Mexico, and Texas. Under Article VII of the Compact, New Mexico has to stop storing native water in reservoirs constructed after 1929 if less than 400,000 AF of usable Rio Grande Project water is available at Elephant Butte and Caballo Reservoirs. Article VII was triggered in early July 2002. According to Reclamation and the State of New Mexico, it would take a well-above average amount of snowfall this winter to increase the amount of Rio Grande Project storage significantly enough to lift the Article VII restriction next year, which is highly unlikely. However, Article XVI of the Compact states that, "Nothing in this Compact shall be construed as affecting the obligations of the United States of America to Mexico under existing treaties, or to the Indian Tribes, or as impairing the rights of the Indian Tribes." Thus, it is the Service's understanding that Reclamation will continue its operations at El Vado Reservoir, under existing agreements, to store water in El Vado to ensure delivery of the water rights of the six Middle Rio Grande Pueblos (Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia, and Isleta). Thus, except for this storage, no storage of snowmelt runoff will likely occur in most of the reservoirs on the Middle Rio Grande, making it very difficult for Reclamation to provide water or manage the river to benefit the silvery minnow.

In evaluating alternative approaches for the long-term survival of the silvery minnow, the Service needs to look at the life cycle of the fish and its habitat needs. First, for a short-lived fish such as the silvery minnow it is crucial that the species has a successful reasonable spawn in late May and/or early June. This was achieved in 2002 through the pulse flow that was released on May 13, 2002 by the U.S. Army Corps of Engineers. Approximately 750,000 silvery minnow eggs were collected and transported for hatching in captivity to ensure the highest level of successful hatching. The next critical life stage is that of recruitment. In order to have replacements for adult mortality (both natural and man made), there must be reasonably healthy recruitment of juveniles into the adult population. By adhering to the June 29, 2001, programmatic BO, it appears that Reclamation may have kept conditions adequate for successful recruitment to have occurred this year. Thus, as fish are salvaged from the river, we have found healthy juveniles as well as adults (J. Smith, NMESFO, pers. comm. 2002).

Finally, carrying over adults and recruits into the silvery minnow population from October to May could be considered the survival stage. It is this stage of the life cycle that would be

impacted by Reclamation's proposed action in its August 30, 2002, memorandum. Thus, the impacts to this life stage of the silvery minnow population by not extending river flows an additional 30 to 60 days in 2002 must be weighed against the long-term needs of the species. In particular, the use of water stored in Heron Reservoir now could reduce the availability of water and/or options to ensure the successful spawning and recruitment of the silvery minnow next year, and perhaps future years, if the drought continues.

The Service has carefully considered the use of water stored in Heron Reservoir for the silvery minnow during the time period covered by the proposed action. According to Reclamation, the City of Albuquerque, and the New Mexico Interstate Stream Commission, using water from Heron Reservoir will have significant long-term impacts to project operations. The long-term survival of the silvery minnow depends heavily on the now-altered system of stored water and the ability to replenish water used from storage. Given the Article VII Compact restrictions on storage, the prediction of a continued drought, and the extreme biological importance of annual spawning in the short life cycle of the silvery minnow, the Service believes it is prudent to reserve the water in Heron Reservoir until the use of that water becomes absolutely necessary to ensure a spawn in the river.

Part of Reclamation's proposal includes continued operations for the six Pueblos' prior and paramount water rights. This operation would deliver a total of approximately 1,700 ac-ft stored in El Vado Reservoir to supply these senior water rights through early November 2002. This amount of water falls far short of the flows deemed necessary to avoid jeopardizing the silvery minnow and would only last for a short period if left in the system (Reclamation, *in litt.*, 2002). Therefore, the Service does not believe that continued prior and paramount operations would result in further negative effects to the species.

The Service recognizes that under current irrigation operations, the delivery of irrigation water and associated return flows play an important role in supporting fish survival in the lower reaches of the river. Irrigation water deliveries to MRGCD and the six Middle Rio Grande Pueblos provide "carriage" water that facilitates the more efficient delivery of supplemental water to benefit the silvery minnow.

Finally, there are some positive operational aspects that are unique to the silvery minnow. There are currently approximately 150,000 – 200,000 silvery minnow safely held in captivity in at least five different locations that can be stocked in the river to augment populations when water conditions allow. The staff at the City of Albuquerque Biological Park, New Mexico State University, the New Mexico Department of Game and Fish, and the Service's National Fish Hatcheries have all worked extremely well together to develop means to induce spawning in captivity, raise the young to recruitment age, and on to adulthood if necessary. These partners deserve considerable recognition for their efforts to conserve the silvery minnow. However, as stated in our Policy Regarding Controlled Propagation of Species Listed Under the Endangered Species Act (65 FR 56916), controlled propagation is not a substitute for addressing factors responsible for an endangered species' decline. Although controlled propagation has a

supportive role in the recovery of some listed species, the intent of the Act is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." Therefore, our first priority is to recover wild populations in their natural habitat wherever possible, without resorting to the use of controlled propagation. While we do not believe controlled propagation can be considered a long-term solution, the fact that we can ensure the silvery minnow's survival during this drought of record through artificial assistance is an extremely valuable tool.

Therefore, given the above, what is the best course of action to ensure prudence in the conservation and protection of the silvery minnow? The options are few and not desirable. However, they reflect choices that come with the worst drought on record. The Service believes Reclamation should continue to store the existing water in Heron Reservoir so as not to preclude the future use of this water to benefit the silvery minnow. Reclamation cannot be held responsible for the drought. Its management of the river thus far has complied with the June 29, 2001 programmatic BO.

VI. Reasonable and Prudent Alternative

Regulations (50 CFR §402.02) implementing section 7 of the Act define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) Can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

Due to the extraordinary circumstances described in this BO, the Service has determined that there is no reasonable and prudent alternative to Reclamation's proposed action that would alleviate jeopardy to the silvery minnow or adverse modification to its proposed critical habitat.

VII. Incidental Take Statement

This biological opinion finds the proposed action will result in jeopardy to the species and destruction or adverse modification of critical habitat, and no reasonable and prudent alternative can be identified. Any incidental taking is prohibited by section 9 of the Act .

VIII. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act 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 the proposed action on the silvery minnow and its proposed critical habitat, to help implement recovery plans, or to develop information.

Because of the unusual circumstances and potentially dire effects to the silvery minnow, the Service strongly urges Reclamation to implement the following conservation recommendations. Implementation of Conservation Recommendations that involve access to Indian Pueblo or Tribal lands requires the consent of the affected Indian Pueblo or Tribe. If implementation of Conservation Recommendations may affect Indian Pueblo or Tribal trust resources, then government-to-government consultation is required. Conservation recommendations described in the June 29, 2001, programmatic BO still apply to this amendment. The Service recommends that Elements E – N of the RPA of the June 29, 2001, programmatic BO continue to be implemented. In addition, the Service recommends the following actions:

(A) Reclamation should cooperate with the MRGCD to use irrigation drains and other works operated by MRGCD in a manner likely to provide refugia in the river for the silvery minnow. Potential works that may be used include, but are not limited to: The Central Wasteway north of Central Bridge, the Peralta Wasteway, Lower Peralta Riverside Drain, and the Lower San Juan Riverside Drain.

(B) Reclamation should work with the State of New Mexico and other appropriate parties to prevent unauthorized use of surface water intended for silvery minnow conservation within the Rio Chama and Middle Rio Grande watersheds.

(C) Reclamation should cooperate with the Service to ensure that any water available to be pumped from the LFCC to the river will be used for maintenance of the silvery minnow to the maximum extent possible. In case of disagreement, the Service should determine where pumping will occur. Reclamation should investigate and implement measures that would increase their ability to pump from the LFCC, such as improving efficiency of check dams and lowering pumps into areas with water.

(D) Reclamation, in coordination with the Corps, should manage any left over supplemental water after October 31, in a manner that most benefits the silvery minnow. Any remaining supplemental water should be released after November 1, 2002, to benefit the silvery minnow until base flow is reached with 50 cfs at the San Marcial gage for a minium of 7 days or until supplemental water is exhausted.

(E) Reclamation should cooperate with the Service to: (1) Release eggs, embryos, or larvae from propagation facilities into the Isleta Reach during spring and summer of 2003, depending on availability and river flows; (2) study the most effective ways to reduce entrainment in the future; and (3) reduce entrainment of silvery minnow eggs into the Isleta Diversion Dam. This could be accomplished in coordination with MRGCD and Isleta Pueblo.

(F) Reclamation should ramp down the release of supplemental water for the minnow to create a manageable recession, with a target of no more than 4 miles of river drying per

day in the Isleta Reach. This will allow for the salvage of silvery minnows and adequate coverage for monitoring effects of the drying.

(G) When flows in the river are appropriate for release of silvery minnows, Reclamation should continue to fund augmentation within the Albuquerque, Isleta, and San Acacia Reaches.

(H) Reclamation, in coordination with the Corps, should provide all necessary funding for NEPA compliance associated with 10(j) reintroduction of silvery minnows within their historic range.

(I) Reclamation, should coordinate with the Corps and the Interstate Stream Comission, to destabilize islands by plowing or disturbance in the Albuquerque, Isleta, and San Acacia Reaches. This would provide new low-velocity habitat in the existing river channel without use of large mechanical or engineering processes. The islands proposed for removal should be agreed upon by the Service, Reclamation, and the Corps. Total acreage reclaimed should exceed 180 acres in each reach and should not adversely affect southwestern willow flycatcher habitat. Reclamation should cooperate with the Service to identify areas of the floodway for destabilization activities.

(J) Reclamation, in coordination with the Corps, should provide assistance to rehabilitate the soils and vegetation and to restore natural processes in areas where salt cedar has been or will be treated with Arsenal or other means of removal, including but not limited to correcting pH, salinity, other soil characteristics, revegetation with native riparian plants, and bank lowering to restore overbank flows.

(K) Reclamation, in coordination with the Corps, should implement one silvery minnow habitat improvement project in each of the Cochiti, Albuquerque, Isleta, and San Acacia Reaches. Examples of potential improvements include jetty jack removal, bank destabilization, creation of side channels and oxbows, and replacement of non-native vegetation with native woody riparian species. Vegetation removal projects should not adversely affect southwestern willow flycatcher habitat. Each improvement should equate to no less than one kilometer in length or one square kilometer, depending on the most appropriate metric for the project. These habitat restoration activities could be completed in combination with activities listed under Conservation Recommendation I.

(L) Reclamation, in coordination with the Corps, Pueblos, and other interested parties, should increase sediment transport from the Cochiti, Jemez, and Galisteo Reservoirs, as well as other sources, to the upper reaches of the river.

(M) Reclamation, in coordination with the Corps, should cooperate under the direction of the Service's silvery minnow rescue coordinator to salvage silvery minnows from isolated

pools and a receding river. This would reduce adverse effects to the silvery minnow to the maximum extent practicable.

(N) Reclamation, in coordination with the Corps, should work with the State to continue gaging diversions and returns to the Rio Grande, Rio Chama, and tributaries from the Colorado/New Mexico State line to Elephant Butte Reservoir. This would benefit the species by providing the Service with information on river conditions on a daily basis and facilitating rescue/salvage actions.

(O) Reclamation, in coordination with the Corps, should provide both in-kind services and monetary assistance to the Service for salvage operations related to this action.

(P) Reclamation, in coordination with the Corps and the Service, should survey the river for isolated pools in the San Acacia and Isleta Reaches in areas likely to become intermittent at least four times each week from when this BO is finalized through December 31, 2002, and count and salvage any silvery minnows present. Reclamation, in coordination with the Service, should also survey the river daily (once every 24 hours) as flows recede and count and salvage any silvery minnows present. For silvery minnows salvaged, a monthly report should be prepared and provided to the Service containing the date, number of fish salvaged, the location in which salvage occurred in latitude and longitude, and the deposition of salvaged fish.

(Q) Reclamation, in coordination with the Corps, should provide overtime funding for Service personnel for silvery minnow salvage since additional staff cannot be hired on such short notice.

(R) Reclamation, in coordination with the Corps, should fund the rental/purchase of field vehicle(s)/equipment for silvery minnow salvage.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

The nearest Service Law Enforcement Office must be notified within 24 hours in writing should any listed species be found dead, injured, or sick. Notification must include the date, time, and location of the carcass, cause of injury or death (if known), and any pertinent information. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. If necessary, the Service will provide a protocol for the handling of dead or injured listed animals. In the event any party to this consultation suspects that a species has been taken in violation of Federal, State, or local law, all relevant information should be reported in writing

within 24 hours to the Services New Mexico Law Enforcement Office (505/346-7828) or the New Mexico Ecological Services Field Office (505/346-2525).

Reinitiation Notice

This concludes formal consultation on the action(s) outlined in your August 30, 2002, request. As provided in 50 CFR § 402.16, reinitiation 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) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this BO; or (3) a new species is listed or critical habitat designated that may be affected by the action. This consultation is valid until: (1) December 31, 2002, or (2) on whatever date prior to December 31, 2002, base flows are commensurate with the June 29, 2001, programmatic BO for a minimum of 7 days without the influence of precipitation. Under either of these conditions, Reclamation must comply with the June 29, 2001, programmatic BO. If the requirements of the June 29, 2001, programmatic BO can not be met after December 31, 2002, consultation must be reinitiated prior to the expiration of this BO to ensure continued compliance with sections 7 and 9 of the Act. Updates of any environmental commitments may require reinitiation of consultation. An increase in net depletions within the action area may also result in the need to reinitiate consultation.

In future correspondence on this project, please refer to consultation number 2-22-02-F-608. Please contact Dr. Joy Nicholopoulos of our New Mexico Ecological Services Field Office at 505-346-2525, if you have any questions or would like to discuss any part of this BO.

Sincerely,

/s/ H. Dale Hall

H. Dale Hall
Regional Director

cc: Field Supervisor, New Mexico Ecological Service Field Office, Albuquerque, NM
Assistant Regional Director, U. S. Fish and Wildlife Service, Region 2 (ES), Albuquerque, NM
Regional Section 7 Coordinator, U. S. Fish and Wildlife Service, Region 2 (ES), Albuquerque, NM

Literature Cited

All other literature citations are available in the appended June 29, 2001 Biological Opinion with the following exceptions:

City of Albuquerque. 2002. *In litt*.: Comments on Draft Biological Opinion and Conference Report on U.S. Bureau of Reclamation's Amended Water Management Operations on the Middle Rio Grande through December 31, 2002.

Papadopulos, S. S. 2000. Water supply study of the Middle Rio Grande for the U. S. Army Corps of Engineers and the New Mexico Interstate Stream commission. July 26, 2000.

Platania, S. P. 1995. Ichtyofaunal survey of the Rio Grande, Santo Domingo and San Felipe Pueblos, New Mexico, July 1994. Report to U.S. Army Corps of Engineers, Albuquerque, New Mexico.

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. 2002a. Spatial Spawning Periodicity of Rio Grande silvery minnow during 1999. American Southwest Ichthyological Research Foundation, 4205 Hannett Avenue NE, Albquerque, New Mexico 87110-4941.

Platania, S. P. 2002b. Spatial Spawning Periodicity of Rio Grande silvery minnow during 2001. American Southwest Ichthyological Research Foundation, 4205 Hannett Avenue NE, Albquerque, New Mexico 87110-4941.

Platania, S. P. 2002c. Rio Grande silvery minnow population monitoring 2002. www.uc.usbr.gov/progact/rg/rgsm2002/index.html.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, 1481 Stevens Lake Road, Pagosa Springs, Colorado

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. 2000. Memorandum to Rio Grande Researchers from New Mexico Fishery Resources Offices, entitled *Egg Collections at San Marcial Railroad Crossing*. May 12, 2000. 1 pg.

U. S. Bureau of Reclamation. 2002a. Draft Environmental Impact Statement for the City of Albuquerque Drinking Water Project.

U.S. Bureau of Reclamation. 2002b. Draft Heron Reservoir Projected Content Graphs.

U.S. Bureau of Reclamation. 2002. *In litt.*: Information on prior and paramount deliveries. September 12, 2002.

U.S. Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Rio Grande Silvery Minnow. Federal Register 64:36271-36290.

U.S. Fish and Wildlife Service. 2000. Policy regarding controlled propagation of species listed under the Endangered Species Act. Federal Register 65:56916-56922.

U.S. Fish and Wildlife Service. 2002a. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Rio Grande Silvery Minnow. Federal Register 67:39206-39235.

U.S. Fish and Wildlife Service. 2002b. Report to the Rio Grande Compact Commission, U.S. Fish and Wildlife Service Activities in the Rio Grande Basin Calendar Year 2001. Prepared for the Rio Grande Compact Commission by the New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

Watts, H. E., C. W. Hoagstrom, and J. R. Smith. 2002. Observations On Habitat Associated with Rio Grande Silvery Minnow, *Hybognathus amarus*. U. S. Fish and Wildlife Service, New Mexico Fishery Resources Office, Albuquerque, New Mexico.

APPENDIX I

June 29, 2001, Programmatic Biological Opinion

APPENDIX II

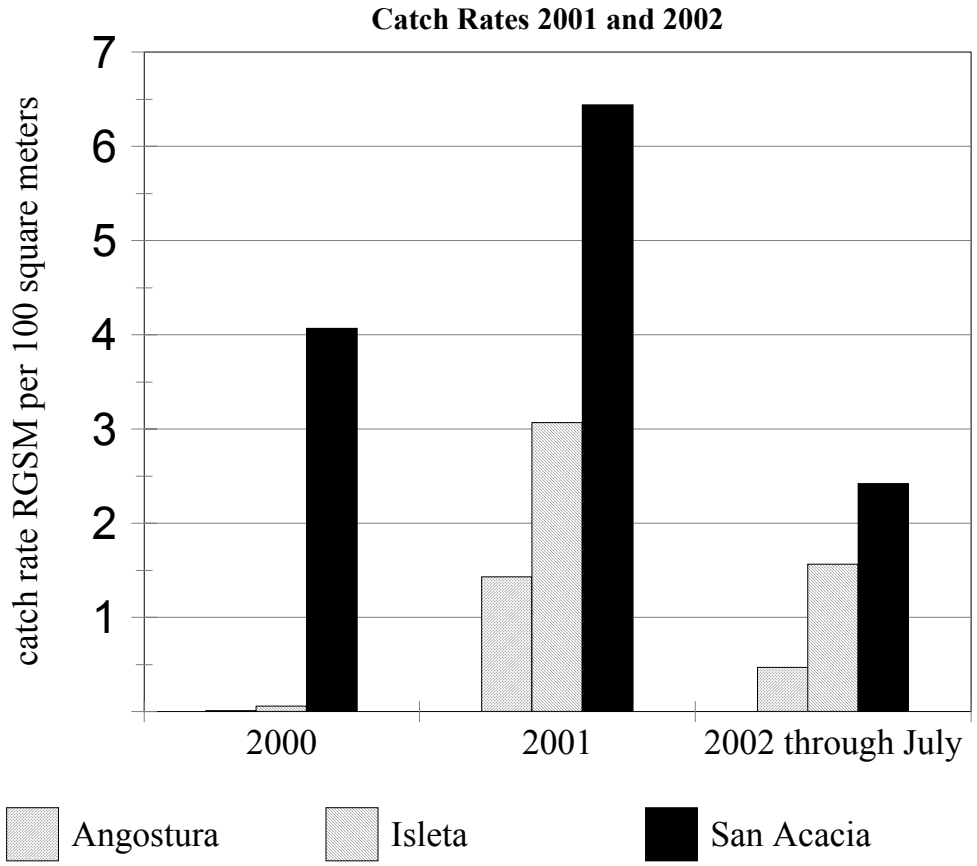

Figure 3. Comparison of total catch rates between 2000 and 2002 in the Angostura, Isleta, and San Acacia Reaches. *Note: Data from 2002 is only from January to July. These data are not indicative of the entire year and are presented only for relative comparison. Data source is Dudley and Platania for 2000, 2001, and 2002. Dudley and Platania data for 2002 are preliminary and subject to change.*

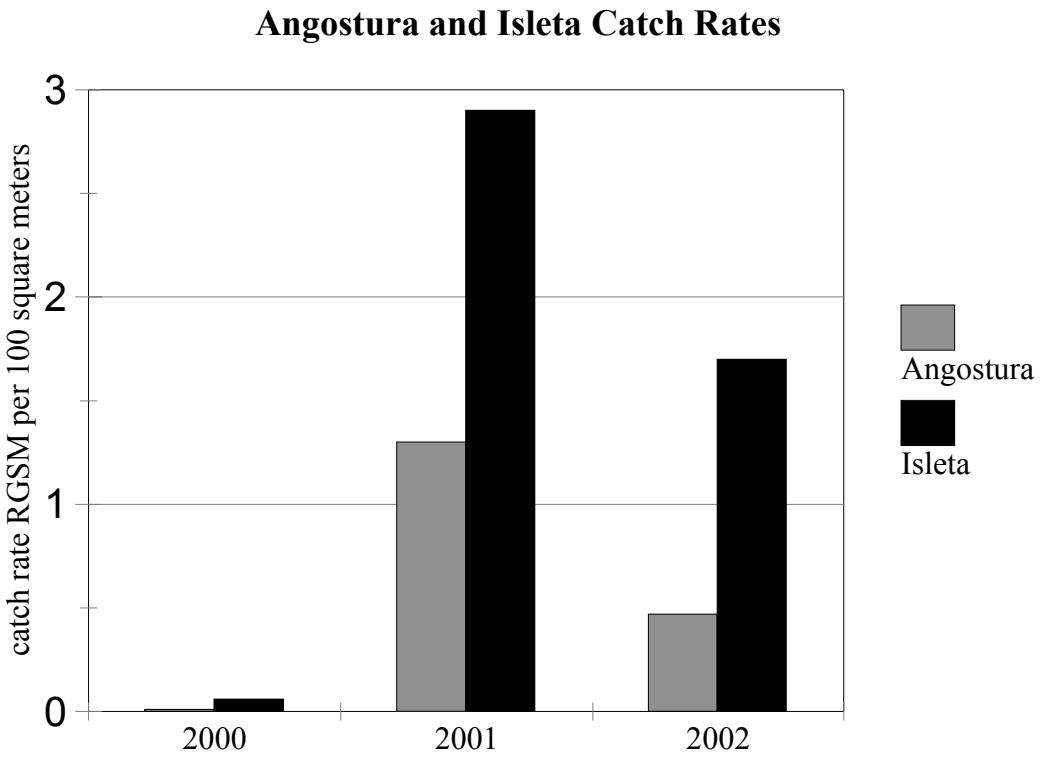

Figure 4. Comparison of catch rates between 2000 and 2002 in the Angostura and Isleta Reaches. *Note: Data from 2002 is only from January to June. These data are not indicative of the entire year and are presented only for relative comparison. Data source is Dudley and Platania for 2000, 2001, and 2002. Dudley and Platania data are preliminary and subject to change.*

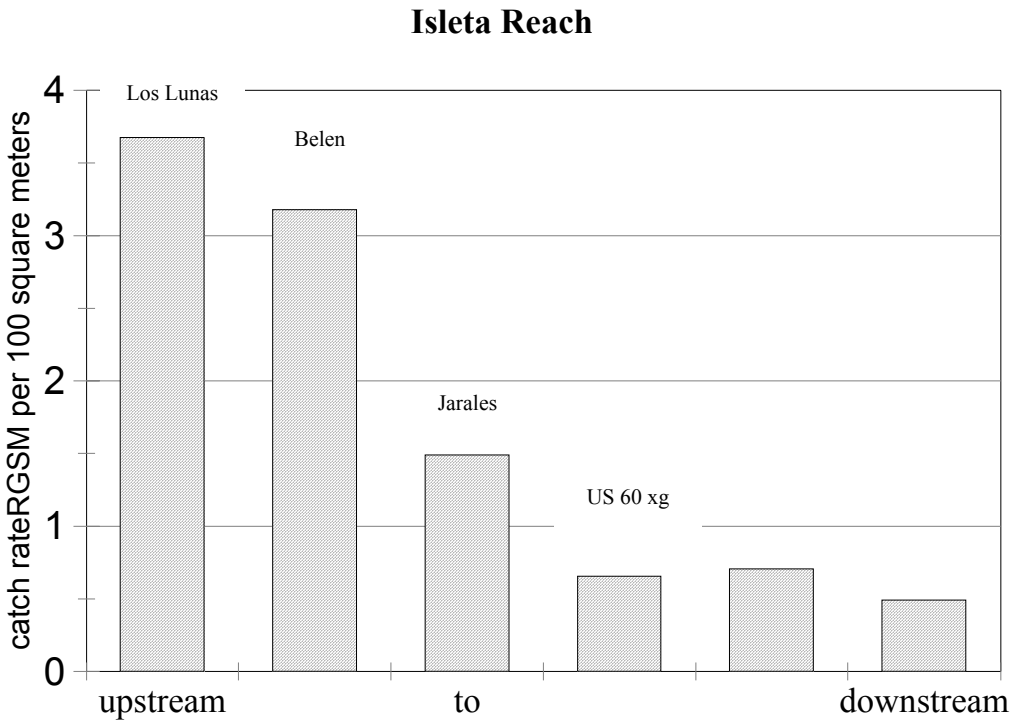

Figure 5. Catch rates for Isleta 2002, upstream to downstream. Data from 2002 is only from January to June therefore, these data are not indicative of the entire year and are presented only for relative comparison. Data source is Dudley and Platania (2001 and 2002). These data are preliminary and subject to change

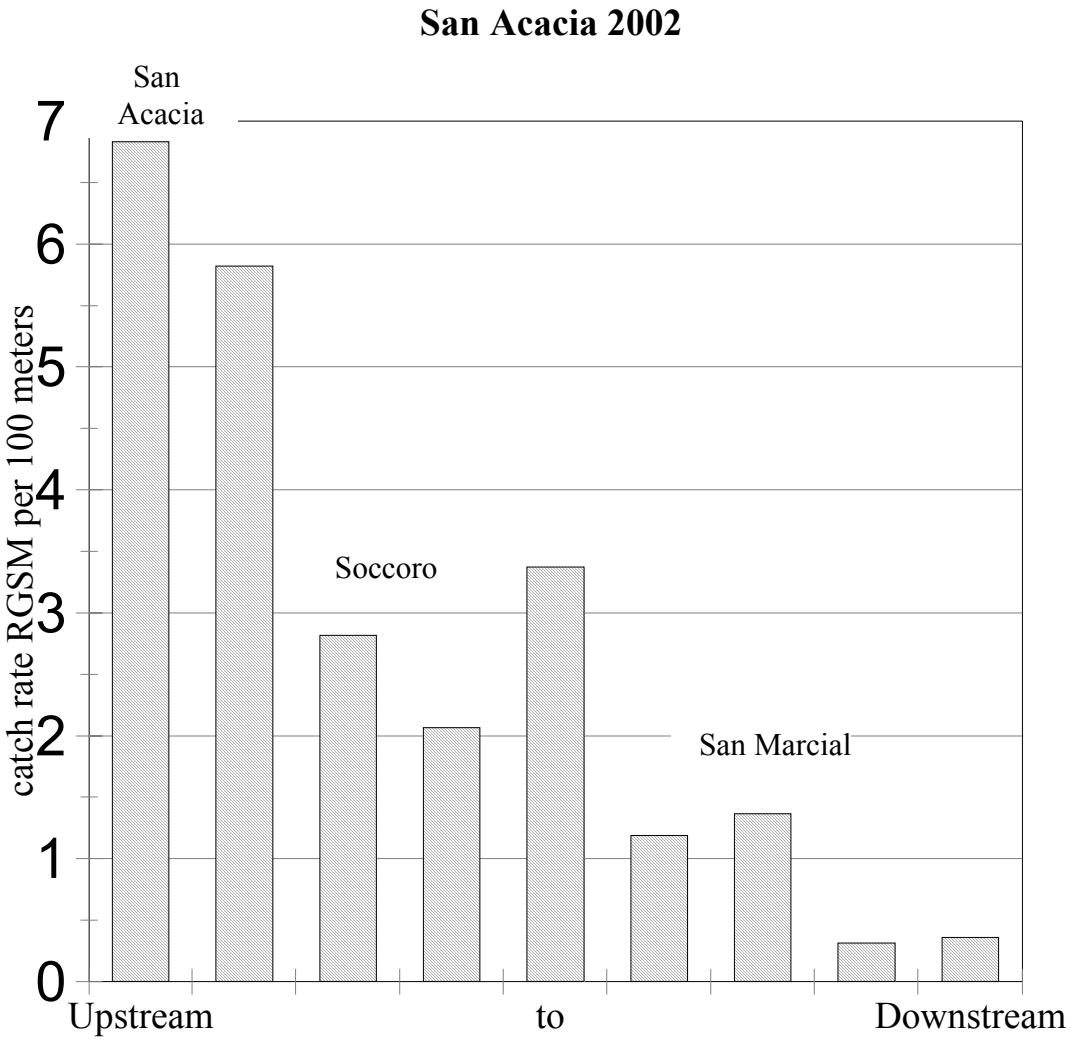

Figure 6. Catch rates for San Acacia 2002, upstream to downstream. Data from 2002 is only from January to June, therefore, these data are not indicative of the entire year and are presented only for relative comparison. Data source is Dudley and Platania (2001 and 2002). These data are preliminary and subject to change.