United States Department of the Interior

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May 21, 2001

Cons. # 2-22-01-F-221

Memorandum

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

From: Field Supervisor, New Mexico Ecological Services Field Office

Subject: Biological Opinion on Reclamation's 2001 Discretionary Actions Related to Water Management on the Pecos River, New Mexico

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the Bureau of Reclamation's (Reclamation) "Proposed Pecos River 2001 Irrigation Season Operations on the Pecos Bluntnose Shiner" (*Notropis simus pecosensis*) and its designated critical habitat in accordance with section 7 of the Endangered Species Act (ACT) of 1973, as amended (16 U.S.C. 1531 *et seq*.). The Service received Reclamation's request for formal consultation for Pecos River water operation for irrigation season 2001 on February 15, 2001. The Service initiated formal consultation on March 6, 2001. A complete administrative record of this consultation is on file at the New Mexico Ecological Services Field Office.

Reclamation has determined that the proposed Sumner Dam 2001 irrigation season water operations action is "likely to adversely affect" the Pecos bluntnose shiner (bluntnose shiner), and "may affect, but is not likely to adversely affect" its critical habitat. According to the biological assessment (BA), the anticipated adverse effects to the bluntnose shiner will result from block releases of irrigation water longer than 4 to 6 days, which will transport bluntnose shiner eggs and larvae into Brantley Reservoir. The eggs and larvae will not survive in the reservoir due to predation by fish and birds, and unsuitable lentic (lake) habitat.

Reclamation's action will improve the base flow conditions in the Pecos River if improved block release timing, longer block release tailouts, and bypass of natural inflows from Sumner Dam are instituted. Reclamation also intends to target an average of 35 cubic feet per second (cfs) at the Near Acme Gage with bypass flows from Sumner Dam. This combination of water operations actions should reduce the likelihood of river intermittency in the Pecos River and improve the conditions of the bluntnose shiner and its critical habitat.

Therefore, the Service has determined that the proposed action will not adversely affect the bluntnose shiner critical habitat in the absence of other effects outside Reclamation's authority.

CONSULTATION HISTORY

With the completion of Brantley Dam in 1989, Sumner Dam releases were reduced in number, but increased in duration, resulting in several impacts to the biological and physical environment in the Pecos River. Based on these impacts, Reclamation initiated formal consultation with the Service in 1991 to address operations on the Pecos River. The consultation concluded in August 1991 with the issuance of a biological opinion (Cons. #2-22-91-F-198). In that opinion, the Service found that the timing of releases of water from upstream storage facilities (large blocks of water for expedient delivery down the channel followed by extensive drying of the river channel) was likely to jeopardize the continued existence of the bluntnose shiner. A reasonable and prudent alternative was formulated by the Service and accepted by Reclamation that removed the likelihood of jeopardy to the bluntnose shiner. That reasonable and prudent alternative consisted of the following:

1. Reclamation, CID, and Service will develop an memorandum of understanding (MOU) for the purpose of formulating annual plans of operation for Reclamation Pecos River facilities. The MOU would be in effect by September 1991 and remain in force for 5 years. During the 5-year period, Reclamation will operate the system similarly to pre-Brantley Dam operations except that flow releases will be gradually ramped on the ascending and descending limbs of the releases to determine the effect that this more natural release method has upon the bluntnose shiner. It would also include the means by which studies could be conducted to determine the effects operation of Reclamation projects has upon listed species.

2. For the 1991 season, releases from Santa Rosa Reservoir will be scheduled to provide gradual increases of flow (ramping) at the beginning of the release periods and similarly, gradual ramping of releases at the end. Mid-summer releases would be made to avoid long-term dewatering of the river channel.

3. Reclamation will fund 5 years of research activities designed to determine biologic and hydrologic needs of the bluntnose shiner and operational guidelines for Reclamation that will protect, maintain, and assist in recovery of the species. During the first year of this study, a microhabitat/community structure study in relation to native and non-native species will be initiated. Additionally, basic life history information concerning spawning periodicity, duration, fecundity, flow effects, and temperature preferences

would continue to be gathered, and a larval fish series of the Pecos River shiner guild would be preserved for future larval fish research.

4. Reclamation will provide colored infrared aerial photographs and video imagery of the Pecos River from Santa Rosa Dam downstream to the Brantley Reservoir inflow during winter low flows. Video imagery will also be conducted during the late spring maximum flow release and the summer low flow. The imagery and photographs will be used to determine the amounts of riverine and sandbar habitat available at these flows.

5. Reclamation's Albuquerque Projects Office staff will conduct those hydrological studies necessary to develop a flow model that will investigate the downstream effect of various releases upon water delivery and habitat conditions for listed species. This model would serve as the basis for future negotiations with Pecos River water users.

6. Bioassay studies will be conducted on a fish species acting as surrogate for the bluntnose shiner to determine if inorganic compounds are causing reproductive impairment. Residue analysis for the bluntnose shiner's prey items in the Pecos River will be conducted for mercury, lead, and selenium.

In that consultation, the Service found that the implementation of this reasonable and prudent alternative also removed the likelihood of take. Therefore, no incidental take of the bluntnose shiner was provided.

The 5-year interagency research effort guided by the MOU resulting from the consultation had as its basic goal to develop management options that conserve and restore the bluntnose shiner and the associated native fish community, and efficiently deliver water for consumptive uses. Overall objectives of the research program were many and diverse:

1. Determine the distribution and abundance of fishes.
2. Characterize life history of bluntnose shiner.
3. Evaluate the relationship between flow and native and non-native larval fishes.
4. Prepare description of early life history developmental series of Pecos River larval fishes.
5. Determine the effects of riverine habitat intermittency on resident fishes.
6. Determine the effect of non-native fish species on the native fish community.
7. Identify spatial and temporal habitat use patterns for fishes at varying flows.
8. Quantify available aquatic macrohabitats at varying flows.
9. Identification, verification, and curation of adult and larval fish samples.

10. Quantify stream channel characteristics using aerial photography and videography.
11. Develop an operations model to evaluate the effects of various operational schedules on surface flows in downstream habitats.
12. Characterize water quality seasonally and at varying flows.
13. Determine the presence/extent of contaminants and effects on resident fishes.
14. Develop and maintain a computerized database.
15. Develop management recommendations.

Within the scope of the MOU, annual meetings of both the signatory parties and the researchers were held to review the findings of the investigations and apply new information to the consideration of annual or seasonal operation plans for the river. Typically, the participants have met prior to both the irrigation and winter seasons to review available water supplies and current information on the bluntnose shiner, and determine recommendations for the operations of the upcoming season. Over the past ten years, a variety of operation scenarios have been implemented on the Pecos River, with attendant monitoring of both biological resources and hydrologic dynamics resulting from those scenarios each season. The information gathered during the monitoring efforts has been reviewed annually by the researchers and the signatory parties. Additional informal and formal consultations have been completed with Reclamation addressing specific impacts within the operations or research conducted during the 5-year period.

Formal consultation with the Service was requested by the Corps in April 1992 concerning operations of Santa Rosa Dam and Reservoir and the potential of that operation to mobilize and transport environmental contaminants to downstream habitats occupied by the endangered interior least tern (*Sterna antillarum*) and the bluntnose shiner. The biological opinion issued for that consultation (Cons. #2-22-92-F-240) found that the Corps' ongoing and proposed operations of Santa Rosa Dam were likely to jeopardize the continued existence of the bluntnose shiner and adversely modify its designated critical habitat on the Pecos River. A reasonable and prudent alternative was proffered by the Service and accepted by the Corps to remove the likelihood of jeopardy /adverse modification. That reasonable and prudent alternative consisted of the following elements:

A) The Corps will become a signatory to the MOU executed between the Service, Reclamation, New Mexico Department of Game and Fish (NMDGF), and CID. The Corps, in conjunction with Reclamation and CID, will develop annual plans of operation for Santa Rosa Dam and Reservoir that provide for the survival and recovery of the bluntnose shiner. These plans should be coordinated with those developed by Reclamation and take into account Reclamation's and CID's commitment to provide various experimental flow regimes for a 5-year period.

B) During the research period, releases from Santa Rosa Reservoir will be scheduled to provide gradual increases of flow (ramping) at the beginning of release periods and similarly gradual decreasing of releases at the end.

C) The Corps, in conjunction with Reclamation and CID, will at the end of the 5-year research effort use the research data to initiate a reservoir water management plan that will provide for the continued survival and recovery of the bluntnose shiner throughout the life of the project.

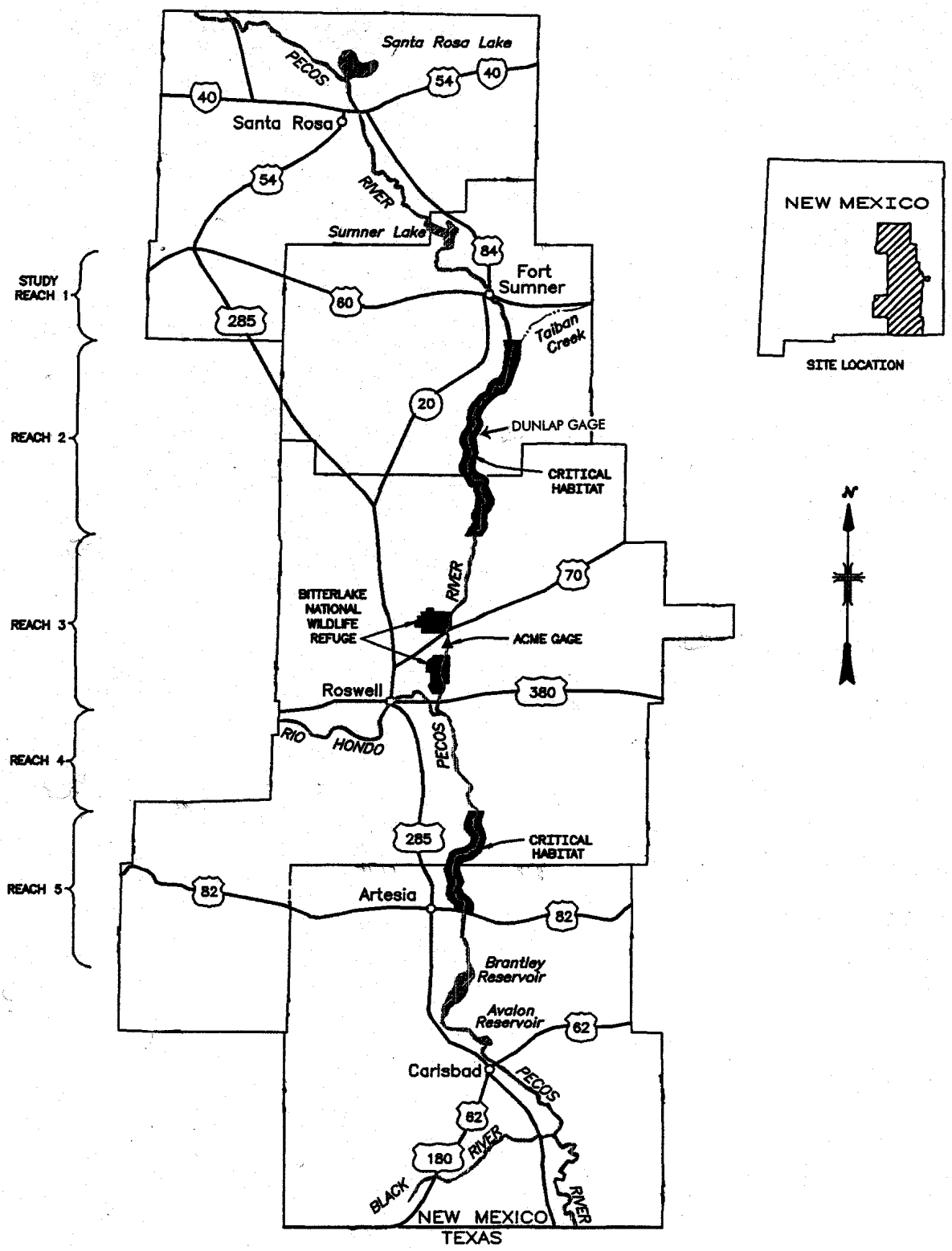
D) The Corps will fund and implement a study to evaluate the downstream transport of mercury into bluntnose shiner critical habitat. The study should determine if transport is occurring, and if it is, what impact it is having upon the bluntnose shiner. If it is found that transported mercury is a problem to the continued existence of the bluntnose shiner, the Corps, in concert with the signatories to the MOU, will initiate remedial action.

With implementation of the reasonable and prudent alternative, the Service did not anticipate that continued operation of Santa Rosa Dam and Reservoir would result in incidental take of the bluntnose shiner. Accordingly, no incidental take was authorized. The participation of the Corps in the existing MOU was found infeasible. Thus, a separate MOU was signed by the Corps, Service, Reclamation, NMDGF, and CID. In order to avoid duplication, joint meetings of the signatories to the two MOUs have been held.

Following the expiration of the 1992 MOU for Reclamation's Pecos operations, a second MOU was signed by the original participants and the New Mexico Office of the State Engineer (OSE) to provide for analysis of existing data, prompt production of reports and management recommendations, and development of water operational plans that are not detrimental to the bluntnose shiner or its habitat. The process of interagency meetings and review of available data on water conditions and the status of the bluntnose shiner for recommendations of seasonal water operations continued under the new MOU. At the October 9, 1998, interagency researchers meeting, it was recommended that a target flow of 35 cfs be provided at the Acme Gauge for the 4-month span of the 1998-1999 winter season for the protection of the bluntnose shiner. On November 9, 1998, Reclamation provided its proposed plan for the winter operations to the Service for review. The proposed action consists of flow management that would produce a range of flows at the Acme Gauge from an anticipated minimum of approximately 26 cfs to a maximum of 41 cfs in order to target 35 cfs. Based on the preliminary analysis of "worst case conditions" arising from the low flows of 26 cfs, the Service, by memorandum dated November 10, 1998, recommended that Reclamation initiate consultation under section 7 of the ACT (Cons. # 2-22-99-F-59). Upon expiration of the original MOU (dated February 1997) a subsequent MOU extended the relationships another three years. The new agreement included the OSE as a signatory. The new MOU marked a crossover from the completion of the study phase to the beginning of the decision making process through the National Environmental Policy Act (NEPA)

phase. The NEPA process is ongoing and no long-range operational decisions have yet been made. As part of the NEPA process, Reclamation plans to continue consultation with the Service over interim operations until the completion of the Pecos Environmental Impact Statement.

The Service conducted formal consultation with Reclamation for Sumner Dam operations for the non-irrigation season winter period (November 1 to March 1) in 1998 (Cons. # 2-22-99-F-59), and informal consultations for the winters of 1999-2000 (Cons. # 2-22-00-I-136) and 2000-2001 (Cons. # 2-22-01-I-038). Furthermore, the Service conducted informal consultations with Reclamation during the irrigation seasons in 1999 (Cons. # 2-22-99-F-347) and 2000 (Cons. # 2-22-99-F-347b (continuation). In 1999, Reclamation submitted a BA and requested formal consultation. The Service informed Reclamation the BA was incomplete (letter of July 19, 1999), and formal consultation was not initiated because Reclamation did not submit a revised BA. The 1999 irrigation season was one of the wettest on record for the 1900s with relatively high flows, therefore formal consultation became unnecessary and informal consultation was conducted. The Service received a draft of the BA for formal consultation for the 2000 irrigation season in May 2000, and worked with Reclamation to include actions to reduce possible incidental take of the bluntnose shiner. Reclamation did not submit a final BA for formal consultation in 2000.


Santa Rosa Lake
PECOS
40
54
40
Santa Rosa
54
RIVER
Sumner Lake
84
Fort Sumner
60
285
Taiban Creek
20
DUNLAP GAGE
CRITICAL HABITAT
70
BITTERLAKE NATIONAL WILDLIFE REFUGE
RIVER
ACME GAGE
Roswell
380
RIO HONDO
PECOS
285
CRITICAL HABITAT
82
Artesia
82
Brantley Reservoir
Avalon Reservoir
62
Carlsbad
PECOS
82
180
RIVER
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NEW MEXICO
TEXAS
STUDY REACH 1
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REACH 3
REACH 4
REACH 5
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SITE LOCATION
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BIOLOGICAL OPINION

I. Description of the Action Area

The Carlsbad Project Area is located within the Pecos River Basin of southeastern New Mexico (Figure 1). The Service has defined the action area for this biological opinion to be the reach of the Pecos River from Santa Rosa Dam downstream to Brantley Dam. Within this action area, the river has a drainage area of approximately 65,984 square kilometers (km) (25,470 square miles) (mi) and is 450 km (280 mi) long.

The Pecos River originates in the Sangre de Cristo Mountains of northern New Mexico and flows into the Rio Grande near Langtry, Texas. Approximately 676 km (420 mi) of the river are in New Mexico. The river begins in the high mountains and then enters the high plains, through which it flows through New Mexico and most of Texas. The historical Pecos River flood plain widens from the town of Fort Sumner to the narrows at Brantley Reservoir. The contemporary river channel is incised within this flood plain. The channel is widest between Fort Sumner and Eightmile Draw confluence, gradually narrowing downstream. Below the Rio Hondo confluence (near Roswell), the channel is deeply incised and greatly narrowed. From downstream of Fort Sumner to near Roswell, New Mexico, it flows through a wide flood plain and is characterized by having a predominantly sand substrate and braided channel. Within this reach, springs and irrigation return flows maintain water flow in the river during times when no water is being released from Sumner Dam. The reach from near Roswell to the headwaters of Brantley Reservoir is characterized by deep entrenchment and the river is confined to a single channel.

Four dams (Santa Rosa, Sumner, FSID, and Brantley) control the flow of the Pecos River in New Mexico (Figure 1). The uppermost dam, Santa Rosa, is operated by the Corps for flood control; and Sumner and Brantley Dams, are operated by Reclamation for irrigation purposes. Sumner Dam was built in 1937 and is 88 km (55 mi) downstream from the Santa Rosa Dam. The Fort Sumner Irrigation Diversion Dam is located 22 km (14 mi) downstream of Sumner Dam and was completed in 1951. The Fort Sumner Diversion Dam was authorized under Public Law No. 88-192 on July 29, 1949. Brantley Dam was completed in 1989 and is 360 km (225 mi) downstream of Sumner Dam. Other than unregulated tributaries entering the river between these dams, operation of the four dams permits almost total flow-control in the river from Santa Rosa, New Mexico, downstream to the New Mexico-Texas border.

Sand dominates the Pecos River substrate. Loose sand is only present in patches downstream of Roswell and is only present as a thin veneer downstream of Lake Arthur Falls. Sediment distribution is reliant on sediment inflows (sand input), which are greatest in the reach between Taiban Creek and Eightmile Draw confluences (due to inflows from uncontrolled tributaries). Few tributaries discharge directly into the Pecos River,

downstream of Roswell, and the largest tributaries (Rio Hondo, Rio Peñasco) have large dams which capture sediment, keeping it from entering the Pecos River.

Between Fort Sumner and Roswell, Pecos River base flows are maintained by groundwater discharge. Base flows between Taiban Creek and Fivemile Draw confluences are sustained, at a very low level, by spring seepage into the riverbed (Shomaker 1971). This reach also receives returned waters from the Fort Sumner Irrigation District between March and October. Between Fivemile Draw confluence and the Near Acme Gage, spring seepage is depleted by local groundwater pumping and contributes little to base flow, making this the driest reach of the Pecos River between Sumner and Brantley (Shomaker, 1971). From Near Acme to the Near Artesia Gage, groundwater inflows are relatively great, supplying relatively stable base flows. Seepage losses deplete river flows from Near Artesia to Brantley Reservoir but base flows are typically maintained as a result of the gains in the reach immediately upstream.

II. Description of the Proposed Action

The proposed action is primarily for operation of Sumner Dam during the irrigation season from March 1 through October 31, 2001. The BA describes the shape and duration of irrigation releases, timing between releases, ramp downs from peak discharges, inflows which are bypassed, and monitoring efforts. This plan is proposed to avoid or minimize detrimental effects to the bluntnose shiner and its critical habitat.

Reclamation's Discretionary Authority for Operation of Sumner Dam

1. Reclamation has the discretion to bypass FSID water allotment (up to 100 cfs);

2. Reclamation has the authority to bypass natural inflows into Sumner Reservoir, if they exceed the FSID allotment, to meet the target of 35 cfs, if needed, for the benefit of the bluntnose shiner;

3. Reclamation does not have the discretion to release water from storage in Sumner Reservoir solely to meet the target of 35 cfs for the bluntnose shiner; releases from Sumner can only be made for the benefit of CID, the project beneficiary.

Pursuant to the requirements of the ACT and implementing regulations, Reclamation is consulting over those aspects of the operations in which there is discretionary Federal involvement or control. The proposed action includes the following actions related to the operations of Sumner Dam for the irrigation season of 2001:

- Supplemental water. Reclamation will bypass natural inflows to Lake Sumner when available (based on total inflow above Lake Sumner as determined by the OSE) and necessary to improve base flows and meet the downstream target of 35 cfs at the Pecos River Acme Gage;

- Restrict the duration of block releases from Sumner Dam to a maximum of 15 days;

- Restrict the cumulative duration of block releases from Sumner in calendar year 2001 to a maximum of 65 days;

- Target a minimum of 14 days between consecutive block releases from Sumner;

- When practicable, provide a ramp down on the end of block releases to improve base flows, particularly during low flow periods;

- Targeting one, seven consecutive week period between June 1, 2001 and August 31, 2001 during which no block releases from Sumner will be made to reduce adverse effects during the peak of the spawning season (June 1 - August 31).

- Reclamation will initiate weekly hydrology/water operations conference calls with the Service.

- Reclamation will continue to support bluntnose shiner population monitoring efforts so that the status of the species can continue to be accurately evaluated.

Supplemental Water Program

Reclamation will again lease water in the basin to make up depletions to the water supply caused by the Sumner Dam bypass operations. In 2001, Reclamation will lease approximately 2,000 acre-feet of river pumpers' water rights, 350 acre-feet of Hagerman Canal water rights, and 500 acre-feet of groundwater rights. The leasing of the groundwater rights is located along the Pecos River between Above Acme Gage and the Gasline habitat site. By not pumping these wells, the water losses observed in the past through this reach may be reduced. If additional funding becomes available, Reclamation would pursue additional water leases.

FSID currently operates and maintains a diversion dam by contract with Reclamation. The FSID has no storage right in Sumner Reservoir, but does have a direct flow right (up to 100 cfs) through the Hope Decree. The entitlement is based on a calculation made by the OSE from flow data collected every two weeks throughout the irrigation season. The FSID Diversion Dam diverts water to irrigators in the district from about February 15 through October 31. Reclamation does not have the permitted water rights associated with these diversions, however, Reclamation does have an ownership interest in the FSID Diversion

Dam. Reclamation proposes to allow FSID to continue to operate the facility in compliance with state and federal law. Reclamation will coordinate with FSID for possible early season releases between February 15 and the time that CID begins its irrigation season in early March. Early releases to FSID will supplement base flows that are generally low during this period.

Coordination

Reclamation will initiate weekly hydrology/water operations conference calls with the Service. The purpose of the conference calls is to improve communication between Reclamation, the water users, and the Service to coordinate water releases in a manner that will benefit the bluntnose shiner and its habitat. Conference calls will occur weekly during the irrigation season from February 15 to October 31. An important component of the weekly conference calls will be to discuss the operational adjustments necessary to meet the suite of water management objectives, such as, block release timing, block release tailouts, and the management of available supplemental water, based on real-time data. Additional conference calls, meetings, and exchange of information will occur as necessary.

III. Environmental Baseline

a. Dams and Pecos River Flows

Four dams (Santa Rosa, Sumner, FSID, and Brantley) control the flow of the Pecos River in New Mexico (Figure 1). The uppermost dam, Santa Rosa, is operated by the Corps for flood control; and Sumner and Brantley dams, are operated by Reclamation for irrigation purposes. Sumner Dam was built in 1937 and is 88 km (55 mi) downstream from the Santa Rosa Dam. The Fort Sumner Irrigation Diversion Dam is located 22 km (14 mi) downstream of Sumner Dam and was completed in 1951. The Fort Sumner Diversion Dam was authorized under Public Law No. 88-192 on July 29, 1949. Brantley Dam was completed in 1989 and is 360 km (225 mi) downstream of Sumner Dam. Other than unregulated tributaries entering the river between these dams, operation of the four dams permits almost total flow-control in the river from Santa Rosa, New Mexico, downstream to the New Mexico-Texas border.

Sumner Dam has reduced the river base flow, reduced sediment inflows from the upper basin, eliminated large floods, and disrupted natural flow patterns. Sumner Dam has also fragmented the Pecos River and the bluntnose shiner no longer occurs upstream of the dam. In addition, Sumner Dam prevents large floods that are important in maintaining channel width and limiting salt cedar encroachment. More frequent floods are also critical in supporting riparian vegetation, recharging the alluvial aquifer, invigorating nutrient cycling, and connecting aquatic and terrestrial ecosystems. Historically, water releases from Sumner Dam were stopped after the irrigation season ended on October 31, and resumed in March each year. As a result, the river downstream of Sumner Dam had only naturally occurring base flows which were frequently very low.

Sumner Dam inundated 24 river-km (15 mi), and altered the downstream flow regime in three primary ways:

1. Flows greater than 1400 cfs were eliminated in all but the wettest conditions (e.g., flood operations, 'spill'; Table 1.

2. During the FSID non-irrigation season (typically 1 November through 14 February but exact dates vary yearly), base flows were stored behind Sumner Dam and not passed over the FSID Diversion Dam as they were in former years (Table 2).

3. During the FSID irrigation season (typically 15 February through 31 October but exact dates vary yearly and daily diversion rates also vary), natural flows greater than100 cfs were stored behind Sumner Dam rather than being passed over FSID Diversion Dam as they were in pre-dam years (Table 3).

Mean daily discharge was recorded on the Pecos River near Guadalupe (currently Pecos River Below Sumner Dam) beginning in 1912. This U.S. Geological Survey (USGS) gage is located between Sumner Dam and FSID Diversion Dam. Complete annual records are available for 18 different years between that time and the beginning of Sumner Dam operations (other years only have partial records). A summary analysis of pre-Sumner Dam flows is presented below, using only records from years with a complete record (partial years were excluded to avoid bias by excluding wet or dry periods that were unmeasured). Results of this analysis are utilized to illustrate each of the three primary affects of Sumner Dam on the downstream flow regime. For comparison, the same summary was completed for the calendar years 1962 through 1979. These years were chosen as best to represent the affects of Sumner Dam since they were post 1950s drought and pre-Santa Rosa Dam (Santa Rosa Dam operations, initiated in 1980, altered Sumner Dam inflows and outflows (Tetra Tech, Inc. 2000).

1. Prior to Sumner Dam flows greater than 1400 cfs were recorded for every year with a complete flow record (Table 2). The lowest annual peak mean daily discharge was 2020 cfs (1934). For the 1962 through 1979 post-Sumner Dam period, flows greater than1400 cfs were recorded in only two years (Table 2). The maximum flow recorded (1980 cfs) was less than the lowest annual peak of the pre-Dam period.

Table 1. Summary of change in frequency and magnitude of peak flows (flows greater than 1400 cfs, maximum Sumner Dam release) Below Sumner Dam Gage for 18 years before and after construction of Sumner Dam.

Period	Days	Days >1400 cfs	Mean Days per Year >1400 cfs	Years with Flows >1400 cfs	Maximum Discharge (cfs)
Pre-Dam	6574	128	7.1	18 (18)	26200
Post-Dam	6574	18	1.0	2 (18)	1980

2. Mean discharge during the FSID non-irrigation season (1 November to 14 February) was 97.3 cfs prior to Sumner Dam. Mean discharge was 93.8 percent reduced (6.0 cfs) in the 1962 through 1979 post-Dam period (Table 3). Minimum and maximum discharge were also much greater in the pre-Dam period. In some years, FSID diversions occurred for two weeks in January which accounts for the 99 cfs maximum post-Dam discharge. Releases were not made from Sumner Dam during this period without FSID diversion.

Table 2. Summary of winter flows at the Pecos River Below Sumner Dam Gage (typical FSID non-irrigation season, 1 November to 14 February).

Period	Days	Mean ft^3/s	Minimum ft^3/s	Maximum ft^3/s
Pre-Dam	1908	97.3	41	265
Post-Dam	1908	6.0	0	99

3. Discharge adequate to overflow the FSID Diversion Dam during the irrigation season (greater than 100 cfs, 15 February to 31 October) was recorded more than twice as often in the years with a complete record prior to Sumner Dam, than in the 1962 through 1979 post-Dam period (Table 4). The mean overflow volume was 59.9 percent greater post-Dam, since FSID overflow occurred almost exclusively during irrigation storage transport releases. 'Scalping' of flow events greater than1400 cfs, to avoid the affects of outliers in this analysis, reduced mean overflow, both pre and post-Sumner Dam, but mean overflow volume was still high in both periods, and was greatest in the post-Dam period (Table 4).

Table 3. Summary of FSID irrigation season flows at the Pecos River Below Sumner Dam Gage. Since FSID can divert a maximum 100 cfs, it was assumed that flows greater than 100 cfs overflowed downstream. The mean overflow for each period was calculated solely for the days in which overflow presumably occurred (discharge greater than 100 cfs).

Period	Days	Days > 100 ft^3/s	Mean Days per Year > 100 ft^3/s	Mean Overflow (ft^3/s)	Adjusted Mean overflow (ft^3/s)
Pre-Dam	4666	2649	147.2	355.7	300.6
Post-Dam	4666	1238	68.8	594.2	590.2

Flow intermittency at Acme has been observed or documented frequently in the past since the construction of Sumner Dam in 1938, but has not occurred since 1991. Historically, before extensive human development in the late 1800s, the Pecos River appears to have been perennial downstream of the Gallinas-Rio Pecos confluence (Hoagstrom 2000). Downstream of the dam the flows have changed dramatically with most water being stored in the reservoir with periodic large block irrigation releases followed by very low base flow periods.

In addition, the Pecos Bluntnose Shiner Recovery Plan stated that the operation of Sumner Dam had significantly altered flow regimes in the upper Pecos River from 1913 to 1991 (Service 1992). During the period 1913 - 1935, prior to dam operation, the average number of days per year when flows were measured less than 1 cfs at the Sumner Dam gage was zero. For the period after dam operation began, 1937-1990, measured flows less than 1 cfs occurred an average of 55.2 days per year. Prior to completion of Brantley Dam and its replacement of McMillan Dam, operation of the Pecos River system was based upon the limited storage available to CID in McMillan and Avalon reservoirs downstream of Sumner Dam. This limited storage capacity caused CID to make several water releases from Sumner during most years. Because of the frequency of these releases, habitat suitable for the bluntnose shiner was maintained from Santa Rosa Dam downstream to Lake McMillan. During these past operations, no flow conditions existed at several locations within the river during the irrigation season.

In 1989, in an effort to fill the newly-completed Brantley Reservoir, downstream water deliveries for the year exacerbated intermittency and long-term drying of the river channel. As a result, Reclamation consulted with the Service over the project's water operations impacts on the bluntnose shiner. In 1991, the Service issued a biological opinion (Cons. # 2-22-92-F-240) stating that Reclamation's Pecos River operations were jeopardizing the continued existence of the bluntnose shiner.

The 1999 irrigation season was unique. Rain events started occurring in April and continued throughout the season. Flows recorded for the 1999 irrigation season appeared to be equal or slightly better than the model predicted. In 1999, bypasses did occur, but were infrequent and small because of sufficient precipitation in the area. The 35 cfs target flow at Acme was exceeded 80 percent of the time, 85 percent for 30 cfs flows, and 91 percent for 26 cfs flows.

In fiscal year 2000, Reclamation leased approximately 1,800 acre-feet of water rights from river pumpers. Additionally, as a result of mediation in Federal District Court, Reclamation entered into an emergency forbearance program with FSID through which Reclamation paid for crops foregone as a result of reduced water use by participating FSID members. The Service provided additional funding in October 2000 to increase the number of irrigators

participating in the forbearance program. The forbearance program resulted in 15 cfs additional flow in the river below the FSID return canal, and provided about one half that amount to Acme after transport losses. However, due to the severe drought, these additional flows were not adequate in bringing the Acme flow up to the target level (35 cfs), but probably prevented intermittency since the average flow from September 9 to October 10, 2000 was only 9 cfs at Acme with a low flow of 2.2 cfs on September 22.

In 2000, bypasses were infrequent, but inflows bypassed between releases were considerably higher due to an extremely dry summer. Flows for the 2000 irrigation season exceeded 35 cfs, 62 percent of the time. Flows exceeding 30 cfs resulted 71 percent of the time and flows exceeding 26 cfs occurred 80 percent of the time. For the 1999-2000 year combined period, 35 cfs was exceeded 71 percent of the time; 30 cfs was exceeded 78 percent of the time; and 26 cfs was exceeded 85 percent of the time.

Fort Sumner and Carlsbad Irrigation Districts

The movement of water for irrigation by FSID and CID are actions that adversely affect the bluntnose shiner and its critical habitat. Reclamation does not have the discretionary authority to release water from storage from Sumner Reservoir, and only releases irrigation water in response to water calls from FSID and CID. The releases of irrigation water from Sumner Dam will have adverse effects to the bluntnose shiner and its critical habitat by reducing Pecos River base flows. After irrigation block releases are made for CID, the flows from Sumner Dam are reduced to the bypass water from Reclamation (not available during dry periods) and FSID's irrigation water (usually 100 cfs). The retention of Pecos River water in Santa Rosa and Sumner Reservoirs reduces the river base flow and decreases the amount of habitat available and increases inter-dependent competition with other fish species.
The FSID Diversion Dam diverts up to 100 cfs for delivery to irrigators in the district from February 15 through October 31. FSID has no storage rights in the upstream reservoirs, but is entitled to water rights that predate Sumner Dam construction (1937). The water entitlement is based on a calculation made by the OSE from flow data collected every two weeks throughout the irrigation season. Sumner Dam bypasses water for FSID and the water travels 23 km (14 mi) downstream to the FSID Diversion Dam. If there is no supplemental bypass releases from Sumner Dam, the river may be dewatered downstream of the diversion dam. The main canal is 24 km (15 mi) long and water is diverted into smaller lateral canals. The system also includes drain canals which collect seepage and runoff from the fields and carries these return flows back to the main canal. These return flows to the Pecos River may be up to half of the amount diverted.

Entrainment of bluntnose shiner eggs and larvae by the FSID Diversion Dam is not an issue, since the species no longer inhabits the reach between Sumner Dam and the diversion dam. Although entrainment cannot occur at the FSID Diversion Dam, the dam does prevent the upstream movement of bluntnose shiners and prevents them from recolonizing the reach

from the dam to Sumner Dam (23 km, 14 mi). The recovery of the species is severely limited by the dams and reservoirs in the Pecos River, since these barriers prevent recolonization of upstream and downstream reaches.

CID releases irrigation water from Brantley Reservoir and does not indirectly affect the bluntnose shiner because it longer exists downstream of the reservoir. In contrast, movement of water by CID through block releases adversely affect the bluntnose shiner during the spawning season. Sumner Dam block releases transport bluntnose shiner eggs and larvae into Brantley Reservoir. The loss of eggs and larvae into Brantley Reservoir from predation and lack of habitat reduces the overall population numbers and is a constraint on recovery of the species. At the completion of each block release, the Sumner Dam gates are closed and the downstream baseflow is comprised of natural baseflows, irrigation water for FSID, and supplemental water if available.

New Mexico Interstate Stream Commission (ISC)

For several years, the ISC has leased water from the CID to augment New Mexico/Texas state line water deliveries. CID delivers ISC - leased water to Texas in conjunction with the movement of irrigation water from Sumner Reservoir. This water is indistinguishable from CID irrigation supply until it is released from Brantley Dam. CID delivers water for ISC to Texas on July 1 and October 1 each year. The Service is unaware of any flexibility in the movement of ISC - leased water from Santa Rosa and Sumner Reservoirs in conjunction with irrigation block releases, but if there is some flexibility, the timing of the releases could possibly be improved to avoid the bluntnose shiner spawning season and increase river base flow during dry periods. The effects of water moved for ISC are indistinguishable from CID block releases, since ISC - leased water moved with CID water and is later released from Brantley Reservoir.

In summary, the creation of reservoirs (Santa Rosa, Sumner, and Brantley) have caused retention of sediment and altered the downstream flow regime. When these effects are combined with the depletion of groundwater, diversion of Pecos River flows, capture of sediment by tributary dams, and pollution of Pecos River water through increased municipal wastewater discharges, feedlot runoff, salinity increases from irrigation returns, and oil field activities, the result is the detrimental changes to the Pecos River. In addition, the river downstream of Roswell has become highly incised, which was facilitated by saltcedar colonization, now transport bluntnose shiner eggs and larvae rapidly into Brantley Reservoir. Finally, the reach downstream of Sumner Dam has become incised and suitable sand/silt habitat of the bluntnose shiner has been replaced by gravel and cobbles for several miles.

a. Rangewide Status of the Bluntnose Shiner in the Action Area

The bluntnose shiner was listed as a State threatened species in New Mexico in 1976, and was federally listed as threatened with critical habitat in 1987 (Service 1987). The bluntnose

shiner was present in historical collections from the mainstem Pecos River between the town of Santa Rosa and the vicinity of the New Mexico-Texas state line. The current range has been reduced to a 362 km (225 mi) section of the river between Fort Sumner and Brantley Reservoir, New Mexico (Brooks *et al.* 1991), which is entirely within the Carlsbad Project Area. The upstream portion of this range (Fort Sumner to Roswell) is believed to support a stable, self-sustaining bluntnose shiner population, due primarily to favorable habitat conditions. The lower portion of this range (Roswell to Brantley Reservoir) sustains a less-stable population, presumably due to poor habitat conditions, (Hatch *et al.* 1985; Brooks *et al.* 1991; Hoagstrom *et al.* 1995; Hoagstrom 1997; 2000). The downstream population is largely dependent upon annual contributions (eggs and larvae) from the upstream population.

The principal reasons for the bluntnose shiner federal listing were habitat alteration due to restricted flow from reservoirs, water diversion for irrigation, siltation, and pollution from agricultural activities along the river (Service 1987). The bluntnose shiner depends upon the release of water from Sumner Dam for its existence. Historically, stopping the flow from Sumner Dam has caused river dewatering and adversely affected the bluntnose shiner and its critical habitat.

b. Description of the Species

Confusion regarding taxonomic status of *Notropis simus* was resolved when Chernoff *et al.* (1982) determined that two subspecies occurred, the Rio Grande bluntnose shiner (*Notropis simus simus*) and Pecos bluntnose shiner (*N. s. pecosensis*). The bluntnose shiner is a relatively small, moderately deep-bodied minnow, rarely exceeding 80 mm (3.1 in) total length (Propst 1999). It has a deep, spindle-shaped silvery body and a fairly large mouth that is overhung by a bluntly rounded snout and a large subterminal mouth. The fish is pallid gray to greenish-brown dorsally and whitish ventrally. A wide silvery lateral stripe extends from the pectoral girdle to the base of the caudal fin. Pelvic and anal fins lack pigmentation, and dorsal and pectoral fins have small black flecks along the fin rays, and the caudal fin is variably pigmented. Adults exhibit little sexual dimorphism except during the reproductive period when females's abdomens become noticeably distended and males develop fine tubercles. The short intestine has two loops and the peritoneum is silvery (Propst 1999).

c. Critical Habitat

The bluntnose shiner critical habitat includes a 103 km (64 mi) reach of the Pecos River extending from a point 16 km (10 mi) south of Fort Sumner downstream to the De Baca/Chaves County line and a 60- km (37 mi) reach from near Hagerman to near Artesia (Service 1987). Although the middle reach (184 km, 114 mi) between the upper and lower critical habitat reaches (Figure 1) was not designated as critical habitat due to frequent river intermittency, it currently serves as important habitat for the bluntnose shiner and supports high numbers of the species. The increase in the bluntnose shiners in this reach is mainly a result of improved base flows and lack of intermittency in recent years, and may be more important to the recovery of the bluntnose shiner than designated critical habitat reaches.

d. Habitat

Bluntnose shiner have been found in every major habitat encountered from Fort Sumner to Artesia, except for stagnant pools (Hatch 1982; Hatch *et al.* 1985). The bluntnose shiner is most common from Old Fort State Park south of Fort Sumner to Roswell (Propst 1999). Downstream (between Roswell and Brantley Reservoir), the narrowing of the river channel from past channelization has resulted in the loss of most of the habitat typically occupied by bluntnose shiner (Brooks *et al.* 1991).

Bluntnose shiners were collected most often in main-channel habitats with sandy substrates, low velocity laminar flows, and at depths from 17 to 41 cm (7 to 16 in) (Hatch *et al.* 1985). Main-channel habitats were utilized proportionately more by each successive age-group, until Age II , when they were found only in this habitat. Larger individuals found mainly in more rapidly flowing water (greater than 40 cm/sec, 1.25 ft/sec), but preferences for particular depths were not found (Hoagstrom *et al.* 1995).

Bluntnose shiners are dependent upon fluvial habitat over shifting sand (Hoagstrom 2000). This dependency is consistent with other shiner species from the Pecos River and Rio Grande in New Mexico, such as the Rio Grande silvery minnow (extirpated in the Pecos River), Rio Grande bluntnose shiner (extinct), phantom shiner (*Notropis orca*) (extinct), plains minnow (*Hybognathus placitus*) (Pecos River), and Arkansas River shiner (*Notropis girardi*) (Pecos River) that are also dependent on this habitat type (Chernoff *et al.* 1982; Bestgen and Platania 1990). These shiner species have proliferated in areas where increased erosion and river channel degradation have increased sand substrates, flow variability, and run habitats (Trautman 1981; Onorato *et al.* 2000). However, they have declined in areas where reservoirs have been established and/or flows have been depleted (Boschung 1987; Cross and Moss 1987; Bestgen and Plantania 1990; Cross and Collins 1995).

Reduced fluvial habitat is presumably responsible for the decline in range and abundance of many native fishes including the bluntnose shiner (Bestgen and Platania 1990; Brooks *et al.* 1991; Service 1992). Reduction of fluvial habitat abundance and substrate stability may affect the bluntnose shiner by restricting or eliminating preferred habitat and/or by reducing food availability (Hoagstrom 2000). It is likely that bluntnose shiner can survive under conditions that do not provide optimal habitat but do provide adequate forage. However, in the wild, competition with other fishes will limit bluntnose shiner success if conditions favor non-drift feeders. Therefore, food supply is likely of primary importance to bluntnose shiner survival.

Bluntnose shiner are adapted to exploit the natural features of large rivers in arid lands (Hoagstrom 2000). Former studies suggest that they prefer main channel habitats of such rivers (Hatch *et al.*1985; Hoagstrom 1997). Bluntnose shiner utilize relatively swift and deep habitats, compared to most other Pecos River fishes of the Carlsbad Project Area (Hoagstrom 1997; 2000). Further, average depth and velocity utilization increase with shiner size (i.e., larger bluntnose shiner typically occupy swifter and deeper habitat than smaller individuals) (Hatch *et al.* 1985; Hoagstrom 1997; Hoagstrom 2000).

Bed forms, the result of bedload transport, create habitat structure within the main channel of alluvial rivers (Hoagstrom 2000). Bedload transport rate varies with many factors (e.g., sediment size, water velocity, water temperature) but is typically present at all times in large, sand-bed rivers. The available combinations of velocity and depth are where bed form structures exist. Water flowing over and around such structures creates unique hydraulic habitats, which are favorable for fishes (e.g., low velocity and relatively great depth within high velocity areas, high dissolved oxygen, stable temperature). Factors that reduce or eliminate bedload movement include sediment deprivation, substrate armoring, and velocity reduction.

The Fort Sumner to Roswell reach of the Pecos River supports all bluntnose shiner size classes, maintains a true sand-bed substrate, and maintains various bedforms (e.g., bars, dunes, ripples) when discharge is adequate. Sediment deprivation and armoring have not degraded the channel in reach and channel configuration remains responsive to flow events (Tashjian 1993; 1994; 1995; 1997). However, low discharge within this reach may impact in-channel habitat diversity. For example, if flows become so low that mean water velocity approaches zero, bedload transport will decline and eventually be eliminated at some discharge greater than zero (where velocity is no longer great enough to mobilize bed sands). At this point, habitat diversity is very low because the range of available velocity and depth combinations is low and habitat structure is not being maintained or created. Bed forms are initially present when bedload transport ceases, but habitat conditions deteriorate over time if such structures are not maintained.

Adult bluntnose shiner are uncommon downstream from Roswell and are rare downstream of Lake Arthur Falls (Hatch *et al.*, 1985; Hoagstrom 1997). The lack of adults is presumably due to the absence of suitable habitat (Brooks *et al.* 1991; Hoagstrom 1997). This absence, at least in part, results from the lack of bed forms within the narrow channel. Bed forms are increasingly rare in the channel downstream from Roswell. This is apparently due to a loss of sediment inflows and the armoring of the riverbed. Main channel habitat in this stretch is generally uniform, since few structures or obstructions alter flow paths. When adult bluntnose shiner are found within this stretch, they are typically associated with rare habitats such as in-channel debris or isolated bed forms (e.g., the upstream faces of scour pools on meander bends).

Throughout the Fort Sumner to Roswell segment, high flows (greater than 500 cfs) reduce habitat variability by filling the incised river channel. The narrow channel and armored substrate downstream of Roswell exacerbates habitat loss at high flows. Greatest high flow habitat variability exists between Taiban Creek and Eightmile Draw, where the channel is widest and the substrate is shifting sand.

Recent efforts to protect bluntnose shiner have focused on the Fort Sumner to Roswell reach. Bluntnose shiners in this reach are threatened by extended periods of low flow and flow intermittency. Frequent occurrence of flow intermittency and lengthy periods with very low flows have greatly reduced bluntnose shiner abundance and virtually eliminated them from the Fivemile Draw to Near Acme stretch in 1981 (Hatch *et al.* 1985) and again in 1990 (Brooks *et al.* 1991). Habitat intermittency results in mass mortalities of all fish species.

Fishes adapted to survive in stagnant waters (e.g., red shiner, western mosquitofish) will be most successful in isolated pools that support fishes during intermittent conditions. Even if minimal surface flow remains, discharge insufficient to mobilize bedload provides a relatively small variety of habitat, and the available variety declines over time. Persistent habitat is primarily shallow and slow, favoring fishes, which are tolerant of poor quality habitat (e.g., red shiner). Target flows (e.g., 35 cfs), utilized to protect bluntnose shiner, have been aimed at improving habitat quality by increasing the available depth/velocity range, adding habitat area, and sustaining a minimum level of bedload transport to maintain habitat structure). The target flow of 35 cfs was previously established as the minimum flow needed for the bluntnose shiner and its habitat (Hoagstrom 1999a). Since 1991, frequent rains and base flow supplementation have reduced the occurrence of flow intermittency (no recorded intermittency since 1991) and have reduced the periods with very low flows. Since 1991, bluntnose shiner have become reestablished between Fivemile Draw and Near Acme and currently are more numerous in this stretch than anywhere else (Hoagstrom 2000).

e. Annual Flow Regime and Fish Community (Hoagstrom 2000)

The significance of fluvial habitat to the bluntnose shiner was also supported by the positive relationship between length and annual flow regime. Bluntnose shiner was the only native fish species whose mean standard length was correlated with annual occurrence and duration of low flow events. Overall, bluntnose shiner density and mean standard length remained relatively stable and high, respectively after 1995. Nineteen ninety five appeared to be unfavorable for the bluntnose shiner due to lengthy low flow and high flow events. Bankfull flows reduce and eliminate low velocity habitat which is important refuge for bluntnose shiner during high flow conditions. Although Pecos bluntnose shiner inhabit flowing waters, they are not typically found in the mainstream during high flows. If they are subjected to high flows for an extended period and are unable to rest in low velocity habitat, they are increasingly likely to be swept downstream (Hoagstrom *et al.*, 1995; Hoagstrom, 1997; 1999a).

After 1995, the following years were had higher baseflows and were more favorable for the bluntnose shiner, although 1997 included an extensive low flow period and 1998 included a 22-day block release (high flow event). These events may be partly responsible for reduced bluntnose shiner density but favorable conditions overall may account for high bluntnose shiner mean length.

During June 2000, the Service delivered the second draft of the Pecos River report to Reclamation (Hoagstrom 2000). This report indicates that the minimum base flow conditions necessary to maintain adequate habitats for resident fishes, particularly for the bluntnose shiner, occur when a minimum of 71 cfs flow is maintained in the middle reach (Acme) of the Pecos River. The optimum flow for native fishes is between 175 and 500 cfs in this reach. Lower base flows (less than 71 cfs) minimally provide habitat for native fishes, but the bluntnose shiner prefers deeper, faster habitats, which are limited in low flows. The 71 cfs flow was not intended to be a flow recommendation, and the report is now being peer reviewed and further refined. Therefore, the Service will continue to seek a target (average) of 35 cfs at the Acme Gage until the report is finalized, and the habitat requirements of the bluntnose shiner is further evaluated (Hoagstrom 1999a, 2000). The target flow of 35 cfs has been used since winter 1998, and was based on the preliminary findings of seven years of fisheries research in the Pecos River (Hoagstrom 1999a).

In summary, bluntnose shiner density trends were more readily related to flow regimes (particularly base flows) than other native fishes (Hoagstrom 2000). This was apparently due to affinity of the bluntnose shiner for fluvial habitats. As base flows are depleted, habitat becomes sluggish and habitat with moderate to swift velocity becomes rare. This low flow condition appears to favor red shiner, Arkansas River shiner, fathead minnow, and western mosquitofish. Surface flow intermittency prior to 1992 decimated all fishes in the reach from Fort Sumner to the Bitter Lake area.

f. Life History

Pecos River Pelagic Spawning Minnow Guild

The bluntnose shiner is a member of the reproductive minnow guild found in large plains rivers (Platania 1995; Platania and Altenbach 1998). In the Pecos River, this guild includes the plains minnow, speckled chub (*Macrhybopsis aestivalis*), Arkansas River shiner, and Rio Grande shiner (*Notropis jemesanus*) along with the bluntnose shiner. The Rio Grande silvery minnow has been extirpated from the Pecos River, and the Arkansas River shiner and the plains minnow have been introduced into the river (Bestgen *et al.* 1989; Bestgen and Platania 1991).

Pelagic spawning minnows represent a reproductive guild that releases non-adhesive, semi-buoyant eggs and broadcasts them in open waters in areas where the direction of the current is favorable to their distribution and survival (Platania and Altenbach 1998). These species have a prolonged spawning period beginning in early summer (May) and ending by October (Sublette *et al.* 1990) with the main spawning period from June through August.

Plantania (1993; 1995) and Platania and Altenbach (1998) described the specific traits of pelagic spawning minnow (including the bluntnose shiner) reproduction in the Pecos River. Platania and Altenbach (1998) found that egg production was related with increases in flow (due to rainstorms and Sumner Dam releases), and eggs developed as they drifted, hatching in 24-48 hours. Protolarvae continued to drift passively for an additional 3 days. The distance eggs and protolarvae are transported during the drift phase is not only dependent on the rate of development, but also on river morphology and water velocity during the 3-5 day period after spawning. Assuming a conservative drift rate of 3 km/h (1.8 mi/h), the eggs could be transported 72-144 km (43-86 mi) before hatching and the protolarvae an additional 216 km (130 mi). Pelagic spawning minnows become actively motile once the yolk-sac absorbed and the swim bladder formed, at which time they begin foraging and move to low-velocity habitats (Platania and Altenbach 1998; Propst 1999).

Platania (1993) conducted spawning studies of the bluntnose shiner in aquaria; and found that a single female bluntnose shiner spawned 370 eggs in one event. The species spawns multiple times during the spawning season. The total number of eggs contained by the bluntnose shiner was reported for two specimens as 1049 and 85 (Hatch *et al.* 1985). In a closely related to the Rio Grande bluntnose shiner subspecies, and female Age II and Age III fish produced 1,298-2,831 eggs and 2,331-3,090 eggs, respectively (Bestgen and Platania 1987) .

After the closure of Sumner Dam, major channel incision occurred during the 1949 to 1980 period, accompanied by saltcedar proliferation along the river banks. Displacement of bluntnose shiner eggs and larvae increased during this period due to higher velocity flows within the incised river channel. This channel incision also reduced the areas of low velocity habitat used by the bluntnose shiner. High flows prevalent throughout1986 and 1987 and lengthy reservoir releases in 1988 (36 days) and in 1989 (56 days) displaced downstream extremely high numbers of bluntnose shiner eggs and larvae (Chris Hoagstrom, pers. comm. 2001).

Age and Growth

Hatch *et al.* (1985) reported that the bluntnose shiner had three age classes (0, I, II), and the average total length was Age 0 (24.0 - 42.9 mm, 1 - 1.7 in), Age I (43.0 - 58.9 mm, 1.7 - 2.3 in), and Age II (59.0 - 72.5 mm, 2.3 - 2.9 in). Hatch *et al.* (1985) found that populations of *N. s. pecosensis* were composed primarily of Age 0 (77.5 percent) and Age I (18.5 percent) and that Age II specimens were uncommon (4 percent).

Age 0 fish were most common from Fort Sumner to Artesia (Hatch *et al*. 1985). Age I bluntnose shiners were found from Fort Sumner to Better Lake National Wildlife Refuge and from Hagerman to Artesia, a distance of 197 stream km (120 mi). Age II fish were the most restricted, being found from 35 km (21 mi) south of Fort Sumner to the U.S. Highway 70 crossing north of Roswell (89 km, 54 mi).

Since 1991, base flow has been enhanced by wet climatic conditions and base flow supplementation from Sumner Dam bypasses. Base flows supplementation in the 1990s appears to have been a factor in the mean lengths of bluntnose shiner (Table 1). Greater size typically results in increased egg production and a more stable population.

Bluntnose shiner growth was second highest in1999 after increased base flows in winter 1998-1999, irrigation season of 1999, and again in the winter of 1999-2000 (Table 1). This improved fish growth leads to improved survival, increased egg production, and subsequently higher bluntnose shiner population numbers (Figure 2).

Table 1. Mean standard length (mm) by study year of common fish species found in seine collections from study area between January 1992 and December 1999. Not all individuals were measured during 1992 and 1993. ‘+’ indicated annual mean Standard Length was above the total mean Standard Length while ‘–‘ indicated the opposite.

Species	1992	1993	1994	1995	1996	1997	1998	1999
red shiner	22.6 -	25.1 +	24.7 -	24.1 -	24.6 -	22.7 -	25.3 +	27.9 +
plains minnow	38.6 +	48.4 +	24.0 -	28.4 +	25.3 -	22.4 -	39.1 +	27.3 +
speckled chub	30.0 +	27.4 +	25.5 -	24.7 -	26.8 -	26.3 -	30.7 +	29.3 +
Arkansas River shiner	26.4 +	28.3 +	23.03 -	22.9 -	22.7 -	24.8 +	28.3 +	27.6 +
Rio Grande shiner	37.1 +	29.9 +	26.8 -	24.8 -	25.9 -	30.7 +	34.9 +	30.1 +
Pecos bluntnose shiner	36.3 +	24.2 -	25.9 -	23.0 -	25.6 -	27.9 -	32.9 +	34.2 +
sand shiner	29.7 +	33.6 +	30.3 +	28.7 -	27.9 -	29.2 +	27.9 -	30.9 +
fathead minnow	24.7 -	26.1 +	28.7 +	26.3 +	28.5 +	23.6 -	27.8 +	23.5 -
plains killifish	32.0 -	29.7 -	31.5 +	30.2 -	26.7 -	30.1 -	34.1 +	31.2 -
western mosquitofish	20.4 -	19.6 -	21.3 +	19.8 -	20.1 -	20.0 -	20.8 -	23.4 +

Food Habits

The bluntnose shiner has a simple S-shaped gut with two flexures, indicating a omnivorous diet (Sublette *et al.* 1990; and Propst 1999). Bestgen and Platania (1987) examined digestive tracts of Rio Grande bluntnose shiner and found a mostly omnivorous diet, including food items of detritus, filamentous algae, terrestrial plant material, and aquatic and terrestrial insects. Platania (1993) conducted a cursory analysis of 655 bluntnose shiner stomachs and determined that it has an omnivorous diet. The diet included typical drifting organisms such as: terrestrial insects (ants and wasps), aquatic invertebrates (mainly dipterians, fly larvae and pupae), larval fish, and plant seeds (saltcedar). Aquatic plant material, such as algae, did not appear to be a dietary component. Propst (1999) reports that young bluntnose shiners probably feed primarily on zooplankton and small aquatic insects associated with low-velocity habitats.

Many species of *Notropis*, including the bluntnose shiner, feed primarily on drifting insects (Starret 1950; Minckley 1963; Medelson 1975; Platania 1993) and seeds (Minckley 1963; Whitaker 1977). As a drift feeder, bluntnose shiner may utilize terrestrial or aquatic food items, depending on availability. Higher flows transports greater drift, therefore drift feeding fishes select areas with relatively high velocities to access maximum forage. However, most fishes are unable to perpetually maintain position in rapid water (Facey and Grossman 1990). Areas in the river with high differences in water velocity allow drift feeding fishes to rest in low velocity waters, while being within one of two body lengths of swift waters that deliver large amounts of drift (Hoagstrom 2000). Drift feeding fishes, such as the bluntnose shiner, benefit from high abundance of habitat with high velocity differences (Hoagstrom 2000).

Competition

Non-native species, including the plains minnow and the Arkansas River shiner (*Notropis girardi*) (Sublette *et. al.* 1990), now comprise a large portion of the shiner guild, and may indicate interspecific competition as a factor in the reduction in bluntnose shiner abundance and distribution. These fish species belong to the same guild of broadcast spawners with semi-buoyant eggs and also spawn during high flow events in the Pecos River, with eggs and larvae being distributed downstream to colonize new areas (Bestgen *et al.* 1989). Young fishes of these species may compete directly with young bluntnose shiner for space and food. The plains minnow has been implicated in the extirpation of the Rio Grande silvery minnow (*Hybognathus amarus*) from the Pecos River through competition and hybridization (Bestgen and Platania 1991; U.S. Fish and Widlife Service 1992). The Arkansas River shiner and the plains minnow may compete with the bluntnose shiner. Williams *et al.* (1985) reported that native fishes of the Southwestern United States are scarce in the presence of abundant numbers of introduced fishes.

Several piscivorous fish species, such as white crappie, spotted bass, and bluegill were primarily found in the Pecos River immediately downstream of Sumner Dam and did not commonly occur at sites where adult native minnows, such as bluntnose shiner and Rio Grande shiner were most abundant (Larson and Propst 2000). Channel catfish and white bass exhibited a more variable longitudinal distribution in the Pecos River, but the low abundance and small size classes of piscivores between Sumner Dam and Brantley Reservoir suggests that piscivory on native shiners is not a major cause of mortality (Larson and Propst 2000).

g. Distribution/Abundance/Population Dynamics

Bluntnose shiner historically occupied the Pecos River from near Santa Rosa downstream to the vicinity of the Texas state line. Chernoff *et al.* (1982) reported the downstream-most collection as being within the state of Texas. Therefore, the documented historical range of the Pecos bluntnose shiner is 583 river-km and the current range (Old Fort Park to Brantley Dam) is 318 river-km (194 mi), roughly 55 percent of the historical range. If one considers that Pecos bluntnose shiner represent the entire species (since the other sub-species (Rio Grande bluntnose shiner) is extinct, the discovery of which directly led to the listing of the Pecos sub-species as federally and State threatened, the decline in distribution is even greater. Rio Grande bluntnose shiner were collected over a range of 813 river-km (496 mi). When combined with Pecos bluntnose shiner, the total documented historical range of bluntnose shiner was 1396 river-km (852 mi), of which the current Pecos bluntnose shiner range represents 23 percent (Chris Hoagstrom, pers. comm. 2001)

The historic trend in bluntnose shiner abundance indicates a decline in abundance, since the 1940s (Hatch *et al.* 1985; Brooks *et al.* 1991; Propst 1999). For example, Koster collected 818 bluntnose shiner on September 3, 1944, at the U.S. Highway 70 bridge. In comparison, between 1992 and 1999, the New Mexico Fisheries Resources Office (NMFRO) personnel collected a total of 815 bluntnose shiners in 39 trips. Collections by Hatch (1982), when

compared to shiner guild values of historic collections, indicate a guild that was no longer dominated by bluntnose shiner. Collections between 1986 and 1990 indicate a further decline in abundance and a reduction in range, although the species still existed within the designated critical habitat reaches (Brooks *et al.* 1991). Brooks *et al.* (1991) found that the bluntnose shiner comprised 3.7 percent of the total number of all shiners collected (5 species) from the Pecos River during 1990, compared to 22.4 percent for all collections prior to 1980 (4 species).

Bluntnose shiner populations remained low through 1993 (Figure 2). In 1994, populations began to rise in the lower reaches and in subsequent years from 1994, began to increase in the upper reaches until 1998. Populations in 1998 dropped to 1995 levels for the upper three listed reaches and remained steady until 2000 when a slight increase was again recorded. The high population density was not sustained in 1997 and 1998 because base flows were not supplemented and frequent reservoir releases caused downstream displacement.

Bluntnose shiner density was most closely monitored in the La Espia and Bitter Lake study reaches (between Taiban Creek confluence and Bitter Lake National Wildlife Refuge). These reaches maintain a self-sustaining (reproducing) bluntnose shiner population. Bluntnose shiner density was very low during 1992 and 1993 (Figure 2). A sustained density increase was first observed in 1994. It is believed that this increase represents a recovery from a severe population decline during the 1988-1991, when many miles of the river between Sumner Dam and Roswell became partially intermittent for several weeks. The population increase was facilitated by the stabilization of base flows which began during 1991. This flow stabilization was primarily the result of increased rainfall.

Recently, experimental and bypass releases have been made from Sumner Dam in an effort to avoid flow intermittency and to enhance in-stream habitat conditions for bluntnose shiner. The first base flow supplemental discharge was made during winter 1995-1996 as a component of the 5-year study period. The base flow target at that time was 60-70 cfs at the Acme Gage. Subsequent to this operation, bluntnose shiner density dramatically increased (Figure 2). In the following year, bluntnose shiner may have been additionally favored by frequent summer rainstorms, which supplied a relatively ‘natural’ flow regime throughout the summer spawning period. Bluntnose shiner density continued to rise through 1997 (Figure 2).

Operations in 1997 and 1998 included many storage transport releases, separated by low flow periods without base flow supplementation. This may not have been as favorable for bluntnose shiner. It appears that the success of bluntnose shiner in 1996 was sustained for the life span of a single year class (two years), declining to pre-boom levels as that class declined. During 1998, bluntnose shiner density declined to pre-1996 levels and has remained relatively stable since that time. Base flow supplementation via Sumner inflow bypass has occurred since August 1998, but bypass operations were only sporadically implemented during the irrigation seasons and have allowed periods (days) with very low

flows and, as a result, may not have maintained favorable habitat conditions for bluntnose shiner at all times.

h. Factors Affecting the Bluntnose Shiner in the Action Area

As a result of various alterations to the Pecos River system most notably the diversion of water for irrigation and the construction of impoundments, the bluntnose shiner has undergone significant population declines in the last 50 years, and is now restricted to two Pecos river segments, totaling about 160 km (100 mi) (Service 1992). In the past (before 1991) some reaches of the Pecos River are frequently dry downstream from Sumner Dam due to the operations of Sumner Dam. With the completion of Brantley Dam in 1989, the incidence of channel drying increased since longer block releases were used to reduce water transport losses. Channel drying was recorded at the Acme Gage in 1989 (22 days), 1990 (32 days), and 1991 (15 days).

At the present time, the bluntnose shiner population is unlikely to expand its distribution, because Santa Rosa Reservoir, Sumner Reservoir, the FSID Diversion Dam, and Brantley Reservoir fragment its river habitat and prevents upstream and downstream migration and colonization. Furthermore, Brantley Reservoir traps the drifting bluntnose shiner eggs and larvae and prevents downstream colonization. Therefore, the possibility of increasing the range of the bluntnose shiner appears problematic. Water withdrawals from the river and water releases from dams are severely limiting the survival of bluntnose shiners. Water pollution from irrigation returns, municipal sewage treatment plants, feedlots, and gas and oil activities reduce water quality which also has detrimental effects on the bluntnose shiner. Finally, the capture of sediment in the upstream and tributary reservoir limits the amount available for habitat development.

In summary, the remaining population of the bluntnose shiner is now restricted to about 55 percent of its historic range. The bluntnose shiner has been extirpated upstream of Sumner Reservoir and downstream of Brantley Dam, and its status is tenuous within much of the inhabited reach from Fort Sumner to Brantley Reservoir because its habitats are threatened by dewatering from Sumner Dam water operations (Hatch *et al.* 1985; Service 1992). Although bluntnose shiner density is currently greater than in 1992 and 1993, the species continues to face the possibility of extinction, since the threat of river intermittency remains. The future status of bluntnose shiner will be largely determined by ongoing Sumner Dam operations. Any flow regime which degrades or impacts in-stream habitat conditions or causes massive downstream displacement of bluntnose shiners will have severe adverse effects on the species.

IV. Effects of the Action

The Service's determination as to whether the proposed action is likely to jeopardize the continued existence of the bluntnose shiner is based on an evaluation of: (1) the status of a species in the project area and range wide; (2) the effects of the proposed action on the survival and recovery of a listed species (including effects of interdependent and interrelated actions); (3) the aggregate effects of other Federal actions on a listed species (e.g., amount of take occurring as a result of Federal actions subject to previous consultations); and (4) the cumulative effects on the listed species (i.e., future non-Federal actions that are reasonably certain to occur in the action area.

Direct and Indirect Effects of Reclamation's Proposed Action

To analyze effects of the proposed action, each operational characteristic has been evaluated. Each characteristic has been proposed to provide benefits to the bluntnose shiner while continuing to operate Sumner Dam to bypass inflows for the FSID and deliver water downstream for use by the CID.

Supplemental Water Effects

Purpose: Provide supplemental water to provide a target flow of 35 cfs at Acme for the bluntnose shiner (within Reclamation authority)

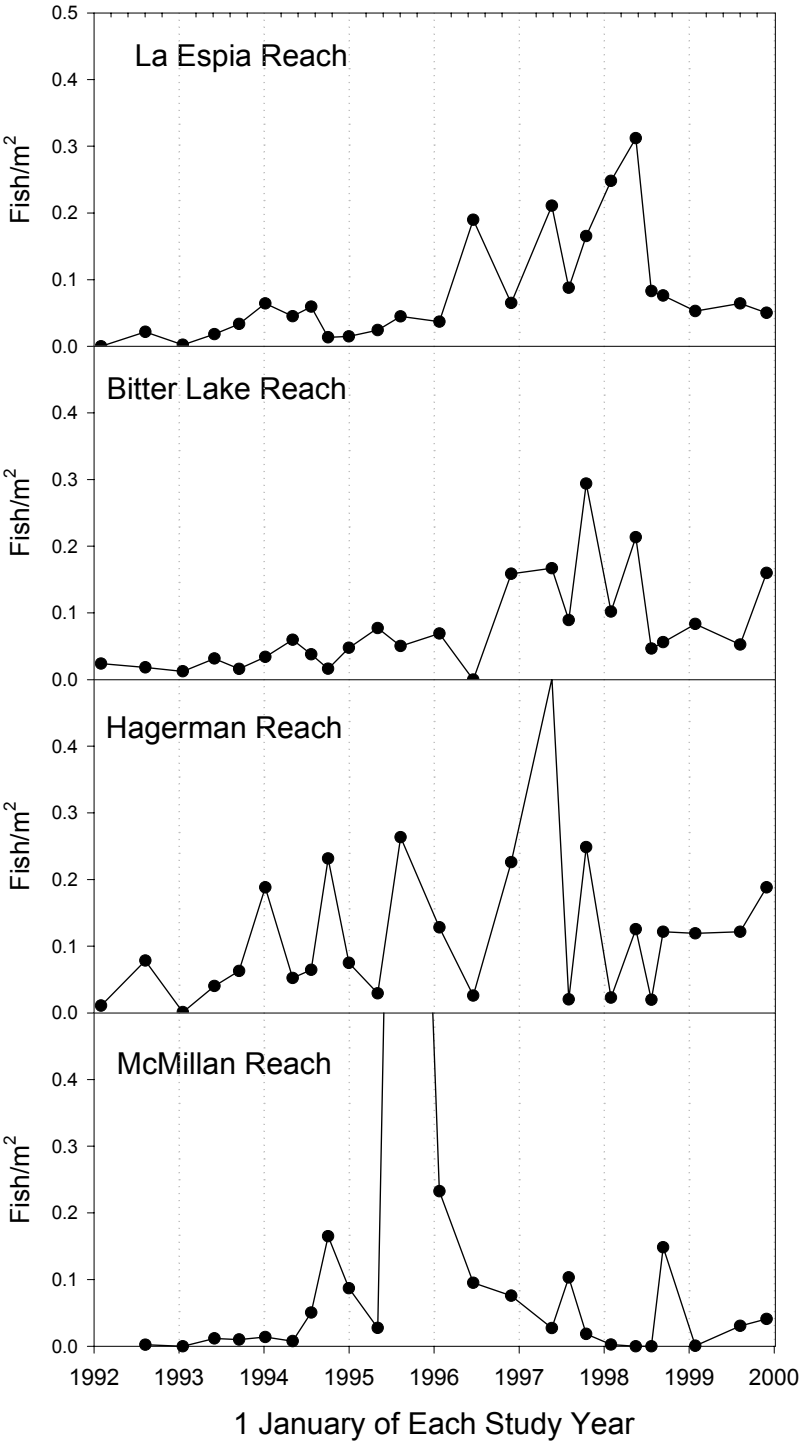

Figure 2.

Bluntnose shiner densities in the Pecos River from 1992 - 2000.

a. Supplemental Water

Reclamation will bypass natural inflows to Lake Sumner when available (based on total inflow above Lake Sumner as determined by the OSE to improve base flows (target 35 cfs at Acme Gage and prevent river intermittency. The proposed action of bypassing flow at Sumner Reservoir to maintain an average target of 35 cfs will reduce negative effects to bluntnose shiner habitat by increasing base flows and the wetted habitat area of the river.

If natural inflows are available, Reclamation will bypass all or a portion of those inflows as needed to target 35 cfs at Acme. Beginning in the winter of 1998, Reclamation has managed for the bypass of inflows when inflows were available and needed to supplement Pecos River base flows. The environmental baseline is characterized by base flows depleted by the cumulative effects of a number of non-Federal actions including groundwater pumping in the basin and the consumptive use of water by non-native vegetation (saltcedar). If Reclamation does not continue to implement this operation, flows will frequently be lower than the modeled predictions and could possibly result in intermittency or temporary stressful conditions to the bluntnose shiner.

The Acme Gage is located 171 km (106 mi) downstream from Sumner Dam, and immediate changes in flow at Acme are not possible through changes in releases from Sumner Dam. Travel time for low volume releases (5-30 cfs) from Sumner Dam to the Acme Gage is from 8 to12 days, therefore flows would be delayed. Flows at Acme may be less than 35 cfs while adjustments to the discharge at Sumner Dam occurs. It appears unlikely that any short duration decrease in flow (excluding intermittency) at Acme would cause bluntnose shiner stranding in isolated pools, or measurably increase competition of the bluntnose shiner with other fishes for habitat and food.

Some bluntnose shiner habitat will be dewatered with subsiding flows, but this is also a natural phenomenon and will result in a temporary reduction in wetted habitat area that may affect bluntnose shiner by limiting foraging, cover, spawning, and rearing habitat. Since, fluctuations in river flow would occur with or without the operation of Sumner Dam, it is impossible to quantify the effects in more than a general manner, unless dam operation results in river intermittency. Periods with very low flows, whether natural or man caused, will result in some degradation of habitat and cause physiological stress in the bluntnose shiner population.

The Pecos River Hydrology Model estimated in the fall of 1998 that this operation would provide 35 cfs at the Acme gage at least 68 percent of the time and 25 cfs at least 89 percent of the time. Without this operation it was estimated that flows at Acme would exceed 35 cfs only 26 percent of the time and would exceed 25 cfs only 65 percent of the time. The actual quantities of inflows that were available for Reclamation to manage depends on the actual inflows that occurred and the call for water made by FSID. With or without the proposed bypass operation, flows at Acme were estimated to exceed 13 cfs 99 percent of the time.

b. Water Leasing

Irrigation well pumping affects the river by lowering the water level of the aquifer. In the past, the State of New Mexico has retired many of these water rights, and the result has been an increase in the water level in the Roswell Artesian Aquifer. River pumping for irrigation also directly reduces the baseflow in the Pecos River. This direct effect is magnified during low flow periods. Reclamation has leased water rights from six river pumpers to reduce these effects.

In 2001, Reclamation will lease water in the basin to make up depletions to the water supply caused by the Sumner Dam bypass operations. In 2001, Reclamation will lease approximately 2,000 acre-feet of river pumpers water rights, 350 acre-feet of Hagerman Canal water rights, and 500 acre-feet of groundwater rights. The leasing of the groundwater rights is located along the Pecos River between Above Acme Gage and the Gasline habitat site. By not pumping these wells, the water losses observed in the past through this reach may be reduced. If additional funding becomes available, Reclamation would pursue additional water leases.

Irrigation Block Release Effects

The Service has determined that block releases will be releases that are greater than 500 cfs. Less than 500 cfs is not detrimental to adult bluntnose shiner (Chris Hoagstrom, pers. comm. 2001).

- Restrict the duration of block releases (greater than 500 cfs) from Sumner Dam to a maximum of 15 days.

Purpose: to improve the longitudinal distribution and population structure of the bluntnose shiner

Hatch *et al.* (1985) reported that Age 0 fish were most common from Fort Sumner to Artesia. Age I bluntnose shiners were found from Fort Sumner to Better Lake National Wildlife Refuge and from Hagerman to Artesia, a distance of 197 stream km (120 mi). Age II fish were the most restricted, being found from 35 km (21 mi) south of Fort Sumner to the U.S. Highway 70 crossing north of Roswell (89 km, 54 mi). This is a result of block releases that transport bluntnose shiner eggs and protolarvae downstream.

- Restrict the total duration of block releases (greater than 500 cfs) from Sumner to a maximum of 65 days.

Purpose: to improve the longitudinal distribution and population structure of the bluntnose shiner

The duration of individual block releases is an important factor for the distribution of bluntnose shiner. For the same reasons, the total number of days of block releases per year is also an important factor. Years when the cumulative block release duration exceeded 65 days had negative consequences on the size class distribution which is not as pronounced during years when the total number of days was equal or less than 65. The distribution of the bluntnose shiner in the Pecos River is many Age 0 fish in the downstream reaches and Age I and II fishes in the upstream reaches. This is caused by the downstream movement of bluntnose shiner eggs and larvae.

- Target a minimum of 14 days between consecutive block releases (greater than 500 cfs) from Sumner.

Purpose: to improve the longitudinal distribution and population structure of the bluntnose shiner

After a block release, bluntnose shiner larvae are not physically able to maneuver out of the downstream current for at least 3 days. By providing at least 14 days between releases, there is sufficient time for the larval bluntnose shiners to physically develop and move to low velocity habitats and avoid the next block release.

- Provide a ramp down period (less than 500 cfs) on the end of block releases (greater than 500 cfs) to improve base flows, particularly during low flow periods.

Purpose: to improve habitat conditions and prolong and increase base flows in the channel between releases

A ramp down immediately following a block release will improve bluntnose shiner habitat by improving the distribution of sediment as flows subside. In addition, the base flows will be increased and prolonged. This is vitally important during low flow periods that may cause intermittency in the river. Intermittency still remains the greatest threat to the existence of the bluntnose shiner, and all possible actions must be taken to prevent it (Hoagstrom, pers. comm. 2001). Ramp downs will not be considered a part of the time period (15 day maximum) for the block releases, since they are beneficial to the bluntnose shiner and its habitat.

- Target one, seven consecutive week period between June 1, 2001 and August 31, 2001 during which no block releases from Sumner will be made to reduce adverse effects during the spawning season (approximately June 1 - August 31).

Purpose: to improve reproductive success and increase population numbers

Targeting a seven week period during which no block releases are made during the peak of the spawning season. Reclamation notes that seven weeks is the longest practical time

period between irrigation releases that can be provided. The seven week respite would allow bluntnose shiners spawned to grow to sufficient size to seek low velocity habitats. It also would provide an opportunity for natural flow spikes to induce spawning.

The bluntnose shiner is a pelagic broadcast spawner that produces semi-buoyant, drifting eggs and larvae (Propst 1999; Platania and Altenbach 1998). Bluntnose shiners have a prolonged spawning period beginning in early summer (May) and ending by October (Sublette *et al.* 1990) with the main spawning period from June through August. This species also spawns during high flow events (rainstorms and Sumner Dam releases) in the Pecos River, with eggs and larvae being distributed downstream to colonize new areas (Platania and Altenbach 1998). The females release non-adhesive, semi-buoyant eggs into the water column and males immediately fertilize the eggs (Platania and Altenbach 1998). The fertilized eggs then drift downstream with the current and hatch in 24-48 hours (Platania and Altenbach 1998). The free-swimming protolarvae remain a component of the drift for up to an additional three days, absorbing most of their yolk-sac. The larvae subsequently begin to actively forage and move to low-velocity habitats (Platania and Altenbach 1998; Propst 1999).

Block releases that occur during the spawning season from May through September will have adverse effects on the bluntnose shiner by transporting eggs and larvae into Brantley Reservoir due to predation by fishes and lack of lotic habitat. However, the effects would be minimal in May and September since the peak spawning period is June, July, and August with May as the start and September as the end of the spawning season. The eggs and protolarvae drift downstream for 3-5 days (Platania and Altenbach 1998). The distance eggs and protolarvae are transported during the drift phase depends on the rate of development and on river morphology and water velocity during the 3-5 day period after spawning. Assuming a conservative drift rate of 3 km/h (1.8 mi/h), the eggs could be transported 72-144 km (43-86 mi) before hatching and the protolarvae an additional 216 km (130 mi) (Platania and Altenbach 1998). The bluntnose shiner's drifting eggs and larvae can be transported downstream from 288 to 360 km (176 to 220 mi) in 4 to 5 days.

The bluntnose shiner distribution occurs from 16 km (10 mi) downstream from Fort Sumner to Brantley Reservoir, a distance of 346 km (215 mi), and block releases during the spawning season exceeding 4 days have the capability of transporting the entire spawning effort (eggs and larvae) into Brantley Reservoir. Therefore, block releases during the spawning season need to be minimized and efforts should be made to have the block releases before and after the spawning season to the extent possible. In the event that irrigation water is required by CID during the spawning season, the block release should be timed to coincide with low flow periods in May, June, and September. This will improve the base flow of the river and offset some of the adverse effects of block releases.

- Reclamation will initiate weekly water operations conference calls with the Service.

Purpose: To improve communication between Reclamation, the Service, and the affected water users.

The weekly calls will improve communications and make it possible to improve the timing of block releases to improve base flows during low water periods. In 2000, low flow occurred in May, June, and September. If block releases could have been initiated in these months, the low river base flows could have been offset. Increasing tailout times on block releases would also benefit base flow conditions with little additional losses due to evaporation since the channel would already be wetted. In addition, the conference calls will assist in planning the timing of block releases in relation to the peak bluntnose shiner spawning season (June through August).

- Reclamation will continue to fund and support bluntnose shiner population monitoring efforts so that the status of the species can be continuously and accurately evaluated.

Purpose: Population monitoring will provide timely information on population levels and trends for the bluntnose shiner. This information is essential to determine the status of the species and to evaluate its response to the water operations actions.

Direct and Indirect Effects Summary

Reclamation's proposed operation to bypass available inflows to target 35 cfs at Acme will augment base flows for the bluntnose shiner and improve habitat conditions by increasing the wetted area of the river. Reclamation's proposal to limit block releases to 15 days or less and to limit the cumulative duration within the calendar year to 65 days or less will reduce adverse effects on the longitudinal distribution and population structure of the species. Reclamation's proposal to provide a minimum rest period of two weeks between block releases will allow young bluntnose shiner to develop and seek preferred habitats. Reclamation's propose to target a seven week rest period during the summer spawning season. This action will improve reproductive success of the species by reducing the number of eggs and larvae entrained into Brantley Reservoir, where they succumb to predators or lack of habitat.

V. Cumulative Effects

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

Cumulative effects include:

- Increased urban use of water, including municipal and private uses. Further use of surface water from the Pecos River will reduce optimal river flow and decrease available habitat for the bluntnose shiner.

- Continuing reduction in river flows from irrigation activities (i.e river and groundwater pumping, diversions, and block releases). The irrigation water depletions reduce river flow that in turn reduces the bluntnose shiner habitat area. The block releases transport bluntnose shiner eggs and larvae into Brantley Reservoir where they do not survive.

In summary, human activities have had many adverse effects on the Pecos River ecosystem in the last 100 years. Although many adverse effects have occurred, it appears that only river intermittency continues to threaten the continued existence of the bluntnose shiner.

VI. Conclusion

After reviewing the current status of the bluntnose shiner, the environmental baseline for the action area, the effects of the proposed water operations, and the cumulative effects, it is the Service's biological opinion that the proposed Pecos River water operations are "not likely to jeopardize" the continued existence" of the bluntnose shiner and will not result in the "destruction or adverse modification" of its designated critical habitat.

The Service's conclusion is based on the following. The bluntnose shiner occupies 55 percent of its historic range. The potential for dewatering the middle reach from the FSID Diversion Dam to Roswell remains an ongoing threat to the bluntnose shiner's existence. Block releases will have adverse effects during the spawning season on the bluntnose shiner eggs and larvae by transporting many of them into Brantley Reservoir, where they perish. Reclamation has included several measures to reduce the adverse effects of block releases including: limiting block releases to 15 days, providing 14 days between block releases, having no more than 65 days of block releases annually, 7 weeks during the spawning season without block releases, and providing a tailout period on block releases.

Reclamation has also taken measures to improve the base flow in the Pecos River. Reclamation has leased water rights from river and groundwater pumpers, and will provide bypass flows at Sumner Dam when they are available, and will coordinate block releases to coincide with low flow periods.

VII. Incidental Take Statement

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

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

Amount or Extent of Take

Take will occur in the form of harm, harassment, death, or injury. This incidental take statement applies only to Reclamation's proposed water operations. The Service anticipates take of the bluntnose shiner eggs and larvae resulting from block releases during it's spawning season. In a few days, these releases transport bluntnose shiner eggs and larvae downstream into Brantley Reservoir where they perish. Take of several thousand eggs and larvae will likely occur, but since the survival of the bluntnose shiner from egg to adult is probably less than 1 percent, the effects should not jeopardize the existence of the species. Adult and young bluntnose shiners will not be affected by block releases, since they can move to lower velocity habitats. The incidental take is difficult to quantify since the

bluntnose shiner releases semi-buoyant, drifting eggs that are essentially the same size and color as the eggs of four other fish species, and differentiation is difficult. However, the following level of take of this species can be anticipated by loss of approximately100,000 eggs and larvae. Reclamation will monitor the bluntnose shiner eggs and larvae entering Brantley Reservoir to determine when the incidental take has been exceeded. The amount of will be reduced by limiting block releases during the bluntnose shiner spawning season. In respect to the target of 35 cfs at the Acme Gage, Reclamation will monitor flows to ensure that a monthly average of 35 cfs is maintained throughout the irrigation.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes that following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the bluntnose shiner:

1. Reclamation will continue to cooperate with the Service, Corps, CID, FSID, and ISC to manage Pecos River flows to benefit the bluntnose shiner.

2. Reclamation will monitor Pecos River hydrological conditions and bluntnose shiner populations.

3. Provide support for propose habitat restoration activities in the Carlsbad Project Area to offset the chronic detrimental effects of Sumner Dam sediment and flood capture on the river channel downstream.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1.1 Reclamation will investigate the possibility of CID and ISC working cooperatively to release ISC water that is leased annually from CID to improve river base flows during low flow periods.

1.2 Reclamation will work with FSID to release water during the period of mid-February to the date before CID begins irrigation to improve base flows (when less than 35 cfs).

1.3 Reclamation will cooperate with the Corps and CID to move water from Santa Rosa Reservoir in a manner that will benefit the bluntnose shiner.

2.1 Reclamation will continue to fund and support monitoring of the bluntnose shiner and its habitat on the Pecos River. When river flows at the Acme Gage are less than 35 cfs during the irrigation season 2001, bluntnose shiner monitoring will be conducted every two weeks.

2.2 Reclamation will begin monitoring bluntnose shiner and egg drift into Brantley Reservoir weekly during block releases from Sumner Dam during the peak spawning season (June 1- August 31) to determine the incidental take of eggs and larvae.

2.3 Reclamation will monitor Pecos River discharge at multiple points between Sumner Dam and Acme throughout the year.

2.4 Reclamation will establish a USGS gaging station to replace the Above Acme Gage and an additional gage between Dunlap and Above Acme.

3.1 Reclamation will continue to support the river restoration activities on the Bitter Lake National Wildlife Refuge.

3.2 Reclamation will seek out additional habitat restoration opportunities along the Pecos River.

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 Reclamation 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 (505/883-7814) or the New Mexico Ecological Services Field Office (505/346-2525).

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 a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Reclamation should monitor effects of water pollution on the bluntnose shiner downstream of the municipalities of Fort Sumner (irrigation return area), Roswell, and Artesia.

2. Reclamation should study the feasibility of creating a conservation pool in Santa Rosa and/or Sumner Reservoirs for release during low flow periods to prevent river intermittency and to benefit the bluntnose shiner.

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.

IX. Reinitiation Notice

This concludes formal consultation on the action(s) outlined in the February 15, 2001, 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) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. This consultation is only valid for irrigation season 2001 and therefore consultation must be reinitiated prior to the expiration of this opinion to ensure continued compliance with section 7 and 9 of the ACT. Updates of any environmental commitments may require reinitiation of consultation. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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