BIOLOGICAL ASSESSMENT

OF PROPOSED PECOS RIVER

2002 IRRIGATION SEASON OPERATIONS

ON THE PECOS BLUNTNOSE SHINER

APRIL 5, 2002

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ALBUQUERQUE AREA OFFICE
ALBUQUERQUE, NEW MEXICO

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1. INTRODUCTION

This Biological Assessment (BA) analyzes the potential effects of the Bureau of Reclamation's (Reclamation) proposed actions on the Pecos bluntnose shiner (shiner), (*Notropis simus pecosensis*), a federally listed threatened species within the Pecos River basin. The proposed actions cover the irrigation season from March 1, 2002 to October 31, 2002.

This species is native to the Pecos River and may be affected by irrigation season operations as proposed by Reclamation. Distribution and life requirements are discussed, as well as an analysis of the effects of the past three (1999, 2000, and 2001) irrigation season operations on this species. An Effects Determination has been made.

The purpose of this interim BA is to formally consult with the U.S Fish and Wildlife Service (Service) over Reclamation's proposed discretionary actions that may affect the Pecos bluntnose shiner in the 2002 irrigation season. During this period, if any new information or finding points to a need for revised operations, then Reclamation would consider modifying this current assessment or preparing a new assessment to address any significant operational changes which may be proposed.

This BA is organized in the following manner: the description of the Pecos Basin; the authorities under which Reclamation operates in the Basin; the background of the hydrological baseline; the historical operations and ESA consultations to date; the description of the proposed action; the species description; analysis of effects; and effects determination.

2. DESCRIPTION OF THE AREA

The Pecos River is a principal tributary of the Rio Grande in the United States. It rises in the Truchas Peak area of the Sangre de Cristo Mountains of northern New Mexico at elevations of more than 13,000 feet and drains 25,000 square miles in New Mexico (Figure 1) and 19,000 square miles in Texas. The river flows through precipitous canyons and gorges, dropping in elevation to about 4,300 feet at Lake Sumner near Fort Sumner, New Mexico, and to 1,000 feet where it flows into the Rio Grande.

From Lake Sumner, the river flows generally southward through broad rolling plains of New Mexico and Texas to its junction with the Rio Grande near Del Rio, Texas. The Middle Basin is located from Fort Sumner to Carlsbad. The major tributaries of the Middle Basin are the Rio Hondo, Rio Felix, Rio Penasco, and Seven Rivers.

Approximately 130,000 acres of land are under irrigation in the Middle Basin. Some 35,000 acres are served fully or partially from surface supplies. The balance of 95,000 acres is served from water from artesian or shallow wells. Many of these wells were put into production after 1950 and they have impacted surface flows in the river. Except for small scattered areas along

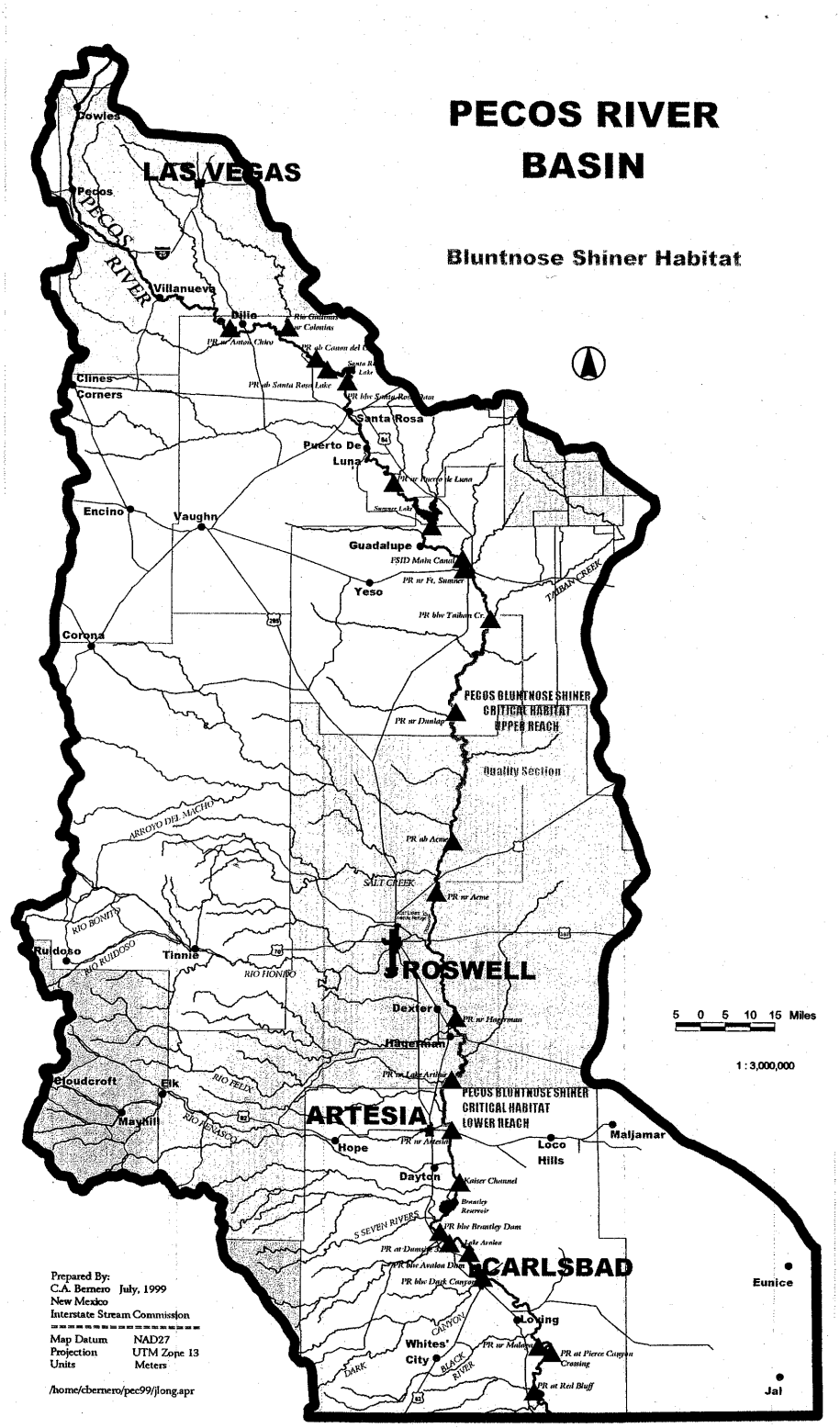


Figure 1. Pecos River Basin within New Mexico. (NM-ISC, 1999)

the higher reaches of the major tributaries, the irrigated lands lie along the main stem of the Pecos River. These lands are primarily in the vicinity of Fort Sumner and Carlsbad and in the Roswell artesian basin which extends from Roswell downstream to near Brantley Dam.

The Carlsbad Project Area (Project Area) is located within the Pecos River Basin of southeastern New Mexico. It includes the reach of the Pecos River from Santa Rosa Reservoir downstream to Brantley Dam. Within this area, the river has a drainage area of approximately 25,470 square miles and traverses 225 miles.

The Fort Sumner Project is located in DeBaca County and consists of a narrow strip of land on the east bank of the Pecos River served by a concrete diversion dam and necessary canals and laterals. The diversion dam is located approximately 14 miles below Sumner Dam. The Fort Sumner Irrigation District (FSID) includes 8,035 acres, of which 6,500 are classified as irrigable. Some of the project lands were first irrigated by the United States Army as early as 1863. Most of the project has been irrigated continuously since 1907. The FSID was formed in 1919 to purchase the works from the original development company. This diversion dam was later replaced by one built by Reclamation.

The Pecos River flows through alternating narrow canyons and slightly wider valleys in the reach from Santa Rosa Dam to Sumner Reservoir. From Sumner Dam downstream for 106 miles to the Pecos River near-Acme gage site (Acme), the channel is generally wide, sandy and unstable. Throughout this reach, water from springs and irrigation returns provide flows in the channel during times when no bypasses were occurring from Sumner Dam. Shifts occur in the bed structure as flows fluctuate through these habitats. The channel becomes spread out and braided USFWS, 1992-1995).

The Sumner-Acme stretch of river is also hydrologically characterized as a losing reach. Surface water is lost both through seepage and evaporation. Depending on the time of year, the amount of water moving down the channel, and local weather conditions, water losses in this portion of the river can be as much as 100% by the time the water reaches Acme. From Acme downstream the river begins to gain water back to the surface and is a gaining reach. In addition, the stream from this point slowly begins to narrow and deepen. 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.

3. RECLAMATION AUTHORITIES

The operations of the Carlsbad Project are authorized in accordance with: 1) the statutory Project authorizations and Reclamation law; 2) the purchase and appropriation of water rights under New Mexico Territorial law and as those rights have been affected by additional permits and applications under New Mexico state law; and 3) the beneficial use requirement that water must be used for its permitted use efficiently because a wasteful use is not beneficial. These authorizations limit the scope of Reclamation's discretionary authority and what can be

accomplished under section 7(a)(2) of the Endangered Species Act (ESA).

The Carlsbad Project was authorized by the Secretary of the Interior in 1905 under the terms of the Reclamation Act of 1902. Under the 1902 Act, the only purpose for a Reclamation Project was irrigation. The Carlsbad Project was constructed out of the ruins of a private irrigation project which had been devastated by floods. In order to compose the Carlsbad Project, Reclamation purchased by warranty deed the water rights which had belonged to the Pecos Irrigation Company and then in 1906, Reclamation made new filings with the Territorial Engineer for additional water rights for the Carlsbad Project. The 1906 filing is known as "Filing Number 6" with the State Engineer of New Mexico. These filings and rights have been adjusted from time to time to accommodate new facility construction, but essentially, the Carlsbad Project operates under the same rights that had been obtained by 1906. The Hope Decree, Number 712, Equity, June 4, 1932, confirmed to the United States water rights for the Carlsbad Project based upon irrigation use. The Carlsbad Project is an irrigation project and Reclamation must maximize water use for the purpose of irrigating lands in the Carlsbad Irrigation District.

In the Carlsbad Project, Reclamation diverts water to storage and then releases the stored water upon the order of the Carlsbad Irrigation District pursuant to legal obligations under contract. The action of diverting water occurs when the water is in the stream and then is diverted at a Reclamation facility. For example, when water is naturally in the stream in May and then is diverted to storage at the dam, the act of diversion is complete and has been taken at the time that the water is physically obstructed in the stream bed in May. The action of diverting to storage only takes place when sufficient water is in the stream for the shiner. Thus, the holding of water in storage subsequent to the diversion is not an action because that action was complete upon the diversion and is not impacting natural flows subsequent to the diversion.

It is clear from the federal statutes that authorized the construction and control the operation of the federal Reclamation facilities that the primary purpose of the facilities of the Carlsbad Project is irrigation. It is also clear that the primary purpose of the water rights obtained by purchase or reservation under New Mexico Territorial law and New Mexico State law is irrigation as well. The Tenth Circuit Court of Appeals, in *Jicarilla Apache Tribe v. United States*, 657 F.2d 1126, (10th Cir. 1981), has ruled that it is illegal for Reclamation storage facilities to be operated solely for purposes other than primary purposes of the project authorizations. Also, the court ruled that the use of project water must be recognized as beneficial under state law. Further, as the federal action of diverting water into storage is complete when the water is diverted, section 7(a)(2) cannot require the release of stored water as section 7(a)(2) only requires the cessation of ongoing actions, and the act of diversion is completed when the water is obstructed at the storage facility. However, as stated above, section 7(a)(2) does require that Reclamation curtail or even cease diverting water to storage entirely when those natural flows are needed to avoid jeopardy of the species. Thus, in accordance with section 7(a)(2), Reclamation has curtailed or ceased the diversion to storage when the natural flows were needed by the shiner.

The Fort Sumner Project was authorized by Congress in 1949 in accordance with Federal Reclamation laws (63 Stat. 483). Reclamation owns the FSID diversion dam and directs the FSID to operate and maintain the facility through contract. Reclamation does not pay any of the operation and maintenance costs of the facility.

The FSID has a direct flow diversion right with a priority date of March 18, 1903. FSID's right to divert up to 100 cubic feet per second (cfs) of the Pecos River's natural flow is senior to Carlsbad Project's right to divert to storage at Santa Rosa or at Sumner Dam. Therefore, Reclamation must not divert to storage at Sumner Dam water necessary to meet FSID's senior diversion water right (up to 100 cfs of natural flow). FSID's water right was perfected prior to Reclamation's involvement with the District. The water right was never transferred to the United States. The legislation specifies that the benefitting district must repay the United States for the construction costs.

4. BACKGROUND OF HISTORICAL OPERATIONS, HISTORICAL HYDROLOGY AND ESA CONSULTATIONS TO DATE

Historical Operations

Sumner Dam

Historical operations by Reclamation in the Pecos Basin began after Sumner Dam was completed in 1937. The operation of Sumner Dam from the fall of 1937 to 1989 was to divert to storage the available natural flows above the senior right of the Fort Sumner Irrigation District and release stored water for irrigation in the Carlsbad Irrigation District (CID). During the FSID irrigation season (March 1 through October 31) and for two eight-day periods during the winter months, Sumner Dam diverted to storage all flows above the FSID's direct diversion water right (up to 100 cfs) as long as the storage was below the conservation space of the reservoir as set by the NM Office of the State Engineer. If the reservoir was at the conservation space elevation, a "spill" occurred and the outflows matched inflows up to the maximum release ability of the outlet works. Stored water was released upon demand in CID consistent with available storage conditions in McMillan and Avalon Reservoirs. The CID block releases efficiently moved water from Sumner Dam to McMillan Reservoir by releasing water at rates between 1,000 and 1,400 cfs, near the capacity of the outlet works. The distance of 226 river miles from Sumner Dam to McMillan Reservoir was too great for small releases to be efficient as they would result in excessive losses to evaporation and seepage. For the period 1938 through 1998, block releases occurred 0 to 5 times per year with an average annual number of 2.4 block releases per year. The block release durations ranged from 3 to 47 days per block release with an average block release duration of 15.5 days.

In 1981, Santa Rosa Dam was completed and a portion of the irrigation storage right in Sumner Reservoir was moved to Santa Rosa Reservoir. This created additional space in Sumner Reservoir for flood control. Santa Rosa releases are generally block releases that are passed through Sumner Dam without being diverted to storage. Therefore, Sumner Dam operations are

not impacted. Stored irrigation water is kept as far up in the system as possible to maximize management opportunities and reduce evaporation. However, if both Santa Rosa Reservoir and Sumner Reservoir have low pools (i.e., less than 10,000 acre-feet) and conditions permit, the volumes are balanced to avoid negatively impacting the fisheries, water quality, recreation and local economy of one community over the other.

In 1989, in an effort to fill the newly-constructed Brantley Dam and perform safety analyses on the facility, a one-time extended release was made from Sumner Dam. In the spring, Reclamation made a single large block release from Sumner Dam to fill Brantley Reservoir to the top of the conservation pool (40,000 acre-feet). The block release was initiated on April 10, and lasted until May 23 (43 days), after which releases were held at approximately 500 cfs for 14 days to maintain Brantley Reservoir pool elevations. For the remainder of the 1989 irrigation season historical operations resumed. This one time event does not constitute normal operations and the expectation is that it will not be repeated.

During the years 1990 through the 1998 irrigation season, historical operations of Sumner Dam resumed. Flows above FSID's water right were diverted to storage and block releases efficiently transported stored water to Brantley Reservoir. Between 1993 and 1996, experimental operations were mixed-in with the normal operations. These experimental operations were conducted to gather hydrologic/hydraulic information for the development of a hydrologic routing model and associated studies of shiner habitat requirements. These experimental operations were coordinated by participating agencies of the Memorandum of Understanding described in the following section. In general these experimental operations modified the block releases to evaluate ramp-up and ramp-down operations.

Block releases occurred between 1 and 4 times per year for the period 1990 through 2001 (not including the years in which block releases were modified for the hydrologic studies). The average annual number of block releases per year was 2.6. The block release durations ranged from 7 to 30 days per block release during this period, with an average block release duration of 15.7 days.

Since the 1998/1999 winter season, the winter season operation of Sumner Dam has been modified to divert water to storage only when not required to meet downstream flow targets at the Acme gage. Since 1999, the Sumner Dam irrigation season operations have been modified to divert water to storage only when available above FSID's water right and when not required to target downstream flows at the Acme gage, to limit the block release duration to a maximum of 15 days, and other limitation on block release timing and frequency.

Fort Sumner Irrigation District Diversion Dam

Lands associated with the Fort Sumner Irrigation District were first irrigated by the United States Army as early as 1863. Most of the project has been irrigated continuously since 1907. FSID was formed in 1919 to purchase the works from the original development company. FSID has the right to divert up to 100 cfs of the natural flow of the Pecos River between March 1st and October 31st of each year and for two eight-day periods during the winter seasonal. If FSID

chooses to use their winter diversion water rights in conjunction with the beginning of their irrigation season diversion rights, bypasses could start a full two weeks earlier than March 1st. FSID has no storage rights. FSID's water right was determined as the natural flow of the river at the diversion dam from the early 1900's to 1937 (construction of Sumner Dam), and as the natural flow of the river as reported by the PDL gage until 1980 (construction of Santa Rosa Dam). Since 1980, the NM Office of the State Engineer calculates a two-week average natural river flow and FSID's water right using the Above Santa Rosa Lake and PDL gages. Anytime FSID calls for their winter diversion water rights, Reclamation uses the State Engineer's calculations for that period of time instead of the PDL gage.

In 1951 Reclamation rebuilt the FSID diversion dam. The new structure did not alter FSID's operation and diversion regime.

Historical Hydrology

The primary gage records available to ascertain the hydrologic conditions of the Pecos River through the middle reach of the Pecos River from Sumner Dam downstream through the Roswell basin are the Pecos River Below Sumner Dam, NM gage (Below Sumner gage), Pecos River near Acme, NM gage (Acme gage), and Pecos River near Artesia, NM gage (Artesia gage). The Acme gage, located northeast of Roswell, NM is utilized as the reference gage on the Pecos River for biological analyses and it is typically the gage with the lowest flow. The Acme gage is located near the bottom of the shiner quality section and downstream from the upper critical habitat section. For these reasons, the historical hydrology of the Acme gage is used in this document for our analyses.

Table 1 shows the flows at Acme gage on a scale beginning at 0 cfs going up to 5,000 cfs. This is done on an exceedence basis to show during what percent of the irrigation season the flows were greater than the cfs displayed at the top of the column. Table 1and Figure 2 provide the summer irrigation season (March 1 through October 31) percent exceedence (percentage of time flows exceeded the given value) for the last approximately 60 years. The percent exceedence for each decade since the 1940's is presented along with the percent exceedence for the combined 2000 and 2001 summer season period and the 1940 through 2001 historical period. For the entire period (1940 through 2001), zero cfs flows were recorded approximately 11 percent of the time (approximately 27 days per annual summer season). The 1940's period had the lowest percent exceedence above zero cfs (an average of approximately 56 days per annual summer season recorded as zero cfs) and the 1980's and 2000/2001 periods had the highest percent exceedence above zero cfs (an average of approximately 2 days per annual summer season recorded as zero cfs).

Table 1. Acme flow percent exceedence values for the period 1940 through 2001.

	Acme Flows (cfs) / Percent Exceedence

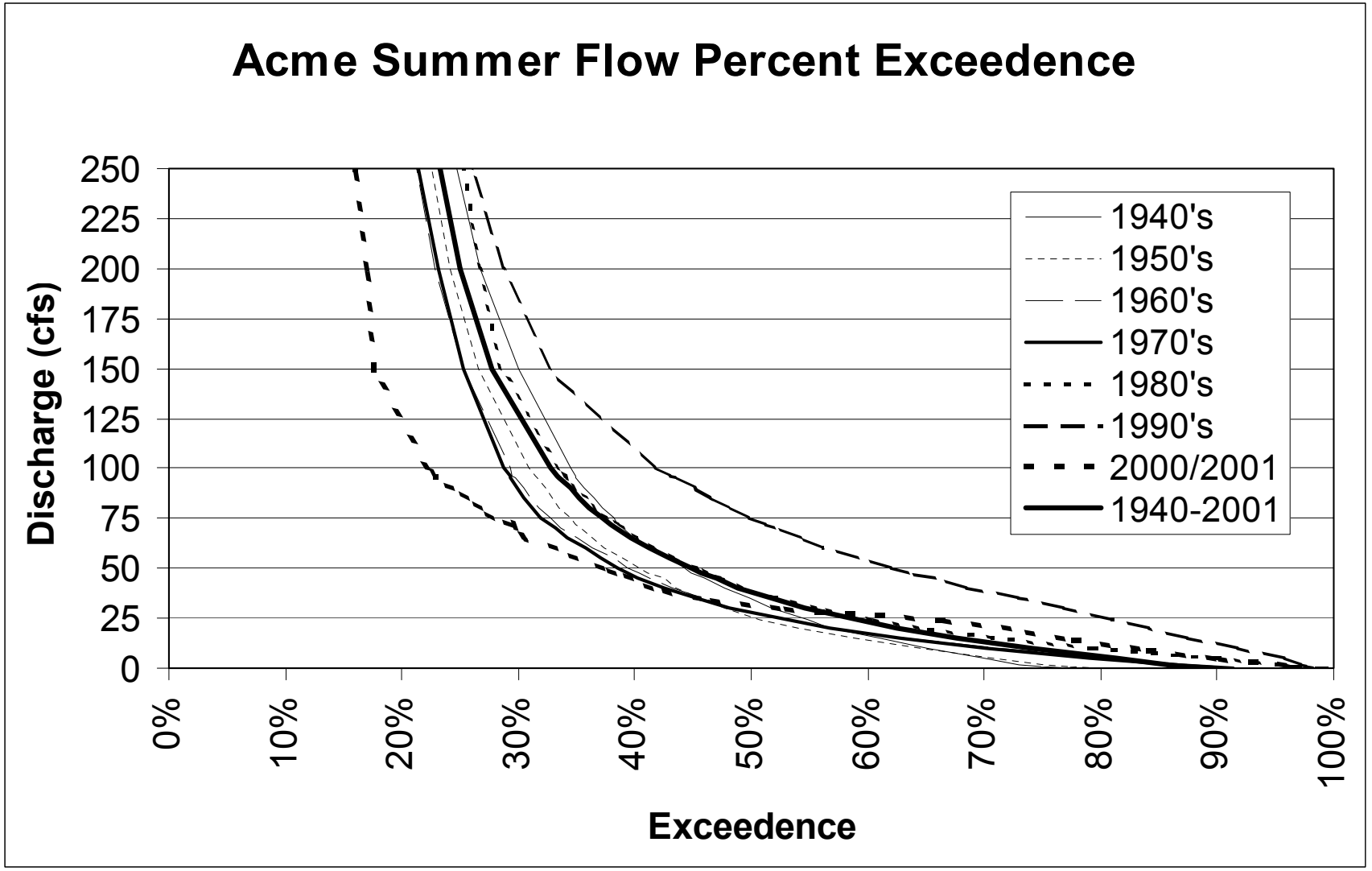
Years	0	10	20	30	40	50	75	100	200	500	1000	5000
40's	77	65	57	52	48	44	38	35	27	19	12	<1
50's	80	65	54	48	44	40	34	31	24	17	6	<1
60's	90	71	57	48	43	39	33	29	23	18	4	<1
70's	91	70	57	48	42	39	32	29	23	17	3	0
80's	99	79	64	56	49	46	38	33	27	20	1	0
90's	98	92	84	77	69	62	50	42	29	19	6	<1
2000/ 2001	99	83	72	52	41	37	28	22	17	13	3	0
1940-2001	89	74	62	55	49	45	37	33	25	18	5	<1

Over the entire period (1940 through 2001), flows greater than 50 cfs were recorded approximately 45 percent of the time. The 2000/2001 period had the lowest percent exceedence above 50 cfs and the 1990's period had the highest percent exceedence above 50 cfs. Flows exceeded 500 cfs approximately 18, 20 and 13 percent of the time for the entire period, the 1980's period (highest percent exceedence) and 2000/2001 period (lowest percent exceedence), respectively. In general, the 1940's and 1950's can be characterized as dry periods and the 1980's and 1990's as wet periods. The 2000/2001 period was very dry with respect to annual precipitation (less than half of 10-year average), however, Reclamation's modified operations for the species (similar to those presented in this BA) resulted in higher minimum flows.

ESA Consultations to Date

On March 1, 1991, Reclamation submitted a biological assessment which addressed impacts to the shiner resulting from proposed Carlsbad Project operations. As part of this analysis, Reclamation included the one time 1989 operations for filling and testing Brantley Dam and Reservoir as a "worst case analysis." Reclamation concluded that "reservoir operations that mimic conditions caused by the 1989 water operations, resulting in long-term drying of the Pecos River channel upstream of Roswell, or that do not benefit reproduction due to timing of water releases, may affect the continued existence of Pecos bluntnose shiner." On August 5, 1991, the Service issued a biological opinion based upon the unique "worst case analysis" 1989 operations. The biological opinion concluded that such anomalous operations would likely jeopardize the continued existence of the shiner, however there is essentially no chance that 1989 water operations will ever be repeated.

Figure 2. Acme flow percent exceedence values for the period 1940 through 2001 for flows less than 250 cfs.



As a result of the reasonable and prudent alternatives in the Service's opinion based upon a one-time event, Reclamation implemented the following: (1) developed a Memorandum of Understanding (MOU) between federal and state agencies along with private water users, represented through organized associations, which defined a process to study and manage Pecos River flows for the benefit of the shiner while continuing to meet downstream water delivery requirements; (2) funded five years of research activities to determine biologic and hydrologic needs of the shiner and operational guidelines; (3) developed a flow model for the Pecos hydrology.

Reclamation re-initiated consultation in the fall of 1998 for winter operations after the completion of the 5-year study. The "Pecos River Winter Operations Plan/Biological Assessment (BA)" was submitted to the Service on November 17, 1998. The effects determination of the BA was the winter operations "may adversely affect" the Pecos bluntnose shiner and "is likely to result in a take" of the shiner, but would "not adversely modify or destroy its critical habitat." The Service concurred with Reclamation's findings that its operations were not likely to result in jeopardy to the shiner and issued a "Take" statement (Consultation #2-22-99F-59).

On June 24, 1999, Reclamation formally submitted a "Biological Assessment of the Pecos Operation Plan for the 1999 Irrigation Season for the Pecos Bluntnose Shiner." The effects determination for this BA was again "may adversely affect the Pecos bluntnose shiner, but will not destroy or adversely modify its critical habitat." The Service did not initiate consultation and returned the BA, citing that Reclamation did not provide the Service with information necessary to initiate formal consultation. The process remained informal for the rest of the season.

Reclamation submitted a BA for the 1999-2000 winter operations on January 10, 2000. This BA included a total of 11 threatened and endangered species for review by the Service, however, not all species were affected by the proposed winter operations. "May affect, but is not likely to adversely affect," for the bald eagle, Pecos bluntnose shiner, Pecos gambusia, Pecos pupfish, and Pecos sunflower was determined. There were no adverse modifications or destruction to critical habitat assessed and a no effect was determined on the remaining species. The Service concurred in a letter to Reclamation on April 5, 2000.

An "Interim Programmatic Biological Assessment of proposed Pecos River Operations on the listed species of the Pecos River Basin," was submitted to the Service on March 31, 2000. A "may affect, but is not likely to adversely affect," was determined for the bald eagle, Pecos bluntnose shiner, Pecos gambusia, Pecos pupfish, and Pecos sunflower. There were no adverse modifications or destruction to critical habitat assessed and "no effect" was determined on the remaining species. Again, the Service returned the BA without initiating consultation. The process remained informal throughout the season.

On January 11, 2001, Reclamation formally submitted another winter BA for the 2000-2001 winter operations regarding only the Pecos bluntnose shiner. The effects determination was "may affect, but is not likely to adversely affect and not likely to adversely modify or destroy

critical habitat." The Service concurred on February 2, 2001.

The 2001 Irrigation Season Operations BA was submitted on February 14, 2001. A "may adversely affect" determination, with a "not likely to adversely modify or destroy its critical habitat" determination was given. The Service accepted and returned a Biological Opinion (Cons. #2-22-01-F-221), on May 21, 2001, citing "not likely to jeopardize the continued existence" of the Pecos bluntnose shiner and "will not result in the destruction of adverse modification of its habitat."

The 2001-2002 Winter Operations BA was submitted on November 19, 2001. The effects determination regarding the Pecos bluntnose shiner was "may affect, but is not likely to adversely affect," and will "not result in the destruction or adverse modification of critical habitat." Several consultation meetings occurred and a supplement to the BA was provided to the Service on February 21, 2002.
The Service's response is pending.

5. DESCRIPTION OF THE PROPOSED ACTION

Reclamation's proposed actions and the actions over which Reclamation is consulting are to: 1) divert to storage available natural inflows over and above FSID's senior water right and 2) release water from storage for the purpose of irrigation in the CID.

The 2002 proposed irrigation operations plan address operating Sumner Dam to carry out these actions. Since 1999, these plans have been used to guide Reclamation's irrigation operations on the Pecos River and have been developed to manage water operations for the period of March 1 through October 31 of each year. This plan is proposed to avoid jeopardizing the shiner, to ensure its conservation, and to assist in recovery of the species. The plan describes when diversions to storage will be curtailed, the shape and duration of storage releases, and timing between releases.

Pursuant to the requirements of the ESA and implementing regulations, Reclamation is consulting over those aspects of the operations in which there is discretionary Federal involvement or control. Below is an outline of the operating characteristics of the proposed actions of Reclamation:

A) Diverting Natural Inflows to Storage

1) Curtailing the diversion into storage of natural inflow[1] in order to satisfy FSID's

[1]Natural inflow to Sumner is identified by a two-week value based on a calculation by the Office of State Engineer to determine the limit of FSID's direct diversion water rights. The calculation may result in FSID's direct diversion water right being less than 100 cfs.

direct diversion water rights (up to 100 cfs).

2) Curtailment of diversion to storage of additional natural inflow will occur if available (i.e. above FSID's water rights) and if that additional natural inflow is needed to meet the downstream target flows which prevent flow intermittence at the Pecos River Near Acme Gage (Acme).

Figure 3 illustrates the availability of additional natural inflows above FSID's water rights that were available for bypass during the 2001 summer season. During the months of March through most of June, the calculated natural inflow exceeded FSID's water right of 100 cfs. During this period, Reclamation bypassed a portion of these available inflows to achieve a target of 35 cfs at Acme. During the months of July through August and parts of September and October, no flows above FSID's water right were available to bypass.

B) Releasing Water from Storage

1) Releasing stored water for the beneficial purpose of irrigation in CID in a manner that does not constitute a wasteful use due to excessive losses through seepage and evaporation;[2]

2) Restricting the duration of block releases[3] from Sumner to a maximum of 15 days;

3) Restricting the cumulative duration of block releases from Sumner in calendar year 2002 to a maximum of 65 days;

4) Targeting a minimum of 14 days between consecutive block releases from Sumner;

[2]Beneficial use does not require that operations make optimum use of water, but, rather, requires at minimum that operations do not lose more water than they deliver (NMSA § 72-5-18). Further, federal Reclamation law also requires beneficial use (43 U.S.C. §§ 372, 383). The Sumner Dam authorization, which added flood control purposes, specifies that the dam shall be operated first for irrigation (33 U.S.C. § 707).

[3] The duration of a block release is defined as the number of days at peak discharge.

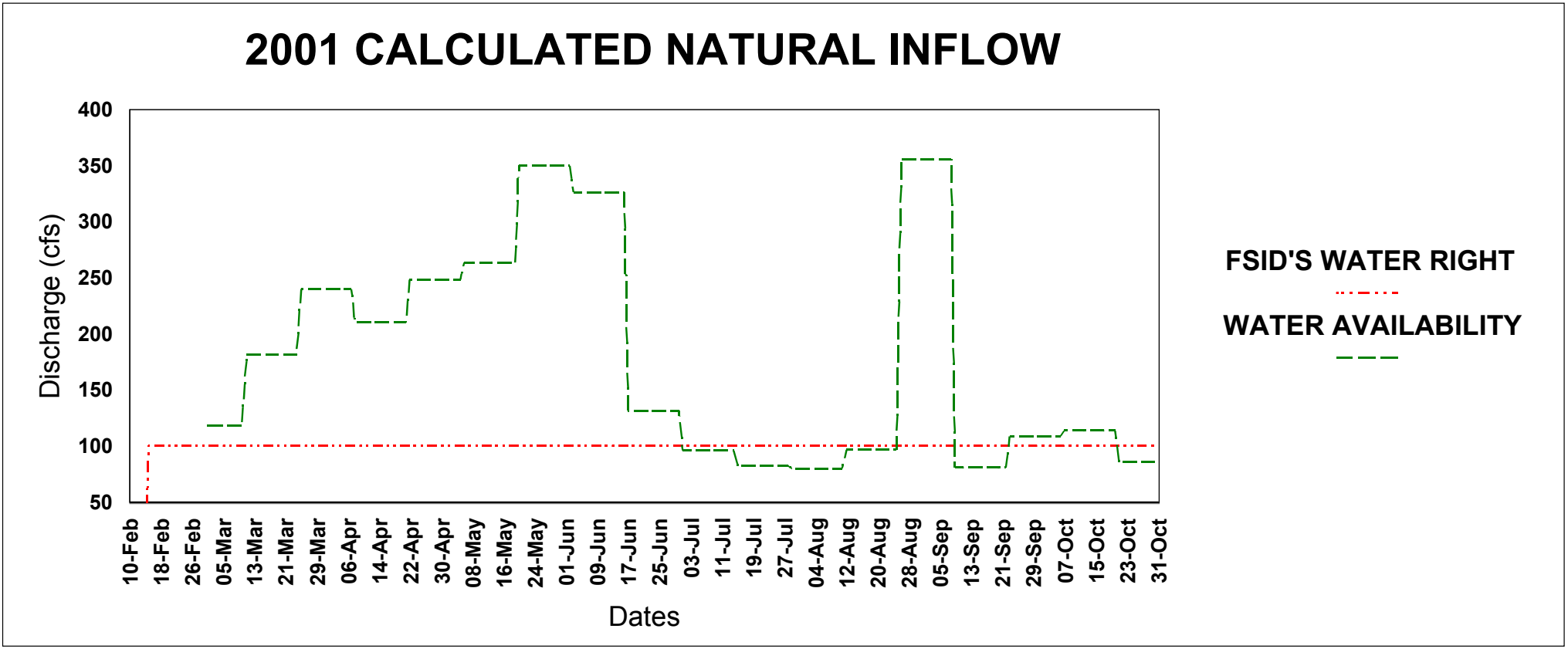


Figure 3. The green dashed line represents calculated natural inflows measured every two weeks throughout the 2001 irrigation season. The red dot-dashed line shows FSID's water right (up to 100 cfs). Water bypassed by Reclamation, for targeting 35 cfs at Acme, was the calculated natural inflow above FSID's water right (100 cfs) only during the two week time period for which it was calculated.

5) Minimize to the extent possible block releases during the months of June, July and August.

6) To the extent that there is flexibility in the timing of block releases, Reclamation will work with the Service to time releases that achieve the efficient movement of water and to the extent possible, minimize possible flow intermittence.

Throughout the calendar year, Reclamation will continue to support population monitoring efforts so that the status of the species can continue to be tracked. Reclamation will initiate weekly hydrology/water operations conference calls. These will include all signatories to the MOU.

6. Reclamation Actions Under (7)(a)(1)

In bypassing natural flow for the species instead of diverting the natural flow into project storage, Reclamation's proposed operations are different than historical operations and increases net depletions. Under the requirements of section 7(a)(1), Reclamation has obtained replacement flows which aid the species and keep project supply whole. In fiscal year 2002, Reclamation has leased approximately 4,390 acre-feet of water obtained from river pumpers, water rights, approximately 500 acre-feet from Hagerman Canal water rights, and approximately 900 acre-feet from groundwater rights located above Roswell, NM. These wells are 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 should be reduced. If additional funding becomes available, Reclamation would pursue additional water leases with willing sellers.

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 some additional flow in the river below the FSID return canal. However, due to the extreme dry, windy conditions, these additional flows were not adequate in bringing the Acme flow up to the target level. The flow at Acme remained between 5 and 15 cfs when precipitation events did not occur.

7. Species List and Description

Listed below by counties are endangered, threatened, or proposed species and their respective critical habitat designations.

Chaves County

Black-footed ferret, *Mustela nigripes*, E
Bald eagle, *Haliaeetus leucocephalus*, T
Mountain plover, *Charadrius montanus*, PT
Northern aplomado falcon, *Falco femoralis septentrionalis*, E
Pecos bluntnose shiner, *Notropis simus pecosensis*, T w/CH
Pecos gambusia, *Gambusia nobilis*, E
Kuenzler hedgehog cactus, *Echinocereus fendleri var. kuenzleri*, E
Pecos sunflower, *Helianthus paradoxus*, T

De Baca County
Black-footed ferret, *Mustela nigripes*, E
Bald eagle, *Haliaeetus leucocephalus*, T
Interior least tern, *Sterna antillarum*, E
Mountain plover, *Charadrius montanus*, PT
Pecos bluntnose shiner, *Notropis simus pecosensis*, T w/CH

Eddy County
Black-footed ferret, *Mustela nigripes*, E
Bald eagle, *Haliaeetus leucocephalus*, T
Interior least tern, *Sterna antillarum*, E
Mexican spotted owl, *Strix occidentalis lucida*, T
Northern aplomado falcon, *Falco femoralis septentrionalis*, E
Pecos bluntnose shiner, *Notropis simus pecosensis*, T w/CH
Pecos gambusia, *Gambusia nobilis*, E
Gypsum wild-buckwheat, *Eriogonum gypsophilum*, T w/CH
Kuenzler hedgehog cactus, *Echinocereus fendleri var. Kuenzleri*, E
Lee pincushion cactus, *Coryphantha sneedii var. leei*, T

Originally, there were eleven federally listed species identified in the Project area. The Service, Albuquerque Ecological Services Office, concluded in May 2000 that all but one of the above species, the Pecos bluntnose shiner, were determined to not be affected by the irrigation season operations; therefore, only the effects of the irrigation operations on the shiner will be analyzed in this BA.

PECOS BLUNTNOSE SHINER

Distribution and Abundance
The *N. simus* was first collected by Cope and Yarrow, at San Ildefonso, Santa Fe County, New Mexico in 1876 (Sublette et. al., 1990). Confusion regarding taxonomic status of *N. simus* was resolved when Chernoff et al. (1982) determined that two subspecies occurred, the Rio Grande and Pecos forms. The Rio Grande form was historically found in the Rio Grande drainage from Chama River, north of Santa Fe, New Mexico, downstream in the Rio Grande to El Paso, Texas. The Rio Grande form is now extirpated (Bestgen and Platania, 1990) in the Pecos River Basin. The Final Rule determining the Pecos bluntnose shiner as threatened indicates historic

occupation of the shiner in the Pecos River between the towns of Santa Rosa and Carlsbad, New Mexico (USFWS, 1987). Collections of shiner during 1990's indicate a current range from Fort Sumner, New Mexico, downstream to Brantley Reservoir (Brooks et al., 1991, Hoagstrom, 2001). An approximate 25 percent reduction from the historical range.

The studied areas were divided into three newly named segments: the Tailwaters, the Rangelands and the Farmlands, which were different from the segments identified in Hoagstrom's (USFWS, 2000) previous investigation. The Tailwater segment started at Sumner Dam and extended to the mouth of Taiban Creek. The Rangeland segment extended from the confluence of Taiban Creek to the middle tract of the Bitter Lake National Wildlife Refuge (BLNWR) and the Farmland segment from that point south to Brantley Reservoir.

The shiner was listed as a New Mexico State threatened species on May 11, 1984 and a federally threatened species by the Service on February 20, 1987. The Service (1991, Biological Opinion) states that the principal reason for its listing was habitat alteration due to dam construction and restricted water flows from reservoirs, water diversion for irrigation, siltation, and pollution from agricultural activities along the Pecos River.

Brooks et al. (1991) reviewed historic and recent surveys of fish communities in the Pecos River. These surveys included collections from Sumner Dam downstream to the Brantley Reservoir inflow. Historically the species occurred throughout the Pecos River in both New Mexico and Texas, but its range is now restricted to a 225-mile section of the river, between Sumner Reservoir and Brantley Reservoir, New Mexico. Intensive surveys that Brooks et al. (1991) summarized and monitoring by the Service since 1992 (Hoagstrom 2000, 2001) form the basis for current knowledge of Pecos bluntnose shiner distribution and abundance.

Past riverine sampling to determine seasonal and annual status and distribution of the shiner were analyzed by Brooks et al. (1991) using a species guild approach, as described by Bain and Boltz (1989). Because of the complex diversity of the Pecos River fish community, comprised of over 30 native and non-native fish species, actual abundance measures for trend analysis are difficult to analyze. The species guild analysis approach, in this case the shiner guild, allows for a simplified analysis with a focus on trends within a certain species guild.

Collections by Hatch (1982), when compared to shiner guild values of historic collections, indicate a guild that was no longer dominated by Pecos bluntnose shiner. Collections between 1986 and 1990 indicate a further decline in abundance and a reduction in range, although the species still exists within the designated critical habitat reaches (Brooks et al., 1991). Non-native species, including the plains minnow (*Hybognathus placitus*) and the Arkansas River shiner (*N. girardi*) (Sublette et. al., 1990), comprised a large portion of the shiner guild, and may have indicated interspecific competition as a factor in shiner abundance and distribution reductions. These species spawn during high flow events in the Pecos River, with eggs and larvae being distributed downstream to colonize new areas (Bestgen et al. 1989).

Hoagstrom (USFWS, 2000) provided additional analyses of historical Pecos bluntnose shiner

survey data and included data from 1992 through 1998. A significant drop in shiner abundance occurred after 1956 (USFWS, 2001). During the 1986 through 1991 era, both the High Plains and the Roswell Basin segment data showed a marked comeback by the shiners from the previous era and remained steady throughout the 1992 through 1998 era. The data suggested that two of the three original segments sampled, where the Pecos bluntnose shiners were most abundant, the High Plains and the Roswell Basin segments showed at least a doubling in abundance, as measured by individuals per collection, up from the 1959 through 1982 era (Table 2), while the Delaware Basin segments (not shown), declined in abundance during that same time.

Table 2. Individuals per collection for Pecos bluntnose shiners of the Pecos River by sampling era. The tables (1:6 and 1:7 in USFWS, 2000), which the data have been taken from were modified, but show the data as presented in its original form.

Era	High Plains Segment	Roswell Basin
pre-1956	220.8	77.8
1959-1982	1.2	9.5
1986-1991	10.9	18.3
1992-1998	9.2	22

The mean density of the abundance of Pecos bluntnose shiners for the new Rangeland section clearly showed an increase from 1992 to 1998 (USFWS, 2001). The mean of the Farmland section also showed a slight increase, however is more highly variable than the Rangeland section. The abundance decline in 1998 was likely attributed to, but not certain, the pulse of the 1996 population reaching its maximum longevity after two years and the post-spawning decline of the 1997 year class. Though there are occasional setbacks, the abundance of Pecos bluntnose shiner continue to show improvement.

The data presented in Table 3 below was arranged in an "irrigation season response period" format as opposed to a calendar year format. It reflects the irrigation season operations affects on the Pecos bluntnose shiner population, however, the population status reflected in the data collected in January and February, preceding each irrigation season, was not affected by the upcoming operations. Additionally, Hoagstrom (USFWS letter, 2002), suggested that the previous irrigation season and/or the winter operations most likely affected the status of over-wintering adults based on March through June data collections. Though the data changes slightly from the calendar year collections, the trends are similar. From 1992 through 1997, the density rose significantly, then dropped to almost 1995 levels, but has since risen again.

Table 3. Presence and abundance of Pecos bluntnose shiner in the Rangelands Segment of the mainstem Pecos River, New Mexico (Taiban Creek confluence to Bitter Lake National Wildlife Refuge, Middle Tract) during the months of July through April from July 1992 through April 2001. A total of 257 collections covering 74,721.48 m² produced 54,747 individual fish. Presence data include total Pecos bluntnose shiner collections (occurrences) and frequency of occurrence (%). Abundance data include

total individual Pecos bluntnose shiner (N), density of individuals (fish/100 m²), and relative abundance within all fishes collected (%). (USFWS letter, 2002)

Response Year*	Presence			Abundance		
	Occurrences		%	N	fish/100 m²	%
1992	19		76.00	123	1.93	1.61
1993	13		86.67	155	4.15	5.60
1994	16		88.89	187	4.32	4.34
1995	19		95.00	256	5.10	7.26
1996	22		84.62	593	11.76	13.37
1997	34		97.14	1,212	18.21	17.31
1998	50		89.29	1,059	6.45	11.33
1999	31		96.88	837	5.99	11.27
2000	29		96.67	1,266	9.60	15.27
Total	233		90.66	5,688	7.61	10.39

*2001 response year data were not presented because data from only a single sample (August 2001) are currently available.

Life Requisites

Hatch (1982) collected the species most frequently in the main stream channel, but the species has been collected in all representative habitat types of the Pecos River (J.E. Brooks, personal communication). Physical habitat utilized by shiner included sand substrate, low current velocity, and water depths of 17 to 41 cm (7 to 16 in), (Hatch, 1982).

Hatch (1982) found Pecos bluntnose shiners growing to a maximum length of 56.5 mm (2 in) standard length with a maximum longevity of age 2. Recent collections (S. P. Platania, personal communication) indicated the Pecos form achieves a similar maximum length and longevity as the Rio Grande form. Rio Grande bluntnose shiner achieved a maximum length of approximately 70 mm (3 in) standard length and maximum of age 3 (Chernoff et al., 1982; Bestgen and Platania, 1987).

N. simus exhibit an S-shaped gut, indicating a carnivorous-omnivorous diet (Sublette et al. 1990). 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. Pecos bluntnose shiner are also omnivorous (Bestgen and Platania 1987).

Reproductive effort of the Pecos bluntnose shiner

Pecos bluntnose shiner have an extended spawning season, beginning in early summer and ending by October (Sublette et al. 1990). It was originally thought that spawning occurred during the descending waters of spring runoff (Bestgen and Platania, 1987), but subsequent research indicates that increased flows from summer rainstorms stimulate spawning (Dudley and Platania, 2000).

Platania (1993) discussed the reproductive biology of the shiner as well as four other plains

fishes in the Pecos River. The shiner is a broadcast spawner which produces semi-buoyant, nonadhesive eggs. These eggs drift throughout the water column and depending on the water temperature hatch within 24-48 hours. Dudley and Platania (1999) concluded that the larvae "...do not have sufficient mobility to move out of the main channel flows..." during these first few days after hatching and drift downstream in post spawning flows for at least 3-4 days before developing a swim bladder. After the swim bladder is fully developed the protolarvae can begin to move horizontally, actively seeking low-velocity habitats (Hoagstrom, 1995; Platania and Altenbach, 1998).

The reproductive effort of the Pecos bluntnose shiner population can be estimated using fecundity and population data. However, recruitment and population size can not reliably be estimated from eggs and subsequent survival. The sampling error for population surveys is greater than the recruitment to juvenile stage, due in part to density-independent factors. The assumptions for assessing reproductive potential are based on population estimates and maximum potential fecundity.

Based on the most recent available data from the Service, New Mexico-Fisheries Resource Office (FRO), a conservative population estimate of 200,000 bluntnose shiners reside in the Pecos River. Maximum fecundity is estimated at 5,000 eggs per mature adult female. Assuming a 1:1 sex ratio and fecundity of 5,000 eggs per female, the estimated reproduction would be approximately 500,000,000 per spawning event.

Expected natural mortality of eggs and protolarvae is approximately 99% (Everhart & Youngs, 1981). Expected survival to the juvenile stage is therefore about 1% , or 50 fish out of 5,000 eggs (Appendix A). Survival from the egg to juvenile stage is considered extremely low (1%) at best and is subject to density-independent factors. Examples of density-independent factors affecting mortality are temperature extremes, oxygen, sediment, salinity, pollution, and /or a host of other outside influences. The critical period for larval bluntnose shiner survival is probably from hatching to first feeding.

Critical Habitat

Critical habitat for this endemic subspecies was designated to include two sections of the Pecos River. The first section starts about 10 miles downstream of Ft. Sumner and extends approximately 64 miles further downstream. The second section starts near Hagerman, New Mexico and extends 37 miles downstream to the Highway 82 bridge, near Artesia, New Mexico (U.S. Fish and Wildlife, 1987). Acme is located in a noncritical habitat stretch of the river roughly 25 miles downstream of the upper critical habitat reach, but serves as important habitat and supports high numbers of shiners.

From Old Fort Park to just below Highway 380, 102 miles downstream, the channel is generally wide, sandy and unstable. Shifts occur in the bed structure as flows fluctuate through these habitats. The channel becomes spread out and braided, creating suitable habitat for the shiner. The combination of a wide, sand-bed channel and variable flow regime, found in the Rangeland Segment, apparently supplies habitat conditions that are relatively favorable for the Pecos

bluntnose shiner (Hoagstrom, 2001). The river channel in the Rangelands is much wider than the Farmlands, maintaining many more backwaters and side-channels at both low and high flows (Fenton et al., 1992). The Rangelands contain an active sand-bed which is responsive to changes in flow (Tashjian, 1993).

This stretch of river is also hydrologically characterized as a losing reach. Surface water is lost both through seepage and evaporation. Depending on the time of year, the amount of water moving down the channel, and local weather conditions, water losses to this portion of the river can be as much as 100 percent by the time the water reaches Acme. From Acme downstream, the river begins to gain water back to the surface and is called a gaining reach, however, the stream from this point slowly begins to narrow and deepen, losing the important features necessary for good shiner habitat. It is known that the lower reach of critical habitat is poor shiner habitat.

Collections made during 1990 by Brooks et al. (1991) indicate that all age classes (age 0-3) were present within the upper Critical Habitat reach, while only age 0 and age 1 were collected in the lower Critical Habitat reach. Hoagstrom (1995) later confirmed that reach five (the lowest study reach below the lower critical habitat area) did contain the highest relative abundance of age class zero individuals of shiners. Block reservoir releases were cited as the cause for fish larvae displacement downstream.

8. Analysis of the Effects of the Proposed Action

In accordance with the ESA and interagency consultation regulations, the proposed actions of the Pecos River 2002 irrigation season operations requiring preparation of this biological assessment are similar to the previous actions identified in the 1999, 2000, and 2001 Irrigation Season Operation plans. The proposed action involves similar impacts to the Pecos bluntnose shiner, and no new species have been listed or proposed within the area of operation. This analysis deals with the direct, indirect, and cumulative effects of the proposed action, together with the effects of the other activities that are interrelated or interdependent with the action. This assessment has been supplemented with relevant changes in information and the latest scientific data regarding the possible impacts of the operations to the Pecos bluntnose shiner.

This assessment will not address the full range of proposed, threatened, and endangered species known to occur in or near the Pecos River basin area. Not all species listed were identified as being affected by this operations proposal.

Direct and indirect effects were considered. There were no interdependent activities identified that were not considered. Some interrelated activities were identified including a wide range of activities associated with Reclamation's acquisition of supplemental water to minimize the effect of modified operations on water users.
The FSID has direct flow rights and calls for and diverts water to which the district is entitled under state law. The State of New Mexico Interstate Stream Commission (ISC) leases water

from the Carlsbad Irrigation District to augment state line deliveries. Since the water is indistinguishable from CID supply until below Brantley, Reclamation delivers it as irrigation supply subject to the same restrictions.

Direct Effects

To analyze the proposed action, each operational characteristic has been assessed. Each characteristic has been proposed to provide benefits to the shiner while continuing to operate Sumner Dam to divert to storage flows above FSID's direct diversion water right and flows required to meet downstream flow targets and to deliver water downstream for use by the CID.

Diverting Natural Inflows to Storage

Reclamation's proposed action of diverting to storage in Sumner Reservoir available natural flows above FSID's direct diversion water right (up to 100 cfs) and when additional flows are not needed to target continuous flows at the Acme gage, allows water to be stored in Sumner Reservoir for the purpose of irrigation in CID without negatively impacting Pecos River base flow conditions. This action is a modification of the 1938 through 1998 historical summer irrigation season Summer Dam operations. The 1938 through 1998 historical operation stored all available water above FSID's water right as long as Sumner Reservoir was at or below the conservation space storage elevation. No additional flows above FSID's water right were bypassed during the historical operations. However, Reclamation's proposed action does bypass available inflows, when needed, above FSID's water right to provide additional flows for the critical and quality habitat areas to avoid jeopardy of the shiner. This action is within Reclamation authority.

Reclamation began curtailing winter season Sumner Dam diversions to storage during the winter of 1998/1999 to target flows of 35 cfs at the Acme gage as identified by the Service's Biological Opinion (Cons. # 2-22-99-F59) under the "Amount or Extent of Take" section. Reclamation began summer operations similar to those proposed in this BA in the summer of 1999. By doing so, Reclamation's proposed operation changes continue to improve the flow conditions in the Pecos River for the Pecos bluntnose shiners as compared to historical operations.

Table 4 provides the approximate percentage of time that natural inflows were available to bypass during the summer seasons between 1940 and 1999. This time period includes both dry and wet cycles and is representative of the percentage of time that a given flow may be available to bypass during the 2002 summer season. For the 60-year summer season period, there were no additional flows available to bypass above what was being bypassed for FSID approximately 33 percent of the time (on average approximately 80 days per annual summer season). For dry conditions similar to the beginning of this summer season, it is anticipated that curtailing the diversion of additional natural flows (above FSID's water right) of 30 to 40 cfs will be required to provide continuous flows at the Acme gage. Over the last 60-years, flows of this magnitude would have been available to bypass approximately 45 percent of the time. The National Weather Service precipitation and temperature outlook for eastern New Mexico is considered climatology. Climatology indicates that the models are not predicting any trend and that there

are equal chances of the conditions being below normal, normal, or above normal.

Table 4. Percent Exceedence Values of Natural Inflow Rates Available to Bypass for the Period 1940 through 1999.

	Natural Inflow Bypass Rates (cfs) / Percent Exceedence											
Years	0	10	20	30	40	50	75	100	200	500	1000	5000
1940-1999	67	56	50	46	43	41	35	31	21	9	3	<1

Though Reclamation will be curtailing diversions of natural flows above FSID's water right to target preventing intermittent flows at the Acme gage, there will be periods when passing all of the natural flow of the Pecos River through Sumner Dam will not result in continuous flows. It is probable that flows at the Acme gage will be intermittent during the 2002 irrigation season though Reclamation will not be taking an action to divert water to storage in Sumner Reservoir.

Reclamation has carried-out actions similar to these proposed actions for the past three summer irrigation seasons. The flow rates above FSID's water right and resulting Acme flows are characterized. The three summer seasons are characterized by a summer with above average precipitation in 1999, a summer with below average precipitation but high conservation storage in Santa Rosa and Sumner Reservoirs making possible 5 block releases in 2000, and a summer with below average precipitation and low conservation storage making possible only 2 block releases in 2001.

In 1999, rain events started occurring in April and continued throughout the season. Significant spates occurred at the end of April, the middle of June and July, and during the first part of August. These events kept flows high and provided enough water to delay block releases throughout the entire season. Sumner Reservoir reached the conservation elevation on August 14 and flows were spilled. One 10 day block release was made in October 1999 to carry CID irrigators through the end of the irrigation period. Natural inflows above FSID's water right passed through Sumner Dam, but were infrequent and small because of sufficient precipitation in the area. The 35 cfs flows at Acme were exceeded 80% of the time, 85% of the time for 30 cfs flows, and 91% of the time for 26 cfs flows. As presented in the Distribution and Abundance section, Pecos bluntnose shiner frequency of occurrence increased after the 1999 summer season (increased from 89.29 percent occurrence to 96.88 percent). The shiner density slightly decreased from 1998 to 1999, and the percent abundance stayed relatively steady.

During the 2000 irrigation season, the Pecos River basin near Fort Sumner, New Mexico, received below average precipitation. Precipitation data were compiled at Sumner Dam weather station. The 10-year average annual precipitation was calculated to be 15.7 inches per year with a range of 9.4 inches (in 1995) and 22.4 inches (in 1999). The 10-year, end of August average precipitation accumulation was 12.2 inches. In 2000, the end of August precipitation accumulation was 6.7 inches, approximately 50 percent of the 10-year end of August average. At the end of September 2000, precipitation had reached a total of 7.0 inches. Precipitation

picked up in October/November and the total for the year 2000 was 13.23 inches.

The dry 2000 summer conditions and lack of storm inflows resulted in the natural inflows infrequently being above FSID's water right, thereby limiting Reclamation's opportunities to curtail the storage of such flows. During the 2000 summer irrigation season, 4 block releases (13.75 day average duration) were possible due to the high conservation storage from the previous wet year. The block releases occurred in February, May, July and August. Acme flows for the 2000 irrigation season exceeded 35 cfs, 62 percent of the time. Flows exceeding 30 cfs occurred 71 percent of the time and flows exceeding 26 cfs occurred 80 percent of the time. During the summer period, flows were in the single digits a various times, the longest duration being 23 days. As presented in the Distribution and Abundance section, Pecos bluntnose shiner frequency of occurrence remained generally even between the 1999 and 2000 summer seasons (96.88 percent in 1999, and 96.67 percent in 2000). The shiner density increased by approximately 60 percent after the 2000 summer season, and the percent abundance increased by approximately 35 percent.

The 2001 summer irrigation season was also below average for precipitation. In 2001, the end of August precipitation accumulation was 5.4 inches, approximately 45 percent of the 10-year end of August average. Of this 5.4 inches of accumulation through August, 2.65 inches (or 49 percent) fell during the months of January, February, and March. The end of September and October 2001 precipitation totals were, 6.17 and 6.51 inches, respectively. Little rainfall fell the remainder of the year. The total precipitation measured at the Sumner Dam weather station in 2001 was 7.67 inches.

The very dry 2001 summer conditions and lack of storm inflows resulted in the natural inflows infrequently being above FSID's water right starting in June. During the 2001 summer irrigation season, only 2 block releases (13.5 day average duration) were possible due to the low conservation storage from below average precipitation over the past year-and-a-half. The block releases occurred in May and July. Though slightly earlier than CID demand called for, a block release was initiated on July 12, 2002, to efficiently transport stored water to Brantley Reservoir while utilizing operational flexibility to move the delivery date forward to try to improve flow conditions and prevent possible intermittence.
The Acme gage recorded numerous periods with flows less than 10 cfs, lasting up to 15 days in duration. During one 13-day period, flows less than one cfs were recorded. The Pecos River went intermittent on July 11 (0 cfs at the Acme gage), which lasted until July 15, at which time the block release flows reached the intermittent segment. Acme gage recorded three days with zero flow (just over 1 percent of the summer season). The intermittent conditions existed for an approximately 14 to 29 mile reach upstream of Acme. Sumner Dam was not diverting to storage any of the natural flow of the river for the approximate 17 day period prior to the intermittence conditions near Acme (Figure 3 illustrates the availability of bypasses during this time). Flows at Acme were 5 cfs or less approximately 15 percent of the season, and were less than 10 cfs approximately 23 percent of the season. Flows exceeded 30 and 35 cfs approximately 35 and 30 percent of the time, respectively. Since all of the data collected in late 2001 and early 2002 have not been processed, the presence and abundance data following the 2001 summer season are not

available at this time. However, shiner monitoring field trips in early and mid-2002 indicate that the presence and abundance indices remained relatively even or increased.

Reclamation's proposed action to divert to storage natural flows of the Pecos River at Sumner Dam only when available above FSID's water right and above that required to provide continuous flows at Acme produces more water than historical operations. The data over the last three years of similar operations show no decline in species abundance (Table 5) indicating that the resulting flow conditions through the critical and quality habitat areas do not adversely affect the shiner. In addition to the above discussion of Acme flows and shiner presence and absence response data during the last three summer seasons, data from the entire 1990's monitoring program are provided in Table 5.

Table 5. Acme flow percent exceedence and shiner presence and abundance response for the 1992 through 2000 summer season. (USBR, 2002; USFWS, 2001)

	Acme Flows (cfs)/Percent Exceedence					Presence	Abundance	
Year	5	10	20	50	100	Percent Occurrence	Density (shiner/100m^2)	Relative Abundance
1992	100	100	97	89	65	76.00	1.93	1.61
1993	100	98	94	77	64	86.67	4.15	5.60
1994	94	92	85	67	45	88.89	4.32	4.34
1995	98	92	82	56	41	95.00	5.10	7.26
1996	96	89	81	55	33	84.62	11.76	13.37
1997	100	97	91	62	33	97.14	18.21	17.31
1998	99	94	87	61	40	89.29	6.45	11.33
1999	100	100	99	61	33	96.88	5.99	11.27
2000	94	89	83	51	31	96.67	9.60	15.27

The summer season Acme flow characteristics are described by percent exceedence values for 0, 10, 20, 50, and 100 cfs. Paired with this information is the shiner percent occurrence (per total collections), density (shiner/100 m²), and percent relative abundance (to other fish) response values.

The above data indicate that determining direct relationships between Pecos River flows and shiner presence and abundance is difficult and that there are many factors affecting the shiner. The years with the highest base flows (as indicated by higher percent exceedence at the 5, 10 and 20 cfs values) did not always have the highest presence or abundance numbers nor did they continue any trend. Similarly, the years with the lowest base flows (as indicated by the lower percent exceedence at the 5,10, and 20 cfs values) did not always have the lowest presence or abundance numbers nor did they continue any trend. It is evident from Table 5 above that the shiner population is not jeopardized by periods of low flows.

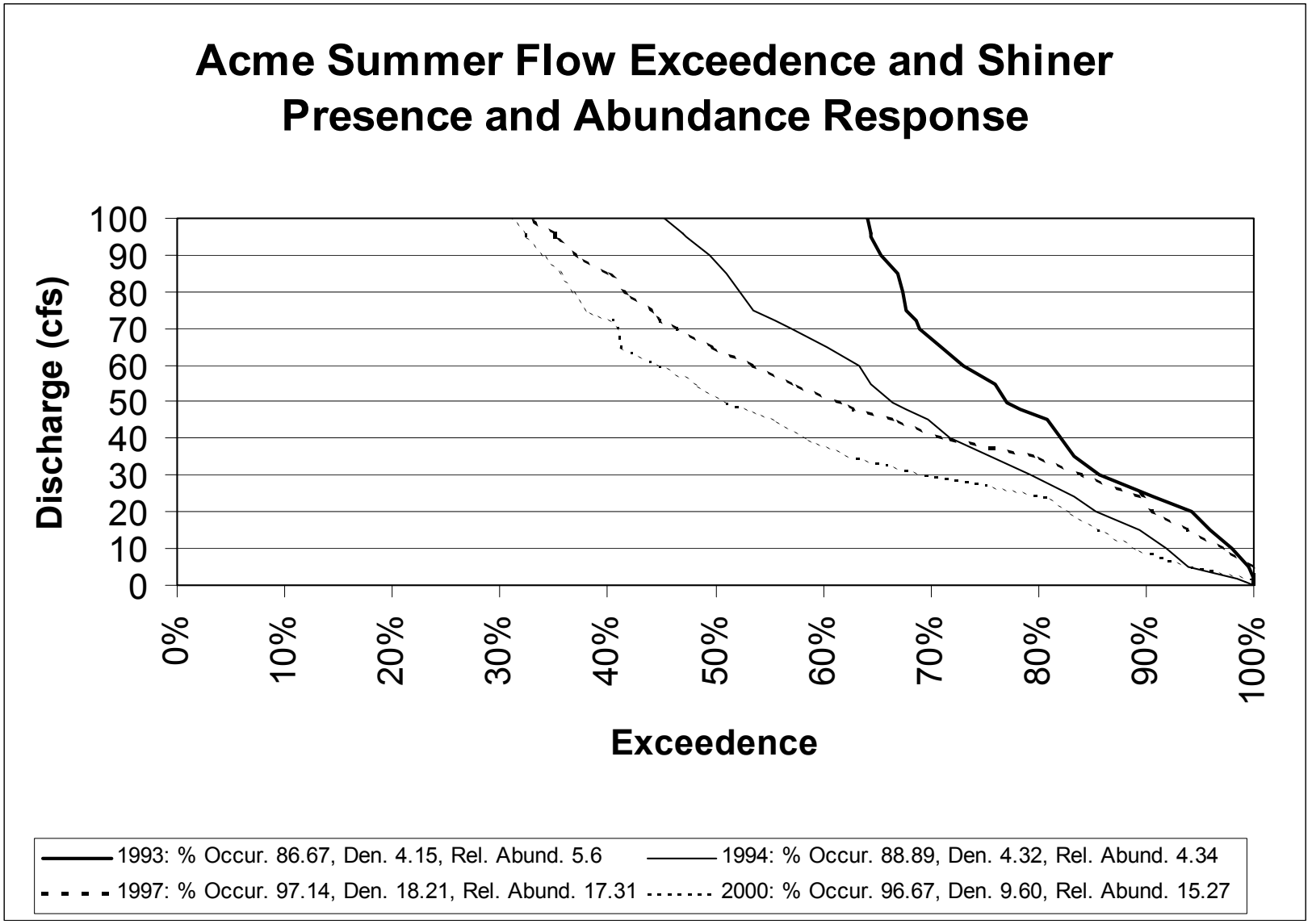
Figure 4 displays the frequency exceedence curve for the Acme summer flows less than 100 cfs for 1993, 1994, 1997, and 2000. The graph also lists shiner presence and abundance response in terms of the percent occurrence (% Occur.), density (Den., shiner/100 m^2), and relative abundance. The summers of 1993 and 1997 had flows greater than 5 cfs 100 percent of the time and flows greater than 10 cfs at least 98 percent of the time. However, 1993 had the third lowest percent occurrence, second lowest density, and third lowest relative abundance of the nine-years of monitoring while 1997 had the greatest percent occurrence, greatest shiner density, and greatest relative abundance. The summers of 1994 and 2000 had flows greater than 5 cfs only 94 percent of the time (lowest of the nine-year monitoring period) and flows greater than 10 cfs at least 89 percent of the time.

The 1994 response data reflect the forth lowest percent occurrence, third lowest density, and second lowest relative abundance of the nine-years of monitoring. The 2000 response data reflect the third highest percent occurrence, the third highest shiner density, and the second highest relative abundance of the monitoring period. The comparisons of these four years indicate that shiner presence and abundance response can not be predicted by only evaluating the hydrologic regime and that similar hydrology does not result in similar response. The comparisons also illustrate that periods of lower discharge at Acme can result in both positive and negative response in presence and abundance.

Releasing Water from Storage

Reclamation's proposed action of releasing stored water from Sumner Dam is for the beneficial purpose of irrigation in CID and is in a manner that does not constitute a wasteful use due to excessive losses through seepage. Reclamation's proposed action will entail releasing stored water at efficient rates (greater than 1,000 cfs release) in blocks that are limited to a maximum of

Figure 4. Acme summer flow exceedence and shiner presence and abundance response



15 days in duration, while targeting a minimum of 14 days between consecutive block releases and targeting one, seven consecutive week period between June 1, 2002 and August 31, 2002 during which no block releases will be made. Additionally, the cumulative duration of block releases from Sumner Dam in calendar year 2002 will be restricted to a maximum of 65 days.

The proposed action is similar to the block releases conducted in the past decade since Brantley Dam was constructed and similar to the block releases conducted prior to Brantley Dam. Pre- and post-Brantley Dam block release regimes averaged 2.4 and 2.6 block releases per year, respectively. The actual number of block releases depends on the volume of water in storage, CID irrigator demand, and hydrologic conditions. The pre- and post-Brantley dam release regime's average block release duration were 15.5 and 15.6 days per block release, respectively. Prior to Brantley Dam, the block release durations ranged from 3 to 47 days. The block release durations ranged from 7 to 30 days after completion of Brantley Dam. There is little variation in the two release regimes.

The efficient release of stored water has two primary effects on the shiner. One being the maintenance of habitat suitable for shiner and the other being the washing of eggs are larvae into Brantley Reservoir. Block releases maintain habitat suitable for shiner by truncating periods of low-flow and no-flow conditions (Service, 1991, Endangered Species Act, Section 7 Consultation - Biological Opinion for Pecos River Water Operations, New Mexico). The frequency of block releases prior to Brantley Dam was identified by the Service (1991) as reducing low-flow and no-flow period duration. The post-Brantley Dam block release regime is almost identical to the pre-Brantley Dam regime, therefore the post-Brantley Dam block releases also maintain habitat suitable for the shiner by truncating periods of low- and no-flow conditions. An example of this benefit was apparent in the 2001 summer season operations when a storage block release initiated on July 12 ended a 3 day intermittent period and 12 day low-flow period.

These low-flow conditions occurred during a scheduled 7-week no block release period. Because the water is held as high in the system as possible (i.e. Santa Rosa) to prevent evaporative losses, coordination with the Army Corps of Engineers to release water from Santa Rosa came to late to prevent intermittent channel drying in the vicinity of the Acme gauge. The water had to be moved in accordance with its permitted use and in a manner which prevented wasteful use.

Block releases transport shiner eggs and larvae into Brantley Reservoir due to the spawning characteristics of the species. Spawning of the shiner is initiated by increased flows, such as rainstorm events or block releases. The peak spawning season for the shiner includes the summer months of June, July, and August. In some years there appears to be more spawning in June and in other years more spawning activity in July and August. Irrigation demand and thus the need for block releases is highest during the summer months.

Effects of block releases on shiner reproduction

Platania's research in 1997 collected Pecos bluntnose shiner eggs at the Artesia site, 47 miles

below the Dexter site and above Lake Brantley during a block release. Using this data, Platania (pers. comm.) estimated that 21,439,348 eggs were transported into Brantley Reservoir (Appendix A). For the purposes of defining incidental take and evaluating impacts of block releases, Reclamation has rounded Platania's estimate to 30 million to adjust for sampling error. Estimated reproductive effort for bluntnose shiner during a flood event is about 500,000,000 eggs. The 30 million eggs estimated incidental take is approximately 6% of the expected natural mortality for eggs and protolarval shiner. Quantifying this small percentage of the natural mortality is an expensive undertaking that does not provide any useful data for recovering the species.

Platania's work showed a snapshot in time of the reproductive effort of the spawning population for a series of events. The effort changes with each spawning event based on which environmental factors are operating. For instance, antecedent conditions are often very important to any singular spawning event. Spawning is stimulated by increased flows, whether natural or man-made. If, within the optimum spawning period, spate events are infrequent, the reproductive output upon an increased flow event probably increases.

After a block release, shiner larvae are not physically able to maneuver out of the downstream current for at least 4 to 6 days. By allowing a resting period of at least 14 days between releases, there is sufficient time for the young shiners to develop and seek habitats for protection during the next block release.

Hoagstrom's (USFWS, 1995) data revealed that in four of the five reaches sampled, the percent of shiners of size class zero (protolarvae and young-of-year) decreased the longer the block releases continued beyond 10 days. Reach 1, near the head of the release, showed the lowest decrease over time. Reaches 2, 3, and 4 had successively larger decreases over the same period of time. Reach 5, showed a significantly increasing percentage of shiners. This reach of river is just above Brantley Reservoir and has the least amount of habitat available to the Pecos bluntnose shiner.

Based on this information, it is likely that block releases of a duration longer than 4 to 6 days transport shiner protolarvae from Reach 5 into Brantley Reservoir. Block releases of 15 days duration or longer likely transport eggs and protolarvae from higher reaches into Brantley Reservoir and may make it difficult for the species to achieve optimal longitudinal distribution. Data presented by the Service at a Research meeting in April 1998 indicated that the duration of block releases were a problem and therefore recommended the maximum release be no longer than 15 days.

Reclamation has incorporated many of the essential components identified by the Pecos River Research Team (1998) in the release of stored water. Incorporating these components into the block release actions will improve the longitudinal distribution and population structure of the shiner, improve reproductive success and increase population numbers. These components include limiting the maximum release duration to 15 days, targeting 14 days of no storage release between consecutive block releases from Sumner, restricting the cumulative duration of

block releases from Sumner in calendar year 2001 to a maximum of 65 days, and targeting one, seven consecutive week period between June 1, 2002 and August 31, 2002 during which no block releases from Sumner will be made.

After a block release, shiner larvae are not physically able to maneuver out of the downstream current for at least 4 to 6 days. By allowing a resting period of at least 14 days between releases, there is sufficient time for the young shiners to develop and seek habitats for protection during the next block release.

As discussed above, the duration of individual block releases is an important factor for the distribution of shiner. Similar to the reasons limiting the duration of block releases to 15 days, the total number of days of block releases per year is also an important factor. Years when the cumulative 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.

By minimizing, to the extent possible, block releases during the months of June, July, and August, the shiner benefit by allowing natural flow spikes to initiate spawning during peak spawning periods. The natural flow spikes and resulting spawning effort may result in more shiner remaining in the channel and grow to sufficient size to seek preferred habitats.

Indirect Effects
Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. There were no indirect effects identified.

Cumulative effects of State and private actions in the project area
Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

For several years, the ISC has leased water from the Carlsbad Irrigation District to augment state line deliveries. Since the water is indistinguishable from CID supply until below Avalon Dam, Reclamation delivers it to Brantley as irrigation supply subject to the same storage release restrictions.

Cumulative effects result from the activities of well pumpers. Well pumpers affect the river by lowering the groundwater aquifer. This is an indirect effect on surface water flows as the impacts of the pumping may be delayed over time. The State of New Mexico has been instrumental in purchasing and retiring these types of water rights. In 2001, Reclamation will also lease from a well pumper, further reducing this commutative impact.

Additional cumulative effects on the shiner result from the action of river pumpers. River pumpers directly affect the flow of the river by pumping water out of the channel, reducing

downstream flows. This direct effect is magnified during low flow periods. Reclamation has leased water rights from six river pumpers and will not pump water from the river. This directly reduces the negative impact of river pumpers in the basin.

However, New Mexico water right permits for the direct diversion of Pecos River water do exist between Sumner Dam and Brantley Reservoir. One such permit was temporarily transferred to a location near the Highway 70 bridge northeast of Roswell, New Mexico, approximately three miles upstream from the Acme gage. The temporary permit allows water to be pumped from the Pecos river for road construction in 2001 and 2002. Steps have been taken by the construction company to prevent the entrainment of shiner in the pump intakes. The pumps do reduce flows in the Pecos River when they operating.

Other cumulative effects on the shiner result from the action of FSID. The FSID has no storage right, but does have direct flow rights through the Hope Decree and water to which the district is entitled. The Hope Decree entitles FSID to divert up to 100 cfs for beneficial use. The actual direct diversion right is based on a calculation made by the OSE from flow data collected every two weeks throughout the irrigation season.

Water to satisfy FSID's senior water right is not diverted to storage at Sumner Dam, but continues downstream for 14 miles to the FSID Diversion Dam where FSID is diverts it into the FSID main canal. If there is no additional natural inflow passing through Sumner Dam or no water being released, the river proper may become dry at this location. The main canal is approximately 15 miles long and water is diverted into smaller lateral canals for the irrigators' use. 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 may be up to half of the diversion allocation.

During periods when 100 cfs is diverted, return flows from the system re-enter the Pecos River proper about one mile above the Taiban confluence. When dry periods occur and less than 100 cfs is available for diversion, return water from the lateral canals, that would normally exit the system, is pumped back up into the main canal system for reuse, utilizing as much of the available water as possible. In this instance return flows are considerably reduced and result in very little water re-entering the river at the end of the main canal. During the 2001/2002 winter season, FSID increased their ability to pump water from the drains back into the irrigation system. It is anticipated that the result of this action will be lower return flows than historically occurred.

The cumulative effects may further exacerbate situations when dry periods start occurring, despite Reclamation's curtailing of its diversion action and not diverting to storage any of the available natural inflows or its purchase and lease of water rights. The environmental baseline is characterized by baseflows 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 nonnative vegetation (salt cedar intrusion). Local weather conditions can often make a significant difference between continuous flows or intermittence.

Interrelated and Interdependent Actions
There were no interdependent activities identified that were not considered. Some interrelated activities were identified including a wide range of activities associated with Reclamation's acquisition of supplemental water to mitigate the effect of modified operations on water users. Reclamation's acquisition efforts may also increase flows in the lower critical habitat area and we are hopeful that a recent forbearance agreement with a rancher near the Acme gage may improve the in-stream conditions in that critical stretch of the river.

9. EFFECT DETERMINATION

Reclamation's proposed action of diverting to storage in Sumner Reservoir available natural flows above FSID's direct diversion water right (up to 100 cfs) and when available additional flows are not needed to target flows preventing flow intermittence at the Acme gage allows water to be stored in Sumner Reservoir for the purpose of irrigation in CID without negatively impacting Pecos River base flow conditions. This proposed action will result in more favorable flow conditions for the shiner than the historical baseline. The proposed action will not impact base flow through the shiner's range. The proposed action will divert to storage flood inflows (though only those above what would be required to target flows at Acme if needed).

Reclamation's proposed action of diverting to storage in Sumner Reservoir available natural flows above FSID's direct diversion water right (up to 100 cfs) and when available additional flows are not needed to target flows preventing intermittent conditions at the Acme gage, does not effect baseflow conditions through the shiner's range and is maintaining habitat conditions that are relatively favorable for the shiner in the upper half of the shiner's range. The action is maintaining habitat conditions in the lower half of the shiner's range, though channel characteristics are not advantageous for the shiner. **As such, Reclamation's proposed action of diversion at Sumner Dam may affect, but is not likely to adversely affect the shiner and will not adversely modify or destroy critical habitat.**

Reclamation's proposed action of releasing stored water from Sumner Dam is for the beneficial purpose of irrigation in CID and is in a manner that does not constitute a wasteful use due to excessive losses through seepage. 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 minimize 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 shiner to develop and seek preferred habitats. Reclamation's proposal to minimize, to the extent possible, block releases during the summer spawning season will improve reproductive success of the species.

However, in addition to these positive attributes of Reclamation's proposed action, there are inherent negative aspects of block releases. It is probable that every block release made to deliver irrigation water from Sumner to Brantley transports shiner eggs and/or larvae into Brantley Reservoir where they do not survive. Because these individuals are lost in the delivery

to Brantley Reservoir, Reclamation requests an **incidental take statement**. Although unquantifiable at the present, it is estimated that 30,000,000 eggs/larvae will be transported into Brantley Reservoir per each block release. The expected natural survival of eggs and protolarvae is approximately 1 percent (Everhart & Youngs, 1981). Therefore, the level of take associated with each block release is on the order of 300,000 eggs and larvae. This level of take is not expected to jeopardize the continued existence of the species due to the small percentage of the reproductive effort associated with the block releases.

Adding to the complexity of any monitoring or egg recovery project are four additional fish species that are pelagic spawners. Because the Pecos bluntnose shiner eggs comprises less than 30% of the total that may be collected during any spawning event, monitoring projects will have to rear hatched larva 6-8 weeks to identify the fish to species. Recovery projects will either have to hatch the eggs and rear the larva until they are old enough to identify (6-8 weeks), or stock egg batches comprised of multiple species into sites which are at or near carrying capacity. The resultant competition among local and relocated larva will probably counteract any beneficial effects. The lack of identified species specific biochemical markers for Pecos River cyprinids currently precludes the use of gnomic tools (PCR, etc.) for species identification.

Currently available research does not provide data on the reproductive effort and survival of bluntnose shiner larva in different reaches of the river. The determination of reproductive effort and linking the data to population surveys will provide valuable analysis for management of the Pecos River. Weekly collections of pelagic eggs and fish larvae from several reaches on the river would provide detailed data on reproductive effort and subsequent survival of the offspring. Funds should be identified to support a graduate student (MS) for two years to conduct the study and publish the results. Possible universities for consideration include Eastern New Mexico University, Texas Tech University, New Mexico State University, and University of New Mexico. The project would focus on linking population surveys to reproductive effort, and differential recruitment related to habitat quality in the different reaches.

Reclamation's proposed action. Although the proposed releases of stored water would at times augment low flows in the reaches of critical habitat (block releases providing flows when the passage of all natural inflow is not sufficient), the proposed action will also result in the loss of individuals. **Therefore, the proposed action of releasing stored water in blocks may adversely affect the Pecos bluntnose shiner, but will not destroy or adversely modify its critical habitat.**

APPENDIX A

Estimated fecundity 5,000 eggs / female	5,000
Natural mortality	99%
Natural survival to juvenile	50 fish out of 5,000 eggs
Pecos Reach - 197 km	200 km
1 km = 1000 m	200,000 m reach length
channel width 10 m	2,000,000 m^2
Latest population data (1999-2000) 0.05 fish / m^2 0.15 fish / m^2 0.20 fish / m^2 0.05 fish / m^2	0.10 fish / m^2
River area * fish / m^2 =	200,000 Pecos bluntnose shiner
1:1 male:female ratio	100,000 female Pecos bluntnose shiner
estimated fecundity - 5,000 eggs / female	500,000,000 estimated reproductive output
estimated mortality into Brantley	30,000,000
percent mortality into Brantley	30,000,000/500,000,000 = ~6% of 99% natural mortality

How do we evaluate population stability? Ongoing population monitoring.

What factors affect recruitment in the Pecos? Block releases & intermittency.

Does monitoring mortality from block releases add to our knowledge on population stability?

How does estimating the mortality due to block releases (6% of 99%) contribute to recovery of the species?

What is the cost/benefit ratio of $100,000 for monitoring egg mortality for species recovery?

Egg Data Summary Sheet

DATE	Mean Daily Discharge SUMNER cfs	Mean Daily Discharge ACME cfs	Total Daily Discharge ACME cf	# Eggs per cf sampled	Total # of eggs per day extrapolated	Daily # of PBS eggs based on 0.515252 rate	Daily # of PBS eggs based on block release days
31-Jul-97	100	87	7,516,800	---	---	---	---
01-Aug-97	881	64	5,529,600	0.0029	16,297	8,397	
02-Aug-97	1220	524	45,273,600	0.0525	2,375,066	1,223,758	
03-Aug-97	1210	485	41,904,000	0.0551	2,308,571	1,189,496	
04-Aug-97	1200	1260	108,864,000	0.1127	12,270,054	6,322,170	6,322,170
05-Aug-97	1200	1380	119,232,000	0.0674	8,031,786	4,138,394	4,138,394
06-Aug-97	1200	1300	112,320,000	0.0225	2,524,412	1,300,708	1,300,708
07-Aug-97	1210	1240	107,136,000	0.0543	5,815,323	2,996,357	2,996,357
08-Aug-97	1240	1170	101,088,000	0.0178	1,794,809	924,779	924,779
09-Aug-97	1240	1090	94,176,000	0.0134	1,258,673	648,534	648,534
10-Aug-97	1240	1090	94,176,000	0.0180	1,694,729	873,212	873,212
11-Aug-97	1260	1080	93,312,000	0.0064	598,943	308,607	308,607
12-Aug-97	1260	1690	146,016,000	0.0052	753,046	388,009	388,009
13-Aug-97	1260	1260	108,864,000	0.0010	105,413	54,314	54,314
14-Aug-97	1270	1220	105,408,000	0.0203	2,137,744	1,101,477	1,101,477
15-Aug-97	1260	1230	106,272,000	0.0061	648,677	334,232	334,232
16-Aug-97	1270	1270	109,728,000	0.0099	1,086,748	559,949	559,949
17-Aug-97	1280	1140	98,496,000	0.0124	1,217,534	627,337	627,337
18-Aug-97	981	1580	136,512,000	0.0064	871,822	449,208	449,208
19-Aug-97	21	2200	190,080,000	0.0030	571,868	294,656	294,656
20-Aug-97	4.5	941	81,302,400	0.0028	227,857	117,404	117,404
21-Aug-97	3.5	521	45,014,400	0.0062	280,428	144,491	
22-Aug-97	3.7	352	30,412,800	0.0021	64,149	33,053	
23-Aug-97	3.7	249	21,513,600	0.0006	13,305	6,855	
24-Aug-97	3.8	204	17,625,600	0.0002	3,656	1,884	
25-Aug-97	44	145	12,528,000	0.0013	16,348	8,423	
26-Aug-97	100	142	12,268,800	0.0006	7,600	3,916	
	21,966	24,914	2,152,569,600		46,694,861	24,059,620	21,439,348

Courtesy of S.P Platania, 2001.

The above data estimates the number of Pecos bluntnose shiner eggs passing a single location in the Pecos River during a block release in August of 1997. The estimate was based on the number of eggs collected at a given site, per a known average discharge per day and extrapolated through the collecting period.

Appendix A

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