

# **Environmental Assessment**

**Reestablishment of the Rio Grande silvery minnow in  
the Big Bend reach of the Rio Grande in Texas**



**Prepared by:**

**U.S. Fish and Wildlife Service**

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# **Environmental Assessment for Reestablishment of the Rio Grande Silvery Minnow into the Big Bend reach of the Rio Grande in Texas.**

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## 1.0 Introduction, Purpose and Need

### 1.1 Introduction

The federally-endangered Rio Grande silvery minnow (see *Appendix A* for a list of scientific names) was historically one of the most abundant and widespread fishes in the Rio Grande, occurring from Española, New Mexico, to the Gulf of Mexico (Bestgen and Platania 1991). It was also found in the Pecos River, a major tributary of the Rio Grande, from Santa Rosa, New Mexico, downstream to its confluence with the Rio Grande (Pflieger 1980). The Rio Grande silvery minnow is extirpated from the Pecos River and also from the Rio Grande downstream of Elephant Butte Reservoir and upstream of Cochiti Reservoir (Bestgen and Platania 1991). The current distribution of the Rio Grande silvery minnow is limited to about 5 percent of its historic range and is only found in the Rio Grande between Cochiti Dam and Elephant Butte Reservoir in New Mexico. Throughout much of its historic range, the decline of the Rio Grande silvery minnow has been attributed to modification of the flow regime, channel drying, reservoirs and dams, stream channelization, decreasing water quality, and perhaps interactions with non-native fish [Bestgen and Platania 1991; Cook et al. 1992; U.S. Fish and Wildlife Service (Service) 1999]. Development of irrigated agriculture and the growth of cities within the historic range of the Rio Grande silvery minnow resulted in a decrease in the quality of river water caused by municipal and agricultural runoff (i.e., sewage and pesticides) that may have also adversely affected the range and distribution of the Rio Grande silvery minnow (Service 1999).

The various life history stages of the Rio Grande silvery minnow require low velocity habitats with a sandy and silty substrate that is generally associated with a meandering river that includes side channels, oxbows, and backwaters (Bestgen and Platania 1991; Platania 1991). Although the Rio Grande silvery minnow is a hardy fish, capable of withstanding many of the natural stresses of the desert aquatic environment, the majority of Rio Grande silvery minnow consist of one year old or younger individuals (Bestgen and Platania 1991), with significantly fewer two and three year old individuals present at any one time. Thus, a successful annual spawn is key to the survival of the species (Service 1999; Dudley and Platania 2001, 2002b). More information about the life history and decline of the Rio Grande silvery minnow can be found in the final listing of the species as endangered (July 20, 1994; 59 FR 36995), the final designation of critical habitat for the species (February 19, 2003; 68 FR 8088), the Rio Grande Silvery Minnow Recovery Plan (Recovery Plan; Service 1999) and the Draft Revised Rio Grande Silvery Minnow Recovery Plan (Draft Revised Recovery Plan; Service 2007a).

The term “Big Bend reach” refers to the portion of the Rio Grande in Texas, from Mulato Dam, east of Presidio, Texas, through Big Bend National Park and the Rio Grande Wild and Scenic River. “Big Bend region” is used to refer to the geographic area of the Big Bend reach and surrounding lands.

The Rio Grande silvery minnow is extirpated from the Big Bend reach and natural repopulation is not possible without human assistance (Service 2007a). Reasons for the species’ extirpation in the Rio Grande in Texas are uncertain, but are believed to have been due to a combination of low flows due to drought and diversions, in combination with water pollution (Edwards 2005). The last documentation of a Rio Grande silvery minnow in the Big Bend reach of the Rio Grande

was in 1960. However, the Big Bend reach has not experienced extensive drying since the drought of the 1950s and the continuing presence of members of the pelagic spawning guild (consisting of fish species that, like the Rio Grande Silvery minnow, produce semi-buoyant eggs that drift downstream, e.g., speckled chub and Rio Grande shiner) (see *Appendix A* for a list of scientific names) is evidence that the Big Bend reach may support reestablishment of Rio Grande silvery minnow (Edwards 2005). In addition, water quality in the Big Bend reach, which may have been one of the factors in the species' decline, appears to be generally improving over time (Edwards 2005). Furthermore, the Rio Grande is protected and managed on both the United States and Mexico sides of the border by Federal, State, and private conservation-oriented landowners. These entities are all working together to conserve the aquatic and riparian habitats along 281 miles (452 kilometers) of the Rio Grande/Rio Bravo. This provides a unique and significant measure of protection for the Rio Grande silvery minnow in the nonessential experimental population (NEP) area.

The Service administers the Endangered Species Act (Act) and is the principal Federal agency responsible for conserving, protecting and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. However, numerous individuals, agencies, and affected parties were involved in the development of the Recovery Plan or otherwise provided assistance and review. On July 8, 1999, we finalized the first Recovery Plan, pursuant to section 4(f) of the Act. The Recovery Plan has been updated and revised and a Draft Revised Recovery Plan (Service 2007a) was released for public comment on January 18, 2007 (72 FR 2301). The Draft Revised Recovery Plan recommends recovery goals for the Rio Grande silvery minnow, as well as research to better understand the biology of the species. The three goals identified for the recovery and delisting of the Rio Grande silvery minnow are:

1. Prevent the extinction of the Rio Grande silvery minnow in the middle Rio Grande of New Mexico.
2. Recover the Rio Grande silvery minnow to an extent sufficient to change its status on the List of Endangered and Threatened Wildlife from endangered to threatened (downlisting).
3. Recover the Rio Grande silvery minnow to an extent sufficient to remove it from the List of Endangered and Threatened Wildlife (delisting).

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

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

## **1.2 Purpose of the Action**

The purpose of the proposed action is to reestablish a self-sustaining population of the endangered Rio Grande silvery minnow in potentially suitable habitat found within the species' historic range in the Rio Grande in the Big Bend area of Texas. The Draft Revised Recovery

Plan defines a self-sustaining population as one that can sustain a minimum of 500,000 fish, for five consecutive years without augmentation from captive-bred fish (Service 2007a).

### **1.3 Need for the Action**

The Rio Grande silvery minnow currently inhabits approximately five percent of its historic range and only exists in the Middle Rio Grande in New Mexico. One of the primary goals of the Draft Revised Recovery Plan is to ensure eventual recovery and delisting of the Rio Grande silvery minnow by creating and maintaining self-sustaining populations in at least three areas of its historic range. The Service and the Draft Revised Recovery Plan have identified the Big Bend reach of the Rio Grande as part of the species' historic range most likely to support an additional population and as the first priority for reestablishment efforts.

In the final rule (67 FR 39212) and Environmental Impact Statement (Service 2003) designating critical habitat for the Rio Grande silvery minnow, the Service determined that the Rio Grande in the Big Bend area is important for the conservation of the species, but that our conservation strategy for the species would be to establish an experimental population in this area under section 10(j) of the Act instead of designating critical habitat there.

The proposed action is needed to produce a self-sustaining population of Rio Grande silvery minnow, under section 10(j) of the Act, which will decrease the risk of extinction of the species due to environmental catastrophe, disease, or other unforeseen events and contribute to conservation and recovery of the species.

### **1.4 Consultation and Coordination**

In 2003, at the onset of the National Environmental Policy Act (NEPA) process for this proposal, the National Park Service and the United States Section of the International Boundary and Water Commission agreed to be cooperating agencies, as defined by NEPA. In January 2004, the Service met with numerous Texas agencies and officials. The Service provided information on the potential reestablishment of the Rio Grande silvery minnow as a NEP in the Big Bend reach. This meeting provided an opportunity for participants to ask questions about 10(j) and why the Service chose this area for possible reestablishment. The State agencies that participated in the information exchange made suggestions for facilitating effective and comprehensive public participation in the process.

The Service convened a NEPA Interdisciplinary Team to assist us in the planning and public participation required by NEPA for this proposal. The Interdisciplinary Team includes representatives from Big Bend National Park, Far West Texas Water Planning Group, Texas Commission on Environmental Quality, Texas Department of Agriculture, Texas Farm Bureau, Texas Parks and Wildlife Department, Texas Water Development Board, United States Section of the International Boundary and Water Commission, University of Texas-Pan American, and the World Wildlife Fund. The Interdisciplinary Team assisted the Service in considering the potential scope of our proposal and in preparing for the NEPA scoping process. After the NEPA scoping meetings, the Service convened the Interdisciplinary Team, which assisted us in considering the best scientific and commercial data available, as well as, the comments received

from the scoping meetings in developing the alternatives considered in this environmental assessment.

The Service is also working closely with natural resource and other agencies in Mexico regarding our proposal to reestablish the Rio Grande silvery minnow in the Big Bend reach. These agencies include the Mexican Section of the International Boundary and Water Commission, the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), the Comisión Nacional de Áreas Naturales Protegidas (CONANP), and the National Institute of Ecology. We are in the process of forming a binational technical team to advise and assist with this project. The entire Big Bend reach is also a portion of the border between the United States and Mexico, thus coordination with these Mexican agencies is crucial to the success of this project. The Rio Grande silvery minnow (also known as the Chamizal minnow) is listed in the Mexican Official Standard under category E, indicating that it is probably extinct in wild habitat (in Mexico) and is not endemic to Mexico.

### **1.5 Scoping**

The Service solicited public input for the draft environmental assessment through written comments and public meetings held: September 20, 2005, in Sanderson, Texas; September 21, 2005, in Alpine, Texas; and, September 22, 2005, in Presidio, Texas. All comments from the three scoping meetings and the public comment period were analyzed and considered in developing the alternatives presented in this environmental assessment.

The Service and Interdisciplinary Team identified issues and concerns associated with Rio Grande silvery minnow reestablishment through the NEPA scoping period. The alternatives have also been discussed with potentially affected State agencies. All comments from the three scoping meetings and the public comment period have been analyzed and considered in developing the alternatives presented in this environmental assessment.

The following is a summary of comments received during the scoping period in the form of e-mails, letters, and verbally at the public meetings:

- Ensure there are no impacts to water users or private property owners.
- Work with Mexico to obtain support and maintain flows.
- Remove non-native species, such as salt cedar.
- Adopt regulatory provisions guaranteeing that the operation of the Rio Grande Project will not be modified and U.S. Bureau of Reclamation contractual obligations to supply water from the Rio Grande Project will not be impacted to make water available for the minnow.
- Legal protection of Rio Grande Project water supplies is essential.
- Fort Quitman to Candelaria is not suitable because it cannot be hydrologically maintained. If the Service sought a reliable source of flowing water through this reach the only source would be Rio Grande Project water which belongs to the constituents of the Elephant Butte Irrigation District and El Paso County Water Improvement District.

- The NEP should be declared permanently and solely as a NEP. There should never be the possibility of converting it to an essential population or reclassifying it to provide additional section 9 protections.
- Any artificial reintroduction of minnow in this area should be done only after a legislative restriction upon that NEP's classification. To accomplish this, the Service should provide its own protections to nearby land and water rights owners by appropriate written regulatory assurances/protections/prohibitions.
- What if the minnow does well and extends its range upward to Little Box Canyon and other areas such as into the Pecos River in Texas?
- What is the likelihood of the Service converting this NEP to one which is essential to the survival of the species? If it's not the Service's intention to make this conversion, how does the Service believe that continuing a Big Bend NEP contributes to recovery?
- The designation of a NEP is insufficient for the recovery of this species in Texas. The best chance for success lies with the proven strategy of designation of critical habitat.
- The Service must research flow needs for the Rio Grande silvery minnow and when, where, and how to assure enough flow to perpetuate the fish in its habitat.
- There is nothing nonessential about the need to establish an additional population of Rio Grande silvery minnow outside the middle Rio Grande in New Mexico.
- We suggest the Service establish a time limit or sunset provision for the experimental status should the agency choose a 10(j) designation. After the expiration of the time limit, Rio Grande silvery minnow should receive full protection under the Act.
- The erosion of the section 7(a)(2) consultation tool to a mere conferencing standard is unacceptable, particularly given the significant, though not extensive, Federal water management actions that would affect this habitat.
- Consider the use of an essential population as one of the alternatives in the draft environmental assessment.

## **1.6 Public and Peer Review Comments**

After developing a proposed rule and draft environmental assessment, we requested written comments from the public on the proposed NEP and draft environmental assessment in the proposed rule published on September 5, 2007 (72 FR 50918). We also contacted the appropriate Federal, State, and local agencies; Tribes; scientific organizations; and other interested parties and invited them to comment on the proposed rule. The initial comment period was open from September 5, 2007, to November 5, 2007. A second comment period was open from February 22, 2008, through March 10, 2008 (73 FR 9755). In conformance with our policy on peer review, published on July 1, 1994 (59 FR 34270), during the initial comment period we solicited opinions from three expert aquatic biologists who are familiar with this species to peer review the proposed rule. All three of the peer reviewers submitted comments.

We reviewed all comments received from the peer reviewers, State agencies, and the public for substantive issues and new information regarding the proposed NEP. Substantive comments

received during the comment period have been addressed in the comment and response section of the final rule or are incorporated directly into the final rule or the environmental assessment, as appropriate.

During the peer review and public comment period for the proposed rule and draft environmental assessment, we received comments from 14 parties, including comments from natural resource management agencies in Mexico and from three peer reviewers. Nine of the 14 parties who commented expressed support for reestablishing the silvery minnow in the Big Bend reach of the Rio Grande. Five commenters expressed support for the designation of the reintroduced population as a NEP, while two commenters, including one peer reviewer, expressed concern that a NEP designation would not provide enough protection for the silvery minnow.

Comments in support of the proposed action by peer reviewers included agreement with the following determinations: (1) the proposed NEP is wholly separate geographically from existing populations of Rio Grande silvery minnow; (2) establishment of a second population of Rio Grande silvery minnow is essential for the recovery of the species; (3) the Big Bend reach of the Rio Grande likely provides the best location for a second population; and (4) it seems appropriate to assume that Rio Grande silvery minnow will not become established outside of the proposed NEP area. One peer reviewer also agreed with our assertion that the continuing presence of speckled chub indicates that the proposed action seems to have a reasonably high probability of success. Commenters from Mexico's National Institute of Ecology indicated that the reintroduction of Rio Grande silvery minnow is a very important initiative for species conservation and habitat restoration on this reach of the Rio Grande.

## **2.0 Alternatives**

### **2.1 Alternative A, Proposed Action: Designate a NEP for Rio Grande silvery minnow in portions of the Rio Grande and Pecos River in the Big Bend region. Reestablish Rio Grande silvery minnow in suitable habitat within this area.**

#### **2.1.1 Geographic scope of the proposed action.**

The geographic boundaries of the NEP would extend, on the Rio Grande, from Little Box Canyon downstream of Ft. Quitman, Hudspeth County, Texas, through Big Bend National Park and the Rio Grande Wild and Scenic River, to Amistad Dam and the nearby railroad bridge and, on the Pecos River, from its confluence with Independence Creek to its confluence with the Rio Grande. More information about the geographic scope of the proposed action can be found in section 2.1.9.

#### **2.1.2 Selection and location of Rio Grande silvery minnow release sites.**

The scope of this proposed action covers all Rio Grande silvery minnow releases in the NEP. Release sites will initially be located in Big Bend National Park and potentially Texas Parks and Wildlife Department lands. Releases on privately owned lands would occur only if landowners are agreeable and the river sites represent potentially suitable habitat. Primary considerations for identifying Rio Grande silvery minnow release sites include:

1. Within or in proximity to potentially suitable habitat.
2. The extent of potentially suitable habitat surrounding a potential release site and its proximity to other similar habitats.
3. Access for logistical support.
4. Willing landowner or manager.

To ensure needed habitat elements exist, we recommend control of salt cedar and giant river cane (also known as giant reed) in the floodplain of the NEP area and upstream of this area (see *Appendix A* for a list of scientific names). The presence and abundance of these plant species have stabilized banks and sediments and caused scouring of sand and silt substrates from the river and reduced channel braiding, thus effectively reducing the amount of Rio Grande silvery minnow habitat (Edwards 2005). We anticipate working with land managers and other interested parties, on a voluntary basis, to develop plans to further guide habitat management. More detailed information can be found in the Reestablishment of the Rio Grande Silvery Minnow to the Big Bend Reach of the Rio Grande: Implementation and Monitoring Plan (Implementation and Monitoring Plan) (*Appendix B*).

### **2.1.3 Rio Grande silvery minnow release techniques**

Release methodology will be based on lessons learned from the successful Rio Grande silvery minnow propagation and augmentation programs in New Mexico (Service 2007b, 2008). In 2000, the Service identified captive propagation as an appropriate strategy to assist in the recovery of the Rio Grande silvery minnow. On-going recovery efforts involving the release of captive-bred Rio Grande silvery minnow for augmentation of the population in the Rio Grande near Albuquerque, New Mexico have demonstrated the potential viability of reestablishment as a tool for Rio Grande silvery minnow conservation. Consistent with Service policy (65 FR 183), captive propagation is conducted in a manner that will, to the maximum extent possible, preserve the genetic and ecological distinctiveness of the Rio Grande silvery minnow and minimize risks to existing wild populations.

Since 2000, more than 600,000 Rio Grande silvery minnow have been propagated, using both adult wild Rio Grande silvery minnow and wild caught eggs, and then released into the wild. While hatcheries successfully spawn Rio Grande silvery minnow, wild eggs are collected to ensure genetic diversity within the remaining population (Remshardt 2006).

Direct and indirect evidence from the Rio Grande silvery minnow monitoring program indicates that augmentation efforts in the Rio Grande near Albuquerque, New Mexico, are contributing to an increase in catch rates of Rio Grande silvery minnow. The success of this augmentation effort indicates that hatchery raised individuals can be released back to the wild with adequate retention in or near original release sites, can experience survival of at least 2 years after release, and ultimately can contribute to future spawning efforts (Remshardt 2006).

As part of the augmentation program, the Service evaluated different release strategies such as time of year, time of day, specific release habitats, and various hatchery environments (natural

outdoor ponds versus indoor facilities). All this information will add to the knowledge needed for future conservation while providing active management strategies for the Rio Grande in New Mexico and reestablishment in the Big Bend reach (Remshardt 2006).

#### **2.1.4 Timing and duration of reestablishment activities**

In order to meet the Purpose and Need of the proposed action, we anticipate releasing Rio Grande silvery minnow into the Big Bend reach at least once per year until either: (1) an evaluation of the program shows the Needs of the Action (Section 1.3) have been met, or (2) the establishment of Rio Grande silvery minnow in potentially suitable habitat becomes highly unlikely.

#### **2.1.5 Monitoring**

It is important for the monitoring program to be able to build on existing data and to be able to use statistically valid methods to assess changes in age-class structure and abundance of Rio Grande silvery minnow and other fish. After the initial stocking of this fish, we will monitor their presence or absence at least annually and document any spawning behavior or young-of-year fish that might be present. When funding is available, monitoring will occur more frequently, especially during the initial few years of reestablishment efforts. This monitoring will be conducted primarily by seining and will be accomplished by Service, Big Bend National Park, or State employees or by contracting with the appropriate species experts. Annual reports will be produced detailing stocking and monitoring activities that took place during the previous year. The Service, and cooperators of the reestablishment program, will also evaluate the program at least every five years. The evaluation will include an analysis of release protocols to determine whether modifications may be necessary to increase the likelihood of success, and an assessment of incremental progress in meeting objectives. More information about monitoring is included in the Implementation and Monitoring Plan (*Appendix B*).

#### **2.1.6 Experimental population**

Under the Act, species listed as endangered or threatened are afforded protection primarily through the prohibitions of the Act outlined in section 9 and the requirements of section 7. Section 9 of the Act prohibits the take of endangered wildlife species. "Take" is defined by the Act as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. These section 9 prohibitions apply to any person subject to the jurisdiction of the United States. Section 7 of the Act outlines the procedures for Federal interagency cooperation to conserve federally-listed species. Section 7(a)(1) mandates all Federal agencies utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. Section 7(a)(2) states that Federal agencies shall, in consultation with the Service, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. Section 7(a)(2) of the Act does not affect activities undertaken on private lands unless those activities are authorized, funded, or carried out by a Federal agency.

Congress made significant changes to the Act with the addition of section 10(j) in 1982, which provides for the designation of specific reestablished populations of listed species as “experimental” populations. The Service has always had the authority to reestablish populations in unoccupied portions of a listed species' historic range when doing so would foster the recovery of the species. However, local citizens often opposed these reestablishments because they were concerned about possible restrictions and prohibitions on Federal and private activities. Under section 10(j), the Secretary of the Interior can designate reintroduced populations established outside the species' current range, but within its historic range, as “experimental.” Designating a population as experimental under section 10(j) provides for increased management flexibility under the Act. On the basis of the best available information, we must determine whether an experimental population is “essential” or “nonessential” to the continued existence of the species. With the experimental population designation, the relevant population is treated as threatened for purposes of section 9 of the Act, regardless of the species' designation elsewhere in its range. Threatened designation allows us greater regulatory flexibility in managing the species by providing opportunities for developing special rules under section 4(d) of the Act. Within a NEP designated area, for the purposes of section 7 of the Act, Rio Grande silvery minnow would be treated as proposed for listing outside of areas administered by the National Park Service [Big Bend National Park and the Rio Grande Wild and Scenic River] and as threatened within these areas (see section 2.1.7).

#### **2.1.7 Nonessential experimental population**

We have determined that reestablishing the Rio Grande silvery minnow in the Big Bend reach of the Rio Grande would further the conservation of the species (Service 2003). The definition of conservation in the Act is the use of “all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.” Thus, to conserve a species is to bring it to a level of recovery, at which point it may be delisted. Although, if successful, a population of Rio Grande silvery minnow in the Big Bend reach of the Rio Grande would be an essential factor in the *recovery* of the species, we have determined that this experimental population would not be essential to the *continued existence of the species in the wild*. Therefore, the Service is designating a NEP for the species in this area. This determination has been made for the following reasons:

- (a) We will ensure, through our section 10 permitting authority and the section 7 consultation process, that the use of Rio Grande silvery minnows from any donor population for releases in the Big Bend reach is not likely to jeopardize the continued existence of the species in the wild;
- (b) A population of Rio Grande silvery minnows exists in the middle Rio Grande, New Mexico, and the possible failure of the NEP that is the subject of this rule will not appreciably reduce the likelihood of survival of the species' existing wild population. Captive propagation facilities maintain a captive population, maximizing genetic diversity to the extent possible, and provide adequate numbers of Rio Grande silvery minnows to maintain the wild New Mexico population. The additional number of Rio Grande silvery minnows needed for reestablishment in the Big Bend reach will not inhibit the population augmentation efforts in the middle Rio Grande, New Mexico; and,

- (c) The captive population is protected against the threat of extinction from a single catastrophic event by housing Rio Grande silvery minnow in three separate facilities. Juvenile minnows produced in excess of the numbers needed to maintain the captive population and augment the wild population in New Mexico are available for reintroduction to the Big Bend reach. Some members of the experimental population are expected to die during the reintroduction efforts after removal from the captive population. The Service finds that even if the entire experimental population died, this would not appreciably reduce the prospects for future survival of the species in the wild. That is, the captive population could produce more surplus minnows and future reintroductions still would be feasible if the reasons for the initial failure are understood. As a result, any loss of an experimental population in the wild will not threaten the survival of the species as a whole.

In view of all these safeguards the Service finds that the reintroduced population would not be “essential” under 50 CFR 17.81(c)(2). Experimental essential status is neither required by section 10(j) of the Act nor the implementing regulations, and it has not been used in past reintroductions of captive-raised animals, such as the red wolf, Mexican grey wolf, black footed ferret, and California condor (see *Appendix A* for a list of scientific names). In addition, based on meetings with State agencies and landowners in the NEP area and letters received during scoping and the public comment period, designation of the released Rio Grande silvery minnow as a NEP is considered necessary to obtain needed State, local, and private cooperation.

For the purposes of section 7 of the Act, under a NEP designation, Rio Grande silvery minnow occurring in the Rio Grande in Big Bend National Park or the Rio Grande Wild and Scenic River, which is administered by the National Park Service, would be treated as threatened. Therefore section 7(a)(1) and the consultation requirements of section 7(a)(2) of the Act would both apply. Outside the National Park system, which includes Big Bend National Park and Rio Grande Wild and Scenic River, silvery minnow would be treated as a species proposed for listing for purposes of section 7(a)(2), and Federal agencies would be required to conference with the Service only on actions that are likely to jeopardize the continued existence of the Rio Grande silvery minnow. Section 7(a)(1), which requires Federal agencies to use their authorities to conserve endangered and threatened species, still applies to all Federal agencies.

Section 10(j) is designed to increase our management flexibility. In addition, the regulatory restrictions of sections 7 and 9 of the Act are considerably reduced under a NEP designation for a listed species, as compared to an essential experimental population, and are usually more compatible with routine human activities in the establishment area. In situations where we have experimental populations, certain section 9 prohibitions would no longer apply and special rules may be written under section 4(d) of the Act. The special rules written for this action include defining allowable take of Rio Grande silvery minnow (see section 2.1.8).

The NEP designation for the reestablishment alleviates landowner and water user concerns about possible land and water use restrictions by providing a flexible management framework for protecting and recovering Rio Grande silvery minnow, while ensuring that the daily activities of landowners are unaffected. Landowners and managers are more likely to accept Rio Grande

silvery minnow in the Rio Grande adjacent to their lands with the flexibility provided by a NEP designation, which allows us to build better partnerships and explore potential habitat improvement projects with a larger group of landowners.

While it is true that consultation requirements would be lessened for the NEP, as compared to an essential experimental population or one with full endangered status, we believe that incidental take associated with otherwise lawful activities would not pose a long-term threat to Rio Grande silvery minnow recovery, as activities that currently occur in the NEP area would be compatible with Rio Grande silvery minnow recovery. Thus, the more stringent legal protections provided under section 7 for an essential experimental or endangered population are unnecessary.

Section 10(j) of the Act requires that an experimental population be geographically separate from other wild populations of the same species. This NEP area is isolated from existing populations of this species by large reservoirs in New Mexico, and the best available information indicates this fish does not survive in large reservoirs because there are many predators and no suitable habitat for Rio Grande silvery minnow (64 FR 36275). These reservoirs will ensure that this NEP remains geographically isolated and easily distinguishable from existing upstream wild populations in New Mexico. In addition, Amistad Reservoir will act as a barrier to the species' downstream movement in the Rio Grande.

#### **2.1.8 Allowable take**

The Act defines "incidental take" as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity such as recreation (e.g., fishing, boating, wading, trapping or swimming), forestry, agriculture, and other activities that are in accordance with Federal, Tribal, State, and local laws and regulations. Under this proposed action, and the associated special rules, a person may take a Rio Grande silvery minnow within the experimental population area so long as the take is unintentional and was a result of an otherwise legal activity. Such conduct will not constitute "knowing take," and will be allowed under provisions of the 4(d) regulations. The exception to this applies to Federal agencies, which must consult under section 7 on their activities that may affect the Rio Grande silvery minnow within Big Bend National Park or the Wild and Scenic River (see section 2.1.7 above). We expect levels of incidental take to be low because activities that currently occur in the NEP area are compatible with Rio Grande silvery minnow recovery. For example, there are no major dams or diversions in the Big Bend reach, which are the primary threats to the species within its current range in the Rio Grande in New Mexico. Also, most of the portion of the Big Bend reach in which we expect Rio Grande silvery minnow to become established is protected and managed for fish, wildlife, and other natural resources by State and Federal agencies in both the United States and Mexico.

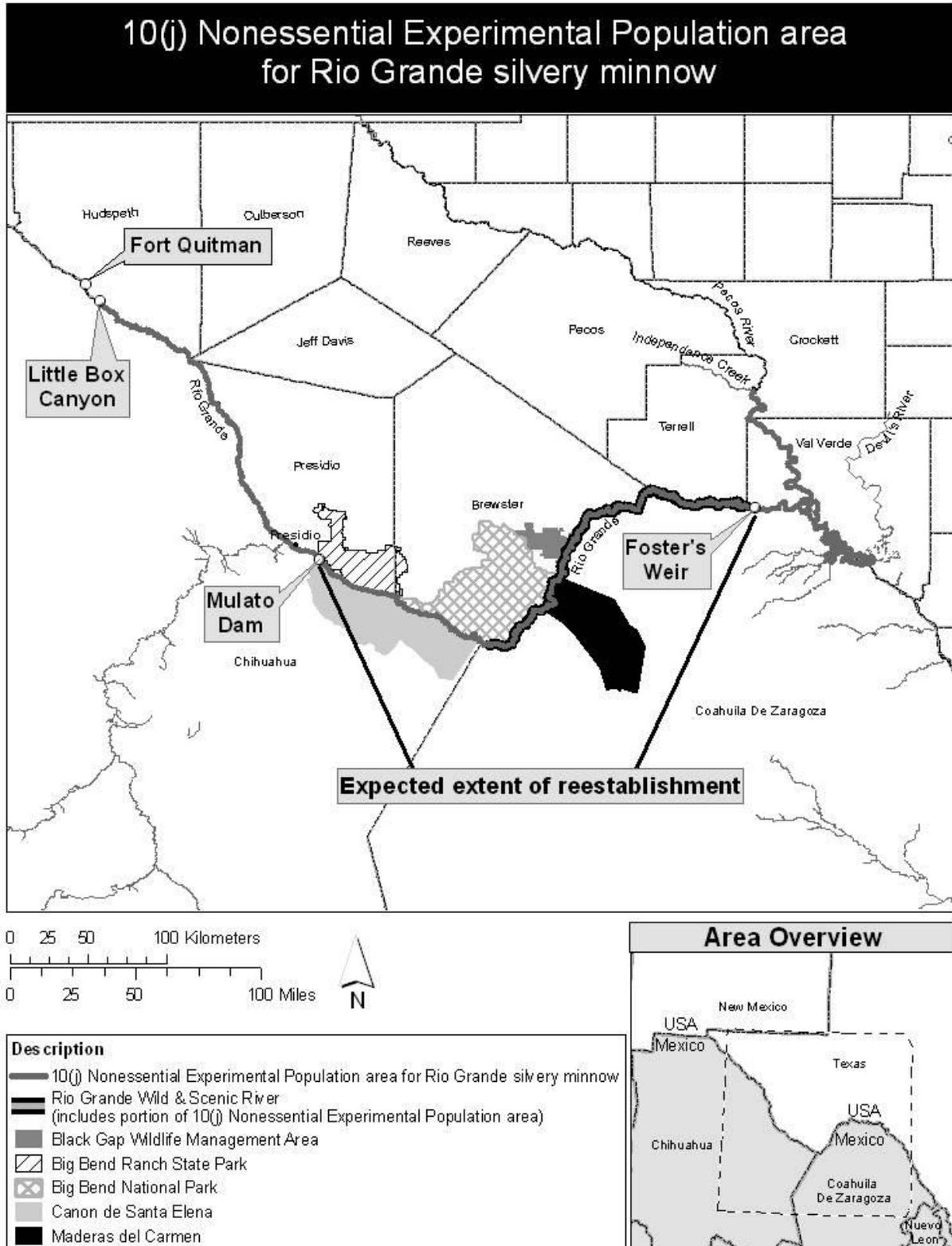
#### **2.1.9 Geographic boundaries for the proposed NEP**

Based on the presence of suitable habitat, the presence of similar fish species that have similar habitat requirements to the Rio Grande silvery minnow, the recommendations of the Rio Grande Silvery Minnow Recovery Team, and the results of a feasibility study (Edwards 2005), the area in which Rio Grande silvery minnow are most likely to become reestablished after potential reintroduction is the Rio Grande from Mulato Dam near Presidio, Texas, to Foster's Weir near

the Terrell/Val Verde County line. However, the geographic extent being considered for designation is larger and includes the Rio Grande from Little Box Canyon downstream of Ft. Quitman, Hudspeth County, Texas, through Big Bend National Park and the Rio Grande Wild and Scenic River, to Amistad Dam and the nearby railroad bridge; Amistad Reservoir; and the Pecos River from its confluence with Independence Creek to its confluence with the Rio Grande. Although only the portions of this area described above contain suitable habitat, this area represents what we believe to be the maximum geographic extent to which the fish could move if released in the Big Bend reach of the Rio Grande. We are proposing designation of a nonessential experimental population of Rio Grande silvery minnow for the maximum extent that fish might move from release sites to minimize regulatory burdens and restrictions for landowners and water users in areas adjacent to the expected establishment area. We believe including this additional area provides a more effective recovery strategy by providing regulatory certainty to land owners, water users, and public agencies outside of the expected extent of establishment in the Big Bend reach of the Rio Grande.

Based on the habitat requirements of the Rio Grande silvery minnow, we do not expect them to become established outside the NEP because they are unlikely to move into the unsuitable habitat at the edges of the NEP beyond the expected extent of reestablishment and are not able to move past physical barriers (dams and weirs) at either end of the NEP. However, if any of the released Rio Grande silvery minnow move outside the designated NEP area, then the Service will consider these fish to have come from the NEP area. In that case, we will propose to amend the section 10(j) rule and enlarge the boundaries of the NEP area to include the entire range of the expanded populations.

Figure 1. Action Area.



**2.2 Alternative B, No Action: Do not designate a NEP for Rio Grande silvery minnow in portions of the Rio Grande and Pecos River in the Big Bend region and do not reestablish Rio Grande silvery minnow in this area.**

The No Action Alternative would continue existing river management without release of Rio Grande silvery minnow. In this alternative, Rio Grande silvery minnow would not be reestablished in the Big Bend reach. The Service believes that movement of Rio Grande silvery minnow from the Rio Grande near Albuquerque, New Mexico to this reach is impossible due to the presence of long reaches of unsuitable habitat and large reservoirs (64 FR 36275). This alternative would allow for the option of designating critical habitat in this reach should future analysis prove that it is warranted.

**2.3 Alternatives Considered But Eliminated from Detailed Study**

**2.3.1 NEP designation and reestablishment of Rio Grande silvery minnow, limited to Rio Grande only where adjacent to Big Bend National Park, Big Bend Ranch State Park, Black Gap Wildlife Management Area, and the Rio Grande Wild and Scenic River.**

This reach of the Rio Grande encompasses the primary reach where we believe suitable habitat exists and Rio Grande silvery minnow are most likely to become established. This alternative would have limited the nonessential experimental population designation only to the reach with suitable habitat and left out of the designation additional reaches to which the fish could possibly, but not likely, move from the proposed release sites, but which do not contain suitable habitat. This alternative could have resulted in regulatory burdens and restrictions for landowners and water users in areas adjacent to the expected establishment area because if the Rio Grande silvery minnow were to move beyond the reach of river designated as an experimental population, it would be fully protected as an endangered species under the Act (see section 2.1.9 for further information).

**2.3.2 Essential experimental population designation and reestablishment of Rio Grande silvery minnow.**

This alternative was not selected for further analysis because the Service has determined that this experimental population would not be essential to the continued existence of the species for the reasons listed in section 2.1.7.

Furthermore, after careful analysis of the land and water use in the Big Bend reach of the Rio Grande, including the analysis performed for the designation of critical habitat for the Rio Grande silvery minnow, we have determined that there are no current or on-going activities with a Federal nexus that are likely to significantly adversely affect the Rio Grande silvery minnow in this area. Thus, the more stringent legal protection provided under section 7 for an essential population designation is not needed to protect reintroduced Rio Grande silvery minnow. Landowners and managers are more likely to accept Rio Grande silvery minnow in the Rio Grande adjacent to their lands with the flexibility provided by a NEP designation, which allows us to build better partnerships and explore potential habitat improvement projects with a larger

group of landowners. Our 10(j) regulations require that, to the extent practicable, a regulation issued under section 10(j) of the Act represents an agreement between the Service, the affected State and Federal agencies, and persons holding any interest in land that may be affected by the establishment of the experimental population. Affected State agencies, landowners, and land managers have indicated support for the proposed reestablishment, provided a NEP is designated and land and water use activities in the proposed NEP area are not constrained.

**Table 1. Alternatives presented with regard to meeting the Purpose and Need of the action.**

<b>Alternatives</b>	<b>A (Proposed Action)</b>	<b>B (No Action)</b>
<b>Purpose and Need:</b> Reestablish a viable Rio Grande silvery minnow population in the Big Bend reach of the Rio Grande.	Meets Purpose and Need if potential habitat is suitable and reestablishment is successful.	Does not meet Purpose and Need because reestablishment is not possible without human assistance.

### **3.0 Affected Environment**

The affected environment consists of biophysical components, social and economic components, and cultural components of the Big Bend region that may be affected by the proposed action. There are two geographic areas addressed in this document: the total NEP area and the expected establishment area for released Rio Grande silvery minnow (see Figure 1). We believe there is very low probability that Rio Grande silvery minnow will move outside the expected establishment area on the Rio Grande from Mulato Dam to Foster's Weir because they are unlikely to find suitable habitat either upstream or downstream from this area. However, the affected environment and impact analysis include the larger area being proposed for designation as a NEP area (see section 2.1.9 for more information about the action area).

Land in the United States along the Rio Grande within the expected establishment area is managed by the State of Texas, National Park Service, United States Section of the International Boundary and Water Commission, CEMEX, and other private landowners. CEMEX is an international cement company which owns land set aside for natural resources protection in both the United States and Mexico along the Big Bend reach. Information in addition to that found in this document on the Big Bend reach and region can be found in the Designation of Critical Habitat for Rio Grande Silvery Minnow; Final Environmental Impact Statement (Service 2003).

Along the portions of the Rio Grande and Pecos River that comprise the action area, there may be effects to the following elements of the environment:

## **3.1 Biophysical**

### **3.1.1 Floodplains, wetlands, riparian zones, and native and non-native vegetation**

The riparian zone in the Big Bend reach once included lance-leaf cottonwoods and willows. Forests were probably not extensive, as riparian vegetation was often cleared by scouring floods. Prior to the establishment of Big Bend National Park most of the larger floodplain areas were cleared for farming and grazing, and native cottonwoods were nearly eliminated by woodcutters. These activities, along with changes to the flow characteristics of the river (high and low water timing, duration, and intensity) and invasion of exotic species, have greatly altered the character of the riparian zone. Additionally, with changes in flooding frequency and dynamics, the Big Bend reach has changed from a channel with erodible banks that migrates across the floodplain to one with stabilized banks and an incised channel (Bennet 2006).

Native trees such as huisache and willow are still common near the river in some areas, but much of the river floodplain is now dominated by nonnative species. Bermuda grass is widespread on many sections of riverbank. Throughout the river corridor, extensive stands of introduced giant river cane, along with native common reed, line the shore. Non-native salt cedar occupies extensive areas, out-competing native species for water and nutrients. In drier areas of the floodplain, particularly in the Rio Grande Wild and Scenic River segment, characteristic Chihuahuan Desert species such as mesquite, saltbush, and creosote bush continue to dominate (see *Appendix A* for a list of scientific names).

#### **3.1.1.1 Federally-listed (threatened and endangered) plant species**

Two federally-threatened species of cactus, bunched cory cactus and Chisos Mountain hedgehog cactus, are present in Big Bend National Park and on lands adjacent to the Rio Grande Wild and Scenic River. Both species occur primarily in upland areas, but may be found within the river corridor in a few locations (National Park Service 1997) (see *Appendix A* for a list of scientific names).

### **3.1.2 Fish and wildlife**

Fish and wildlife resources potentially affected by the proposed action include the Rio Grande silvery minnow and those animals that are potential predators and/or competitors.

#### **3.1.2.1 Rio Grande silvery minnow**

Seven collections made between 1938 and 1960 document that the Rio Grande silvery minnow was among the most common fishes of the Big Bend reach. The species has not been found in this reach since 1960, despite frequent fish samplings from 1977 to the present. There are no records of the Rio Grande silvery minnow in the Rio Conchos in either historic or recent collections (Service 2007a).

### **3.1.2.2 Fish communities of the lower Big Bend reach.**

The portion of the Rio Grande between Presidio and Amistad Reservoir contains a somewhat different and more diverse fish fauna than upstream or downstream reaches. Forty-six known species of fish have been recorded in the Big Bend reach, including eight species that are now extirpated or extinct. Thirty-four are native, and 12 have been introduced (National Park Service 1997). This reach is characterized by at least two major categories of fishes: large-bodied, long-lived, big-river fishes and small-bodied, short-lived fishes. Examples of the former include the longnose gar, gizzard shad, river carpsucker, blue sucker, smallmouth buffalo, and common carp. Several species of game fish, including blue catfish and flathead catfish, are present and caught by anglers in Big Bend National Park. The majority of the native fish in the Big Bend reach are of minnow size. At least 12 species of minnow, 10 of which are native, occur in this reach of the Rio Grande. Two of these species (speckled chub and Rio Grande shiner), like the Rio Grande silvery minnow, are pelagic spawners, producing semi-buoyant eggs that drift downstream. Both are widespread throughout the reach. Other common members of the fish fauna in the Big Bend reach include the red shiner, Tamaulipas shiner, Mexican tetra, and western mosquito fish (Service 2003) (see *Appendix A* for a list of scientific names).

### **3.1.2.3 Federally-listed (threatened and endangered) fish and wildlife species.**

The Rio Grande in this reach presently contains no federally-listed threatened or endangered species. One candidate species for Federal listing, the Texas hornshell (a freshwater mussel), is present in this reach. In 1998, 32 sites along approximately 100 river-miles (161 kilometers) of the Rio Grande downstream of Big Bend National Park in Texas/Mexico were surveyed by Texas Parks and Wildlife Department (Howells and Ansley 1999; Howells 2001). Although no live Texas hornshell were observed, 3 of 5 valves collected were of recently dead specimens. In addition, Big Bend National Park began conducting searches for mussels starting in 2005 and has found 48 dead Texas hornshells, many of them recently dead, in the Rio Grande in Big Bend National Park, and in the lower canyons area (approximately from Reagan Canyon to Bullis Fold) of the Rio Grande Wild and Scenic River downstream of the Park (Skiles 2008). In March 2008, live Texas hornshell were discovered in the Rio Grande wild and Scenic River in Terrell County, confirming that there is an extant population in the Big Bend reach of the Rio Grande.

One federally-endangered fish species, the Big Bend gambusia, occupies shallow, spring-fed natural pools near Rio Grande Village in Big Bend National Park. The Big Bend gambusia is not a riverine species and has never been found within the Rio Grande. When discovered, the species occupied a single spring near Boquillas Crossing. Individuals were introduced into three spring-fed pools near the river corridor, where the species currently persists. This species remains threatened due to the greatly restricted area of its habitat. The gambusia is vulnerable to the introduction of other minnow species to the isolated pools in which it occurs (Service 1984) (see *Appendix A* for a list of scientific names).

There are no records of the southwestern willow flycatcher in Big Bend National Park, although its presence at the extreme eastern edge of its geographic range is a possibility. The bald eagle, which was delisted in 2007, occasionally uses Big Bend National Park during migration. This

species is a rare visitor to the river floodplain during spring and fall. The peregrine falcon, which nests in canyons above the river corridor along the Big Bend reach, was de-listed in 1999. Other federally-listed wildlife species present within Big Bend National Park, but largely outside of the river corridor, are the black-capped vireo (Troy 2006) and the Mexican long-nosed bat (England et al. 2004) (see *Appendix A* for a list of scientific names).

#### **3.1.2.4 State-listed and conservation target species.**

The Mexican stoneroller, Chihuahua shiner, proserpine shiner, Conchos pupfish, and blue sucker are all listed as threatened in the state of Texas. In addition, the Big Bend reach includes a number of freshwater fish species listed as conservation target species (Service 2006), including the Mexican tetra, smallmouth buffalo, west Mexican redhorse, gray redhorse, longnose dace, speckled chub, Rio Grande shiner, roundnose minnow, tamaulipas shiner, and blue catfish (see *Appendix A* for a list of scientific names).

#### **3.1.2.5 Other wildlife.**

The river corridor in the Big Bend reach is used extensively by a large number of wildlife species. A number of medium-sized mammals including gray fox, raccoon, and striped skunk inhabit the riparian zone. Several broad-ranging mammals, including black bear and mountain lion, occasionally use the river corridor in Big Bend National Park. Mexican beaver, a Mexican endangered species, occupies areas along the Rio Grande throughout the Big Bend reach. Nutria, a non-native mammal, have invaded the river corridor and caused degradation of aquatic habitat in some areas by consuming aquatic vegetation (Milholland 2005) (see *Appendix A* for a list of scientific names).

More bird species have been recorded at Big Bend than any other National Park. Many resident and migrant species make use of the riparian vegetation along the river corridor. Common nesters in riparian habitat include the mourning dove, Western yellow-billed cuckoo, black-chinned hummingbird, ladder-backed woodpecker, Bell's vireo, common yellowthroat, yellow-breasted chat, orchard oriole, summer tanager, Northern cardinal, blue grosbeak, and painted bunting. Somewhat less common are white-winged and common ground doves, western screech-owl, elf owl, vermilion flycatcher, and hooded oriole (Wauer 1985) (see *Appendix A* for a list of scientific names).

The most common amphibians along the river are Rio Grande leopard frog and red-spotted toad. Three native species of turtle reside in the river corridor: Big Bend slider, yellow mud turtle, and spiny softshell. The non-native elegant slider is also present and may be threatening the Big Bend slider by hybridization. Lizard species present in the floodplain include the Texas banded gecko, southwestern earless lizard, desert spiny lizard, canyon lizard, side-blotched lizard, and marbled whiptail. Common snakes include the coachwhip, spotted night snake, and western diamondback rattlesnake. Less common to rare are the trans-Pecos blind snake, glossy snake, Great Plains rat snake, desert kingsnake, blotched water snake, checkered garter snake, and Big Bend patch-nosed snake (Big Bend Natural History Association 2002) (see *Appendix A* for a list of scientific names).

### **3.1.3 Water quality**

Over the last 20 years extensive development and population growth has occurred in the United States-Mexico border region, particularly in the El Paso/Juarez metropolitan area approximately 300 miles (483 kilometers) upstream from Big Bend National Park. This growth, fueled in part by more than 1400 maquiladora (product assembly) plants on the Mexican side of the border, has resulted in increased potential for water quality degradation and toxic chemical contamination. Heightened public and government attention was focused on these issues in 1993 when American Rivers, the principal river conservation organization in the United States, listed the Rio Grande/Rio Conchos as the most endangered river system in America. Sources of contaminants in the area immediately upstream from Big Bend National Park include untreated sewage from Ojinaga, Chihuahua, Mexico and smaller border villages; livestock grazing in riparian areas; agricultural runoff; and mining activities including past underground mining for mercury near Terlingua just outside of Big Bend National Park boundaries. However, the largest potential sources of toxic contaminants in the Big Bend reach are further upstream. Point and nonpoint pollution sources include agricultural runoff from farming operations around El Paso/Ciudad Juarez and in the upstream watershed of the Rio Conchos, drainage from past and current mining activities in Mexico and the United States, and both treated and untreated municipal and industrial wastewater from El Paso/Ciudad Juarez. Elevated fecal coliform levels, as well as heavy metals and pesticides, have been identified in several segments of the Rio Grande in Texas, particularly downstream from border cities. As noted previously, water quality generally improves downstream from Big Bend National Park on the Rio Grande Wild and Scenic River, due to the presence of springs, which help to maintain higher flows and provide greater dilution of salts and other pollutants. More information on the water quality in the Big Bend reach can be found in the Designation of Critical Habitat for Rio Grande Silvery Minnow; Final Environmental Impact Statement (Service 2003). In addition, recommendations for research and monitoring of water quality in the NEP area can be found in the Implementation and Monitoring Plan (*Appendix B*).

## **3.2 Social and Economic**

### **3.2.1 Land and water use**

Land uses within the action area are agriculture, grazing, ranching, recreation, and conservation.

Big Bend National Park occupies roughly 800,000 acres (323,750 hectares), or 25 percent of the total land area in Brewster County. Lands within Big Bend National Park are owned by the United States and used primarily for recreational and conservation purposes. Grazing is not allowed in Big Bend National Park, but is legally allowed on private ranches adjacent to the Rio Grande Wild and Scenic River downstream of Big Bend National Park boundaries. Grazing of trespass livestock from Mexico occurs frequently in Big Bend National Park. The U.S. Department of Agriculture, in cooperation with the National Park Service, conducts periodic trespass livestock round-ups.

Surrounding lands are used for a variety of purposes, primarily recreation, ranching, and agriculture. To the northwest, Big Bend Ranch State Park occupies over 280,000 acres (113,312

hectares) along the Rio Grande from southeast of Presidio to near Lajitas. The State Park offers camping, lodging, and a variety of recreational activities for visitors. To the east, the Black Gap Wildlife Management Area borders Big Bend National Park, encompassing 100,000 acres (40,469 hectares) including a 30-mile (48-kilometer) reach of the Rio Grande Wild and Scenic River. This remote area is undeveloped and receives relatively few visitors. The mountain region to the north of Big Bend National Park also provides recreational opportunities and attracts tourists to Alpine, the largest town in Brewster County with a population of roughly 6,000. In Presidio County, small-scale agriculture occurs along the Rio Grande; however, very little irrigated agriculture occurs within the Big Bend reach overall (Service 2003). Elsewhere throughout Presidio, Brewster, and Terrell counties, as across the border in Mexico, grazing remains the predominant land use (Service 2003).

Aside from Black Gap Wildlife Management Area, lands downstream from Big Bend National Park are owned by 12-15 private landowners. Most are very large holdings and are minimally grazed. Several former ranches have been subdivided into smaller acreages with numerous owners. Although some cattle are present on private lands along the Rio Grande Wild and Scenic River, the remoteness and ruggedness of the region make active livestock management difficult or impossible along much of the river zone. Sheep and goat raising is more common in the lowest reaches of the Rio Grande Wild and Scenic River (National Park Service 2004).

Throughout the 1990s, the number of annual visitors to Big Bend National Park ranged from 250,000 to 350,000, and record high visitation occurred in 2005, at over 400,000. The river zone is a primary recreational area for Big Bend National Park visitors. Users of the Rio Grande corridor include private and commercial recreational boaters, anglers, non-boating riverside campers, and day-use recreationists. Approximately three percent of Big Bend National Park visitors participate in either a commercial or private river trip. Commercial outfitters currently operate out of the gateway communities of Lajitas, Terlingua, and Study Butte. River trip options range from half-day trips through Santa Elena canyon to wilderness trips of many days extending through the Lower Canyons of the Rio Grande Wild and Scenic River. Those visitors not taking a boat trip visit the river corridor for hiking, camping, and wildlife viewing opportunities (National Park Service 1997).

There is little recreational use of the Rio Grande Wild and Scenic River except for float trips originating primarily at La Linda, downstream of Big Bend National Park, and fishing parties boating from privately owned access points further downstream (National Park Service 2004). Visitors to this remote region enjoy the opportunities it offers for wilderness solitude, and nature and wildlife viewing. River traffic from recreational boaters in the Rio Grande Wild and Scenic River averages range from 1,100 to 1,500 visitors per year. Limits are placed on the size of groups and numbers of launches per day, according to the Recreational River Use Management Plan (National Park Service 1997).

Fishing is allowed in Big Bend National Park and the Rio Grande Wild and Scenic River. In Big Bend National Park, a free National Park Service fishing permit is required per party. From 1999 through 2006, an average of 137 fishing permits was issued annually. The vast majority of permittees fished near riverside development zones such as Rio Grande Village and Castolon. A minority of people fished at a few widely dispersed backcountry road access points and by boat.

The only species commonly sought by fishing parties are catfish. In Big Bend National Park, use of rods, trot, and throw lines is allowed. In order to prevent introduction of exotic fish and invertebrate species, use of live bait is not allowed in Big Bend National Park except for use of other fish caught locally in the river. This makes it possible to use traps or nets for capture of minnows with which to bait catfish hooks. Big Bend National Park staff report that extremely few fishing permittees in Big Bend National Park actually capture minnows for bait, preferring the convenience of purchasing non-living commercially available baits (Skiles 2006).

State fishing regulations apply for the Rio Grande Wild and Scenic River outside of Big Bend National Park. Again, catfish are the only common target species. In addition to fishing methods described above, use of free-floating plastic bottles with a short line attached, known as jug fishing, is also practiced. Bait restrictions are not in place in the Rio Grande Wild and Scenic River, thus use of commercially available live or non-living bait is most common, yet capture of bait minnows is not prohibited. Similar to within Big Bend National Park, there is virtually no use of locally captured bait minnows due to the greater convenience of purchased bait (Skiles 2006).

### **3.2.2 Water rights and use**

United States water rights to Rio Grande water flowing below Fort Quitman are allocated under the Treaty of February 3, 1944, for “Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande” (TS 994; 59 Stat 1219). Under the 1944 Treaty, the United States is allocated one-half of the flows occurring in the main channel of the Rio Grande downstream from Fort Quitman, and one-third of the flows reaching the main channel from six Mexican tributaries including the Rio Conchos. The Rio Conchos is by far the largest of the six tributaries. The treaty also provides that this third shall not be less, as an average amount over a five year cycle, than 350,000 acre-feet (ac-ft) annually. This treaty also entrusts the International Boundary and Water Commission, United States, and Mexico with the application of its terms.

Water rights on federally-owned property in Big Bend National Park belong exclusively to the United States under Texas State law. Big Bend National Park holds state-administered rights to approximately 1,500 ac-ft of water per year, of which it typically uses around 600 ac-ft for campground irrigation. From the mouth of the Rio Conchos downstream to Big Bend National Park, a number of private parties own state-administered water rights. Water diversions in the Presidio Valley are primarily for agriculture. A resort development at Lajitas, just west of Big Bend National Park, is placing increasing demand on river water to meet the needs of extensive landscaping, guest facilities, and an 18-hole golf course. Other private water uses are for stock and rural domestic use. From Big Bend National Park downstream to Amistad Reservoir, water diversions from the river are minimal (Service 2003).

### **3.2.3 Demographics**

The Big Bend region is one of the most sparsely populated regions of the country. The counties described below border the Rio Grande and/or the Pecos River within the proposed action area. Presidio, Brewster, and Terrell counties border the Rio Grande along the reach where we expect

the Rio Grande silvery minnow would become established after releases under the proposed action. Hudspeth, Jeff Davis, Val Verde, and Crockett counties border the Rio Grande and/or the Pecos River along the reaches that are proposed to be included as part of the larger area designated as a NEP area, but are not within the area we expect Rio Grande silvery minnow would become established after releases.

### **Hudspeth County**

Hudspeth County had a year 2005 population of 3,295. This total represents a decline in population of 1.5 percent from 2000. Population density in Hudspeth County was approximately 0.7 persons per square mile in 2000. In 2004, 75.9 percent of the population reported being of Hispanic or Latino origin. Median household income in Hudspeth County is approximately \$21,855. Over twenty-eight percent of the population lives in poverty.

Hudspeth County is dominated by rangeland. Texas Parks and Wildlife Department manages about 11,000 acres in Hudspeth and Culberson counties as part of the Sierra Diablo Wildlife Area. Business statistics indicate a total of 42 private non-farm establishments (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

### **Jeff Davis County**

Only a small fraction of a mile of the Rio Grande borders Jeff Davis County. Jeff Davis County had a year 2005 population of 2,306. This total represents a growth in population of 4.5 percent from 2000. Population density in Jeff Davis County was approximately 1.0 person per square mile in 2000. In 2004, 36.6 percent of the population reported being of Hispanic or Latino origin. Median household income in Jeff Davis County is approximately \$32,248. Nearly 15 percent of the population lives in poverty.

Valentine and Fort Davis are the only significant population centers in Jeff Davis County. Business statistics indicate a total of 56 private non-farm establishments (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

### **Presidio County**

Presidio County had a year 2005 population of 7,722. This total represents a growth in population of 5.7 percent from 2000. Population density in Presidio County was approximately 1.9 persons per square mile in 2000. In 2004, 84 percent of the population reported being of Hispanic or Latino origin. Median household income in Presidio County is approximately \$24,000. Nearly twenty-eight percent of the population lives in poverty.

Presidio County is dominated by rangeland. Presidio and Marfa, the county seat, are the only significant population centers. Business statistics indicate a total of 125 private non-farm establishments (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

## **Brewster County**

Brewster County had a year 2005 population of 9,079 people spread out over 6,200 square miles, resulting in a population density of 1.4 persons per square mile. Reports indicate forty-five percent of the population is of Hispanic or Latino origin. Median household income is approximately \$29,200. Nearly eighteen percent of the population lives in poverty.

Brewster County is a rural county dominated by private ranches and some 3 million acres of rangeland. However, no ranching or grazing activities occur in Big Bend National Park, the only part of the county potentially affected by designation of a NEP and reestablishment of Rio Grande silvery minnow. Business statistics indicate 297 private non-farm business establishments in 2003. Big Bend National Park is one of the largest employers in Brewster County. Big Bend National Park staffing in 2000 included 90 permanent and 45 seasonal National Park Service employees. The concessions company in Big Bend National Park employed an additional 56 permanent and 15 seasonal workers (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

## **Terrell County**

Terrell County had a 2005 population of roughly 996. This total represents a decline of almost eight percent from 2000. Population density in Terrell County is 0.5 persons per square mile. Reports indicate nearly fifty-one percent of the population is of Hispanic or Latino origin. Median household income in Terrell County is approximately \$26,700 and the average earnings per job are approximately \$16,800. Eighteen percent of the population lives in poverty.

Terrell County is a sparsely settled area dominated almost entirely by rangeland. The population density is 180 times lower than that of the State of Texas as a whole. Sanderson, the county seat, is the only significant population center. Business statistics indicate a total of 18 private non-farm business establishments, all employing fewer than 20 people (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

## **Val Verde County**

Val Verde County had a year 2005 population of 47,596. This total represents a growth in population of 6.1 percent from 2000. Population density in Val Verde County was approximately 14.1 persons per square mile in 2000. In 2004, 78 percent of the population reported being of Hispanic or Latino origin. Median household income in Presidio County is approximately \$30,407. Twenty-two percent of the population lives in poverty. Business statistics indicate a total of 814 private non-farm establishments (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

## **Crockett County**

Crockett County had a year 2005 population of 3,934. This total represents a decline in population of four percent from 2000. Population density in Crockett County was approximately 1.5 persons per square mile in 2000. In 2004, 55 percent of the population reported being of

Hispanic or Latino origin. Median household income in Presidio County is approximately \$33,037. Over 15 percent of the population lives in poverty. Business statistics indicate a total of 122 private non-farm establishments (Statistics from [www.fedstats.gov](http://www.fedstats.gov); Texas Water Development Board 2001; Brock et al. 2001).

### **3.3 Cultural**

#### **3.3.1 Indian trust resources**

There are no issues regarding Federal Indian trust resources in the NEP area.

#### **3.3.2 Environmental justice**

The social and economic data cited above for Presidio, Brewster, and Terrell counties—including low income levels, high rates of poverty, and significant Hispanic populations—indicate that the population in these counties may be susceptible to environmental justice concerns associated with impacts to local economies.

#### **3.3.3 Cultural resources**

Although no complete survey has been done, archeologists estimate that Big Bend National Park may contain 26,000 archeological sites, with evidence and material remains of 10,000 years of American Indian occupation. Two prehistoric archeological sites are presently considered public: the Hot Springs pictograph site and the Chimneys. There are eight National Historic Register sites or districts in Big Bend National Park. The Hot Springs Historical District lies largely within 91.4 meters (300 feet) of the river. The site consists of an old motel, store, and post office, all no longer in use. The Rio Grande Wild and Scenic River downstream of Big Bend National Park contains additional prehistoric and historic sites, mostly on private property. A thorough inventory of sites in the Big Bend reach is not currently available thus the exact number of prehistoric sites that may be present within the boundaries of the area proposed for designation as a NEP area is unknown (Mallouf and Tunnell 1977; National Park Service 2004).

## **4.0 Environmental Consequences**

**4.1 Alternative A, Proposed Action: Designate a NEP area for Rio Grande silvery minnow in Texas. Reestablish Rio Grande silvery minnow in suitable habitat in the NEP area.**

### **4.1.1 Biophysical**

**4.1.1.1 Floodplains, wetlands, riparian zones, and native and non-native vegetation**

No direct impacts on floodplains, wetlands, riparian zones, and native or non-native vegetation are anticipated under this alternative. Aquatic habitat and vegetation within the flood plains in this reach may be improved as an indirect result of this alternative if discretionary conservation

measures are implemented under section 7(a)(1) of the Act to improve habitat for the Rio Grande silvery minnow. By focusing management attention on the needs of the Rio Grande silvery minnow, this alternative would provide further justification for the allocation of Big Bend National Park and other resources towards removal of encroaching vegetation that has armored the banks, including non-native species such as salt cedar and giant river cane, within the flood plains in this reach to improve habitat for the Rio Grande silvery minnow. Removal of salt cedar and giant river cane from areas where it has become dominant would also benefit native riparian vegetation. No adverse direct or indirect impacts to any threatened or endangered plant species are anticipated.

#### **4.1.1.2 Fish and wildlife**

We expect that this alternative would result in the establishment of a self-sustaining Rio Grande silvery minnow population that would contribute to the recovery of this species. We will ensure, through our section 10 permitting authority and the section 7 consultation process, that the use of Rio Grande silvery minnow eggs, juveniles, or adults from any donor population for these releases is not likely to jeopardize the continued existence of the species. The anticipated success of this reestablishment would enhance the conservation and recovery potential of this species by extending its present range into currently unoccupied historic habitat (Service 2007a).

We believe that incidental take of individual fish within the NEP associated with otherwise lawful activities would not pose a substantial threat to Rio Grande silvery minnow recovery, as activities that currently occur in the NEP area are compatible with Rio Grande silvery minnow recovery. Thus, the more stringent legal protections provided under section 7 for an essential experimental population are unnecessary. For example, there are no major dams or diversions in the Big Bend reach, which are the primary threats to the species within its current range in the Rio Grande in New Mexico. Also, most of the portion of the Big Bend reach in which we expect Rio Grande silvery minnows to become established is protected and managed for fish, wildlife, and other natural resources by State and Federal agencies in both the United States and Mexico. Although under existing Big Bend National Park guidelines, anglers may use nets to capture minnows for use as bait, the number of anglers using nets to capture minnows is small. Their impact upon the Rio Grande silvery minnow is expected to be inconsequential (see pp. 36-37 for further details).

Due to the fact that Rio Grande silvery minnow was once a common species in the Big Bend reach, it is anticipated that their potential reestablishment will not significantly affect the current fish community in the Big Bend reach. If reestablishment is successful, some decrease in population density of other members of the minnow family (Cyprinidae) may occur due to similar habitat and food habits. However, this will be monitored over time along with Rio Grande silvery minnow monitoring. To the extent that designation of a NEP and reestablishment of Rio Grande silvery minnow would focus management attention on habitat preservation and improvement, it may benefit certain other species whose habitat overlaps that of the Rio Grande silvery minnow. This reach currently supports two members of the Rio Grande silvery minnow's reproductive guild (pelagic spawners), the speckled chub and Rio Grande shiner. This reach also includes other minnow species, which have been extirpated from upstream and downstream sections of the Rio Grande. All of these species would likely receive some benefit

from this alternative if discretionary conservation measures are implemented under section 7(a)(1) of the Act. No adverse direct or indirect impacts to any threatened or endangered fish or wildlife species are anticipated.

#### **4.1.1.3 Water quality**

No direct impacts on water quality are anticipated under this alternative. Water quality in this reach may be slightly improved as an indirect result of this alternative if discretionary conservation measures are implemented under section 7(a)(1) of the Act to improve water quality for the Rio Grande silvery minnow. No adverse direct or indirect impacts to water quality are anticipated.

### **4.1.2 Social and economic**

#### **4.1.2.1 Land use**

Grazing and agriculture are not legal activities within Big Bend National Park. Ranching and farming activities upstream of Big Bend National Park and downstream on lands adjacent to the Rio Grande Wild and Scenic River take place on private lands and use state-administered water rights with no Federal nexus. Thus existing land use patterns will not be affected by the known and foreseeable impacts of this alternative. Private parties and land owners carrying out activities with no Federal involvement would be unaffected by designation of a NEP and associated 4(d) rules and reestablishment of Rio Grande silvery minnow. Thus, there would be no direct or indirect effects on private land use as a result of the proposed action.

No direct impacts on the Rio Grande Wild and Scenic River are anticipated under this alternative. Aquatic habitat within the Rio Grande Wild and Scenic River may be improved as an indirect result of this alternative if actions are implemented under section 7(a)(1), discretionary conservation measures, to improve habitat for the Rio Grande silvery minnow. There would be no adverse direct or indirect effects on the Rio Grande Wild and Scenic River as a result of the proposed action.

This alternative would not have any adverse direct or indirect effects on recreation in the Big Bend reach. The National Park Service currently manages the river corridor in a manner that attempts to serve the needs of both recreation and preservation. No projections exist on general Big Bend National Park and Rio Grande Wild and Scenic River visitation or use of the river corridor in the coming years. Given the remoteness of the Big Bend region, it is unlikely that visitation and use rates will change dramatically in the near future. Recreational use of the river and adjacent riparian areas, including number and size of float trip launches, will continue to be regulated by Big Bend National Park under existing and/or forthcoming guidelines. There are no data which indicate that river use by rafters and campers would likely result in any adverse effect on the Rio Grande silvery minnow. Although human use of the Rio Grande corridor in Big Bend National Park does represent one possible source of contamination of river water, this impact is indistinguishable from, and is far less significant than, impacts from other sources.

To the extent that a NEP designation and reestablishment of Rio Grande silvery minnow would focus management attention on habitat improvement via removal of non-native species, such as salt cedar and giant river cane, this alternative would result in enhanced opportunities for wildlife viewing, enjoyment of natural ecological processes, and river access.

### **Impacts on Federal Agency Actions**

The outcome of possible future section 7 consultations cannot be predicted or pre-judged, particularly if the consultations arise due to unforeseen or unusual events such as a river channel avulsion along the international border. However, impacts on Federal agencies in this reach appear to be minimal. Given the information at hand, no significant modifications to specific and foreseeable agency actions would be expected. There would be some economic cost to Federal agencies associated with section 7 implementation if a NEP is designated and Rio Grande silvery minnow are reestablished, however, the cost for section 7 consultation is expected to be relatively minor compared to the overall cost of any project planning and implementation. An indirect effect of the proposed action is that critical habitat for the Rio Grande silvery minnow could not be established in the Big Bend reach under this alternative because the Act does not allow a NEP area and critical habitat to be designated in the same area.

### **National Park Service Consultations**

The primary Federal agency that would be impacted under this alternative is the National Park Service. In the recent past, Big Bend National Park has engaged in informal section 7 consultations with the Service in conjunction with proposed general and river management scenarios, and for specific development and restoration projects. Past consultations have involved several listed species present in Big Bend National Park, including the peregrine falcon (now delisted), Big Bend gambusia, Mexican long-nosed bat, black-capped vireo, bunched cory cactus, and Chisos Mountain hedgehog cactus. Currently, no federally-threatened or endangered species inhabit the Big Bend reach, so there is no history of consultations directly relevant to this alternative.

Under this alternative, current or foreseeable Big Bend National Park actions for which consultation may be required include: Water diversions from the Rio Grande at Castolon and Rio Grande Village; salt cedar removal; Recreational River Use Management Plan (National Park Service 1997); General Management Plan (National Park Service 2004); and, Rio Grande Wild and Scenic River Management Plan (National Park Service 2004). Under this alternative, consultations may take place to give special consideration to possible impacts on Rio Grande silvery minnow. However, it is not expected that present policies would have to be altered if a NEP is designated and Rio Grande silvery minnow are reestablished. In fact, although current and foreseeable salt cedar and giant river cane removal activities may have temporary negative effects on Rio Grande silvery minnow and may require section 7 consultation, these actions would likely have a beneficial effect on Rio Grande silvery minnow in the long term.

A more detailed description of activities and management plans that may require section 7 consultations with Big Bend National Park can be found in the Designation of Critical Habitat for the Rio Grande Silvery Minnow: Final Impact Statement (Service 2001). Although the

requirements for section 7 consultation would be different for critical habitat designation versus a NEP designation and reestablishment of Rio Grande silvery minnow, the activities that may require consultation would be similar.

### **International Boundary and Water Commission Consultations**

The United States Section of the International Boundary and Water Commission is an independent Federal commission with jurisdiction over the Rio Grande channel from Percha Diversion Dam, Sierra County, New Mexico to the international boundary at El Paso, Texas-Ciudad Juarez, Chihuahua, Mexico. In the river's international reach, which extends to the Gulf of Mexico, both the United States and Mexican Sections of the International Boundary and Water Commission have authority. The International Boundary and Water Commission is charged with applying the boundary and water treaties between the two countries and settling differences that arise in the application of the treaties. Commission responsibilities include maintaining the river channel as an international boundary. Current or foreseeable actions of the United States Section of the International Boundary and Water Commission for which consultation might be required include boundary maintenance activities at stream gages within Big Bend National Park and Rio Grande Wild and Scenic River. However, such actions have been relatively infrequent along the international reach of the Rio Grande. Much of the river corridor within Big Bend National Park and the Rio Grande Wild and Scenic River segment consists of fairly narrow and steep-walled canyons, in which a significant channel shift is unlikely. It is possible, however, that a future channel shift in this area would necessitate action by the International Boundary and Water Commission, in cooperation with Mexico. This alternative would require the United States Section of the International Boundary and Water Commission to consult before undertaking channel relocation or rectification projects in Big Bend National Park or Rio Grande Wild and Scenic River. In this unlikely event, the Service would work with the United States Section of the International Boundary and Water Commission to complete section 7 consultation in a timely and efficient manner. Under a NEP designation, section 7 consultations would not be required for actions that would not affect the species within Big Bend National Park or the Rio Grande Wild and Scenic River.

### **Customs and Border Patrol Consultations**

The Service is currently working with Customs and Border Patrol to develop a streamlined system for threatened and endangered species management and section 7 consultations along the United States – Mexico border, including the Big Bend reach. At this time, it is unknown exactly what activities may be conducted by Customs and Border Patrol along the Big Bend reach. The Service has been coordinating with Customs and Border Patrol and helping them to develop best management practices and analyze potential effects to listed species, migratory birds, and wetlands that may occur as a result of their proposal to construct and maintain border barriers (e.g., fences, walls, vehicle barriers) along the United States–Mexico border. Modifications to levees on either side of the international bridge between Presidio, Texas and Ojinaga, Chihuahua, Mexico have been proposed in lieu of a border fence within the NEP area. At this time, no border walls or fences are being proposed within the expected establishment area of the Rio Grande silvery minnow within the NEP area. If Customs and Border Patrol proposes activities that may affect the Rio Grande silvery minnow in the NEP area, the Service would

work with the agency to complete any necessary section 7 requirements in a timely and efficient manner.

### **Environmental Protection Agency Consultations**

The Environmental Protection Agency issues permits for the treatment and disposal of waste under the National Pollutant Discharge Elimination System (NPDES). In Texas, the Texas Commission on Environmental Quality is authorized to implement the NPDES program for their state through the Texas Pollutant Discharge Elimination System (TPDES). The issuance of an individual TPDES permit is not considered a Federal action subject to section 7 consultation.

Any changes to the Texas Surface Water Quality Standards would be submitted to the Environmental Protection Agency for approval. The decision by the Environmental Protection Agency to approve or disapprove the changes in Texas Surface Water Quality Standards is a Federal Action subject to consultation with the Service under section 7 of the Act. Under this alternative, if proposed changes to the standards may affect Rio Grande silvery minnow within Big Bend National Park or the Rio Grande Wild and Scenic River, the Environmental Protection Agency would be required to consult with the Service under section 7 of the Act. If such a case presents itself, the Service would work with the agency to complete section 7 consultation in a timely and efficient manner.

### **Service Internal Consultations**

If the Rio Grande silvery minnow is reestablished in the Big Bend reach, management for the species could require internal consultations by the Service. Such consultations may take place with regard to minnow rescue or relocation efforts, fish stocking, and vegetation management.

For all of the reasons described above, we would not expect there to be a significant change in land or water uses practices involving agriculture, grazing, ranching, conservation, or recreation from the current condition under this alternative.

#### **4.1.2.2 Water rights and use**

No direct impacts on stream flow or the availability of water for any use are anticipated under this alternative. No alteration of naturally occurring hydrological processes would result from the proposed designation of a NEP and reestablishment of Rio Grande silvery minnow. Flow conditions in this reach may be slightly improved if discretionary conservation measures are implemented under section 7(a)(1) of the Act, such as removal of non-native salt cedar in a significant portion of the reach. Another indirect effect may occur if implementation of this alternative provides further incentive to establish a water rights market. In this scenario water rights may be acquired legally from willing sellers or leasers such that water may remain in the river for downstream users, or as a beneficial use for fish and wildlife in the river corridor. For example, the Trans Pecos Water Trust, based in Alpine, Texas, is a non-profit organization that is currently working on developing such a system.

There would also be no direct or indirect effects of designation of a NEP and reestablishment of Rio Grande silvery minnow on existing water rights and management arrangements. The Texas Commission on Environmental Quality's Rio Grande Watermaster Office retains authority over the allocation and control of Rio Grande water south of Fort Quitman. There is no Federal nexus affecting the delivery of water in this region, and no privately or municipally held water rights would be affected. The exercise of rights held by Big Bend National Park is not expected to be affected. No economic impacts associated with acquiring or reallocating water for instream flow are anticipated due to implementation of this alternative.

Because this alternative will not affect existing patterns of land and water use, no negative economic or social impacts, direct or indirect, are expected.

### **4.1.3 Cultural**

**No direct or indirect effects on cultural resources as a result of the proposed action have been identified.**

#### **4.1.3.1 Impacts on Indian trust resources**

No Indian trust resources are involved or would be affected by designation of this reach as a NEP, nor from reestablishment of Rio Grande silvery minnow.

#### **4.1.3.2 Environmental justice effects**

Although the social and economic data cited above for Hudspeth, Jeff Davis, Presidio, Brewster, Terrell, Val Verde, and Crockett counties indicate that the population of these counties may be susceptible to environmental justice concerns associated with impacts to local economies, no actual environmental justice issues associated with the preferred alternative have been identified. The area proposed under this alternative consists largely of federally and State owned and/or managed lands, and any costs resulting from designation of a NEP and reestablishment of Rio Grande silvery minnow would be borne by Federal agencies. In addition, the proposed action will not directly or indirectly adversely affect water quality, quantity, use, or rights.

#### **4.1.3.3 Impacts on cultural resources**

Existing historic and archeological sites in Big Bend National Park and the Rio Grande Wild and Scenic River would be unaffected by any known or foreseeable impacts of NEP designation and reestablishment of Rio Grande silvery minnow. The potential for locating archeological sites in the floodplain zone is low, due to centuries of scouring and sedimentation. This alternative would not directly or indirectly cause changes in the character or use of any historic properties. No conflicts between designation of a NEP and reestablishment of Rio Grande silvery minnow and American Indian religious or cultural concerns have been identified.

## **4.2 Alternative B, No Action**

### **4.2.1 Biophysical**

#### **4.2.1.1 Floodplains, wetlands, riparian zones, and native and non-native vegetation**

No direct impacts on floodplains, wetlands, riparian zones, and native or non-native vegetation are anticipated under this alternative. The present status of vegetation in the Big Bend reach, including threatened and endangered species, would remain unchanged if a NEP is not designated and Rio Grande silvery minnow are not reestablished. As an indirect effect, it is possible that some species and habitat types may suffer future declines if, as a result of a NEP not being designated and Rio Grande silvery minnow not being reestablished, there is less incentive to improve aquatic habitat in the Big Bend reach.

#### **4.2.1.2 Fish and wildlife**

The Rio Grande Silvery Minnow Recovery Team stated in the Draft Revised Recovery Plan that it recognizes the necessity for reestablishing the Rio Grande silvery minnow in portions of its historic range outside of the Middle Rio Grande in New Mexico (Service 2007a). Not implementing the proposed action may have a direct adverse affect on the potential for recovery of the Rio Grande silvery minnow by forgoing an opportunity to reestablish a population of Rio Grande silvery minnow in the Big Bend reach, which has been identified as the portion of the species historic range with the greatest potential for reestablishment. In addition, chances for the Rio Grande silvery minnow's eventual recovery and delisting may be reduced if, as a result of not designating a NEP and not reestablishing Rio Grande silvery minnow in the Big Bend reach, these areas could become further impaired as a result of less incentive to restore ecological processes and improve habitat in the Big Bend reach.

The present status of Rio Grande fish species and communities, threatened and endangered species, and other wildlife in the Big Bend reach is likely to remain unchanged if a NEP is not designated and Rio Grande silvery minnow are not reestablished. It is possible that some species may suffer future declines, as an adverse indirect effect of this alternative, if there is less incentive for habitat improvement projects than had the reestablishment occurred.

#### **4.2.1.2 Water quality**

No direct or indirect impacts on water quality are anticipated under this alternative. Adverse impacts on water quality resulting from recent reductions in river flow, and from point and non-point sources upstream from the Big Bend reach in the United States and Mexico, would remain.

### **4.2.2 Social and economic**

A decision to forego designation of a NEP and reestablishment of Rio Grande silvery minnow would have no direct or indirect social or economic impacts in the Big Bend region.

#### **4.2.2.1 Land use**

Land use on private and public lands would not be affected, directly or indirectly, by this alternative. Recreational use of Big Bend National Park and Rio Grande Wild and Scenic River would be largely unaffected by this alternative. The National Park Service will continue to exercise authority over recreational use of the river, and to maintain a permitting process that places limits on the size and number of private and commercial river rafting trips through Big Bend National Park and Rio Grande Wild and Scenic River.

#### **Impacts on Federal Agency Actions**

In and upstream from Big Bend National Park, and along the Rio Grande Wild and Scenic River, Federal actions would continue to be subject to existing environmental regulations. The National Park Service would continue to manage the river and riparian habitat within the Big Bend reach in such a way as to provide for recreation and to preserve the area's ecological character and biological diversity.

#### **Impacts on Federal Agency Consultations**

Under this alternative, no Federal agency would be required to consult under the provisions of Act section 7 on impacts to Rio Grande silvery minnow. Therefore, there would be no direct or indirect effects from this alternative.

#### **4.2.2.2 Water rights and use**

A decision to forego designation and reestablishment would have no direct effect on existing water rights and management arrangements. Additionally, none of the factors currently affecting stream flow in the Big Bend reach would be influenced either positively or negatively by this alternative. No alteration of naturally occurring hydrological processes would result from a decision to forego designation and reestablishment. As an indirect effect, opportunities to conserve or improve the water resource in this reach may be reduced if, as a result of a NEP not being designated and Rio Grande silvery minnow not being reestablished, there is less incentive to pursue them.

#### **4.2.3 Cultural**

No direct or indirect effects would be expected to the cultural environment if the no action alternative is selected.

#### **4.3 Summary and cumulative effects**

Cumulative Regulations prepared by the Council on Environmental Quality for implementing NEPA require Federal agencies to analyze and disclose effects that result from incremental impact of an action "when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

For all of the reasons described above, we do not expect there to be a significant change in land or water uses practices involving agriculture, grazing, ranching, or recreation from the current condition under the proposed action. Effects of the proposed action would consist primarily of the potential for additional discretionary conservation measures (such as under section 7(a)(1) of the Act) to conserve and/or improve aquatic habitat for the Rio Grande silvery minnow. For example, if a NEP area is designated in the Big Bend reach and Rio Grande silvery minnow are reestablished in the area, this may provide additional incentive and potential for funding for control of non-native species, such as salt cedar and giant reed. Salt cedar and giant reed are non-native species that have invaded large areas of the riparian corridor along the Rio Grande in the Big Bend reach. These species are often able to out-compete native vegetation, becoming quite dense in some areas, which leads to degraded riparian, aquatic, and foraging habitat and poor access to the river. There are currently pilot projects underway within the Big Bend reach to control these species and restore riparian and aquatic habitat on both public and private lands. The increased incentive to control these species to improve aquatic habitat for the Rio Grande silvery minnow could result in cumulative effects leading to improved ecological functioning, increased native habitat for fish and wildlife species, and clearer access to the river, and would be beneficial to the ecosystem, recreationists, landowners, ranchers, and farmers.

The only potentially adverse effect of the proposed action that has been identified is the cost and time required for additional section 7 consultations that may be needed for actions with a Federal nexus that may affect the Rio Grande silvery minnow within Big Bend National Park or the Rio Grande Wild and Scenic River. This may create additional work-load for the Federal agencies involved, however, as stated earlier, we do not expect that there would be many section 7 consultations required, and therefore this effect should be minimal.

If the no action alternative is selected, there may be an adverse affect on the Rio Grande silvery minnow’s potential for recovery. The Big Bend reach has been identified as the portion of the species range with the greatest potential for reestablishment. Therefore, if we forego this opportunity to reestablish the Rio Grande silvery minnow in the Big Bend reach, the possibility of recovering the species may be significantly reduced. The Rio Grande silvery minnow is an endangered species that currently occupies only about five percent of its historic range. Where it does occur in the wild, in the middle Rio Grande in New Mexico, it faces many threats to its survival including habitat fragmentation and degradation and dewatering of the river. Thus, the cumulative effect of not designating a NEP and not releasing Rio Grande silvery minnow into the Big Bend in addition to the threats to the species in its current range could adversely affect the species’ ability to recover and eventually be removed from the list of endangered species.

## **5.0 List of Preparers**

U.S. Fish and Wildlife Service

## **6.0 List of Agencies, Organizations and Persons Contacted**

This list of agencies, organizations, and businesses contacted during the scoping period for this environmental assessment is not exhaustive. In addition to those listed below, individual landowners, researchers, media outlets, and other interested parties were also contacted.

Albuquerque Metro Flood Control Authority  
Albuquerque Wildlife Federation  
Alpine Chamber of Commerce  
Amarillo Chamber of Commerce  
American Fisheries Society  
Amigos Bravos  
Audubon Society  
Balmorhea Chamber of Commerce  
Bandelier National Monument  
Bernalillo County Commissioners  
Big Bend National Park  
Big Bend Natural History Association  
Big Spring Chamber of Commerce  
Brewster County Historical Commission  
Brewster County Judge  
Brownsville Chamber of Commerce  
Carlsbad Irrigation District  
Chaves County Commission  
City of Albuquerque  
City of Alpine  
City of Carlsbad  
City of Farmington  
City of Fort Stockton  
City of Las Cruces  
Coalition of Arizona/NM Counties  
Cochiti Pueblo  
Conejos Water Conservation District  
Crane Chamber of Commerce  
Davis Mountains Trans-Pecos Heritage  
De Baca Soil and Water Conservation District (NM)  
Del Rio Chamber of Commerce  
Desert Sports  
Dona Ana County Board of Commissioners  
Eddy County  
El Paso County Water Improvement  
El Paso Water Utilities  
Elephant Butte Irrigation District  
Far Flung Adventures  
Federal Emergency Management Agency  
Federal Highway Administration

Forest Guardians  
Fort Stockton Chamber of Commerce  
Friends of Big Bend National Park  
Governor Bill Richardson  
Governor Rick Perry  
Hagerman-Dexter Soil & Water Conservation District (NM)  
Honorable Senator Bingaman's Office  
Hudspeth County Conservation Commission  
International Boundary and Water Commission, Mexican Section  
International Boundary and Water Commission, U.S. Section  
Jicarilla Apache Nation  
Lajitas Real Estate  
Land and Water Fund  
Los Alamos County Utilities  
Lower Valley Water District (TX)  
Marathon Chamber of Commerce  
Marfa Chamber of Commerce  
Mescalero Apache Tribe  
Middle Rio Grande Conservancy District  
Middle Rio Grande Council of Governments  
National Audubon Society  
National Park Service  
National Parks and Conservation Association  
New Mexico Acequia Commission  
New Mexico Cattle Growers' Association  
New Mexico Department of Agriculture  
New Mexico Department of Game and Fish  
New Mexico Energy, Minerals and Natural Resources Department  
New Mexico Environment Department  
New Mexico Farm and Livestock Bureau  
New Mexico Highway and Transportation Department  
New Mexico Interstate Stream Commission  
New Mexico Museum of Natural History  
New Mexico Office of the State Engineer  
New Mexico State Lands Office  
New Mexico State Parks and Recreation Division  
New Mexico State Senate  
New Mexico Wildlife Federation  
Pecos Chamber of Commerce  
Pecos River Compact Commissioner for Texas  
Presidio Chamber of Commerce  
Pueblo of Acoma  
Pueblo of Cochiti  
Pueblo of Isleta  
Pueblo of Jemez  
Pueblo of Laguna

Pueblo of Nambe  
Pueblo of Picuris  
Pueblo of Pojoaque  
Pueblo of San Felipe  
Pueblo of San Ildefonso  
Pueblo of San Juan  
Pueblo of Sandia  
Pueblo of Santa Ana  
Pueblo of Santa Clara  
Pueblo of Santo Domingo  
Pueblo of Taos  
Pueblo of Tesuque  
Pueblo of Zia  
Rio Chama Acequia Association  
Rio Grande Adventures/Outback Expeditions  
Rio Grande Compact Commission  
Rio Grande Conservation Commission  
Rio Grande District Engineer (CO)  
Rio Grande Institute  
Rio Grande Restoration  
Rio Grande Water User's Association  
Sanderson Chamber of Commerce  
Sandia National Laboratories  
Sandoval County Commissioners  
Santa Ana Pueblo  
Santa Fe County Commissioners  
Save Our Bosque Task Force  
Sierra Club  
Sierra County Board of Commissioners  
Sierra Soil and Water Conservation District (NM)  
Socorro County Board of Commissioners  
Socorro Utilities-Gas & Water  
Southern Appalachian Biodiversity Project  
Southwest Environmental Center  
State of Colorado Attorney General's Office  
Texas Commission on Environmental Quality  
Texas Department of Agriculture  
Texas Farm Bureau  
Texas Nature Conservancy  
Texas Parks & Wildlife Department  
Texas River Expeditions  
Texas Rivers Protection Association  
Texas Senator Frank Madla  
Texas State Representative Lon Burnam  
Texas State Representative Pete Gallego  
Texas Water Commission

Texas Water Development Board  
The Nature Conservancy  
The Nature Conservancy, Mexico Program  
Town of Taos, Water Resources Division  
U.S. Army Corps of Engineers  
U.S. Bureau of Indian Affairs  
U.S. Bureau of Land Management  
U.S. Bureau of Reclamation  
U.S. Department of Transportation  
U.S. Environmental Protection Agency  
U.S. Geological Survey  
U.S. Representative Ciro Rodriguez  
U.S. Representative Heather Wilson  
U.S. Representative Henry Bonilla  
U.S. Representative Rubén Hinojosa  
U.S. Representative Solomon Ortiz  
U.S. Representative Steve Pearce  
U.S. Representative Sylvestre Reyes  
U.S. Representative Tom Udall  
U.S. Senator Jeff Bingaman  
U.S. Senator John Cornyn  
U.S. Senator Kay Bailey Hutchison  
U.S. Senator Pete Domenici  
USDA Forest Service  
USDA-APHIS Wildlife Services (New Mexico)  
Uvalde Chamber of Commerce  
Valencia County Board of Commissioners  
Village of Los Lunas  
Water Resources Research Institute  
World Wildlife Fund  
World Wildlife Fund, Chihuahuan Desert Project

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## 8.0 Appendix A – Scientific Names

### Common Name

### Scientific Name

#### Vegetation

Bermuda grass  
Bunched Cory cactus  
Chisos Mountain hedgehog  
cactus  
Common reed  
Creosote bush  
Giant reed  
Huisache  
Mesquite  
Saltbush  
Salt cedar (tamarisk)  
Willow

*Cynodon dactylon*  
*Coryphantha ramillosa*  
*Echinocereus chioensis*  
  
*Phragmites communis*  
*Larrea tridentata*  
*Arundo donax*  
*Acacia farnesiana*  
*Prosopis spp.*  
*Atriplex spp.*  
*Tamarix ramosissima*  
*Salix spp.*

#### Fish

Big Bend gambusia  
Blue catfish  
Blue sucker  
Chihuahua shiner  
Common carp  
Conchos pupfish  
Flathead catfish  
Gizzard shad  
Gray redhorse  
Longnose dace  
Longnose gar  
Mexican tetra  
Mexican stoneroller  
Proserpine shiner  
Red shiner  
Rio Grande shiner  
Rio Grande silvery minnow  
River carpsucker  
Roundnose minnow  
Smallmouth buffalo  
Speckled chub  
Tamaulipas shiner  
Texas shiner  
West Mexican redhorse  
Western mosquitofish  
White sucker  
Yellow bullhead

*Gambusia gaigei*  
*Ictalurus furcatus*  
*Cycleptus elongatus*  
*Notropis chihuahua*  
*Cyprinus carpio*  
*Cyprinodon eximius*  
*Pylodictis olivaris*  
*Dorosoma cepedianum*  
*Moxostoma congestum*  
*Rhinichthys cataractae*  
*Lepisosteus osseus*  
*Astyanax mexicanus*  
*Campostoma ornatum*  
*Cyprinella proserpina*  
*Cyprinella lutrensis*  
*Notropis jemezianus*  
*Hybognathus amarus*  
*Carpiodes carpio*  
*Dionda episcopa*  
*Ictiobus bubalus*  
*Machrybopsis aestivalis aestivalis*  
*Notropis braytoni*  
*Notropis amabilis*  
*Moxostoma austrinum*  
*Gambusia affinis*  
*Catostomus commersoni*  
*Ameiurus natalis*

**Invertebrates**

Texas hornshell

*Popenaias popeii*

**Birds**

Bald eagle

*Haliaeetus leucocephalus*

Bell's vireo

*Vireo bellii*

Black-capped vireo

*Vireo atricapilla*

Black-chinned hummingbird

*Archilochus alexandri*

Blue grosbeak

*Guiraca caerulea*

Common ground dove

*Columbina passerina*

Common yellowthroat

*Geothlypis trichas*

Elf owl

*Micrathene whitneyi*

Hooded oriole

*Icterus cucullatus*

Ladder-backed woodpecker

*Picoides scalaris*

Mourning dove

*Zenaida macroura*

Northern cardinal

*Cardinalis cardinalis*

Orchard oriole

*Icterus spurius*

Painted bunting

*Passerina ciris*

Peregrine falcon

*Falco peregrinus*

Southwestern willow  
flycatcher

*Empidonax trailii extimus*

Summer tanager

*Piranga rubra*

Vermilion flycatcher

*Pyrocephalus rubinus*

Western screech-owl

*Otus kennicottii*

Western yellow-billed cuckoo

*Coccyzus americanus occidentalis*

White-winged dove

*Zenaida asiatica*

Yellow-breasted chat

*Icteria virens*

**Mammals**

Black bear

*Ursus americanus*

Black footed ferret

*Mustela nigripes*

Gray fox

*Urocyon cinereoargenteus*

Mexican beaver

*Castor canadensis*

Mexican long-nosed bat

*Leptonycteris nivalis*

Mexican wolf

*Canis lupus baileyi*

Mountain lion

*Felis concolor*

Nutria

*Myocastor coypus*

Raccoon

*Procyon lotor*

Red wolf

*Canis rufus*

Striped skunk

*Mephitis mephitis*

**Reptiles and Amphibians**

Big Bend slider

*Chrysemys scripta gaigeae*

Big Bend patch-nosed snake

*Salvadora deserticola*

Blotched water snake

*Natrix erthrogaster transversa*

**Reptiles and Amphibians  
(cont.)**

Canyon lizard  
Checkered gartersnake  
Coachwhip  
Desert kingsnake  
Desert spiny lizard  
Elegant slider  
Glossy snake  
Great Plains rat snake  
Marbled whiptail  
Red-spotted toad  
Rio Grande leopard frog  
Side-blotched lizard  
Southwestern earless lizard  
Spiny softshell turtle  
Spotted night snake  
Texas banded gecko  
Trans-Pecos blind snake  
Western diamondback  
rattlesnake  
Yellow mud turtle

*Sceloporus merriami annulatus*  
*Thamophis marcianus*  
*Masticophis flagellum*  
*Notiosorex crawfordi*  
*Sceloporus spp.*  
*Trachemys scripta elegans*  
*Arizona elegans*  
*Eumeces obsoletus*  
*Cnemidophorus tigris marmoratus*  
*Bufo punctatus*  
*Rana berlandieri*  
*Uta stabsburiana*  
*Holbrookia texana scitula*  
*Apalone spinifera*  
*Spermophilus spilosoma*  
*Coleonyx brevis*  
*Elaphe subocularis*  
*Pseudacris triseriata*  
  
*Kinosternon flavescens*

## **9.0 Appendix B**

### **Rio Grande Silvery Minnow Reestablishment in the Big Bend Reach of the Rio Grande: Implementation and Monitoring Plan**

#### **A. Introduction**

##### **1. Population Status of Rio Grande Silvery Minnow in the Big Bend Reach of the Rio Grande**

In this document, “Big Bend reach” refers to the portion of the Rio Grande in Texas, from Mulato Dam, east of Presidio, Texas, through Big Bend National Park and the Rio Grande Wild and Scenic River. “Big Bend region” is used to refer to the geographic area of the Big Bend reach and surrounding lands.

The historical distribution of the Rio Grande silvery minnow included the Rio Grande from Española, New Mexico, through the Big Bend reach to the Gulf of Mexico, and the Pecos River from near Santa Rosa, New Mexico, to the confluence with the Rio Grande. Seven collections made between 1938 and 1960 documented that Rio Grande silvery minnow was among the most common fishes of the Big Bend reach. Despite several sampling events from 1977 to the present, the species has not been found in the area. There are no records of the silvery minnow in the Rio Conchos of Mexico in either historic or recent collections [U.S. Fish and Wildlife Service (Service) 2007].

Rio Grande silvery minnow is extirpated from the Big Bend reach of the Rio Grande and natural repopulation is not possible without human assistance (Service 2007a). Reasons for the species’ extirpation in the Rio Grande in Texas are uncertain, but are believed to have been due to drought and diversions, in combination with water pollution. However, continued presence of other native members of the pelagic spawning guild (e.g., speckled chub and Rio Grande shiner) is evidence that the Big Bend Reach may support reestablishment of Rio Grande silvery minnow.

##### **2. Suitability of Big Bend Reach for Rio Grande Silvery Minnow Reestablishment**

Based on the presence of suitable habitat, the presence of fish species that have similar habitat requirements, the recommendations of the Rio Grande Silvery Minnow Recovery Team, and the results of a feasibility study (Edwards 2005), the area in which silvery minnow are most likely to become reestablished after potential reintroduction is the Rio Grande from Mulato Dam near Presidio, Texas to Foster’s Weir near the Terrell/Val Verde County line.

The Rio Grande Silvery Minnow Recovery Team (Recovery Team) developed a reach-by-reach analysis of the Rio Grande and Pecos River basins to identify the salient hydrological, chemical, and biological features of each reach. This analysis addressed the threats to the Rio Grande silvery minnow and considered the suitability of each reach for potential reestablishment (Service 2007a).

The Recovery Team's reach-by-reach analysis considered: (1) the understanding of reasons for the species' extirpation from the selected reach; (2) the presence of other members of the reproductive guild (pelagic spawner; non-adhesive, semibuoyant eggs); (3) habitat conditions (including susceptibility to river drying and presence of diversion structures); and (4) the presence of congeners (i.e., other species of *Hybognathus*). The following list of reaches or portions of reaches were selected, in order of priority, to be most suitable for reestablishment (Service 2007a):

1. Rio Grande, Presidio to Amistad Reservoir
2. Rio Grande, Amistad Reservoir to Falcon Reservoir
3. Pecos River, Sumner Dam to Brantley Reservoir
4. Pecos River, Red Bluff Reservoir to Amistad Reservoir
5. Rio Grande, Elephant Butte Reservoir to Presidio
6. Pecos River, Brantley Dam to Red Bluff Reservoir

More information on each reach and how the reaches were selected and prioritized can be found in the Draft Revised Recovery Plan (Service 2007a). The following is an excerpt from the Draft Revised Recovery Plan regarding the suitability of the Big Bend Reach:

*Hydrology:* The Rio Grande in this reach is perennial, and is dominated by the Rio Conchos entering from the Mexico. Flow reductions only occurred during the severest droughts of the 1950s, until 2003, when portions of this reach again ceased to flow. There is a seasonal peak that is shortened due to water diversions and upstream dams in the Rio Conchos. There are large storm event peaks in October and November. There are increases in depletion anticipated, due to increased irrigation and storage capacity on the Mexican side of the river. The Treaty of 1944 sets the upper limit for the amount of diversion, but this may not be enforced.

This reach is not leveed and has small rock dam weirs. The substrate ranges from silt to cobble and boulder, depending on local conditions. There are no channel maintenance activities in this reach. Almost half of this reach is in canyons, including Big Bend National Park. The lower canyon reach is outside Big Bend National Park, but land use is managed by the National Park Service as a part of the Rio Grande Wild and Scenic River designation in this stretch.

The channel is not mobile in the canyon sections. Outside the canyon reaches, the river is braided in some sections with a moderate gradient on average but higher gradient relative to the immediate upstream reach. Base flow in this reach is approximately 400 cfs.

*Water quality:* The river in this reach has high salinity and turbidity. This reach has both point and non-point source discharges, with the water quality dominated by contributions from the Rio Conchos, as well as perennial streams, and springs.

*Fish community:* This reach has a warm-water native fish community with some non-natives. The reach has a high number of large river species, such as smallmouth buffalo. The main predator is blue catfish. The Rio Grande silvery minnow was historically present in this reach, but is no longer present. There is no niche competition.

*Reestablishment potential:* Good.

*Further study:* Existing fish community, water quality data from the Rio Conchos.

## **B. Reestablishment Plan**

### **1. Goal, Objective, and Tasks**

#### **a. Goal**

The goal of this implementation and monitoring plan is to reestablish a self-sustaining population of the federally-endangered Rio Grande silvery minnow in potentially suitable habitat found within the species' historic range in the Rio Grande within the Big Bend area of Texas. The Draft Revised Recovery Plan defines a self-sustaining population as one that can sustain a minimum of 500,000 unmarked fish, for five consecutive years without augmentation from captive-bred fish (Service 2007a).

#### **b. Objective**

The objective of this implementation and monitoring plan is to establish a two-year class population of Rio Grande silvery minnow into the Big Bend reach of the Rio Grande and to monitor the population, including reproduction and genetics.

#### **c. Tasks**

- Raise Rio Grande silvery minnow in captivity. Eggs collected from the wild are the preferred source for Rio Grande silvery minnow raised in captivity for this reestablishment effort. However, Rio Grande silvery minnow will be raised from eggs spawned in captivity, if needed.
- Stock fish in Big Bend reach of Rio Grande (including site preparation such as installation of holding pens).
- Genetic monitoring.
- Monitoring of Rio Grande silvery minnow population in Big Bend reach of Rio Grande.

#### d. Estimated Expenses

The following budget is based on needs for federal fiscal year (FY) 2009 (October 2008 – September 2009) with out-year estimates for FY 2010 – 2013.

<b>Task</b>	<b>Cost Estimate</b>
Propagation	100,000
Release	
Transportation	2,000
Soft Release (Site Prep / Nets) – FY 2009 only	5,000
Genetic Monitoring	
Pre-release screening	20,424
Wild population monitoring	20,424
Population Monitoring (4 trips/year)	
3 staff x 5 days x 4 trips = 60 days @ \$500/day	30,000
Reproduction Monitoring (30 days/year)	20,000
Estimate 2008	197,848
Out-year Estimate FY 2010 (3%)	203,633
Out-year Estimate FY 2011 (3%)	209,742
Out-year Estimate FY 2012 (3%)	216,034
Out-year Estimate FY 2013	222,515
<b>Total 5 year (FY 2009-2013)</b>	<b>\$1.05 M</b>

## 2. Risks

Releasing captive-reared fish into the wild is not without risks. Genetic and ecological risks must be considered along with the possible benefits of the reestablishment efforts.

### a. Genetic Risks

Researchers investigating the genetics of the Rio Grande silvery minnow in the Rio Grande in New Mexico have found that there are genetic consequences to capturing Rio Grande silvery minnow eggs in the wild, transporting them to rearing facilities, and repatriating these individuals (Alò and Turner 2005; Osborne et al. 2006). There are two primary risks to genetic resources associated with captive propagation: (1) loss of genetic diversity at all genetic loci, and (2) imposition of artificial selection on wild genotypes. Researchers (Alò and Turner 2005; Osborne et al. 2005a, b) found that the mean estimate of genetic effective size of Rio Grande silvery minnow in the wild was below that required to maintain > 95% of genetic variation at a neutrally-evolving genetic locus over the long term. Researchers have also concluded that any

Rio Grande silvery minnow reestablishment efforts require using individuals from a genetic source that is already less than optimum (Alò and Turner 2005; Osborne et al. 2005, 2006). In addition, in comparing wild and captive stocks, they found that rare alleles present in wild populations have been lost in captive stocks and stocks reared from wild-caught eggs have exhibited higher rates of inbreeding than wild stocks. Although maximizing the size, time, and geographic sampling of broodstock can reduce these effects, they cannot eliminate them (Alò and Turner 2005; Osborne et al. 2005, 2006).

In cooperation with conservation partners with expertise in the captive propagation of Rio Grande silvery minnow and genetics management, the Service has formed a Rio Grande Silvery Minnow Captive Propagation and Genetics Workgroup. This group worked with Dexter National Fish Hatchery and Technology Center to develop the Rio Grande Silvery Minnow Genetics Management and Propagation Plan and meets regularly to plan the captive propagation contribution to the recovery of the Rio Grande silvery minnow and provide fish for restoration and augmentation in the middle Rio Grande and reintroduction of the species into other areas of its historic range.

The propagation strategy is based on two key elements: (1) the collection of eggs from the middle Rio Grande to meet the majority of targeted stocking numbers, and (2) maintaining fish from the annual wild egg collection as broodstock in the event catastrophic changes occur in the river. These actions minimize the risk to the extant population by preventing broodstock mining and maximize the potential to replicate as closely as possible a natural recruitment cycle. The propagation program will be contingent on an orchestrated balance between the use of wild caught eggs and captive propagation that will require ongoing monitoring of river populations and genetic monitoring of wild and captive stocks.

The propagation program will use a combination of wild-egg collections and hatchery spawning of fish from wild-eggs (F1) to produce fish for stocking. Eggs will be collected in the river every spring from natural spawning events and delivered to propagation facilities. The majority of these eggs drift into hostile waters such as Elephant Butte reservoir or river reaches that become dewatered (Platania and Altenbach 1998). The eggs will be hatched, and larval fish reared to adulthood in captivity. A small portion from each year class will be retained as captive broodstock. If recruitment fails in any given year, the captive stock can be used to produce fish to maintain the species through the next year.

Additionally, paired or communal spawning will be conducted annually. Ongoing genetic monitoring will be used to ensure a minimum number of breeding animals contribute to the next generation. We expect that in low water years, when natural spawning is not expected to yield adequate numbers of eggs for the program, captive propagation will be required in terms of increasing the genetic effective population size, and to meet targeted stocking numbers.

The Rio Grande Silvery Minnow Genetics Management and Propagation Plan is designed to provide a strategy for maintenance of genetic diversity in the species (Service 2007b). In concert with strategies to address the underlying cause of the species' decline, fish from collected eggs and F<sub>1</sub> propagated fish will ensure long-term survival and recovery of the Rio Grande silvery

minnow by providing offspring appropriate for reintroduction as identified in the Recovery Plan (Service 2007a) and in the Services' conservation strategy for the species (67 FR 39212).

### **b. Ecological Risks**

Ecological concerns associated with stocking captive-reared Rio Grande silvery minnow in the wild include pathogen and parasite transmission, and intra- and inter-specific actions including competition and predation, and fitness. To minimize the risks of pathogen and parasite transmissions, all Federal fish hatcheries rearing and producing fish are inspected annually as per the Service's Aquatic Animal Health Policy using the American Fisheries Society, Fish Health Section Blue Book Standards. Facilities must maintain a Class-A certification, meaning they are free of all tested pathogens, in order to stock fish into the wild. Targeted pathogens include internal and external parasites, bacteria and viruses. Dexter National Fish Hatchery and Technology Center, where Rio Grande silvery minnow are currently being raised for augmentation and reintroduction efforts, has qualified as a Class-A facility for 76 years, since it was constructed. In addition to the standard yearly fish health inspection, an additional Fish Lot inspection will be completed on the Rio Grande silvery minnow destined for the Big Bend reach 30 days prior to being transported to release sites. This inspection will be conducted according to the guidelines listed above. If any of the targeted pathogens are diagnosed, the fish will not be released and remedial actions will be taken immediately. Any additional facilities that are used to raise Rio Grande silvery minnow for this re-establishment effort will also be regularly inspected to ensure that they meet the standards described above.

The Rio Grande silvery minnow to be released in Big Bend are adapted to the natural conditions found in the Rio Grande in New Mexico. It is unknown how these individuals will adapt to the different conditions found in the Big Bend reach, including hydrology, seasonality of spawning cues, and habitat availability. Additionally, the species complex found in the Big Bend reach is somewhat dissimilar to that found in its current range in the Rio Grande in New Mexico: there are more native species that share similar spawning habits and life history strategies with the Rio Grande silvery minnow and fewer non-native species in Big Bend. Habitat requirements of Rio Grande silvery minnow may overlap with current resident populations. The effects that these interactions may have on either species are unknown but may include displacement and predation. Post-release monitoring of Rio Grande silvery minnow will allow us to track the relative abundance of various fish species, which will help us to understand if there are effects from releasing Rio Grande silvery minnow in the Big Bend reach on other species and whether further research will need to be done.

### **3. Source of Fish**

The source of silvery minnow for releases in the Big Bend reach in 2008 will be the Service's Dexter National Fish Hatchery and Technology Center. In subsequent years, Rio Grande silvery minnow may be raised at another facility assigned to provide fish specifically for this purpose.

#### **4. Age, Size, and Number of Fish**

- a. Age 1 (50-60 mm Standard Length minimum)  
Year 1 = 150K (One year only, assuming equal survival of both age classes)
- b. Age 0 (40 mm Standard Length minimum)  
Year 1 = 50K  
Year 2 = 200K  
Year 3 = 200K  
Year 4 = 200K  
Year 5 = 200K  
Years 6 – 10 will be determined based on results from first 5 years.

#### **5. Release Sites and Procedures**

##### **a. Release Sites**

Based on the presence of suitable habitat, the presence of fish species that have habitat requirements similar to the silvery minnow, the recommendations of the Recovery Team, and the results of the feasibility study mentioned above, we believe that the Rio Grande, from Mulato Dam (near the western border of Big Bend Ranch State Park) to Foster's Weir, east of the Terrell/Val Verde county line, is suitable for the reestablishment of the silvery minnow under a nonessential experimental population (NEP) designation. Therefore, we plan to release the silvery minnow into its historic habitat in this area.

Release sites will initially be located in Big Bend National Park and potentially on Texas Parks and Wildlife Department lands. Releases on privately owned lands would occur only if landowners are agreeable and have potentially suitable habitat. Primary considerations for identifying silvery minnow release sites include:

1. Within or in proximity to potentially suitable habitat.
2. The extent of potentially suitable habitat surrounding a potential release site and its proximity to other similar habitats.
3. Access for logistical support.
4. Willing landowner or manager.

A number of potential release sites have been identified that have a combination of demonstrably suitable habitats and ease of access by vehicle (Edwards 2005). Arranged from upstream to downstream throughout the study area, the potential release sites identified include:

1. Colorado Canyon Access in Big Bend Ranch State Park
2. Contrabando Canyon Access in Big Bend Ranch State Park
3. Mouth of Terlingua Creek in Big Bend National Park
4. Santa Elena Canyon River Access in Big Bend National Park
5. Hot Springs in Big Bend National Park
6. Boquillas Canyon Access in Big Bend National Park
7. Dryden Crossing

The Technical Team working on this project met in May of 2008 and selected the following four release sites and two back-up alternatives to be used if needed, for the initial release of Rio Grande silvery minnow in the winter of 2008–2009:

1. Grassy Banks in Big Bend Ranch State Park
2. Mouth of Terlingua Creek/Santa Elena Canyon Access in Big Bend National Park
3. Rio Grande Village Boat Ramp in Big Bend National Park
4. Adam’s Ranch (pending private landowner approval)

Back-up options include:

1. Solis in Big Bend National Park
2. Dryden Crossing

#### **b. Release Procedures**

As part of the silvery minnow augmentation program in New Mexico, the Service evaluated different release strategies such as time of year, time of day, specific release habitats, and various hatchery environments (natural outdoor ponds versus indoor facilities). All this information adds to our knowledge of the species and will assist us in future recovery actions, such as providing management strategies for the proposed reestablishment of silvery minnow in the Big Bend reach. For example, preliminary results have verified the importance of low-velocity habitat of sufficient depth (> 0.5 m) for release; these habitats provide areas for cover and acclimation to riverine conditions after release (Service 2007a).

Initial releases will likely be conducted once per year at two to four release sites. Transplanted fish will be “tempered” in the Rio Grande prior to their release (Edwards 2005). The Texas Parks and Wildlife Department’s Heart of the Hills Fisheries Science Center has extensive data on this technique, and its success. Holding pens will be installed at release sites to hold Rio Grande silvery minnow prior to final release, thus allowing acclimatization to riverine conditions, reducing predation and reducing downstream dispersal. This method is also known as a “soft release.” Release procedures and conditions will be carefully documented and analyzed to allow for adaptive management.

#### **6. Genetic monitoring**

The Draft Revised Rio Grande Silvery Minnow Recovery Plan (Draft Revised Recovery Plan; Service 2007a) recommends that genetic monitoring should be conducted on reintroduced populations to ensure that genetically diverse individuals are restocked, and to track the fate of genetic diversity in the reintroduced populations over time. Genetic monitoring will follow a detailed protocol similar to that designed in the middle Rio Grande of New Mexico to provide critical information in a timely manner. The results of such a study will provide important genetic guidelines for future restocking efforts (Service 2007a). Funding for genetic monitoring of the wild population in New Mexico, the captive population, and at least the initial year of

genetic monitoring of Rio Grande silvery minnow in the Big Bend reach post release have been provided by the Middle Rio Grande Endangered Species Collaborative Program.

## **7. Population Monitoring**

The Draft Revised Recovery Plan recommends using the Middle Rio Grande Long-Term Fish Population Monitoring Program methodology as the model in the development and implementation of a sampling protocol for a long-term fish monitoring program. It is important for monitoring programs to be able to build on existing data and to be able to use statistically valid methods to assess changes in age-class structure and abundance of Rio Grande silvery minnows and other fish. The Middle Rio Grande Long-Term Fish Population Monitoring Program [see *Appendix E* in the Draft Revised Recovery Plan (Service 2007a)] has already established a methodology and provides a historical context.

For the first two years of monitoring post release, grant monies under section 6 of the Act have been identified to fund population monitoring. The first two years of monitoring will be conducted quarterly by Texas Parks and Wildlife Department and University of Texas – Pan American, with assistance from the Service, the National Park Service and other conservation cooperators, and will help us estimate not only survival and relative abundance, but also monitor for signs of reproductive activity (gravid females, young-of-year, etc.). In addition, monitoring of the fish population in areas of the Rio Grande near release sites in the fall of 2008, prior to releases of Rio Grande silvery minnow, will be added to data previously collected and help establish baseline information on the existing fish community. This information will allow accurate assessment of future trends in fish community structure.

Monitoring needs beyond two years post release will be determined based on results of the initial two years of monitoring and progress of the overall project. Post-release population monitoring will be conducted a minimum of once per year in October. Based on information from population monitoring in the middle Rio Grande in New Mexico, October is typically a good month to monitor to capture a snapshot of the population, and collect information about both adult and young-of-year survival.

## **8. Adaptive Management**

As stated in the Draft Revised Recovery Plan (Service 2007a), it will be necessary to periodically review, evaluate, and revise research and management activities to ensure progress toward recovery of the Rio Grande silvery minnow. Monitoring will determine the success and future direction of the reestablishment project. As phases of the project are completed or relevant findings verified, new information may identify additional or alternative methods, research, or recovery actions that may be needed (Service 2007a).

## **C. Recommendations for Habitat Improvement**

The presence of suitable habitat for all life stages of the Rio Grande silvery minnow will be vital to the success of this reestablishment effort. To ensure needed habitat elements exist and for landowners and managers wishing to create or conserve silvery minnow habitat, we recommend

the measures below. In particular, we recommend control of salt cedar (*Tamarix* sp.) and giant river cane (also known as giant reed; *Arundo donax*) in the floodplain of the NEP area and upstream of this area. The presence and abundance of these plant species have stabilized banks and sediments, caused scouring of sand and silt substrates from the river and reduced channel braiding, thus effectively reducing the amount of Rio Grande silvery minnow habitat (Edwards 2005).

We are collaborating with the World Wildlife Fund, U.S. Geological Survey (USGS), the United States and Mexico Section of the International Boundary and Water Commission, and superintendents and managers of six protected areas along the Big Bend Reach of the Rio Grande on a series of collaborative, bi-national ecological restoration efforts in the NEP area. Aquatic and riparian habitat studies and ecological restoration and enhancement projects, including the control of the invasive and exotic *Tamarix* sp. and *Arundo donax*, are currently underway within the following six protected areas in the U.S. and Mexico:

- Big Bend National Park (National Park Service, Department of Interior)
- Big Bend Ranch State Park [Texas Parks & Wildlife Department (TPWD)]
- Black Gap Wildlife Management Area (TPWD)
- Área de Protección de Flora y Fauna Cañon Santa Elena [Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)]
- Área de Protección de Flora y Fauna Maderas del Carmen (SEMARNAT)
- Rio Grande Wild and Scenic River (National Park Service, Department of Interior)

We anticipate continuing to work with land managers and owners and other interested parties, on a voluntary basis, to develop plans to further guide habitat management. More detailed information about each of the recommendations below can be found in the Draft Revised Recovery Plan and the document, Feasibility of Reintroducing Rio Grande Silvery Minnows (*Hybognathus amarus*) to the Rio Grande, Big Bend Region, Texas (Edwards 2005). The following recommendations should be addressed simultaneously:

1. Control of salt cedar (*Tamarix* sp.) and giant river cane (also known as giant reed; *Arundo donax*) in the floodplain of the reestablishment area and upstream of this area.

Several pilot projects using different methods to control these non-native species have been implemented in the Big Bend reach in both the United States and Mexico. Monitoring of these projects is helping to inform resource managers of the pros and cons of different techniques and to develop an overall strategy for control of these invasive species in the Big Bend reach.

2. Continue coordination with Mexico to ensure timely and consistent treaty water deliveries to the Rio Grande/Rio Bravo del Norte in the Big Bend region.
3. Encourage flows within the Big Bend reach that support Rio Grande silvery minnow recruitment and maintain populations throughout the year.

We have been coordinating with both the United States and Mexico Sections of the International Boundary and Water Commission on this reintroduction effort and plan to work with them and other conservation partners to identify potential opportunities to address this need.

4. Within existing legal authorities, implement all measures to increase water use efficiencies and conservation.
5. Implement a comprehensive program of data collection on water supply and use for improvement of water and habitat management.

#### **D. Recommended Research**

Further examination of the Rio Grande silvery minnow, its relationships with other species, and its habitat conditions in the Big Bend reach will be important in helping to guide adaptive management for this reestablishment effort. More detailed information about each of the recommendations below can be found in the Draft Revised Recovery Plan (Service 2007a) and the feasibility study by Edwards (2005). The list below represents the most important research for providing information to guide continuing reintroduction efforts that has been identified at this time and includes a brief summary of research that has already begun:

1. Monitor and study the effects of salt cedar and giant cane removal on the quality and quantity of Rio Grande silvery minnow habitat in the Big Bend reach.

Several pilot projects using different methods to control these non-native species have been implemented in the Big Bend reach in both the United States and Mexico. The World Wildlife Fund is initiating research and monitoring of such projects in Big Bend National Park in 2008.

2. Further study the existing fish community in the Big Bend reach.

Fish monitoring for this reintroduction project has been funded for the initial two years post release through a section 6 grant.

3. Develop a better understanding of water quality in the Rio Grande as it affects the health of Rio Grande silvery minnow or the quality of its essential fish habitat within and upstream of the reestablishment area, including water entering from the Rio Conchos. Essential fish habitat refers to the waster and substrate necessary for feeding, spawning, reproduction, cover, movement, or growth to maturity and includes aquatic areas and their associated physical, chemical, and biological properties that are used by the Rio Grande silvery minnow.

Along with our conservation partners, we will begin collecting water quality data at each of the release site in 2008 to determine how to direct overall water quality research in the Big Bend reach as it relates to Rio Grande silvery minnow.

4. Evaluate historical flow data, both pre- and post-impoundment on the Rio Grande and Rio Conchos, to better understand the historical flow regime in the Big Bend reach.

Big Bend National Park is currently sponsoring a research project related to this recommendation that also examines river events and conditions that lead to the establishment of tamarisk.

5. Examine the timing of spawning of Rio Grande silvery minnow in the Big Bend reach, which may have seasonally different spawning cues than those in the Rio Grande in New Mexico.

The quarterly monitoring efforts that will be initiated with the reintroduction project will include looking for gravid females and juvenile fish to help us understand the spawning behavior of the Rio Grande silvery minnow in the Big Bend reach. These observations will help to guide future research efforts on this topic.

6. Determine the effects of various stocking conditions and release sites on Rio Grande silvery minnow.

Much work has been done on this subject in the middle Rio Grande of New Mexico, which will guide our initial release efforts in the Big Bend reach and we will continue to collect information on this topic as releases proceed in the NEP area.

7. Estimate the minimum viable population size for maintaining a healthy population in the Big Bend reach.

The Service is currently working with the Conservation Breeding Specialist Group, which operates under the International Union for Conservation of Nature's Species Survival Commission, the Middle Rio Grande Endangered Species Collaborative Program, and other conservation cooperators to develop a population viability analysis for the middle Rio Grande and the Big Bend reach. This analysis will assist us in refining our conservation and recovery efforts for the species and in determining a realistic density goal for the species based on the quantity and quality of Rio Grande silvery minnow habitat in the Big Bend reach.

8. Use standard geomorphological and GIS techniques to determine extent of the floodplain in all reaches and the area of inundation at peak flows between April and November (when Rio Grande silvery minnow may respond to increases in flow by spawning).

The Service and USGS have collaborated with the Technical Team for this project to develop a proposal for this type of work. The Rio Grande Endangered Species Collaborative Program is providing funds to initiate the study and proposals have been submitted to other potential sources of funding, but are pending approval.

9. Measure channel degradation and aggradation trends.

Big Bend National Park is currently sponsoring a research project related to this recommendation that also examines river events and conditions that lead to the establishment of tamarisk.

10. Investigate the potential of habitat construction that, during periods of low flow, will provide suitable habitat for the Rio Grande silvery minnow.

The USGS project mentioned under number 8 above will also begin to address this research need.

11. Develop a larval fish key for the Big Bend reach.
12. Develop and implement a sampling methodology of sufficient rigor to generate a statistically reliable population estimate for each population of Rio Grande silvery minnow.
13. Establish and maintain a single, centralized, standardized database for storage and retrieval of hydrologic, biologic, economic, and social data, including both stockings and captures of target species, and collect and maintain specimens in a research museum.

## E. References Cited

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