

Appendix A. Correspondence

- Letter of commitment from MRGCD (water use).
- Letter from Reclamation (J. Hanson) to SHPO regarding concurrence on cultural resource findings and concurrence.
- Intra-service Section 7 Biological Evaluation Form
- U.S. Fish and Wildlife Service Final Fish and Wildlife Coordination Act Report

June 9, 2005

Mr. Karl Martin, Acting Director
Albuquerque Area Office
U.S. Bureau of Reclamation
555 Broadway NE
Albuquerque, New Mexico 87102

Re: Water for Rio Grande Silvery Minnow Sanctuary

Dear Mr. Martin:

The purpose of this letter is to confirm the commitment of the Middle Rio Grande Conservancy District to provide, subject to the physical availability of water, an average of 10 cfs of water for the Rio Grande Silvery Minnow Sanctuary. That water will come from the Albuquerque Riverside Drain, and will be moved out of the Drain into the Sanctuary by means of a structure to be built as part of the Sanctuary project. Inasmuch as the Sanctuary parallels and is adjacent to the Drain, our preliminary analyses show that moving water from the Drain into the Sanctuary is unlikely to result in any discernable increase in depletions due to seepage or evaporation.

If you have any questions, please call me.

Very Truly Yours,

(original signed)

Subhas Shah
Chief Engineer

xc: Dr. Charles T. DuMars, General Counsel

Ferjancic, Kenneth P.

From: Sterling Grogan [Grogan@mrgcd.us]
Sent: Monday, August 29, 2005 10:15 AM
To: Subhas Shah
Cc: Yasmeen Najmi; Chris Gorbach; Ferjancic, Kenneth P.; David Gensler
Subject: Minnow sanctuary design changes

Shah:

David and I met with Reclamation and FishPro, their consultant, on Friday Aug 26 to discuss changes to the preliminary design of the minnow sanctuary. Those changes, and other items discussed:

1. Supply pipeline is replaced by a pump station located in the drain approximately even with N. end of sanctuary, about 4,000 feet downstream from Barr heading. It will probably use two 10-cfs pumps, plus a 3 cfs "nuisance pump" with generator for emergencies. Maximum diversion will be 15 cfs, and it will be metered.
2. A planned 1.7 foot tall "berm" in bottom of drain to "check" for sump, is going to be replaced, at David's suggestion, by a "ramp flume", i.e., a hard-surfaced section of the drain associated with the pump station, designed to get the required head at expected flows.
3. Reclamation needs an MoA with MRGCD, Chris Gorbach with get us a draft.
4. Ground breaking ceremony with Sen. Domenici now scheduled for Tuesday, October 11. No other details available now.
5. Reclamation received a couple of letters of complaint about the minnow sanctuary (via the NEPA process), will provide us with copies.
6. Construction planned to be done by March 1, but could run into March, which David indicated would be OK.
7. Return flows will enter drain via a pipe above 300 cfs water level, without a flapper valve on end, angled downstream at 45 degrees; erosion is not a concern; capacity to return to either drain or river will be built-in.

Sterling

Sterling Grogan, Biologist & Planner
Middle Rio Grande Conservancy District
1931 2nd Street SW
Albuquerque, New Mexico 87102
Voice: 505 247 0235 ext. 337
Mobile: 505 263 1212
Fax: 505 243 7308
grogan@mrgcd.com



United States Department of the Interior

BUREAU OF RECLAMATION

Albuquerque Area Office
555 Broadway Blvd., NE Suite 100
Albuquerque, New Mexico 87102-2352

IN REPLY REFER TO:

ALB-189
ENV-3.00

JUL 08 2005

FEDERAL EXPRESS

Ms. Lisa Meyer
New Mexico State Historic Preservation Office
New Mexico Historic Preservation Department
228 E. Palace Ave
Santa Fe, NM 87501

Subject: Rio Grande Silvery Minnow Sanctuary

Dear Ms. Meyer:

In order to comply with Section 106 of the National Historic Preservation Act of 1966, the Albuquerque Area Office of the Bureau of Reclamation requests your views on our efforts to identify historic properties for the above project (as specified in 36 CFR 800.4). The Bureau of Reclamation, Albuquerque Area Office proposes to construct a sanctuary for the Rio Grande Silvery Minnow. As currently proposed, the artificial rearing channel will be dug along the eastside floodplain, between the river and the levee, and would be approximately 1,000 feet in length (see site map). The site is on land administered by the City of Albuquerque Parks and Open Space Division and the Middle Rio Grande Conservancy District. Operational water for the facility, approximately 15 cfs maximum, would be provided by surface water from the Barr Riverside Drain. A new 24-30 inch pipe would convey water from the existing Barr Main Canal diversion structure. The existing diversion structure would be modified and would fit with inclined wedge wire screens to prevent large debris from entering the pipeline. The pipeline would direct water under the levee and into a new 3,500 foot long water delivery canal that will be located next to an existing road. As the canal approaches the artificial rearing channel, water will be directed through a fish screen housing building that would contain a screen filter. A small pipeline would return screened materials from the building (including eggs, larvae, and fish) back to the Barr Riverside Drain. After screening, water will be routed to the sanctuary rearing channel. Following circulation through the facility, water will be discharged to either the Rio Grande or the Barr Riverside Drain. The discharge outlet would be either screened to contain minnows within the sanctuary or allow for releases and to prevent entry by other species into the system. Minnows will be released directly or transported to various locations in the Rio Grande once collected and enumerated.

LA127144, the Glass Gardens Site lies directly north of the project area. The site was the main Albuquerque city dump up until the middle 20th century. The clear area to the north of the project area (see site map) contains deep, intact midden deposits of glass, ceramics, slag, construction

RECEIVED BOR
ALBUQUERQUE AREA OFFICE
074882

JUL 13 2005

RECEIVE

Class: NEW 2000
Fri: LMM RS

HISTORIC PRESERVATION
DIVISION

Date	Initial	To
7/8	9A	189

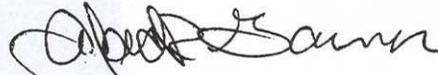
Action

ubble, wood, metals, and rubber. On May 27, 2005, City archaeologist Matt Schmader and Reclamation archaeologist Dr. Jeffery Hanson, conducted a site visit to the project area. It was determined that while some surface material from the Glass Garden site extends into the project area, it is re-deposited and lacking in integrity. That portion of the site that contains the historically significant midden deposits will be avoided. There is also an historic line of cable and post fencing that runs parallel to the route of the proposed sanctuary. This fencing will also be avoided.

Directly to the south of the proposed project area there is a trash dump which most likely represents a separate episode of city dumping. The area sits several feet above the existing floodplain and contains cultural material over fifty years of age including a Royal Crown soda bottle dated 1948 and a New Mexico license plate dated 1947. Within this site there is a service road and utility power line that transects it. This site will also be avoided by the proposed project.

Please provide your views on this proposal as your schedule permits. Should you have any questions about the project, please do not hesitate to call Dr. Jeffery Hanson, of my staff, at 505-462-3607.

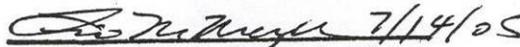
Sincerely,



A. Jack Garner
Area Manager

Enclosure

No Historic Properties Affected.


for NM State Historic Preservation Officer

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Jennifer Parody
Telephone Number: 505-761-4710
Date: August 22, 2005
Consultation #: 02-22-05-I-520

I. Region: 2

II. Service Activity (Program):

Ecological Services: Element AA of the Reasonable and Prudent Alternative (RPA) in the March 2003 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the U.S. Bureau of Reclamation's (Reclamation) Water and River Maintenance Operations, the U.S. Army Corps of Engineers' (USACE) Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

Rio Grande silvery minnow (*Hybognathus amarus*) (silvery minnow) (E)

Rio Grande silvery minnow critical habitat

Southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher) (E)

Bald eagle (*Haliaeetus leucocephalus*) (T)

Interior least tern (*Sterna antillarum athalassos*) (E)

B. Proposed species and/or proposed critical habitat within the action area:

Southwestern willow flycatcher critical habitat

C. Candidate species within the action area:

Yellow-billed cuckoo (*Coccyzus americanus*)

IV. Location:

A. Ecoregion: Upper Middle Rio Grande

B. County and State: Bernalillo County, New Mexico

C. Latitude and Longitude: Lat: 35° 05'; Long: 106° 39'

D. Distance (Miles) and direction to nearest Town: the project site is within the limits of the City of Albuquerque

E. Species/Habitat Occurrence

Occupied habitat and critical habitat for the silvery minnow encompasses the mainstem of the Rio Grande from Cochiti dam to the headwaters of Elephant Butte Reservoir. The silvery minnow requires different velocity of flow for its life stages including slow

moving backwater areas, deeper pools, and higher flows for spawning. The flycatcher has been documented to nest near or adjacent to the river at numerous locations throughout the Middle Rio Grande. Nesting occurs from May through August. Nesting flycatcher have not been documented in the action area, however, the species is known to use the area for migration.

The bald eagle winters on the Rio Grande arriving in early November and departing in late February each year. Bald eagles have been observed roosting within the action area.

Interior least terns typically nest on sand bars in inland rivers in the Midwestern US, but in New Mexico they nest in playa habitats, not on river bars. They require aquatic habitats nearby for foraging on small fishes. These birds may use sand bars or wetlands near but not in the action area as foraging sites while migrating in March through May annually.

Yellow-billed cuckoos occur within gallery cottonwood forest patches with mixed woody native and exotic understory layers. While the overstory exists, understory vegetation of this types is not present in the action area.

V. Geographic area and Proposed Action

The proposed project site would be located south of downtown Albuquerque, New Mexico, in Bernalillo County, approximately 4,800 feet south of Bridge Blvd., on the east side of the Middle Rio Grande (see attached BA, Figure 1). The project's region of influence is limited to approximately 5 acres of bosque, and includes the project site, referred to as the Barr site, a minor portion of the bank of the Middle Rio Grande, and two artificial water conveyance canals east of the existing levee: the Albuquerque Riverside Drain (Drain) and the Barr Main Canal (Figure 2).

Proposed Action:

The proposed project, the Rio Grande Silvery Minnow Sanctuary (Sanctuary), was developed in partnership with the Bureau of Reclamation and the Middle Rio Grande Conservancy District (MRGCD). The intent of this facility is to contribute to the continued enhancement and recovery of the Rio Grande silvery minnow (silvery minnow) through the creation of additional habitat for the species. The Sanctuary will be comprised of an artificial rearing and breeding channel, containing elements of the natural environment including backwater pools and eddies.

The overall geometry of the Sanctuary would conform to the landform that is available in the bosque between the Glass Gardens site to the north and the construction debris landfill to the south (see Figure 2). The actual Sanctuary would vary in width and direction to conform to the existing topography and to avoid removal of existing cottonwood trees to the greatest extent possible. The proposed facility, including overbank areas, would occupy a maximum area 1,500 feet long and 100 feet wide, with variable widths averaging 50 feet.

The Sanctuary and internal features, including bars, channels, pools, and backwaters would be constructed with native soil (from excavated materials on site if suitable)

combined with hard materials (i.e. rock, sand bags, small gabions, large woody debris, etc.) to create forms with defined structure. Mature cottonwood removed from the site would be recycled and used as large woody debris within the channel. Fine sand to small gravels would be used as substrate for the Sanctuary. All imported materials would come from locally approved, certified sources. A limited number of haul trips would be required along existing public roads to bring these materials to the site.

The Sanctuary will be located off channel, in the bosque, and will use water from the adjacent Barr Main diversion canal. Water from the sanctuary will re-circulate through the Sanctuary and subsequently drain either into the Rio Grande via an outfall channel or when river hydraulics preclude discharge, return to the drain. A fish screen with mesh 300 micron openings, a size sufficient to prevent entry by RGSM larvae and eggs, would be provided for the water conveyance channel at the fish screen building. The facility outfall channel would be equipped with fish screens to contain juvenile and adult RGSM in the Sanctuary until they are released, as well as to prevent entry by aquatic species present in the drain and river. Release of silvery minnows into the river would be entirely controlled by outfall structures and would occur only under a Section 10 permit from the Service.

Work in the drain would occur in winter, when flows are low. To minimize effects to any silvery minnows that may be present in the drain, coffer dams will be installed to allow dewatering of the construction area and fish movement past the work site.

The bank surrounding the outfall channel would be armored at the mouth with riprap to provide protection during high flow events and to prevent bank sloughing. Although installation of this structure would occur during low flow periods in the winter, a small cofferdam, extending approximately 5 feet from the bank into the river, might be required. Water removed from the cofferdam area would be discharged into a small settling basin prior to discharge back into the river downstream of the construction area. Because the river is approximately 500 feet wide at this location, cofferdamming would result in a negligible impact to instream resources as best management practices (BMPs) to prevent erosion and sedimentation would be implemented. Installation of the fish release channel and associated bank protection would remove 100 cy of bank material. Two to four mature cottonwoods may be removed from this location.

The Sanctuary site has been mechanically cleared of underbrush, and invasive weedy species have colonized cleared areas in many locations. Vegetation clearing was done by the US Army Corps of Engineers as part of the Bosque Fuels Reduction Project. Remaining vegetation is composed of a mid-successional riparian forest with a nearly closed canopy comprised predominantly of Rio Grande cottonwood trees. Limited riparian cover is present along the nearly vertical banks of the Drain. Siberian elm, salt cedar, and numerous weedy herbaceous species including Western salsify, cheatgrass, and tumble mustard occupy the bosque floodplain. Up to 18 mature cottonwoods and 60 immature cottonwoods would be removed from the project area. All other vegetation removal would be restricted to minimal herbaceous and weedy species removal largely around the drains.

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitat

Bald Eagle

The proposed project 'may affect, but is not likely to adversely affect' the bald eagle. The removal of approximately 18 mature cottonwoods from the project footprint would have relatively minor, if any, adverse effects on wintering bald eagles and their roost trees as the majority of tree removal would be conducted away from the mainstem river channel where perching is most likely to occur. Removal of one to four mature cottonwood in the vicinity of the Rio Grande fish release/water return outlet is not likely to adversely effect roosting eagles as there are ample available perch trees in the general vicinity.

Operation of construction equipment at the proposed Sanctuary site would produce noise levels that are likely to disturb any wintering bald eagles potentially foraging within this section of the river. Temporary displacement of some individuals may occur. Construction of main facilities would occur between September and March (in-water construction from October 1 – February 28). Because no nesting territories are documented within miles of the site, noise impacts to nesting eagles are not anticipated. During construction of the Sanctuary, if a bald eagle is spotted within 0.25 mile of active project construction, construction activities would be delayed until the eagle leaves the area on its own accord. Bald eagles are present in the Middle Rio Grande during the winter months and may be disturbed during river and riparian construction of the diversion structures and associated activities. However, this area is not known to provide breeding habitat for the bald eagle. As a result, nesting pairs and chicks would not be disturbed or threatened during construction activities.

Southwestern Willow Flycatcher and Proposed Critical Habitat

The proposed project 'may affect, but is not likely to adversely affect' the willow flycatcher. Conducting construction during the winter would avoid any direct effects on migrating flycatchers. The removal of trees should have no effect on flycatchers, since they are not known to utilize the site for nesting. Although the project area is located in proposed critical habitat for the flycatcher, the habitat in the area is not suitable for nesting and no flycatchers are known to nest in the area.

The proposed project is not likely to adversely modify proposed critical habitat. Areas to be cleared of vegetation do not contribute to any PCEs of the proposed critical habitat. The project site and adjacent area (approximately ¼ mile direction, north and south) were evaluated in April 2005 for the presence of potential or actual habitat for the flycatcher. The results of this site visit indicate that the project site has no potential or actual suitable habitat for the species; however, it may serve as a migrational corridor. Clearing and grubbing activities would occur after the flycatcher nesting season. The loss of trees that may incidentally be used during migration would be replaced by replanting efforts.

Rio Grande Silvery Minnow and Critical Habitat

The proposed project 'may affect, but is not likely to adversely affect' the silvery minnow or its critical habitat. Construction of in-water components would occur during low flow periods from October 1 – February 28. Direct effects to the few, if any, silvery minnows present in the project area may occur during in-water construction within the Drain at the surface intake and outfall locations, as well as along the banks of the Rio Grande in the vicinity of the proposed fish release/water return discharge. Direct impacts to individuals may occur due to temporary increases in sedimentation and turbidity. The use of heavy machinery within the streambeds of the Drain and Rio Grande due to intake/outfall work would temporarily disturb sediment and force any silvery minnows present in the area to move away from the construction channel. The cofferdams proposed for intake installation in the Drain and for in-water work in the Rio Grande would allow for fish bypass during construction. During the cofferdam dewatering phase of construction, project managers would utilize BMPs to exclude silvery minnows from the construction area.

Disturbance and short-term increases in suspended sediment levels can reduce light penetration, inhibit primary production, abrade and clog fish gills, stop migration, and cause any fish in the area to avoid disturbed reaches of the river or Drain. These impacts could result in a disruption to silvery minnow behaviors, causing them to avoid available habitat, lose foraging opportunities near the project area, and delay or prevent movement to potential habitat in adjacent reaches. Noise and vibrations caused by machinery operating in the Drain and the river may cause silver minnows to avoid the area during periods of construction activity. However, these effects would be minimized by the short duration of in-water portions of the project (estimated to be less than one month). Few silvery minnows are known to occur within the Drain; therefore adverse effects to the species are anticipated to be insignificant due to in-water and bank work at that location.

There is some potential risk to the silvery minnow associated with releases of fuel or oil into the Drain and Rio Grande from equipment and machinery used during the Sanctuary construction. In the event of a spill, fish could be adversely affected by released chemicals or contaminants; effects could range from death to harassment resulting in abandonment of the area of the spill. The potential for this effect will be reduced with the implementation of a spill prevention, containment, and control plan which will be in place at the start of construction.

Construction would disturb a negligible amount of designated critical habitat within the Rio Grande, including 34 linear feet of streambank and a very minor amount of riverbed due to construction of the outlet channel. In-water work in the Drain would be initiated during the river's winter low-flow period to avoid to the extent possible the spring snow melt and summer monsoon seasons of high flows in the river. The Drain is located outside of the Rio Grande levee, and is therefore not included in the designated critical habitat for the species.

Potential short-term adverse effects of the project on RGSM critical habitat are

mostly related to increased sediment and turbidity as a result of placement of the fish release/water return outfall structure along the Rio Grande streambank (PCE #4, water quality). A potential fuel spill would also increase the contaminant level of the system, thus reducing the quality of habitat in the project area. Construction activities (including noise, and equipment near the stream and increased sediment) could create a temporary physical migratory barrier, displacing silvery minnow in the project area and have minor, short-term adverse effects to silvery minnow critical habitat.

Interior Least tern

The interior least tern occurs as an occasional spring migrant in the project area and in the Middle Rio Grande Valley. The species is not known to nest in the project area. Most project work will take place outside the nesting season or in the bosque away from potential habitat. Construction activities along the riverbank will be completed by October and therefore are not expected to affect migrating terns. Minimal effects to potential habitat at the location of the outfall channel are possible. Therefore, the proposed project may affect, not likely to adversely affect the interior least tern.

Yellow-billed Cuckoo

The proposed project will not affect yellow-billed cuckoo because habitat for this species is not present within the project area. The project site and adjacent area (approximately ¼ mile direction, north and south) were evaluated in April 2005 for the presence of potential or actual habitat for the cuckoo. The results of this site visit indicate that the project site has no potential or actual suitable habitat for the species; however, it may serve as a migrational corridor. Clearing and grubbing activities would occur after the cuckoo nesting season. The loss of trees that may incidentally be used during migration would be replaced by replanting efforts.

B. Explanation of actions to be implemented to reduce adverse effects:

Not applicable

VIII. Effect determination and response requested:

<u>Determination</u>	<u>Response Requested</u>
A. Listed species/designated critical habitat: may affect, is not likely to adversely affect	
Rio Grande silvery minnow	<u> ✓ </u> Concurrence
Rio Grande silvery minnow critical habitat	<u> ✓ </u> Concurrence
Southwestern willow flycatcher	<u> ✓ </u> Concurrence
Interior least tern	<u> ✓ </u> Concurrence
B. Proposed species/proposed critical habitat: not likely to adversely modify	
Southwestern willow flycatcher critical habitat	<u> ✓ </u> Concurrence
C. Candidate species: not likely to adversely affect	
Yellow-billed cuckoo	<u> ✓ </u> Concurrence

Lyli Davis
Signature

8/30/05
Date

Endangered Species Branch Chief, New Mexico Ecological Services Field Office

IX. Reviewing ESFO Evaluations:

- B. Concurrence: ✓ Nonconcurrency: _____
- C. Formal consultation required: _____
- D. Conference required _____
- E. Informal conference required _____
- F. Remarks (attach additional pages as needed):

Susan McCallum
Signature

8/29/05
Date

SM Field Supervisor, New Mexico Ecological Services Field Office



United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

September 8, 2005

Memorandum

To: U.S. Bureau of Reclamation, Attention: Charles Fischer, Albuquerque,
New Mexico

From: Field Supervisor, U.S. Fish and Wildlife Service, Albuquerque, New Mexico

Subject: Final Fish and Wildlife Coordination Act Report for the Rio Grande Silvery Minnow
Sanctuary Project, Albuquerque, New Mexico

Attached is the final Fish and Wildlife Coordination Act Report (CAR) for the Rio Grande Silvery Minnow Sanctuary Project. The proposed project would create an artificial rearing and breeding channel (naturalized refugia), containing elements of the natural environment including backwaters, pools and eddies, to augment Rio Grande silvery minnow production.

This report has been prepared by the U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, under the authority of and in accordance with the requirements of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e). Should project plans change or a considerable amount of time elapse before this project begins, impacts on fish and wildlife should be re-examined.

Susan MacMullin

Susan MacMullin

Attachment

Fish and Wildlife Coordination Act Report
for the
Rio Grande Silvery Minnow Sanctuary Project
Albuquerque, New Mexico

Submitted to:
U.S. Bureau of Reclamation
555 Broadway NE, Suite 100
Albuquerque, New Mexico 87102

Prepared by:
Michael J. Buntjer
U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113

September 2005

TABLE OF CONTENTS

INTRODUCTION.....1
STUDY AREA DESCRIPTION.....3
 Site Description3
 Geomorphology and Hydrology3
 Vegetation Changes4
 Fish and Wildlife Changes5
 Aquatic Resources.....5
 Terrestrial Resources.....6
 Vegetation6
 Mammals.....7
 Birds.....7
 Reptiles and Amphibians8
 Threatened and Endangered Species8
 Rio Grande Silvery Minnow8
 Southwestern Willow Flycatcher9
 Bald Eagle10
PROJECT DESCRIPTION10
 Preferred Alternative.....10
 No Action Alternative12
EVALUATION METHODOLOGY12
FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT12
 Threatened and Endangered Species13
FISH AND WILDLIFE RESOURCES WITH THE PROJECT13
 Threatened and Endangered Species13
DISCUSSION13
RECOMMENDATIONS.....15
LITERATURE CITED16

Figure 1.	Rio Grande Silvery Minnow Sanctuary Project Site	2
Table 1.	Monthly Flow Data (2001-2003) for the Albuquerque Riverside Drain	11
Appendix A.	Common and Scientific Names of Plants That May Occur in the Middle Rio Grande Floodplain	20
Appendix B.	Common and Scientific Names of Mammals That May Occur in the Middle Rio Grande Floodplain	21
Appendix C.	Common and Scientific Names of Fish That May Occur in the Middle Rio Grande and Associated Drains	22
Appendix D.	Common and Scientific Names of Birds That May Occur in the Middle Rio Grande Floodplain	23
Appendix E.	Common and Scientific Names of Reptiles and Amphibians That May Occur in the Middle Rio Grande Floodplain.....	26

INTRODUCTION

This is the final Fish and Wildlife Coordination Act Report (CAR) for the Rio Grande Silvery Minnow Sanctuary (Minnow Sanctuary) and has been prepared by the U.S. Fish and Wildlife Service (Service) under authority of and in accordance with the requirements of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 USC 661-667e). Should project plans change or a considerable amount of time elapse before this project begins, impacts on fish and wildlife should be re-examined.

The Rio Grande silvery minnow (silvery minnow, *Hybognathus amarus*) is federally listed as endangered. It is also listed as endangered in the states of New Mexico and Texas, and the Republic of Mexico. It was historically one of the most abundant and widespread fishes in the Rio Grande Basin, occurring from Española, New Mexico, downstream to the Gulf of Mexico (Bestgen and Platania 1991). The silvery minnow was also found in the Pecos River from Santa Rosa, New Mexico, downstream to its confluence with the Rio Grande (Pflieger 1980). The known distribution of the silvery minnow is limited to the Rio Grande between Cochiti Dam and Elephant Butte Reservoir (Sublette *et al.* 1990; Bestgen and Platania 1991). The decline of the silvery minnow has been attributed to modification of the flow regime from impoundments, water diversion for agriculture, stream channelization, habitat fragmentation, and interactions with both non-native fish and decreasing water quality (Cook *et al.* 1992; Bestgen and Platania 1991; U.S. Fish and Wildlife Service (Service) 2003a; Buhl 2001).

Restoring aquatic habitats and creating naturalized refugia that support the silvery minnow are considered essential components for recovery of the species (Service 1994). Recommendations for such efforts are included as part of the Reasonable and Prudent Alternative (RPA) in the March 2003 Service Biological Opinion for the U.S. Bureau of Reclamation's (Reclamation) Water and River Maintenance Operations, the U.S. Army Corps of Engineers' (Corps) Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico (Service 2003a).

Reclamation, in cooperation with the Service and the Middle Rio Grande Conservancy District (MRGCD), has initiated the feasibility and design of the Minnow Sanctuary to augment silvery minnow production. This facility would be comprised of an artificial rearing and breeding channel, containing elements of the natural environment including backwaters, pools and eddies. The project is located parallel to the Middle Rio Grande near the existing City of Albuquerque refugium, approximately 0.9 miles south of Bridge Boulevard (at 2323 Second Street), in Bernalillo County, New Mexico (Figure 1). The purpose of this facility is to contribute to the recovery of silvery minnow through captive propagation of the species as part of the Middle Rio Grande ESA Collaborative Program (Collaborative Program).

This report describes fish and wildlife resources in the project area, anticipated benefits to those resources, and recommendations to minimize any potential adverse effects for those resources.

Rio Grande Silvery Minnow Sanctuary Site Map

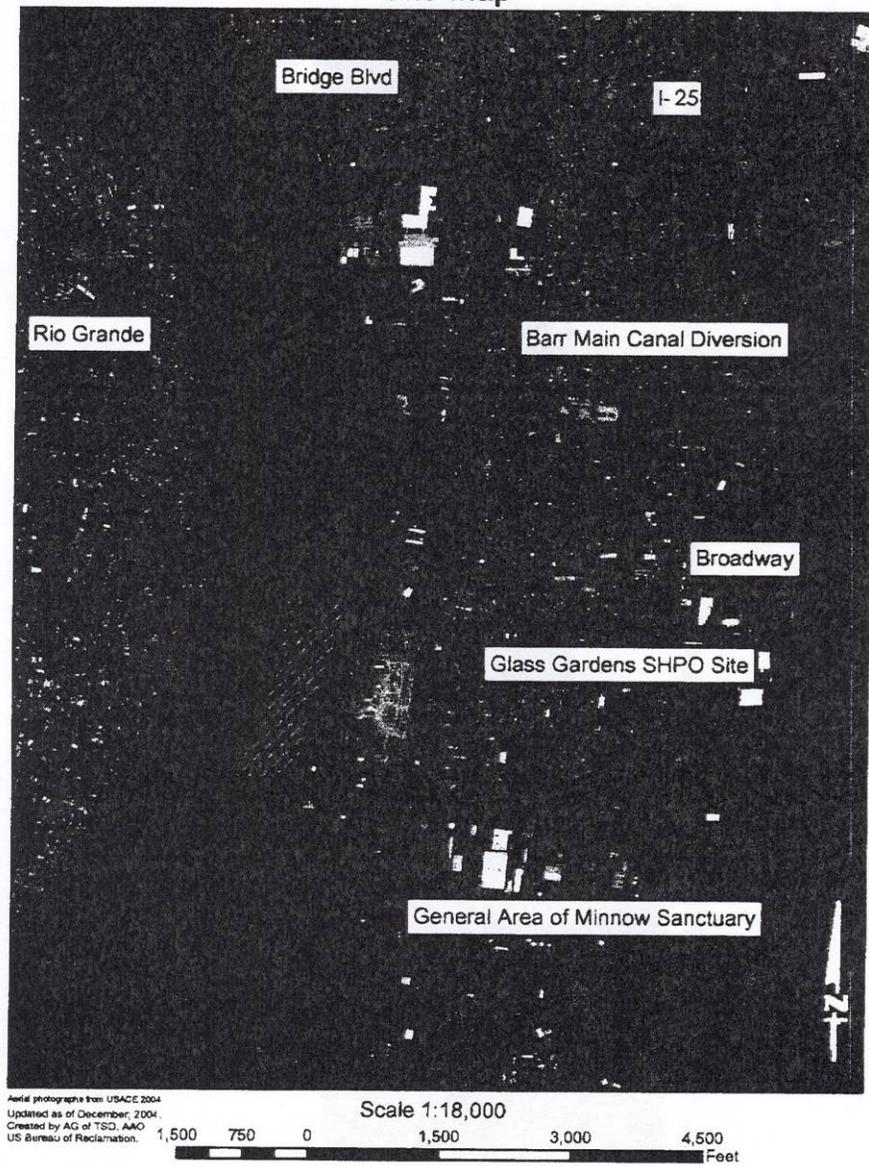


Figure 1. Rio Grande Silvery Minnow Sanctuary project site and surrounding area of influence (modified from Draft Environmental Assessment (Draft EA) 2005)

STUDY AREA DESCRIPTION

Site Description

The project site is located on land administered by the City of Albuquerque Parks and Recreation Open Space Division and the MRGCD (Figure 1). The site was historically used for industrial, agricultural, and residential purposes. An old landfill believed to be used in the 1930s and 1940s is located just north of the site, referred to as the “Glass Gardens”, and a smaller landfill of unknown age is located immediately to the south of the site. The project’s area of influence includes approximately 5 acres of bosque, a portion of the bank of the Middle Rio Grande, and the Albuquerque Riverside Drain (Riverside Drain). The Riverside Drain diverts water from the Rio Grande at the Angostura Dam, approximately 25 river miles upstream of the project site, and returns to the Rio Grande about 10 miles downstream. Although the project features are still being developed, the proposed facility would be a maximum 1,500 feet (ft) long and 100 ft wide within the bosque, with the proposed length currently approaching 1,000 ft.

The project area has been mechanically cleared of underbrush, and invasive weedy species have colonized cleared areas in many locations. Remaining vegetation in the bosque is comprised predominantly of Rio Grande cottonwood trees. The City Open Space Division manages the bosque where the proposed Minnow Sanctuary would be located. Mitigation is planned for vegetation removed during construction (Draft EA 2005). There is some riparian cover present along the banks of the Riverside Drain, particularly on the east bank. Siberian elm, salt cedar, and numerous weedy herbaceous species including Western salsify, cheatgrass, and tumble mustard occupy the bosque floodplain. The site contains significant amounts of debris, including concrete piles, tires, household items, glass and asphalt.

The Barr Main Canal diversion structure, known as the Barr Main Canal Heading, is located approximately 0.75 miles upstream of the project site. The diversion structure consists of a check/gate dam that diverts a portion of the Riverside Drain flow east into the Barr Main Canal for irrigation purposes. The Riverside Drain and Barr Main Canal flow parallel each until they are south of the project site, where the Canal diverts to the east away from the river channel. Water for the proposed project would be pumped from the Riverside Drain to the Minnow Sanctuary, and returned to the Rio Grande or to the drain depending on operational considerations.

Geomorphology and Hydrology

The Minnow Sanctuary project occurs within the floodplain of the Rio Grande. The Rio Grande flows 1,885 miles from its headwaters in southern Colorado, through New Mexico, where it empties into the Gulf of Mexico as it forms the border between Texas and Mexico. In New Mexico, the Rio Grande is divided into three regions: the Upper, Middle, and Lower Rio Grande. The Rio Grande at Albuquerque lies within the Middle Rio Grande region, which

extends from Cochiti Dam downstream to Elephant Butte Reservoir, a distance of approximately 175 miles. The river in this region prior to dam construction was a wide, braided, shallow, sand bed channel and wide floodplain (Crawford *et al.* 1993). Flows in the Middle Rio Grande and its tributaries upstream of Albuquerque follow a seasonal pattern of high flows during spring runoff and low flows during the fall and winter months, with occasional (monsoonal) flow spikes from summer thunderstorms.

The Rio Grande is highly regulated for flood control and water delivery. Upstream of the proposed project there are six reservoirs: Heron, El Vado, Abiquiu, Galisteo, Cochiti, and Jemez Canyon. There are some diversion dams including Angostura Diversion Dam downstream of Cochiti Dam, and other diversions such as Isleta Diversion Dam and San Acacia Diversion Dam, downstream of Albuquerque. Numerous other conveyances, drains, and laterals move water within the Rio Grande floodplain (U.S. Geological Survey 1996). Each reservoir, diversion dam, and associated irrigation water conveyance system is operated at a multi-agency level that includes Federal, State, and local regulations in compliance with the Rio Grande Compact. Water is managed for municipal and agricultural purposes, factoring in necessary flood control and mandatory deliveries to Texas and Mexico.

Current water operations affecting the general project area result in reduced peak releases and reduced volumes due to consumption, irrigation, flood control, timing of water releases, and water salvage efforts. Reservoirs, diversion dams, and irrigation management have changed the hydrology and sediment supply of the Rio Grande, causing degradation of the channel and chronic erosion of the river banks in some areas. Kellner jetty jacks were placed along the river to channelize and stabilize the banks. Through the Minnow Sanctuary project area, the Rio Grande is a relatively straight sand bed river with sandy banks.

Vegetation Changes

Fragmentation of the native riparian forest, river manipulation, hunting, trapping, livestock grazing, and the introduction of exotic species (plants and animals) have altered the vegetation and historic abundance and diversity of fish and wildlife (Crawford *et al.* 1993). Human development and encroachment in the Rio Grande floodplain have greatly restricted the active floodplain width. Analysis of aerial photography taken by Reclamation in February 1992 shows that of the 175 miles of Middle Rio Grande, only 1 mile, or 0.6 percent of the floodplain has remained undeveloped.

Water management, including development of impoundments, levees, and diversions have drastically altered natural hydrological processes (e.g., spring and monsoonal runoff). This altered hydrology limits natural regeneration of native cottonwoods and willows, and promotes the growth of non-native salt cedar and Russian olive, which are replacing the native cottonwood/willow vegetative complex. As a result of these changes, the quality and quantity of

fish and wildlife habitat has steadily decreased (Service 2001). A list of common and scientific names of plants that may occur in the Middle Rio Grande floodplain is provided in Appendix A.

The most dramatic changes in vegetation composition along the Rio Grande resulted from the reduction of wetted areas such as marshes and wetlands, and the increase in agricultural lands and exotic vegetation, primarily salt cedar and Russian olive. From 1918 to the present, wetland-associated habitats (e.g., wet meadows) have undergone a 93 percent reduction (Crawford *et al.* 1993). Salt cedar and Russian olive were introduced into New Mexico (as ornamentals, shade trees, and for erosion control) in the early 1900s (Crawford *et al.* 1993). By 1935, both plants were common along the Middle Rio Grande (Hink and Ohmart 1984).

Fish and Wildlife Changes

Historically, 27 native fish species occupied the Rio Grande drainage (Sublette *et al.* 1990). Many native fish are extinct and/or extirpated from the Rio Grande in New Mexico. There are at least 31 introduced or non-native fish species within the Rio Grande drainage (Sublette *et al.* 1990). Terrestrial wildlife that have been extirpated from the Rio Grande drainage include the gray wolf, jaguar, grizzly bear, river otter, and mink (Hink and Ohmart 1984). Approximately 46 mammalian species currently occur within the Middle Rio Grande (see Appendix B for a list of common and scientific names of mammals). Surveys of the Middle Rio Grande in 1981 and 1982 documented 277 bird species (Hink and Ohmart 1984), and 259 species were documented in 1992 and 1993 (Thompson *et al.* 1994). Bird occurrence and abundance have also changed with habitat changes. Swans and loons may have been plentiful, but are now absent or rare (Abert 1962). Twelve bird species are declining in abundance and 14 species are increasing. The declining species are associated with decreasing native riparian areas, and the increasing species are associated with agricultural areas (Thompson *et al.* 1994). Therefore, changes in the fish and wildlife community of the Rio Grande are largely due to the direct and indirect effects of human settlements and/or development and manipulation of the Rio Grande and associated changes in watershed and riparian zones.

Aquatic Resources

The aquatic habitat in the Rio Grande has been altered by levees, dams, irrigation structures, and reservoirs for agriculture, flood control, recreation, and protection for developments within the floodplain. Jetty jack fields have straightened and channelized the river for more effective water transport. Reservoir operations have altered the river's natural hydrograph (i.e., its characteristic rise and fall) including reductions in peak spring flows (Crawford *et al.* 1993). Downstream of Cochiti Dam, the altered sediment and flow regimes have transformed the river from a wide, braided, sand bed system to a narrower and deeper channel with no active floodplain (U.S. Bureau of Reclamation (Reclamation) 1999). Therefore, wetlands and slack water areas are scarce (Crawford *et al.* 1993). The cold, clear-water releases from Cochiti Dam and the entrenched channel, armored with a gravel bed, have created an aquatic system that favors cool-

water fishes and invertebrates, and limits warm-water fisheries below the dam downstream to Albuquerque. Consequently, the existing aquatic resources in the project area differ from those that occurred historically due to human activities (Crawford *et al.* 1993). A list of common and scientific names of fish that may occur in the Middle Rio Grande and adjacent drains is provided in Appendix C.

The loss of native fish species in the Middle Rio Grande illustrates that the hydrologic and morphological changes in the channel have had a major affect on fishery resources. The historical or pre-development ichthyofauna of the Middle Rio Grande in New Mexico is thought to have included at least 16 species (Hatch 1985; Smith and Miller 1986; Propst *et al.* 1987), four of which were endemic to the region. The silvery minnow is the only native pelagic, broadcast spawning minnow surviving in the Middle Rio Grande (Bestgen and Platania 1991). A considerable number of non-native fishes have been introduced into the Middle Rio Grande, either accidentally or as game fish by the New Mexico Department of Game and Fish. Today, the Middle Rio Grande contains at least 27 fish species, of which 12 are native and 15 are introduced or non-native.

On November 20, 2004, the Southwest Ichthyological Research Laboratory at New Mexico State University (NMSU) sampled the Riverside Drain adjacent to the project site. A total of 48 specimens (seven fish species) were collected including Rio Grande silvery minnow, white sucker, rainbow trout, fathead minnow, longnose dace, channel catfish, and yellow bullhead (David E. Cowley, NMSU, unpublished data). The most commonly collected species were white sucker ($n = 24$) and Rio Grande silvery minnow ($n = 6$). The presence of Rio Grande silvery minnow, rainbow trout, and longnose dace suggest seasonally adequate water quality within the drain.

Terrestrial Resources

Vegetation

The Middle Rio Grande corridor winds its way through a mosaic of Plains-Mesa Sand Scrub from Desert Grasslands in the north to Chihuahuan scrub in the south (Dick-Peddie 1993). Vegetative communities within the riparian corridor of the Middle Rio Grande were historically characterized by a cottonwood overstory with a willow and saltgrass-dominated understory. Other riparian species included New Mexico olive, baccharis, false indigo bush, and wolfberry. Wetlands were common, vegetated with cattails, sedges, spikerush, rushes, yerba mansa, and other wetland plants (Scurlock 1998).

The existing vegetation community of the bosque in the project area is a result of the altered flow regime, drainage for agriculture and development, levees, channelization, and the explosive growth of exotic salt cedar, Russian olive, and Siberian elm. Overbank flooding and in-channel scouring rarely occurs, reducing the opportunity for cottonwood regeneration. As a result, rapid colonizers such as salt cedar, Russian olive, and other exotics that thrive in the altered hydrologic

regime have significantly degraded the native riparian plant community (Crawford *et al.* 1993). In addition, salt cedar thickets contribute to the loss of wetlands (a habitat type that is now very limited in the Middle Rio Grande) by stabilizing channels and having high evapotranspiration rates.

Vegetation assemblages within the project area are a mixture of exotic and native plants, with the majority being exotic species. Salt cedar, Russian olive, Siberian elm, and tree-of-heaven occur extensively in the area. Native woody species present in the project area include cottonwood and coyote willow. Vegetation associated with the proposed restoration area contains an overstory of woody riparian exotic/natives and exotic understory shrubs. The dominant overstory assemblage is comprised of native Rio Grande cottonwoods, and exotic Siberian elm and Russian olive.

Mammals

Existing mammal populations are also a result of the existing water operations and land uses in the project area. Hink and Ohmart (1984) performed systematic floral and faunal surveys throughout the Middle Rio Grande. Residential development, agricultural conversion and subsequent irrigation systems, and construction of bridges/roads resulted in the permanent loss of all habitats within developed areas. Development has also caused a disruption of animal movement and dispersal patterns, and has caused continual disturbance to animal communities in the adjacent, fragmented portions of the bosque (Crawford *et al.* 1993). The largest mammal likely to occur in the project area is the coyote. Other mammals such as raccoon, beaver, muskrat, long-tailed weasel, and striped skunk may occur in the general project area. Desert cottontail rabbit, black-tailed jackrabbit, rock squirrel, pocket gopher, deer mouse, western harvest mouse, and American porcupine are also likely to occur. The most common small mammals in the Middle Rio Grande bosque are the white-footed mouse and house mouse (Stuart and Bogan 1996). Eleven species of bats are found along the Rio Grande (Findley *et al.* 1975). Two bat species are restricted to riparian areas, the Yuma myotis and little brown bat.

Birds

Hink and Ohmart (1984) found that riparian areas are used heavily by most bird species in New Mexico. Cottonwood-dominated community types are highly used and are preferred habitat for many species, especially during the nesting season. Marshes, drains, and areas of open water contribute to the bird diversity of the riparian ecosystem because of the strong attraction by water-loving birds. At various times of the year, such as during migration, riparian areas support the highest bird densities and species richness in the Middle Rio Grande region.

The river in and near the proposed project area provides habitat on a seasonal basis for a variety of waterfowl including Canada geese, mallard, gadwall, green-winged teal, American widgeon, northern pintail, northern shoveler, ruddy duck, and common merganser. Raptors that may occur in the project area include the bald eagle, turkey vulture, northern harrier, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, American kestrel, common barn owl, and great-horned owl.

Game species include the mourning dove and scaled quail. A list of common and scientific names of birds that may occur in the Middle Rio Grande floodplain is provided in Appendix D.

Reptiles and Amphibians

Hink and Ohmart (1984) documented 3 turtle species, 17 lizard species, and 18 snake species in the Middle Rio Grande ecosystem. According to Degenhardt *et al.* (1996), up to 57 species of reptiles may occur in the Middle Rio Grande of New Mexico. Reptiles typically found in the habitat types within the project area include the western collared lizard, southern prairie lizard, Great Plains skink, regal ringneck snake, desert striped whipsnake, smooth green snake, and western garter snake. Thirteen amphibian species may be found in the Middle Rio Grande Valley (Degendardt *et al.* 1996). Amphibians associated with riparian areas such as wet meadows and marshes include chorus frogs, leopard frogs, and bullfrogs (Crawford *et al.* 1993). Amphibians common to all the habitat types (wetland, riparian, and upland) include the tiger salamander, Woodhouse's toad, red-spotted toad, and northern leopard frog. The most often captured or perhaps the most abundant amphibians along the Rio Grande are the bullfrog and Woodhouse's toad (Hink and Ohmart 1984). Other species documented along the Rio Grande include Couch's spadefoot toad, New Mexico spadefoot, red-spotted toad, and northern leopard frog (Hink and Ohmart 1984). Applegarth (1983) suggests the northern leopard frog and painted turtle were more abundant when wetlands were more numerous. A list of common and scientific names of reptiles and amphibians that may occur in the Middle Rio Grande floodplain is provided in Appendix E.

Threatened and Endangered Species

As the quality and quantity of the fish and wildlife habitat within the Rio Grande corridor has decreased over time, so has its ability to sustain certain native flora and fauna. Several species endemic to the Middle Rio Grande are extinct, extirpated, or have been federally listed as threatened or endangered under the Endangered Species Act (ESA). This report provides information pertaining to listed species (i.e., Rio Grande silvery minnow, southwestern willow flycatcher, bald eagle) that may be affected by the proposed project.

Rio Grande Silvery Minnow

The silvery minnow is a moderately sized, stout minnow, approximately 3.5 inches in length that spawns in the late spring and early summer, coinciding with high spring flows (Sublette *et al.* 1990). Natural habitat for the silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are low or reduced from main-channel velocities. Stream reaches dominated by straight, narrow, incised channels with rapid flows are not typically occupied by silvery minnows (Sublette *et al.* 1990; Bestgen and Platania 1991).

The species was federally listed as endangered in July 1994 (Service 1994, 59 FR: 36988-37001). The Service (1993, 58 FR: 11821-11828) cited the de-watering of portions of the Rio Grande below Cochiti Dam through water regulation activities, the construction of main-stream dams,

the introduction of non-native competitor/predator species, and the degradation of water quality as factors responsible for declines in the silvery minnow population. On February 19, 2003, the Service published a final rule establishing critical habitat for the minnow within the last remaining portion of their historical range in the Middle Rio Grande, from Cochiti Dam to the utility line crossing the Rio Grande, a permanent identified landmark in Socorro County (Service 2003b, 68 FR: 8088-8135). The width of critical habitat along the Rio Grande is defined as those areas bound by existing levees or, in areas without levees, 300 ft of the riparian zone adjacent to the bankfull stage of the river. Most of the proposed project occurs within designated silvery minnow critical habitat (i.e., between the river levees).

Past actions within the project area have eliminated and severely altered habitat conditions for the silvery minnow. Narrowing and channel deepening, restraints to channel migration through jetty jacks, the invasion of non-native vegetation species, and changes in the flow regime have all adversely affected the silvery minnow and its habitat.

Southwestern Willow Flycatcher

The Service listed the southwestern willow flycatcher (flycatcher) as endangered on February 27, 1995 (Service 1995a, 60 FR: 10694-10715). The flycatcher is also classified as endangered by the State of New Mexico (New Mexico Department of Game and Fish 1987). The current range of the flycatcher includes southern California, southern portions of Nevada and Utah, Arizona, New Mexico, western Texas, and southwestern Colorado (Unitt 1987; Browning 1993). In New Mexico, the species has been observed in the Rio Grande, Rio Chama, Zuni, San Juan, San Francisco, and Gila River drainages. Available habitat and overall numbers have declined statewide (Service 1997, 62 FR: 39129-39147). A final recovery plan for the flycatcher has been developed (Service 2003c, 68 FR: 10485).

Loss and modification of nesting habitat is the primary threat to this species (Phillips *et al.* 1964; Unitt 1987; Service 1997, 62 FR: 39129-39147). Loss of migratory stopover habitat also threatens the flycatcher's survival. Large scale losses of southwestern wetlands have occurred, particularly the cottonwood-willow riparian habitats that are used by the flycatcher (Phillips *et al.* 1964; Carothers 1977; Rea 1983; Johnson and Haight 1984; Howe and Knopf 1991). The flycatcher is a riparian obligate and nests in riparian thickets associated with streams and other wetlands where dense growths of willow, buttonbush, boxelder, Russian olive, salt cedar or other plants are present. Nests are often associated with an overstory of scattered cottonwood. Throughout the flycatcher's range, these riparian habitats are now rare, widely separated by vast expanses of arid lands, in small and/or linear patches. Flycatchers begin arriving in New Mexico in late April and May to nest, and the young fledge in early summer. Flycatchers nest in thickets of trees and shrubs approximately 6.5 to 23 ft in height or taller, with a densely vegetated understory from ground or water surface level to 13 ft or more in height. Surface water or saturated soil is usually present beneath or next to occupied thickets (Phillips *et al.* 1964; Muiznieks *et al.* 1994). At some nest sites, surface water may be present early in the nesting season with only damp soil present by late June or early July (Muiznieks *et al.* 1994; Sferra *et al.* 1995). Habitats not selected for nesting or singing are narrower riparian

zones with greater distances between willow patches and individual willow plants. Suitable habitat adjacent to high gradient streams does not appear to be used for nesting. Areas not selected for nesting or singing may still be used during migration.

Potential flycatcher habitat exists along the Rio Grande in the Albuquerque area. This habitat is primarily composed of riparian shrubs and trees, chiefly Goodding's, peachleaf, and coyote willow, Rio Grande cottonwood, and salt cedar; and may be used by migrating flycatchers.

Bald Eagle

The project area is also within the known and historic range of the bald eagle. The Service reclassified the bald eagle from endangered to threatened on July 12, 1995 (Service 1995b, 60 FR: 36000-36010). Adults of this species are easily recognized by their white heads and dark bodies. Wintering bald eagles frequent all major river systems in New Mexico from November through March, including the Rio Grande. Bald eagle prey includes fish, waterfowl, and small mammals. Bald eagles prefer to roost and perch in large trees near water. Suitable perch sites occur within the project area, typically large cottonwoods at the river's edge.

At present and in the foreseeable future, major threats to the eagle are destruction and degradation of its habitat and environmental contamination of its food supply. The main threats to New Mexico's wintering population are impacts to their prey base and availability of roost-sites. Eagles may also occur around ponds outside the riparian zone but cottonwood trees within the riparian zone are used for perches and night roosts. Winter bald eagle surveys were conducted annually for eight years along the Rio Grande between 1988 and 1996 from Albuquerque, upstream to the confluence of the Rio Chama. The mean annual sighting is 64, with the largest number sighted in 1993 (88). The survey data show that wintering bald eagles use the habitat in the vicinity of the project for feeding and perching (Reclamation 1999).

PROJECT DESCRIPTION

Two alternatives were developed for the Minnow Sanctuary. The two alternatives include a no action alternative and an action alternative (Preferred Alternative).

Preferred Alternative

The Minnow Sanctuary would be an artificial rearing and breeding channel designed to provide a diversity of habitats such as side channels, backwaters, and pools for all life stages of silvery minnow. The proposed project would be operated year-round and would help fulfill the naturalized refugia requirements (i.e., one of two breeding and rearing facilities for the captive propagation of silvery minnow) of the Service's March 2003 Biological Opinion. Because project success can vary due to site-specific conditions and other uncertainties, post-project monitoring would be implemented to refine the anticipated production goal of 10,000 to 15,000 fish. Mitigation and adaptive management strategies would also be implemented upon project completion.

The project would include a water intake and enclosed pump station on the Riverside Drain at the north end of the Minnow Sanctuary site, and outlet facilities on the south end of the project site. Although the final project design is not yet complete, the proposed facility would be a maximum

1,500 ft long and 100 ft wide (50 ft average width), with a proposed length of approximately 1,000 ft. Water for the Minnow Sanctuary would be provided from the Riverside Drain. The maximum flow design for the project and associated facilities is 15 cubic feet per second (cfs).

During the irrigation season (March to October) the primary water source for the drain is diversions from the Rio Grande with minor contributions from groundwater and storm runoff. During the non-irrigation season (November to February) source water for the drain is primarily groundwater and occasional stormwater return flow. The average monthly flows in the Riverside Drain range from 9 to 141 cfs (Table 1). Mean flows in the drain are lowest in winter during the non-irrigation season. Because water withdrawals from the drain in winter would not likely require 15 cfs, it is anticipated the drain would maintain a minimum flow of 6 cfs.

Table 1. Monthly flow data (2001-2003) for the Riverside Drain, as measured approximately one mile upstream from Barr Main Canal Heading (modified from Draft EA 2005); values may be minimal because groundwater seepage likely provides additional flow before reaching the diversion.

Flow (cfs)	Month											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Mean	29	21	76	115	114	107	128	141	119	112	42	26
High	36	59	168	162	164	146	194	233	166	161	76	38
Low	19	16	15	68	64	73	65	72	33	61	13	9

A new surface water intake structure and pump station would be required to divert water from the drain at the upstream end of the Minnow Sanctuary. The intake would be set into the bank and equipped with a self-cleaning vertical screen that would remove medium- to large-sized debris and fish before entering the intake structure. Water diverted from the drain would be pumped through a pipe to the sanctuary. Water exiting the sanctuary would flow through a 500 ft² covered outlet structure with a fish screen. Screening of intake and outlet structures would be incorporated to preclude debris and non-target fish species from entering the sanctuary and preventing silvery minnow from escaping.

All flow would be returned to the Rio Grande (via a 500 ft open channel) or to the drain (via a 150 ft 30 inch diameter pipe). During high flows, when flows in the Rio Grande preclude gravity flow of return water to the river, water would be returned to the drain. To allow for release of fish, larvae, and eggs, flows would be returned to the river. Because no additional water supply is planned, a water recirculation pump would be provided as an emergency back up to re-circulate existing water throughout the facility when necessary. If drain water is not available for extensive periods of time fish held in the facility would be released.

The design of the sanctuary would conform to the existing bosque landform. The sanctuary and internal features including bars, side channels, pools, and backwaters would be constructed with native soil (from excavated materials on site, if suitable) combined with hard materials (i.e., rock,

sand bags, small gabions, large woody debris, etc.) to create defined habitat structures. Fine sand to small gravels would be used as substrate for the sanctuary.

Because the sanctuary would be designed to be as natural as possible, the facility would not be equipped with predator controls. If monitoring reveals that predation is an issue, predator fencing may be installed to exclude predacious reptiles and amphibians from entering the sanctuary. Measures to minimize bird or raccoon predation could also be installed. It is proposed that flows, dissolved oxygen, temperature, and water level be monitored continuously.

Because the sanctuary is a pilot project, the number of fish reared in the facility would be conservative until the performance of the system can be evaluated. Using a range of 51 to 150 silvery minnow per 100 m², the initial stocking density would be approximately 11,250 fish (for roughly 7,500 m² of habitat) (Draft EA 2005). Production numbers would be adjusted following operational reviews and evaluations.

No Action Alternative

Under the No Action Alternative, no project elements would be implemented. Measures to create a naturalized refugium for silvery minnow and off- or side channel habitat would not be implemented.

EVALUATION METHODOLOGY

Since May 1, 2005, the Service has attended project status meetings with Reclamation and other stakeholders (e.g., MRGCD, the City of Albuquerque, the Corps, and Congressional staff) to discuss project features, design, and construction methods. The Service and Reclamation also conducted joint field trips to the project area. Additional biological data and background information were derived through review of relevant literature and personal communications. Reclamation has provided a majority of the technical and background information. Surveys for the southwestern willow flycatcher were conducted in 2000 (Howell 2000) in the project vicinity, but no flycatchers were detected. Surveys for bald eagles in the project area were conducted by the Corps between 1988 and 1996. A fish survey was conducted in the Riverside Drain adjacent to the project area in November 2004. In addition, silvery minnow surveys have been conducted in the Rio Grande along the Albuquerque reach since the winter of 1999, and in previous years.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

The Minnow Sanctuary and surrounding area has been degraded by water management, flood control, and human use. If the sanctuary is not constructed, an opportunity to create a naturalized refugium and increase silvery minnow production would be missed. The bosque in the project area would remain as is and continue to provide minimal aquatic habitat without the project. The Riverside Drain would continue to provide marginal aquatic and riparian habitat. Short-term impacts to fish and wildlife resources due to construction would not occur.

Threatened and Endangered Species

An opportunity to increase production of silvery minnow would not occur without the project. Aquatic habitat would continue to be minimal for silvery minnow and could ultimately hamper recovery efforts. Projects such as these may help to reverse the trend in loss of silvery minnows.

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

Temporary, short-term impacts to fish and wildlife may occur from noise, dust, and the presence of workers and machinery during project construction. Runoff from construction work sites, access routes, staging areas, and unprotected fills could degrade water quality in the Rio Grande. Accidental spills of fuels, lubricants, hydraulic fluids and other petrochemicals, although unlikely, would be harmful to aquatic life.

Construction of the rearing channel would permanently remove approximately 1.8 acres (78,000 ft²) of bosque habitat that is dominated by weedy invasive species. Up to 18 mature cottonwoods and 60 immature cottonwoods would be removed from the project area. Existing cottonwood trees that border the sanctuary site would be maintained to contribute leaf litter and other organic debris associated with overhead canopy habitat.

Implementation of the Minnow Sanctuary project should provide unique aquatic habitat for silvery minnow and help ensure the continued persistence of this federally listed species. Although some seasonal impacts to the adjacent Riverside Drain fishery (via reduced winter flows downstream of the diversion structure) could occur, these should be minimal and off-set by development of the naturalized refugium. The overall quality and quantity of fish and wildlife habitat within the project area is expected to improve.

Threatened and Endangered Species

Analysis of effects to listed species will be addressed in detail in the ESA intraservice section 7 consultation.

DISCUSSION

The Service anticipates some minor short-term impacts to fish and wildlife resources associated with project construction. To ensure that federally listed species are not adversely impacted by the project, ESA section 7 consultation should be completed prior to construction. To minimize adverse impacts to birds protected under the Migratory Bird Treaty Act, tree stands or other adequately vegetated areas slated for grubbing or clearing should be surveyed for the presence of nesting birds during the general migratory bird nesting season of March through August. Disturbance to nesting areas should be avoided until nesting is completed. Vegetation clearing and construction related soil disturbances can cause sediment-laden runoff to enter waterways. To minimize impacts associated with erosion, the contractor should employ silt curtains, coffer

dams, dikes, straw bales, or other suitable erosion control measures. Construction related petrochemical spills can also negatively impact fish and wildlife resources. Therefore, measures should be implemented to minimize the likelihood of petrochemical spills. Spill procedures should be in place prior to construction to minimize impacts associated with unexpected spills. To ensure that the project objectives are met, post-construction monitoring of the project area should be conducted.

The Minnow Sanctuary would benefit fish and wildlife by providing a naturalized refugium and increasing the production of silvery minnow. The Minnow Sanctuary would expand upon restoration efforts associated with other Middle Rio Grande projects. The project would be in addition to ongoing efforts including the Tingley Ponds and Route 66 projects and the upcoming Middle Rio Grande Bosque Restoration Project. The project would also partially fulfill the requirements of the Service's March 2003 Biological Opinion by creating a breeding and rearing facility for the captive propagation of silvery minnow. Therefore, the Service believes the project would provide important short- and potentially long-term aquatic habitat for silvery minnow within the Rio Grande corridor in Albuquerque.

Construction activities that result in unavoidable adverse impacts to fish and wildlife require the development of mitigation plans. These plans consider the value of fish and wildlife habitat affected. The Service has established a mitigation policy used as guidance in determining resource categories and recommending mitigation (Service 1981, 46 FR: 7644-7663). The riparian bosque and associated floodplain habitat within the project area are consistent with "Resource Category No. 2"; that is, habitats of high value that are relatively scarce or becoming scarce on a national basis or in the eco-region.

Although the project area contains a large amount of exotic species; overall, riparian and floodplain habitats are classified in Category 2 because they are scarce. According to Johnson and Jones (1977), about 90 percent of the historic riparian habitat in the Southwest has been eliminated. The Service mitigation policy states that the degree of mitigation should correspond to the value and scarcity of the fish and wildlife habitat at risk. Consequently, no net loss of in-kind habitat value should be the mitigation goal for this resource category. The Service believes that the proposed project not only meets, but exceeds the "no net loss of in-kind habitat" mitigation goal for this resource category. Therefore, no mitigation beyond what has already been identified in the Environmental Commitments section of the DEA (2005) for the project is needed.

RECOMMENDATIONS

The Service offers the following recommendations concerning fish and wildlife resources for the proposed project:

1. As proposed, avoid construction during the migratory bird nesting season of March through August. Where that is not possible, tree stands or other adequately vegetated areas slated for grubbing or clearing should be surveyed for the presence of nesting birds prior to construction. Avoid disturbing nesting areas until nesting is complete.
2. Employ silt curtains, cofferdams, dikes, straw bales or other suitable erosion control measures during project construction.
3. Store and dispense fuels, lubricants, hydraulic fluids, and other petrochemicals outside the 100-year floodplain. Inspect construction equipment daily for petrochemical leaks. Contain and remove any petrochemical spills and dispose of these materials at an approved upland site. Construction equipment should be parked outside the 100-year floodplain during periods of inactivity.
4. Ensure equipment operators carry an oil spill kit or spill blanket at all times and are knowledgeable in the use of spill containment equipment. Develop a spill contingency plan prior to initiation of construction. Immediately notify the proper Federal and State authorities in the event of a spill.
5. Incorporate post-project monitoring and adaptive management strategies to ensure project success.
6. Implement the Environmental Commitments identified in the DEA 2005.

LITERATURE CITED

- Abert, J. 1962. Abert's New Mexico report. Report on several trips through the Middle Rio Grande Valley in 1846. Horn and Wallace Press. Albuquerque, New Mexico.
- Applegarth, J. 1983. Status of the leopard frog (*Rana pipiens*) and the painted turtle (*Chrysemys picta*) in the Rio Grande of north-central New Mexico. Report submitted to the U.S. Army Corps of Engineers, Albuquerque, New Mexico. 78 pp.
- Bestgen, K.R., and S. P. Platania. 1991. Status and conservation of the Rio Grande silvery minnow, *Hybognathus amarus*. Southwestern Naturalist 36(2):225-232.
- Browning, M. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24:241-257.
- Buhl, K.J. 2001. The relative toxicity of inorganic contaminants to the Rio Grande silvery minnow (*Hybognathus amarus*) and fathead minnow (*Pimephales promelas*) in a water quality simulating the Rio Grande, New Mexico. Columbia Environmental Research Center Field Research Station, Yankton, South Dakota, 76 pp.
- Carothers, S. 1977. Importance, preservation, and management of riparian habitats: an overview. General Technical Report RM-43. U. S. Department of Agriculture, Forest Service, Denver, Colorado.
- Cook, J.A., K.R. Bestgen, D.L. Propst, and T.L. Yates. 1992. Allozymic divergence and systematics of the Rio Grande silvery minnow, *Hybognathus amarus* (Teleostei: Cyprinidae). Copeia 1992:36-44.
- Crawford, C., A. Cully, R. Leutheuser, M. Sifuentes, L. White, and J. Wilber. 1993. Middle Rio Grande Ecosystem, Bosque Biological Management Plan. Middle Rio Grande Biological Interagency Team. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 291 pp.
- Degenhardt, W., C. Painter, and A. Price. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press. Albuquerque, New Mexico. 431 pp.
- Dick-Peddie, W.A. 1993. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press, Albuquerque, New Mexico. 244 pp.
- Draft EA (Draft Environmental Assessment). 2005. Rio Grande Silvery Minnow Sanctuary. U.S. Department of Interior, Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico. 63 pp.

- Findley, J., A. Harris, D. Wilson, and C. Jones. 1975. *Mammals of New Mexico*. University of New Mexico Press. Albuquerque, New Mexico. 360 pp.
- Hatch, M.D. 1985. Native fishes of the major drainages east of the continental divide, New Mexico. Unpublished Master of Science thesis, Eastern New Mexico University, Portales, New Mexico. 85 pp.
- Hink, V.C., and R.D. Ohmart. 1984. Middle Rio Grande biological survey. U.S. Army Engineer District, Albuquerque, New Mexico. Contract No. DACW47-81-C-0015, Arizona State University. 193 pp.
- Howell, D.J. 2000. Survey for southwestern willow flycatcher (*Empidonax traillii extimus*) in Belen, Los Lunas, and southwest Albuquerque areas of the Middle Rio Grande, New Mexico. Prepared for the U.S. Army Corps of Engineers. Albuquerque, New Mexico.
- Howe, W., and F. Knopf. 1991. On the imminent decline of Rio Grande cottonwoods in central New Mexico. *Southwestern Naturalist* 36(2):218-224.
- Johnson, R., and D. Jones. 1977. Importance, preservation and management of riparian habitat: a symposium. U.S. Department of Agriculture, Forest Service. General Technical report RM-43. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Johnson, R., and L. Haight. 1984. Riparian problems and initiatives in the American Southwest: a regional perspective. Pages 404-412 *In: California riparian systems: ecology, conservation, and productive management* (R.E. Warner and K.M. Hendrix, editors.). University of California Press, Berkeley, California. 1035 pp.
- Muiznieks, B., S. Sferra, T. Corman, M. Sogge, and T. Tibbitts. 1994. Arizona Partners in Flight - Southwestern Willow Flycatcher Survey, 1993. Draft technical report: nongame and endangered wildlife program, Arizona Game and Fish Department, Phoenix, Arizona. April 1994. 28 pp.
- New Mexico Department of Game and Fish. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, New Mexico. 29 pp.
- Pflieger, W.L. 1980. *Hybognathus nuchalis* Agassiz, central silvery minnow. Page 177 *in Atlas of North American Freshwater Fishes* (D.S. Lee et al., eds.). North Carolina State Museum of Natural History, Raleigh, 867 pp.
- Phillips, J., R. Marshall, and G. Monson. 1964. *The Birds of Arizona*. University of Arizona Press, Tucson, Arizona. 212 pp.

- Propst, D. L., G. L. Burton, and B. H. Pridgeon. 1987. Fishes of the Rio Grande between Elephant Butte and Caballo Reservoirs, New Mexico. *Southwestern Naturalist* 43(3):408-411.
- Rea, A. 1983. *Once a river: bird life and habitat changes on the middle Gila*. University of Arizona Press, Tucson, Arizona. 285 pp.
- Scurlock, D. 1998. *From the Rio to the Sierra: an environmental history of the Middle Rio Grande Basin*. General Technical Report RMRS-GTR-5. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 440 pp.
- Sferra, S., R. Meyer, and T. Corman. 1995. *Arizona partners in flight 1994 Southwestern Willow Flycatcher Survey*. Tech. Rep. 69. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix. 46 pp.
- Smith, M. L., and R. R. Miller. 1986. The evolution of the Rio Grande Basin as inferred from its fish fauna. *Zoogeography of North American freshwater fishes*. p. 457-485. John Wiley and Sons, New York.
- Stuart, J. and M. Bogan. 1996. *Interim report, fragmented riparian habitats and small mammal assemblages in the Middle Rio Grande valley, New Mexico*. National Biological Service, Museum of Southwestern Biology, University of New Mexico. Albuquerque, New Mexico. 39 pp.
- Sublette, J., M. Hatch, and M. Sublette. 1990. *The Fishes of New Mexico*. New Mexico Department of Game and Fish. University of New Mexico Press, Albuquerque, New Mexico. 393 pp.
- Thompson, B., D. Leal, and R. Meyer. 1994. *Bird community composition and habitat importance in the Rio Grande system of New Mexico with emphasis on neotropical migrant birds*. New Mexico Cooperative Fish and Wildlife Research Unit and Fishery and Wildlife Sciences Department, New Mexico State University, Las Cruces, New Mexico. Submitted to U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico. 151 pp.
- Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. *Western Birds* 18:137-162.
- U.S. Bureau of Reclamation. 1999. *Biological Assessment, Rio Grande Restoration at Santa Ana Pueblo, Terrestrial Habitat Enhancement Plan*. U.S. Department of Interior, Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico. 27 pp.
- U.S. Fish and Wildlife Service. 1981. *U.S. Fish and Wildlife Service mitigation policy*. *Federal Register* 46(15):7644-7663.

- U.S. Fish and Wildlife Service. 1993. Proposal Rule to List the Rio Grande Silvery Minnow as Endangered, with Critical Habitat. Federal Register 58:11821-11828.
- U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Final Rule to list the Rio Grande Silvery Minnow as an Endangered Species. Federal Register 59:36988-37001.
- U.S. Fish and Wildlife Service. 1995a. Endangered and Threatened Wildlife and Plants; Final Rule to list the Southwestern Willow Flycatcher as an Endangered Species. Federal Register 60:10694-10715.
- U.S. Fish and Wildlife Service. 1995b. Endangered and threatened wildlife and plants; final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states. Federal Register 60:36000-36010.
- U.S. Fish and Wildlife Service. 1997. Final Determination of Critical Habitat for the Southwestern Willow Flycatcher. Federal Register 62(140):39129-39147.
- U.S. Fish and Wildlife Service. 2001. Final Fish and Wildlife Coordination Report for the Riparian and Wetland Restoration Project, Pueblo of Santa Ana Reservation, Sandoval County, New Mexico. Submitted to the U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico. January 2001.
- U.S. Fish and Wildlife Service. March 17, 2003 (2003a). Programmatic Biological Opinion on the Effects of Actions Associated with the U.S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and Non-Federal Entities' Discretionary Actions Related to Water Management on the Middle Rio Grande, New Mexico. Albuquerque.
- U.S. Fish and Wildlife Service. 2003b. Endangered and Threatened Wildlife and Plants; Final Rule for the Designation of Critical Habitat for the Rio Grande Silvery Minnow. Federal Register 68:8088-8135.
- U.S. Fish and Wildlife Service. 2003c. Notice of Availability of the Final Southwestern Willow Flycatcher Recovery Plan. Federal Register 68(43):10485.
- U.S. Geological Survey. 1996. Water Resources Data, New Mexico, Water Year 1996. U.S. Geological Survey Water-Data Report NM-95-1. In cooperation with the State of New Mexico and other agencies. Water Resources Division, U.S. Geological Survey, 4501 Indian School Road NE, Albuquerque, New Mexico. 446 pp.

Appendix A. Common and Scientific Names of Plants That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Baccharis (N)	<i>Baccharis</i> spp.
Seepwillow (N)	<i>Baccharis glutinosa</i>
Coyote willow (N)	<i>Salix exigua</i>
Peachleaf willow (N)	<i>Salix amygdaloides</i>
Goodding's willow (N)	<i>Salix gooddingii</i>
Buttonbush (N)	<i>Cephalanthus</i> spp.
False indigo bush (N)	<i>Amorpha fruticosa</i>
New Mexico olive (N)	<i>Forestiera neomexicana</i>
Black locust (N)	<i>Robinia pseudo-acacia</i>
Boxelder (N)	<i>Acer negundo</i>
Chinaberry (I)	<i>Melia azedarach</i>
Rio Grande cottonwood (N)	<i>Populus fremonti</i>
White mulberry (I)	<i>Morus alba</i>
Russian olive (I)	<i>Elaeagnus angustifolia</i>
Salt cedar (I)	<i>Tamarix</i> spp.
Siberian elm (I)	<i>Ulmus pumila</i>
Tree-of-heaven (I)	<i>Ailanthus altissima</i>
Apache plume (N)	<i>Fallugia paradoxa</i>
Wolfberry (N)	<i>Lycium andersonii</i>
Fourwing saltbush (N)	<i>Atriplex canescens</i>
Virginia creeper (I)	<i>Parthenocissus inserta</i>
Phragmites (N)	<i>Phragmites communis</i>
Sago pondweed (N)	<i>Potamogeton pectinatus</i>
Sedge (N)	<i>Carex</i> spp.
Saltgrass (N)	<i>Distichlis stricta</i>
Spikerush(N)	<i>Eleocharis</i> spp.
Horsetail (N)	<i>Equisetum</i> spp.
Rush (N)	<i>Juncus</i> spp.
Bulrush (N)	<i>Scirpus</i> spp.
Sacaton (N)	<i>Sporobolus</i> spp.
Cattail (N)	<i>Typha latifolia</i>
Smartweed (N)	<i>Polygonum lapathifolium</i>
American milfoil (N)	<i>Myriophyllum exalbescens</i>
Yerba manza (N)	<i>Anemopsis californica</i>
Primrose (N)	<i>Oenothera</i> spp.
Fendler globemallow (N)	<i>Sphaeralcea fendleri</i>
Pricklypear (N)	<i>Opuntia</i> spp.
Buffalo gourd (N)	<i>Cucurbita foetidissima</i>
Spiny aster (I)	<i>Aster spinosus</i>
Golden currant (N)	<i>Ribes aureum</i>
Watercress (N)	<i>Nasturtium officinale</i>

(N = native, I = introduced or non-native)

Appendix B. Common and Scientific Names of Mammals That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Opossum	<i>Didelphis virginiana</i>
Desert shrew	<i>Notiosorex crawfordi</i>
Yuma myotis	<i>Myotis yumanensis</i>
Little brown bat	<i>Myotis lucifugus</i>
Long-legged myotis	<i>Myotis volans</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Big brown bat	<i>Eptesicus fuscus</i>
Hoary bat	<i>Lasiurus cinereus</i>
Spotted bat	<i>Euderma maculatum</i>
Townsend's big-eared bat	<i>Plecotis townsendii</i>
Pallid bat	<i>Antrozous pallidus</i>
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>
Desert cottontail	<i>Sylvilagus auduboni</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>
Beaver	<i>Castor canadensis</i>
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>
Colorado chipmunk	<i>Eutamias quadrivittatus</i>
Spotted ground squirrel	<i>Spermophilus spilosoma</i>
Rock squirrel	<i>Spermophilus variegatus</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Northern grasshopper mouse	<i>Onychomys leucogaster</i>
Deer mouse	<i>Peromyscus maniculatus</i>
White-footed mouse	<i>Peromyscus leucopus</i>
Piñon mouse	<i>Peromyscus truei</i>
Western harvest mouse	<i>Reithrodontomys megalotis</i>
Hispid cotton rat	<i>Sigmodon hispidus</i>
Norway rat	<i>Rattus norvegicus</i>
Muskrat	<i>Ondatra zibethicus</i>
New Mexican jumping mouse	<i>Zapus hudsonius luteus</i>
Ord kangaroo rat	<i>Dipodomys ordii</i>
Merriam kangaroo rat	<i>Dipodomys merriami</i>
Silky pocket mouse	<i>Perognathus flavus</i>
Plains pocket mouse	<i>Perognathus flavescens</i>
Yellow-faced pocket gopher	<i>Pappogeomys castanops</i>
Botta pocket gopher	<i>Thomomys bottae</i>
American porcupine	<i>Erethizon dorsatum</i>
Coyote	<i>Canis latrans</i>
Gray fox	<i>Urocyon cinereoargenteus scottii</i>
Raccoon	<i>Procyon lotor</i>
Striped skunk	<i>Mephitis mephitis</i>
Long-tailed weasel	<i>Mustela frenata</i>
Mink	<i>Mustela vison</i>
Badger	<i>Taxidea taxus</i>
Bobcat	<i>Lynx rufus</i>
Mountain lion	<i>Felis concolor</i>
Mule deer	<i>Odocoileus hemionus</i>

Appendix C. Common and Scientific Names of Fish That May Occur in the Middle Rio Grande and Associated Drains.

Common Name	Scientific Name
Gizzard shad (N)	<i>Dorosoma cepedianum</i>
Rainbow trout (I)	<i>Oncorhynchus mykiss</i>
Brown trout (I)	<i>Salmo trutta</i>
Northern pike (I)	<i>Esox lucius</i>
Red shiner (N)	<i>Cyprinella lutrensis</i>
Common carp (I)	<i>Cyprinus carpio</i>
Rio Grande chub (N)	<i>Gila pandora</i>
Rio Grande silvery minnow (N)	<i>Hybognathus amarus</i>
Fathead minnow (N)	<i>Pimephales promelas</i>
Flathead chub (N)	<i>Platygobio gracilis</i>
Longnose dace (N)	<i>Rhinichthys cataractae</i>
River carpsucker (N)	<i>Carpiodes carpio</i>
Flathead catfish (N)	<i>Pylodictis olivaris</i>
White sucker (I)	<i>Catostomus commersoni</i>
Rio Grande sucker (N)	<i>Catostomus plebeius</i>
Smallmouth buffalo (N)	<i>Ictiobus bubalus</i>
Black bullhead (I)	<i>Ameiurus melas</i>
Yellow bullhead (I)	<i>Ameiurus natalis</i>
Channel catfish (I)	<i>Ictalurus punctatus</i>
Western mosquitofish (N)	<i>Gambusia affinis</i>
White bass (I)	<i>Morone chrysops</i>
Green sunfish (I)	<i>Lepomis cyanellus</i>
Bluegill (N)	<i>Lepomis macrochirus</i>
Longear sunfish (I)	<i>Lepomis megalotis</i>
Largemouth bass (I)	<i>Micropterus salmoides</i>
White crappie (I)	<i>Pomoxis annularis</i>
Black crappie (I)	<i>Pomoxis nigromaculatus</i>
Yellow perch (I)	<i>Perca flavescens</i>

(N = native; I = introduced or non-native; Sublette *et al.* 1990 designations)

Appendix D. Common and Scientific Names of Birds That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Pied-billed grebe	<i>Podilymbus podiceps</i>
Common loon	<i>Gavia immer</i>
American white pelican	<i>Pelecanus erythrorhynchos</i>
Double-crested cormorant	<i>Phalacrocorax auritus</i>
Olivaceous cormorant	<i>Phalacrocorax olivaceus</i>
American bittern	<i>Botaurus lentiginosus</i>
Least bittern	<i>Ixobrychus exilis</i>
Great blue heron	<i>Ardea herodias</i>
Great egret	<i>Ardea alba</i>
Snowy egret	<i>Egretta thula</i>
Little blue heron	<i>Egretta caerulea</i>
Cattle egret	<i>Bubulcus ibis</i>
Green-backed heron	<i>Butorides striatus</i>
Black-crowned night heron	<i>Nycticorax nycticorax</i>
White-faced ibis	<i>Plegadis chihi</i>
Snow goose	<i>Chen caerulescens</i>
Canada goose	<i>Branta canadensis</i>
Wood duck	<i>Aix sponsa</i>
Green-winged teal	<i>Anas crecca</i>
Mallard	<i>Anas platyrhynchos</i>
Northern pintail	<i>Anas acuta</i>
Cinnamon teal	<i>Anas cyanoptera</i>
Northern shoveler	<i>Anas clypeata</i>
Gadwall	<i>Anas strepera</i>
Hooded merganser	<i>Mergus cuculatus</i>
Red-breasted merganser	<i>Mergus serrator</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Virginia rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
Common moorhen	<i>Gallinula chloropus</i>
American coot	<i>Fulica americana</i>
Sandhill crane	<i>Grus canadensis</i>
Whooping crane	<i>Grus americana</i>
Killdeer	<i>Charadrius vociferus</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
American avocet	<i>Recurvirostra americana</i>
Solitary sandpiper	<i>Tringa solitaria</i>
Spotted sandpiper	<i>Actitis macularia</i>
Long-billed curlew	<i>Numenius americanus</i>
Forster's tern	<i>Sterna forsteri</i>
Black tern	<i>Chlidonias niger</i>
Turkey vulture	<i>Cathartes aura</i>
Osprey	<i>Pandion haliaetus</i>
Black-shouldered kite	<i>Elanus caeruleus</i>
Mississippi kite	<i>Ictinia mississippiensis</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Northern harrier	<i>Circus cyaneus</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Common black-hawk	<i>Buteogallus anthracinus</i>

Appendix D continued. Common and Scientific Names of Birds That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Swainson's hawk	<i>Buteo swainsoni</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
American kestrel	<i>Falco sparverius</i>
American peregrine falcon	<i>Falco peregrinus anatum</i>
Ring-necked pheasant	<i>Phasianus colchicus</i>
Northern bobwhite	<i>Colinus virginianus</i>
Scaled quail	<i>Callipepla squamata</i>
Gambel's quail	<i>Callipepla gambelii</i>
Rock dove	<i>Columba livia</i>
White-winged dove	<i>Zenaida asiatica</i>
Morning dove	<i>Zenaida macroura</i>
Common ground-dove	<i>Columbina passerina</i>
Yellow-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Greater roadrunner	<i>Geococcyx californianus</i>
Common barn-owl	<i>Tyto alba</i>
Great horned owl	<i>Bubo virginianus</i>
Burrowing owl	<i>Athene cunicularia</i>
Lesser nighthawk	<i>Chordeiles acutipennis</i>
Common nighthawk	<i>Chordeiles minor</i>
White-throated swift	<i>Aeronautes saxatalis</i>
Black-chinned hummingbird	<i>Archilochus alexandri</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Belted kingfisher	<i>Ceryle alcyon</i>
Northern flicker	<i>Colaptes auratus</i>
Olive-sided flycatcher	<i>Contopus borealis</i>
Western wood-pewee	<i>Contopus sordidulus</i>
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>
Black phoebe	<i>Sayornis nigricans</i>
Say's phoebe	<i>Sayornis saya</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
Cassin's kingbird	<i>Tyrannus vociferans</i>
Western kingbird	<i>Tyrannus verticalis</i>
Eastern kingbird	<i>Tyrannus tyrannus</i>
Violet-green swallow	<i>Tachycineta thalassina</i>
Bank swallow	<i>Riparian riparia</i>
Cliff swallow	<i>Hirundo pyrrhonota</i>
Barn swallow	<i>Hirundo rustica</i>
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
Black-billed magpie	<i>Pica pica</i>
American crow	<i>Corvus caurinus</i>
Chihuahuan raven	<i>Corvus cryptoleucus</i>
Black-capped chickadee	<i>Parus atricapillus</i>
Verdin	<i>Auriparus flaviceps</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
Cactus wren	<i>Campylorhynchus brunneicapillus</i>
Black-tailed gnatcatcher	<i>Polioptila melanura</i>
Eastern bluebird	<i>Sialia sialis</i>
Western bluebird	<i>Sialia mexicana</i>

Appendix D continued. Common and Scientific Names of Birds That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Hermit thrush	<i>Catharus guttatus</i>
American robin	<i>Turdus migratorius</i>
Lesser goldfinch	<i>Carduelis psaltria</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Curved-billed thrasher	<i>Toxostoma curvirostre</i>
Crissal thrasher	<i>Toxostoma dorsale</i>
European starling	<i>Sturnus vulgaris</i>
Bell's vireo	<i>Vireo bellii</i>
Warbling vireo	<i>Vireo gilvus</i>
Orange-crowned warbler	<i>Vermivora celata</i>
Virginia's warbler	<i>Vermivora virginiae</i>
Lucy's warbler	<i>Vermivora luciae</i>
Yellow warbler	<i>Dendroica petechia</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Wilson's warbler	<i>Wilsonia pusilla</i>
Yellow-breasted chat	<i>Icteria virens</i>
Summer tanager	<i>Piranga rubra</i>
Western tanager	<i>Piranga ludoviciana</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Pyrrhuloxia	<i>Cardinalis sinuatus</i>
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
Blue grosbeak	<i>Guiraca caerulea</i>
Lazuli bunting	<i>Passerina amoena</i>
Indigo bunting	<i>Passerina cyanea</i>
Painted bunting	<i>Passerina ciris</i>
Spotted towhee	<i>Pipilo maculatus</i>
Brown towhee	<i>Pipilo fuscus</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Rufous-crowned sparrow	<i>Aimophila ruficeps</i>
American tree sparrow	<i>Spizella arborea</i>
Chipping sparrow	<i>Spizella passerina</i>
Lark sparrow	<i>Chondestes grammacus</i>
Black-throated sparrow	<i>Amphispiza bilineata</i>
Lark bunting	<i>Calamospiza melanocorys</i>
Lincoln's sparrow	<i>Melospiza lincolnii</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
Red-wing blackbird	<i>Agelaius phoeniceus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Great-tailed grackle	<i>Quiscalus mexicanus</i>
Bronzed cowbird	<i>Molothrus aeneus</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Orchard oriole	<i>Icterus spurius</i>
Northern oriole	<i>Icterus galbula bullockii</i>
House finch	<i>Carpodacus mexicanus</i>

Appendix E. Common and Scientific Names of Reptiles and Amphibians That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Tiger salamander	<i>Ambystoma tigrinum</i>
Couch's spadefoot	<i>Scaphiopus couchii</i>
Plains spadefoot	<i>Spea bombifrons</i>
New Mexico spadefoot	<i>Spea multiplicata</i>
Great Plains toad	<i>Bufo cognatus</i>
Green toad	<i>Bufo dibilis</i>
Red-spotted toad	<i>Bufo punctatus</i>
Woodhouse's toad	<i>Bufo woodhousii</i>
Canyon treefrog	<i>Hyla arenicolor</i>
Western chorus frog	<i>Pseudacris triseriata</i>
Plains leopard frog	<i>Rana blairi</i>
Bullfrog (introduced)	<i>Rana catesbeiana</i>
Northern leopard frog	<i>Rana pipiens</i>
Yellow mud turtle	<i>Kinosternon flavescens</i>
Snapping turtle	<i>Chelydra serpentina</i>
Painted turtle	<i>Chrysemys picta</i>
Ornate box turtle	<i>Terrapene ornata</i>
Big Bend slider	<i>Trachemys gaigeae</i>
Red-eared slider (introduced)	<i>Trachemys scripta</i>
Spiny softshell	<i>Trionyx spiniferus</i>
Collared lizard	<i>Crotaphytus collaris</i>
Leopard lizard	<i>Gambelia wislizenii</i>
Greater earless lizard	<i>Cophosaurus texanus</i>
Lesser earless lizard	<i>Holbrookia maculata</i>
Texas horned lizard	<i>Phrynosoma cornutum</i>
Roundtail horned lizard	<i>Phrynosoma modestum</i>
Desert spiny lizard	<i>Sceloporus magister</i>
Crevice spiny lizard	<i>Sceloporus poinsettii</i>
Eastern fence lizard	<i>Sceloporus undulatus</i>
Tree lizard	<i>Urosaurus ornatus</i>
Side-blotched lizard	<i>Uta stansburiana</i>
Chihuahuan whiptail	<i>Cnemidophorus exsanguis</i>
Checkered whiptail	<i>Cnemidophorus grahamii</i>
Little striped whiptail	<i>Cnemidophorus inornatus</i>
New Mexico whiptail	<i>Cnemidophorus neomexicanus</i>
Western whiptail	<i>Cnemidophorus tigris</i>
Desert grassland whiptail	<i>Cnemidophorus uniparens</i>
Plateau striped whiptail	<i>Cnemidophorus velox</i>
Many-lined skink	<i>Eumeces multivirgatus</i>
Great Plains skink	<i>Eumeces obsoletus</i>
Texas blind snake	<i>Leptotyphlops dulcis</i>
Western blind snake	<i>Leptotyphlops humilis</i>
Glossy snake	<i>Arizona elegans</i>
Trans-pecos rat snake	<i>Bogertophis subocularis</i>
Racer	<i>Coluber constrictor</i>
Ringneck snake	<i>Diadophis punctatus</i>
Great Plains rat snake	<i>Elaphe guttata</i>

Appendix E continued. Common and Scientific Names of Reptiles and Amphibians That May Occur in the Middle Rio Grande Floodplain.

Common Name	Scientific Name
Western hooknose snake	<i>Gyalopion canum</i>
Western hognose snake	<i>Heterodon nasicus</i>
Night snake	<i>Hypsiglena torquata</i>
Common kingsnake	<i>Lampropeltis getula</i>
Milk snake	<i>Lampropeltis triangulum</i>
Coachwhip	<i>Masticophis flagellum</i>
Striped whipsnake	<i>Masticophis taeniatus</i>
Bullsnake or gopher snake	<i>Pituophis melanoleucus</i>
Longnose snake	<i>Rhinocheilus lecontei</i>
Big Bend patchnose snake	<i>Salvadora deserticola</i>
Mountain patchnose snake	<i>Salvadora grahamiae</i>
Ground snake	<i>Sonora semiannulata</i>
Plains blackhead snake	<i>Tantilla nigriceps</i>
Blackneck garter snake	<i>Thamnophis cyrtopsis</i>
Wandering garter snake	<i>Thamnophis elegans</i>
Checkered garter snake	<i>Thamnophis marcianus</i>
Common garter snake	<i>Thamnophis sirtalis</i>
Lyre snake	<i>Trimorphodon biscutatus</i>
Western diamondback rattlesnake	<i>Crotalus atrox</i>
Blacktail rattlesnake	<i>Crotalus molossus</i>
Western rattlesnake	<i>Crotalus viridis</i>
Massasauga	<i>Sistrurus catenatus</i>