BIOLOGICAL ASSESSMENT

River Management Alternatives for the Rio Grande Canalization Project

UNITED STATES SECTION,
INTERNATIONAL BOUNDARY AND WATER COMMISSION

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River Management Alternatives for the Rio Grande Canalization Project

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United States Section, International Boundary and Water Commission

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TABLE OF CONTENTS

LIST OF FIGURES ..... **iv**
LIST OF TABLES ..... **iv**
ACRONYMS AND ABBREVIATIONS ..... **v**
SECTION 1 INTRODUCTION **1-1**
1.1 RGCP Authorization, Location, and Operation 1-1
1.1.1 Description 1-1
1.1.2 Operation and Maintenance 1-2
1.2 Report Organization and Content 1-5
SECTION 2 RIVER MANAGEMENT ALTERNATIVES **2-1**
2.1 Composition of River Management Alternatives 2-1
2.2 The No Action Alternative 2-1
2.2.1 Levee System Management 2-2
2.2.2 Floodway Management 2-5
2.2.3 Maintenance of Pilot Channel and Irrigation Facilities 2-5
2.2.4 Sediment Management 2-7
2.3 Flood Control Improvement Alternative 2-7
2.3.1 Levee System Management 2-8
2.3.2 Floodway Management 2-10
2.3.3 Maintenance of Pilot Channel and Irrigation Facilities 2-11
2.3.4 Sediment Management 2-11
2.4 Integrated USIBWC Land Management Alternative 2-11
2.4.1 Levee System Management 2-11
2.4.2 Floodway Management 2-12
2.4.3 Maintenance of Pilot Channel and Irrigation Facilities 2-16
2.4.4 Sediment Management 2-16
2.5 Targeted River Restoration Alternative 2-16
2.5.1 Levee System Management 2-17
2.5.2 Floodway Management 2-17
2.5.3 Maintenance of Pilot Channel and Irrigation Facilities 2-19
2.5.4 Sediment Management 2-20
2.6 Comparison of Alternative Features 2-20
2.7 Environmental Measures and Associated Projects 2-20
2.7.1 Linear Projects 2-20
2.7.2 Point Projects 2-25
2.7.3 Summary of Alternatives by Project 2-25

2.8 Implementation Timetable....2-29
2.8.1 Linear Projects....2-31
2.8.2 Point Projects....2-32
SECTION 3 INTERRELATED STUDIES....3-1
3.1 dRAFT eNVIRONMENTAL iMPACT iMPACT - River Management Alternatives for the Rio Grande Canalization Project....3-1
3.2 Biological Assessment - USIBWC Rio Grande Projects: American Dam to Fort Quitman, Texas....3-1
3.3 Environmental Assessment for Operation and Maintenance of the Rectification Project....3-1
3.4 Rio Grande Rectification Project Mitigation Assessment....3-2
3.5 Bridge of Americas Replacement EA....3-2
3.6 American Canal Extension Project EA....3-2
3.7 Reconstruction of the American Canal Project EA....3-2
3.8 Rio Grande Management Plan....3-3
3.9 Biological Assessment of Spoil Removal in the RGCP....3-3
3.10 EIS for El Paso-Las Cruces Sustainable Water Project....3-3
3.11 Fish and Wildlife Coordination Act Report for the El Paso-Las Cruces Regional Sustainable Water Project....3-4
3.12 Biological Assessment for the El Paso-Las Cruces Regional Sustainable Water Project....3-4
3.13 RGCP Threatened and Endangered Species Survey Technical Report....3-4
3.14 Alternatives Formulation Report....3-5
3.15 City of Las Cruces Biological Evaluation....3-5
3.16 Reformulation of River Management Alternatives for the Rio Grande Canalization Project....3-6
SECTION 4 ECOLOGICAL SETTING....4-1
4.1 Climate....4-1
4.2 Soils and Geology....4-1
4.3 Hydrology....4-2
4.4 Vegetation....4-2
4.4.1 Historic Vegetation....4-2
4.4.2 Invasive Species....4-3
4.5 Wetlands....4-5
4.6 Vegetation Community Classification....4-6
4.6.1 Riparian Communities....4-6
4.6.2 Uplands....4-8

4.7 Reference Communities 4-8
4.8 Vegetation Management Within the RGCP 4-11
4.8.1 Leased Areas 4-11
4.8.2 Mowed Areas....4-12
4.9 Aquatic Communities....4-13
4.9.1 Historic Aquatic System....4-13
4.9.2 Current Aquatic Communities....4-13
SECTION 5 METHODOLOGY....5-1
5.1 Assumptions Regarding Presence or Absence of T&E Habitat 5-1
5.2 Assumptions Regarding Effects on Potential T&E Habitat Due to Implementing Environmental Measures....5-1
5.3 Work Plan....5-2
5.4 T&E Species Information Supplied by Agencies....5-3
5.5 Terrestrial Field Survey Methods....5-3
5.5.1 Spring Field Surveys 5-3
5.5.2 Fall/Winter Vegetation Survey....5-9
5.6 Aquatic Surveys....5-9
5.6.1 Surveys at Sampling Transects....5-9
5.6.2 Additional Sampling Conducted at USFWS Mitigation Sites 5-10
SECTION 6 RESULTS....6-1
6.1 Presence or Absence of T&E Species 6-1
6.2 Effects Determination....6-1
6.2.1 No-Action Alternative....6-9
6.2.2 Flood Control Improvement Alternative....6-10
6.2.3 Integrated USIBWC Land Management Alternative 6-10
6.2.4 Targeted River Restoration Alternative....6-10
SECTION 7 REFERENCES....7-1

APPENDICES

Appendix A: Agency Correspondence
Appendix B: Description of River Management Units
Appendix C: Observed Avians
Appendix D: Observed Mammals and Reptiles During Field Surveys
Appendix E: Plant Species
Appendix F: Photo Log from Spring Terrestrial Survey Locations
Appendix G: Aquatic Survey Results
Appendix H: Life History of Five Federally Listed T&E Species with Habitat Potentially Occurring in the RGCP

LIST OF FIGURES

Figure 1-1 Location of the Rio Grande Canalization Project 1-3
Figure 2.1 Location of River Management Units 2-3
Figure 2.2 Environmental Measures to be Implemented as Linear Projects 2-23
Figure 2.3 Distribution of Point Projects in the Rincon and Mesilla Valleys 2-27
Figure 5.1 Locations of Spring Terrestrial Survey 5-5
Figure 5.2 Locations of Fall/Winter Detailed Vegetation Survey 5-7
Figure 5.3 Map of Aquatic Sampling Transects 5-11

LIST OF TABLES

Table 2.1 Estimated Needs for Levee Rehabilitation for the Flood Control Improvement Alternative 2-9
Table 2.2 Potential Levee Rehabilitation for the Integrated USIBWC Land Management and Targeted River Restoration Alternatives 2-12
Table 2.3 Comparison of Alternative Measures 2-21
Table 2.4 Linear Project Identification and Acreage 2-22
Table 2.5 Point Projects Associated with the Integrated USIBWC Land Management and Targeted River Restoration Alternatives 2-25
Table 2.6 Summaries of Projects by Measure and Alternative 2-29
Table 2.7 Implementation Timetable for Linear Projects 2-30
Table 2.8 Implementation Timetable for Point Projects 2-31
Table 4.1 Vegetation Communities and Aquatic Habitat within the RGCP 4-6
Table 4.2 Reference Communities Associated with Environmental Measures 4-9
Table 4.3 Reference Communities by Alternative 4-9
Table 4.4 Vegetation Management Within the ROW 4-11
Table 4.5 Acreage Leased in the RGCP 4-12
Table 4.6 Vegetation Management by Mowing 4-12
Table 5.1 List of Preparers 5-3
Table 5.2 T&E Species Potentially Occurring in the RGCP 5-4
Table 5.3 Transect Location for Aquatic Sampling Sites 5-10
Table 6.1 Presence/Absence of Suitable Habitat Based on Literature Review 6-3
Table 6.2 Presence or Absence Analyses for Species Based on Field Surveys 6-5
Table 6.3 Potential Effect of O&M Activities and Environmental Measures on T&E Species 6-7
Table 6-4 Effects Determination by Alternative 6-9

ACRONYMS AND ABBREVIATIONS

AFR	Alternatives formulation report
AWP	Aransas-Wood buffalo population
BA	Biological assessment
BLM	United States Bureau of Land Management
BMP	Best management practices
cfs	Cubic feet per second
DEIS	Draft environmental impact statement
EA	Environmental assessment
EBID	Elephant Butte Irrigation District
EIS	Environmental impact statement
FONSI	Finding of no significant impact
FR	Federal Register
GIS	Geographic information system
GPS	Global positioning system
NEPA	National Environmental Policy Act
NMGF	New Mexico Department of Game and Fish
NRCS	Natural Resources Conservation Service
O&M	Operation and maintenance
PL	Public law
RGCP	Rio Grande Canalization Project
RMU	River management unit
ROW	Right-of-way
SWEC	Southwest Environmental Center, Las Cruces, New Mexico
T&E	Threatened and endangered
TPWD	Texas Parks and Wildlife Department
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USIBWC	United States Section, International Boundary and Water Commission
WHAP	Wildlife habitat appraisal procedure

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SECTION 1
INTRODUCTION

The purpose of this biological assessment (BA) is to evaluate the effects on threatened and endangered (T&E) species as a result of implementing river management alternatives for the Rio Grande Canalization Project (RGCP). The United States Section, International Boundary and Water Commission (USIBWC) proposes to implement expanded ecosystem-enhancing river management strategies for its RGCP operation and maintenance (O&M) activities, while continuing to deliver water and provide flood control in accordance with the existing convention, treaty, and agreements between the United States and Mexico. Proposed changes in the RGCP O&M and implementation of environmental measures would constitute a major federal action. Potential river management alternatives are currently under evaluation in a draft environmental impact statement (DEIS). This BA will enhance USIBWC's compliance with the following federal and state laws and regulations:

- National Environmental Policy Act (Public Law [PL] 91-190, 42 United States Code, [USC] 4321 et seq.)
- Endangered Species Act of 1973 (PL 93-205) and amendments of 1988 (PL 100-478)
- New Mexico Endangered Plant Species Act (9-10-10 New Mexico Statutes Annotated and attendant Regulation 19 New Mexico Annotated Code 21.2)
- New Mexico Wildlife Conservation Act of 1974 (New Mexico Statutes Annotated 17-2-37 through 17-2-46, 1978 compilation)
- Chapters 67 and 68 of the Texas Parks and Wildlife Code, and Section 65.171-65.184 of Title 31 of the Texas Administrative Code.

1.1 RGCP AUTHORIZATION, LOCATION, AND OPERATION

1.1.1 Description

The RGCP was constructed between 1938 and 1943, as authorized by an Act of Congress approved June 4, 1936 (49 Stat. 1463) to facilitate compliance with the 1906 Convention and properly regulate and control, to the fullest extent possible, the water supply for use in the two countries (United States and Mexico) as provided by the treaty. The RGCP includes the river channel and adjoining right-of-way (ROW) land for which the USIBWC has legal control. The RGCP extends for 105.4 miles along the Rio Grande from the Percha Diversion Dam, located downstream from Caballo Dam in Sierra County, New Mexico, to the vicinity of the American Diversion Dam in El Paso County, Texas. Figure 1-1 depicts the RGCP location.

The 1936 Act authorized construction of the RGCP in agreement with the Engineering Record Plan of December 14, 1935 (Baker 1943). Major elements of the plan were acquisition of ROW for the river channel and adjoining floodways; improvement of the alignment and efficiency of the river channel conveyance for water delivery; and flood control

measures extending through the Rincon and Mesilla Valleys of New Mexico and El Paso Valley in Texas.

As part of the RGCP, a deeper main channel was dredged for a length of 95 miles to facilitate water deliveries for irrigation. The river varies in width from 175 to 300 feet with a depth of 2 to 3 feet in the lower reaches and 7 to 10 feet in the upper reaches. Sections of the river bank are armored with rock revetment to reduce erosion and help maintain a consistent channel alignment. The canalization process removed a number of meanders, reducing the overall RGCP length by approximately 10 miles due to channel cutoffs (Baker 1943).

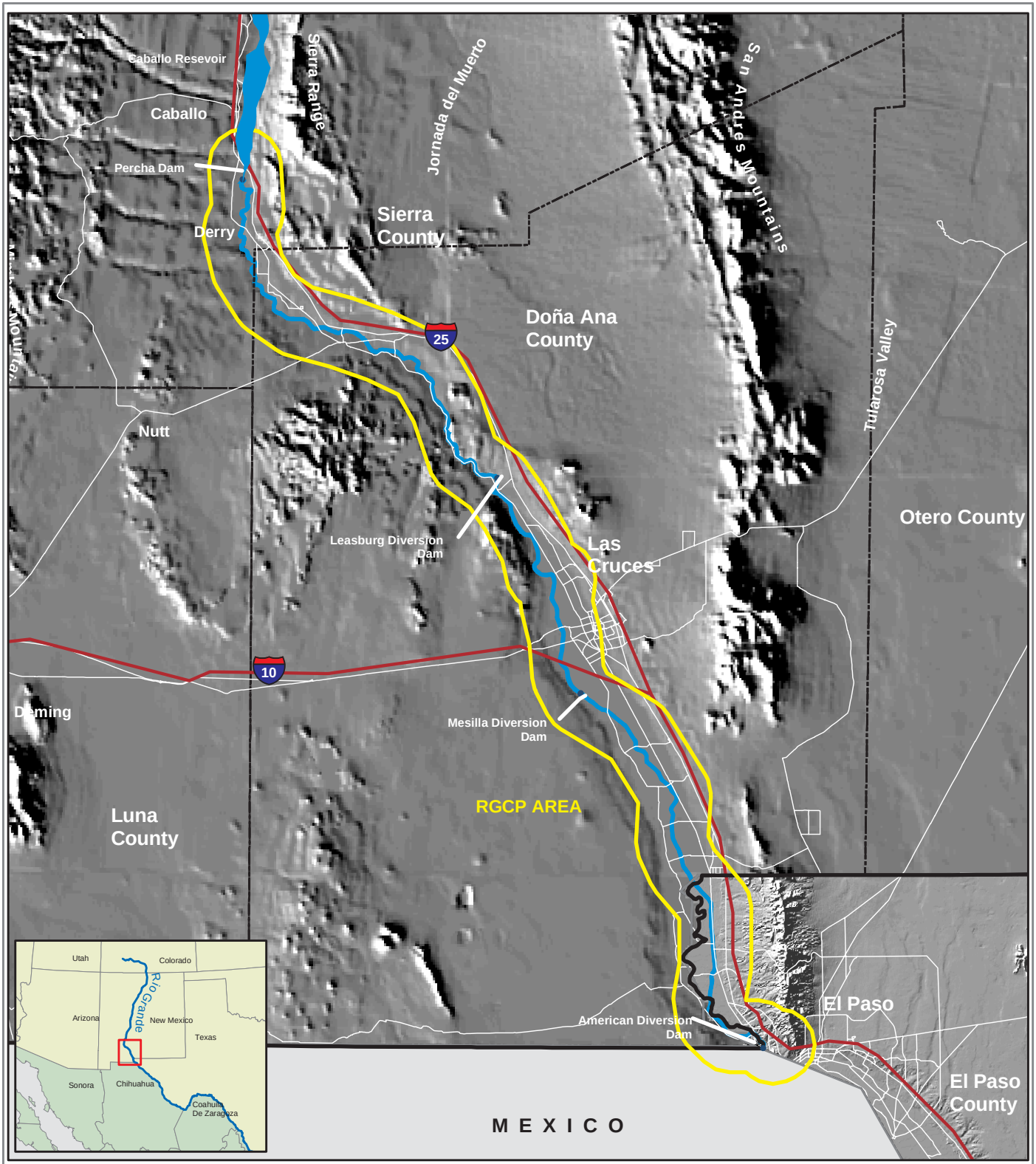
Flood control levees were placed along 131 miles of the RGCP, nearly two-thirds of its length. Associated flood control activities included clearing and leveling of approximately 3,400 acres on the floodplain, diverting arroyo outlets, and constructing sediment control dams. The total sediment volume moved during the original RGCP was over 13 million cubic yards (Baker 1943). Additional features included installation of pipe culverts and drainage gates, removal and construction of bridges, building of access roads, and placement of miles of fence revetment to prevent erosion and create new channel banks.

A significant operational change since completion of the RGCP was construction of sediment/flood control dams in tributary arroyos in the early 1970s by the United States Natural Resources Conservation Service (NRCS). A combination of flood control dams at Broad Canyon, Green Canyon, Arroyo Cuervo, and Berrenda Arroyo, controls discharges over 300 square miles of the RGCP tributary basin, and reduces the flood peak frequency by an estimated 40 percent (U.S. Army Corps of Engineers [USACE] 1996).

Improvement in efficiency of the river channel conveyance was required to deliver irrigation waters to both Mexico, in compliance with the Convention of 1906, and the Rio Grande Project in the Las Cruces and El Paso region. The Rio Grande Project is a regional water initiative coordinated by the U.S. Bureau of Reclamation (USBR) that furnishes irrigation water for about 178,000 acres of land, and electric power for communities and industries in south-central New Mexico and west Texas. Elephant Butte Reservoir, constructed between 1912 and 1916, provides most of the storage for the Rio Grande Project, while three diversion dams route stored water to the irrigation canals: Leasburg Dam, completed in 1908, and Percha and Mesilla Dams, constructed between 1914 and 1919 (USBR 2002).

1.1.2 Operation and Maintenance

The USIBWC has been responsible for maintaining flood control and water delivery capabilities of the RGCP since its completion in 1943. To accomplish this mission the agency performs O&M activities that include sediment removal from the channel and lower end of the arroyos; leveling of the floodway; vegetation management along channel banks, floodway, and levees; replacement of channel bank riprap; care of dams on arroyos; and maintenance of infrastructure such as levee roads, bridges, and gates at the American Diversion Dam.



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UTM Zone 13 N / NAD 83

0 5 10 20 30 40 Kilometers

0 3 6 12 18 24 Miles

Figure 1-1 Location of Rio Grande Canalization Project (RGCP)

United States Section,
International Boundary Water Commission

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Throughout the years the USIBWC has strived to incorporate environmental measures and operate and maintain the RGCP to enhance ecosystem conditions while complying with the Congress-mandated mission of flood control and efficient water deliveries to the States of New Mexico and Texas, as well as Mexico. Environmental measures included limited planting of cottonwood trees, selective mowing to retain native vegetation and control salt cedar, test areas of limited mowing, and use of artificial in-stream structures to diversify aquatic habitat as required by a Section 404 dredging permit issued by the USACE. Descriptions of O&M activities and proposed environmental measures are discussed in detail in Section 2.

1.2 REPORT ORGANIZATION AND CONTENT

The BA is organized into seven sections.

- Introduction – Describes the RGCP location, authorization, and operations.
- Description of Alternatives – Describes the river management alternatives under consideration by the USIBWC (note: currently no preferred alternative has been selected).
- Interrelated Studies – Presents a summary of major environmental studies conducted for and related to the RGCP.
- Ecological Setting – Provides a review of the historical setting and existing conditions of the RGCP.
- Methodology – Describes methods used for determining effects of the river management alternatives on T&E species.
- Results – Presents the effects determination of the no-action and action alternatives.
- References – Lists the references used to establish methods and results of report.

The appendices provide information on agency correspondence; RMU descriptions; observed bird, mammal, reptile, and plant species; terrestrial survey locations and habitat; aquatic survey results; and habitat requirements for five federally listed T&E species potentially occurring within the RGCP.

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SECTION 2
RIVER MANAGEMENT ALTERNATIVES

Four river management alternatives (the Alternatives) are under consideration within the DEIS. The USIBWC will select an alternative for implementation after public comments on the DEIS. Because no preferred alternative has been selected by the USIBWC, each alternative is described in this section and an effects determination for each is presented in Section 6.

2.1 COMPOSITION OF RIVER MANAGEMENT ALTERNATIVES

The Alternatives are composed of mission activities and environmental measures. Mission activities include ongoing O&M practices as well as future actions such as levee rehabilitation.

Mission activities and environmental measures for each alternative are described based on four management categories:

- Levee system management
- Floodway management
- Maintenance of pilot channel and irrigation facilities
- Sediment management

Mission activities and environmental measures are also described based on their respective location with the RGCP. The RGCP was subdivided into seven distinct geographic reaches identified as river management units. Each RMU presents unique opportunities and limitations for floodway management and implementation of environmental measures. Appendix B provides a description of each RMU and Figure 2-1 shows the location of RMUs.

Implementation of environmental measures results in either linear or point projects. Linear projects extend over several miles while point projects were limited to site-specific locations.

2.2 THE NO ACTION ALTERNATIVE

The No Action Alternative consists of continuing O&M activities currently conducted by the USIBWC. Those activities are directed toward flood protection and water delivery, with some activities involving environmental improvements. The No Action Alternative is "no change" from current management direction or level of management intensity.

Maintenance activities are accomplished to ensure that the flood control and water delivery objectives of the RGCP can be met. The two primary locations where O&M activities are carried out are El Paso, Texas and Las Cruces, New Mexico. The USIBWC regularly patrols the RGCP from these locations and conducts inspections prior to the flood

and irrigation season of early March through September. Engineering surveys are performed regularly to identify potential problem areas due to sediment accumulation. The channel is inspected for bank sloughing, washing, or erosion during and after all flood events. Corrective actions are taken if problems are identified.

Key features of the No Action Alternative are:

- Levee system management.
- Floodway management through mowing and grazing leases.
- Maintenance of pilot channel and irrigation facilities.
- Sediment management.

2.2.1 Levee System Management

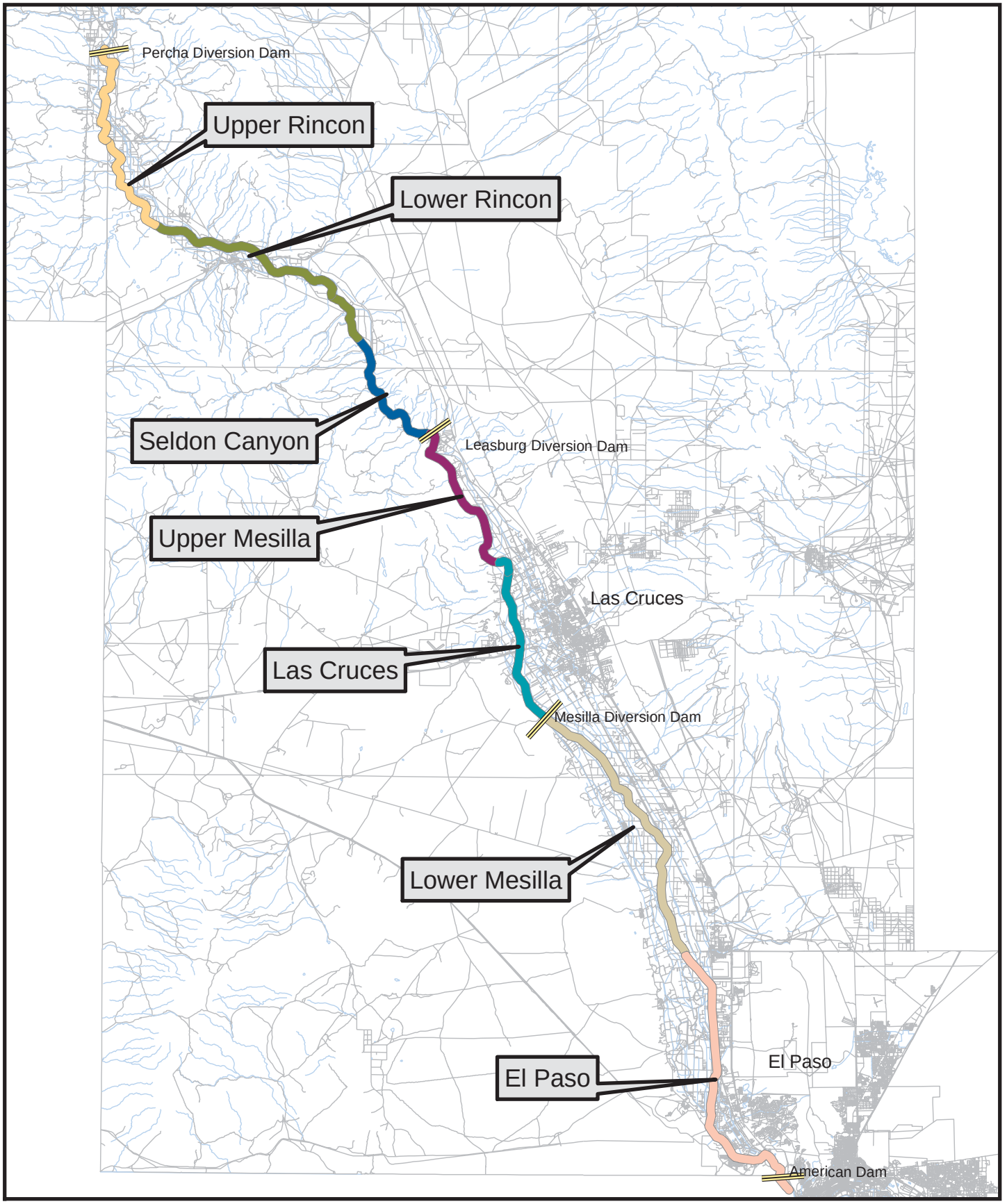
The RGCP flood control system was constructed in conjunction with the canalization project from 1938 to 1943. The system was designed to provide protection from a storm of large magnitude with a very low probability of occurrence, the 100-year storm (probability of one event every 100 years). Flood control in the RGCP relies on upstream flow regulation as well as the use of levees to contain high-magnitude flooding in areas with insufficient natural terrain elevation.

Flood control levees extend for 57 miles along the west side of the RGCP, and 74 miles on the east side for a combined total of 131 miles. Naturally elevated bluffs and canyon walls contain flood flows along portions of the RGCP that do not have levees. The levees range in height from about 3 feet to about 18 feet and have slopes of about 3:1 (length to width) on the river side and 2.5:1 on the "land" side. The levees have a gravel maintenance road along the top.

The levees are positioned on average about 750 to 800 feet apart north of Mesilla Dam and 600 feet apart south of Mesilla Dam. The floodway between the levees is generally level or uniformly sloped toward the channel. The floodway contains mostly grasses, some shrubs, and widely scattered trees. The bank of the channel at the immediate edge of the floodway is typically vegetated with a narrow strip of brush and trees. Levees were originally built to provide 3 feet of freeboard during the design flood in most reaches.

Levees are inspected regularly at the beginning of each flood season and immediately after each flood event. Maintenance includes encouraging grass growth on the levee slopes for erosion control, cutting brush and tall weeds from the slopes, and repairing levee slopes. Levee slopes are mowed to prevent growth of brush and trees that could obstruct flows, or cause root damage to the structure itself.

Levee roadways are generally unpaved gravel roads designed for passage of O&M personnel and equipment. Levee maintenance includes road grading and road resurfacing with gravel as needed. The entire levee road system for RGCP is resurfaced within a 20-year cycle.



North

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UTM Zone 13 N / NAD 83

0 5 10 20 30 40 Kilometers

0 2.5 5 10 15 20 Miles

Figure 2-1 Location of River Management Units

United States Section,
International Boundary Water Commission

J:\736\736620\IBWC Drive\Projects\Management units.mxd

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2.2.2 Floodway Management

Mowing of the Floodway

Mowing of the floodway outside the main channel but between the flood control levees is maintained to remove obstructions. Mowing of the floodway controls weed, brush, and tree growth, and is conducted at least once each year prior to July 15. Farm tractors with rotary slope mowers are generally used to mow the floodways. Slope mowers are used for vegetation maintenance on the channel banks. Some areas with dense vegetation require a second late summer mowing.

Since 1999 the USIBWC has conducted limited tree planting and maintained provisional test areas ("no-mow" zones) intended to evaluate effects of additional vegetation growth on RGCP functions. Tree planting has been limited to approximately 800 non-irrigated cottonwood poles planted individually at 100-foot intervals. Due to drought conditions in recent years, only a fraction of the poles remain.

Three no-mow zones are currently maintained. The first no-mow zone extends 5 miles on each side of the river, from Percha Dam to the Doña Ana County line, and ranges in width from 10 to 35 feet. At an average 20-foot width, it covers approximately 24 acres. A second no-mow zone extends 5 miles on each side of the river, from Shalem Bridge to Picacho Bridge, where vegetation is allowed to grow for a width of 35 feet. The extent of this no-mow zone is approximately 33 acres. Regular mowing is maintained in areas adjacent to bridges (400 feet upstream and downstream from the structure) and access points to the river (100-foot segments located at 800-foot intervals). In combination, the two no-mow zones previously described cover less than 1 percent of the 8,332-acre floodway within the ROW. A third no-mow zone corresponds to Seldon Canyon where USIBWC historically has not conducted mowing operations, as the agency's jurisdiction is limited to the channel bed and stream bank.

Grazing Leases

The USIBWC administers a land lease program in the RGCP. Currently, approximately 43 percent of the total 8,332 acres of the RGCP floodway are leased. No permanent structures may be constructed on the RGCP floodway. By leasing land within the floodway, the need for mowing is reduced (USIBWC 2000).

2.2.3 Maintenance of Pilot Channel and Irrigation Facilities

Channel Maintenance

Maintenance of the pilot channel is performed during non-irrigation periods when water levels are lowest. The RGCP main channel is maintained by removing debris and deposits, including sand bars, weeds, and brush that grow along the bed and banks. Any major depositions or channel closures caused by sediment loads from arroyo flows are removed.

Channel excavation is performed with bulldozers, excavators, front end loaders, and scrapers either from the channel bank or from within the channel. Normal maintenance work on the main channel is conducted during the non-irrigation and non-flood seasons from September 15 to March 1. Islands and sandbars with vegetation may remain in place as long as the river's carrying capacity is not significantly affected. If required, annual maintenance includes placement of additional riprap to protect meandering channel and stream banks. Any scouring or gouging of the banks due to flooding is repaired immediately.

Because the 1970 dams in tributary basins control over one-third of the upper RGCP basin north of Leasburg Dam (USACE 1996), dredging of the main channel has been conducted infrequently. A study on the scour and deposition of sediments within the main RGCP channel was conducted by the USACE (1996) as part of a functionality evaluation of the RGCP. The extent of bed elevation changes in the channel was evaluated for low, high, and 100-year flows.

The USACE study estimated that consecutive years of low flow conditions would result in only minor scour and deposition along the river. A more significant scour (maximum 2.6 feet) and deposition (maximum of 1 foot) were estimated for a 10-year period of consecutive elevated flows. For a 100-year flood, changes ranged from a maximum deposit of 0.7 feet to maximum scour of 1.7 feet. A more significant deposition (greater than 5 feet of sediment) was predicted for a limited number of channel cross sections downstream from Rincon Arroyo, Trujillo Canyon, Tierra Blanca Canyon, Placitas Arroyo, and Faulkner Arroyo (USACE 1996).

Maintenance of Irrigation Facilities

Drainage and irrigation structures in the RGCP are licensed to other entities by the USIBWC. The USIBWC Project Manager confirms that the licensee adequately maintains the structures, and that all inlet and outlet channels to the structures are kept open and free of debris.

The Hatch and Rincon Siphons, operated and maintained by USIBWC and Elephant Butte Irrigation District (EBID), are subject to erosive forces that, if not controlled, would impact the integrity of the structures. The USIBWC and EBID protect the siphons by maintaining slow-moving backwater with riprap dams across the channel at siphon crossings. Boulders are added periodically to reinforce the dams when excessive flows cause damage. The USIBWC completed engineering construction for erosion protection of the two siphons as well as preliminary design of the Picacho flume (Montgomery Watson 2000, 2001).

Maintenance of American Diversion Dam

American Diversion Dam, defining the southern boundary of the RGCP, is operated by the USIBWC. The USIBWC Project Manager cooperates and coordinates dam operations with the USBR to ensure that water delivery objectives are met. Normal maintenance of the American Diversion Dam is performed during the non-irrigation season. Three other

diversion dams associated with the RGCP (Percha Dam, Leasburg Dam, and Mesilla Dam) are operated and maintained by EBID.

2.2.4 Sediment Management

Maintenance of NRCS Dams

Under an agreement with the EBID and Caballo NRCS District (IBM 65-356 dated December 10, 1965 and Supplement No. 1 dated February 15, 1974), the USIBWC is responsible for maintaining five NRCS sediment control dams and associated access roads. This maintenance includes mowing discharge canal slopes; cleaning and maintaining trash racks, intakes, and outlets; repairing fences; and grading access roads. This maintenance allows dams to perform effectively in reducing sediment load to the river and reducing flood potential. The USIBWC monitors the level of sediment in the dams to ensure that outlet gates on the discharge structure are set to the proper level. PL 93-126; Stat. 451, approved October 18, 1973, limits the USIBWC maintenance expenditures to $50,000 per year. Maintenance work is generally done annually following joint inspections by the USIBWC, NRCS, and EBID personnel.

Sediment Removal from the Mouth of the Arroyos

The USIBWC conducts dredging at the mouth of the arroyos to maintain grade of the channel bed and ensure the channel conveys irrigation deliveries. Channel excavation is performed with bull dozers, excavators, front end loaders, and scrapers, either from the channel bank or from within the channel.

In 1998 artificial fish habitat structures were placed at 13 locations within the RGCP channel as a mitigation action required by the USACE Clean Water Act Section 404 permit for dredging sediments from the mouth of several arroyos. Three types of structures providing variable water velocity habitat for aquatic organisms were tested in the Upper Rincon Valley: vortex weirs (two structures), embayments (three structures), and rock groins (seven structures). These various structures, built to test their performance as fish habitat, were monitored over a 3-year period, and most are currently silted and no longer functional.

Sediment Disposal

Sediment collected from channel excavation, arroyo mouth maintenance, and other sediment control efforts is deposited on the floodway, on upland spoil areas, or on other federal or private lands approved for this purpose.

2.3 FLOOD CONTROL IMPROVEMENT ALTERNATIVE

The primary focus of this Alternative is to address known or potential flood control deficiencies in the RGCP. Key features of this Alternative are to:

- Improve the levee system in terms of flood containment capacity (potential for peak water levels to reach the levees); and
- Improve erosion control in uplands and floodway to reduce sediment load to the RGCP and improve water quality.

Although the actions described below are primarily intended to improve RGCP functionality, they offer opportunities for environmental improvements in the river and floodway. For instance, backwaters associated with erosion protection structures provide a valuable fish habitat, while sediment management practices could lead to reduced dredging and improved wildlife habitat.

2.3.1 Levee System Management

Current Practices

The Flood Control Improvement Alternative would retain routine maintenance of the levee system in terms of inspections, erosion, vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

In addition to routine levee maintenance, this Alternative takes into consideration a potential increase in flood containment capacity. Flood containment capacity, as evaluated in 1996 by the USACE, identified a number of potential deficiencies in the RGCP on the basis of hydraulic modeling of the 100-year storm. Those findings were re-evaluated as part of the development of the DEIS to include potential effects of environmental measures such as vegetation growth in the floodway (Parsons 2001a; 2003).

Table 2.1 presents current estimates of the need to increase levee height or build new levees in the RGCP. Data are presented for the entire length of the RGCP and subdivided geographically by RMU. Construction of a 2.8-mile floodwall in the Canutillo area to replace a discontinuous railroad berm would be a priority action for flood control (USACE 1996). Most of the potential levee deficiencies are located in the southern, mostly urbanized reaches of the RGCP (El Paso RMU). Potential deficiencies were also identified for 8.8 miles of unconfined RGCP sections where simulated flood levels could extend past the ROW. Approximately 3 miles of unconfined ROW fall within government-controlled land where extending the floodplain past the ROW boundary is acceptable. Therefore, only 6 miles of new levee are projected.

Table 2.1 Estimated Needs for Levee Rehabilitation for the Flood Control Improvement Alternative

		RIVER MANAGEMENT UNIT						
	ENTIRE RGCP	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO
RIVER MILE:	**105 - 0**	**105 - 90**	**90 - 72**	**72 - 63**	**63 - 51**	**51 - 40**	**40 - 21**	**21 - 0**
Current Flood Control (miles)								
Unconfined ROW length	81.6	24.0	9.6	18.0	14.0	1.9	0.0	14.1
Existing Levees	13	8.0	30.4	0.0	8.0	20.5	38.0	24.7
Total for RGCP (east and west side)	211	32.0	40.0	18.0	22.0	22.4	38.0	38.8
Rehabilitation Measures (miles)								
New levee (6' height)	6.0	0.0	0.6	0.0	0.0	0.0	0.0	5.4
Floodwall (8 ft, Canutillo area)	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Raise levee (2 ft. average)	60.1	0.0	9.0	0.0	5.4	18.2	10.2	17.3
Riprap cover (for velocities >4 ft./sec)	3.2	0.2	1.0	0.0	0.0	0.0	0.9	1.1

Preliminary Flood Control Improvement Estimates

The Flood Control Improvement Alternative incorporates levee height increase and building of additional levees or floodwalls as the two measures to be considered in the DEIS to increase flood containment capacity. These measures were adopted only as a work assumption to estimate effects of potential construction activities because of the potential overestimation of levee deficiencies in terms of flood containment capacity, and incomplete information on the structural integrity of the levee system. The assumption adopted in the DEIS is that existing levees would be raised to meet freeboard design criteria or new levees would be constructed in unconfined areas where flood levels would extend past the ROW boundary.

Results of this evaluation are required to ascertain the need for a levee rehabilitation program, and to reassess the overall flood control strategy for the RGCP. Such strategy might incorporate the addition of non-structural flood control measures such as flood easement acquisitions, limited levee setbacks to increase flood dissipation in the floodway, and/or removal of sediment within the floodplain that was deposited from dredging operations since project inception.

In areas where rebuilding of levees would be required, existing levee material would be re-engineered with clay material to meet specifications for the new levee. Additional material would be obtained from sediment removed from the active river channel as a result of maintaining channel capacity or from new borrow sites. Other sources of levee material would be from implementation of environmental measures such as lowering the bank in the form of successively low benches to promote establishment of cottonwood/willow seedlings, and reopening of old meanders.

2.3.2 Floodway Management

Mowing of the Floodway

No changes are proposed relative to the No Action Alternative.

Modified Grazing Practices

A management program would be developed and implemented in coordination with the NRCS to improve erosion control in areas within the ROW currently leased for grazing. Those areas include the floodway and uplands where the sloped terrain is more susceptible to erosion during storm events. The program would adopt additional best management practices (BMP) according to conditions at each specific location. These BMPs would include physical methods such as placement of erosion control blankets in areas not yet vegetated, modified guidelines for livestock grazing leases, and monitoring to ensure vegetation is properly maintained.

Currently livestock grazing is allowed on 3,552 acres of RGCP land through leases (USIBWC 1994). Grazing can impact riparian areas leading to a higher weed cover, or trampling and creation of trails, which are susceptible to erosion due to over-concentration of cattle (Kaufman and Krueger 1984). BMPs identified would be implemented within the framework of the USIBWC directive for management of grazing leases (USIBWC 2002). This directive assigns responsibilities for monitoring grazing leases, and requires lease renewals to be in compliance with USEPA's guidance for grazing in public lands (USEPA 1994), and Pollution Prevention/Environmental Impact Reduction Checklist for Grazing (http://es.epa.gov/oeca/ofa/pollprev/graze.html).

Details concerning the modified grazing program would be developed in concert with regulatory agencies. However, it is assumed that uplands grazing regimens would be modified to promote forage production for the purposes of wildlife and watershed protection. Subsequent vegetative response would result in increased vegetation cover and reduced soil erosion. The grazing program could include vegetative treatments such as seeding, prescribed burns, and mechanical thinning of woody vegetation. The purpose of the treatments is to increase species and structural diversity, reduce soil erosion, and increase the amount of cool season grasses.

It is anticipated that floodway grazing in some leases could be suspended temporarily until the vegetation responds at the appropriate level, at which time grazing would be reinstated to manage forage production. Cessation of grazing from riparian areas until riparian function is restored is consistent with current U.S. Bureau of Land Management (BLM) guidelines (BLM 1993). Modification of the floodway grazing regime would be adjusted based on site-specific conditions to achieve the desired community.

Based on vegetation response, salt cedar control and or mowing could be implemented to reduce recruitment of invasive vegetation. The USIBWC would implement additional BMPs for erosion control that could include: 1) reducing mowing frequency and/or increasing

mowing height to allow some vegetation recovery; 2) rotating mowing between grazing leases; 3) reducing frequency and extent of grading operations within the floodway; 4) mulching and seeding graded areas to minimize erosion; and 5) using erosion control fabric, silt fences, hay bales, and other measures to prevent erosion.

2.3.3 Maintenance of Pilot Channel and Irrigation Facilities

No changes are proposed relative to the No Action Alternative.

2.3.4 Sediment Management

No changes are anticipated with respect to the No Action Alternative in maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

2.4 INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE

This Alternative incorporates environmental measures within the floodway in combination with actions for flood control improvement, erosion protection, and reassessment of sediment management practices as previously identified for the Flood Control Improvement Alternative. The Integrated USIBWC Land Management Alternative restricts all environmental measures to RGCP lands under USIBWC jurisdiction. Key features of this Alternative are to:

- Develop a riparian corridor for bank stabilization and wildlife habitat by lowering the stream bank ("shavedown") and native plantings; and
- Promote development of native grasses in combination with salt cedar control to create "beads" surrounding and connecting riparian bosque.

2.4.1 Levee System Management

Current Practices

This Alternative retains routine maintenance of the levee system in terms of levee erosion, vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

The Alternative incorporates a re-evaluation of the RGCP flood containment capacity as previously described for the Flood Control Improvement Alternative, with an increase in floodway vegetation. Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the Alternative as a work assumption in the DEIS to estimate potential effects of construction activities. Input data for the Targeted River Restoration Alternative, which incorporates moderately smaller floodway vegetation growth, were used in the simulation, and the results applied without modification to the Integrated

USIBWC Land Management Alternative. Modeling results indicated an increase in levee rehabilitation due to greater amount of vegetation on the floodway relative to the Flood Control Improvement Alternative (Table 2.2).

Table 2.2 Potential Levee Rehabilitation for the Integrated USIBWC Land Management and Targeted River Restoration Alternatives

		RIVER MANAGEMENT UNIT						
	ENTIRE RGCP	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO
RIVER MILE:	**105 - 0**	**105 - 90**	**90 - 72**	**72 - 63**	**63 - 51**	**51 - 40**	**40 - 21**	**21 - 0**
Current Flood Control (miles)								
Unconfined ROW length	81.6	24.0	9.6	18.0	14.0	1.9	0.0	14.1
Existing Levees	130	8.0	30.4	0.0	8.0	20.5	38.0	24.7
Total for RGCP	211	32.0	40.0	18.0	22.0	22.4	38.0	38.8
Rehabilitation Measures (miles)								
New levee (6' height)	6.0	0.0	0.6	0.0	0.0	0.0	0.0	5.4
Floodwall (8 ft, Canutillo area)	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Raise levee (2 ft. average)	63.1	0.0	10.5	0.0	5.7	18.7	10.5	17.3
Riprap cover (for velocities >4 ft./sec)	3.2	0.2	1.0	0.0	0.0	0.0	0.9	1.1

2.4.2 Floodway Management

Two measures considered under the No Action Alternative are modified under the Integrated USIBWC Land Management Alternative, namely management of grazing leases and annual vegetation mowing. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP. For vegetation management, four measures described below are incorporated to partially replace mowing in various reaches of the RGCP:

- Modified grassland management;
- Native vegetation planting;
- Bosque enhancement; and
- Reconfiguration of stream banks for regeneration of native woody vegetation (shavedowns).

Modified Grassland Management

Currently both floodway and levee slopes in the RGCP are mowed at least once a year prior to July 15. The purpose of mowing is to control growth of shrubs and trees, primarily salt cedar. Salt cedar can reach up to 9 feet in height in a single growing season and must be controlled annually. The modified grassland management would replace current mowing

regimes in selected areas to improve wildlife habitat by 1) increasing vegetation diversity, 2) developing native herbaceous vegetation, and 3) improving the riparian corridor and upland/riparian interface. To continue providing salt cedar control, control methods such as herbicide, mechanical (mowing), manual and/or burning would be instituted. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Site preparation, salt cedar treatments (*e.g*. mowing followed by herbicide) and shallow disking to prepare soil and chemical treatments (salinity management);
- Seeding of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions, and vegetation treatments which promote establishment and sustainment of native species. Monitoring would be in place to assess treatment results and modify methods as appropriate.

The modified grassland management areas are outside the hydrologic floodplain and would be dominated by intermediate and xeric native species. Depressions and shallow groundwater interspersed within these areas would support mesic and hydric vegetation, potentially creating additional diversity and improved wildlife habitat.

Native Vegetation Planting

Planting is the environmental measure used to establish native riparian vegetation in areas not in proximity to the river. Restoration by planting may be accomplished through seeding, transplants, and pole planting. Depending on the planting method, establishment could require irrigation or micro-irrigation to increase the probability of success (Dressen *et al.* 1999).

Seeding. Seeds of native plants can be purchased from suppliers or collected from nearby areas and distributed in the floodway. Success of seedling establishment must be accompanied by clearing competing vegetation, particularly invasive exotic species.

Transplants. Trees, shrubs, and herbaceous plants may be transplanted into riparian zones. A few well established individuals can help contribute seeds to the site as well as provide immediate wildlife benefits.

Pole Planting. This technique involves obtaining long poles, or branches, from live trees and planting them in holes. Cottonwoods and willows are two species that can be successfully grown from poles. Areas would be planted with trees approximately 3 years old, placing the poles directly in contact with shallow ground water. This is accomplished by digging a hole with an auger to the water table. Poles are then pushed through so the root system is in contact with the water and the hole is refilled with dirt. Poles must be planted while they are dormant (*i.e*., from January through April of each year). Poles are usually wrapped with chicken wire to protect them from girdling by beavers.

Researchers have increased the success of pole planting through such methods as 1) using very long poles inserted into holes drilled to the groundwater; 2) drilling holes to groundwater, backfilling with soil or mulch, and planting poles on top of the backfilled hole; 3) irrigating poles until their roots have reached groundwater; and 4) promoting root growth by applying rooting hormone compounds. Site specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, micro topography survey *etc*.;
- Site preparation, including removal of established salt cedar and treatment of suppressed (recently mowed) salt cedar;
- Soil preparation, including physical (*i.e*. disking) and chemical treatments (salinity management);
- Seeding or planting of native vegetation; and
- Implementation of a maintenance and monitoring plan

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

Bosque Enhancements

This measure involves selective removal of exotic vegetation in existing bosques to allow establishment of native vegetation (Southwest Environmental Center [SWEC] 2002). Sites selected for bosque enhancement include wooded areas within the hydrologic floodplain. The process of selective removal would likely be extended to other restored areas as a long-term practice once riparian vegetation became established. Site specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, and micro topography survey;
- Site preparation, including removal of established salt cedar;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation, and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants

and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

Reconfiguration of Stream Banks for Native Woody Vegetation Regeneration (Shavedowns)

This measure would allow overbank flooding within the floodway by shaving down the banks to within 1 foot of the irrigation flows to promote inundation during moderately-high storm flows. The process of shaving down would reconnect portions of the river and former floodplain. Overbank flooding within the floodway would provide conditions suitable for establishment and maintenance of native riparian species, particularly cottonwoods, whose seeds have a short period of viability and will only germinate in moist soil (Stromberg and Patton 1991). Implementing this environmental measure would sufficiently lower the floodway at selected locations and allow for potential inundation during the months of March and April. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, and micro topography survey;
- Site shavedown and relocation of soil to levee and floodway;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

Lowering of Stream Banks. Cottonwood regeneration through overbank flows would require land preparation, including disking, shavedowns, and partial excavation of areas inundated at peak flow levels. Excavation would be performed in selected locations of the floodway to re-shape the bank, forming a series of low terraces subject to intermittent overflows and allowing the establishment of vegetation adapted for those patterns. This measure is based on the partial stream restoration concept successfully implemented in the Middle Rio Grande at the Overbank Flow Project near Albuquerque, New Mexico, and the Bosque del Apache National Wildlife Reservation (Crawford *et al*. 1999).

Best Management Practices. BMPs would be applied for bank protection and would increase the probability of vegetation development as bank shavedowns exposed to high water velocities may not support a diverse riparian habitat. Three strategies for bank protection that would be utilized are back flooding, bench configuration, and land grading. A maintenance and monitoring plan would also be implemented.

Back Flooding. Back flooding is a method whereby river water enters a drainage channel that is lower than river elevation through a downstream cut in the bank and minimizes the runoff distance when river water recedes. Backflooding minimizes water velocity over excavated areas until vegetation is established. This construction method would create a habitat similar to opening a former meander to the river on the downstream end. For bank shavedown areas located on the outer bend of the river, a river diversion barrier parallel to the river and between the bank shavedown area and the river would be used to slow overbank flows (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm).

Bench Configuration. The stream bank would be lowered in the form of up to three successively low benches, and then a few broad and shallow side channels would run through the benches to promote better seedling establishment.

Land Grading. A grading plan would be prepared that establishes which areas of the site will be graded, how drainage patterns will be directed, and how runoff velocities will affect receiving waters. The grading plan would also include information regarding when earthwork will start and stop, the degree and length of finished slopes, and where and how excess material will be disposed. Berms, diversions, and other storm water practices that require excavation and filling would also be incorporated into the grading plan.

2.4.3 Maintenance of Pilot Channel and Irrigation Facilities

No changes are expected relative to the No Action alternative.

2.4.4 Sediment Management

No changes are expected associated with the No Action Alternative regarding maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

2.5 TARGETED RIVER RESTORATION ALTERNATIVE

Relative to the previous Alternatives, the Targeted River Restoration Alternative emphasizes environmental measures associated with partial restoration of the RGCP, such as various methods for riparian corridor development, and opening of meanders and modification of arroyos to increase aquatic habitat diversification. Native vegetation establishment by overbank flows would be induced by controlled water releases from Caballo Dam during high storage conditions in Elephant Butte Reservoir. Environmental measures would also extend beyond the ROW through voluntary conservation easements to preserve wildlife habitat and encourage bosque development. This Alternative also includes actions previously identified for flood control improvement. Key features of this Alternative are to:

- Develop a riparian corridor for bank stabilization and wildlife habitat;
- Increase opportunity of overbank flows using controlled water releases;

- Manage grasslands in combination with salt cedar control to "connect" riparian bosque locations in the floodway and river/upland ecotone;
- Reopen low-elevation meanders, in addition to arroyo habitat, to provide backwater habitat and associated riparian vegetation; and
- Establish voluntary conservation easements outside the ROW to preserve remnant bosques and wetlands, create bosque and grassland habitat, and increase the width of the river corridor.

2.5.1 Levee System Management

Current Practices

The Targeted River Restoration Alternative retains routine maintenance of the levee system in terms of levee erosion and vegetation control, and levee road maintenance.

Flood Containment Capacity Evaluation

The Alternative incorporates re-evaluation of the RGCP flood containment capacity as previously described for the Integrated USIBWC Land Management Alternative. Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the Alternative as a work assumption to estimate effects of potential construction activities in the DEIS.

2.5.2 Floodway Management

Management of grazing leases and annual vegetation mowing, as currently conducted under the No Action Alternative, are modified under the Targeted River Restoration Alternative. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP floodway.

For vegetation management, development of a riparian corridor would be accomplished by the planting and enhancement of native woody vegetation, as well as modified grassland management. Under the Targeted River Restoration Alternative these measures would be complemented by use of seasonal peak flows to promote natural regeneration of riparian bosque, and use of conservation easements outside the ROW for connectivity with uplands. These two additional measures are described below.

Controlled Water Releases for Overbank Flooding

This measure would temporarily modify stream flows, allowing flood surges over the floodway to simulate historical overbank flows. Controlled releases from Caballo Dam up to a maximum flowrate of approximately 3,600 cubic feet per second (cfs) above typical irrigation levels, would be scheduled to simulate spring/summer overbank flooding in the upper reaches of the RGCP. These discharges would be a combination of coordinated

irrigation deliveries and additional water releases from the purchase of water rights, and would be limited to high water storage conditions in Elephant Butte Reservoir.

Due to greater availability of potentially inundated floodway and proximity to the water release point (Caballo Dam), regeneration of native woody vegetation would take place largely in the Rincon Valley. A total of 516 acres have been identified as potentially inundated areas within the RGCP. The acreage by RMU is subsequently presented in the description of the linear projects for the Alternatives.

Land preparation would include disking to remove vegetation, and partial shavedowns of stream banks. The ability to control the timing and intensity of flows has two primary advantages over shavedowns alone:

- Timed releases would ensure inundation during optimum cottonwood seed germination periods rather than by chance through storm events. This would ensure that bank preparation would not be in vain if a storm event did not occur; and
- Bank preparation (soil disturbance) in many locations could be conducted by disking rather than excavating since relatively higher water levels would be achieved through controlled releases.

Voluntary Conservation Easements Outside ROW

This measure would incorporate lands outside the ROW for environmental improvements through conservation easements sponsored by federal agencies. Available programs include the National Parks Service Land and Conservation Fund, the USACE Continuing Authorities Program (Sections 206 and 1135 for ecosystem restoration), and NRCS programs for conservation reserves, wetlands reserves, wildlife habitat incentives, and environmental quality incentives. Areas identified for potential easements include remnant bosques and uplands, as well as some croplands. A total 1,618 acres of potential conservation easements have been identified in areas adjacent to the RGCP. The acreage by RMU is subsequently presented in the description of the linear projects for the Alternatives.

The main function of easements would be to enhance the connectivity of riparian communities with upland areas, provide buffer zones, and increase corridor width. For existing bosques and undeveloped lands, the main purpose of easements would be to control their conversion to an alternate use. Management options for easements in agricultural lands include developing native grasslands in combination with salt cedar control, and reducing maintenance along sections of irrigation drains or canals to extend riparian vegetation and wetlands.

Along Seldon Canyon, where USIBWC has no land ownership, conservation easements were identified primarily in association with controlled water releases from Caballo Dam for overbank flows.

2.5.3 Maintenance of Pilot Channel and Irrigation Facilities

Current Practices

Under this Alternative routine maintenance of the pilot channel would be continued as well as maintenance of American Diversion Dam and irrigation facilities. Partial changes in channel configuration would be introduced in the Rincon Valley by reopening of former meanders within the ROW.

Reopening of Meanders Within the ROW

Re-establishment of six former meanders eliminated during construction of the RGCP would be conducted for diversification of aquatic habitat, to maintain hydraulic connectivity, and to provide shelter for fish and invertebrates species. The reopened meanders would provide slow-moving waters during the late spring and early summer, a required condition for breeding and spawning of various native fish species. Such a condition is uncommon in the RGCP because that period coincides with high flows of the main irrigation season.

Reopening of meanders within the ROW would typically be done in the form of high-flow side channels. These structures would divert water during high flow periods, route it through a more shallow waterway with slower velocities, and return it downstream to the main channel. Backwater conditions would occur during low flow periods. Significant excavation within the ROW would be required to develop the gradually sloping banks of the channel to provide aquatic and riparian habitat. Excavated meanders, with a combined surface area of 147 acres would be converted to 30 percent open water and 70 percent native bosque using shavedowns and/or plantings. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey;
- Excavation;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

2.5.4 Sediment Management

Current Practices

Under this Alternative maintaining five NRCS sediment control dams and associated access roads would be conducted as indicated for the No Action Alternative, while sediment disposal would be conducted primarily outside the ROW. Changes would also be introduced for sediment removal from the mouth of the arroyos.

Arroyo Dredging for Habitat Diversification

Changes in sediment removal from the mouth of the arroyos would be introduced in this alternative for diversification of fish habitat. This measure entails excavating the entrances of selected arroyos to increase the amount of backwater and bottom variation to increase the amount of slow-moving waters during the late spring and early summer. Twelve major arroyos in the Rincon Valley have been identified as having the most significant potential for diversification of aquatic habitat.

2.6 COMPARISON OF ALTERNATIVE FEATURES

Table 2.3 presents a comparison of measures by management category for all Alternatives. Most measures under consideration are associated with floodway management under the Integrated USIBWC Land Management and Targeted River Restoration Alternatives. Levee rehabilitation and sediment disposal apply to all action alternatives. The Targeted River Restoration Alternative also includes measures for diversification of the aquatic habitat (modified dredging of arroyos and reopening of meanders).

2.7 ENVIRONMENTAL MEASURES AND ASSOCIATED PROJECTS

Environmental measures represent river restoration techniques to foster development of riparian corridor and/or diversify aquatic habitat. Environmental measures were arranged as projects for a given site or reach of the RGCP. Projects were classified as either linear or point projects based on their geographic coverage along the RGCP.

2.7.1 Linear Projects

Linear projects, each extending over several miles of the RGCP, were organized by distinct geographic reaches within RMUs. Four environmental measures are described as linear projects:

- Modification of grazing practices in the floodway and uplands to control erosion and reduce sediment load;

Table 2.3 Comparison of Alternative Measures

MANAGEMENT CATEGORY	NO ACTION ALTERNATIVE	FLOOD CONTROL IMPROVEMENT ALTERNATIVE	INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE	TARGETED RIVER RESTORATION ALTERNATIVE
Levee System Management	Routine levee/ road maintenance	No change	No change	No change
	n/a	Levee system improvements	Levee system improvements	Levee system improvements
Floodway Management	Unmodified grazing leases	Modified leases for erosion control (3,552 acres)	Modified leases for erosion control (3,552 acres)	Modified leases for erosion control (3,493 acres)
	Continued mowing (4,657 acres)	No change	Continued mowing (2,674 acres)	Continued mowing (2,223 acres)
			Modified grassland management (1,641 acres)	Modified grassland management (1,641 acres)
			Native vegetation planting (223 acres)	Native vegetation planting (189 acres)
			Stream bank reconfiguration (127 acres)	Seasonal peak flows / bank preparation (516 acres)
	n/a	n/a	n/a	Voluntary conservation easements (1,618 acres)
Channel and Facilities Management	Debris removal and channel protection	No change	No change	No change
	American Dam and irrigation structures maintenance	No change	No change	No change
	n/a	n/a	n/a	Reopening of six former meanders (147 acres)
Sediment Management	NRCS Sediment dam maintenance	No change	No change	No change
	Sediment removal from arroyos / mitigation actions	No change	No change	Modified arroyo dredging for aquatic habitat (7 acres)
	Disposal from dredging pilot channel	Disposal mainly outside ROW	Disposal mainly outside ROW	Disposal mainly outside ROW
	Disposal from environmental measure excavation	n/a	Disposal inside ROW	Disposal inside ROW

- Modification of grassland management practices (mowing regimes) in the floodway;
- Use of seasonal peak flows to promote regeneration of native riparian vegetation (cottonwoods and willows); and
- Use of voluntary conservation easements (agriculture and preservation easements).

Each linear project is identified by the two initial letters of the RMU in which they are located, followed by a number that represents a proposed measure. Table 2.5 is a matrix presenting the project and associated Alternatives. Figure 2.2 illustrates the distribution of linear projects along the RGCP.

Table 2.4 Linear Project Identification and Acreage

RMU	MEASURE 1: MODIFIED GRAZING IN UPLANDS AND FLOODWAY		MEASURE 2: MODIFIED GRASSLAND MANAGEMENT IN THE FLOODWAY		MEASURE 3: CONTROLLED RELEASES FROM CABALLO DAM FOR OVERBANK FLOWS*		MEASURE 4: VOLUNTARY CONSERVATION EASEMENTS	
	Project:	Acres:	Project:	Acres:	Project:	Acres:	Project:	Acres:
Upper Rincon	UR-1	1911	UR-2	639	UR-3	214		
Lower Rincon	LR-1	473	LR-2	611	LR-3	302	LR-4	536
Seldon Canyon							SC-4 *	808
Upper Mesilla	UM-1	638	UM-2	22			UM-4	28
Las Cruces	LC-1	136	LC-2	301				
Lower Mesilla	LM-1	256	LM-2	68			LM-4**	202
El Paso	EP-1	138					EP-4	44
All RMUs		3,552		1,641		516		1,618
Associated with Alternative:	*All Action Alternatives*		*Integrated USIBWC Land Management and Targeted River Restoration*		*Targeted River Restoration*		*Targeted River Restoration*	

* *Seldon Canyon voluntary conservation easements are associated with measure 3, controlled releases from Caballo Dam.*

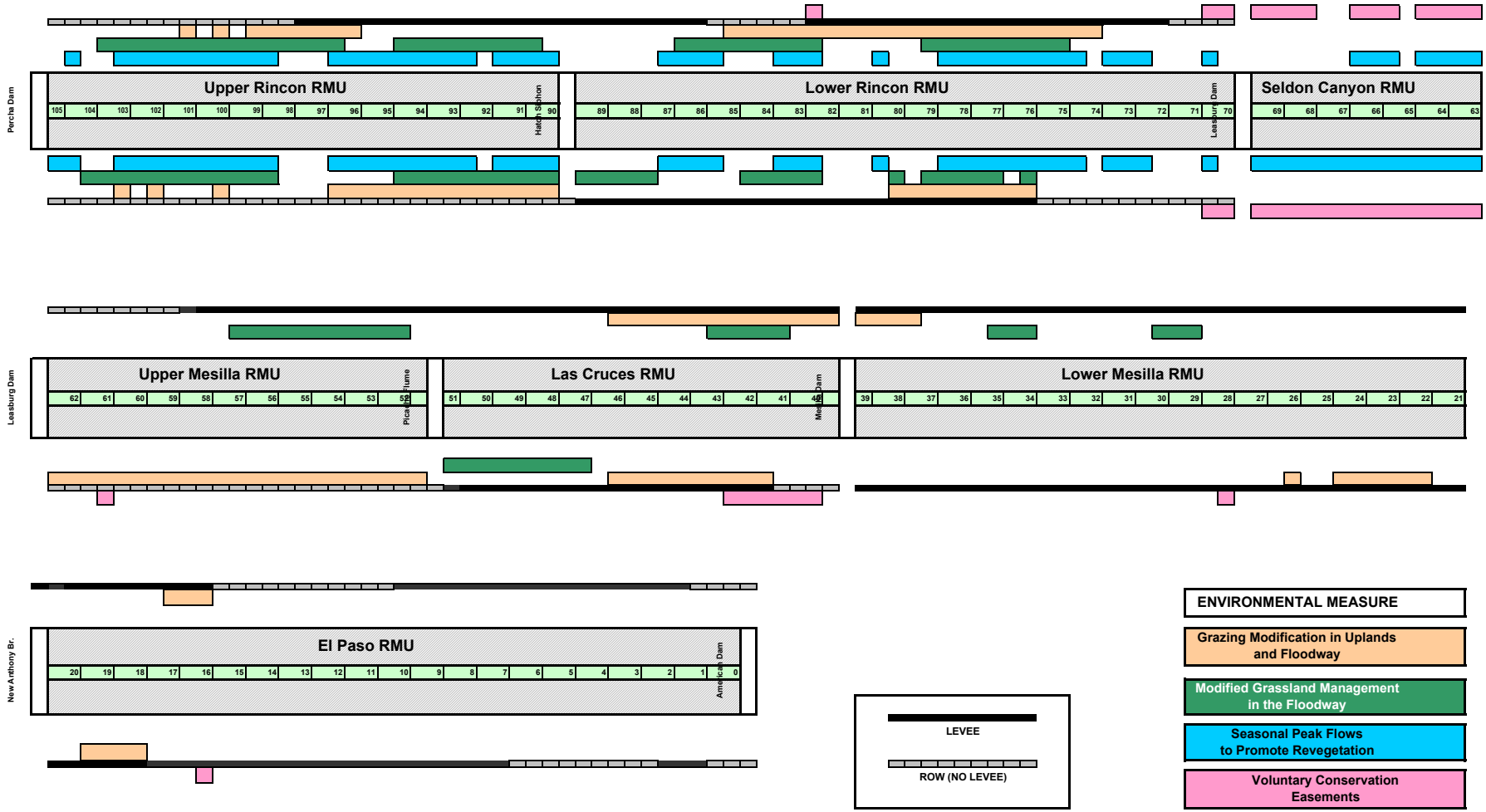
** *Overlaps with the Las Cruces RMU. The majority of potential estimates are in the vicinity of a current restoration project, the "Picacho Wetlands Restoration Project" (SWEC 2002).*

The Flood Control Improvement Alternative includes six linear projects that entail modification of grazing practices to further reduce erosion in leased areas. Most of the lease areas are located in the Rincon Valley and Upper Mesilla Valley.

The Integrated USIBWC Land Management Alternative includes 11 linear projects associated with changes in grazing leases as well as modified management of floodway vegetation.

The Targeted River Restoration Alternative includes linear projects associated with four types of environmental measures, modified grazing leases, modified grassland management, seasonal peak flows, and voluntary conservation easements.

Figure 2-2 Environmental Measures to be Implemented as Linear Projects



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2.7.2 Point Projects

Point projects are limited to site specific locations offering unique opportunities for implementation of environmental measures. Point projects are identified by a number that represents the approximate river mile where they are located, followed by a letter that identifies a specific measure to be implemented. Table 2.5 presents all point projects included in the Integrated USIBWC Land Management and Targeted River Restoration alternatives. The following measures were developed as point projects:

- Planting of native cottonwood and willows within the hydrologic floodplain for riparian corridor development, and/or enhancement of existing bosque;
- Bank shavedowns to promote regeneration of native vegetation;
- Opening of former meanders to diversify aquatic habitat; and
- Modification of dredging at arroyos by creating embayments.

Point projects for the Integrated USIBWC Land Management Alternative focused on improvement and restoration of riparian vegetation. Projects are listed separately for vegetation planting within the hydrologic floodplain and for shavedown of stream banks to promote overbank flooding during moderately high storm flows. Point projects for the Targeted River Restoration Alternative are focused on restoration of the riparian corridor and diversification of the aquatic habitat by reopening low-elevation meanders and modifying arroyo habitat. Figure 2.3 shows the location of point projects in the Rincon and Mesilla Valleys.

2.7.3 Summary of Alternatives by Project

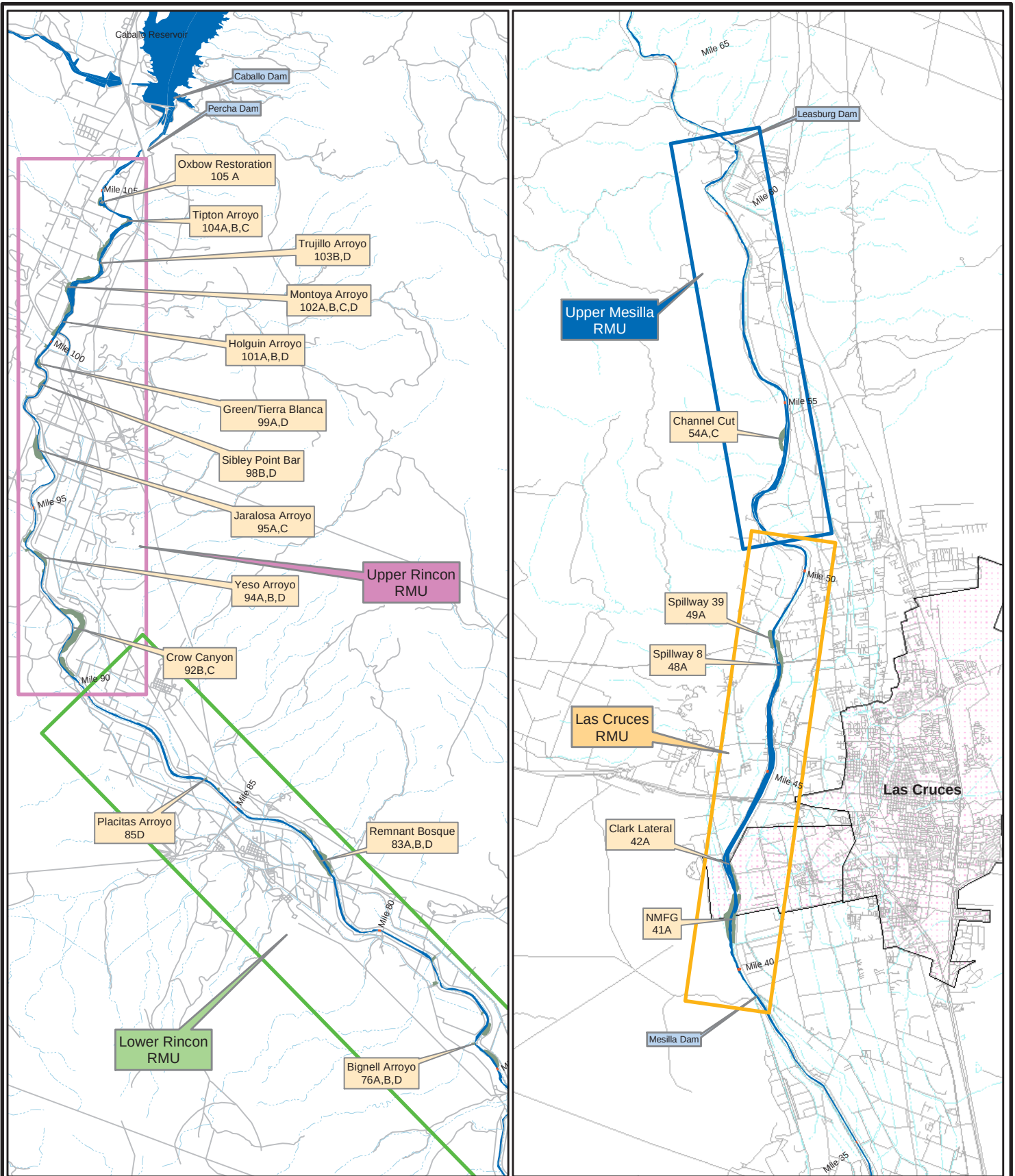
Table 2.6 provides a project list by management category and environmental measure. The applicability of those projects to each of the action alternatives is also indicated.

Table 2.5 Point Projects Associated with the Integrated USIBWC Land Management and Targeted River Restoration Alternatives

			INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE		TARGETED RIVER RESTORATION ALTERNATIVE		
RIVER MILE ID			**MEASURE A: NATIVE VEGETATION PLANTING**	**MEASURE B: STREAM BANK SHAVEDOWNS**	**MEASURE A: NATIVE VEGETATION PLANTING**	**MEASURE C: OPEN FORMER MEANDERS**	**MEASURE D: MODIFY DREDGING AT ARROYOS**
105	Oxbow Restoration	Project *Acres*	105A *6.6*			105C *6.6*	
104	Tipton Arroyo	Project *Acres*	104A *2.5*	104B *3.4*	104A *2.5*		104D *0.2*
103	Trujillo Arroyo	Project *Acres*		103B *26.5*			103D *0.8*
102	Montoya Arroyo	Project *Acres*	102A *2.8*	102B *24.7*		102C *2.8*	102D *0.17*

Table 2.5 Point Projects Associated with the Integrated USIBWC Land Management and Targeted River Restoration Alternatives (…*continued*)

			INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE		TARGETED RIVER RESTORATION ALTERNATIVE		
RIVER MILE ID			**MEASURE A: NATIVE VEGETATION PLANTING**	**MEASURE B: STREAM BANK SHAVEDOWNS**	**MEASURE A: NATIVE VEGETATION PLANTING**	**MEASURE C: OPEN FORMER MEANDERS**	**MEASURE D: MODIFY DREDGING AT ARROYOS**
101	Holguin Arroyo	Project *Acres*	101A *6.0*	101B *12.5*	101A *6.0*		101D *0.16*
99	Green Tierra	Project *Acres*	99A *5.1*		99A *5.1*		99D *0.27*
98	Sibley Point Bar	Project *Acres*		98B *4.1*			98D *0.27*
97	Jaralosa Arroyo	Project *Acres*				97C *28.0*	97D *0.44*
95	Jaralosa South	Project *Acres*	95A *5.1*			95C *5.1*	
94	Yeso Arroyo	Project *Acres*	94A *11.5*	94B *3.9*	94A *11.5*		94D *0.44*
92	Crow Canyon	Project *Acres*		92B *17.9*		92C *84.6*	
85	Placitas Arroyo	Project *Acres*					85D *0.52*
83	Remnant Bosque	Project *Acres*	83A *16.2*	83B *17.9*	83A *16.2*		83D *0.3*
78	Rincon/Reed Arroyo	Project *Acres*					78D *2.74*
76	Bignell Arroyo	Project *Acres*	76A *10.3*	76B *16.3*	76A *10.3*		76D *0.52*
54	Channel Cut	Project *Acres*	54A *19.6*			54C *19.6*	
49	Spillway No. 39	Project *Acres*	49A *15.9*		49A *15.9*		
48	Spillway No. 8	Project *Acres*	48A *34.6*		48A *34.6*		
42	Clark Lateral	Project *Acres*	42A *15.4*		42A *15.4*		
41	Picacho and NMGF	Project *Acres*	41A *71.3*		41A *71.3*		
	Total Acreage:		***223***	***127***	***189***	***147***	***6.8***



North 30

SCALE = 1 : 500,000 or 1 INCH = 41,667 FEET
UTM Zone 13 N / NAD 83

0 1.25 2.5 5 7.5 10 Kilometers

0 1.25 2.5 5 7.5 10 Miles

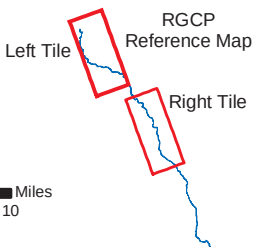


Figure 2-3 Distribution of Point Projects in the Rincon and Mesilla Valleys

United States Section,
International Boundary Water Commission

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Table 2.6 Summaries of Projects by Measure and Alternative

		ALTERNATIVE*		
ENVIRONMENTAL MEASURE	**PROJECT LIST**	**FCI**	**IULM**	**TRR**
Floodway Management				
Modified grazing leases (erosion control)	UR-1, LR-1, UM-1, LC-1, LM-1, EP-1	X	X	X
Modified grassland management	UR-2, LR-2, UM-2, LC-2, LM-2		X	X
Vegetation planting and bosque enhancement	104A to 48A (14 Projects)		X	X
Stream bank shavedowns	104B to 76B (9 Projects)		X	
Seasonal peak flows / bank preparation	UR-3, LR-3			X
Conservation easements	LR-4, SC-4, UM-4, LM-4, EP-4			X
Pilot Channel Management				
Reopening of former meanders	105C to 54C (6 Projects)			X
Sediment Management				
Modified arroyo dredging for habitat	104D to 76D (12 Projects)			X

* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

2.8 IMPLEMENTATION TIMETABLE

Establishing a riparian corridor and aquatic habitat diversification are envisioned as long-term processes that will progress as water is secured and the effectiveness of projects is documented. Direct intervention measures such as pole planting, micro-irrigation, and induced overbank flooding for seedling germination by bank re-shaping and/or controlled water releases, will be initially required to induce development of the riparian corridor. Dredging will be initially required for reopening meanders and creating embayments in arroyos to maintain their functionality.

Once established, riparian vegetation could be sustained through continued use of agricultural practices such as flood irrigation or micro-irrigation and, in some areas, controlled discharges from Caballo Dam during high runoff years. Given the physical limitations for potential releases and available floodable land, overbank flooding appears to be practical mostly in the Rincon Valley. In this area controlled discharges would be gradually increased, as dictated by the success of previous releases, until a selected maximum target for release is achieved. In all areas where expansion of the riparian corridor is anticipated, routine tracking of groundwater depth will be required to ensure adequate conditions for establishment of riparian vegetation (typically less than 10 feet for cottonwoods and willows). Long-term exotic species control would likely be required in all projects.

Monitoring of measures is applied to all Alternatives. Monitoring includes observing the area and/or collecting data for a period of time after implementation to determine if the measures are achieving their intended functions. Regulatory agencies are generally moving in the direction of requiring monitoring. For example, the USACE requires at least 3 years of monitoring of wetlands mitigation, including submittal of written progress reports.

A 20-year timeline was adopted for project implementation. The timeline was divided into three phases. During the 5-year Phase 1, implementation plans would be developed and funded, agreements would be reached for interagency cooperation and water use, and selected projects would be tested at a pilot scale. Project performance would be monitored to determine success, water use, and need for modification, and to conduct an environmental benefit versus investment analysis. Priority projects, as determined by the potential environmental benefit, would be implemented during a 5-year, Phase 2. Remaining projects would be implemented in the subsequent 10 years, in Phase 3. Site prioritization would be conducted according to an adaptive management approach previously discussed. Following Phase 3, environmental measures would be maintained in the long run and, to the extent possible, expanded to sustain the riparian corridor and ensure functionality of aquatic habitat diversification projects. Timetables for linear and point projects, presented in Tables 2.7 and 2.8, respectively, are described below.

Table 2.7 Implementation Timetable for Linear Projects

MEASURE		PHASE 1 (YEARS 1-5)	PHASE 2 (YEARS 6-10)	PHASE 3 (YEARS 11-20)	ALTERNATIVE*
Grazing modifications	Actions	Guidelines, Implementation	Guidelines revision, monitoring		FCI, IULM, TRR
	Projects	UR-1, LR-1, LC-1, UM-1, LM-1, EP-1			
Grasslands management	Actions	Guidelines, pilot testing and monitoring	Implementation, monitoring	Monitoring	ILM, TRR
	Projects	UR-2	LR-2, UM-2, LC-2, LM-2		
Peak flows	Actions	Agreements, water acquisition	Implementation, monitoring	Monitoring	TRR
	Projects		UR-3, LR-3		
Conservation easements	Actions	Agreements; target remnant bosques	Implementation	Secure additional easements	TRR
	Projects	LR-4, SC-4	LM-4, EP-4, UM-4		

* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

Table 2.8 Implementation Timetable for Point Projects

		PROJECTS BY RIVER MILE		
ALTERNATIVE / MEASURE	**MEASURE ID**	**PHASE 1 PILOT TESTING (YEARS 1-5)**	**PHASE 2 (YEARS 6-10)**	**PHASE 3 (YEARS 11-20)**
Integrated USIBWC Land Management Alternative				
Planting and bosque enhancement	A	105, 104, 41	102, 101, 99, 94, 95,	83, 76, 54, 49, 48, 42
Stream bank shavedowns	B	104	103, 102, 101, 98, 94	92, 83, 76
Targeted River Restoration Alternative				
Planting and bosque enhancement	A	104, 41	101, 99, 49, 48, 42	94, 83, 76
Reopening meanders	C	105	102, 54	97, 92, 95
Modified arroyo dredging	D	104	103, 102, 101, 99, 98, 97, 94	85, 83, 78, 76

2.8.1 Linear Projects

Grazing Modifications. All projects would be completed during Phase 1 and would include development of guidelines, compliance policies, projects implementation, and monitoring programs. Subsequent phases would involve continued implementation, monitoring, and revision of the guidelines as necessary. These projects are the least complex to implement because the measure is limited to change in practices within the ROW. The projects would be conducted throughout most of the RGCP.

Grassland Management. Phase 1 includes a single pilot project in the Upper Rincon Valley. The remaining four projects would be implemented in Phase 2 followed by monitoring and modifications to the guidelines as necessary. The projects would be conducted primarily in the Rincon and Mesilla Valleys.

Peak Flows. Phase 1 concentrates on water acquisition and agreements for water use by controlled releases from Caballo Dam. Peak flows would be implemented during Phase 2 and 3 coupled with monitoring and modifications as necessary. The projects would be conducted in the Rincon Valley.

Conservation Easements. Phase 1 would include development easement agreements and target remnant bosques in the Lower Rincon and Seldon Canyon projects. Phase 1 easements coincide with areas identified for induced overbank flows by controlled water releases. Phase 2 would include easement agreements and project implementation in the Mesilla Valley and El Paso. Target areas are located in the Rincon and Mesilla Valleys.

2.8.2 Point Projects

Planting and Bosque Enhancement. Phase 1 includes pilot projects in the Rincon Valley and south of Las Cruces. Pilot projects include two small sites (9.1 acres) and a larger site (71 acres) coinciding with a planned restoration project, the Picacho Wetlands Pilot Project (SWEC 2002). Implementation throughout the RGCP would begin in Phase 2 and Phase 3 after site-specific monitoring and potential modifications are made to the measure. Phase 2 emphasizes the Rincon Valley and Phase 3 completes the Rincon Valley and the remaining RGCP projects.

Stream Bank Shavedowns. Phase 1 includes a single, 3.4-acre pilot project in the Rincon Valley. Implementation throughout the Rincon Valley would begin in Phase 2 and 3 after site-specific monitoring and potential modifications are made to the measure. Phase 2 includes five projects north of Yeso Arroyo, and Phase 3 includes the remaining three projects. Selection of projects was based on a representative example of the measure to test and provide several years of monitoring before larger scale implementation. The projects would be implemented in the Rincon Valley.

Reopening of Meanders. Phase 1 includes a single, 6.6-acre pilot project in the Rincon Valley. After site-specific monitoring and potential modifications are made to the measure, the remaining projects would be conducted. Phase 2 includes two projects (22.4 acres) and Phase 3 includes three projects including the largest restoration project (84.6 acres at Mile 54). The largest and potentially more water-consumptive projects are planned for Phase 2 and 3 after water acquisition agreements can be put into place. Pilot testing would provide several years of monitoring before larger scale projects are implemented.

Modified Dredging of Arroyos. Phase 1 includes a single pilot project in the Rincon Valley. The project coincides with the location other measures involving construction/earth moving. Implementation throughout the RGCP would begin in Phases 2 and 3 after site-specific monitoring, water use agreements and potential modifications are made to the measure. As with Phase 1, these projects would coincide with other measures involving construction/earth moving. Selection of projects would be based on a representative test implementation and would provide several years of monitoring before larger scale implementation. All projects would be conducted in the Rincon Valley.

SECTION 3
INTERRELATED STUDIES

A number of studies have been conducted on projects within and in proximity to the RGCP. This section contains a summary of major environmental studies, and National Environmental Policy Act (NEPA)-related documents with information relevant to potential impacts of T&E species and environmental conditions of the RGCP.

3.1 DRAFT ENVIRONMENTAL IMPACT IMPACT - RIVER MANAGEMENT ALTERNATIVES FOR THE RIO GRANDE CANALIZATION PROJECT

The USIBWC is evaluating long-term river management alternatives for the RGCP, a 105.4-mile narrow river corridor that extends from below Percha Dam in Sierra County, New Mexico to American Dam in El Paso, Texas. The RGCP, operated and maintained by the USIBWC since its completion in 1944, facilitates water deliveries and provides flood control.

The No Action Alternative and three action alternatives were evaluated in the Draft EIS. The alternatives were developed in a manner that enhances and restores the riparian ecosystem while maintaining flood control and water delivery requirements of the RGCP. Alternatives formulation was the result of a 3-year public consultation process that included regulatory agencies, irrigation districts, and environmental organizations.

Measures under consideration as part of the alternatives included grazing leases modification to improve erosion control, changes in floodway vegetation management, riparian restoration, and aquatic habitat diversification. The USIBWC will select a preferred alternative following the public comment period on the Draft EIS.

3.2 BIOLOGICAL ASSESSMENT - USIBWC RIO GRANDE PROJECTS: AMERICAN DAM TO FORT QUITMAN, TEXAS

In 2001 the USIBWC prepared a BA on the effects of current O&M practices for Rio Grande projects located adjacent and south of the RGCP. Overall, suitable habitat required for nesting T&E species was not present; however, marginal habitat for migrant T&E species existed in limited areas. For instance, sandbars and beaches along the river, many of which become exposed during periods of low flow, provided limited waterfowl habitat and possibly migrant interior least tern habitat. Based on analyses of literature review and field surveys, migrant T&E species use was uncommon but could not be completely ruled out. The BA concluded that current O&M practices (similar to those conducted within the RGCP) did not impact endangered species or adversely affect any critical habitat (Parsons 2001d).

3.3 ENVIRONMENTAL ASSESSMENT FOR OPERATION AND MAINTENANCE OF THE RECTIFICATION PROJECT

The USIBWC prepared an environmental assessment (EA) for the annual O&M of the Rectification Project. The Rectification Project is adjacent and south of the RGCP extending

from American Dam to Fort Quitman, Texas. The EA concluded that O&M activities do not impact endangered species or adversely affect any critical habitat, and that annual O&M work did not constitute a major federal action which would cause significant local, regional, or national impact on the environment (USIBWC 1979).

3.4 RIO GRANDE RECTIFICATION PROJECT MITIGATION ASSESSMENT

In 1995 the USIBWC completed a mitigation assessment as a requirement for Special Condition No. 2 in the Department of the Army Permit No. TX-91-50426 for four potential mitigation opportunities along the Rio Grande Rectification Project (USIBWC 1995). The USIBWC determined that potential mitigation opportunities could be accomplished with existing resources available to the USIBWC. Other opportunities would be accomplished as funding and new information became available. Four mitigation opportunities were considered, establishing Rio Bosque Park Wetlands, seeding denuded areas, tree planting, and preservation of snags in the floodway. These mitigation opportunities were intended to address lack of habitat in the Rio Grande Rectification Project.

3.5 BRIDGE OF AMERICAS REPLACEMENT EA

An EA of the Bridge of the Americas concluded that bridge construction would not significantly impact natural and cultural resources (USIBWC 1993a). The Bridge of the Americas is adjacent and south of the RGCP. The bridge is located in a reach of the Rio Grande confined to a concrete channel 4.4 miles long. This concrete channel did not provide habitat for T&E species. Notice of Availability of the Final EA and Finding of No Significant Impact (FONSI) was published in the Federal Register July 14, 1993.

3.6 AMERICAN CANAL EXTENSION PROJECT EA

The Rio Grande American Canal Extension included rehabilitation of a portion of the existing Franklin Canal, construction of a new, reinforced concrete-lined canal, and other associated works. The project was adjacent and south of the RGCP. The EA concluded that the project would benefit fish and wildlife by implementation of mitigation plans to provide wetlands (USIBWC 1993b).

Notice of availability of the Final EA and a FONSI was published in the Federal Register January 7, 1994. This publication included a report by the U.S. Fish and Wildlife Service (USFWS), with Texas Parks and Wildlife Department, prepared under authority of the Fish and Wildlife Coordination Act. The Fish and Wildlife report recommended creation of 30 acres of wetlands as mitigation for losses to wetland habitat associated with construction of the project. The Rio Bosque Park was suggested as a location for the wetlands mitigation site.

3.7 RECONSTRUCTION OF THE AMERICAN CANAL PROJECT EA

In 2001 a final EA for the proposed action of reconstruction of the existing American Canal was published (Encon International, Inc. 2001). The proposed project for rehabilitation

and enlargement of the 1.98-mile-long American Canal (also known as Reach F) included demolishing the deteriorating concrete open channel segments of the canal and replacing them with reinforced concrete-lined canal segments. No T&E species were observed in this study and no potential T&E habitat was affected by the action. The EA concluded that this activity was not a major federal action that would have a significant adverse effect on the quality of the human environment.

3.8 RIO GRANDE MANAGEMENT PLAN

On July 18, 1994 the USIBWC submitted the Rio Grande Management Plan to fulfill a special condition of the Clean Water Act Section 404 permit issued by the USACE for dredge and fill activities associated with the annual maintenance on the RGCP and three other projects (Rectification Project, Presidio/Ojinaga Flood Control Project, and the Rio Grande Boundary Preservation Project). The purpose of the management plan was to identify opportunities for preservation and enhancement of riparian habitat and to identify possible mitigation measures for unavoidable impacts (USIBWC 1994).

3.9 BIOLOGICAL ASSESSMENT OF SPOIL REMOVAL IN THE RGCP

A BA for spoil removal in the RGCP was prepared in 1994 (Ohmart 1994). The report separately evaluated each arroyo in the RGCP and recommended ways to minimize impacts. The study indicated that the bald eagle, interior least tern, and whooping crane could potentially occur as transients in the RGCP. These species were not expected to be impacted due to the limited disturbance by spoil removal and timing of the activity. The northern aplomado falcon, the southwestern willow flycatcher, and Sneed pincushion cactus were not expected to occur due to lack of suitable habitat. The BA determined that the effects of spoil removal from the mouths of arroyos on T&E species would be insignificant due to lack of habitat.

3.10 EIS FOR EL PASO-LAS CRUCES SUSTAINABLE WATER PROJECT

In December 2000, an environmental impact statement (EIS) was completed for the El Paso-Las Cruces Regional Sustainable Water Project, an initiative to secure Rio Grande water as a long-term drinking water supply for the Cities of El Paso and Las Cruces (USIBWC and EPWU/PSB 2000). This project required water transfer using diversion structures and aqueducts whose area of influence overlaps with that of the RGCP.

The "River with Local Plants" was identified as the Preferred Alternative for the project. This alternative would include expansion of an existing water treatment plant, construction of four new plants, and construction of four permanent diversion structures on the Rio Grande. Water would be conveyed through underground pipelines. The EIS included standard construction and operating procedures, BMPs, and recommended environmental enhancements and impact avoidance.

T&E studies done for this EIS included habitat studies and reconnaissance-level surveys for birds, amphibians and reptiles, and mammals. No suitable habitat was observed for aquatic species. Based on literature reviews and habitat evaluations, the bald eagle, southwestern willow flycatcher, interior least tern, and whooping crane potentially use or migrate through the area. The bald eagle and southwestern willow flycatcher were observed during field surveys. Bald eagles were observed along the Rio Grande in Doña Ana County, New Mexico; southwestern willow flycatchers were observed in Seldon Canyon.

3.11 FISH AND WILDLIFE COORDINATION ACT REPORT FOR THE EL PASO-LAS CRUCES REGIONAL SUSTAINABLE WATER PROJECT

In March 2001, the USFWS published the final Fish and Wildlife Coordination Act Report for the El Paso-Las Cruces Regional Sustainable Water Project (USFWS 2001). Based on the evaluation of fish and wildlife impacts, and the existing ecosystem condition of the Rio Grande from Elephant Butte Reservoir to El Paso, the USFWS made several recommendations to mitigate for expected impacts of all alternatives proposed in the El Paso-Las Cruces Regional Sustainable Water Project EIS. The USFWS compared and ranked alternatives based on their potential impacts on aquatic and terrestrial resources, and rated those alternatives in terms of their potential to enhance aquatic and terrestrial communities. The USFWS stated that one benefit of the preferred alternative for the Rio Grande fisheries and other aquatic-dependent species is the contribution to a more year-round flow regime that would be necessary before effective enhancements to the riverine ecosystem could be considered (USFWS 2001).

3.12 BIOLOGICAL ASSESSMENT FOR THE EL PASO-LAS CRUCES REGIONAL SUSTAINABLE WATER PROJECT

In May 2000, a BA was completed for the El Paso-Las Cruces Regional Sustainable Water Project (CH2M Hill & Geomarine 2000). The BA addressed the presence of potentially suitable habitat for T&E species, results of field surveys, and effects determination for species with potential to occur in the RGCP and surrounding areas. The BA found that potential habitat existed in the Rio Grande corridor for the brown pelican, whooping crane, bald eagle, southwestern willow flycatcher (Seldon Canyon only), and interior least tern. The BA concluded that the effect of the project on these species was "may affect, not likely to adversely affect." The BA provided recommendations for mitigation and enhancement of wildlife habitat. Recommendations included control of exotic species, channel enhancements (embayments, backwaters, and sloughs), native riparian vegetation plantings, and watershed management measures.

3.13 RGCP THREATENED AND ENDANGERED SPECIES SURVEY TECHNICAL REPORT

In April 2001, a report on T&E species was prepared for the RGCP (Parsons 2001c). That report described the results of T&E habitat surveys and T&E species presence/absence surveys conducted in the RGCP (September 2000, November-December 2000, and

January 2001). The only T&E species observed during field surveys was the interior least tern. No suitable nesting habitat for T&E bird species was observed, although there was limited habitat to potentially attract migratory birds such as the interior least tern and piping plover, for feeding and resting. No aquatic species nor suitable habitat for aquatic T&E species was observed (Parsons 2001c).

3.14 ALTERNATIVES FORMULATION REPORT

An alternatives formulation report (AFR) was issued in March 2001 as the basis to determine potential effects associated with river management alternatives for the RGCP (Parsons 2001a). The report described the formulation and public consultation process, and preliminary alternatives based upon issues raised by stakeholders in public scoping meetings (October 1999), technical workshops and public meetings conducted in Las Cruces and El Paso between September and October 2000. A comprehensive list of potential environmental measures and O&M practices was used to prepare the AFR. The list of potential environmental measures was screened based on compatibility with project functionality, primarily flood containment. Hydraulic modeling was used to identify locations and potential changes in levee functionality along the RGCP due to implementation of environmental measures. Four action alternatives were screened in the AFR for future evaluation in the EIS.

3.15 CITY OF LAS CRUCES BIOLOGICAL EVALUATION

In 2002 the City of Las Cruces received a USEPA Sustainable Development Challenge Grant to initiate the Rio Grande Riparian Ecological Corridor Project (City of Las Cruces 2003). Kay Kasa Enterprises was commissioned to conduct a biological evaluation to assess the impacts of the project on Threatened, Endangered, and Sensitive species and habitat. Two project components were evaluated: wetland construction, and the development of a hike and bike trail along the Rio Grande adjacent to the City of Las Cruces.

The wetland construction component targets a 30-acre parcel southwest of Las Cruces, currently owned by the New Mexico Game and Fish Department. The proposed wetland would be inundated with ground water seepage and drain water from the Picacho Drain. Salt cedar will also be removed in an effort to offset consumptive water use by the wetland. The proposed path along the Rio Grande floodway is 1.1 miles long, originating at the Mesilla Bridge and extending north to the Las Cruces Outfall Channel.

Findings of the BA indicate that the City of Las Cruces Riparian Corridor Project "May affect – but is not likely to adversely affect" threatened, endangered, and sensitive species or their habitats (City of Las Cruces 2003). All reasonably foreseeable negative impacts would be entirely mitigable, and most foreseeable impacts would be positive.

3.16 REFORMULATION OF RIVER MANAGEMENT ALTERNATIVES FOR THE RIO GRANDE CANALIZATION PROJECT

Findings of the AFR, issued in March 2001 (Parsons 2001a), were reviewed during presentations and a technical workshop organized by the USIBWC between June 14, 2001 and May 8, 2002 (Parsons 2003). These presentations were attended by representatives of the USBR, USFWS, EBID, El Paso County Water Improvement District No. 1, the SWEC, Alliance for the Rio Grande Heritage, and Rio Grande Citizens Forum. Four review meetings with members of the farming community and representatives of various environmental organizations were also held by the USIBWC between October 31, 2001 and December 5, 2002. Reformulated alternatives retained for the EIS analysis reflected additional analyses performed by the USIBWC in response to comments and input from various stakeholders. The reformulated alternatives were incorporated into the DEIS (Parsons 2003).

SECTION 4
ECOLOGICAL SETTING

The Chihuahuan Desert is subdivided into three regions: the northern Trans-Pecos region, the middle Mapimian region, and the southern Saladan region (MacMahon 1988). The RGCP is located in the northern Trans-Pecos region of the Chihuahuan Desert.

The Trans-Pecos region of the Chihuahuan Desert is historically a mosaic of grasslands and desert shrub lands (Burgess 1995; McClaran 1995). Tobosa, black grama, and other grass species dominate the grassland communities. Desert shrub species are primarily creosote bush or tarbush. Riparian vegetation is dominated by willows, cottonwood, and mesquites with contributing species including ash and desert willow. Recently, invasive salt cedars have attained dominance in the majority of riparian communities.

Within the Trans-Pecos ecological region, most of the Rio Grande floodplain is used as irrigated farmland. Cultivated areas are leveled and commonly graded into benches. The floodplain was formerly subject to flooding from the river but is now well protected outside the USIBWC levees.

4.1 CLIMATE

Humidity is generally low, with cool winters and hot, dry summers. For El Paso, Doña Ana, and Sierra Counties, the average daily maximum temperature in July is 95ºF, while the average daily minimum temperature in January is 30ºF. The area receives an average of 8 inches of rain annually. Rainfall is heaviest July through September, and occurs mostly in intense thunderstorms which can cause local flooding and soil erosion from levee slopes and river banks. The average length of the growing season (frost-free period) is 248 days (U.S. Department of Agriculture [USDA] 1971).

4.2 SOILS AND GEOLOGY

Intermontane sediments known locally as bolson deposits underlie most of the RGCP. These sediments washed down from nearby mountains and filled the basin formed during the uplift of the mountains and the faulting that occurred in the Tertiary period and continued into the Quaternary. The basin in El Paso County, known as the Hueco Bolson, was enclosed at first but was later drained when the Rio Grande made its present course. Since then, water from precipitation and runoff has leached the carbonates from the parent material and formed layers of caliche at various depths below the surface (USDA 1971).

Soils on the floodplain of the Rio Grande formed in alluvium recently deposited by the river. At the landscape level, the NRCS (USDA 1971) characterizes these floodplain soils as the Harkey-Glendale Association. This association is made up of deep, nearly level calcareous soils. Surface soils are typically silty clay loams over stratified layers of loamy soils and fine sand. Locally, the RGCP soils are classified as Made land, Gila soil material. This series consists of soil materials, chiefly from Gila soils, which are silty clay loam, fine

sandy loam, and sand in texture. The soil is made of recently deposited alluvial material, which has been moved and shaped for construction of levees and for relocation and straightening of the river channel.

4.3 HYDROLOGY

The flow of the Rio Grande originates from watersheds in the southern slopes of the Colorado mountains and the mountain ranges of northern New Mexico. This water is stored at Elephant Butte and Caballo Reservoirs. The water is used to irrigate the Mesilla, El Paso, and Juarez Valleys.

The water released from Elephant Butte Reservoir has averaged 682,000 acre-feet annually. A large portion of this flow (~495,000 acre-feet) is diverted annually to irrigate croplands in New Mexico. The remainder and return flow then reach El Paso at an annual rate of 443,000 acre-feet. As the flow reaches American Diversion Dam, 269,000 acre-feet are diverted annually to the American Canal, which is the main supply canal for the El Paso Valley. The diversion to Mexico has amounted to 60,000 acre-feet annually which is used to irrigate the Juarez Valley in accordance with the 1906 Convention.

The Elephant Butte Reservoir operations are based on average historic losses and evaporation rates for Elephant Butte and Caballo Reservoirs. Scheduled outflow from Elephant Butte and Caballo are based on average irrigation demands for years with a full water supply.

4.4 VEGETATION

4.4.1 Historic Vegetation

When the Spanish arrived in the 16th century, the bank, sand bars, and adjacent floodplain areas of the Rio Grande were vegetated with scattered bosques of varying-age valley cottonwood, with a willow and salt grass dominated understory (Scurlock 1998). Open, grassy areas, or vegas, were also present. Cattails and other wetland species grew in and around ponds, marshes, and swampy sites. Other major plants associated with bosques included New Mexico olive, baccharis, false indigo bush, wolfberry, and in southern reaches, mesquite. All these plant communities were considerably modified by human activity during the historic period (Crawford *et al*. 1996, and Dick-Peddie 1993). Fossil evidence traces the bosque community back 2 million years. Bosques were dynamic, growing and spreading when weather was favorable, and dying off during periods of prolonged drought or prolonged floods. The communities ranged from old growth to pioneer species, and provided varied and diverse habitat for native wildlife (Crawford *et al.* 1996).

Wetlands were abundant in the Rio Grande floodplain, evidence of a shallow water table and dynamic shifting river (Stotz 2000). The early Spanish explorers throughout El Paso and Mesilla valleys observed numerous oxbows and pools. The wetlands provided habitat and refuge for wildlife during the low flows of the river.

Numerous floods resulting in a highly variable river channel characterized the flow regime. Snowmelt, widespread summer rains, and localized heavy thunderstorms caused floods (Scurlock 1998). The river course frequently changed, meandering throughout the valley. Minor lateral shifts were frequent and even large-scale changes in the channel occurred. Channel width varied considerably, historical reports described the river width ranging from 600 feet wide to virtually a trickle among sandbars (Stotz 2000).

The current dominance of invasive, exotic vegetation such as salt cedar and subsequent decline of species characteristic of historic bosques is in response to anthropomorphic factors including altered hydrology and land use changes among others (Everitt 1998; DeBano and Schmidt 1989; Schmidly and Ditton 1978).

4.4.2 Invasive Species

Salt Cedar

Several species of salt cedar were introduced into the United States from southern Europe and the eastern Mediterranean region in the late 1800s. Many of these species escaped cultivation, and spread rapidly throughout the riparian areas of the southwest. Salt cedar has several characteristics that make it well suited to the desert regions of the southwest.

Salt cedar is considered a facultative phreatophyte able to survive in conditions where groundwater is depleted and the soil is unsaturated (DiTomaso 1998). Salt cedar can survive drought conditions longer than cottonwoods and willows, and can then rapidly respond to the presence of water (Devitt *et al*. 1997) and may desiccate watercourses (Vitousek 1990; DiTomaso 1998). In addition to the ability of salt cedar to tolerate drought and saline conditions, there is some evidence that the fire regime of these riparian areas may be altered by the presence of salt cedar (Bock and Bock 1990; Smith *et al*. 1998). Salt cedar is relatively tolerant of fire, while most native riparian species are not.

Salt cedar is the dominant woody species found in the riparian and wetland vegetation communities of the RGCP. It would likely dominate the majority of the floodplain replacing herbaceous communities if mowing ceased. Salt cedar tends to release seeds later in the season than cottonwood or willow, starting about the middle of July (Gladwin and Roelle 1998), but salt cedar release seeds for a much longer period of time (up to 5 months) and the seeds are viable for up to 3 months after release (USBR 2000). Salt cedar requires bare moist soil for germination, similar to the conditions required by cottonwood and willow. However, the longer period of release provides salt cedar with the ability to germinate later in the season when water flows are declining, including after late summer monsoonal rains (USBR 2000).

Salt cedar removal is a labor intensive process often requiring a combination of mechanical, manual and chemical treatments (Sudbrock 1993). Seasonal, long-term flooding can be a successful alternative when the salt cedar seedlings are small and they can be completely inundated (Gladwin and Roelle 1998).

Russian Olive

The Russian olive has also become established within many riparian areas of the southwest. Russian olive was introduced into the United States in the late 1800s, and subsequently escaped cultivation (Olson and Knopf 1986). Russian olive is a rapidly growing plant with a deep taproot and extensive lateral branching (Borell 1971). The Russian olive can effectively compete with native species for space and water, and is a superior competitor on bare mineral substrates due to nitrogen fixing root nodules (Plant Conservation Alliance 1997). Russian olive is considered relatively salt tolerant, although not as salt tolerant as salt cedar (Olson and Knopf 1986; Vines 1960), and is often found as a co-dominant species with willow. It is generally considered inferior wildlife habitat to native riparian species (Olson and Knopf 1986).

Russian olive is most prevalent in the northern reaches of the RGCP. Generally, the easiest way to control Russian olive is with a regime of mowing and removing the cut material. However, the seeds of the Russian olive are readily dispersed by many birds, so if mowing were reduced in some areas, this plant may become more abundant.

Russian Thistle

Russian thistle, also known as tumbleweed, was introduced into the United States in the late 1800s. It has colonized extensive areas within the RGCP, particularly in disturbed sites in response to grazing and mowing. The seeds of Russian thistle are dispersed when the plant dries and wind tumbles the dried plant to a new location. Russian thistle is a particular problem in agricultural areas because of its extensive seed bank and water use. Research in croplands indicates that Russian thistle may be able to extract water from deep in the soil profile (Schillinger and Young 1999), potentially lowering the water table.

Control of Russian thistle is primarily through chemical controls and occasionally with mechanical controls (*e.g.,* tilling). Chemical control is preferred because of the seed bank that is often exposed when mechanical control methods are used.

Current Vegetation

Vegetation in the RGCP area are primarily disturbance-type communities, generally dominated by invasive exotic plant species. Species composition in these communities is related to river proximity. A border of hydrophytic vegetation, generally 10-15 feet wide, occurs on the river bank forming the sloped side of the channel. This narrow riparian zone is dominated by salt cedar with occasional seep willow, willow, or herbaceous vegetation, including common reed, sedges, and rushes. Isolated wetlands are found along the river channel, spillways, and low-lying areas within the floodplain. Salt grass is the common grass occurring in wetland sites.

Riparian Communities

There has been limited research conducted about the riparian communities in the RGCP (Watts 1998). As a result, Parsons (2001b) conducted field studies to document vegetation and habitat quality of the RGCP. Field studies found that periodic mowing maintains a large portion of the riparian community in disturbed, or early serial state characterized by herbaceous vegetation and shrubland re-growth. Riparian areas not mowed or otherwise maintained rapidly become dominated by non-native salt cedar. The control of woody vegetation through mowing is a major O&M activity within the floodway and is conducted to reduce woody vegetation for flood control and water delivery purposes.

The majority of the RGCP floodway is rarely flooded and disassociated from the river channel. Natural channel characteristics formed through periodic flooding and high velocity flows are largely absent. The widespread absence of young and mid-aged cottonwood within the RGCP (Parsons 2001b) suggests that the irrigation driven hydrologic regime has greatly influenced riparian native species composition.

In terms of native cottonwood regeneration, there is little evidence of new cottonwood establishment among the scattered and declining cottonwood remnants. Natural propagation appears to be limited to isolated, new growth trees propagated through root suckers with little successful seed germination observed (Parsons 2001b).

4.5 WETLANDS

Wetlands have undergone considerable modification in recent history. Wetlands were found throughout the Rio Grande floodplain created by a dynamic river system responding to heavy snow melts or storm generated runoff. The presence of abundant and mosaic wetlands interspersed among riparian vegetation was driven by seasonal rain and basin hydrology (Crawford *et al*. 1996). By some accounts, wetlands extent increased in response to widespread land use changes, which modified river hydrology, raised water tables and created saturated soil conditions (Wozniak 1995).

As recently as the early 1900s, high water tables in the floodplain created many wet meadows, marshes, and ponds providing habitat for wildlife and subsequently reducing its value as cropland. In response to saturated soil conditions, extensive drainage canals were built in the 1920s to remove water and improve agricultural productivity. The drainage eliminated the majority of wetlands by the 1930s thereby increasing the importance of the remaining wetlands found among the irrigation network and river margin (Wozniak 1995).

Within the RGCP, wetlands are largely restricted to narrow margins and former oxbows within the floodway. High water tables during irrigation season have created pockets of emergent marsh and wet meadow sites within the floodway and on private lands adjacent to the ROW (Parsons 2001b). The two most significant wetlands on private lands adjacent to the ROW are found north of Seldon canyon and south of Las Cruces.

4.6 VEGETATION COMMUNITY CLASSIFICATION

Vegetation communities are classified as either riparian (the floodway) or upland vegetation. Riparian is generally defined as land occurring along a water body (Briggs 1996) transitioning between permanently saturated wetlands and upland areas (BLM 1993). Older and more classical riparian interpretations identify primarily woody vegetation associated only with stream or river systems. Recent interpretations include a broader view involving, surface and subsurface water influences, and natural forces and human-induced activities that affect woody and emergent vegetation (Dall *et al.* 1997). For classification purposes, lands within the floodway (including wetlands) are classified as riparian with the wetter areas classified as wetlands. Within each riparian and upland class, more detailed physiognomic classes are defined. Table 4.1 presents vegetation community classification used to describe the RGCP.

4.6.1 Riparian Communities

Herbaceous. Due to mowing, much of the riparian community is maintained in an early successional state and classified as herbaceous. Herbaceous communities include non-woody vegetation such as grasses, sedges, and forbs with less than 20 percent cover in trees and shrubs. This community corresponds to Hink and Ohmart Type VI open grassland or emergent community. Although the herbaceous community is diverse, many non-native, invasive, and noxious species such as Russian thistle, red bladderpod, and jimson-weed occur. Many plants are opportunistic, early successional species which are often indicators of disturbance. With the exception of Seldon Canyon, the herbaceous class is abundant throughout the RGCP.

Table 4.1 Vegetation Communities and Aquatic Habitat within the RGCP

VEGETATION COMMUNITY	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO	TOTALS
Riparian (floodway)								
Herbaceous	303	542	14	289	459	399	555	2551
Herbaceous – on levees	46	154		46	131	217	154	748
Woodland	380	196	8	242	195	264	160	1,445
Shrubland	302	305	4	117	38	49	24	839
Exposed ground	276	101	0	138	36	111	40	702
Croplands	40	26	0	0	0	0	0	66
Wetlands - Emergent marsh	42	31	2	15	11	29	10	140
Wetlands – Palustrine Woodland	12	20	0	0	3	1	1	37
Total Riparian (acres)	*1,401*	*1,375*	*28*	*836*	*873*	*1,070*	*944*	*6,527*
Uplands								
Herbaceous	789	83	0	0	0	0	0	872
Woodland /Shrubland	721	51	0	0	0	0	0	772
Exposed ground	131	30	0	0	0	0	0	161
Total Upland (acres)	*1,641*	*164*	*0*	*0*	*0*	*0*	*0*	*1,805*
Total Land Acreage	**3,042**	**1,539**	**28**	**836**	**873**	**1,070**	**944**	**8,332**
Open Water/Unconsolidated Shore	271	541	263	292	420	498	445	2730
Total Acreage for the RGCP	**3,313**	**2,080**	**291**	**1,128**	**1,293**	**5,168**	**989**	**11,062**

Within the floodway, herbaceous lands are normally characterized as intermediate to xeric grasslands. Xeric grasslands are located on the levees and higher sites within the floodway. Approximately 748 acres of grasslands are part of the levee. Isolated lower sites are composed of mesic vegetation at times transitioning into hydric (wetland) communities. In the absence of mowing, herbaceous areas would likely convert to a woody salt cedar community.

Woodlands. Woodlands are dominated by woody vegetation over 9 feet tall and with a minimum canopy cover of 20 percent. This community corresponds to Hink and Ohmart Type III woodland, and is also referred to in this document as bosques. Woodlands consist of native and non-native woody species, with native species rarely dominating. The dominant species in this community is invasive salt cedar. Common native species include honey mesquite, littleleaf sumac, peachleaf willow, and occasional Rio Grande cottonwood.

Shrublands. Shrublands are characterized by woody vegetation less than 9 feet with a canopy cover less than 20 percent. This community corresponds to Hink and Ohmart Type V dense shrub community. Within the RGCP, the dominant species in the shrubland is salt cedar. The shrubland class is similar in species composition of the woodland community. Native species in this class include apache plume, aromatic sumac, baccharis, fourwing saltbush, and pale wolfberry. Shrublands dominated by willow/seepwillow often transition into palustrine wetlands. Due to the changes in vegetation as a result of the mowing there is a significant overlap between shrubland and herbaceous communities. Permanent shrubland habitat is found closer to the river or in other areas more difficult to mow.

Exposed Ground. This land cover classification is characterized by the absence of vegetation and includes bare soil, sand, silt, and gravel and vegetation, if present, is very sparse. Bar ground accounts for a significant amount of the floodway. A recent study in the RGCP using a transect sampling method found that in over half of survey sites (18 of 35 sites), bare ground was actually the dominant land cover type and in 11 sites, it was the second most dominant land cover type (Watts 1998).

Cropland. Croplands include alfalfa, chili, corn, cotton, pecan and a number of other crops. These agricultural areas make up a small percentage of the land cover within the floodway.

Wetlands. Wetlands are those areas where water saturation is the dominant factor determining soil development and the types of plants and animal communities present (Cowardin *et al.* 1979). Wetlands are found on sandbars near the center of the channel, river margins or in close proximity to the mouths of arroyos (Parsons 2001a). Wetlands are also found in the floodway where groundwater is at or just below the surface. These wetlands are classified as palustrine woodlands or emergent marsh.

- **Emergent Marsh.** The emergent marsh class is dominated by herbaceous vegetation such as bulrush, cattail, and horsetail. Non-native, or noxious species include Johnsongrass, downy brome, and careless weed. Hydrology is a function of rainfall, episodic flooding, and depth of water table. The majority of wetlands

in the RGCP are classed as emergent marsh. Emergent marshes are primarily found in the Upper Rincon, Lower Rincon and Lower Mesilla RMUs. Two fairly significant emergent marsh areas are located on private property north of Seldon Canyon and south of Las Cruces. Both areas are within potential conservation easements.

- **Palustrine Woodlands.** Palustrine woodlands are dominated by facultative to obligate woody wetland vegetation. The class is characterized by mixtures of native and non-native plant species found in moist soil conditions. Willow/seepwillow cover types found in saturated soil conditions fall within this category. Depending on hydrologic regime, cottonwood bosques can be classified as palustrine woodlands or riparian woodland. Palustrine woodlands characterized by native species are rare, and when found, occur as narrow isolated pockets. The majority of native dominated palustrine woodland sites are found in the Upper Rincon RMU. Palustrine woodlands can include species such as New Mexico olive, baccharis, false indigo bush, and wolfberry (Scurlock 1998).

4.6.2 Uplands

The uplands represent lands outside the historic floodplain and are dominated by xeric plant species. Grazing in the uplands has reduced populations of some grasses, and the grass communities with grazing tolerant forbs and shrubs. These communities include less palatable species such as snakeweed and shrubs such as saltbush and salt cedar (Scurlock 1998; Stotz 2000).

Woodland/shrubland. The woodland/shrubland community includes non-agricultural trees but will occasionally include drier former agricultural lands dominated by woody vegetation (over 20 percent woody coverage). Shrublands are mostly less than 9 feet in height and over 20 percent canopy cover. The majority of the woody upland sites are shrubland class.

Herbaceous. Herbaceous lands include all non-woody vegetation including grasses and forbs. Herbaceous areas are composed of less than 20 percent woody cover. Recent studies of upland vegetation suggest that ground coverage is often less then 20 percent within this and other uplands classes (USACE 1996).

Exposed Ground. Exposed lands are relatively abundant in the northern reach of the RGCP and include bare soil, sand, silt, and gravel. This land cover classification is defined by the absence of vegetation (<5 percent coverage). Vegetation, if present, is sparser than in vegetated land use classes. Exposed ground is often interspersed within herbaceous and woodlands.

4.7 REFERENCE COMMUNITIES

Reference Communities represent the desired future condition of vegetation communities as a result of implementing environmental measures. The actual process of developing

desired future communities is dependent on site-specific characteristic and monitoring to achieve success. Table 4.2 lists potential reference communities created as a result of implementing environmental measures. Table 4.3 presents the total acreage of each reference community by alternative. The following section describes each of the four reference communities.

Table 4.2 Reference Communities Associated with Environmental Measures

ENVIRONMENTAL MEASURE	ALTERNATIVE*	REFERENCE COMMUNITY
Modified grazing leases (uplands)	FCI, IULM, TRR	Improved uplands
Modified grazing leases (riparian zone)	FCI, IULM, TRR	Improved riparian
Modified grassland management	IULM, TRR	Native grasslands
Native vegetation planting	IULM, TRR	Native bosque
Existing bosque enhancement	IULM, TRR	Native bosque
Bank shavedowns	IULM	Native bosque
Seasonal peak flows/bank preparation	TRR	Native bosque
Reopening former meanders within ROW	TRR	Native bosque
Conservation easements	TRR	Native bosque, native grasslands and/or remnant bosques

* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

Table 4.3 Reference Communities by Alternative

EVALUATION CRITERIA	NO ACTION	FLOOD CONTROL IMPROVEMENT	INTEGRATED USIBWC LAND MANAGEMENT	TARGETED RIVER RESTORATION
Improved Uplands (acres)	NC	1805	1805	1805
Improved Riparian (acres)	NC	1747	1747	1688
Native Bosque or Cottonwood/Willow riparian community (acres)	NC	NC	350	1549
Native Grasslands (acres)	NC	NC	1641	1929

nc=no change

Improved Riparian Community. This community would be developed through modification of floodway grazing lease practices in conjunction with additional salt cedar control methods. Although the primary objective is improved erosion control and bank stability in grazed areas, the improved riparian community would incorporate livestock grazing in a manner more compatible with biological quality, and increase forage production. It would develop habitat corridors between patches of bosque, provide increased protection of floodway wetlands, contain the expansion of existing large stands of non-native vegetation, and enhance wildlife habitat. Grazing would be managed to promote regeneration of native vegetation and increase species diversity. Grazing management could include vegetation treatments such as burning, mechanically clearing and re-seeding.

Despite the improved habitat quality, the reference community would continue to be disconnected from the river, composed primarily of herbaceous vegetation with woodlands dominated by invasive species. However, the herbaceous vegetation would be structurally

and floristically diverse. Salt cedar would be controlled to limit the expansion of existing non-native bosque vegetation. Vegetation along the river and in wetlands locations would be maintained in a manner that improves bank stability and decreases potentially sedimentation.

Improved Uplands Community. This community would be developed through modification of upland grazing lease practices and incorporate grazing practices in a manner more compatible with increasing vegetative cover to reduce soil erosion and enhance wildlife habitat. The reference community would be dominated by upland herbaceous vegetation with a percent cover equal to or greater than 40 percent. Leases would be managed to increase the amount of palatable grass species such as grama grass species and other bunch grasses. Modified grazing regimes in conjunction with woody vegetation management will result in a greater contribution of less grazing tolerant grass species, more ground cover and improved soil stabilization.

Native Grassland Communities. Grasses have the greatest potential for holding soils, thus decreasing erosion. Coupled with densely wooded patches the habitat is ideally suited for a number of small mammal and bird species (USACE 2003). Native grasslands would be developed to improve habitat corridors between patches of bosque, provide increased protection of riparian wetlands, and enhance wildlife habitat. However, this reference community would continue to be disconnected from the river, and would be composed primarily of intermediate and xeric native grasses and other herbaceous vegetation. Within isolated mesic and hydric areas, species would include salt grass, cattail, sedges, and rushes.

Grasslands would be established by plantings and maintained through woody vegetation control. A woody component would likely be present, but typically less then a 20 percent aerial coverage. Where appropriate, woody vegetation would be retained for structural diversity and would include native woody vegetation such as screw bean mesquite. More xeric species would become established on higher sites. Salt cedar would be controlled. Vegetation along the river and in wetlands locations would not be maintained, with the exception of salt cedar removal to improve bank stability and decrease potential erosion and sedimentation.

Prescribed burning of grassland may be warranted to improve grass production. Most grasses are relatively tolerant of fire, and the subsequent nutrient pulse will allow grasses to rapidly recover after a fire. If native grasses are well-established, burning will control most woody plants (if they are small) and will promote growth of most herbaceous plants. In addition, if native plants are well established, particularly in the rooting zone, burning will not harm the roots and the soil will remain stabilized (Scurlock 1998; Crawford *et al*. 1996).

Native Bosque Community. Developing and sustaining native bosque communities could include clearing, hydrologic modifications, planting/natural regeneration, salt cedar control, fuel reduction, and natural or induced flooding (USACE 2003). This reference community would be floristically and structurally similar to native riparian communities characterized by uneven aged, multi strata woody plants, with interspersed grasslands and isolated wetlands. This would lead to an increase in valuable wildlife habitat, such as edge areas and patches. The community would be considered hydrologically connected, with the

potential for overbank flows and long term sustainability. Exotic vegetation, particularly salt cedar, would compose less than 20 percent of the community. Dominant woody species would include cottonwood and willow, with other species occurring such as western chokeberry, New Mexico olive, false indigo bush, and wolfberry among others.

Development of this community would require considerable site preparation, and long-term exotic species control. Periodic reduction in fuel loads may be required. Fuel load reduction consists of removing dead and fallen trees and excess leaf litter. When the flood disturbance regime was still functional, much of this material would have been removed by periodic flooding (USACE 2003).

4.8 VEGETATION MANAGEMENT WITHIN THE RGCP

Vegetation management affects the floristic and structural characteristics of vegetation communities. Vegetation management is conducted to reduce the amount of vegetation and potential obstructions within the ROW. The USIBWC manages the floodway vegetation primarily by mowing and grazing. Table 4.4 presents vegetation management by habitat type.

Table 4.4 Vegetation Management Within the ROW

		HABITAT TYPE		
CURRENT VEGETATION MANAGEMENT	ENTIRE PROJECT	WETLANDS*	RIPARIAN (EXCLUDING WETLANDS)	UPLANDS
No Mow Zones	57	0	57	0
Crop Leases	66	0	66	0
Annual Mowing	4,657	124	4,533	0
Grazing Leases	3,552	53	1,694	1,805

* Boundaries of grazing and mowing zones are not clearly delineated; therefore wetland area was proportionally assigned to vegetation management type.

4.8.1 Leased Areas

Grazing Leases. Grazing allotments are leased to private ranchers, and most of the grazing animals on these allotments are cattle. Agricultural and grazing leases require that brush and vegetation be removed or mowed annually within portions of the lease. Additionally, no permanent structures may be constructed. Table 4.5 lists the acreage leased by RMU (USIBWC 2000a).

Crop Easements. An estimated 66 acres of floodway are leased for crop production in the Rincon Valley. The majority of the land is in row crops; however, pecans are grown in the Lower Rincon Valley within the east floodway.

Table 4.5 Acreage Leased in the RGCP

RMU	HABITAT TYPE	LEASED AREA (ACRES)
Upper Rincon	Upland and Riparian	1,911
Lower Rincon	Upland and Riparian	473
Upper Mesilla Valley	Riparian	638
Las Cruces	Riparian	136
Lower Mesilla Valley	Riparian	256
El Paso	Riparian	138
Total Area Leased	***Upland and Riparian***	***3,552***

4.8.2 Mowed Areas

Annual Mowing of Floodway. Mowing of the riparian zone controls weed, brush, and tree growth, and is conducted at least once each year prior to July 15. Farm tractors with rotary slope mowers are generally used to mow the floodways. Slope mowers are used for vegetation maintenance on the channel banks. Some areas with dense vegetation may require a second late summer mowing. Approximately 4,657 acres are potentially mowed within the floodway (Table 4.6). However, the actual area mowed is less because some areas within the ROW are either inaccessible or heavily wooded Based on field observations conducted during the mowing season, mowers frequently work around well-established woodland patches in designated mow area and have been directed to avoid some native stands. The actual acreage cut by Slope mowers, is estimated at 80 percent of the potential area mowed or approximately 3,725 acres.

No-Mow Zones. Approximately 57 acres of no mow zones are located in the Upper Rincon and Las Cruces RMU. Since 1999 the USIBWC has conducted limited tree planting and maintained provisional test areas ("no-mow" zones) intended to evaluate effects of additional vegetation growth on RGCP functions.

Table 4.6 Vegetation Management by Mowing

METHOD	ACREAGE	COMMENTS
Grazing Leases	1,747	Based on a review of aerial imagery, potentially 30% of leased riparian areas are woodlands dominated by salt cedar. As such, active salt cedar control is estimated at 1,222 acres of floodway by lease holders. The remaining areas are grazed woodlands.
Mowing	4,657	Based on a review of aerial imagery, potentially 20% of mowed areas are woodlands mostly dominated by salt cedar. As such, mowing for the purpose of salt cedar control is estimated at approximately 3,725 acres of floodway. The remaining areas are unmanaged woodlands or areas otherwise avoided due to lack of accessibility or protection for designated areas.

4.9 AQUATIC COMMUNITIES

4.9.1 Historic Aquatic System

The earliest recorded accounts of the abundance and types of fish were made by Spanish explorers around El Paso, Texas (Stotz 2000). Early Spanish explorers noted the quantities of fish and eels in the Rio Grande. In 1846 large fish and eels were still being reported as quite common in the river near El Paso (Ruxton 1973). A more specific account of the fish in the El Paso area comes from a 1773 description of life in El Paso: "…the river abounds in fish, known as rok fish, although some call it bream. Other delicious kinds are the corazon and the enguila, all of more than medium size. The enguilas [eels] are found more often in the ponds formed by the overflow of the river than in its channel." Within the waters of the Rio Grande fish and fresh-water turtles were common and utilized as food sources

4.9.2 Current Aquatic Communities

A total 2,730 acres of open water/unconsolidated shore (depending on flow regimes) are found within the RGCP (Table 4.1). Instream habitat is characterized as low diversity lotic habitat with very little pool/riffle structure (optimal aquatic habitat). The vast majority of the river is considered as an undifferentiated run. Instream cover, which provides essential habitat for different life stages of invertebrate and vertebrate life, is practically non-existent. The river channel is mostly straight with little to no sinuosity except in the upper reaches of the RGCP; hence, there is little variation in velocity. Sand and silt dominate the substrate and are generally the least favorable substrates for supporting aquatic organisms and support the fewest species and individuals. The riverbank is moderately stable to unstable.

Aquatic ecosystems are influenced by upland and floodplain-riparian vegetation. Vegetation composition will influence and is influenced by the prevailing hydrological regime. The floodplain is dominated by herb/graminoid species with woody plants located along the bank. There is little to no overhanging vegetation to ameliorate instream water temperatures. The RGCP supports a fish community of at least 22 species including channel catfish, white crappie, bluegill, common carp, river carpsucker, smallmouth buffalo, gizzard shad, black bullhead, flathead catfish, largemouth bass, warmouth, green sunfish, and longear sunfish (Sublette *et al.* 1990).

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SECTION 5
METHODOLOGY

Effect determinations were assessed by determining the presence or absence of T&E habitat and if present, analyzing the potential effects of environmental measures and O&M activity associated with each alternative. Effects determination for each listed species was based on the following definitions:

- "No effect" – Either the T&E species habitat was not present in the RGPC and/or the alternative would have no effect on available T&E species habitat.
- "May affect – is not likely to adversely affect" – T&E species habitat or T&E individuals could potentially be present in the RGPC and the alternative would have beneficial, insignificant or discountable effects.
- "May affect – is likely to adversely affect" – T&E species habitat or T&E individuals could potentially be present in the RGPC and the adverse effects can not be avoided.

5.1 ASSUMPTIONS REGARDING PRESENCE OR ABSENCE OF T&E HABITAT

The following assumptions formed the basis of determining potential presence or absence of T&E species within the RGCP:

- The likelihood for T&E species to occur in the RGCP could be substantially determined from literature reviews and comparisons of species life history requirements with vegetation community descriptions.
- Analyses of aerial photography and development of vegetation maps could be used to concentrate field surveys in areas containing possible T&E habitat.
- Although the likelihood of actually observing a rare species in the course of field surveys was low, suitability of habitat was readily identifiable in the field.

5.2 ASSUMPTIONS REGARDING EFFECTS ON POTENTIAL T&E HABITAT DUE TO IMPLEMENTING ENVIRONMENTAL MEASURES

The goal of implementing environmental measures is to improve and restore native riparian communities and diversify aquatic habitat in the RGCP. As a result, an assessment of potential future environmental conditions is necessary to analyze the effects on T&E species. Assumptions concerning the effects of future environmental conditions on listed species included:

- The current anthropomorphic factors would continue to be the dominating influence. Specifically the highly altered hydrologic and sediment regime would remain in place through the implementation period.

- The amount of reference community created assumed successful implementation of environmental measures.
- Environmental measures would result in a community comparable to the reference communities described in subsection 4.7. Sites would vary in seral stage, structure and site-specific characteristics, but generally classified as the reference community.
- Native communities would develop over a 20-year implementation period.

5.3 WORK PLAN

A work plan for T&E surveys was completed in April 2000 and approved by USIBWC. The approved work plan was provided to the USFWS Austin Regional Office, New Mexico Department of Game and Fish (NMGF), and Texas Parks and Wildlife Department (TPWD. Four field surveys were conducted. Survey objectives are described below.

Spring T&E Habitat Survey, April 24 through 28, 2000

- Identify vegetation communities present within the RGCP,
- Assess the presence or absence of potentially suitable habitat for threatened or endangered species at 42 locations.

Fall Aquatic Survey, September 11 through September 22, 2000

- Characterize aquatic habitat in the RGCP,
- Identify aquatic species occurring in the RGCP during high flow (irrigation period).

Fall/Winter Vegetation Survey, November 27 through December 1, 2000

- Conduct additional habitat surveys based on 148 vegetation survey locations conducted in conjunction with wildlife habitat surveys.

Winter Aquatic Habitat Survey, January 22 through January 24, 2001

- Identify aquatic species occurring during low flow (non-irrigation period).

Terrestrial and aquatic field surveys were conducted along the entire RGCP. Surveys were concentrated in areas that contained potentially suitable habitat based on the initial land cover analyses and species-specific reports.

The fall aquatic survey was scheduled to coincide with high irrigation flows in the Rio Grande. The fall/winter terrestrial T&E species survey was scheduled to coincide with avian migrations, while the winter aquatic survey was scheduled to occur during low flow.

Staff

The staff used to perform surveys, identify terrestrial and aquatic flora and fauna, perform geographic information system (GIS) analysis, and report results are identified in Table 5.1.

Table 5.1 List of Preparers

STAFF	EXPERTISE
R.C. Wooten, Ph.D.	Project Principal, NEPA, and technical direction
Carlos Victoria-Rueda, Ph.D.	Project management
James Hinson, M.S.	Biologist
Rick Billings, M.S.	Southwestern aquatic systems
John Sigler, Ph.D.	Southwestern aquatic systems
Patty Phillips, M.S.	Ornithology, southwestern vegetation
Mike Sipos, M.S.	Mammalogy, ornithology, GIS, GPS
Chris Westerman, M.S.	Wetlands, southwestern vegetation

5.4 T&E SPECIES INFORMATION SUPPLIED BY AGENCIES

Information on T&E species in the RGCP was requested from the USFWS, TPWD, and NMGF. Table 5.2 lists federally-listed species potentially occurring in the RGCP, along with their state listing status. Information from these agencies and other published sources was used to determine habitat requirements for each protected species. Correspondence with agencies are provided in Appendix A.

5.5 TERRESTRIAL FIELD SURVEY METHODS

5.5.1 Spring Field Surveys

Survey locations included wetlands and riparian zones along the Rio Grande and representative sample sites within major vegetation communities. Survey locations were based on preliminary vegetation maps, species distribution information, and habitat preference data to concentrate surveys within potential endangered or threatened species habitat. Sites most likely to contain potential threatened or endangered species habitat were emphasized during the survey. All survey locations were recorded using a global positioning system (GPS) and are depicted in Figure 5.1.

The Seldon Canyon RMU was not surveyed. Seldon Canyon is located within the RGCP; however, the USIBWC has limited ROW with the majority of the river section held as private property. The privately owned section begins north of Leasburg Dam and ends south of Seldon Bridge, a distance of 8.6 miles.

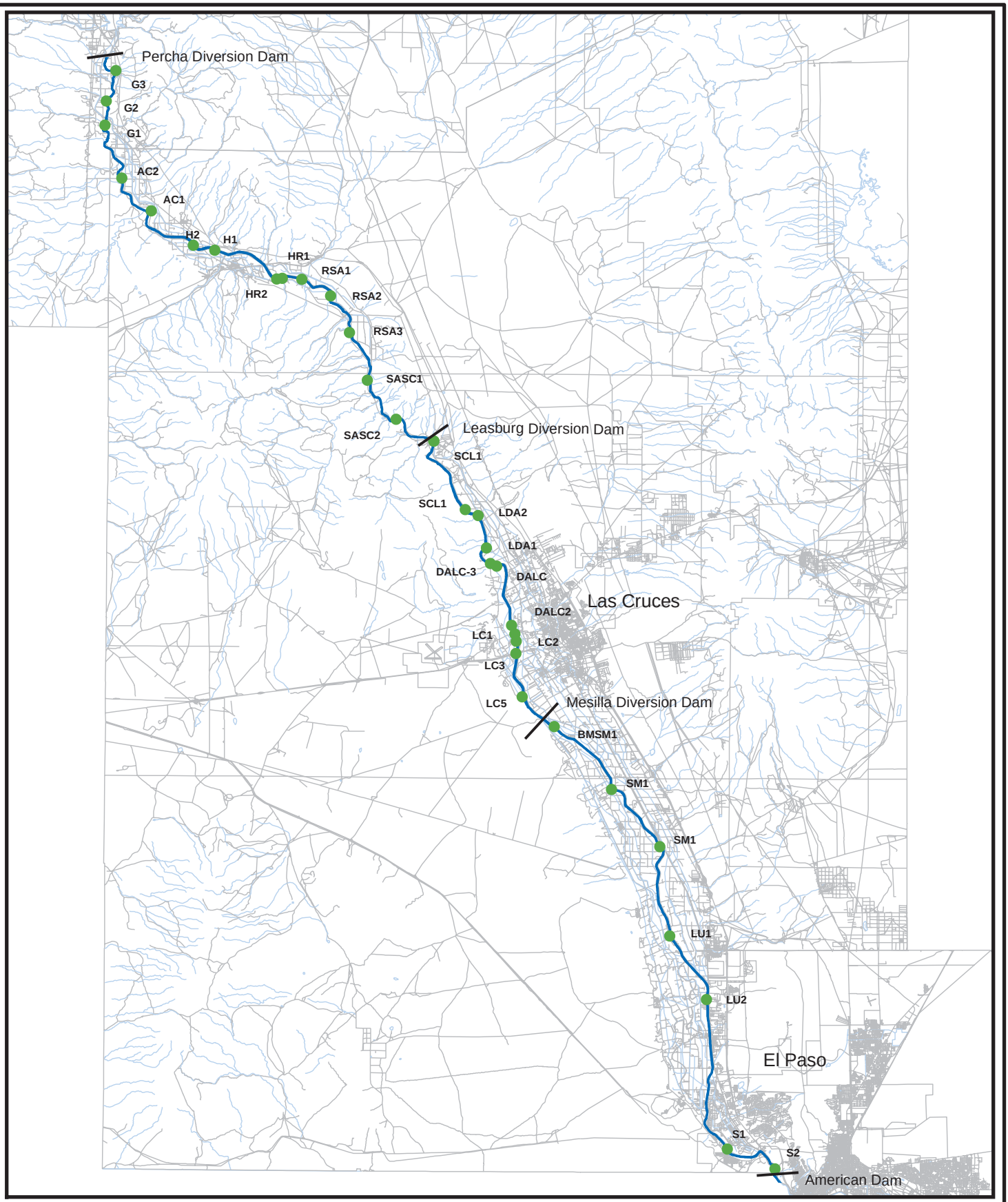
Table 5.2 T&E Species Potentially Occurring in the RGCP

		LISTING STATUS*	
COMMON NAME	**SCIENTIFIC NAME**	**STATE**	**FEDERAL**
El Paso County, TX			
Interior least tern	*Sterna antillarum*	E	E
Northern aplomado falcon	*Falco femoralis septentrionalis*	E	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E
Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	E	E
Mexican spotted owl	*Strix occidentalis lucida*	T	T
Doña Ana County, NM			
Bald eagle	*Haliaeetus leucocephalus*	T	T
Black-footed ferret	*Mustela nigripes*	S	E
Interior least tern	*Sterna antillarum*	E	E
Mexican spotted owl	*Strix occidentalis lucida*	S	E
Northern aplomado falcon	*Falco femoralis septentrionalis*	E	E
Sneed pincushion cactus **	*Coryphantha sneedii sneedii*	E	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E
Whooping crane	*Grus americana*	E	E
Sierra County, NM			
Bald eagle	*Haliaeetus leucocephalus*	T	T
Black-footed ferret	*Mustela nigripes*	S	E
Chiricahua leopard frog	*Rana chiricahuensis*	S	C
Gila trout	*Oncorhynchus gilae*	T	E
Mexican spotted owl	*Strix occidentalis lucida*	S	E
Northern aplomado falcon	*Falco femoralis septentrionalis*	E	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E
Todsen's pennyroyal **	*Hedeoma todsenii*	E	E
Whooping crane	*Grus americana*	E	E

T – Threatened; E – endangered, S – sensitive; C – candidate;

** New Mexico endangered plant species listed as protected, category L1.

Color Infrared Orthoimagery and aerial photographs were used to create preliminary vegetation maps along the 106-mile study corridor. *In situ* vegetation characterization (pedestrian surveys) were conducted to provide more detailed vegetative descriptions (*e.g.,* dominant vegetation species, vegetation structure) at selected survey locations. Vegetation characterizations were conducted at 42 sites along the river. Each of these sites was photographed. A photo log of selected sites is found in Appendix F.



Survey Location

North

SCALE = 1 : 570,000 or 1 INCH = 47,500 FEET
UTM Zone 13 N / NAD 83

0 5 10 20 30 40 Kilometers

0 2.5 5 10 15 20 Miles

Figure 5-1 Locations of Spring Terrestrial Survey

United States Section,
International Boundary Water Commission

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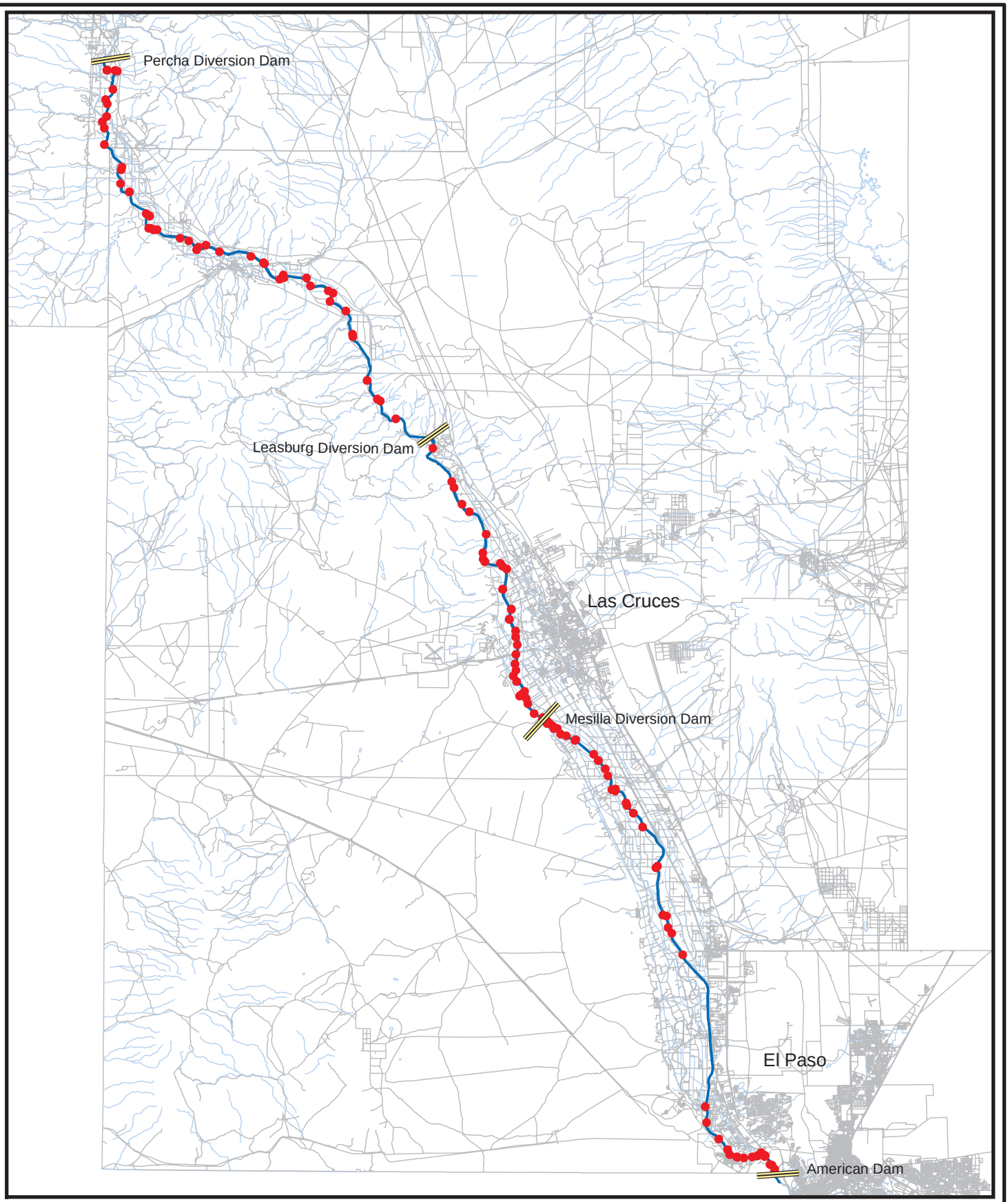

Survey Location

North

SCALE = 1 : 570,000 or 1 INCH = 47,500 FEET
UTM Zone 13 N / NAD 83

0 5 10 20 30 40 Kilometers

0 2.5 5 10 15 20 Miles

Figure 5-2 Locations of Fall / Winter Detailed Vegetation Survey

United States Section,
International Boundary Water Commission

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5.5.2 Fall/Winter Vegetation Survey

Fall/Winter terrestrial field surveys were conducted November 27 through December 1, 2000 to develop detailed vegetation classification maps, assess wildlife habitat value and conduct additional wildlife species pedestrian surveys. The wildlife habitat appraisal procedure (WHAP) (TPWD 1995) was used to record the following information at each survey location:

- Vegetation and species diversity.
- Position of species associations (*e.g*., riparian zone, floodway, or levee).
- Vegetation utilization by wildlife.
- Site potential.
- Uniqueness and relative abundance.
- Vertical vegetation stratification.
- Other structural diversity components (*e.g*. brush and rock piles, snags, fallen logs, thick grass cover, etc.).
- Condition of existing vegetation.
- Any wildlife species observed.
- Other notes (*e.g.,* signs of cattle use, structures, habitat features such as wetlands).

Vegetation community characterizations were made at 148 survey locations (Figure 5.2). If T&E species were observed during vegetation surveys, identifications were documented in field logs and on vegetation survey forms. Vegetation species lists are found in Appendix E.

5.6 AQUATIC SURVEYS

5.6.1 Surveys at Sampling Transects

Physical and chemical information was recorded at transect locations along the RGCP (Table 5.3 and Figure 5.3). During the fall (high flow) collections, all data points, including river cross-section locations, were captured by GPS. Depth and water velocity at each transect location (1 to 10 points per cross section) were recorded with a Marsh-McBirney Model 2000 portable water flow meter. Water quality parameters were measured during both field surveys using a Yellow Springs Instruments model 650 MDS probe system. These parameters were water temperature, pH, dissolved oxygen, and conductivity. Appendix G presents aquatic survey results.

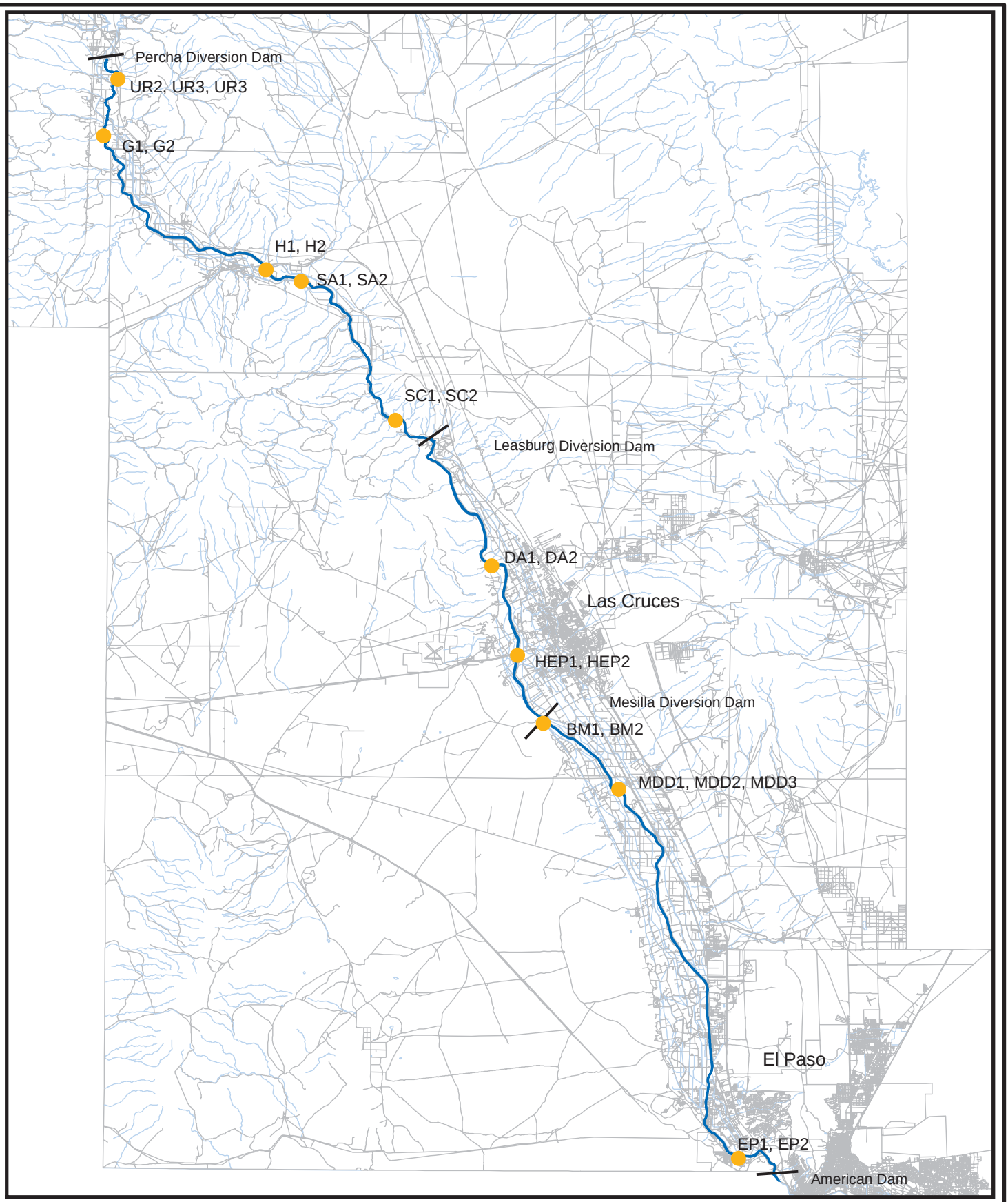
Table 5.3 Transect Location for Aquatic Sampling Sites

MANAGEMENT UNIT	TRANSECT SERIES	TRANSECT IDENTIFICATION	COMMENTS
Upper Rincon	Upper Rincon	UR2, UR3, UR3	At Tipton Arroyo
Upper Rincon	Garfield	G1, G2	Sibley Arroyo
Lower Rincon	Hatch	H1, H2	Downstream of Rincon Siphon
Lower Rincon	Sierra Alta	SA1, SA2	At Rincon Arroyo
Seldon Canyon	Seldon Canyon	SC1, SC2	Highway 185 at Mile Marker 18
Upper Mesilla	Doña Ana	DA1, DA2	Downstream of Shalem Colony Bridge
Las Cruces	Las Cruces	HEP1, HEP2	Downstream of Picacho Bridge
Lower Mesilla	Black Mesa	BM1, BM2	Downstream of Mesilla Bridge
Lower Mesilla	Mesilla Valley	MDD1, MDD2, MDD3	Downstream of Mesilla Diversion Dam
El Paso	El Paso	EP1, EP2	At Cottonwood Bosque Area

Cross sections were completed at each transect location, and readings from the GPS and flow were taken. Depth and velocity readings were recorded on field data sheets. Distance between data points at a given transect was based on notable changes in depth or velocity. Physical chemistry readings were recorded on field data sheets once for each management unit location. Electrofishing or seining was completed at each transect location to document fish species present. All habitat types at the location were electrofished or seined.

5.6.2 Additional Sampling Conducted at USFWS Mitigation Sites

In 1994-1995, accumulated sediment was removed from the confluence zones of 14 arroyos within the RGCP by the USIBWC downstream of Caballo Dam. Mitigation for unavoidable impacts to aquatic habitat was required by the U.S. Army Corps of Engineers for approval of the Section 404 permit. Mitigation measures included construction of two vortex weirs, three embayments, and nine groins. Mitigation sites were included in the surveys of the aquatic ecosystem, not only because of their presence in the RGCP, but because of the quantitative information being collected on the sites by the USFWS, New Mexico Fisheries Resource Office, Albuquerque.



Aquatic Sampling Transect Locations

North

SCALE = 1 : 570,000 or 1 INCH = 47,500 FEET
UTM Zone 13 N / NAD 83

0 5 10 20 30 40 Kilometers

0 2.5 5 10 15 20 Miles

Figure 5-3 Map of Aquatic Sampling Transects

United States Section,
International Boundary Water Commission

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SECTION 6
RESULTS

This section presents the effects determination for T&E species for each alternative. For those species with no potential habitat in the RGCP (as determined from literature review and field survey results) the determination of "no-effect" was applied. For those species with potential habitat in the RGCP, O&M activity and environmental measures associated with each alternative were assessed to determine potential effects.

6.1 PRESENCE OR ABSENCE OF T&E SPECIES

Habitat for listed aquatic species does not occur within the RGCP. The Chiricahua leopard frog inhabits rivers and other aquatic habitats at elevations of 3,281 to 8,890 feet. The Rio Grande drainage is occupied by these frogs only in Alamosa Creek in Socorro County, New Mexico, and Cuchillo Negro Creek in Sierra County, New Mexico. The Gila trout occurs in small, high mountain stream habitats, which do not occur in the RGCP (Table 6.1).

Similarly, most terrestrial T&E species require upland habitats that do not occur in the RGCP. These species would not be expected to be present and are excluded as potentially occurring within the RGCP.

Based on literature review, five species with potential habitats occur within the RGCP. These include the interior least tern, southwestern willow flycatcher, whooping crane, piping plover, and bald eagle (Table 6.1). However, results of the spring and fall/winter terrestrial field surveys found potential suitable habitat for only three species, the interior least tern, piping plover, and bald eagle. Table 6.2 presents the presence and absence analyses based on field surveys. Although suitable habitat for southwestern willow flycatcher was not found during field surveys, it has been documented adjacent to the USIBWC ROW in previous studies (Kay Casa Enterprises 2002; Ch2M Hill and Geomarine 2000). Suitable habitat for the whooping crane was not found. The findings are consistent with previous studies summarized in Section 3. Appendix H provides additional life history information for species with potential habitat in the RGCP.

6.2 EFFECTS DETERMINATION

The potential effects of O&M activities and environmental measures on T&E species are presented in Table 6.3. Potential effects could be short-term and direct as a result of construction activities and/or long-term as a result of restoring and improving riparian habitats. Currently, suitable habitat for listed species is largely absent in the RGCP. However, environmental measures could potentially result in development of suitable habitat. Specifically, measures associated with the Integrated USIBWC Land Management Alternative and Targeted River Restoration Alternative could potentially result in future vegetation communities consistent with T&E requirements.

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Table 6.1 Presence/Absence of Suitable Habitat Based on Literature Review

		Listing Status*					
Common Name	**Scientific Name**	**Federal Listing**	**El Paso Co. ‡**	**Doña Ana Co. †**	**Sierra Co. †**	**Required Habitat**	**Presence/Absence Determination**
Interior least tern	*Sterna antillarum*	E	E	E	---	River sandbars and beaches. Requirements correspond with unconsolidated shore/sandbars found within RGCP.	Potential habitat present
Northern aplomado falcon	*Falco femoralis septentrionalis*	E	E	E	E	Brushy prairie and yucca flats. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E	E	E	Prefers brushy fields and thickets along streams. Has been documented in areas outside of and adjacent to the RGCP. Requirements correspond with Riparian Shrubland/Woodland and Palustrine Woodland found within RGCP	Potential habitat present
Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	E	E	E	---	Limestone ledges in the Chihuahuan desert and grassland at 4,300-5,400 feet. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Mexican spotted owl	*Strix occidentalis lucida*	E	T	S	S	Dense coniferous forest. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Bald eagle	*Haliaeetus leucocephalus*	T	---	T	T	Prefers timbered areas along coasts, large lakes, and rivers. Requirements correspond with Riparian Shrubland/Woodland and Palustrine Woodland found within RGCP. Has been documented in northern reaches of the RGCP (southern Sierra County). Potential habitat in the form of snags, are most common in northern reaches of the RGCP.	Potential habitat present
Black-footed ferret	*Mustela nigripes*	E	---	S	S	Mixed shrub; associated w/ prairie dogs. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Whooping crane	*Grus americana*	E	---	E	E	Prefers marshes and prairie potholes in summer and winters in coastal marshes. Documented north of the RGCP at Bosque del Apache NWR (experimental population).	Potential habitat present

Table 6.1 Presence/Absence of Suitable Habitat as a Result of Literature Search (…continued)

		Listing Status*					
Common Name	**Scientific Name**	**Federal Listing**	**El Paso Co. ‡**	**Doña Ana Co. †**	**Sierra Co. †**	**Required Habitat**	**Presence/Absence Determination**
Chiricahua leopard frog	*Rana chiricahuensis*	C	---	---	S	Rocky slopes of springs, streams and rivers. Invades stock tanks. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
American peregrine falcon	*Falco peregrinus anatum*	E	---	---	---	Cliffs, high river banks, large trees, tall buildings. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Arctic peregrine falcon	*Falco peregrinus tundrius*	E	---	---	---	Cliffs, high river banks, large trees, tall buildings. Rests at Texas coast during migration. Habitat not present based on literature review and detailed vegetation community maps.	Habitat not present
Piping plover	*Charadrius melodus*	T migratory	---	---	---	Beaches, sand dunes, sparsely vegetated areas along oceans, rivers and streams.	Potential habitat present
Gila trout	*Oncorhynchus gilae*	E	---	---	T	Small, high mountain streams. Habitat not presents based on literature review and detailed vegetation community maps.	Habitat not present
Todsen's pennyroyal	*Hedeoma todsenii*	E	---	---	E	Pinion juniper woodland, sandy gypsum soil, north-facing slopes. Habitat not presents based on literature review and detailed vegetation community maps.	Habitat not present

T- threatened; E – endangered; S – sensitive; C – candidate;

* USFWS. 2004. U.S. Fish and Wildlife Southwest Region 2, New Mexico Ecological Services Field Office.
‡ Texas Parks and Wildlife. 2003. Annotated County List of Rare Species, El Paso County, Texas.
† New Mexico Game and Fish. 2004. County-specific state listings for Sierra and Doña Ana Counties, New Mexico. Correspondence, January 13, 2004.

Table 6.2 Presence or Absence Analyses for Species Based on Field Surveys

SPECIES WITH POTENTIAL HABITAT PRESENT IN RGCP	RESULTS OF FIELD SURVEY	PRESENCE/ ABSENCE HABITAT DETERMINATION
Interior least tern	At least one interior least tern was observed during fall surveys in September 2000, presumably in the process of migrating south. The interior least tern is the only listed species observed within the RGCP during field surveys. The tern was initially sighted in the Lower Mesilla Valley RMU, south of Mesilla Dam, in 2000. The solitary individual was observed in flight over the river and resting on unvegetated sand bars. Five additional sightings were made on the same date within 5 miles south of the first sighting, and may have been the same individual. Altered flow conditions in the river have eliminated any suitable nesting habitat in the RGCP; however, interior least terns may use the area for feeding or resting during migration.	Limited habitat present
Piping plover	Suitable habitat for migrating birds potentially exists on sandbars, however, this plover is known only as a rare spring (April) migrant, having been verified at Springer Lake (Colfax Co.) and reliably reported at Bosque del Apache National Wildlife Refuge in Socorro Canyon. No sightings have occurred in the RGCP.	Limited habitat present
Southwestern willow flycatcher	Suitable habitat is nonexistent within the RGCP. The thickets of willow and/or salt cedar are not dense enough and do not meet the 10 m (30 feet) wide criteria (see appendix H for description of requirements). Vertical structure of thickets in un-mowed areas is not suitable and the current hydrologic regime does not provide for saturated soils. Potential habitat does occur in areas adjacent to the USIBWC ROW (Seldon Canyon, Leasburg State Park and Picacho wetlands restoration pilot project).	Habitat not present
Bald eagle	Only marginal habitat (large trees) was found in the northern most portions of the RGCP near Percha Dam. Bald eagles have been sighted in previous studies in the northern portions of the RGCP.	Limited habitat present
Whooping crane	The whooping crane's preferred habitat of marshes and prairie potholes is rare to non-existent in the RGCP. There are no prairie potholes, and marsh vegetation is generally confined to small sand bar islands, arroyo mouths, and spillways. In addition, the migratory path of the whooping crane has been extensively documented, and the crane has never been observed to use the RGCP area.	Habitat not present

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Table 6.3 Potential Effect of O&M Activities and Environmental Measures on T&E Species

O&M ACTIVITY / ENVIRONMENTAL MEASURE*	ALTERNATIVE	POTENTIAL EFFECT TO LISTED SPECIES
Current O&M activities	NA, FCI, IULM, TRR	Long-term sediment removal/ disposal operations, channel bank protection and road maintenance are conducted. Frequency of sediment removal and channel bank protection occurs infrequently (minimal since 1961). Road maintenance occurs on a less then annual basis. Vegetation management by mowing either within USIBWC maintained areas or within leased areas is conducted on an annual basis. Maintenance activities could potentially create short-term noise disturbance to interior least terns and bald eagles within RGCP.
Levee rehabilitation	FCI, IULM, TRR	Activities could potentially create short-term noise disturbance to infrequent migrants, the interior least tern and bald eagle.
Modify grazing practices	FCI, IULM, TRR	No likely benefit as a result of implementing this measure
Modified grassland management in floodway	IULM, TRR	No likely benefit as a result of implementing this measure
Plant woody native vegetation and/or enhance existing bosques	IULM, TRR	No likely benefit within 20-year implementation period.
Bank shavedowns	IULM	Earthwork and related construction activities could potentially create short-term noise disturbance to interior least terns and bald eagles infrequently over- wintering within RGCP. Development of riparian woodlands in conjunction with potential moist soil conditions as a result of bank shavedowns could create conditions suitable for southwestern willow flycatcher nesting habitat. The lowering of banks would have a potential of creating interspersed wetlands and or moist soil conditions within the restoration areas. This combination of wetlands/wet conditions in conjunction with riparian development could result in long-term beneficial effects to southwestern willow flycatcher habitat. No likely benefit to bald eagles within 20-year implementation period would be expected.
Open former meanders	TRR	Earthwork and related construction activities could potentially create short-term noise disturbance to interior least terns and bald eagles infrequently over- wintering within RGCP. Development of riparian woodlands in conjunction with potential moist soil conditions as a result of opening former meanders could create conditions suitable for southwestern willow flycatcher nesting habitat. The opening of meanders would have a potential of creating interspersed wetlands and or moist soil conditions within the restoration areas. This combination of wetlands/wet conditions in conjunction with riparian development could result in long-term beneficial effects to southwestern willow flycatcher habitat. No likely benefit to bald eagles within 20-year implementation period would be expected.
Modify dredging at arroyos by creating embayments	TRR	No likely benefit as a result of implementing measure within 20-year implementation period. Dredging activities could potentially create short-term noise disturbance to interior least terns and bald eagles that infrequently over-winter within the RGCP.
Seasonal peak flows	TRR	No likely benefit as a result of implementing measure within 20-year implementation period would be expected.
Conservation easements	TRR	Management of conservation estimates could potentially benefit listed species. However, if suitable habitat currently exits in some conservation easements (*i.e*. those located in Seldon Canyon), implementation of measure (*i.e.,* salt cedar reduction) could adversely effect southwestern willow flycatcher habitat. Therefore, surveys would be conducted within conservation easements prior to environmental measure implementation. No likely benefit to bald eagles within 20-year implementation period would be expected.

* NA- No Action; FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

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Table 6-4 presents the summary of effects to T&E species by alternative. Irrespective of alternative, short-term and direct impacts associated with alternatives are not likely to adversely affect T&E species because of the limited availability of T&E habitat with the RGCP. In the unlikely event that T&E species would be encountered in the RGCP (*e.g.* migrating), disturbance would be short-term and not likely to adversely affect individuals. In the case of voluntary conservation easements (Targeted River Restoration Alternative) located outside the RGCP, any adverse effects to potential T&E species would be entirely mitigable. Most foreseeable effects as a result of creating native vegetation communities would be positive.

6.2.1 No-Action Alternative

Currently, suitable habitat for all but three listed species (piping plover, bald eagle, and interior least tern) is absent from the RGCP (Table 6.2). Although piping plover habitat is potentially present, the migrant status of the piping plover and the lack of sighting within the RGCP result in a "no-effect" determination. For the bald eagle and interior least tern, O&M practices associated with the no-action alternative result in a "may affect – is not likely to adversely affect" determination.

Table 6-4 Effects Determination by Alternative

LISTED SPECIES	NO ACTION ALTERNATIVE	FLOOD CONTROL IMPROVEMENT ALTERNATIVE	INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE	TARGETED RIVER RESTORATION ALTERNATIVE
Interior least tern	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect
Northern aplomado falcon	No-effect	No-effect	No-effect	No-effect
Southwestern willow flycatcher	No-effect	No-effect	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect
Sneed pincushion cactus	No-effect	No-effect	No-effect	No-effect
Mexican spotted owl	No-effect	No-effect	No-effect	No-effect
Bald eagle	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect	May affect – is not likely to adversely affect
Black-footed ferret	No-effect	No-effect	No-effect	No-effect
Whooping crane	No-effect	No-effect	No-effect	No-effect
Chiricahua leopard frog	No-effect	No-effect	No-effect	No-effect
American peregrine falcon	No-effect	No-effect	No-effect	No-effect
Arctic peregrine falcon	No-effect	No-effect	No-effect	No-effect
Piping plover	No-effect	No-effect	No-effect	No-effect
Gila trout	No-effect	No-effect	No-effect	No-effect
Todsen's pennyroyal	No-effect	No-effect	No-effect	No-effect

6.2.2 Flood Control Improvement Alternative

Suitable habitat for all but three listed species (piping plover, bald eagle, and interior least tern) would continue to be absent from the RGCP. Although piping plover habitat is potentially present, the migrant status of the piping plover and the lack of sighting within the RGCP result in a "no-effect" determination. For the bald eagle and interior least tern, O&M practices associated with the flood control improvement alternative result in a "may affect – is not likely to adversely affect" determination.

Reference communities developed by this Alternative include improved uplands and improved riparian woodlands. There would be no long-term effects (beneficial or adverse) to threatened and endangered species as a result of developing these reference communities.

6.2.3 Integrated USIBWC Land Management Alternative

Suitable habitat for four listed species (piping plover, bald eagle, interior least tern, and southwestern willow flycatcher) would be potentially present within the RGCP. Although piping plover habitat is potentially present, the migrant status of the piping plover and the lack of sighting within the RGCP result in a "no-effect" determination. O&M practices associated with the Integrated USIBWC Land Management alternative may result in a "may affect – is not likely to adversely affect" determination for the bald eagle and interior least tern. Development of native riparian woodlands could create conditions suitable for southwestern willow flycatcher nesting habitat. The lowering of banks would have a potential of creating interspersed wetlands and or moist soil conditions within the restoration areas. This combination of wetlands/wet conditions in conjunction with riparian development could result in long-term beneficial effects to southwestern willow flycatcher habitat. As a result a "may affect – is not likely to adversely affect" determination was made for the southwestern willow flycatcher under the Integrated USIBWC Land Management Alternative.

6.2.4 Targeted River Restoration Alternative

Suitable habitat for four listed species (piping plover, bald eagle, interior least tern, and southwestern willow flycatcher) would be potentially present within the RGCP. Although piping plover habitat is potentially present, the migrant status of the piping plover and the lack of a sighting within the RGCP result in a "no-effect" determination. O&M practices associated with the Targeted River Restoration Alternative may result in a "may affect – is not likely to adversely affect" determination for the bald eagle and interior least tern. Development of riparian woodlands in conjunction with potential moist soil conditions as a result of opening meanders could create conditions suitable for southwestern willow flycatcher nesting habitat. The opening of meanders would have a potential of creating interspersed wetlands and or moist soil conditions within the restoration areas. This combination of wetlands/wet conditions in conjunction with riparian development could result in long-term beneficial effects to southwestern willow flycatcher habitat.

In addition, implementation of the conservation easements could potentially benefit the southwestern willow flycatcher. However, if suitable habitat currently exits in some conservation easements, measure implementation (*i.e.,* salt cedar reduction) could adversely affect the species habitat. Although there is a potential likelihood of southwestern willow flycatcher habitat within conservation easements (primarily within Seldon Canyon), a determination of "may affect – is not likely to adversely affect" is made under the following mitigation conditions:

- T&E surveys would be conducted within conservation easements as they become available in order to determine presence or absence of southwestern willow flycatcher habitat. Species-specific surveys would be conducted prior to any vegetation treatments (salt cedar control) if potential habitat were found in conservation easements.
- Wherever possible, vegetation treatments (salt cedar control) would not be used in known habitats of listed species.
- Where treatments would be necessary in proximity to known listed or sensitive species' habitats, the treatment would be selected to minimize the effect.
- Treatments should occur outside the nesting season, which is generally May through July. If treatments must occur, surveys should be conducted and active nests marked and avoided.

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SECTION 7
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Appendix A
Agency Correspondence

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Austin Ecological Services Office
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512)490-0057

OCT 29 1999

2-15-98-I-0035

Sylvia A. Waggoner
Environmental Management Division
International and Boundary Water Commission
The Commons, Building C, Suite 310
4171 N. Mesa Street
El Paso, Texas 79902

Dear Mr. Waggoner,

Attached is a list of threatened and endangered species and species of concern for El Paso County, responding to your request, dated September 16, 1999. This list is provided for your consideration in planning studies for the Rio Grande Canalization Project, pursuant with Section 7(a) of the Endangered Species Act of 1973, as amended.

Please contact Nathan Allan at (512) 490-0057, extension 237 for any additional assistance you may need.

Sincerely,

William Seawell
for
David C. Frederick
Supervisor

Enclosure

This list represents species that may be found in counties throughout the state. It is recommended that the field station responsible for a project area be contacted if additional information is needed (see enclosed map).

DISCLAIMER

This County by County list is based on information available to the U.S. Fish and Wildlife Service at the time of preparation, date on page 1. This list is subject to change, without notice, as new biological information is gathered and should not be used as the sole source for identifying species that may be impacted by a project.

Edwards Aquifer species: (Edwards Aquifer County) refers to those six counties within the Edwards Aquifer region. The Edwards Aquifer underlies portions of Kinney, Uvalde, Medina, Bexar, Hays, and Comal Counties (Texas). The Service has expressed concern that the combined current level of water withdrawal for all consumers from the Edwards Aquifer adversely affects aquifer-dependent species located at Comal and San Marcos springs during low flows. Deterioration of water quality and/or water withdrawal from the Edwards Aquifer may adversely affect eight federally-listed species.

Comal Springs riffle beetle	(E)	*Heterelmis comalensis*
Comal Springs dryopid beetle	(E)	*Stygoparnus comalensis*
Fountain darter	(E w/CH)	*Etheostoma fonticola*
Peck's cave amphipod	(E)	*Stygobromus (=Stygonectes) pecki*
San Marcos gambusia	(E w/CH)	*Gambusia georgei*
Texas wild-rice	(E w/CH)	*Zizania texana*
Texas blind salamander	(E)	*Typhlomolge rathbuni*
San Marcos salamander	(T □w/CH)	*Eurycea nana*

* The Barton Springs salamander is found in Travis County but may be affected by activities within the Barton Springs Segment of the Edwards Aquifer, which includes portions of Northern Hays County.

Migratory Species Common to many or all Counties: Species listed specifically in a county have confirmed sightings. If a species is not listed they may occur as migrants in those counties.

American peregrine falcon	(E‡)	*Falco peregrinus anatum*
Least tern	(E ˜)	*Sterna antillarum*
Whooping crane	(E w/CH)	*Grus americana*
Arctic peregrine falcon	(TSA)	*Falco peregrinus tundrius*
Bald eagle	(T)	*Haliaeetus leucocephalus*
Piping plover	(T)	*Charadrius melodus*
Loggerhead shrike	(SOC)	*Lanius ludovicianus*
White-faced ibis	(SOC)	*Plegadis chihi*

El Paso County

American peregrine falcon	(E‡)	*Falco peregrinus anatum*
Least tern	(E ˜)	*Sterna antillarum*
Northern aplomado falcon	(E)	*Falco femoralis septentrionalis*
Southwestern willow flycatcher	(E‡)	*Empidonax traillii extimus*
Sneed pincushion cactus	(E)	*Coryphantha sneedii (=Escobaria=Mammillaria) var. sneedii*
Mexican spotted owl	(T‡)	*Strix occidentalis lucida*
Texas false saltgrass	(SOC)	*Allolepsis texana*
Ferruginous hawk	(SOC)	*Buteo regalis*

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

October 15, 1999

Cons. # 2-22-00-I-025

Sylvia A. Waggoner, Division Engineer
Attn: Doug Echlin, Environmental Protection Specialist
International Boundary and Water Commission
The Commons, Building C, Suite 310
4171 N. Mesa Street
El Paso, Texas 79902

Dear Ms. Waggoner:

This responds to your letter dated September 16, 1999, requesting a list of species federally listed or proposed to be listed, that may be affected by management of the Rio Grande Canalization Project. The proposed project is located along the Rio Grande downstream of Caballo Dam, New Mexico, to American Diversion Dam, El Paso, Texas.

We have used the information in your letter to narrow the list of species potentially occurring in the project area in Sierra and Doña Ana counties, New Mexico (enclosure). We recommend you contact the Fish and Wildlife Service in Austin, Texas for species in Texas.

Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services Austin Field Office
10711 Burnet Road, Suite 200
Austin, Texas 78758

If appropriate, authorization from the U. S. Fish and Wildlife Service (Service) for the "incidental take" of endangered or threatened species should be obtained prior to initiating the proposed project in order to avoid potential violations of the Endangered Species Act of 1973, as amended (Act). It is the responsibility of the Federal action agency and/or project proponent to determine whether the proposed action "may affect" or result in take of any listed or proposed species. We recommend that an adequate species-specific survey be conducted during the appropriate flowering/breeding season and within suitable habitat to address project-related impacts on these species. Although candidates are not protected under the Act, the Service is required to monitor their status. If any candidates or species of special concern decline precipitously, they could be listed as endangered or threatened species. Therefore, actions which may

October 15, 1999

CANALIZATION PROJECT LIST
ENDANGERED, THREATENED, AND CANDIDATE SPECIES
AND SPECIES OF CONCERN

Big free-tailed bat, Nyctinomops macrotis (=Tadarida m., T. molossa), SC
Desert pocket gopher, Geomys bursarius arenarius, SC
Fringed myotis, Myotis thysanodes, SC
Greater western mastiff bat, Eumops perotis californicus, SC
Long-legged myotis, Myotis volans, SC
Long-eared myotis, Myotis evotis, SC
Occult little brown bat, Myotis lucifugus occultus, SC
Pale Townsend's (=western) big-eared bat, Plecotus townsendii pallescens, SC
Small-footed myotis, Myotis ciliolabrum, SC
Spotted bat, Euderma maculatum, SC
Yuma myotis, Myotis yumanensis, SC
American peregrine falcon, Falco peregrinus anatum, SC
Bald eagle, Haliaeetus leucocephalus, T
Black tern, Chlidonias niger, SC
Interior least tern, Sterna antillarum, E
Loggerhead shrike, Lanius ludovicianus, SC
Southwestern willow flycatcher, Empidonax traillii extimus, E
Western burrowing owl, Athene cunicularia hypugaea, SC
White-faced ibis, Plegadis chihi, SC
Whooping crane, Grus americana, XN
Yellow-billed cuckoo, Coccyzus americanus, SC
Desert viceroy butterfly, Limenitis archippus obsoleta, SC
Texas horned lizard, Phrynosoma cornutum, SC
Arizona southwestern toad, Bufo microscaphus microscaphus, SC
Anthony blister beetle, Lytta mirifica, SC
Desert night-blooming cereus, Cereus greggii var. greggii, SC
Sand prickly pear, Opuntia arenaria, SC
Sandhill goosefoot, Chenopodium cycloides, SC
Pinos Altos fameflower, Talinum humile, SC

Index

E	=	Endangered
T	=	Threatened
SC	=	Species of Concern (taxa for which further biological research and field study are needed to resolve their conservation status)
XN	=	Nonessential experimental

GOVERNOR
Gary E. Johnson

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

Villagra Building
P.O. Box 25112
Santa Fe, NM 87504

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October 1, 1999

Ms. Sylvia A. Waggoner
The Commons, Building C. Suite 310
4171 N. Mesa Street
El Paso, TX 79902

Re: RIO GRANDE CANALIZATION PROJECT
NMGF No.6857

Dear Ms. Waggoner:

In response to your letter dated September 16, 1999 regarding the above referenced project, enclosed is a list of species of concern which occur in Sierra County through Dona Ana County. Other sources of information are listed below.

1. http://www.fw.vt.edu/fishex/states/nm.htm for species accounts and to download New Mexico Species of Concern (wildlife species by county)
2. http://www.nmnhp.unm.edu for custom, site-specific searches on plants and wildlife
3. http://www.nmnhp.unm.edu/bisonm/BISONM.CFM for simple searches by listing category
4. New Mexico State Forestry Division (505-827-5830) for state-listed plants
5. U.S. Fish and Wildlife Service (505-346-2525) for federally listed wildlife species

Thank you for the opportunity to review and comment on your project. If you have any questions, please contact Amy Fisher of my staff at 505-827-9913 or afisher@state.nm.us

Sincerely,

Tod W. Stevenson

Tod W. Stevenson, Chief
Conservation Services Division

TWS/AF/rc

xc: Field Supervisor, New Mexico Ecological Services, USFWS
Steve Henry (SW Area Operations Chief, NMGF)
Amy Fisher (Assistant Chief Conservation Services Division, NMGF)

New Mexican Wildlife of Concern - Dona Ana County

mmon Name	SCIENTIFIC NAME	FWS.. ESA	NM... WCA	FS. R3	BLM.. NM	NM... Sen	FWS. SOC
stern Small-footed Myotis Bat	Myotis ciliolabrum melanorhinus	-	-	-	S	S	S
ma Myotis Bat	Myotis yumanensis yumanensis	-	-	-	S	S	S
cult Little Brown Myotis Bat	Myotis lucifugus occultus	-	-	S	S	S	S
ng-legged Myotis Bat	Myotis volans interior	-	-	-	S	S	S
inged Myotis Bat	Myotis thysanodes thysanodes	-	-	-	S	S	S
stern Red Bat	Lasiurus blossevillii	-	-	S	-	S	-
stern Red Bat	Lasiurus borealis	-	-	S	-	S	-
otted Bat	Euderma maculatum	-	T	S	S	-	S
le Townsend's Big-eared Bat	Plecotus townsendii pallescens	-	-	S	S	S	S
g Free-tailed Bat	Nyctinomops macrotis	-	-	-	S	S	S
gan Mountains Colorado Chipmunk	Tamias quadrivittatus australis	-	T	-	S	-	S
sert Pocket Gopher	Geomys arenarius arenarius	-	-	-	S	-	S
ck Pocket Mouse	Chaetodipus intermedius rupestris	-	-	-	-	S	-
cos River Muskrat	Ondatra zibethicus ripensis	-	-	-	S	S	S
d Fox	Vulpes vulpes	-	-	-	-	S	-
ngtail	Bassariscus astutus	-	-	S	-	S	-
stern Spotted Skunk	Spilogale gracilis	-	-	-	-	S	-
mmon Hog-nosed Skunk	Conepatus mesoleucus	-	-	-	-	S	-
ihuahuan Pronghorn	Antilocapra americana mexicana	-	-	S	-	-	-
sert Bighorn Sheep	Ovis canadensis mexicana (endangered pops)	-	E	S	-	-	-
na Ana Talussnail	Sonorella todseni	-	T	-	S	-	S
chony Blister Beetle	Lytta mirifica	-	-	-	S	S	S
olete Viceroy Butterfly	Basilarchia archippus obsoleta	-	-	S	-	-	-

IVE WILDLIFE APPARENTLY NO LONGER OCCURRING IN DONA ANA COUNTY

rican Eel	Anguilla rostrata (extirpated from NM)
ican Tetra	Astyanax mexicanus
Grande Chub	Gila pandora
Grande Silvery Minnow	Hybognathus amarus
Grande Shiner	Notropis jemezanus
Grande Bluntnose Shiner	Notropis simus simus (extinct, proposed for delisting under NM WCA)
y Redhorse	Moxostoma congestum
thead Catfish	Pylodictis olivaris
e Sucker	Cycleptus elongatus
zona Black-tailed Prairie Dog	Cynomys ludovicianus arizonensis
ican Gray Wolf	Canis lupus baileyi (extirpated from NM)
ft Fox	Vulpes velox velox
zzly Bear	Ursus arctos (extirpated from NM)
uar	Panthera onca arizonensis
il	Pecosorbis kansasensis
te Vertigo Snail	Vertigo ovata

New Mexican Wildlife of Concern - Sierra County

mon Name.....	SCIENTIFIC NAME.....	FWS.. ESA	NM... WCA	FS. R3	BLM.. NM	NM... Sen	FWS. SOC
Grande Cutthroat Trout	Oncorhynchus clarki virginalis	-	-	S	-	S	-
a Trout	Oncorhynchus gilae	E	T	S	-	-	-
fin Dace	Agosia chrysogaster (native to Gila basin only in NM)	-	-	-	S	-	S
Grande Chub	Gila pandora	-	-	-	-	S	-
Grande Sucker	Catostomus plebeius	-	-	S	-	-	-
te Sands Pupfish	Cyprinodon tularosa	-	T	-	-	-	S
zona Toad	Bufo microscaphus microscaphus	-	-	S	S	S	S
ricahua Leopard Frog	Rana chiricahuensis	C	-	S	-	S	-
thern Leopard Frog	Rana pipiens	-	-	S	-	-	-
Bend Slider	Trachemys gaigeae	-	-	-	-	S	-
s Horned Lizard	Phrynosoma cornutum	-	-	S	S	-	S
rt Kingsnake	Lampropeltis getula splendida	-	-	S	-	-	-
s Longnose Snake	Rhinocheilus lecontei	-	-	S	-	-	-
ert Massasauga	Sistrurus catenatus edwardsii	-	-	S	-	-	-
wn Pelican	Pelecanus occidentalis carolinensis	E	E	S	-	-	-
tropic Cormorant	Phalacrocorax brasilianus	-	T	S	-	-	-
t Egret	Ardea alba egretta	-	-	S	-	-	-
wy Egret	Egretta thula brewsteri	-	-	S	-	-	-
e-faced Ibis	Plegadis chihi	-	-	S	S	-	S
sissippi Kite	Ictinia mississippiensis	-	-	S	-	-	-
d Eagle	Haliaeetus leucocephalus	T	T	S	-	-	-
thern Goshawk	Accipiter gentilis	-	-	S	S	S	S
chern Gray Hawk	Asturina nitida maximus	-	-	S	S	-	S
mon Black-hawk	Buteogallus anthracinus anthracinus	-	T	S	-	-	-
inson's Hawk	Buteo swainsoni	-	-	S	-	-	-
ruginous Hawk	Buteo regalis	-	-	S	S	-	S
mado Falcon	Falco femoralis septentrionalis	E	E	S	-	-	-
rican Peregrine Falcon	Falco peregrinus anatum	E	T	S	-	-	-
ern Snowy Plover	Charadrius alexandrinus nivosus	-	-	S	-	-	-
ntain Plover	Charadrius montanus	C	-	S	-	S	-
ck Tern	Chlidonias niger surinamensis	-	-	-	S	-	S
mon Ground-dove	Columbina passerina pallescens	-	E	S	-	-	-
Owl	Micrathene whitneyi whitneyi	-	-	S	-	-	-
rowing Owl	Athene cunicularia hypugaea	-	-	-	S	-	S
ican Spotted Owl	Strix occidentalis lucida	T	-	S	-	S	-
ifer Hummingbird	Calothorax lucifer	-	T	S	-	-	-
ted Kingfisher	Ceryle alcyon	-	-	S	-	-	-
thwestern Willow Flycatcher	Empidonax traillii extimus	E	E	S	-	-	-
gerhead Shrike	Lanius ludovicianus	-	-	-	S	-	S
l's Vireo	Vireo bellii	-	T	S	-	-	-
y Vireo	Vireo vicinior	-	T	S	-	-	-
ague's Pipit	Anthus spragueii	-	-	S	-	-	-
rd's Sparrow	Ammodramus bairdii	-	T	S	S	-	S
ied Bunting	Passerina versicolor	-	T	S	-	-	-

TEXAS PARKS & WILDLIFE

October 14, 1999

Douglas Echlin
Environmental Protection Specialist
International Boundary and Water Commission
4171 North Mesa, Suite C-130
El Paso, Texas 79902-1441

Dear Mr. Echlin:

This letter is in response to your request for information on rare species within or near the Canalization Project in El Paso County, Texas. To that end, please find enclosed printouts of special species from the general project area and a list of rare species for El Paso County for your reference. Following is information about these and other rare species potentially occurring in the project vicinity.

Federal and State Endangered—

Empidonax traillii extimus (Southwestern Willow Flycatcher) – groves of mesquite, willow, and cottonwood along desert streams; has declined due to destruction of riparian woodlands

Species of Concern—

Ondatra zibethicus ripensis (Pecos River Muskrat) – in El Paso area it has been recorded from irrigation ditches along the Rio Grande

Allolepis texana (Texas false saltgrass) – in El Paso area it has been recorded along the Rio Grande in alkaline soil

Cereus greggii var. *greggii* (desert night-blooming cereus) – shrublands in lower elevation desert flats and washes; flowering concentrated during a few nights in late May to late June

Opuntia arenaria (sand prickly-pear) – deep loose sands in sparsely vegetated dune or sandhill areas; flowering May-June

The information included is based on the best data available to the state regarding rare species. However, these data do not provide a definite statement as to the presence or absence of rare species within your project area, nor can these data substitute for an on-site evaluation by qualified biologists. This information is intended to assist you in avoiding harm to species that may occur on your site. **Please do not include species occurrence printouts in your draft or final documents. Because some species are especially sensitive to collection or harassment, these records are for reference only.**

This letter does not constitute a review of fish and wildlife impacts that might result from the activity for which this information is provided. Should you need such a review, contact Kathy Boydston of the Wildlife Habitat Assessment Program, Wildlife Division (512/389-4581).

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512-389-4800
www.tpwd.state.tx.us

January 26, 2004

Douglas Echlin, Acting Chief
Environmental Management Division
International Boundary and Water Commission
The Commons, Building C, Suite 310
4171 N. Mesa Street
El Paso, TX 79902

Re: Rio Grande Canalization Project, Endangered Species List Request, El Paso County

Dear Mr. Echlin:

Texas Parks and Wildlife Department received your letter regarding the proposed Rio Grande Canalization project in El Paso County and preparation of a biological assessment of the project location. The letter requested a current list of threatened and endangered species for El Paso County that could be affected by the project.

Please find the list of special species that occur in El Paso County. Although this list should prove useful to you as background material, it is not intended as a substitute for comprehensive on-site evaluations by competent biologists. Determination of the actual presence of a species in a given area depends on a number of variables such as daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency and population density (both wildlife and human). Absence of a species can be demonstrated only with great difficulty and then only with repeated negative observations, taking into account all of the variable factors contributing to the lack of observability.

If rare plant or animal species are found within or near the project area, precautions should be taken to avoid adverse impacts to them. If it is determined adverse impacts could occur with completion of your project, then mitigation in the form of planning to reduce adverse impacts and/or compensation for damages should occur. More site-specific information from a search of the Texas Biological and Conservation Data system and review of potential project impacts to endangered and threatened species can be obtained from Celeste Brancel at (512) 912-7021.

If you have any questions, please feel free to contact me at (512) 389-4638.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512-389-4800

www.tpwd.state.tx.us

Sincerely,

Kathy Boydston

Kathy Boydston
Wildlife Habitat Assessment Program
Wildlife Division

KB:dg.10228

Attachment

EL PASO COUNTY

	Federal Status	State Status
***** AMPHIBIANS *****		
Northern Leopard Frog (*Rana pipiens*) – streams, ponds, lakes, wet prairies, and other bodies of water; will range into grassy, herbaceous areas some distance from water; eggs laid March-May and tadpoles transform late June-August; may have disappeared from El Paso County due to habitat alteration		
***** BIRDS *****		
American Peregrine Falcon (*Falco peregrinus anatum*) – potential migrant, but also nests in west Texas on high cliff ledges; eats mostly birds, but will prey on insects and small mammals	DL	E
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) - potential migrant	DL	T
Baird's Sparrow (*Ammodramus bairdii*) - shortgrass prairie with scattered low bushes and matted vegetation		
Common Black Hawk (*Buteogallus anthracinus*) - cottonwood-lined rivers and streams; willow tree groves on the lower Rio Grande floodplain; formerly bred in south Texas		T
Mexican Spotted Owl (*Strix occidentalis lucida*) – remote, shaded canyons of coniferous mountain woodlands (pine and fir); nocturnal predator of mostly small rodents and insects; day roosts in densely vegetated trees, rocky areas, or caves	LT	T
Montezuma Quail (*Cyrtonyx montezumae*) – open pine-oak or juniper-oak with ground cover of bunch grass on flats and slopes of semi-desert mountains and hills; travels in pairs or small groups; eats succulents, acorns, nuts, and weed seeds, as well as various invertebrates		
Mountain Plover (*Charadrius montanus*) – breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		
Northern Aplomado Falcon (*Falco femoralis septentrionalis*) - open country, especially savanna and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus; nests in old stick nests of other bird species	LE	E
Prairie Falcon (*Falco mexicanus*) – open, mountainous areas, plains and prairie; nests on cliffs		
Southwestern Willow Flycatcher (*Empidonax traillii extimus*) – thickets of willow, cottonwood, mesquite, and other species along desert streams	LE	E
Western Burrowing Owl (*Athene cunicularia hypugaea*) - open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows and man-made structures, such as culverts		
Yellow-billed Cuckoo (*Coccyzus americanus*) - status applies only west beyond the Pecos River Drainage; breeds in riparian habitat and associated drainages; springs, developed wells, and earthen ponds supporting mesic vegetation; deciduous woodlands with cottonwoods and willows; dense understory foliage is important for nest site selection; nests in willow, mesquite, cottonwood, and hackberry; forages in similar riparian woodlands; breeding season mid-May-late Sept	C1	

	Federal Status	State Status
Zone-tailed Hawk (*Buteo albonotatus*) - arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions		T
FISHES		
Bluntnose Shiner (*Notropis simus*) (extirpated) - main river channels, often below obstructions over substrate of sand, gravel, and silt; damming and irrigation practices presumed major factors contributing to decline		T
*** MAMMALS ***		
Big Free-tailed Bat (*Nyctinomops macrotis*) – habitat data sparse but records indicate that species prefers to roost in crevices and cracks in high canyon walls, but will use buildings, as well; reproduction data sparse, but gives birth to single offspring late June-early July; females gather in nursery colonies; winter habits undetermined, but may hibernate in the Trans-Pecos; opportunistic insectivore		
Black-footed Ferret (*Mustela nigripes*) (extirpated) - potential inhabitant of any prairie dog towns in the general area	LE	E
Black-tailed Prairie Dog (*Cynomys ludovicianus*) - dry, flat, short grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle; live in large family groups	C1	
Black Bear (*Ursus americanus*) - within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA; NL	T
Cave Myotis Bat (*Myotis velifer*) - roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Petrochelidon pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Davis Mountains Cottontail (*Sylvilagus floridanus robustus*) – brushy pastures, brushy edges of cultivated fields, and well-drained streamsides; active mostly at twilight and at night, where they may forage in a variety of habitats, including open pastures, meadows, or even lawns; rest during daytime in thickets or in underground burrows and small culverts; feed on grasses, forbs, twigs and bark; not sociable and seldom seen feeding together		
Desert Pocket Gopher (*Geomys arenarius*) – in Texas, restricted to the Trans-Pecos; cottonwood-willow association along the Rio Grande in El Paso and Hudspeth counties; live underground, but build large and conspicuous mounds; life history not well documented, but presumed to eat mostly vegetation, be active year round, and bear more than one litter per year		
Fringed Myotis Bat (*Myotis thysanodes*) – habitat variable, ranging from mountainous pine, oak, and pinyon-juniper to desert-scrub, but prefers grasslands at intermediate elevations; highly migratory species that arrives in Trans-Pecos by May to form nursery colonies; single offspring born June-July; roosts colonially in caves, mine tunnels, rock crevices, and old buildings		

	Federal Status	State Status
Gray Wolf (*Canis lupus*) (extirpated) – formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands	LE	E
Pale Townsend's Big-eared Bat (*Corynorhinus townsendii pallescens*) - roosts in caves, abandoned mine tunnels, and occasionally old buildings; hibernates in groups during winter; in summer months, males and females separate into solitary roosts and maternity colonies, respectively; single offspring born May-June; opportunistic insectivore		
Pecos River Muskrat (*Ondatra zibethicus ripensis*) – creeks, rivers, lakes, drainage ditches, and canals; prefer shallow, fresh water with clumps of marshy vegetation, such as cattails, bulrushes, and sedges; live in dome-shaped lodges constructed of vegetation; diet is mainly vegetation; breed year round		
Yuma Myotis Bat (*Myotis yumanensis*) - desert regions; most commonly found in lowland habitats near open water, where forages; roosts in caves, abandoned mine tunnels, and buildings; single offspring born May-early July		

MOLLUSKS

Franklin Mountain Talus Snail (*Sonorella metcalfi*) – terrestrial; bare rock, talus, scree; inhabits igneous talus most commonly of rhyolitic origin		
Franklin Mountain Wood Snail (*Ashmunella pasonis*) - terrestrial; bare rock, talus, scree; talus slopes, usually of limestone, but also of rhyolite, sandstone, and siltstone, in arid mountain ranges		

*** REPTILES ***

Big Bend Slider (*Trachemys gaigeae*) – almost exclusively aquatic, sliders (*Trachemys* spp.) prefer quiet bodies of fresh water with muddy bottoms and abundant aquatic vegetation, which is their main food source; will bask on logs, rocks or banks of water bodies; breeding March-July; this species found in Big Bend region of Texas and northeastern Mexico		
Chihuahuan Mud Turtle (*Kinosternon hirtipes murrayi*) - semi-aquatic, prefers bodies of fresh water with abundant aquatic vegetation; eats invertebrates; breeds March-July		T
Mountain Short-horned Lizard (*Phrynosoma hernandesi*) - diurnal, usually in open, shrubby, or openly wooded areas with sparse vegetation at ground level; soil may vary from rocky to sandy; burrows into soil or occupies rodent burrow when inactive; eats ants, spiders, snails, sowbugs, and other invertebrates; inactive during cold weather; breeds March-September		
New Mexico Garter Snake (*Thamnophis sirtalis dorsalis*) - nearly any type of wet or moist habitat; irrigation ditches, and riparian-corridor farmlands, less often in running water; home range about 2 acres; active year round in warm weather, both diurnal and nocturnal, more nocturnal during hot weather; bears litter July-August		
Texas Lyre Snake (*Trimorphodon biscutatus*) – mostly crevice-dwelling in predominantly limestone-surfaced desert northwest of the Rio Grande from Big Bend to the Franklin Mountains, especially in areas with jumbled boulders and rock faults/fissures; secretive; egg-bearing; eats mostly lizards		T
Trans-Pecos Black-headed Snake (*Tantilla cucullata*) – small size with a uniform body color and a small, dark head; secretive; fossorial; mostly nocturnal; mesquite-creosote and pinon-juniper-oak; eggs laid June-August; eat insects, spiders, and other invertebrates		T

	Federal Status	State Status

*** VASCULAR PLANTS ***

Alamo beardtongue (*Penstemon alamosensis*) – semi-desert grassland on rocky soils, usually on sheltered, often north-facing, slopes and in mesic canyon bottoms; occasionally in rock crevices or among unbrowsed shrubs; flowering late April-May

Comal snakewood (*Colubrina stricta*) – only known Texas population lies at the base of an igneous rock outcrop in the Chihuahuan Desert east of El Paso; flowering late spring or early summer

Dense cory cactus (*Escobaria dasyacantha* var. *dasyacantha*) – grasslands and open oak woodlands over igneous soils and perhaps limestone at moderate elevations (2500-6000 feet) in mountains of the Chihuahuan Desert; flowering April-July; fruiting June-October

Desert night-blooming cereus (*Peniocereus greggii* var. *greggii*) – shrublands in lower elevation desert flats and washes; flowering concentrated during a few nights in late May-late June

Hueco rock-daisy (*Perityle huecoensis*) – dry limestone rock outcrops only known location is in the Hueco Mountains in El Paso County

Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) – creosote bush bajadas; alluvial valleys, mesas, and hillsides of desert, grassland, or woodland, 2300-5000 feet. — LE

Resin leaf brickellbush (*Brickellia baccharidea*) – mixed desert shrublands on gravelly soils derived from limestone and perhaps also from igneous rocks, on bajada slopes and in arroyos; flowering summer-fall

Sand prickly-pear (*Opuntia arenaria*) – deep, loose sands in sparsely vegetated dune or sandhill areas; flowering May-June

Sand sacahuista (*Nolina arenicola*) – windblown Quaternary sand in dune areas east of Van Horn; also in shrublands on steep Permian limestone slopes in the Guadalupe Mountains; flowering March-August

Sneed's pincushion cactus (*Escobaria sneedii* var. *sneedii*) – dry limestone outcrops on rocky slopes in desert mountains of the Chihuahuan Desert; flowering April-September (peak season in April?) — LE — E

Texas false saltgrass (*Allolepis texana*)– deep silty or sandy soil; cultivated and waste meadow lands or sand flats; perhaps locally in saline or strongly alkaline soil; flowering (June-) July-October

Wheeler's spurge (*Chamaesyce geyeri* var. *wheeleriana*) – sparsely vegetated loose sand in reddish sand dunes or coppice mounds; flowering and fruiting August-September?

Status Key:

LE, LT	Federally Listed Endangered/Threatened
PE, PT	Federally Proposed Endangered/Threatened
E/SA, T/SA	Federally Listed Endangered/Threatened by Similarity of Appearance
C1	Federal Candidate for Listing, Category 1; information supports proposing to list as endangered/threatened
DL, PDL	Federally Delisted/Proposed for Delisting
NL	Not Federally Listed
E, T	State Listed Endangered/Threatened
"blank"	Rare, but with no regulatory listing status

Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.

FEDERAL ENDANGERED, THREATENED,
PROPOSED, AND CANDIDATE SPECIES
AND SPECIES OF CONCERN IN NEW MEXICO
Consultation Number 2-22-00-I-025
December 18, 2003

Doña Ana County

ENDANGERED

- Interior least tern (*Sterna antillarum*)
- Northern aplomado falcon (*Falco femoralis septentrionalis*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Sneed pincushion cactus (*Coryphantha sneedii* var. sneedii)

THREATENED

- Bald eagle (*Haliaeetus leucocephalus*)
- Mexican spotted owl (*Strix occidentalis lucida*)

CANDIDATE

- Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

- Desert pocket gopher (*Geomys bursarius arenarius*)
- Organ Mountains Colorado chipmunk (*Eutamias quadrivittatus australis*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Western red bat (*Lasiurus blossevillii*)
- Pecos River muskrat (*Ondatra zibethicus ripensis*)
- White Sands woodrat (*Neotoma micropus leucophaea*)
- American peregrine falcon (*Falco peregrinus anatum*)
- Arctic peregrine falcon (*Falco peregrinus tundrius*)
- Baird's sparrow (*Ammodramus bairdii*)
- Bell's vireo (*Vireo bellii*)
- Black tern (*Chlidonias niger*)
- Western burrowing owl (*Athene cunicularia hypugea*)
- Desert viceroy butterfly (*Limenitis archippus obsoleta*)
- Anthony blister beetle (*Lytta mirifica*)
- Doña Ana talussnail (*Sonorella todseni*)
- Alamo beard tongue (*Penstemon alamosensis*)
- Desert night-blooming cereus (*Cereus greggii* var. greggii)
- Mescalero milkwort (*Polygala rimulicola* var. mescalerorum)
- Nodding rock-daisy (*Perityle cernua*)
- Organ Mountain evening-primrose (*Oenothera organensis*)
- Organ Mountain figwort (*Scrophularia laevis*)
- Sand prickly pear (*Opuntia arenaria*)
- Sandhill goosefoot (*Chenopodium cycloides*)
- Standley whitlow-grass (*Draba standleyi*)

Sierra County

ENDANGERED

Northern aplomado falcon (*Falco femoralis septentrionalis*)
Southwestern willow flycatcher (*Empidonax traillii extimus*)
Gila trout (*Oncorhynchus gilae*)
Todsen's pennyroyal (*Hedeoma todsenii*), with critical habitat

THREATENED

Bald eagle (*Haliaeetus leucocephalus*)
Mexican spotted owl (*Strix occidentalis lucida*)
Chiricahua leopard frog (*Rana chiricahuensis*)

CANDIDATE

Black-tailed prairie dog (*Cynomys ludovicianus*)*
Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Organ Mountains Colorado chipmunk (*Eutamias quadrivittatus australis*)
Townsend's big-eared bat (*Corynorhinus townsendii*)
Southwestern otter (*Lutra canadensis sonorae*)
White Sands woodrat (*Neotoma micropus leucophaea*)
American peregrine falcon (*Falco peregrinus anatum*)
Arctic peregrine falcon (*Falco peregrinus tundrius*)
Baird's sparrow (*Ammodramus bairdii*)
Bell's vireo (*Vireo bellii*)
Black tern (*Chlidonias niger*)
Northern goshawk (*Accipiter gentilis*)
Western burrowing owl (*Athene cunicularia hypugea*)
Desert sucker (*Catostomus clarki*)
Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)
Sonora sucker (*Catostomus insignis*)
White Sands pupfish (*Cyprinodon tularosa*)
Desert viceroy butterfly (*Limenitis archippus obsoleta*)
Mineral Creek mountainsnail (*Oreohelix pilsbryi*)
Duncan's pincushion cactus (*Coryphantha duncanii*)
Pinos Altos flame flower (*Talinum humile*)
Sandhill goosefoot (*Chenopodium cycloides*)

Index

Endangered	=	Any species which is in danger of extinction throughout all or a significant portion of its range.
Threatened	=	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate	=	Candidate Species (taxa for which the Service has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities).
Species of Concern	=	Taxa for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. Species of Concern are included for planning purposes only.
*	=	Introduced population

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

December 19, 2003

Cons. # 2-22-00-I-025

Douglas Echlin, Acting Chief
International Boundary and Water Commission
Environmental Management Division
The Commons, Building C, Suite 310
4171 North Mesa Street
El Paso, Texas 79902

Dear Mr. Echlin:

Thank you for your December 8, 2003, letter requesting information on threatened or endangered species or important wildlife habitats that could be affected by proposed Rio Grande Canalization Project (Canalization Project). The U.S. International Boundary and Water Commission is examining its approach to flood protection including construction and maintenance activities to determine the extent flood management can support increased vegetation within the Rio Grande floodway. Typical Canalization Project maintenance activities include, but are not limited to, vegetation mowing along the floodways, sediment removal from the pilot channel, and reconditioning of levee slopes. Proposed construction activities would include, but are not limited to, raising and strengthening existing levees, channel improvements, and installation of grade control structures. The Canalization Project originates in Sierra County, New Mexico, runs through Dona Ana County, New Mexico, and terminates 200 feet downstream of the American Diversion Dam in El Paso, El Paso County, Texas.

We have enclosed a current list of federally endangered, threatened, proposed, and candidate species, and species of concern that may be found in Doña Ana and Sierra Counties, New Mexico.[1] Under the Endangered Species Act, as amended (Act), it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with us further. If your action area has suitable habitat for any of these species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts. Please keep in mind that the scope of federally listed species compliance also includes any interrelated

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[1] Additional information about these species is available on the Internet at <http://nmrareplants.unm.edu>, <http://nmnhp.unm.edu/bisonm/bisonquery.php>, and <http://ifw2es.fws.gov/endangeredspecies>.

or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects.

Candidates and species of concern have no legal protection under the Act and are included in this document for planning purposes only. We monitor the status of these species. If significant declines are detected, these species could potentially be listed as endangered or threatened. Therefore, actions that may contribute to their decline should be avoided. We recommend that candidates and species of concern be included in your surveys.

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. We recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands. These habitats should be conserved through avoidance, or mitigated to ensure no net loss of wetlands function and value.

The Migratory Bird Treaty Act (MBTA) prohibits the taking of migratory birds, nests, and eggs, except as permitted by the U.S. Fish and Wildlife Service. To minimize the likelihood of adverse impacts to all birds protected under the MBTA, we recommend construction activities occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until nesting is complete.

We suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding fish, wildlife, and plants of State concern.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. In future correspondence regarding this project, please refer to consultation # 2-22-00-I-025. If you have any questions about the information in this letter, please contact John Branstetter at the letterhead address or at (505) 346-2525, ext. 4753.

Sincerely,

Brian Hamilton

for Joy E. Nicholopoulos
State Supervisor

Enclosure

cc: (w/o enc)
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico
Field Supervisor, Austin Ecological Services Field Office, Austin, Texas

GOVERNOR
Bill Richardson

STATE OF NEW MEXICO

DEPARTMENT OF GAME & FISH

One Wildlife Way
P.O. Box 25112
Santa Fe, NM 87504

DIRECTOR AND SECRETARY
TO THE COMMISSION
Dr. Bruce Thompson

Visit our Web Site home page at www.gmfsh.state.nm.us
For basic information or to order free publications: 1-800-862-9310

STATE GAME COMMISSION
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Santa Fe, NM

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Las Cruces, NM

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Alcalde, NM

Peter Pino
Zia Pueblo, NM

Guy Riordan
Albuquerque, NM

Leo Sims
Hobbs, NM

January 13, 2004

Douglas Echlin
International Boundary and Water Commission
The Commons, Building C, Suite 310
4171N. Mesa Street
El Paso, Texas 79902

Re: Request for state listed threatened or endangered species in Sierra and Dona Ana counties.
NMGF No. 9102

Dear Mr. Echlin,

In response to your letter dated December 8, 2003 regarding the above referenced project, enclosed is a list of species of concern, which occur in Dona Ana and Sierra Counties. Based on the information provided, the Department of Game and Fish (Department) cannot assess the impact of your project on wildlife and is not able to conduct site specific searches. Other sources of information are

1. http://fwie.fw.vt.edu/states/nm.htm for species accounts and searches.
2. To download New Mexico Species of Concern (wildlife species by county) go to http://www.gmfsh.state.nm.us/PageMill_Images/NonGame/wildlifeofconcern.pdf
3. http://nmnhp.unm.edu/ for custom, site-specific database searches on plants and wildlife. Go to Data then to Free On-Line Data and follow the directions.
4. New Mexico State Forestry Division (505-827-5830) or http://nmrareplants.unm.edu/index.html for state-listed plants
5. U.S. Fish and Wildlife Service (505-346-2525) or http://ifw2es.fws.gov/NewMexico/ for federally listed wildlife species

Thank you for the opportunity to review and comment on your project. If you have any questions, please contact Pat Mathis at (505) 522-9796 or pmathis@state.nm.us

Sincerely,

Janell Ward

Janell Ward, Assistant Chief
Conservation Services Division

JW/pm

xc: Joy Nicholopolous, New Mexico Ecological Services, USFWS
Luis Rios, Southwest Area Operations Chief, NMGF
Pat Mathis, Southwest Area Habitat Specialist, NMGF

OPTIONAL FORM 99 (7-90) 1/23/04
FAX TRANSMITTAL # of pages ► 5

To JAMES HINSON	From DOUG ECHLIN
Dept./Agency HARSON - Austin	Phone # 915/832-4740
Fax # 512/719-6099	Fax # 915/832-4167

NSN 7540-01-317-7368 6099-101 GENERAL SERVICES ADMINISTRATION

New Mexico Species of Concern - Dona Ana County

Common Name	SCIENTIFIC NAME	FWS.. ESA	NM... WCA	FS.. RO	BLM.. NM	NM... Sen	FWS. SOC
Northern Leopard Frog	Rana pipiens	-	-	S	-	-	-
Bleached Earless Lizard	Holbrookia maculata ruthveni	-	-	-	-	S B	-
Texas Horned Lizard	Phrynosoma cornutum	-	-	S	S	-	-
White Sands Prairie Lizard	Sceloporus undulatus cowlesi	-	-	-	-	S B	-
Little White Whiptail	Cnemidophorus gypsi	-	-	-	-	S B	-
Desert Kingsnake	Lampropeltis getula splendida	-	-	S	-	-	-
Brown Pelican (no data)	Pelecanus occidentalis carolinensis	E	E	E	-	-	-
Neotropic Cormorant	Phalacrocorax brasilianus	-	T	S	-	-	-
American Bittern	Botaurus lentiginosus	-	-	S	-	-	-
Great Egret	Ardea alba egretta	-	-	S	-	-	-
Snowy Egret	Egretta thula brewsteri	-	-	S	-	-	-
Green Heron	Butorides virescens	-	-	S	-	-	-
Black-crowned Night-Heron	Nycticorax nycticorax hoactli	-	-	S	-	-	-
White-faced Ibis	Plegadis chihi	-	-	S	S	-	-
Osprey	Pandion haliaetus carolinensis	-	-	S	-	-	-
White-tailed Kite (no data)	Elanus caeruleus majusculus	-	-	S	-	-	-
Mississippi Kite	Ictinia mississippiensis	-	-	S	-	-	-
Bald Eagle	Haliaeetus leucocephalus	AD,T mg	T	S	-	-	-
Northern Goshawk	Accipiter gentilis	-	-	S	S	S	S
Common Black-Hawk	Buteogallus anthracinus anthracinus	-	T	S	-	-	-
Swainson's Hawk	Buteo swainsoni	-	-	S	-	-	-
Ferruginous Hawk	Buteo regalis	-	-	S	S	-	-
Aplomado Falcon	Falco femoralis septentrionalis	E mg	E	S	-	-	-
American Peregrine Falcon	Falco peregrinus anatum	DM m	T	S	-	-	S
Sora	Porzana carolina	-	-	S	-	-	-
Whooping Crane	Grus americana	EXPN,E mg	E	S	-	-	-
Western Snowy Plover	Charadrius alexandrinus nivosus	-	-	S	-	-	-
Mountain Plover	Charadrius montanus	PT	-	S	-	S	-
Black-necked Stilt	Himantopus mexicanus	-	-	S	-	-	-
Long-billed Curlew	Numenius americanus americanus	-	-	S	-	-	-
Interior Least Tern	Sterna antillarum athalassos	E mg	E	S	-	-	-
Black Tern	Chlidonias niger surinamensis	-	-	-	S	-	S
Common Ground-dove	Columbina passerina pallescens	-	E	S	-	-	-
Burrowing Owl	Athene cunicularia hypugaea	-	-	-	S	-	S
Mexican Spotted Owl	Strix occidentalis lucida	T hmg	-	S	-	S	-
Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C	-	S	-	S	-
Broad-billed Hummingbird	Cynanthus latirostris magicus	-	T	S	-	-	-
Costa's Hummingbird	Calypte costae	-	T	S	-	-	-
Belted Kingfisher	Ceryle alcyon	-	-	S	-	-	-
Southwestern Willow Flycatcher	Empidonax traillii extimus	E h	E	S	-	-	-
Loggerhead Shrike	Lanius ludovicianus	-	-	-	S	S	-
Bell's Vireo	Vireo bellii	-	T	S	-	-	S
Gray Vireo	Vireo vicinior	-	T	S	-	-	-
Gray Catbird	Dumetella carolinensis ruficrissa	-	-	S	-	-	-
American Redstart	Setophaga ruticilla tricolora	-	-	S	-	-	-
Baird's Sparrow	Ammodramus bairdii	-	T	S	S	-	S
Varied Bunting	Passerina versicolor	-	T	S	-	-	-
Western Small-footed Myotis Bat	Myotis ciliolabrum melanorhinus	-	-	-	S	S	-
Yuma Myotis Bat	Myotis yumanensis yumanensis	-	-	-	S	S	-
Occult Little Brown Myotis Bat	Myotis lucifugus occultus	-	-	S	S	S	-
Long-legged Myotis Bat	Myotis volans interior	-	-	-	S	S	-
Fringed Myotis Bat	Myotis thysanodes thysanodes	-	-	-	S	S	-

New Mexico Species of Concern - Dona Ana County

Common Name	SCIENTIFIC NAME	FWS.. ESA	NM... WCA	FS. R3	BLM.. NM	NM... Sam	FWS. SOC
Western Red Bat	Lasiurus blossevillii	-	-	S	-	S	S
Eastern Red Bat	Lasiurus borealis	-	-	S	-	S	-
Spotted Bat	Euderma maculatum	-	T	S	S	-	S
Pale Townsend's Big-eared Bat	Plecotus townsendii pallescens	-	-	S	S	S	-
Big Free-tailed Bat	Nyctinomops macrotis	-	-	-	S	S	-
Organ Mountains Colorado Chipmunk	Tamias quadrivittatus australis	-	T	-	S	-	S
Desert Pocket Gopher	Geomys arenarius arenarius	-	-	-	S	-	S
Desert Pocket Gopher	Geomys arenarius brevirostris	-	-	-	-	S n	-
Rock Pocket Mouse	Chaetodipus intermedius rupestris	-	-	-	-	S	-
Pecos River Muskrat	Ondatra zibethicus ripensis	-	-	-	S	S	S
Red Fox	Vulpes vulpes	-	-	-	-	S	-
Ringtail	Bassariscus astutus	-	-	S	-	S	-
Western Spotted Skunk	Spilogale gracilis	-	-	-	-	S	-
Common Hog-nosed Skunk	Conepatus mesoleucus	-	-	-	-	S	-
Chihuahuan Pronghorn	Antilocapra americana mexicana	-	-	S	-	S	-
Desert Bighorn Sheep	Ovis canadensis mexicana (endangered pops)	-	E	S	-	S	-
Dona Ana Talussnail	Sonorella todseni	-	T	-	S	S	S
Anthony Blister Beetle	Lytta mirifica	-	-	-	S	S	S
Obsolete Viceroy Butterfly	Basilarchia archippus obsoleta	-	-	S	-	-	S

NATIVE SPECIES APPARENTLY NO LONGER OCCURRING IN DONA ANA COUNTY

American Eel	Anguilla rostrata	(extirpated from NM)
Mexican Tetra	Astyanax mexicanus	
Rio Grande Chub	Gila pandora	
Rio Grande Silvery Minnow	Hybognathus amarus	
Rio Grande Shiner	Notropis jemezanus	
Rio Grande Bluntnose Shiner	Notropis simus simus	(extinct)
Gray Redhorse	Moxostoma congestum	
Flathead Catfish	Pylodictis olivaris	
Blue Sucker	Cycleptus elongatus	
Arizona Black-tailed Prairie Dog	Cynomys ludovicianus arizonensis	
Mexican Gray Wolf	Canis lupus baileyi	
Swift Fox	Vulpes velox velox	
Grizzly Bear	Ursus arctos	(extirpated from NM)
Jaguar	Panthera onca arizonensis	
American Bison	Bos bison	
NM Ramshorn Snail	Pecosorbis kansasensis	
Ovate Vertigo Snail	Vertigo ovata	

New Mexico Species of Concern - Sierra County

Common Name	SCIENTIFIC NAME	FWS ESA	NM WCA	FS R3	BLM NM	NM Sen	FWS SOC
Rio Grande Cutthroat Trout	Oncorhynchus clarki virginalis	-	-	S	-	S m	S
Gila Trout	Oncorhynchus gilae	E m	T	S	-	-	-
Longfin Dace	Agosia chrysogaster	-	-	-	S	-	-
Rio Grande Chub	Gila pandora	-	-	-	-	S	-
Rio Grande Sucker	Catostomus plebeius	-	-	S	-	-	-
White Sands Pupfish	Cyprinodon tularosa	S	T	-	-	N	S
Arizona Toad	Bufo microscaphus microscaphus	-	-	S	S	S	S
Chiricahua Leopard Frog	Rana chiricahuensis	T	-	S	-	S	-
Northern Leopard Frog	Rana pipiens	-	-	S	-	-	-
Big Bend Slider	Trachemys gaigeae	-	-	-	-	S	-
Texas Horned Lizard	Phrynosoma cornutum	-	-	S	S	-	-
Desert Kingsnake	Lampropeltis getula splendida	-	-	S	-	-	-
Brown Pelican	Pelecanus occidentalis carolinensis	E	E	S	-	-	-
Neotropic Cormorant	Phalacrocorax brasilianus	-	T	S	-	-	-
Great Egret	Ardea alba egretta	-	-	S	-	-	-
Snowy Egret	Egretta thula brewsteri	-	-	S	-	-	-
White-faced Ibis	Plegadis chihi	-	-	S	S	-	-
Mississippi Kite	Ictinia mississippiensis	-	-	S	-	-	-
Bald Eagle	Haliaeetus leucocephalus	AD,T mg	T	S	-	-	-
Northern Goshawk	Accipiter gentilis	-	-	S	S	S	S
Northern Gray Hawk	Asturina nitida maximus	-	-	S	S	-	-
Common Black-Hawk	Buteogallus anthracinus anthracinus	-	T	S	-	-	S
Swainson's Hawk	Buteo swainsoni	-	-	S	-	-	-
Ferruginous Hawk	Buteo regalis	-	-	S	S	-	-
Aplomado Falcon	Falco femoralis septentrionalis	E mg	E	S	-	-	-
American Peregrine Falcon	Falco peregrinus anatum	DM m	T	S	-	-	S
Western Snowy Plover	Charadrius alexandrinus nivosus	-	-	S	-	-	-
Mountain Plover	Charadrius montanus	PT	-	S	-	S	-
Black Tern	Chlidonias niger surinamensis	-	-	-	S	-	S
Common Ground-dove	Columbina passerina pallescens	-	E	S	-	-	-
Elf Owl	Micrathene whitneyi whitneyi	-	-	S	-	-	-
Burrowing Owl	Athene cunicularia hypugaea	-	-	-	S	-	S
Mexican Spotted Owl	Strix occidentalis lucida	T hmg	-	S	-	S	-
Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C	-	S	-	S	-
Lucifer Hummingbird	Calothorax lucifer	-	T	S	-	-	-
Belted Kingfisher	Ceryle alcyon	-	-	S	-	-	-
Southwestern Willow Flycatcher	Empidonax traillii extimus	E h	E	S	-	-	-
Loggerhead Shrike	Lanius ludovicianus	-	-	-	S	S	-
Bell's Vireo	Vireo bellii	-	T	S	-	-	S
Gray Vireo	Vireo vicinior	-	T	S	-	-	-
Sprague's Pipit	Anthus spragueii	-	-	S	-	-	-
Baird's Sparrow	Ammodramus bairdii	-	T	S	S	-	S
Varied Bunting	Passerina versicolor	-	T	S	-	-	-
Western Small-footed Myotis Bat	Myotis ciliolabrum melanorhinus	-	-	-	S	S	-
Yuma Myotis Bat	Myotis yumanensis yumanensis	-	-	-	S	S	-
Occult Little Brown Myotis Bat	Myotis lucifugus occultus	-	-	S	S	S	-
Long-legged Myotis Bat	Myotis volans interior	-	-	-	S	S	-
Fringed Myotis Bat	Myotis thysanodes thysanodes	-	-	-	S	S	-
Long-eared Myotis Bat	Myotis evotis evotis	-	-	-	S	S	-
Pale Townsend's Big-eared Bat	Plecotus townsendii pallescens	-	-	S	S	S	S

New Mexico Species of Concern - Sierra County

Common Name	SCIENTIFIC NAME	FWS- ESA	NM- WCA	FS, R3	BLM- NM	NM- Sen	FWS, SOC
Gunnison's Prairie Dog	Cynomys gunnisoni	-	-	-	-	s	-
Botta's Pocket Gopher	Thomomys bottae opulentus	-	-	-	-	s n	-
Desert Pocket Gopher	Geomys arenarius arenarius	-	-	-	s	-	s
Desert Pocket Gopher	Geomys arenarius brevirostris	-	-	-	-	s n	-
Pecos River Muskrat	Ondatra zibethicus ripensis	-	-	-	s	s	s
Ringtail	Bassariscus astutus	-	-	s	-	s	-
Common Hog-nosed Skunk	Conepatus mesoleucus	-	-	-	-	s	-
Chihuahuan Pronghorn	Antilocapra americana mexicana	-	-	s	-	m	-
Desert Bighorn Sheep	Ovis canadensis mexicana (endangered pops)	-	E	s	-	m	-
Mineral Creek Mountainsnail	Oreohelix pilsbryi	-	T	-	-	n	s
SW Pearly Checkerspot Butterfly	Charidryas acastus sabina	-	-	-	-	-	s
Obsoleta Viceroy Butterfly	Basilarchia archippus obsolete	-	-	s	-	-	-

NATIVE SPECIES APPARENTLY NO LONGER OCCURRING IN SIERRA COUNTY

American Eel	Anguilla rostrata	(extirpated from NM)
Rio Grande Silvery Minnow	Hybognathus amarus	
Speckled Chub	Macrhybopsis aestivalis aestivalis	
Loach Minnow	Rhinichthys cobitis	
Blue Sucker	Cycleptus elongatus	
Gray Redhorse	Moxostoma congestum	
Arizona Black-tailed Prairie Dog	Cynomys ludovicianus arizonensis	
Hot Springs Cotton Rat	Sigmodon fulviventer goldmani	(extinct, NM endemic)
Mexican Gray Wolf	Canis lupus baileyi	
Grizzly Bear	Ursus arctos	(extirpated from NM)
Jaguar	Panthera onca arizonensis	
Merriam's Elk	Cervus elaphus merriami	(extinct)
American Bison	Bos bison	

Appendix B
Description of River Management Units

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Appendix B
Description of River Management Units

The Rio Grande Canalization Project was divided into seven distinct geographic reaches identified as river management units (RMUs). A summary of each RMU is presented below.

Upper Rincon RMU

Description- The RMU is a 16.5-mile stretch of river located south of Percha Dam. This is the least populated segment of the river, with large tracts of ROW lands and adjacent BLM lands on the east and west sides of the river. It includes more than 2,830 acres inside the right of way (ROW).

Structures – There are no constructed levees north of the Doña Ana County line. A 7-mile long levee on the east side extends from Doña Ana County line south to the end of the RMU boundary. Armored (rip-rap) is present to varying degrees along the channel. Eight aquatic in-stream mitigation sites are present. Structures include the Arrey and Garfield bridges.

Land use – The Upper Rincon above Doña Ana County line is currently managed by USIBWC as a no-mow zone. The RMU is bounded on the east and west sides by agricultural lands within upper portion. On the leveed portion (lower 9.5 mile area) the east side levee separates contiguous agricultural lands with the west side dominated extensively by BLM tracts. USIBWC uplands right of way is leased for grazing.

Hydrology –The highest flow rates of the Canalization Project are found below Percha Dam during water delivery periods. The RMU contains 7 tributaries; Trujillo Arroyo, Montoya Arroyo, Tierra Blanca Arroyo, Sibley Arroyo, Green Arroyo, Berrenda Creek, Jaralosa Arroyo, Cuervo Arroyo, and McLeod Draw.

Erosion and Sedimentation – Sedimentation occurs at the mouths of the arroyos. This tends to divert the river flow against the opposite bank, which is subject to erosion if not armored. Erosion may also occur on the same bank but downstream from the arroyo as the flow deflects back across the river.

Vegetation – Remnant riparian vegetation exists in pockets adjacent to arroyo confluence concentrated in the northern end of the RMU adjacent to Percha Dam State Park. Fringes of vegetation are established in many mowed areas providing bank stabilization.

Channel Processes – The riverbanks are generally elevated above the water surface by 5 to 10 feet. Significant sedimentation occurs in this reach due to contributions from large arroyo watersheds. This material has been periodically removed for water conveyance purposes. Sediment disposal outside of the ROW has historically been an issue due to the lack of available space.

Corridor and ROW Dimension - The width of the USIBWC ROW varies from 250 feet to about 1,250 feet until Jaralosa Arroyo where extensive uplands are included within the ROW. A second large upland tract is located within the Crow Canyon arroyo on the west side of the river.

Potential – The RMU includes old meanders within the ROW, which were cut off by canalization during construction. The large amount of area contained within the ROW's large floodway, while numerous arroyos provide potential for numerous site-specific restoration measures. Seasonal peak flows have a potential to inundate over 200 acres of floodway.

Lower Rincon RMU

Description – The RMU is a 18-mile stretch dominated by agricultural (primarily row crops) on either side of the river. The RMU is considered marginal for restoration due to potential levee deficiencies, water delivery structures and extensive amount of private lands. The RMU Includes more than 598 acres of potential enhancement sites inside the ROW and 256 acres outside the ROW.

Structures – Rincon Siphon, Hatch Siphon, and 31 miles of levees characterize the RMU. Five mitigation sites are present in the RMU. The RMU includes Salem, Hatch (US85 and NM26), Atchison, Topeka and Santa Fe Railroad, Hatch-Rincon (NM140 and HWY 154), and new Rincon Bridge.

Land use – The entire RMU is mowed. Agriculture dominates the landscape with a few areas changing into the BLM tracts. Narrow bands of agriculture separate BLM tracks from the ROW along the unleveed lower west side. Angostura Arroyo provides some connectivity between uplands, arroyo habitat and the river corridor.

Hydrology – The RMU contains seven contributing arroyos: Placitas Arroyo. Spring Canyon, Ralph Arroyo, Rincon Arroyo, Angostura Arroyo, Reed Arroyo and Bignell Arroyo. Extensive flooding of agriculture lands is possible along the southerly unleveed west bank, unleveed west bank north of Rincon bridge, and in the east side of Garfield Drain.

Erosion and Sedimentation – The arroyos contribute extensive amounts of sediment into the river. Integrity of the siphons due to erosion is a major concern.

Vegetation – Remnant riparian vegetation exists on private lands adjacent to the ROW. The majority of the ROW is dominated by upland and riparian herbaceous communities. Mowing has suppressed the majority of salt cedar from dominating the entire area between the channel and levee. A diversity of vegetation can be found along the Angostura Arroyo, Reed Arroyo and Bignell Arroyo.

Channel Processes – There appears to be little modification in channel sinuosity since project construction. No bends or meanders appear to have been straightened during construction.

Corridor Dimension – The width of the ROW varies from about 300 feet to 800 feet. The ROW becomes significantly wider at the confluence of the Angostura Arroyo and extends from the corridor at Reed Arroyo and Bignell Arroyo.

Potential – The Lower Rincon has riparian and aquatic enhancement opportunities for improving the riparian corridor between the Upper Rincon and Seldon Canyon and connecting upland habitat with the riparian corridor. Seasonal peak flows potential to inundate over 300 acres of floodway.

Seldon Canyon RMU

Description – The Seldon Canyon RMU is a 9-mile section bounded by Seldon Canyon ending at Leasburg Dam State Park The RMU is currently managed as a no-mow zone. The RMU is adjacent to southwestern willow flycatcher habitat on private property. The very limited ROW restricts options outside of the channel proper, and as a result, restoration options although listed as a potential goal are largely limited.

Structures – Tonuco bridge is the only listed structure.

Land use – Extensive undeveloped lands (BLM, New Mexico State University and private) buttress the river corridor. Considerable topographic relief has restricted agriculture conversion of the area. The RMU is managed as a no-mow zone.

Hydrology – The RMU contains 3 major arroyos, Broad Canyon, Foster Canyon and Faulkner Canyon.

Erosion and Sedimentation – Sedimentation at Leasburg Dam has widened the river and created extensive islands even at high flows. The process of sediment accumulation followed by vegetation of islands is readily apparent north and west of Leasburg Dam.

Vegetation – Extensive and mature salt cedar woodlands are found along the Broad Canyon confluence with the river. The majority of non-uplands property is privately held.

Channel Processes - Increasing elevation changes through the canyon result in high flow rates. Increased flows in conjunction with channel blockage can present potential flood management problems north of the canyon.

Corridor Dimension – The river corridor ranges between 300 feet and 1500 feet in width. The riparian zone is clearly visible in aerial photographs by the sharp contrast between salt cedar dominated communities and upland shrub scrub areas.

Potential – The USIBWC has a limited ROW within the canyon; extensive private lands are adjacent to the river. There is possible habitat for southwestern willow flycatcher located adjacent to the floodway.

Upper Mesilla RMU

Description – The Upper Mesilla RMU is a 12-mile stretch extending from Leasburg Dam State Park to the outskirts of Las Cruces at Shalem Colony Bridge. Levees on the east side and extensive BLM holdings on the west define the RMU. Sites include a total of 214 acres within the ROW and 56 acres of potential acquisitions.

Structures – The east side of the river has over 9-miles of maintained levees. Structures include Leasburg Bridge.

Land use – The entire east side of the river is in agriculture. Extensive pecan orchards dominate the agricultural areas.

Hydrology – Other than upstream water flows, the RMU is influenced by Apache Canyon and two spillways (identified as WW 2 and WW 2A).

Erosion and Sedimentation – Water velocities are less than in the northern RMU, having been reduced through attenuation and water diversions at Leasburg Dam. The RMU begins a significant departure from previous RMUs which contain numerous arroyos contributing sediment.

Vegetation – The majority of the east ROW is dominated by upland and riparian herbaceous communities. Mowing has suppressed the majority of salt cedar from dominating the entire area between the channel and levee. Vegetation on the west side ROW has been grazed and appears to be partially mowed along the level floodplain. Several large dense salt cedar bosques are found on the west side with mature and declining cottonwoods found within the bosques. There is little indication of cottonwood re-growth. Pole plantings have been attempted on the east side near spillway WW 2A and across the river from a channel cut site.

Channel Processes – The major modification of channel sinuosity is a 0.8 mile meander straightened during project construction.

Corridor Dimension – The river corridor ranges between 800 feet and 1500 feet in width.

Potential – The most significant attribute of the RMU is the uninterrupted connectivity between BLM lands and the west side of the river corridor. In addition, hydraulic analyses (HEC-RAS modeling) showed no potential deficiencies in the east side levees. This provides restoration opportunities for a previous channel cut (0.8 miles in length) on the west side. In addition, modifying grazing practices along with salt cedar control on the west side could improve wildlife habitat and terrestrial/riverine ecotone. Interagency agreements concerning grazing along the west side would be required. West side ROW provides a unique opportunity to improve the river corridor and uplands connectivity by altering to a large extent grazing and mowing. The west side of the river contains several remnant bosques, mostly dominated by salt cedar but with occasional mature cottonwoods and cottonwood snags.

Las Cruces RMU

Description- Urbanization and heightened need for flood control are the major issues. The RMU begins at Shalem Colony Bridge and extends south for 15 miles to Mesilla Dam. The Las Cruces RMU includes both developed and agricultural lands.

Structures – Over 18 miles of levees bound the east and west sides of the river. Bridges include Shalem, Picacho (U.S. 70, 80 and 180), and IH 10.

Land use – Land use is composed of an urbanized/agricultural matrix. The levees are used as recreational areas (e.g. access and parking for fishing jogging, nature walks, etc). The upper 5 miles of the RMU are managed as a no-mow zone.

Hydrology – Box Canyon is the primary arroyo entering the river. Spillways WW 4, WW 6 and WW 10 provide some opportunities for enhancement.

Vegetation – The majority of the ROW is dominated by upland and riparian herbaceous communities. Mowing has suppressed the majority of salt cedar from dominating the entire area between the channel and levee.

Channel Processes – A 0.6-mile meander was straightened on the east side north of WW 39.

Corridor Dimension – The river corridor ranges between 700 feet and 1100 feet in width.

Potential – Las Cruces RMU provides significant opportunities for managing in a multiple-use manner. Despite urbanization constraints, considerable improvements in the form of recreation areas and selective habitat are possible. Local agency cooperation is required to fully realize potential. Emphasis is on enhancing and creating habitat associated with spillways and connecting sites within the current no-mow zone. Further mowing reduction and green zone management should include salt cedar control.

Lower Mesilla RMU

Description – The Lower Mesilla Valley begins at Mesilla Dam and extends south 19 miles to New Anthony Road. The Lower Mesilla RMU is dominated by agriculture on both sides of the river. The northern portion of the RMU is characterized by extensive pecan orchards and the southern portions are primarily cropped.

Structures – Levees bound both sides of the RMU with the exception of a 2-mile stretch located on the west side of the river, north of Mesilla Dam. Bridges include Mesilla, Santo Tomas (NM 28), Mesquite (NM 228), Vado, Berino and Old Anthony Bridge.

Land use – Evidence of overgrazing was observed in several locations within the floodway. A golf course (Anthony Country Club) is located in the floodway. Mowing occurs up to the river bank in several locations.

Hydrology – Several spillways feed into the river (WW 104 through WW 115). The water level during irrigation flow is at times less than 1 foot below the incised bank. This is in contrast to water levels in many parts of the northern project area where water levels were observed to be several feet below the bank even at high flows.

Vegetation – The majority of the ROW is dominated by upland and riparian herbaceous communities. Mowing has suppressed the majority of salt cedar from dominating the entire area between the channel and levee.

Channel Processes – Seven old channels cut off by the canalization are located mostly outside the ROW.

Corridor Dimension – The corridor is virtually uniform in width, averaging 650 feet. There is remarkably little variability throughout the RMU in overall dimensions.

Potential – With the exception of a NMGF site, opportunities are restricted. Due to private landowner involvement and adjacent state property, the NMGF site presents an opportunity for restoration of bosque and wetlands.

El Paso RMU

Description – The RMU begins at New Anthony Road and extends south 20 miles to American Dam. Urbanization and flood control problems are the major issue.

Structures – Levees bound both sides of the river with the exception of a 4.5 mile length on the west side of the river beginning at Anapra Bridge progressing northward. Flood protection is afforded by natural relief along this section.

Land use – Land use is primarily urbanized with a mix of agricultural in the northern section of the RMU. As in the Las Cruces RMU, many of the areas are used as recreational areas. Several bridges in the RMU include, New Anthony, Vinton, Canutillo, Borderland, Artcraft, County Club, Anapra, and Brick Plant.

Hydrology – Several spillways (WW 116 through WW 128) provide some opportunities for enhancement.

Vegetation – The majority of the ROW is dominated by upland and riparian herbaceous communities. Mowing has suppressed the majority of salt cedar from dominating the entire area between the channel and levee

Channel Processes - Some of the most extensive changes to the river have occurred in the El Paso area. The Vinton cutoff, completed several decades before the Canalization Project, significantly straightened the river. The old meander, approximately 3.5 miles in length, is mostly situated on Public Utilities Board land.

Corridor Dimension – The channel is similar in dimension to that of the Lower Mesilla Valley rarely exceeding 800 feet in width.

Potential - El Paso provides significant opportunities for managing in a multiple use manner. Overriding flood control concerns limit actions which could aggravate flooding. Furthermore, urbanization adjacent to levees reduce future flood control options to raising levees rather than using levee setbacks. Despite urbanization constraints, considerable improvements in the form of recreation areas are possible. Local agency cooperation is required to fully realize potential. Selective mowing over the years has allowed limited natural regeneration of cottonwood stands.

Appendix C
Observed Avians

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Appendix C
Observed Avians

COMMON NAME	SCIENTIFIC NAME
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
Ash-throated flycatcher	*Myiarchus cinerascens*
Band-tailed pigeon	*Columba fasciata*
Barn swallow	*Hirundo rustica*
Black-chinned hummingbird	*Archilochus alexandri*
Black-crowned night heron	*Nycticorax nycticorax*
Black-necked stilt	*Himantopus mexicanus*
Blue-winged teal	*Anas discors*
Brown-headed cowbird	*Molothrus ater*
Burrowing owl	*Athene cunicularia*
Cassin's sparrow	*Aimophila cassinii*
Cattle egret	*Bubulcus ibis*
Chihuahuan raven	*Corvus verticalis*
Cinnamon teal	*Anas cyanoptera*
Cliff swallow	*Petrochelidon pyrrohonata*
Double-crested cormorant	*Phalacrocorax auritus*
European starling	*Sturnus vulgaris*
Gadwall	*Anas stripera*
Gambel's quail	*Callipepla gambeii*
Golden eagle	*Aquila chrysaetos*
Great blue heron	*Ardea herodias*
Greater roadrunner	*Geococcyx californianus*
Greater yellowlegs	*Tringa flavipes*
Great-tailed grackle	*Quiscalus mexicanus*
Green heron	*Butorides virescens*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
Inca dove	*Columbina inca*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern shoveler	*Anas clypeata*
Osprey	*Pandion haliaetus*
Phainopepla	*Phainopepla nitens*
Pied-billed grebe	*Podilymbus podiceps*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agleaius phoeniceus*

COMMON NAME	SCIENTIFIC NAME
Rock dove	*Columba livia*
Snowy egret	*Egretta thula*
Solitary sandpiper	*Tringa solitaria*
Spotted towhee	*Pipilo maculatus*
Swainson's hawk	*Buteo swainsoni*
Turkey vulture	*Cathartes aura*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced ibis	*Plegadis chihi*
White-winged dove	*Zenaida asiatica*
Willet	*Catoptrophorus semipalmatus*
Yellow-breasted chat	*Icteria virens*

Appendix D
Observed Mammals and Reptiles During Field Surveys

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Appendix D
Observed Mammals and Reptiles During Field Surveys

COMMON NAME	SCIENTIFIC NAME
SNAKES:	
Coachwhip	*Masticophis flagellum*
Desert striped whipsnake	*Masticophis taeniatus*
Western diamondback rattlesnake	*Crotalus atrox*
LIZARDS:	
Eastern fence lizard	*Scleroporus undulatus*
New Mexico whiptail	*Cnemidophorous neomexicanus*
MAMMALS:	
Beaver	*Castor canadensis*
Gopher*	*Thomomys* spp.
Kangaroo rat*	*Dipodomys* spp.
Mice*	*Perognathus* and *Peromyscus* spp.
Raccoon*	*Procyon lotor*
Rock squirrel	*Spermophilus variegatus*
Spotted ground squirrel	*Spermophilus spilosoma*
Wood rat*	*Neotoma* spp.
* These species were identified to genus by identifying burrows, tracks, and other forms of activity.	

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Appendix E
Plant Species

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Appendix E
Plant Species

Palustrine Woodland

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Grasses and Forbes				
Alkali sacaton	*Sporobolus airoides*	FAC	Native	
Amamastla	*Rumex chrysocarpus*	FACW; NI	Native	
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Broom snakeweed	*Gutierrezia sarothrae*	NI	Native	Invasive
Bulrush	*Scirpus maritimus*	OBL	Native	
Canada rye	*Elymus canadensis*	FAC+; FAC	Native	
Carelessweed	*Amaranthus palmeri*	FACU-; FACU	Native	Invasive
Cattail	*Typha latifolia*	OBL	Native	Invasive
Cocklebur	*Xanthium strumarium*	FAC-; FAC	Native	Noxious and Invasive
Common reed	*Phragmites australis*	FACW; FACW+	Introduced	Noxious and Invasive
Cutgrass	*Leersia oryzoides*	OBL	Native	
Dandelion	*Taraxacum officinale*	FACU+; FACU	Introduced	Invasive
Giant cane	*Arundinaria gigantea*	FACW	Native	
Globe mallow	*Sphaeralcea incana*	NI	Native	
Goldenrod	*Solidago* spp.		Native	
Guara	*Gaura* spp.		Native	
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Needle grama	*Bouteloua aristidoides*	NI	Native	
Peppergrass	*Lepidium montanum*	UPL	Native	
Pigweed	*Amranthus albus*	FACU	Native	Invasive
Purple aster	*Machaeranthera canescens*	NI; UPL	Native	Invasive
Red bladderpod	*Sphaerophysa salsula*	FACU	Introduced	Noxious and Invasive
Russian thistle	*Salsola kali*	FACU	Introduced	Noxious and Invasive
Sand dropseed	*Sporobolus Cryptandrus*	FACU-	Native	Invasive
Sedge	*Carex* spp.		Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
Skeleton plant	*Lygodesmia* spp.		Native	
Spikerush	*Eleocharis* spp.		Native	
Squirrel tail	*Elymus longifolium (E. elimoides)*	FACU-; UPL	Native	
White sweet clover	*Melilotus albus*	FACU; FACU+	Introduced	Invasive
Wild licorice	*Galium lanceolatum*		Native	
Windmillgrass	*Chloris* spp.		Native	
Witchgrass	*Panicum capillare*	FAC	Native	Invasive
Yellow bristlegrass	*Setaria geniculata*	FAC	Native	Invasive
Shrubs and Vines				
Aromatic sumac	*Rhus aromatica*	NI	Native	
Baccharis	*Baccharis glutinosa (B. salicifolia)*	FACW	Native	

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Fourwing saltbush	*Atriplex canescens*	UPL	Native	
Indigobush	*Psorothamnus* spp.		Native	
Milkweed vine	*Sarcostemma* spp.		Native	
Pale wolfberry	*Lycium pallidum*		Native	
Prickly pear	*Opuntia* spp.		Native	
Purple sage	*Salvia dorrii*		Native	
Trees				
Honey mesquite	*Prosopis glandulosa*	FACU-; FACU	Native	Invasive
Rio Grande cottonwood	*Populus wislizenii (P. fremontii)*	FACW-; FACW	Native	
Russian olive	*Elaeagnus angustifolia*	FAC; FACW-	Introduced	Invasive
Salt Cedar	*Tamarix ramosissima*	FACW; FACW+	Introduced	Noxious and Invasive
Screwbean mesquite	*Prosopis pubescens*	FAC+; FACW-	Native	
Siberian elm	*Ulmus pumila*	NI	Introduced	Invasive
Southwestern black willow	*Salix gooddingii*	FACW+; OBL	Native	
Torrey berry	*Lycium torreyi*	NI	Native	
Velvet ash	*Fraxinus velutina*	FAC; FAC+	Native	

Riparian Woodland

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Grasses and Forbes				
Alkali sacaton	*Sporobolus airoides*	FAC	Native	
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Broom snakeweed	*Gutierrezia sarothrae*	NI	Native	Invasive
Broomweed	*Amphiachyris dracunculoides*		Native	Invasive
Bulrush	*Scirpus maritimus*	OBL	Native	
Bundleflower	*Desmanthus illinoensis*	UPL	Native	Invasive
Canada rye	*Elymus canadensis*	FAC+; FAC	Native	
Carelessweed	*Amaranthus palmeri*	FACU-; FACU	Native	Invasive
Cattail	*Typha latifolia*	OBL	Native	Invasive
Cutgrass	*Leersia oryzoides*	OBL	Native	
Dandelion	*Taraxacum officinale*	FACU+; FACU	Introduced	Invasive
Jointfir	*Ephedra* spp.		Native	
Giant cane	*Arundinaria gigantea*	FACW	Native	
Globe mallow	*Sphaeralcea incana*	NI	Native	
Goldenrod	*Solidago spp.*		Native	
Ground-cherry	*Physalis* spp.		Native	
Guara	*Gaura* spp.		Native	
Horsetail	*Equisetum arvense*	FACW-	Native	Noxious and Invasive
Jimson-weed	*Datura Stramonium*	NI	Introduced	Noxious and Invasive
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Knotweed	*Polygonum* spp.		Native	
Koehria	*Koehria* spp.			

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Mint	*Mentha arvensis*	FACW	Native	Invasive
Needle grama	*Bouteloua aristidoides*	NI	Native	
Paspalum	*Paspalum* spp.		Native	
Peppergrass	*Lepidium montanum*	UPL	Native	
Plantain	*Plantago sp.*		Native	
Purple aster	*Machaeranthera canescens*	NI; UPL	Native	Invasive
Rabbitfoot grass	*Polypogon monspeliensis*	FACW+	Introduced	Invasive
Red bladderpod	*Sphaerophysa salsula*	FACU	Introduced	Noxious and Invasive
Russian thistle	*Salsola kali*	FACU	Introduced	Noxious and Invasive
Saltgrass	*Distichlis spicata*	FACW	Native	Invasive
Salt heliotrope	*Heliotropium curassavicum*	FACW; FACW+	Native	
Sand dropseed	*Sporobolus Cryptandrus*	FACU-	Native	Invasive
Sedge	*Carex* spp.		Native	
Sideoats grama	*Bouteloua curtipendula*		Native	
Silver bluestem.	*Bothriochloa barbinodis*	NI	Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
Skeleton plant	*Lygodesmia* spp.		Native	
Sprangletop	*Leptochloa fascicularis*	FACW; FACW+	Native	Invasive
Squirrel tail	*Elymus longifolium (E. elimoides)*	FACU-; UPL	Native	
White sweet clover	*Melilotus albus*	FACU; FACU+	Introduced	Invasive
Wild licorice	*Galium lanceolatum*		Native	
Windmillgrass	*Chloris* spp.		Native	
Witchgrass	*Panicum capillare*	FAC	Native	Invasive
Yellow bristlegrass	*Setaria geniculata*		Native	Invasive
Shrubs and Vines				
Aromatic sumac	*Rhus aromatica*	NI	Native	
Baccharis	Baccharis glutinosa (B. salicifolia)	FACW	Native	
Fourwing saltbush	*Atriplex canescens*	UPL	Native	
Indigobush	*Psorothamnus* spp.		Native	
Milkweed vine	*Sarcostemma* spp.		Native	
Pale wolfberry	*Lycium pallidum*		Native	
Prickly pear	*Opuntia* spp.		Native	
Puncture vine	*Tribulus terrestris*		Introduced	Noxious and Invasive
Purple sage	*Salvia dorrii*		Native	
Turpentine bush	*Ericameria laricifolia*		Native	
Narrowleaf yucca	*Yucca angustissima*		Native	
Trees				
Honey mesquite	*Prosopis glandulosa*	FACU-; FACU	Native	Invasive
Littleleaf sumac	*Rhus microphylla*		Native	
Peachleaf willow	*Salix amygdaloides*	FACW	Native	
Rio Grande cottonwood	*Populus wislizenii (P. fremontii)*	FACW-; FACW	Native	
Russian olive	*Elaeagnus angustifolia*	FAC; FACW-	Introduced	Invasive
Salt Cedar	*Tamarix ramosissima*	FACW; FACW+	Introduced	Noxious and

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
				Invasive
Screwbean mesquite	*Prosopis pubescens*	FAC+; FACW-	Native	
Siberian elm	*Ulmus pumila*	NI	Introduced	Invasive
Southwestern black willow	*Salix gooddingii*	FACW+; OBL	Native	
Torrey berry	*Lycium torreyi*	NI	Native	
velvet ash	*Fraxinus velutina*	FAC; FAC+	Native	
Whitethorn acacia	*Acacia constricta*	NI	Native	

Riparian Shrubland

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Grasses and Forbes				
Alkali mallow	*Malvella leprosa*	FACW	Native	Noxious and Invasive
Alkali sacaton	*Sporobolus airoides*	FAC	Native	
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Black grama	*Bouteloua eriopoda*		Native	
Broom snakeweed	*Gutierrezia sarothrae*	NI	Native	Invasive
Buffalo gourd	*Cucurbita foetidissima*	NI	Native	Invasive
Bulrush	*Scirpus maritimus*	OBL	Native	
Cattail	*Typha latifolia*	OBL	Native	Invasive
Cocklebur	*Xanthium strumarium*	FAC-; FAC	Native	Noxious and Invasive
Gumweed	*Grindelia* spp.		Native	
Jointfir	*Ephedra* spp.		Native	
Jimson-weed	*Datura Stramonium*	NI	Introduced	Noxious and Invasive
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Koehria	*Koehria* spp.			
Morning glory	*Convovulus* spp.			
Paspalum	*Paspalum* spp.		Native	
Pigweed	*Amranthus albus*	FACU	Native	Invasive
Purple aster	*Machaeranthera canescens*	NI; UPL	Native	Invasive
Purple threeawn	*Aristida purpurea*		Native	Invasive
Rush	*Juncus* spp.		Native	
Russian thistle	*Salsola kali*	FACU	Introduced	Noxious and Invasive
Sand dropseed	*Sporobolus Cryptandrus*	FACU	Native	Invasive
Sideoats grama	*Bouteloua curtipendula*		Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
Skeleton plant	*Lygodesmia* spp.		Native	
Sprangletop	*Leptochloa fascicularis*	FACW; FACW+	Native	Invasive
Split-leaf brickellbush	*Brickellia laciniata*		Native	
Spikerush	*Eleocharis* spp.		Native	

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Stickleaf	*Mentzelia multiflora*	NI	Native	
Virginia ground cherry	*Physalis virginia*		Native	Invasive
Windmillgrass	*Chloris* spp.		Native	
Yellow aster	*Eastwoodia elegans*		Native	
Yellow bristlegrass	*Setaria geniculata*		Native	Invasive
Shrubs and Vines				
Apache plume	*Fallaugia paradoxa*		Native	
Aromatic sumac	*Rhus aromatica*	NI	Native	
Baccharis	*Baccharis glutinosa (B. salicifolia)*	FACW	Native	
Fourwing saltbush	*Atriplex canescens*	UPL	Native	
Pale wolfberry	*Lycium pallidum*		Native	
Prickly pear	*Opuntia* spp.		Native	
Sand sage	*Artemisia filifolia*		Native	Invasive
Trees				
Creosote	*Larea tridentata*		Native	Invasive
Honey mesquite	*Prosopis glandulosa*	FACU-; FACU	Native	Invasive
Rio Grande cottonwood	*Populus wislizenii (P. fremontii)*	FACW-; FACW	Native	
russian olive	*Elaeagnus angustifolia*	FAC; FACW-	Introduced	Invasive
Salt Cedar	*Tamarix ramosissima*	FACW; FACW+	Introduced	Noxious and Invasive
Screwbean mesquite	*Prosopis pubescens*	FAC+; FACW-	Native	
Velvet ash	*Fraxinus velutina*	FAC; FAC+	Native	

Riparian Grassland

Common Name	Scientific Name	Wetland Indicator Status	Nativity	Notes
Grasses and Forbes				
Alkali mallow	*Malvella leprosa*	FACW	Native	Noxious and Invasive
Alkali sacaton	*Sporobolus airoides*	FAC	Native	
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Black grama	*Bouteloua eriopoda*		Native	
Broom snakeweed	*Gutierrezia sarothrae*	NI	Native	Invasive
Broomweed	*Amphiachyris dracunculoides*		Native	Invasive
Buffalo bur	*Solanum rostratum*		Native	Noxious and Invasive
Buffalo gourd	*Cucurbita foetidissima*	NI	Native	Invasive
Carelessweed	*Amaranthus palmeri*	FACU-; FACU	Native	Invasive
Cocklebur	*Xanthium strumarium*	FAC-; FAC	Native	Noxious and Invasive
Daisy	*Leucanthemum* spp.		Native	
Dandelion	*Taraxacum officinale*	FACU+; FACU	Introduced	Invasive
Desert marigold	*Baileya multiradiata*		Native	
Dodder	*Cuscuta* spp.			
Evening primrose	*Oenothera coronopifolia*		Native	
Frogfruit	*Phyla incisa*	OBL	Native	
Giant cane	*Arundinaria gigantea*	FACW	Native	
Globe mallow	*Sphaeralcea incana*	NI	Native	

Common Name	Scientific Name	Wetland Indicator Status	Nativity	Notes
Goldenrod	*Solidago spp.*		Native	
Green sprangletop	*Leptochloa dubia*		Native	
Guara	*Gaura* spp.		Native	
Gumweed	*Grindelia* spp.		Native	
Horsetail	*Equisetum arvense*	FACW-	Native	Noxious and Invasive
Jimson-weed	*Datura Stramonium*	NI	Introduced	Noxious and Invasive
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Jointfir	*Ephedra* spp.		Native	
Koehria	*Koehria* spp.		Native	
Little bluestem	*Schizachyrium scoparium*	FACU	Native	
Marsh fleabane	*Pluchea purpurascens (P. odorata var. odorata)*	OBL(6); FACW+	Native	
Mustard	*Brassica* spp.		Introduced	Noxious and Invasive
Narrow spike dropseed	*Sporobolus contractus*		Native	
Needle grama	*Bouteloua aristidoides*	NI	Native	
Panic grass	*Panicum spp.*			
Peppergrass	*Lepidium montanum*	UPL	Native	
Pigweed	*Amranthus albus*	FACU	Native	Invasive
Portulaca	*Portulacaria* spp.		Native	
Purple aster	*Machaeranthera canescens*	NI; UPL	Native	Invasive
Ragweed	*Ambrosia artemisiifolia*	FACU-; FACU	Native	Noxious and Invasive
Red bladderpod	*Sphaerophysa salsula*	FACU	Introduced	Noxious and Invasive
Rush	*Juncus* spp.		Native	
Russian thistle	*Salsola kali*	FACU	Introduced	Noxious and Invasive
Saltgrass	*Distichlis spicata*	FACW	Native	Invasive
Salt heliotrope	*Heliotropium curassavicum*	FACW; FACW+	Native	
Sand dropseed	*Sporobolus Cryptandrus*	FACU	Native	Invasive
Scorpionweed	*Phacelia integrifolia*		Native	
Sedge	*Carex* spp.		Native	
Silver bluestem	*Bothriochloa barbinodis*		Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
Skeleton plant	*Lygodesmia* spp.		Native	
Sneezeweed	*Helenium Autumnale*	FACW	Native	Invasive
Spectacle pod	*Dithyrea Wislizenii*	NI	Native	
Stickleaf	*Mentzelia multiflora*	NI	Native	
Sunflower	*Helianthus* spp.			
Thread-leaf ragwort	*Senecio flaccidus*		Native	
White sweet clover	*Melilotus albus*	FACU; FACU+	Introduced	Invasive
Wild licorice	*Galium lanceolatum*		Native	
Wild rye	*Elymus* spp.		Native	
Windmillgrass	*Chloris* spp.		Native	
Witchgrass	*Panicum capillare*	FAC	Native	Invasive
Yellow aster	*Eastwoodia elegans*		Native	
Yellow bristlegrass	*Setaria geniculata*		Native	Invasive
Shrubs and Vines				
Baccharis	Baccharis glutinosa (B. salicifolia)	FACW	Native	
Buckwheat	*Eriogonum* spp.		Native	
Fourwing saltbush	*Atriplex canescens*	UPL	Native	
Milkweed vine	*Sarcostemma* spp.		Native	

Common Name	Scientific Name	Wetland Indicator Status	Nativity	Notes
Pale wolfberry	*Lycium pallidum*		Native	
Poisonous milkweed	*Asclepias subverticillata*	FACU	Native	Invasive
Prickly pear	*Opuntia* spp.		Native	
Puncture vine	*Tribulus terrestris*		Introduced	Noxious and Invasive
Dock	*Rumex* spp.			
Turpentine bush	*Ericameria laricifolia*		Native	
Narrowleaf yucca	*Yucca angustissima*		Native	
Trees				
Desert willow	*Chilopsis linearis*	UPL	Native	
Green ash	*Fraxinus pennsylvanica*		Native	
Honey mesquite	*Prosopis glandulosa*	FACU-; FACU	Native	Invasive
Live oak	*Quercus* spp.		Native	
Marsh-elder	*Iva* spp.		Native	
Peachleaf willow	*Salix amygdaloides*	FACW	Native	
Rio Grande cottonwood	*Populus wislizenii (P. fremontii)*	FACW-; FACW	Native	
Russian olive	*Elaeagnus angustifolia*	FAC; FACW-	Introduced	Invasive
Salt Cedar	*Tamarix ramosissima*	FACW;FACW+	Introduced	Noxious and Invasive
Screwbean mesquite	*Prosopis pubescens*	FAC+; FACW-	Native	
Siberian elm	*Ulmus pumila*	NI	Introduced	Invasive
Snakewood	*Condalia* spp.		Native	
Southwestern black willow	*Salix gooddingii*	FACW+; OBL	Native	
Summer cypress	*Kochia scoparia*	FAC	Introduced	Noxious and Invasive
Whitethorn acacia	*Acacia constricta*	NI	Native	

Croplands

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Grasses and Forbes				
Alfalfa	*Medicago ruthenica*		Cultivated	
Barnyardgrass	*Echinochloa crus-galli*	FACW-	Introduced	Invasive
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Chile			Cultivated	
Cotton	*Gossypium* spp.		Cultivated	
Crested anoda	*Anoda Cristata*	FAC	Native	Invasive
Dallisgrass	*Paspalum dilatatum*	FAC	Introduced	Invasive
Dandelion	*Taraxacum officinale*	FACU+; FACU	Introduced	Invasive
Downy brome	*Bromus tectorum*		Introduced	Noxious and Invasive
Globe mallow	*Sphaeralcea incana*	NI	Native	
Guara	*Gaura* spp.		Native	
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Koehria	*Koehria* spp.		Native	
Lovegrass	*Eragrostis* spp.			
Mexican sprangletop	*Leptochloa fusca*	FACW-	Native	Invasive
Pigweed	*Amranthus albus*	FACU	Native	Invasive

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Sedge	*Carex* spp.		Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
White sweet clover	*Melilotus albus*	FACU; FACU+	Introduced	Invasive
Windmillgrass	*Chloris* spp.		Native	
Yellow bristlegrass	*Setaria geniculata*		Native	Invasive
Trees				
Pecan	*Carya illinoinensis*		Cultivated	

Emergent Marsh

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Grasses and Forbes				
Alkali sacaton	*Sporobolus airoides*	FAC	Native	
Arrowhead	*Sagittaria montevidensis*	NI; NI	Introduced	Invasive
Barnyardgrass	*Echinochloa crus-galli*	FACW-	Introduced	Invasive
Bermudagrass	*Cynodon dactylon*	FACU+; FACU	Introduced	Noxious and Invasive
Bulrush	*Scirpus maritimus*	OBL	Native	
Canada rye	*Elymus canadensis*	FAC+; FAC	Native	
Canarygrass	*Phalaris* spp.			
Carelessweed	*Amaranthus palmeri*	FACU-; FACU	Native	Invasive
Cattail	*Typha latifolia*	OBL	Native	Invasive
Cocklebur	*Xanthium strumarium*	FAC-; FAC	Native	Noxious and Invasive
Cutgrass	*Leersia oryzoides*	OBL	Native	
Downy brome	*Bromus tectorum*		Introduced	Noxious and Invasive
Frogfruit	*Phyla incisa*		Native	
Giant cane	*Arundinaria gigantea*		Native	
Giant dropseed	*Sporobolus giganteus*	UPL	Native	
Guara	*Gaura* spp.		Native	
Gumweed	*Grindelia* spp.		Native	
Hall's panic grass	*Panicum hallii*	FACU	Native	
Horsetail	*Equisetum arvense*	FACW-	Native	Noxious and Invasive
Johnsongrass	*Sorghum halepense*	FACU; FACU+	Introduced	Noxious and Invasive
Manzanilla	*Coreopsis* spp.	NI		
Marsh fleabane	*Pluchea purpurascens (P. odorata var. odorata)*	OBL; FACW+	Native	
Paspalum	*Paspalum* spp.		Native	
Pigweed	*Amranthus albus*	FACU	Native	Invasive
Purple aster	*Machaeranthera canescens*	NI; UPL	Native	Invasive
Red bladderpod	*Sphaerophysa salsula*	FACU	Introduced	Noxious/Invasive
Rush	*Juncus* spp.		Native	
Russian thistle	*Salsola kali*	FACU	Introduced	Noxious and Invasive
Saltgrass	*Distichlis spicata*	FACW	Native	Invasive
Salt heliotrope	*Heliotropium curassavicum*	FACW; FACW+	Native	

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR STATUS	NATIVITY	NOTES
Sedge	*Carex* spp.		Native	
Silverleaf nightshade	*Solanum elaeagnifolium*		Native	Noxious and Invasive
Skeleton plant	*Lygodesmia* spp.		Native	
Spikerush	*Eleocharis* spp.		Native	
Sprangletop	*Leptochloa fascicularis*	FACW FACW+	Native	Invasive
Squirrel Tail	*Elymus longifolium (E. elimoides)*	FACU-; UPL	Native	
Stinging cevalia	*Cevalia sinuata*			
Wild rye	*Elymus* spp.		Native	
Witchgrass	*Leptoloma cognatum*	NI	Native	Invasive
White sweet clover	*Melilotus albus*	FACU; FACU+	Introduced	Invasive
Shrubs and Vines				
Aromatic sumac	*Rhus aromatica*	NI	Native	
Baccharis	*Baccharis glutinosa (B. salicifolia)*	FACW	Native	
Fourwing saltbush	*Atriplex canescens*	UPL	Native	
Indigobush	*Psorothamnus* spp.		Native	
Milkweed vine	*Sarcostemma* spp.		Native	
Trees				
Russian olive	*Elaeagnus angustifolia*	FAC; FACW-	Introduced	Invasive
Salt Cedar	*Tamarix ramosissima*	FACW; FACW+	Introduced	Noxious and Invasive
Siberian elm	*Ulmus pumila*	NI	Introduced	Invasive
Southwestern black willow	*Salix gooddingii*	FACW+; OBL	Native	

OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-3%)
UPL	Obligate Upland	Almost always occurs (estimated probability 99%) under natural conditions in non-wetlands in regions specified.
NI	No Indicator	Insufficient information was available to determine indicator status.
+	Modifier	Indicates a probability toward the higher end of the category.
-	Modifier	Indicates a probability toward the lower end of the category.

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Appendix F
Photo Log from Spring Terrestrial Survey Locations

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LU1: Anthony Country Club Golf Course

LU2: Area near Vinton Bridge that is dominated by Russian thistle rather than by bermudagrass. A narrow band of willows line the river banks. There is an occasional cottonwood tree at the edge of the thistle community.

DALC2: Russian olive dominates river bank with few salt cedar intermixed. Cottonwood pole plantings are located in the center of the flood plain. Flood plain is dominated by bermudagrass.

DALC2: Shore birds (Willets - *Catoptrophorus semipalmatus*) utilizing sandbar on the west side of the channel.

DALC3: Wide flood plain dominated by sand dropseed (*Sporobolus cryptandrus*). River bank is lined by a narrow band of willows (<5m wide).

LDA2: West side of river is dominated by salt cedar. Occasional cottonwoods occur. Many snags providing good habitat for cavity dwellers. This site has been severely overgrazed.

SCL1: Salt cedar lining the river bank. Bermudagrass dominates the flood plain. Relatively wide flood plain.

Leasburg Dam: Very dense salt cedar community with an occasional cottonwood. Many cottonwood snags.

RSA2: Severely overgrazed area that is dominated by salt cedar. Little vegetation to stabilize river bank.

Selden Canyon: Salt cedar community with interspersed cottonwoods and willows.

Arroyo: Arroyo confluence with railroad right-of-way. Salt cedar and willows line the river bank.

HR2: Wetlands habitat with volunteer cottonwoods. Vegetated sand bar lines the river.

H1: Narrow flood plain that is dominated by salt cedar. Willow and alkali sacaton line the river.

H1: An arroyo confluence with the river. Surrounding flood plain dominated by salt cedar and bermudagrass. Flood plain on west side of river consists of mostly bare ground.

H2: Well vegetated island wetland on sand bar in the middle of the channel.

AC1: Wide flood plain dominated by seep willow, cottonwoods, salt cedar, and sand dropseed.

G1: Armored river bank. Wide flood plain dominated by sand dropseed. Several dead pole plantings.

G3: Green ash and cottonwoods dominate the center of the flood plain. The area surrounding the trees has been severely overgrazed.

Appendix G
Aquatic Survey Results

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Appendix G
Aquatic Survey Results

No aquatic species afforded protection under the federal Endangered Species Act were collected during either the fall high flow or winter low flow collection surveys. As previously discussed, no suitable habitat for T&E aquatic species was observed in field surveys. Aquatic species collected during field surveys are listed in Table G-1 and G-2.

Table G-1 Aquatic Species Collected During Field Surveys

COMMON NAME	SCIENTIFIC NAME	CAPTURE LOCATION (TRANSECT SERIES)	
		September 2000	January 2001
Western mosquitofish	*Gambusia affinis*	DA, MDD	MDD
Channel catfish	*Ictalurus punctatus*	UR, H, DA, SC, SP, EP	EP, DA
Green sunfish	*Lepomis cyanellus*	DA	
Bluegill	*Lepomis macrochirus*	UR	
Longear sunfish	*Lepomis megalotis*	UR, SP, EP	
Largemouth bass	*Micropterus salmoides*	UR, H, DA	H, UR
Fathead minnow	*Pimephales promelas*	H, DA, EP, UR	BM, DA, SA
Bullhead minnow	*Pimephales vigilax*	MDD	EP, BM
Flathead catfish	*Pylodictis olivaris*	H, SC, SP, EP	
Red shiner	*Cyprinella lutrensis*	H	
Common carp	*Cyprinus carpio*	H	H
River carpsucker	*Carpiodes carpio*	UR	

BM = Black Mesa MU, DA = Doña Ana, EP = El Paso, G = Garfield, H = Hatch, LC = Las Cruces, MDD = Mesilla Diversion Dam, SA = Sierra Alta, SC = Seldon Canyon, UR = Upper Rincon,

USFWS Mitigation Sites

USFWS mitigation sites (two vortex weirs, three embayments, and nine groins) provide the most diverse aquatic habitat in the RGCP. A brief description of each of the 14 mitigation locations is provided in Appendix F. Fish data are being collected on the mitigation sites by the USFWS New Mexico Fisheries Resource Office, Albuquerque. Fish species collected by USFWS are listed in Table 4.6.

Table G-2 Species Collected at USFWS Mitigation Sites

COMMON NAME	SCIENTIFIC NAME
Bluegill	*Lepomis macrochirus*
Bullhead minnow	*Pimephales vigilax*
Channel catfish	*Ictalurus punctatus*
Fathead minnow	*Pimephales promelas*
Gizzard shad	*Dorosoma cepedianum*
Green sunfish	*Lepomis cyanellus*
Largemouth bass	*Micropterus salmoides*
Longnose dace	*Rhinichthys cataractae*
Red shiner	*Cyprinella lutrensis*
Spotted bass	*Micropterus punctulatus*
Threadfin shad	*Dorosoma petenense*
Western mosquitofish	*Gambusia affinis*
White bass	*Morone chrysops*
Yellow perch	*Morone americana*

Table G-3 Morphological Characteristics for Each Aquatic Transect

MANAGEMENT UNIT	TRANSECT SERIES/ID	GPS UNIT	DEPTH (ft)	VELOCITY (ft/s)	SUBSTRATE	NOTES
El Paso	El Paso/EP1	1	East Bank			
		2	0.85	0.21	Sand	
		3	0.8	0.48	Sand	
		4	0.95	0.47	Sand	
		5	0.55	0.31	Sand	
		6	0.15	0	Sandbar	
		7	0	0	Sandbar	
		8	1.45	0.57	Sand/silt	
		9	1.65	0.69	Sand/silt	
		10	1.8	0.54	Sand/silt	Shifting substrate
		11	1.75	0.62	Sand/silt	
		12	3.4	0.66	Sand	
		13	4.3	0.52	Sand	
		14	3.4	0.38	Sand	
		15	West Bank			
El Paso	El Paso/ EP2	1	East Bank			
		2	2.5	0.14	Silt	Pool
		3	4.5	0.45	Sand/ Silt	
		4	2.4	0.15	Sand/ Silt	
		5	1.1	0.05	Sand/ Silt	
		6	0.9	0.04	Sand/ Silt	
		7	1.15	0.11	Sand/ Silt	
		8	1.3	0.19	Sand/ Silt	
		9	1.4	0.44	Sand/ Silt	

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
		10	1.35	0.51	Sand/ Silt	
		11	1.4	0.51	Sand/ Silt	
		12	1.5	0.56	Sand/ Silt	
		13	1.6	0.45	Sand/ Silt	
		14	2.1	0.06	Sand/ Silt	Pool
		15	West Bank			
Lower Mesilla	Mesilla Valley/ MDD1	0	East Bank			
		1	0	0	Sandbar	
		2	0.1	0.04	Sand	
		3	0.1	0.01	Sand	
		4	0	0	Sandbar	
		5	0	0	Sandbar	
		6	0	0	Sandbar	
		7	0.5	0.21	Sand	
		8	2	0.7	Sand	
		9	1.6	0.25	Sand	
		10	0	0	Sandbar	
		11	0	0	Sandbar	
		12	1	0.34	Sand	
		13	1.6	0.55	Sand	
		14	West Bank			
Lower Mesilla	Mesilla Valley/ MDD2	0	West Bank			
		1	1.5	0.05	Sand	
		2	3.5	0.23	Sand	
		3	1.8	0.48	Sand	
		4	0.8	0.27	Sand	
		5	0.6	0.25	Sand	
		6	0.7	0.36	Sand	
		7	0.5	0.17	Sand	
		8	0	0	Sandbar	
		9	0	0	Sandbar	
		10	0	0	Sandbar	
		11	East Bank			
Lower Mesilla	Mesilla Valley/ MDD3	1	East Bank			
		2	1	0.3	Sand	
		3	0.1	0.08	Sand	
		4	0	0	Sandbar	
		5	0	0	Sandbar	

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
		6	0.4	0.06	Sand	Wind pushing water upstream
		7	0.3	0.01	Sand	
		8	0	0	Sandbar	
		9	0.2	0.06	Sand	Wind pushing water upstream
		10	0.8	0.41	Sand	
		11	1.5	0.6	Sand	
		12	1.9	0.61	Sand	
		13	1.6	0.45	Sand	
		14	West Bank			
Lower Mesilla	Black Mesa/ BM1	1	East Bank			Some gravel on bank.
		2	1.8	0.46	Sand	
		3	1.5	0.59	Sand	
		4	1.3	0.62	Sand	
		5	0.9	0.54	Sand	
		6	0.95	0.51	Sand	Flow is from east to west
		7	1.1	0.56	Sand	
		8	1.3	0.2	Sand	
		9	1.25	0.65	Sand	
		10	1.4	0.53	Sand	
		11	1.5	0.55	Sand	
		12	1.25	0.45	Sand	
		13	0.85	0.46	Sand	
		14	1.6	0.54	Sand	
		15	1.75	0.59	Sand	
		16	2.6	0.57	Sand	
		17	3.9	0.53	Sand	
		18	4.5	0.42	Sand	
		19	1.9	0.25	Cobble	
		20	West Bank			
Lower Mesilla	Black Mesa/ BM2	1A	West Bank			West side bank, very swift- unable to get point near shore
		1B	1.75	0.19	Sand	

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
		1	3.9	0.65	Sand	Deep channel with swift moving water.
		2	3.35	0.71	Sand	
		3	3.5	0.55	Sand	
		4	2.1	0.43	Silt	
		5	1.3	0.16	Sand	
		6	1.25	0	Sand	
		7	0	0	Sandbar	
		8	0.6	0.26	Sand	
		9	0.45	0.34	Sand	
		10	0.75	0.52	Sand	
		11	0.95	0.47	Sand	
		12	0.95	0.51	Sand	
		13	1.1	0.52	Sand	
		14	1.15	0.45	Sand	
		15	East Bank			
Upper Mesilla	Doña Ana/ DA1	1	East Bank			
		2	2.3	0.33	Cobble/sand/silt	
		3	3.5	0.63	Sand	
		4	1.75	0.73	Sand	
		5	1.35	0.44	Sand	
		6	0.65	0.35	Sand	
		7	0.8	0.38	Sand	
		8	0	0	Sandbar	
		9	0.4	0.34	Sand	
		10	0.25	0.31	Sand	
		11	1.45	0.59	Sand	
		12	1.65	0.7	Sand	
		13	1	0.49	Sand	
		14	1.35	0.69	Sand	
		15	2.45	0.7	Sand	
		16	3.6	0.69	Sand	
		17	2.95	0.29	Sand	
		18	4.2	0.19	Sand	
		19	2	0.12	Sand	
		20	West Bank			
Upper Mesilla	Doña Ana/ DA2	1A	West Bank			
		1B	West Bank			
		2	0.95	0.27	Gravel	

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
		3	2.15	0.53	Sand	
		4	2.55	0.68	Sand	
		5	2	0.56	Sand	
		6	1.35	0.58	Sand	
		7	1.3	0.57	Sand	
		8	2.21	0.41	Gravel	
		9	2.35	0.44	Sand	
		10	1.15	0.15	Sand	
		11	0.85	0.47	Sand	
		12	1.1	0.6	Sand	
		13	1.25	0.64	Sand	
		14	2.55	0.64	Sand	
		15	East Bank			
Las Cruces	Las Cruces/ HEP1	1	West Bank			
		2	1	0.97	Sand/cobble	
		3	0.3	0.62	Sand	
		4	0.1	0.22	Sand	
		5	0.6	0.43	Sand	
		6	2.3	0.27	Sand	
		7	0	0	Sandbar	
		8	0	0	Sandbar	
		9	0.6	0.21	Sand	
		10	0.3	0.37	Sand	
		11	1.6	0.67	Sand	
		12	1.1	0.51	Sand	
		13	0.8	0.41	Sand	
		14	0.6	0.5	Sand	
		15	East Bank			
Las Cruces	Las Cruces HEP2	1	East Bank			
		2	1.8	0.65	Sand	
		3	3	0.5	Sand	
		4	2	0.44	Sand	Flow is from west to east
		5	0.5	0.46	Sand	Flow is from west to east
		6	1.1	0.46	Sand	
		7	1.5	0.57	Sand	
		8	2.2	0.43	Sand	
		9	West Bank			

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
Seldon Canyon	Seldon Canyon/ SC1	1	East Bank			
		2	3.1	0.38	Silt	
		3	5.1	0.52	Silt	
		4	5.11	0.39	Silt	
		5	5.7	0.34	Silt	
		6	3.4	0.47	Silt	
		7	2.3	0.6	Sand	
		8	2.3	0.58	Sand	
		9	2.2	0.37	Sand	
		10	2.5	0.4	Sand	
		11	2.4	0.52	Sand	
		12	2.3	0.68	Sand	
		13	2.6	0.78	Sand	
		14	West Bank			
Seldon Canyon	Seldon Canyon/ SC2	1	East Bank			
		2	1.6	0.33	Silt/Sand	
		3	1.3	0.23	Sand	
		4	1.9	0.18	Sand	
		5	2.4	0.12	Sand	
		6	0.7	0.15	Sand	
		7	2.4	0.54	Sand	
		8	3.7	0.82	Sand	
		9	2.9	0.47	Sand	
		10	1.3	0.19	Sand	
		14	West Bank			No GPS point taken, no satellites
Lower Rincon	Sierra Alta/ SA1	1	East Bank			
		2	0	0	Sandbar	
		3	1	0.6	Gravel	
		4	1.8	0.79	Gravel	
		5	3.2	0.74	Gravel	
		6	3.6	0.91	Gravel	
		7	2.9	0.52	Sand	
		8	1.5	0.1	Sand/Silt	Shifting substrate
		9	West Bank			
		10	West Bank			

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
Lower Rincon	Sierra Alta/ SA2	1	East Bank			
		2	1	0.07	Cobble	
		3	1.3	0.53	Gravel	
		4	1.7	0.49	Gravel	
		5	2.1	0.8	Gravel	
		6	2.3	0.9	Gravel	
		7	3	0.76	Gravel	Large submersed fallen tree log.
		8	3.3	0.85	Gravel	
		9	2.9	0.59	Gravel	
		10	2.6	0.65	Gravel	
		11	1.6	0.49	Gravel	
		12	1.4	0.39	Cobble	
		13	1.2	0.32	Cobble	
		14	West Bank			
Lower Rincon	Hatch/ H1	1	0	0		Edge of Cattails
		2	0	0		Mudbar
		3	0.2	0.23	Sand/gravel	
		4	0.4	0.32	Gravel	
		5	0.85	0.53	Sand/gravel	
		6	1.8	0.83	Gravel	
		7	2.2	0.51	Gravel	
		8	3.45	1.12	Gravel	
		9	3.2	1.26	Gravel	Could not stand between point 9 and 10.
		10	3.1	0.97	Gravel	
		11	East Bank			
Lower Rincon	Hatch/ H2	1	East Bank			
		2	0	0		
		3	0	0		
		4	0.6	0.01	Silt	
		5	0	0	Mudbar	
		6	0.7	0.11	Silt	
		7	1.5	0.28	Gravel/silt	
		8	2.8	0.38	Silt/Sand	
		9	3.3	0.64	Gravel	
		10	3.8	0.76	Gravel	
		11	3.1	0.79	Gravel	Could not get to west bank

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
Upper Rincon	Upper Rincon/ UR2	1	East Bank			
		2	0.5	0	Gravel	
		3	0.8	0.02	Gravel	
		4	1.4	0.01	Gravel	
		5	4	0.3	Gravel	
		6	4.2	0.53	Gravel	
		7	3.3	0.4	Gravel	
		8	2.3	0.5	Gravel	
		9	0.75	0.16	Gravel	
		10	West Bank			
Upper Rincon	Upper Rincon/ UR3	1	East Bank			
		2	1.1	0.01	Sand/Gravel	
		3	4.5	0.41	Sand/Gravel	
		4	4.6	0.61	Sand/Gravel	
		5	4.2	0.31	Sand/Gravel	
		6	3.5	0.8	Sand/Gravel	
		7	2.4	0.52	Sand/Gravel	
		8	2.4	0.06	Sand/Gravel	
		9	1.1	0.28	Sand/Gravel	
		10	West Bank			
Upper Rincon	Upper Rincon/ UR4	1	East Bank			
		2	2.1	0.03	Sand/Gravel	Some vegetation overhang
		3	4.8	0.26	Sand/Gravel	
		4	3.6	0.39	Sand/Gravel	
		5	3.8	0.23	Gravel	
		6	3.6	0.03	Silt	
		7	West Bank			
Upper Rincon	Garfield/ G1	1A	West Bank			
		1	2.3	0.75	Cobble	
		2	2.9	1.14	Cobble	
		3	2.4	1.42	Cobble	
		4	2.6	0.65	Cobble	
		5	1.7	0.81	Cobble	
		6	1.1	0.27	Cobble	
		7	1.1	0.47	Cobble	
		8	0.57	1.2	Cobble	
		9	1.1	0.24	Silt	
		10	East Bank			

Table G-3 (Continued)

Management Unit	Transect Series/ID	GPS Unit	Depth (ft)	Velocity (ft/s)	Substrate	Notes
Upper Rincon	Garfield/ G2	1	West Bank			
		2	3.3	0.63	Cobble	
		3	3.1	1.05	Cobble	
		4	1.3	0.54	Cobble	
		5	0.6	0.19	Cobble	
		6	1.2	0.36	Cobble	
		7	2.25	0.61	Cobble	
		8	1.8	0.01	Cobble	
		9	East Bank			

Appendix H
Life History of Five Federally-Listed T&E Species with Habitat Potentially Occurring in the RGCP

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Appendix H
Life History of Five Federally-Listed T&E Species with Habitat Potentially Occurring in the RGCP

This section provides a detailed discussion of each of the five federally-listed T&E species with habitat potentially occurring in the RGCP. Shorelines, sandbars, and emergent wetlands are the sites in the RGCP most likely to contain T&E species habitat.

INTERIOR LEAST TERN (Sterna antillarum)

Status and Distribution

The interior population of the least tern was listed as an endangered species May 28, 1985 without critical habitat. Historically in New Mexico, interior least terns bred on sandbars on the Canadian, Red, and Rio Grande River systems. They now occur as remnant colonies within their historic distribution. Interior least terns nest in three reservoirs along the Rio Grande: Falcon, Amistad, and Lake Casa Blanca. The adult populations in these reservoirs ranged from 64 to 525 birds between 1985 and 1988.

Their winter home is not known, but probably includes coastal areas of Central and South America. Sightings have been made in Guyana and El Salvador. A recovery plan has been developed (USFWS 1990).

Life History and Ecology

Interior least terns are the smallest of the terns, measuring only 8 to 9 inches long, and have a black crown on the head, a white underside and forehead, grayish back and wings, orange legs, and a yellow bill with a black tip. Their diet consists of small fish which they catch in shallow waters of lakes or streams.

Nesting areas are used from late April to August. Interior least terns nest in small colonies in sparsely vegetated sandbars along rivers, sand and gravel pits, lakes or reservoirs. The nest is a shallow depression scraped in an open sandy area, gravelly patch, or barren flat. Chicks leave the nest a few days after hatching, but parental attention continues until migration in early September.

Habitat Description

Habitat requirements center around three ecological factors: presence of bare or nearly bare alluvial islands or sandbars, favorable water levels during nesting season, and food availability, mainly fish. Nesting habitat is sparsely vegetated beaches and sandbars along rivers, sand and gravel pits, lakes or reservoirs. Wide river channels with scattered sand bars are the preferred habitat. With loss of natural habitat, interior least terns have begun to utilize sand and gravel pits and dredge islands.

Reasons for Decline

Interior least terns were nearly exterminated by plume hunters. The USFWS stated that threats and reasons for decline of the interior least tern included: (1) permanent inundation or destruction of nesting areas by reservoirs and channelization projects; (2) alteration of natural river or lake dynamics causing unfavorable vegetation succession on remaining islands; (3) recreational use of sandbars; (4) nest inundation by reservoir water releases and annual spring floods; (5) water pollution; and (6) predation (Arroyo 1992). The primary threat to the interior least tern is loss and degradation of habitat. Dams, reservoirs, and other alterations to river systems have reduced their preferred sandbar nesting habitat. Fluctuating water levels in streams may cause scouring of sandbars or high flows that wash away chicks and nests. Increased recreational use of beaches and sandbars results in reduced use of such areas by the interior least tern.

Presence/Absence Analysis

At lease one interior least tern was observed during fall surveys in September 2000, presumably in the process of migrating south. Altered flow conditions in the river have eliminated any suitable nesting habitat in the RGCP; however, interior least terns may use the area for feeding or resting during migration.

SOUTHWESTERN WILLOW FLYCATCHER (Empidonax traillii extimus)

Status and Distribution

The southwestern willow flycatcher (*Empidonax traillii extimus*) was placed on the federal endangered species list on February 17, 1995. Critical habitat was designated on July 22, 1997; however, there is no recovery plan in place. The southwestern willow flycatcher is also classified as endangered by the State of Texas. Historically, the southwestern willow flycatcher was widely distributed and fairly common throughout its range, especially in southern California and Arizona (Unitt 1987); however, southwestern willow flycatcher populations have apparently declined. In 1993, USFWS estimated that only 230 to 500 nesting pairs existed throughout the bird's entire range .

Life History and Ecology

The southwestern willow flycatcher (Order *Passeriformes*; Family *Tyrannidae*) is a subspecies of one of the 10 North American species in the genus *Empidonax*. The *Empidonax* flycatchers are renowned as one of the most difficult groups of birds to distinguish by sight. A.R. Phillips described the southwestern willow flycatcher in 1948 (Phillips 1948). It is generally paler than other willow flycatcher subspecies, although this difference is indistinguishable without considerable experience and training. The southwestern species differs in morphology (primarily wing formula) but not overall size. The southwestern willow flycatcher's diet is composed mainly of aerial insects. Flycatchers catch their food on the wing and will glean them from leaves. The birds forage within and above dense riparian

vegetation, water edges, backwaters, and sandbars adjacent to nest sites. Details on specific prey items are not currently known (Tibbitts *et al* 1994).

Southwestern willow flycatchers begin arriving along the Rio Grande before breeding in mid-May. Southwestern willow flycatcher territory size, as defined by song locations of territorial birds, probably changes with population density, habitat quality, and nesting stage. Early in the season, territorial flycatchers may move several hundred meters between singing locations. It is not known whether these movements represent polyterritorial behavior or is an active defense of the entire area encompassed by singing locations. However, during incubation and nesting phases, territory size, or at least the activity centers of pairs, can be very small and restricted to an area less than 0.5 hectare. Estimated breeding territory size of 0.2 hectares for a pair of flycatchers occupying a 0.6-hectare patch on the Colorado River has been documented. Activity centers may expand after young are fledged but still dependent on adults.

Once a territory and a mate are defined, nest building and egg laying occurs. The nest site plant community is typically even-aged, structurally homogenous, and dense (Brown 1988). Nests are usually found in the fork of a shrub or tree from 4 to 25 feet above the ground (Unitt 1987; Tibbitts *et al* 1994). Nests are typically made of a collection of grasses and forbs lined with small fibers. Typically, only one clutch of three to four eggs is laid. If something happens to the first clutch (parasitism or loss of young), a pair may lay another clutch later in the season. The female will incubate the eggs for approximately 12 days, and the young fledge (are fully feathered) approximately 13 days after hatching (King 1955). The young fledge by late June or early July (Tibbitts *et al* 1994). Flycatchers begin to migrate to their winter habitat around September.

Habitat Description

The southwestern willow flycatcher breeds in dense riparian habitats along rivers, streams, or other wetlands. Vegetation can be dominated by dense growth of willows (*Salix* sp.), seepwillow (*Baccharis* sp.), or other shrubs and medium sized trees. Almost all southwestern willow flycatcher breeding habitats are within proximity (less than 20 yards) of water or very saturated soil. Nesting habitat for the southwestern willow flycatcher varies greatly by site and includes such species as cottonwood, willow, tamarisk, box elder, and Russian olive. Species composition, however, appears less important than plant and twig structure.

Four main "types" of preferred habitat have been described. They are as follows (adapted from Sogge, *et al* 1997):

1. Monotypic high - elevation willow: nearly monotypic stands of willow, 9-21 ft in height with no distinct overstory layer; often associated with sedges, rushes, nettles and other herbaceous wetland plants; usually very dense structure in lower 6 ft; live foliage density is high from the ground to the canopy.
2. Monotypic exotic - nearly monotypic, dense stands of exotics such as salt cedar or Russian olive, 12-30 ft in height forming a nearly continuous, closed canopy (with

no distinct overstory layer); lower 6 ft often difficult to penetrate due to branches; however, live foliage density may be relatively low, 3-6 ft above ground, but increases higher in the canopy; canopy density uniformly high.

3. Native broadleaf dominated - composed of single species or mixtures of native broadleaf trees and shrubs, including cottonwood, willows, boxelder, ash, alder, and buttonbush, height from 9-45 ft; characterized by trees of different size classes; often a distinct overstory of cottonwood, willow, or other broadleaf tree, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in the understory.
4. Mixed native/exotic - Dense mixtures of native broadleaf trees and shrubs mixed with exotic/introduced species such as salt cedar or Russian olive; exotics are often primarily in the understory, but may be a component of overstory; the native and exotic components may be dispersed throughout the habitat or concentrated as a distinct patch within a larger matrix of habitat; overall, a particular site may be dominated primarily by natives or exotics, or be a more-or-less equal mixture.

Reasons for Decline

The most significant historical factor in the decline of the southwestern willow flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat. Large-scale losses of southwestern wetlands have occurred, particularly the cottonwood-willow riparian habitats of the southwestern willow flycatcher (Johnson *et al* 1987; Unitt 1987). Changes in the riparian plant community have reduced, degraded, and eliminated nesting habitat for the southwestern willow flycatcher, curtailing its distribution and numbers (Cannon and Knopf 1984; Taylor and Littlefield 1986; Unitt 1987).

Habitat losses and changes occurred (and continue to occur) because of urban, recreational, and agricultural development, water diversion and impoundment, channelization, livestock grazing, and replacement of native habitats by introduced plant species. Hydrological changes, natural or human-induced, can greatly reduce the quality and extent of southwestern willow flycatcher habitat. Although riparian areas are often not considered fire-prone, several sites with relatively large numbers of breeding southwestern willow flycatchers were recently destroyed by fire (Paxton *et al* 1996), and many others are at risk to similar catastrophic loss. Fire danger in these riparian systems may be exacerbated by conversion from native to exotic vegetation (such as salt cedar), diversion or reduction of surface water, and drawdown of local water tables.

Presence/Absence Analysis

The southwestern willow flycatcher was recently documented in salt cedar communities in the Seldon Canyon region of the Rio Grande. These communities, however, are located outside the USIBWC project boundaries. Suitable habitat does not occur within the RGCP area. Although salt cedar does exist along the river banks, these communities do not meet the minimum patch size and density requirements for the southwestern willow flycatcher.

BALD EAGLE (Haliaeetus leucocephalus)

Status and Distribution

The bald eagle was listed as endangered on March 11, 1967 and a federal recovery plan was written and approved in 1995. A proposed rule to reclassify the bald eagle from endangered to threatened in most of the lower 48 states was published on July 12, 1994 (Federal Register [FR] 1994) and a final rule to reclassify the bald eagle from endangered to threatened in the lower 48 states was published on July 12, 1995 (FR Vol. 60:36000-36010). This ruling became effective August 11, 1995 (FR 1995). The U.S. Fish and Wildlife Service proposed to remove the bald eagle from the endangered species list on July 2, 1999.

Life History and Ecology

The species is primarily water-oriented, and the majority of the populations occurring in New Mexico are found near streams and lakes. On the other hand, there are some "dry land" areas where these eagles occur regularly, most notably in the region between the Pecos Valley and the Sandia, Manzano, Capitan, and Sacramento mountains, plus on the Mogollon Plateau. The birds typically night-roost in groups in trees, usually in protected sites such as canyons. Birds were most often seen soaring, but on occasion they were also found perched in trees or on snags. Bald eagles are often found in woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of trees and shrubs along the margins. The bald eagle can also be found in grasslands dominated by wild oat (*Avena* spp.), ripgut brome (*Bromus rigidus*), soft chess (*Bromus mollis*), bur clover (*Medicago hispida*), and filaree (*Erodium* spp.) with less than 5 percent wood cover. These birds require large trees or cliffs near water with a good supply of fish. They winter beside oceans, rivers, lakes, or where carrion is available. Breeding habitat primarily consists of lakes and rivers within the Sonoran desert; winter habitat is usually lakes within coniferous forests (Haynes and Schuetze 1997).

At Caballo Reservoir, NM, gizzard shad were highly available to bald eagles for capture and consumption. The major food items of bald eagles in New Mexico appear to be waterfowl, fish, and carrion. Mammals such as jackrabbits (*Lepus* spp.) are also taken, especially by dry land eagles The bulk of a bald eagle's diet is fish, however, they will also feed on waterfowl, small mammals (especially rabbits), and carrion (Haynes and Schuetze 1997).

Habitat Description

The bald eagle is primarily water-oriented, and the majority of the populations occurring in New Mexico are found near streams and lakes. On the other hand, there are some "dry land" areas where these eagles occur regularly, most notably in the region between the Pecos Valley and the Sandia, Manzano, Capitan, and Sacramento mountains, in addition to the Mogollon Plateau. The birds typically night-roost in groups in trees, usually in protected sites such as canyons. Bald Eagles are often seen in association with open expanses of water. Other than this one requirement, however, the species probably occurs in virtually all associated habitats. Birds are most often seen soaring, but on occasion they were also found perched in trees or on snags. Woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of trees and shrubs along the margins provide suitable habitat for bald eagles. Grasslands dominated by wild oat (*Avena* spp.), ripgut brome (*Bromus rigidus*), soft chess (*Bromus mollis*), bur clover (*Medicago hispida*), and filaree (*Erodium* spp.) with less than 5 percent wood cover are also frequented by bald eagles. These birds usually require large trees or cliffs near water with a good supply of fish. They winter beside oceans, rivers, lakes, or where carrion is available. Bald Eagles prefer areas with high amounts of water-to-land edge and where prey is concentrated or generally available; in AZ, they are often associated with open waters, such as lakes and perennial streams. Breeding habitat primarily consists of lakes and rivers within the Sonoran desert; winter habitat is usually lakes within coniferous forests (Haynes and Schuetze 1997).

Reasons for Decline

When America adopted the bird as its national symbol in 1782, as many as 100,000 nesting bald eagles lived in the lower 48 states. By 1963, only 417 nesting pairs remained due to habitat destruction and the use of DDT and other organochlorine pesticides which caused egg shells to thin and crack, resulting in nesting failures. Today, this number has risen to an estimated 5,748 nesting pairs. There are several reasons for the listing of bald eagles as threatened, these include: Loss of habitat, such as development near lakes, cutting of roosts and nest trees, and loss of riparian habitat; Reproductive impairment from certain pesticides and contaminants; Disturbance during nesting (*e.g.* boats, vehicles, or individuals approaching too close to nests); And, random shootings, lead shot ingestion from waterfowl carcasses, and entanglement in fishing line and tackle (Haynes and Schuetze 1997).

Presence/Absence Analysis

Marginal habitat exists in the northern most reaches of the RGCP near Percha Diversion Dam.

WHOOPING CRANE (Grus americana)

Status and Distribution

The whooping crane was listed as endangered on March 11, 1967 (35 FR 8495). Over 10 years later critical habitat was designated for the whooping crane (43 FR 20938). As of 1996 the adult whooping crane population numbered 205 in the wild (Meine and Archibald 1996). This is up from the all time population low of 15 birds in the winter of 1941-42. Today, this population of migrating whooping cranes is found between Wood Buffalo National Park (Canada, breeding range) and Aransas National Wildlife Refuge (Texas, U.S., wintering range). This Aransas-Wood buffalo population (AWP) remains the only self-sustaining wild population.

In the nineteenth century, the principal breeding range extended from central Illinois northwest through northern Iowa, western Minnesota, northeastern North Dakota, southern Manitoba, and Saskatchewan, to the vicinity of Edmonton, Alberta. A nonmigratory population of whooping cranes existed in Louisiana until they were extirpated in the 1940's.

In 1975, experimental efforts to establish a second migratory flock through cross-fostering began at Grays Lake National Wildlife Refuge in southeastern Idaho. Eggs were transferred from the nests of AWP whooping cranes to nests of greater sandhill cranes. Sandhill crane "foster parents" raised the whooping cranes and taught them their traditional migration route to wintering grounds along the middle Rio Grande Valley in New Mexico. These fostered cranes did not form pair bonds and therefore did not breed. Due to the failure of the experiment and other extenuating factors, the foster program was halted. There are only three whooping cranes left in the New Mexico foster population (NMNHP 1997). Due to failure of the experiment, the USFWS proposed to designate the whooping crane population in the Rocky Mountains (New Mexico) as an experimental nonessential population and remove whooping crane critical habitat designations from four national wildlife refuges: Bosque del Apache in New Mexico, Monte Vista and Alamosa in Colorado, and Grays Lake in Idaho. There is a reintroduced population in Florida consisting of 26 subadult captive-produced whooping cranes released in 1993-1995 in the Kissimmee Prairie. This population is considered an experimental nonessential population.

Life History and Ecology

The whooping crane is one of 15 species of cranes found on the planet. Whooping cranes are the tallest birds in North America with males averaging heights of 4.5 ft. These birds can weigh up to 7.5 kg, and have a wingspan up to 7.5 ft wide.

Whooping cranes eat snails, larval insects, leeches, frogs, minnows, small rodents, and berries. They may scavenge dead ducks, marsh birds, or muskrats. During migration they stop to eat aquatic animals, roots, and waste grain in stubble fields. At their wintering grounds, they eat shellfish, snakes, acorns, small fish, and wild fruit.

Whooping cranes mate for life. Adult birds are able to breed in their third or forth year. In early spring, adults display elaborate courtship rituals, bobbing, weaving, jumping and calling with their mates. Experienced pairs may not breed every year, especially when habitat conditions are poor. The female lays two large eggs and both adults incubate them for the next month. The eggs will hatch at different times, and the second chick is often pushed out

of the nest or starves. Pairs will renest if their first clutch is destroyed or lost before mid-incubation.

Habitat Description

The nesting grounds of the AWP within Wood Buffalo National Park are in poorly drained areas where muskeg and boreal forest intermix. Nesting territories range widely in size from 1.3 to 47.1 km^2. Whooping cranes nest along the marshy areas among bulrushes, cattails, and sedges that provide food and protection from predators.

Most of the winter is spent in Texas in brackish bays, estuarine marshes, and tidal flats of the Gulf of Mexico in and near Aransas National Wildlife Refuge. Saltgrass, cordgrass, and other aquatic vegetation dominate these areas.

Reasons for Decline

Whooping cranes rapidly declined in the late 1800s and early 1900s as a result of hunting, collecting (eggs and feathers), and conversion of their habitat to agriculture. Habitat loss and alteration is the greatest threat to these birds, especially at Aransas National Wildlife Refuge. Pollution, waterway construction, oil drilling, and human recreational activities are threats whooping cranes face today. The primary cause of death of adult whooping cranes is collisions with power lines or fences during migration. Also, shooting (accidental) of whoopers is a cause of death for these protected birds when they are mistaken for sandhill cranes during sandhill crane hunting season. Loss of genetic diversity and subsequent inbreeding depression are general concerns for the small and narrowly based whooping crane population (Mirande *et al* 1993).

Presence/Absence Analysis

The whooping crane's preferred habitat of marshes and prairie potholes is rare to non-existent in the RGCP area. There are no prairie potholes, and marsh vegetation is generally confined to small sand bar islands, arroyo mouths, and wasteways. In addition, the migratory path of the whooping crane has been extensively documented, and the crane has never been observed to use the RGCP area.

PIPING PLOVER (Charadruis melodus)

Status and Distribution

The Piping Plover (*Charadrius melodus*) has been reported in New Mexico on only six occasions and is currently holds a federal status of threatened. In New Mexico, the Piping Plover is considered a species of concern (BISON-M # 041505, 2000).

Life History and Ecology

This species breeds (or bred) locally from Alberta and Manitoba south to Nebraska, in the Great Lakes region, and along the Atlantic Coast from New Brunswick south to North Carolina. The species migrates mainly through the Mississippi Valley and along the Atlantic Coast, and it winters primarily along the Atlantic and Gulf coasts from South Carolina to Texas. In New Mexico, this plover is known only as a rare spring (April) migrant, having been verified at Springer Lake (Colfax Co.) and reliably reported at Bosque del Apache National Wildlife Refuge in Socorro Canyon (BISON-M # 041505, 2000).

Habitat Description

At all seasons, the piping plover occurs on sandflats or along bare shorelines of rivers, lakes, or coasts. The species, which occupies its breeding grounds from late March to August, nests on beaches in the Great Lakes and Atlantic Coast areas, bare areas on islands in the upper Missouri River system, and patches of sand, gravel, or pebbly-mud on the alkali lakes of the northern Great Plains. Most adults return to their previous nesting sites, where males set up and defend territories spaced 0.25-2.0 km apart (Haig and Oring 1987). Both sexes participate in digging a shallow nest scrape in the sand and lining it with tiny pebbles or shells. They also share in the incubation of the four-egg clutch and the brooding of the young. When feeding, plovers run in short starts and stops. The piping plover forages on a variety of invertebrates, including marine worms, fly larvae, beetles, crustaceans, mollusks, and other small animals and their eggs (Bent 1929). During the winter, piping plovers use algal, mud, and sand flats along the Gulf Coast.

Reasons for Decline

Habitat destruction and poor breeding success are major reasons for the population decline. Plovers that use prairie alkali lakes suffer significant losses of eggs and chicks to predators that have increased in abundance in recent decades. Construction of reservoirs on the rivers and channelization has resulted in a loss of sandbar habitat. Plovers using the remaining sandbars on rivers are susceptible to predation, direct disturbance by people, and water fluctuations as the result of dam operations.

Presence/Absence Analysis

The piping plover's preferred habitat of mudflats and sandbars is present in the RGCP area, however, the piping plover is a rare migrant to New Mexico and never documented in the RGCP.

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