Final

Environmental Impact Statement

Volume I of III

Prepared for:

United States Section
International Boundary and Water Commission

Alternative Vegetation Management Practices for the
Lower Rio Grande Flood Control Project
Cameron, Hidalgo and Willacy Counties, Texas

Cooperating Agencies

United States Department of the Interior
Fish and Wildlife Service
Texas Parks and Wildlife Department

December 2003

Prepared by the United States Army Corps of Engineers, Galveston and Fort Worth Districts, under Contract DACA63-97-D-0011, Delivery Order 15, with Wendy Lopez and Associates, Inc. (LOPEZGARCIA GROUP)

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Cover Sheet

Alternative Vegetation Maintenance Practices for the Lower Rio Grande Flood Control Project

( ) Draft (X) Final

Lead Agency

United States Section, International Boundary and Water Commission, United States and Mexico (USIBWC)

Cooperating Agencies

United States Fish and Wildlife Service
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Abstract

This Final Environmental Impact Statement (FEIS) covers the proposed Alternative Vegetation Maintenance Practices for the Lower Rio Grande Flood Control Project in Cameron, Hidalgo, and Willacy counties, Texas. The vegetation maintenance program was established to divide flood flows and prevent flooding events. The Preferred Continued Maintenance Alternative (No-Action) and three other alternatives (Prior Maintenance, Suspended Maintenance and Expanded Maintenance) are discussed and potential impacts of each alternative are analyzed in the FEIS. Major environmental issues involve the following topics: biological resources, socioeconomics, environmental justice, land use, water resources, cultural resources, soils and geology, hazardous materials, air quality, and noise.

Other Requirements Served

This FEIS is intended to serve other environmental review and consultation requirements pursuant to 40 CFR 1502.25(a).

Date DEIS Made Available to EPA and the Public:

July 11, 2003

Date FEIS Made Available to EPA and the Public:

December 26, 2003

Executive Summary

EXECUTIVE SUMMARY

The purpose of this Final Environmental Impact Statement (FEIS) is to present and analyze the impacts of current and proposed United States Section, International Boundary and Water Commission (USIBWC) vegetation maintenance activities within the United States portion of the Lower Rio Grande Flood Control Project (LRGFCP). The vegetation maintenance program was established to fulfill the United States Government's obligations under International Boundary and Water Commission (IBWC) Minute No. 212 and No. 238 and to protect life and properties in the United States and Mexico from Rio Grande flooding events. Within this vegetation maintenance program, the USIBWC must fulfill commitments arising from a 1990 Consent Decree (CA No. 89-3005-RCL (1990 WL 116845 (D.D.C.)), Jul. 31, 1990), 1993 Biological Opinion (BO), and new 2003 BO dated May 23, 2003. The 2003 BO resulted from reinitated consultation due to the expiration of the 1993 BO. This FEIS addresses the impacts of alternative vegetation maintenance practices as required under the 1990 Consent Decree.

-The project area addressed in this FEIS includes approximately 43,210 acres along the United States portion of the Rio Grande. Although the LRGFCP includes an extensive off-river floodway system, no analysis of the impacts in the off-river floodways is included since no change in vegetation maintenance practices is proposed for these areas. All of the alternatives address maintenance activities between River Mile (RM) 28.00 and RM 186.00. The LRGFCP area is located within Hidalgo County, Cameron County, and Willacy County, Texas. The following paragraphs describe the four vegetation maintenance alternatives considered by the USIBWC. Each alternative assumes a 20-year project life based on estimates of the required time to reach full climax vegetation.

Under the 2003 BO, USIBWC agreed to designate the Continued Maintenance Alternative as the Preferred Alternative. Additional terms of the 2003 BO include avoiding maintenance activities during migratory bird peak breeding season (March through August), when possible. If this is not possible, USIBWC will conduct surveys to locate active nests prior to mowing activities. The 2003 BO also contains stipulations to ensure the environmental commitments of USIBWC are met in a timely manner. This includes regular progress reports and the formation of a coordination workgroup with representatives from USIBWC, USFWS, Cameron County, Hidalgo County, and Willacy County, Texas Parks and Wildlife Department (TPWD), and LRGV Water Committee and Program. The group will work to obtain easements for the wildlife travel corridor and monitor the progress of implementing commitments under the BO.

Prior Maintenance Alternative

The Prior Maintenance Alternative would return vegetation maintenance practices to the previous activities specified in IBWC Minutes No. 212 and No. 238, dated December 22, 1961, and September 10, 1970, respectively. This alternative calls for the implementation of vegetation maintenance practices as conducted prior to the 1993 BO, and assumes an expansion in the area of the Lower Rio Grande Valley National Wildlife Refuge (LRGV NWR). Under the Prior Maintenance Alternative, vegetation within an average of approximately 164 feet (ft) of the river would be maintained between RM 28.00 and RM 169.14, covering approximately 1,022 acres.

Continued Maintenance Alternative (No-Action)

The Continued Maintenance Alternative is a continuation of the current vegetation maintenance practices, developed by the USIBWC in response to the 1993 Biological Assessment (BA) prepared for the United States Fish and Wildlife Service (USFWS) BO. This alternative also assumes an expansion in the area of the LRGV NWR. Under this alternative, vegetation would be maintained within approximately 75 ft of the river, between RM 28.00 and RM 62.50, and maintenance activities would cover an estimated 291 acres. A 33-foot wide wildlife travel corridor would be established and maintained landward of the 75-foot maintenance strip. The Continued Maintenance Alternative has been chosen as the Preferred Alternative.

Suspended Maintenance Alternative

The Suspended Maintenance Alternative involves the termination of all vegetation maintenance activities from RM 28.00 to RM 186.00.

Expanded Maintenance Alternative

The Expanded Maintenance Alternative calls for an expansion of the current vegetation maintenance practices into additional areas upstream of the segment addressed by the USFWS BO, which ends at RM 62.50. Under this alternative, vegetation maintenance would occur within approximately 75 ft of the Rio Grande, covering 874 acres between RM 28.00 and RM 186.00. A 33-foot wide wildlife travel corridor would be established and maintained landward of the 75-foot maintenance strip. This alternative also assumes an expansion of the area of the LRGV NWR. The Expanded Maintenance Alternative would provide the most benefits for flood control purposes, but require that new areas with potential habitat along the Rio Grande be brought under the maintenance program.

Summary of Impacts

Nine resource areas were identified and potential environmental consequences were analyzed. The specified resource areas identified in this FEIS include biological resources (with a focus on species of concern including the ocelot, jaguarundi, Walker's manioc, Texas ayenia, and the South Texas ambrosia), socioeconomic resources and environmental justice, land use, water resources, cultural resources, soil and geology, hazardous materials, air quality, and noise. The environmental consequences for each

alternative are presented in the text below. A summary of these consequences is listed in Table 2-3 of this FEIS.

The Prior Maintenance Alternative could potentially cause shifts in wildlife guilds as a result of changes in habitat. Approximately 27 acres of potential threatened and endangered ocelot and jaguarundi (cat) habitat could be lost under this alternative and a wildlife corridor would not be established. If cat habitat could not be avoided, additional consultation with USFWS would be required. Socioeconomic resources and land use would be unaffected under this alternative. The magnitude of flooding events would be reduced. Erosion events are not anticipated since vegetation would be maintained at an aboveground level; therefore, water resources and soils and geology would not be impacted. Soils would not be disturbed by the vegetation maintenance and therefore cultural resources would not be affected. Applicable standards pertaining to hazardous materials would be followed. Criteria pollutants emitted as a result of this alternative would be <0.002 percent of the Cameron and Hidalgo counties emission inventory. Noise from vegetation maintenance equipment would be consistent with current agricultural practices.

The Continued Maintenance Alternative (No-Action) would not present any changes or additional actions from the current vegetation maintenance practices. All nine resource areas would be unaffected from the current baseline. A wildlife corridor, covering approximately 57 acres would be established under this alternative. USIBWC has chosen the Continued Maintenance Alternative as the Preferred Alternative.

Termination of vegetation maintenance under the Suspended Maintenance Alternative could potentially increase wildlife habitat and improve near-shore aquatic ecosystems. Approximately 12 acres of potential threatened and endangered cat habitat would be re-established if vegetation maintenance were terminated. The magnitude of flooding events would be marginally greater than the current conditions. Re-growth of vegetation could have positive impacts on water quality. The local economy would be unaffected by this alternative. Land use, cultural resources, soils and geology, hazardous materials, air quality and noise would not be affected if vegetation maintenance were suspended.

The Expanded Maintenance Alternative could potentially cause shifts in wildlife guilds as a result of changes in habitat. Approximately 42 acres of potential threatened and endangered cat habitat could be lost under this alternative; however, a wildlife travel corridor, covering approximately 314 acres would be established. If cat habitat could not be avoided, additional consultation with USFWS would be required. The local economy and employment would be unaffected. Land use and cultural resources would not be affected. Erosion events are not anticipated; therefore water resources and soils and geology would not be impacted. Applicable standards pertaining to hazardous materials would be followed. Criteria pollutants emitted as a result of this alternative would be <0.002 percent of Cameron and Hidalgo counties emission inventory. The noise resulting from vegetation maintenance would be consistent with current agricultural practices.

The environmental consequences resulting from the alternatives do not require mitigation. Since the lower portion of the project area impinges on the Texas Coastal Zone, a Texas Coastal Zone Consistency Determination is included as Chapter 5 of this FEIS. The Coastal Coordination Council has concurred with the determination that the project is consistent with the Texas Coastal Management Program.

The USIBWC's Draft Environmental Impact Statement (DEIS) for vegetation maintenance activities within the LRGFCP was made available for public review and comment from July 11, 2003, to October 9, 2003, and a public meeting was held on July 30, 2003. This FEIS incorporates agency and public comments that were received during the DEIS public review period, as well as comments received from agencies during the comment period for the Preliminary Draft Environmental Impact Statement (PDEIS), and public scoping meetings held in January 1991 and September 1998. All comments are responded to in this FEIS.

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Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

AAHU	Average Annual Habitat Units
AMS	Accelerator Mass Spectrometry
APE	Area of Potential Effect
AQCR	Air Quality Control Region
AST	Aboveground Storage Tank
BA	Biological Assessment
BCC	Brownsville Chamber of Commerce
BLIHC	Border Low Income Housing Coalition
BO	Biological Opinion
BPUB	Brownsville Public Utilities Board
BWR	Brownsville Weir and Reservoir
C	Candidate
CAA	Clean Air Act
CCC	Coastal Coordination Council
CDP	Census Designated Places
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	Carbon Monoxide
CORRACTS	Corrective Actions
CNRA	Coastal Natural Resource Area
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	A-Weighted Sound Levels
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
EVFD	Edinburg Volunteer Fire Department
°F	degrees Fahrenheit
FEIS	Final Environmental Impact Statement
FIC	Farmland Information Center
FIP	Federal Implementation Plan
FPPA	Farmland Policy Protection Act

FR	Federal Register
FRB	Federal Reserve Bank
ft	feet
HEC	Hydrologic Engineering Center
HEP	Habitat Evaluation Procedure
HMR	Hydraulic Modeling Report
HPR	Historic Properties Report
HU	Habitat Units
HUD	United States Department of Housing and Urban Development
IBWC	International Boundary and Water Commission, United States and Mexico
INS	Immigration and Naturalization Service
km	kilometers
LE	Land Evaluation
LESA	Land Evaluation and Site Assessment
LRGFCP	Lower Rio Grande Flood Control Project
LRGV	Lower Rio Grande Valley
LRGV NWR	Lower Rio Grande Valley National Wildlife Refuge
LUST	Leaking Underground Storage Tank
m	meters
mi	miles
McFD	McAllen Fire Department
MFD	Mission Fire Department
MOU	Memorandum of Understanding
MxIBWC	Mexico Section, International Boundary and Water Commission
NAAQS	National Ambient Air Quality Standards
NASQAN	National Stream Quality Accounting Network
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPL	National Priorities List
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historical Places
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWS	National Weather Service
PE	Proposed Endangered
PM	Particulate Matter
POL	Petroleum, Oil and Lubricants
ppm	parts per million

PT	Proposed Threatened
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RM	River Mile
RN	Registered Nurse
ROD	Record of Decision
RTHL	Registered Texas Historic Landmark
RUZ	Restricted Use Zone
SA	Site Assessment
SAL	State Archaeological Landmark
SANWR	Santa Ana National Wildlife Refuge
SCS	Soil Conservation Survey
SIP	State Implementation Plan
SWANCC	Solid Waste Agency of Northern Cook County
SWLF	Solid Waste Landfills
SWQMP	Surface Water Quality Monitoring Plan
SWPPP	Storm Water Pollution Prevention Plan
TA	Texas Almanac
TAC	Texas Antiquities Code
TARL	Texas Archeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
TCMP	Texas Coastal Management Program
TDH	Texas Department of Health
TDHR	Texas Department of Human Resources
TDS	Total Dissolved Solids
TEA	Texas Education Agency
THC	Texas Historical Commission
TNC	The Nature Conservancy
TNRCC	Texas Natural Resource Conservation Commission
TNRIS	Texas Natural Resource Information System
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TSD	Treatment, Storage and Disposal
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
USACE	United States Army Corps of Engineers
USBP	United States Border Patrol
USC	United States Code
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USDC	United States Department of Commerce
USDOS	United States Department of State
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

USIBWC	United States Section, International Boundary and Water Commission
UST	Underground Storage Tank
UTBEG	University of Texas Bureau of Economic Geology
VOC	Volatile Organic Compounds
WMA	Wildlife Management Area
WRP	Wetland Reserve Program

Foreword

FOREWORD

This FEIS was prepared for the United States Section of the International Boundary and Water Commission (USIBWC) by the Galveston and Fort Worth Districts of the United States Army Corps of Engineers (USACE) in accordance with the Council on Environmental Quality's (CEQ) Regulations Implementing the Procedural Provision of the National Environmental Policy Act (NEPA) of 1969, including Executive Orders 11514 and 11991. This FEIS was prepared under Contract No. DACA63-97-D-0011, Delivery Order No. 0015 with the United States Army Corps of Engineers District, Ft. Worth, and administered by the United States Army Corps of Engineers District, Galveston. This FEIS considers alternative vegetation maintenance practices for the Lower Rio Grande Flood Control Project (LRGFCP). The major sections of this FEIS are summarized below:

- Executive Summary: Provides a summary of the first five chapters of the document.
- Chapter 1 - Purpose of and Need for Action: Presents a discussion of the LRGFCP area, scope of the FEIS, methodology and limitations, and the need to consider the impacts of alternative vegetation maintenance practices for this project.
- Chapter 2 - Description of Alternatives: Provides a description of the alternatives considered during this evaluation, as well as alternatives considered for this document but eliminated from further analysis. A summary of impacts from each alternative is presented at the end of the chapter.
- Chapter 3 - Affected Environment: Presents the existing social and natural environmental conditions within the project area. The discussion provides an understanding of the environment in which the project would take place and describes significant resources in the project area.
- Chapter 4 - Environmental Consequences: Provides a discussion of the environmental consequences of each of the evaluated alternatives, including a summary of possible past and reasonably foreseeable future cumulative impacts.
- Chapter 5 - Texas Coastal Zone Consistency Determination: Provides a discussion of USIBWC compliance with the Texas Coastal Management Program.
- Chapter 6 - Public Involvement: Provides a summary of the issues that were raised during two public scoping meetings. Discusses agency coordination efforts and the public review process, including the public meeting.

- Chapter 7 - List of Preparers: Provides a list of the persons involved in the preparation of this FEIS.
- Chapter 8 - References: Provides a list of references cited in the document.

This document also contains thirteen appendices:

- Appendix A contains the Consent Decree.
- Appendix B contains the IBWC Minutes.
- Appendix C contains Section 7 Consultation and the Biological Opinion.
- Appendix D contains the Off-River Wildlife Travel Corridor Plan.
- Appendix E contains the Notices of Intent and Notices of Availability documents.
- Appendix F contains Scoping Meeting Notices.
- Appendix G contains the Scoping Meeting Summaries.
- Appendix H contains the Memoranda of Understanding (MOU).
- Appendix I contains the International Considerations documents.
- Appendix J contains the Agency Correspondence and Public Comments.
- Appendix K contains the Public Meeting Summary Report.
- Appendix L contains the Threatened and Endangered Species Report.
- Appendix M contains the Habitat Evaluation Procedure (HEP) Report.

Chapter 1

Purpose of and Need for Action

CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The United States Section, International Boundary and Water Commission (USIBWC) conducts vegetation maintenance activities along the Rio Grande in order to accommodate specific flood flows (design flood flows), as mandated by international agreement, through various portions of the Lower Rio Grande Flood Control Project (LRGFCP). In the early 1990's, the USIBWC altered its vegetation maintenance practices within the LRGFCP as a result of a lawsuit centered on the protection of federally listed threatened and endangered species and their habitat. This Final Environmental Impact Statement (FEIS) addresses the impacts of alternative vegetation maintenance practices within the United States portions of the LRGFCP as required under a Consent Decree administered by the United States District Court for the District of Columbia (Appendix A).

1.2 BACKGROUND

In 1932, an agreement was reached between the United States and Mexico to develop a coordinated plan for an international project to protect the Lower Rio Grande Valley (LRGV) in both countries against flooding from the Rio Grande. This agreement, which later resulted in the LRGFCP, was developed by the International Boundary Commission, later the International Boundary and Water Commission, United States and Mexico (IBWC). The IBWC is comprised of the United States (USIBWC) and Mexican (MxIBWC) sections, each responsible for meeting treaty obligations within their national boundaries.

The LRGFCP contains a variety of features for protection of the LRGV of Texas, including the Rio Grande main stem, an Interior Floodway System, and the Anzalduas and Retamal Diversion Dams. The United States portion of the LRGFCP is operated to convey excess floodwaters of the Rio Grande Valley to the Gulf of Mexico through the river and United States interior floodways. Two diversion dams, Anzalduas Dam and Retamal Dam, are jointly operated by the USIBWC and MxIBWC. Anzalduas Dam is operated to divert water as required by the Treaty of February 3, 1944, "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande" (TS994; 59 Stat. 1219). Flood operations of the LRGFCP also involve close coordination of the USIBWC and MxIBWC in the operation of two upstream reservoirs (Amistad and Falcon) to control floodwaters reaching the LRGFCP area. The two sections work closely on the division of excess floodwaters diverted into each country's interior floodway systems.

Normal operation of the LRGFCP includes the daily operation of the Anzalduas Dam for diversion of Mexican waters and frequent inspection of the entire LRGFCP area to ensure flood readiness. Retamal Dam is not a daily operational structure and is only operated in the event floodwaters need to be diverted to the Mexican interior floodway. Anzalduas Dam is used for daily diversion of waters to Mexico as well as to divert floodwaters to the United States interior floodway.

The design flood for the LRGFCP is an approximate 100-year flood, with a flow of 250,000 cubic feet per second (cfs) at Rio Grande City. During the design flood, both Anzalduas Dam and Retamal Dam will divert 105,000 cfs into the United States and Mexico, respectively. Flow diversion during the design flood will limit flood flows through the Brownsville-Matamoros area to 20,000 cfs.

Anzalduas Dam diverts floodwaters to the interior floodway system, located in Hidalgo, Cameron, and Willacy counties. Figure 1-1 illustrates the three floodways within the LRGV interior system. This system allows for the passage of 105,000 cfs in the Main Floodway, 84,000 cfs in the North Floodway, and 21,000 cfs in the Arroyo Colorado. With the exception of one area in Arroyo Colorado and two areas in the North Floodway, the Off-River Floodway System passes the design flood flows with a minimum of two feet freeboard.

The original vegetation maintenance practices for the LRGFCP, as implemented by the IBWC, were conceptualized and presented in Minutes No. 212, "Improvement of the Channel of the Lower Rio Grande," adopted December 22, 1961, and No. 238, "Improvement of the International Flood Control Works of the Lower Rio Grande," adopted September 10, 1970. Under Minute No. 212, both governments agreed to annual concurrent channel bank mowing to reduce heavy brush growth in the river reach and to ensure a river channel capacity of 20,000 cfs at the Brownsville-Matamoros area. This maintenance mowing was considered necessary to prevent flooding in Brownsville and Matamoros for the design flood and to ensure that brush did not deflect river flood flows toward either country, thus altering the international boundary alignment by erosion. A major project improvement program was undertaken following the 1967 Hurricane Beulah flood to provide protection against a design flood of 250,000 cfs at the upstream end of the LRGFCP area. This resulted in the adoption of Minute No. 238. Minute No. 238 called for equally dividing flood flows into interior floodways in each country and thereby ensuring the 20,000 cfs maximum flow at Brownsville and Matamoros. In order to retain the capacities of the floodways, each country agreed to additional vegetation maintenance to remove brush and other obstructions within the floodways.

Vegetation maintenance is defined primarily as the mowing of vegetation, usually grass and brush, on an annual basis. Occasionally, grubbing (uprooting) or hand trimming of larger plants is required. Maintenance under the IBWC Minutes could include the removal or control of vegetation, as necessary, to assure that the United States meets its international obligations in relation to the volume of flood water that can be carried by the main channel of the Rio Grande.

A 34.5-mile reach of the Rio Grande, between River Mile (RM) 28.00 (southeast of Brownsville) and RM 62.50 (northwest of Brownsville), was the primary area along the

Rio Grande selected for regular vegetation maintenance. The vegetation was mowed from the edge of the low water level to the top of the high water level banks, or where the high water level bank was not well defined, to a point 328 feet (100 meters) from the water's edge, whichever was less. Mowing usually occurred along river bends on level or low-lying ground. These vegetation maintenance practices were continued until the early 1990's.

On November 1, 1989, the Sierra Club, Frontera Audubon Society, and National Audubon Society filed a civil action suit against the USIBWC alleging violations of the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA). The plaintiffs alleged that the USIBWC had not prepared an Environmental Assessment (EA) or Environmental Impact Statement (EIS) relative to the operation and maintenance activities for the United States portion of the LRGFCP as required by NEPA. The plaintiffs also alleged that the USIBWC had not entered into formal consultation with the United States Fish and Wildlife Service (USFWS) pursuant to Section 7 of the ESA with respect to the impacts of the United States portion of the LRGFCP on federally-listed threatened or endangered species.

Upon discussions between USIBWC and the plaintiffs, the United States District Court for the District of Columbia issued a Consent Decree concerning the case on July 31, 1990. In the Consent Decree, the USIBWC agreed to enter into formal consultation with the USFWS regarding the impacts of all vegetation clearing activities of the United States LRGFCP on federally listed species. Additionally, the USIBWC agreed to the preparation of this EIS, which specifically addresses alternative vegetation maintenance practices.

On September 28, 1990, the USIBWC contacted the USFWS to initiate the Section 7 consultation process. After the initial meetings, the USIBWC began preparation of a Biological Assessment (BA) for vegetation clearing activities. The BA was submitted on May 29, 1991, beginning formal consultation with the USFWS under the ESA. The consultation process resulted in a revised BA that was submitted on February 5, 1993, followed by issuance by the USFWS of a Biological Opinion (BO) on May 6, 1993. The BO addressed vegetation-clearing activities over the 34.5-mile portion of the LRGFCP from RM 28.00 to RM 62.50.

As a result of the 1993 BO, maintenance practices along the river channel were modified to reduce potential impacts to endangered species and to support the concept of "The Wildlife Corridor" developed by the USFWS. The BO also required the preparation of a "Lower Rio Grande Flood Control Project Off-River Wildlife Travel Corridor Plan" by the USIBWC. This plan was submitted on April 13, 1994, to the USFWS. A detailed description of the modified maintenance practices is provided in Chapter 2. The modified maintenance practices have continued to date in accordance with the USIBWC BA and the USFWS BO.

The five-year duration of the 1993 BO has since expired. The USFWS issued a new 2003 BO, dated May 23, 2003. Under the 2003 BO, USIBWC agreed to designate the Continued Maintenance (No-Action) Alternative as the Preferred Alternative. Additional new terms of the 2003 BO include avoiding maintenance activities during migratory bird

peak breeding season (March through August), when possible. If this is not possible, USIBWC will conduct surveys to locate active nests prior to mowing activities. The 2003 BO also contains stipulations to ensure the environmental commitments of USIBWC are met in a timely manner. This includes regular progress reports and the formation of a coordination workgroup with representatives from USIBWC, USFWS, Cameron County, Hidalgo County, and Willacy County, Texas Parks and Wildlife Department (TPWD), and LRGV Water Committee and Program. The group will work to obtain easements for the wildlife travel corridor and monitor the progress of implementing commitments under the BO.

A Notice of Intent (NOI) to prepare the EIS was first published in the *Federal Register* (FR) on November 19, 1990 (55 FR 48176-48177). A scoping meeting notification was issued on December 17, 1990 (55 FR 51777), scheduling the public meeting for January 8, 1991 in Weslaco, Texas. A second NOI was published in the FR on August 26, 1998 (63 FR 45518-45519), after funding for preparation of this EIS was received by the USIBWC. The USIBWC conducted a second scoping meeting on September 10, 1998, in Weslaco, Texas. The public scoping period began with the publication of the NOI and concluded after 60 days on October 26, 1998. Comments from both scoping meetings were used to formulate the scope of the FEIS. A summary of both scoping meetings is included in Appendix G.

The USIBWC's Draft Environmental Impact Statement (DEIS) for vegetation maintenance activities within the LRGFCP was made available for public review and comment from July 11, 2003, to October 9, 2003. A public meeting was held on July 30, 2003, in Weslaco, Texas, and a summary report of the meeting is included in Appendix K. This FEIS incorporates or responds to all agency and public comments that were received during the DEIS public review period, as well as comments received from agencies during the comment period for the Preliminary Draft Environmental Impact Statement (PDEIS), and public scoping meetings held in January 1991 and September 1998. Appendix J includes all comments received along with USIBWC's responses to those comments.

All of the documents referenced in the preceding paragraphs are included in Appendices A through K of this FEIS.

1.3 PURPOSE AND NEED

The IBWC is the international body responsible for overseeing boundary and water treaties along the 2,000-mile border between the United States and Mexico. The IBWC operates within a set of international flood control goals, which have provided the framework for the purpose of and need for the LRGFCP. These goals are:

- ***Legal Goal*** - Provide a flood control project that fulfills international treaty requirements, preserves the river channel to define the international boundary, and provides for delivery of irrigation, municipal, and industrial waters.
- ***Management Goal*** - Provide a flood control project that ensures flood readiness and distributes floodwaters equitably.

- ***Safety Goal*** - Provide a flood control project that protects against design flow floods and preserves life and property.

The objective of the LRGFCP vegetation maintenance program is to fulfill the United States Government's obligations under IBWC Minute No. 212 and No. 238 and the protection of life and property in the United States and Mexico from Rio Grande floods. Furthermore, the USIBWC must fulfill commitments arising from the 1990 Consent Decree, the 1993 BO, and the 2003 BO. The pertinent elements of the LRGFCP vegetation maintenance program are based on the need to:

- Maintain channel banks to provide adequate flood conveyance.
- Equitably divert flood flows into interior floodways.
- Remove brush and other obstructions within floodways.
- Maintain "The Wildlife Corridor" per the 1993 BO, the 2003 BO, and the 1994 LRGFCP Off-River Wildlife Travel Corridor Plan.

1.4 SCOPE OF THE EIS

1.4.1 Description of the Project Area

The LRGFCP encompasses a wide range of flood control measures over a large portion of the LRGV; however, this FEIS will only address the vegetation maintenance practices that affect the flood conveyance capability through the Brownsville, Texas, area. Therefore, for the purpose of this FEIS, the project area is limited to a distance of 158 river miles from just below Brownsville (RM 28.00) in Cameron County, Texas, to Penitas (RM 186.00) in Hidalgo County, Texas. The project boundaries include areas within the USIBWC rights of way. The project area for this FEIS, presented in Figure1-1, is illustrated in more detail in Chapter 2 of this FEIS. The study area for some of the resources addressed within this FEIS may extend beyond the project boundary. These study areas are defined within each resource section.

1.4.2 Scope of the Analysis

Federal agencies that fund, support, permit, or implement major programs and activities are required to take into consideration the environmental consequences of proposed actions in the decision-making process under the NEPA of 1969, Title 42, United States Code (USC), Section 4321, et seq. (42 USC 4321 et seq.). The intent of NEPA is to require federal decision-makers to consider the environmental impacts of proposed projects prior to an implementing decision. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. The CEQ issued regulations implementing the process in Title 40, Code of Federal Regulations (CFR), Parts 1500-1508 (40 CFR 1500-1508). The USIBWC's Operational Procedures for Implementing Section 102 of NEPA were published in the FR on September 2, 1981 (46 FR 44083-44094).

This FEIS presents and analyzes the impacts of alternative USIBWC vegetation maintenance practices. This document will also discuss other ongoing and proposed projects in the project area that would contribute to cumulative environmental effects

within the reasonably foreseeable future. Reasonably foreseeable future impacts are those resulting from active or proposed projects scheduled for completion within the next five years. These projects would occur within the project area or directly impact the project area in a manner that would increase or magnify the level of impacts resulting from the USIBWC maintenance practices.

This FEIS will address current or proposed projects and their impacts in the United States; it will not assess impacts in Mexico in accordance with Section 2-3(b) of Executive Order (EO) 12114. The preparers of this FEIS acknowledge that one-half of the Rio Grande (called the Rio Bravo in Mexico) belongs to Mexico, and that the consequences of maintenance practices to the LRGFCP will not be limited to the United States side of the border. As an active participant in this project, this EIS and the resulting recommendations will be submitted to the MxIBWC for their review.

During the preparation of this document, analysis focused on vegetation maintenance practices on the United States side of the main stem of the Rio Grande. Because the limit of jurisdiction for this document ends at the mid-river international boundary, discussions of impacts to Mexico resulting from United States vegetation maintenance activities are not presented.

Vegetation maintenance practices in the off-river areas including the interior floodways are not addressed in this document. USIBWC currently performs vegetation maintenance of approximately 5,400 acres in the interior floodways. Maintenance along the Off-River Floodway System includes mowing, cleaning pilot channels and lateral drains of sediment and vegetation, levee reconditioning and roadway maintenance, and floodway smoothing (IBWC, 1994a).

The LRGFCP Off-River Floodway System provides the USIBWC adopted freeboard only with continuation of the current maintenance practices. Based on hydraulic studies (IBWC, 1992), the USIBWC concluded that additional mature vegetation within this system would not be prudent. Such vegetation could affect the design flood event, threatening an area near Highway 77 in the Arroyo Colorado Floodway and two bridges in the North Floodway (IBWC, 1994a).

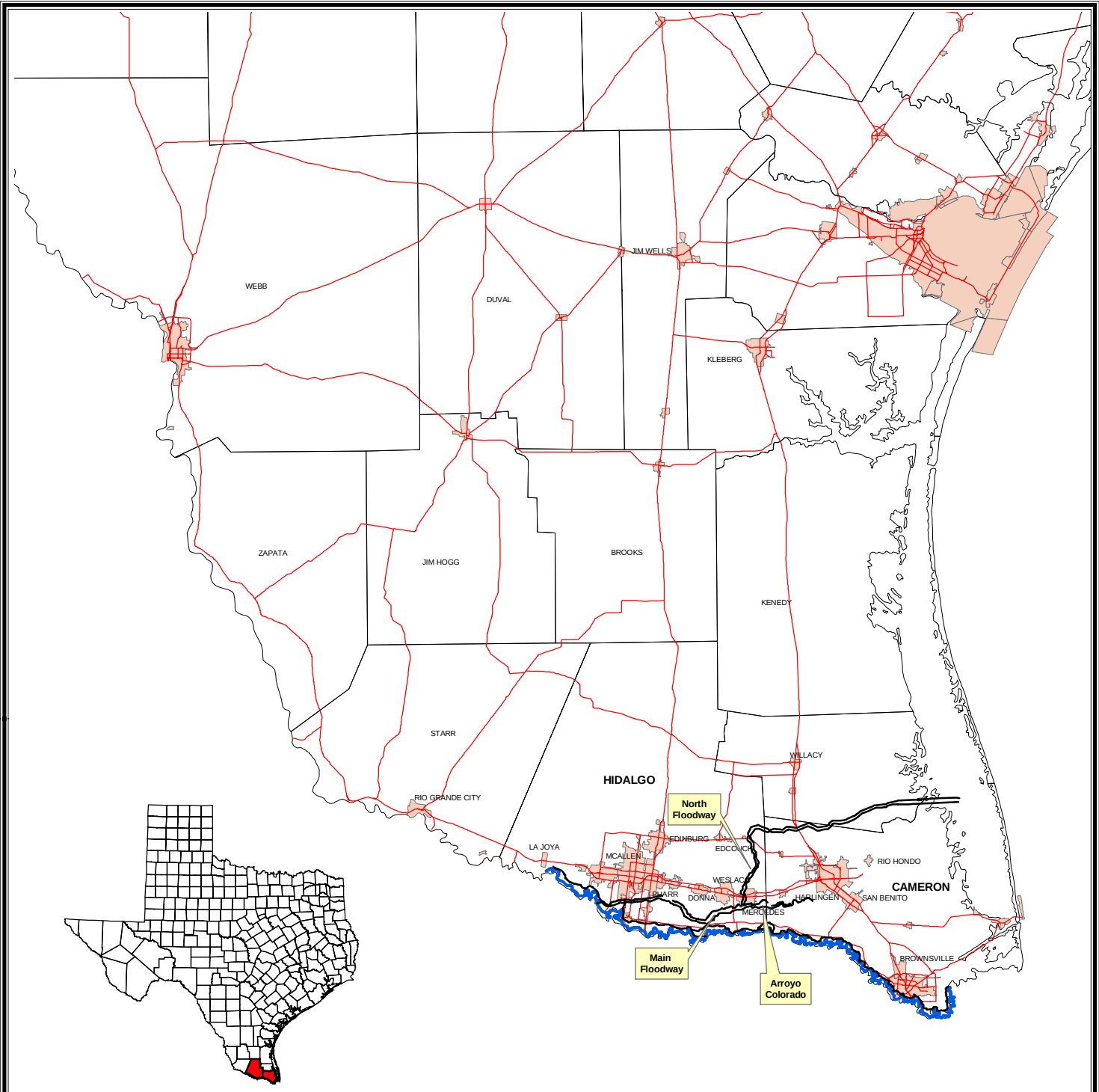
In the May 6, 1993 BO, the USFWS determined that a minimum 33-foot wide wildlife travel corridor immediately outside the Off-River Floodway System would be beneficial for the dispersal and survival of the federally endangered ocelot and jaguarundi. This determination remains in the 2003 BO. Borrow areas immediately outside the interior floodway contain narrow strips of vegetation, which could serve as linkages to islands of optimal habitat. The off-river plan called for a wildlife travel corridor to be established through negotiations and floodway easements with property owners and counties. No actual changes in the vegetation maintenance practices for the interior floodways are proposed. Therefore, alternative maintenance practices in these areas are not considered in this FEIS.

1.5 METHODOLOGY AND LIMITATIONS

This FEIS was prepared using the most recent information available to describe and assess potential impacts to the resources occurring within the project area. The existing

data sources and information used for analysis include the project proponents; other local, state, and federal agencies; field studies/surveys; scientific literature; professional judgement; and other qualitative and quantitative assessments. In the case of several resources, it was deemed necessary to perform new or additional studies in conjunction with this FEIS to develop or update information for this effort. These studies included updated Hydrologic Engineering Center modeling (HEC-2) of the main channel of the Rio Grande, a cultural resource assessment of the LRGFCP area focusing on the main channel area, a threatened and endangered species survey, and a Habitat Evaluation Procedure (HEP) report. Descriptions of these studies and their associated specific limitations are provided in the resource sections of this document.

Specific limitations apply to the range of possible alternatives that can be addressed by this FEIS. The focus of this FEIS is past, present, and future vegetation maintenance practices within the LRGFCP area. Hydraulic or water control operations of the LRGFCP fall within the realm of the international agreements governing the project and are therefore not a subject of this FEIS. The USIBWC does not have unilateral control of flood operations of the LRGFCP and thus cannot make commitments regarding such operations, which are international and controlled by both sections of the IBWC. In accordance with the provisions of applicable treaties and IBWC Minutes, the United States has a limited degree of discretion in issues related to maintenance of the LRGFCP area within the United States.



N

0 10 20 40 Miles

Figure 1-1

Project Area
USIBWC Rio Grande Flood Control Project

Chapter 2

Description of Proposed Alternatives

CHAPTER 2

DESCRIPTION OF PROPOSED ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the project area, the process used to determine alternatives, proposed vegetation maintenance alternatives, alternatives eliminated from further consideration, other reasonably foreseeable cumulative actions, and succinctly summarizes the environmental consequences of the alternatives. These alternatives were initially identified during the scoping process and refined as a result of studies that occurred during the preparation of this document. The most significant study directly affecting the alternatives presented is the *Hydraulic Modeling Report* (HMR) (WLA, 2001) which considered the potential changes in water surface elevation associated with the vegetation maintenance alternatives. Three other supporting studies include *An Assessment of Potential Effects to Historic Properties within the Lower Rio Grande Flood Control Project by Proposed Maintenance Activities of the United States International Boundary Water Commission* (Cooper *et al.*, 2002), the *Threatened and Endangered Species Survey Report for Alternatives to Vegetation Maintenance* (GSRC, 2003) and the *Habitat Evaluation Report* (GSRC, 2002). This chapter also identifies other reasonably foreseeable actions that could contribute to cumulative impacts. This FEIS addresses four alternatives, including the Continued Maintenance Alternative (No-Action).

2.2 IMPORTANT FEATURES OF THE PROJECT AREA

The Rio Grande, from El Paso, Texas to the Gulf of Mexico, forms part of the international boundary between the United States and Mexico. In 1932, these two countries reached an agreement to develop a coordinated plan for an international project to protect the communities and farmlands of the LRGV in both countries against flooding from the Rio Grande. This agreement was developed and implemented by the IBWC, and resulted in the construction of the LRGFCP.

The LRGFCP within the project area is comprised of a variety of features that protect life and property in the LRGV against Rio Grande floodwaters. These include the Rio Grande pilot channel, flood levees to the north in the United States and to the south in Mexico, and two diversion dams that divert excess floodwaters into off-river floodways in both the United States and Mexico. The LRGFCP flood levees are grass-covered earthen structures, with a distance between the United States and Mexican levees ranging from approximately 400 feet (ft) to 3 miles (IBWC, 1992). The two diversion dams are Retamal Dam located at RM 129.22 and Anzalduas Dam located at

RM 169.14. Anzalduas Dam diverts floodwaters to the United States off-river floodway system and Retamal Dam diverts floodwaters to the Mexican off-river floodway system. Flood control operations of the LRGFCP also involve close coordination between the USIBWC and MxIBWC to operate two upstream dams – Amistad and Falcon – to control floodwaters reaching the LRGFCP area.

Other features of the LRGFCP include irrigation weirs, pump intakes, drainage outfalls, highway and railroad bridges, river gauges, and farm levees. Major features of the LRGFCP within the project area for this FEIS, such as the levees, diversion dams, and bridge crossings, are identified on Figures 2-1 through 2-6. These features are as follows:

- The Los Tomates Restricted Use Zone, where land use is restricted for flood control and protection purposes on both countries' floodplain, is located along the LRGFCP between RM 45.00 and RM 52.50 in the Brownsville/Matamoros area.
- Eight bridges that cross the Rio Grande at various locations within the project area.
- Retamal Dam which diverts floodwaters to the Mexican off-river floodway and is located on the Rio Grande at RM 129.22.
- Anzalduas Dam which diverts floodwaters to the United States off-river floodway and is located on the Rio Grande at RM 169.14.

For this FEIS, a further important feature of the LRGV is the LRGV National Wildlife Refuge (LRGV NWR). The LRGV NWR is a large system of noncontiguous tracts of protected land managed by USFWS to conserve habitat and wildlife, including endangered plant and animal species. The LRGV NWR lands are located both between and outside the LRGFCP flood control levees. LRGV NWR lands that are located between the levees are located on the United States floodplains of the LRGFCP along the Rio Grande main stem. In some cases, USFWS has purchased farmland within the LRGFCP and converted the land to natural habitat.

2.3 HISTORY OF THE FORMULATION OF ALTERNATIVES

Section 1.2 provides a detailed background of the legal and administrative history that led to the need for action. This section briefly describes the process that led to the formulation of alternatives considered in this FEIS.

Alternatives to the existing maintenance practices of the USIBWC were identified during a public meeting held January 8, 1991, and the scoping meeting for this EIS held September 10, 1998, in Weslaco, Texas. The scoping process ensures that affected agencies and the public have an early opportunity to participate in the development of the scope and the range of alternatives proposed for the EIS. A summary of each meeting is provided in Appendix G to this FEIS. The majority of comments resulting from the public and scoping meetings and 60-day written comment period concerned wildlife and habitat along the river corridor, the impacts to vegetation, and design flood flow conveyance. Other major comments concerned additional studies regarding design flood flow for this section of the river, safety issues for the United States Border Patrol (USBP)

and other state and federal law enforcement personnel, and the need to consider potential cumulative impacts resulting from USBP projects.

Utilizing public comments as a basis, the USIBWC prepared an initial set of four alternatives to the current vegetation maintenance practices. These four alternatives were refined and expanded based on the results of preliminary studies conducted in conjunction with this FEIS, along with agency coordination, in particular with the USFWS which resulted in the provisions of the 2003 BO. All of the alternatives involve variations in the degree of vegetation maintenance that would be practiced by the USIBWC.

The baseline for this FEIS reflects data from various sources, including 1996, 1999, and 2000 data used in the HMR. Given the estimated 20-year length of time for vegetation to grow to a mature/climax condition, the impacts of the various alternatives are projected to an approximate 20-year future time.

It should be noted that the results of hydraulic modeling reflected in the HMR show that the water surface elevations under the design flood flow event exceed the elevation of the top of the United States levees in the upper reaches of the LRGFCP for all of the alternatives. The degree of "overtopping" varies between alternatives. Even if a significant expansion of vegetation maintenance occurred (increasing the flow-carrying capacity of the Rio Grande), hydraulic modeling indicates that the levees would be "overtopped." Such an event has never happened because design flood flows have not occurred within the LRGFCP since the levees were constructed. As noted in Chapter 1, this FEIS is limited to consideration of alternative vegetation management practices, and the consideration of measures to correct possible levee "overtopping" is not included in the scope of this effort. Furthermore, any impacts associated with levee "overtopping" are the result of a pre-existing condition not caused by vegetation maintenance practices of the USIBWC. Therefore, such theoretical impacts are not analyzed. Vegetation maintenance affects the degree of "overtopping," but is not the proximate cause. A separate, large-scale study would be required to reevaluate the effectiveness of the current LRGFCP with regard to flood control and flood-water conveyance, and this would involve evaluation of both the USIBWC and MxIBWC project components.

2.4 ALTERNATIVES

The four alternatives considered in this FEIS are as follows, with a summary of the salient vegetation maintenance practices and assumptions in Table 2-1:

- Prior Maintenance Alternative
- Continued Maintenance Alternative (No-Action)
- Suspended Maintenance Alternative
- Expanded Maintenance Alternative

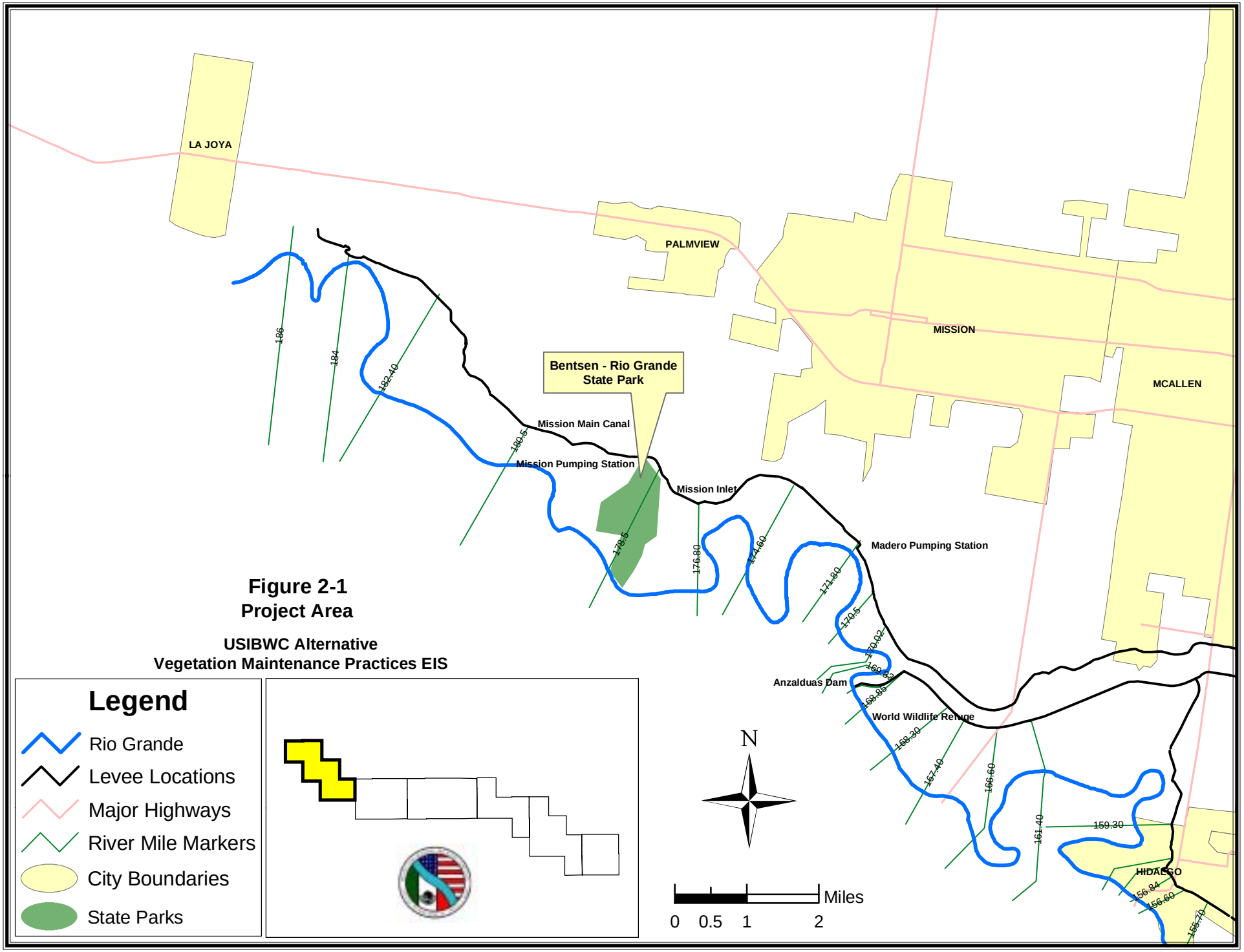


Figure 2-1
Project Area

USIBWC Alternative
Vegetation Maintenance Practices EIS

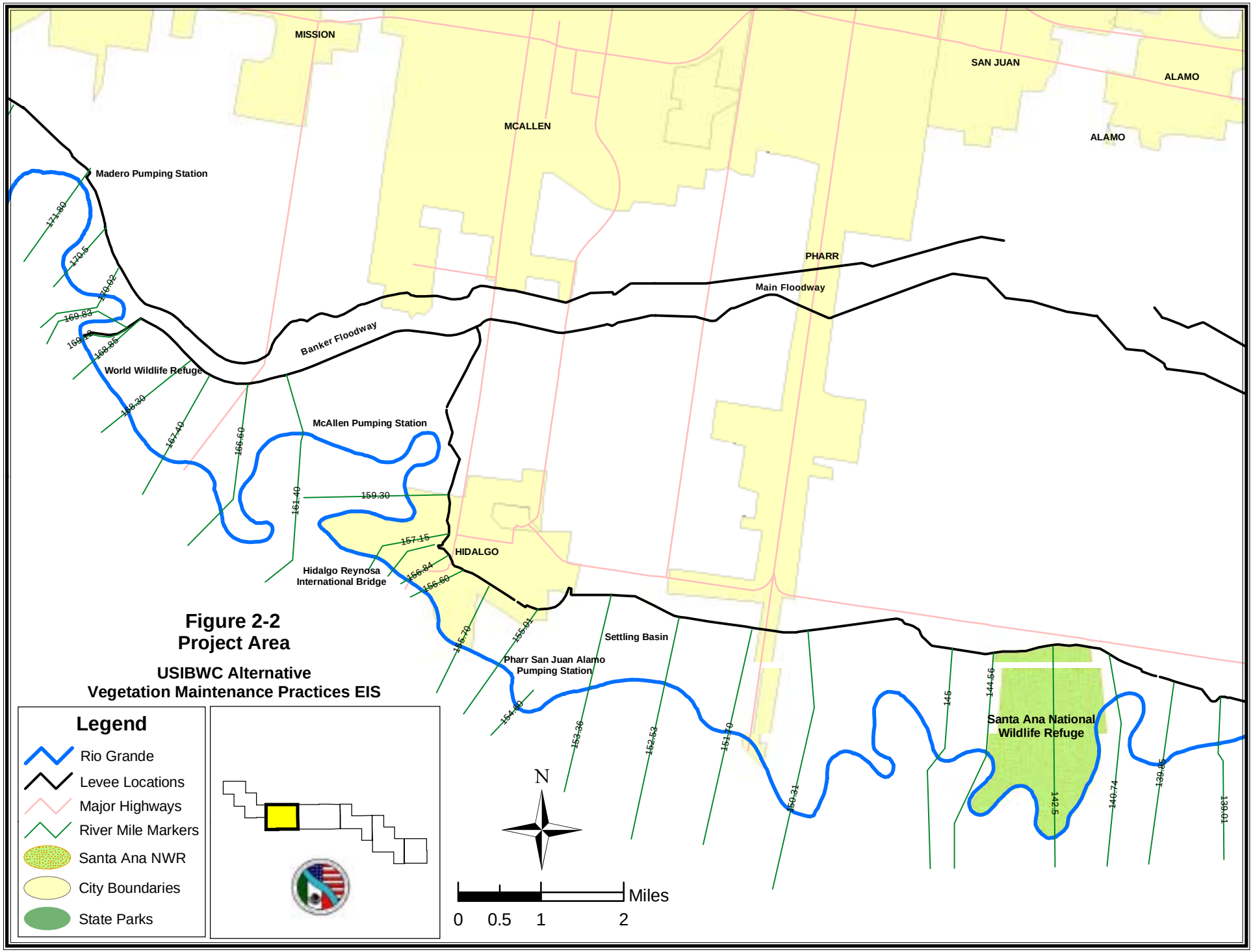


Figure 2-2
Project Area

USIBWC Alternative
Vegetation Maintenance Practices EIS

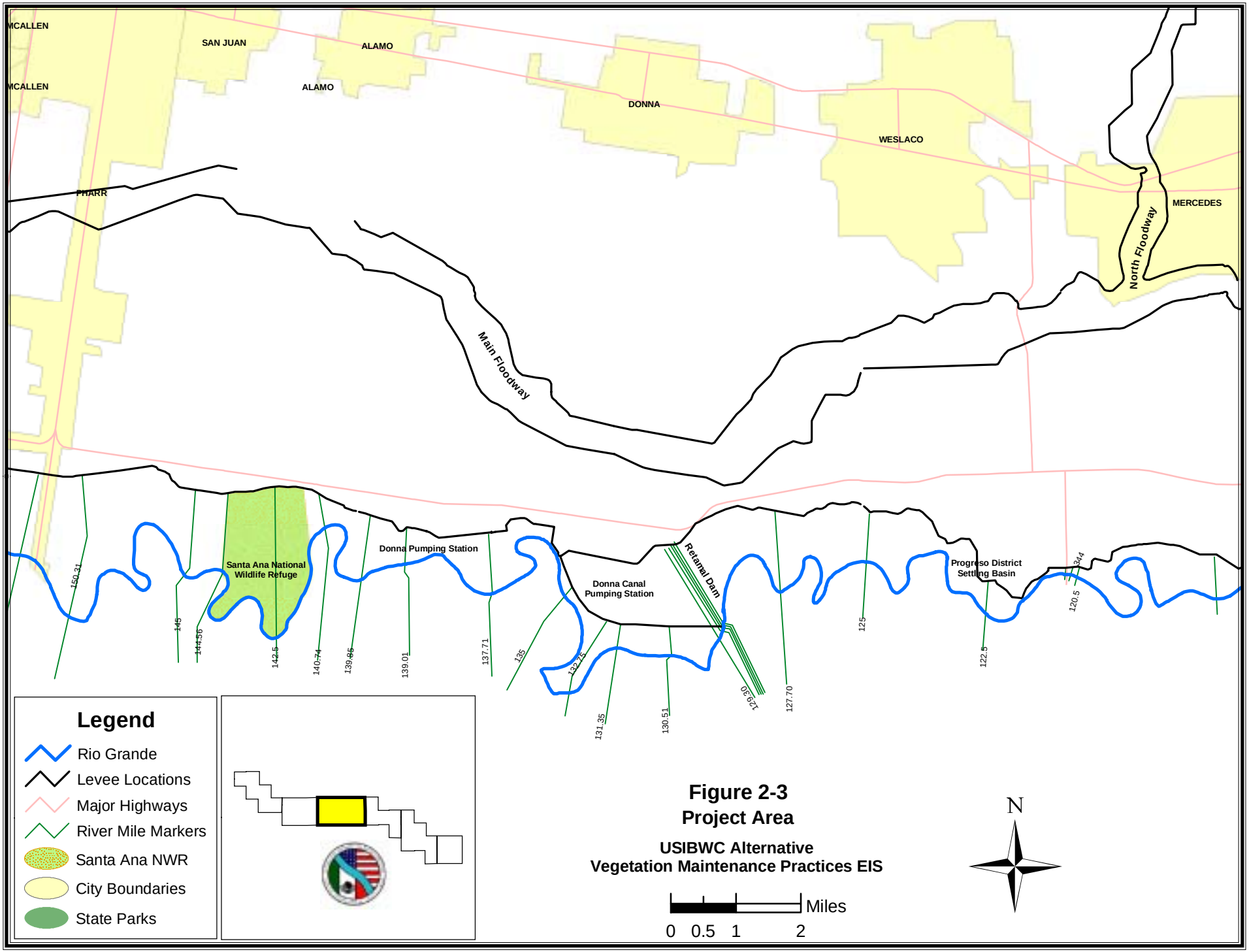
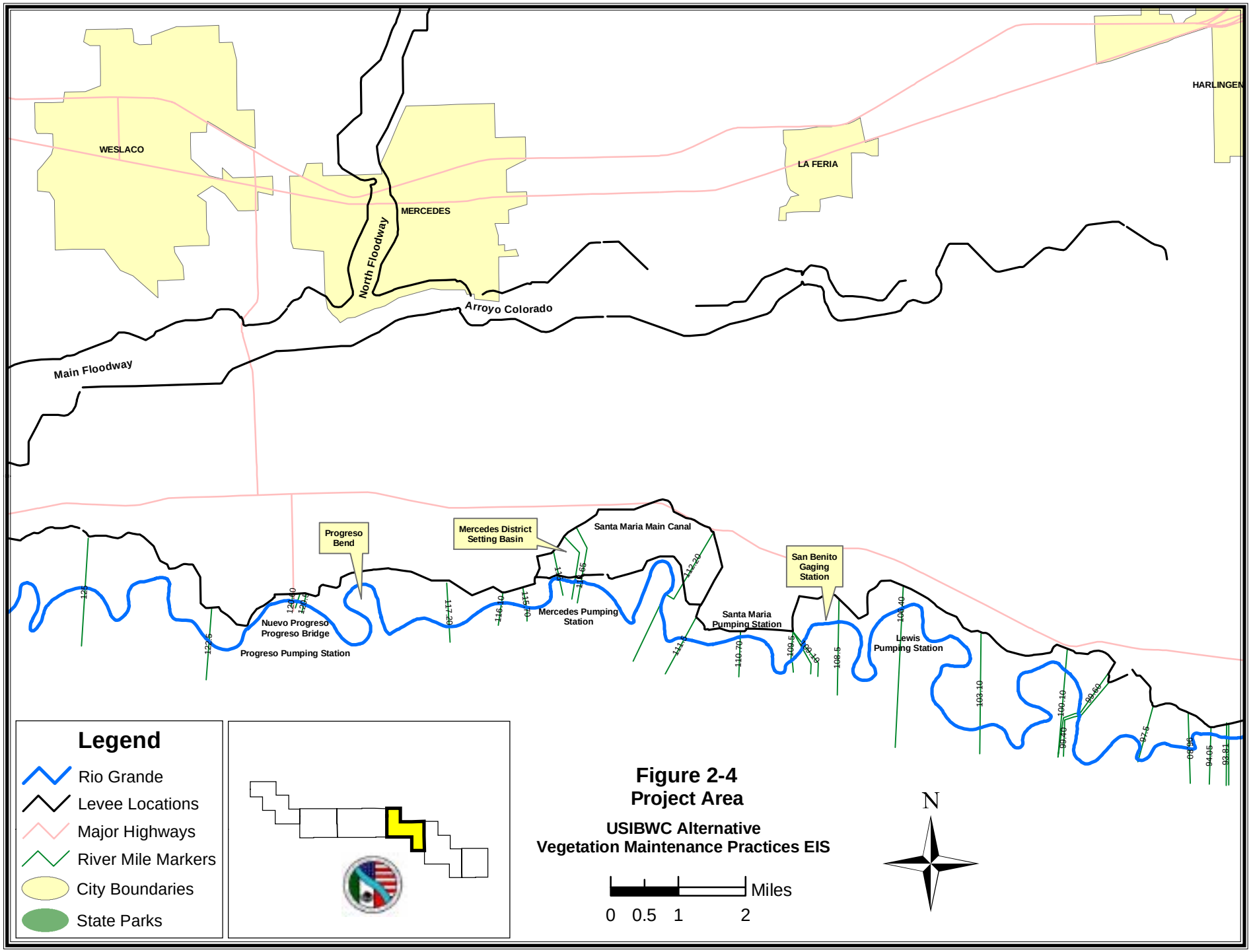
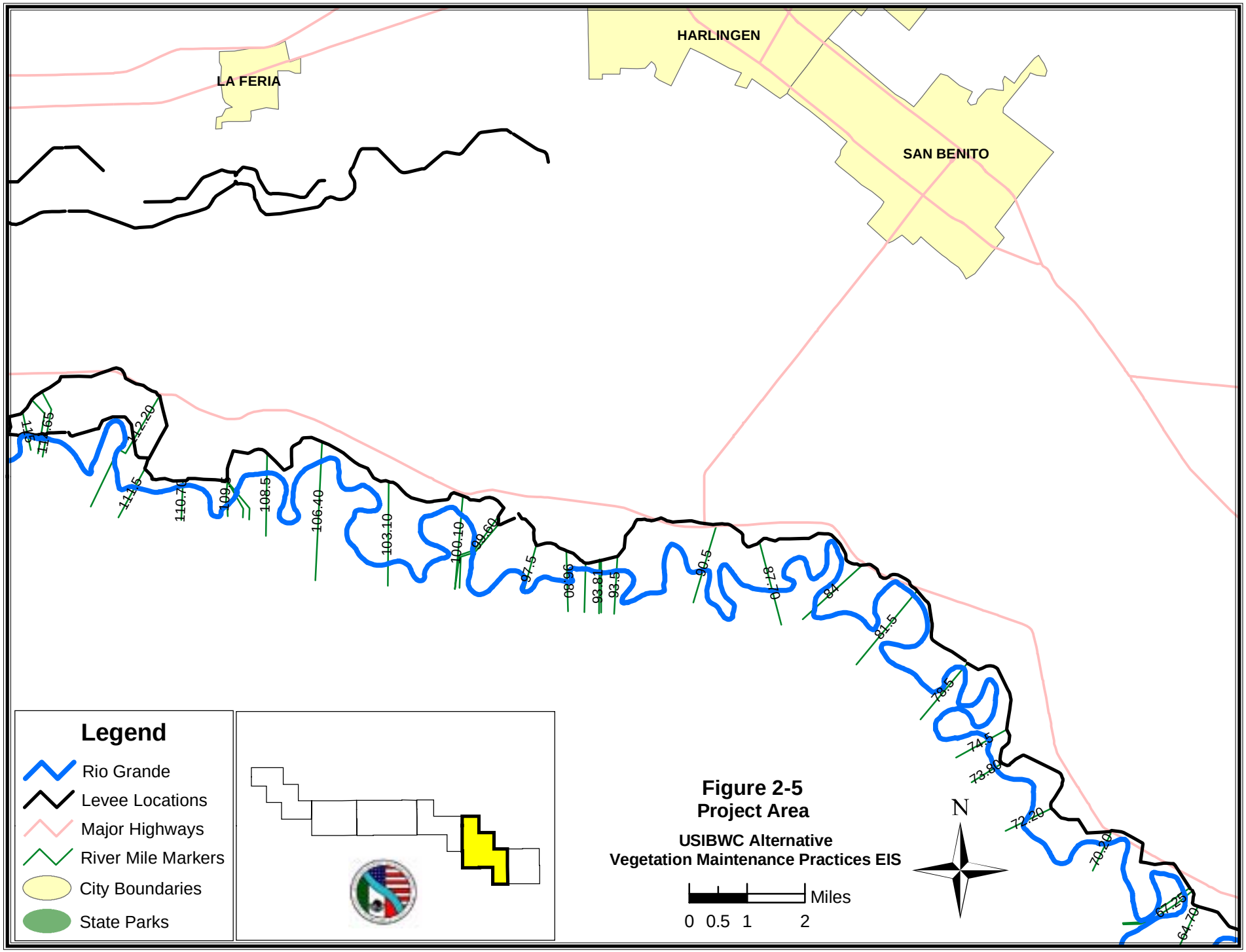


Figure 2-3
Project Area

USIBWC Alternative
Vegetation Maintenance Practices EIS


WESLACO
MERCEDES
LA FERIA
HARLINGEN
North Floodway
Arroyo Colorado
Main Floodway
Progreso Bend
Mercedes District Setting Basin
Santa Maria Main Canal
San Benito Gaging Station
Nuevo Progreso Progreso Bridge
Progreso Pumping Station
Mercedes Pumping Station
Santa Maria Pumping Station
Lewis Pumping Station
Legend
Rio Grande
Levee Locations
Major Highways
River Mile Markers
City Boundaries
State Parks
Figure 2-4
Project Area
USIBWC Alternative
Vegetation Maintenance Practices EIS
Miles
0 0.5 1 2
N


HARLINGEN
LA FERIA
SAN BENITO
Legend
Rio Grande
Levee Locations
Major Highways
River Mile Markers
City Boundaries
State Parks
Figure 2-5
Project Area
USIBWC Alternative
Vegetation Maintenance Practices EIS
Miles
0 0.5 1 2
N

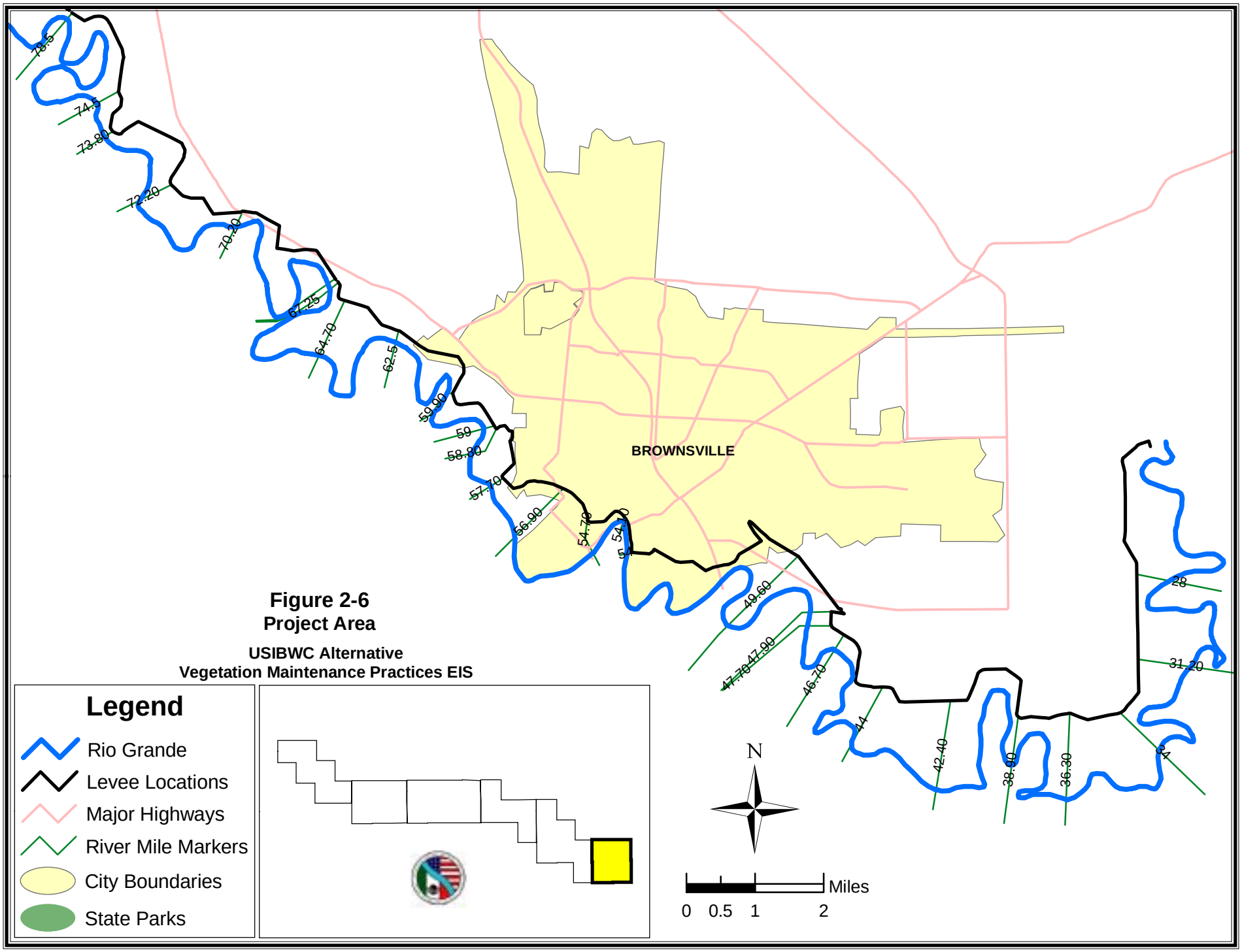


Figure 2-6
Project Area

USIBWC Alternative
Vegetation Maintenance Practices EIS

Table 2-1 Vegetation Maintenance Alternatives

Feature	Prior Maintenance Alternative	Continued Maintenance Alternative	Suspended Maintenance Alternative	Expanded Maintenance Alternative
Frequent Bank Maintenance	RM 28.00 to 62.50	RM 28.00 to 62.50	--	RM 28.00 to 186.00
Infrequent Bank Maintenance	RM 62.50 to 169.14	--	--	--
No Bank Maintenance	RM 169.14 to 186.00	RM 62.50 to 186.00	--	--
Wildlife Travel Corridor	No	Yes	Yes	Yes
Expanded Wildlife Refuge	Yes	Yes	Yes	Yes

2.4.1 Prior Maintenance Alternative

The Prior Maintenance Alternative is the return to prior maintenance practices as specified in IBWC Minutes No. 212 and No. 238, dated December 22, 1961 and September 10, 1970, respectively. This alternative represents the implementation of vegetation maintenance practices as conducted prior to the 1993 BO, but includes an expansion in the area of the LRGV NWR. Figures 2-7 through 2-11 show the location of the prior vegetation maintenance areas along the lower Rio Grande. All alternatives assume an expansion of the LRGV NWR to provide for a consistent comparison of future project conditions.

Prior to 1993, vegetation maintenance of the LRGFCP was governed by IBWC Minute No. 212, adopted December 22, 1961. Under the terms of this Minute, both the United States and Mexico agreed to concurrent channel bank mowing to reduce heavy brush growth in the river reach and to ensure a river channel capacity of 20,000 cfs at the Brownsville-Matamoros area. IBWC Minute No. 212 defined the area to be mowed as the banks of the river channel from the low water's edge to the top of the channel bank or to a point 328 ft (100 meters) from the low water's edge, whichever distance is less. Under the Minute, clearing of the channel banks was called for between RM 28.00 and Anzalduas Dam at RM 169.00, approximately 141 river miles.

In 1962, the United States and Mexico began extensive clearing of the Rio Grande channel banks in accordance with IBWC Minute No. 212. Clearing was completed on both the United States and Mexican banks over the 141-mile reach in 1967 prior to the hurricane season when flooding is most likely along the Rio Grande. In 1967, Hurricane Beulah hit the LRGV, causing extensive flooding along the Rio Grande and the off-river floodways.

A major LRGFCP improvement program was undertaken following the 1967 Hurricane Beulah flood to provide protection against such flooding. This resulted in the adoption of IBWC Minute No. 238 on September 10, 1970. IBWC Minute No. 238 mandates that the LRGFCP must safely pass a 250,000 cfs flood event at Rio Grande City, Texas, and also requires equal diversion of flood flows into the United States and

Mexican off-river floodways to limit the maximum flow of the Rio Grande to 20,000 cfs at Brownsville-Matamoros.

The improvements in the LRGFCP resulting from IBWC Minute No. 238, specifically construction of Retamal Dam and the Mexican interior floodway, resulted in the reduction of vegetation maintenance to the 34.5-mile reach of the Rio Grande between RM 28.00 and 62.50. Approximately 280 acres of vegetation were routinely mowed on the low and high banks along river bends on level or low lying ground, with additional mowing occurring on an as needed basis. Vegetation maintenance consisted of mowing discontinuous sections, of various lengths, along the pilot channel of the river. The mowed areas varied in length from less than five hundred feet up to one mile. At the time of the Hurricane Gilbert flood in 1988, USIBWC mowed the playas in and around Brownsville several times each year, especially before each hurricane season. This practice continued until 1993.

As noted in Section 2.2, the USFWS maintains the LRGV NWR areas to conserve habitat and wildlife. USFWS has been engaged in purchasing additional tracts of land to expand the habitat protected by the LRGV NWR, and plans to continue this expansion program contingent on funding and the availability of suitable property. USFWS prefers to purchase lands capable of supporting the type of vegetation that is typical of the current LRGV NWR mature/climax vegetated habitat. Therefore, in addition to the vegetation maintenance practiced by the USIBWC, it is anticipated that further expansion of the USFWS refuges would occur in the future.

However, accurate data on where USFWS may be purchasing these additional lands could not be obtained since additional purchases are dependent on funding and the availability of suitable land. Therefore, the increase in LRGV NWR habitat was estimated based on various known factors, together with some assumptions as reflected in the HMR. Holdings of the USFWS within the LRGV include 89,326 acres (Ditto, 1999) with a plan to add an additional 43,174 acres (USFWS, 1997). Within the LRGFCP, USFWS holdings total approximately 9,965 acres with an estimated future total of 11,550 acres. This represents a 16 percent increase over the current holdings, but for a conservative estimate this FEIS assumes the actual increase would total 20 percent. Therefore the estimated expansion factor that should be applied to the current LRGV NWR land area is 1.20 – i.e., a net 20 percent increase in land area projected over the estimated 20-year analysis period for this FEIS, with the additional conservative assumption that all of the NWR land areas would include mature/climax vegetation.

Given the foregoing discussion, the Prior Maintenance Alternative represents the LRGFCP approximately 20 years in the future if: (1) USIBWC had continued its maintenance practices in accordance with IBWC Minutes No. 212 and No. 238 without the restrictions of the 1993 USFWS BO; and (2) the USFWS had continued to expand its land holdings within the United States floodplain and these land holdings had aged to mature/climax conditions.

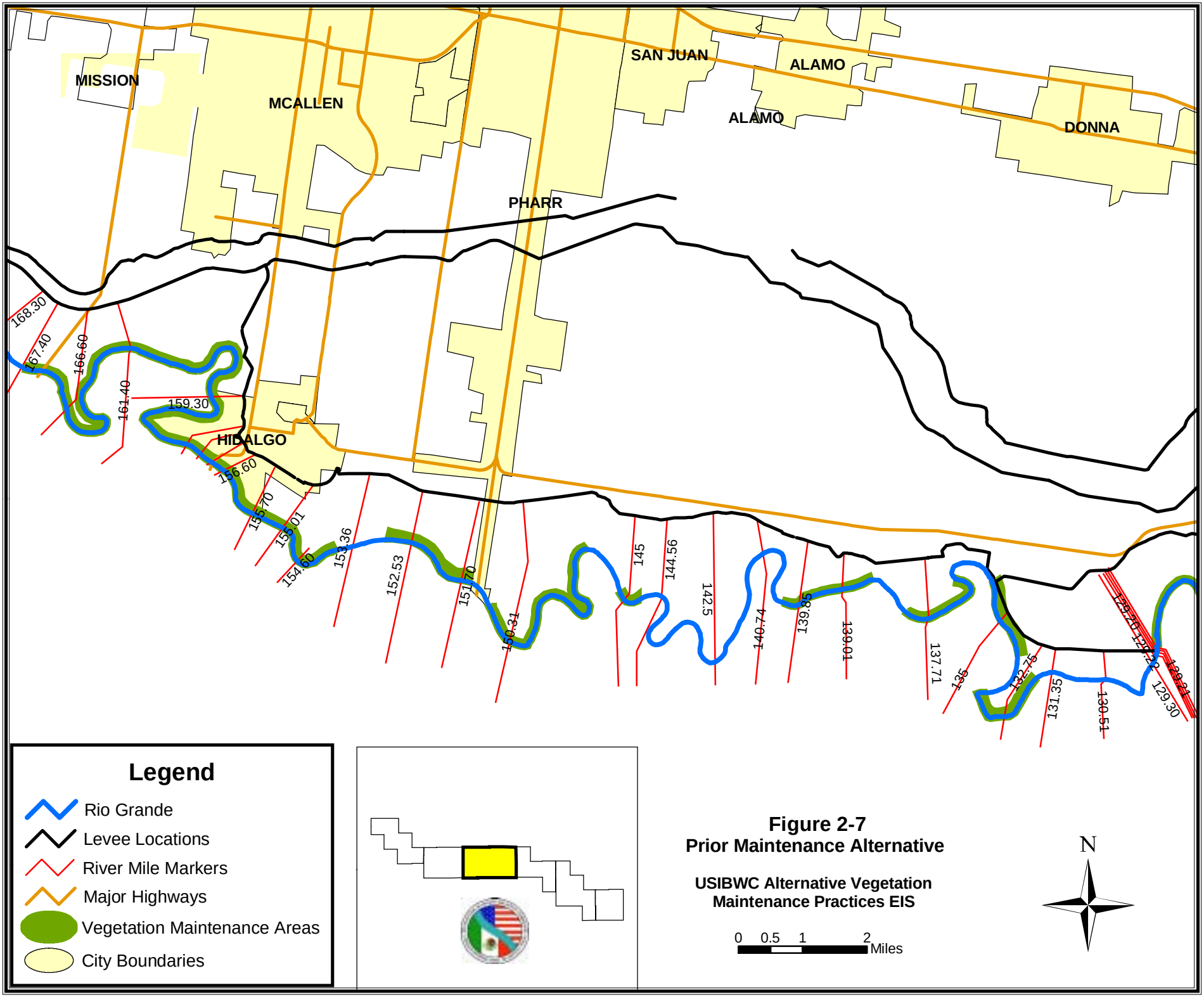


Figure 2-7
Prior Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

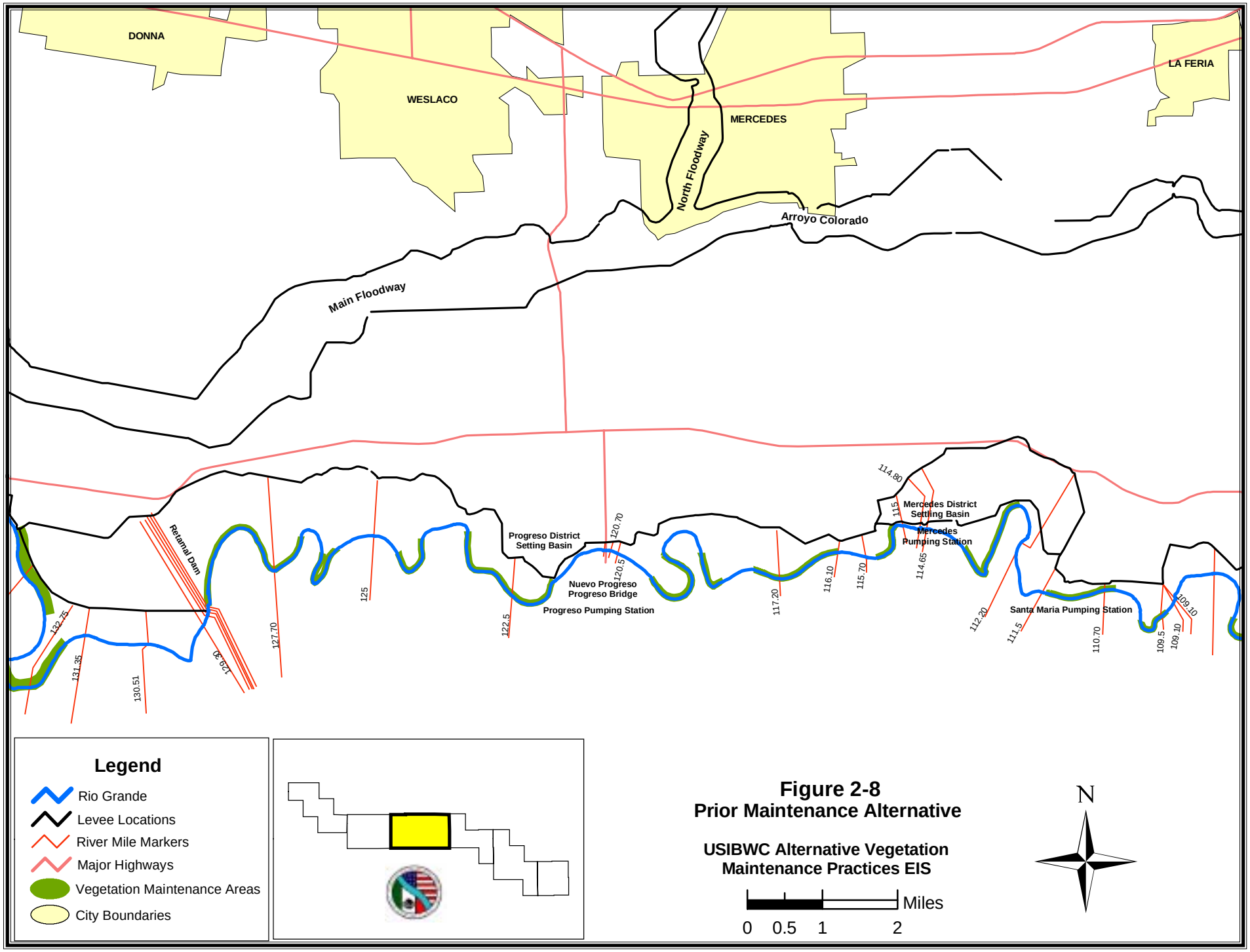


Figure 2-8
Prior Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

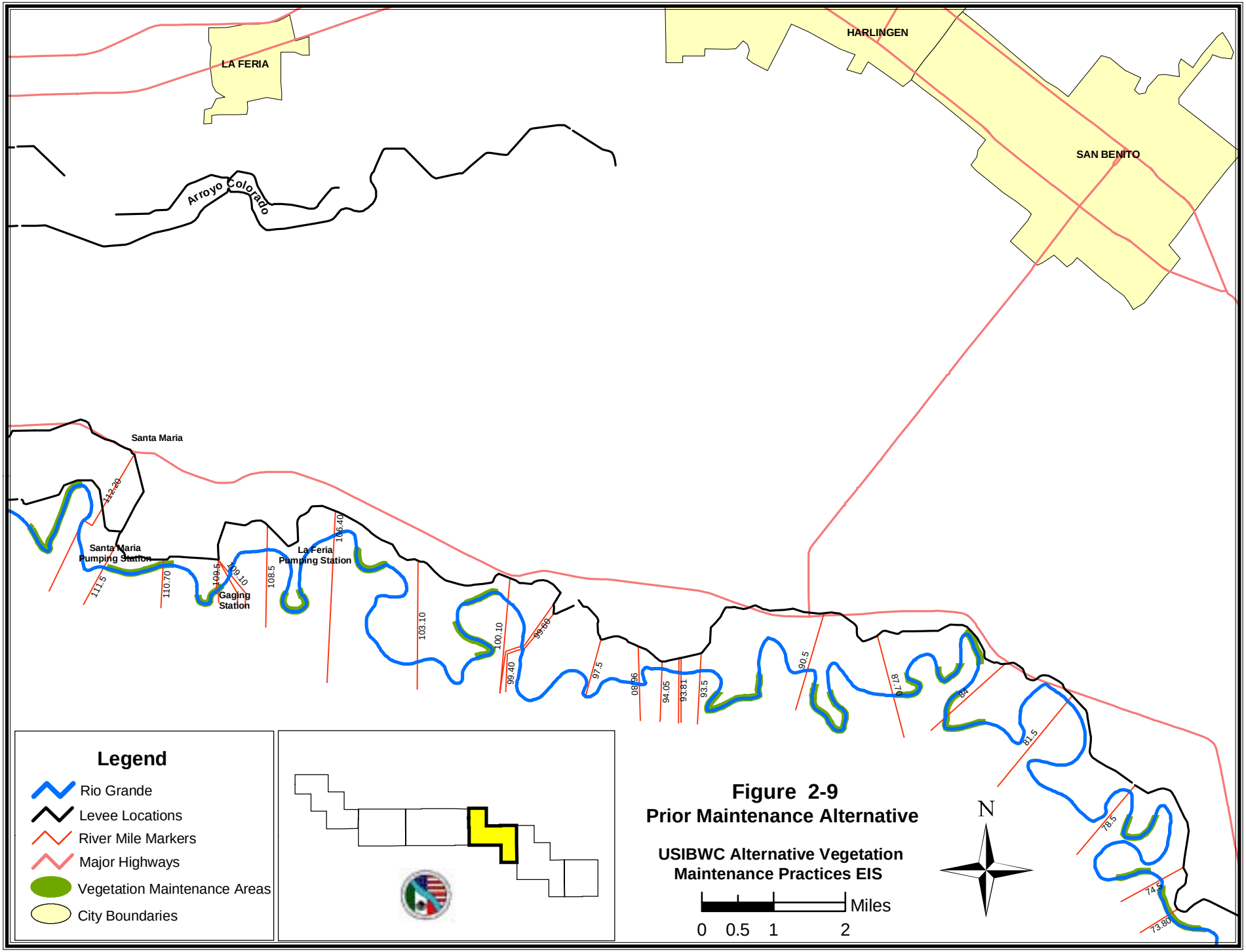


Figure 2-9
Prior Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

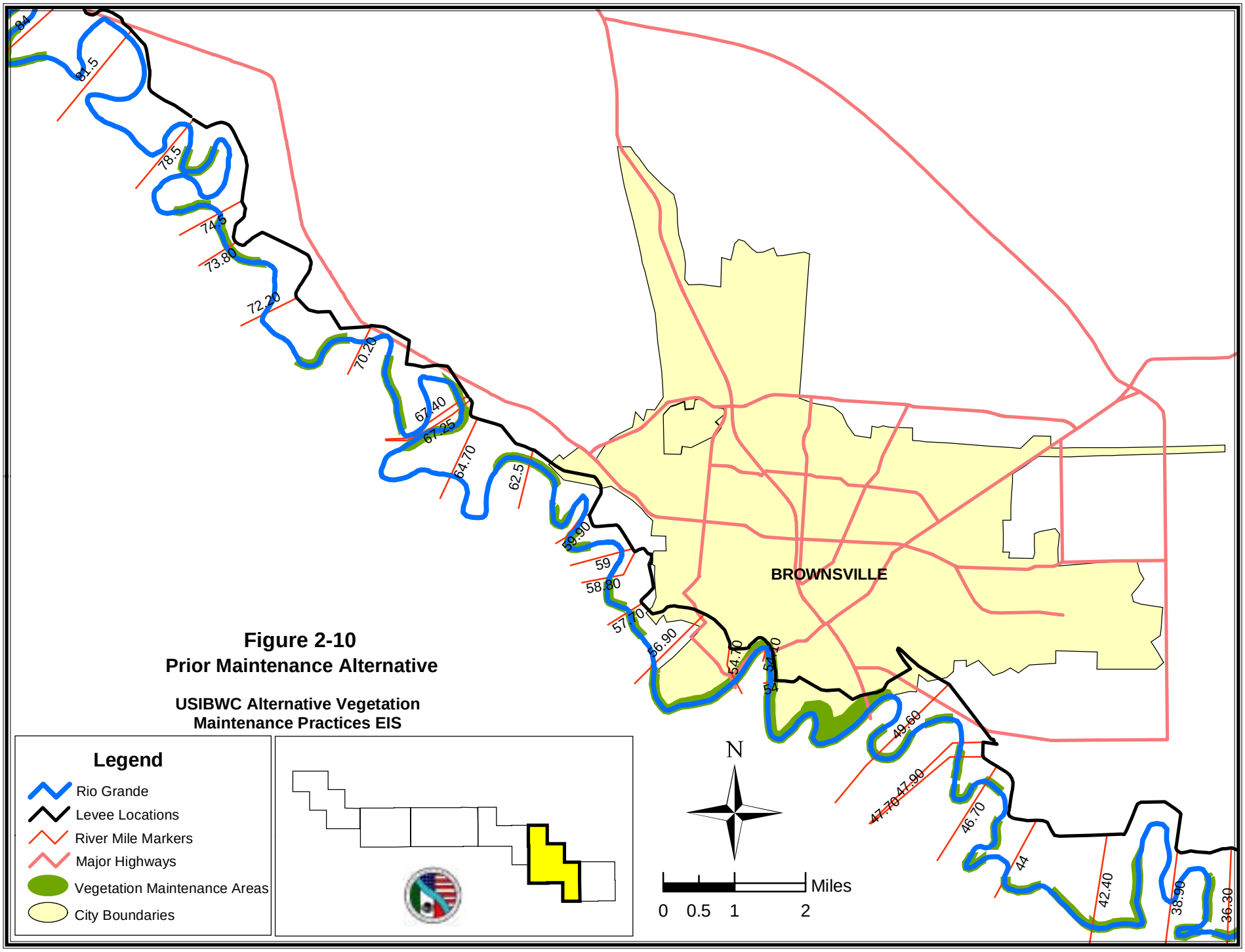


Figure 2-10
Prior Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

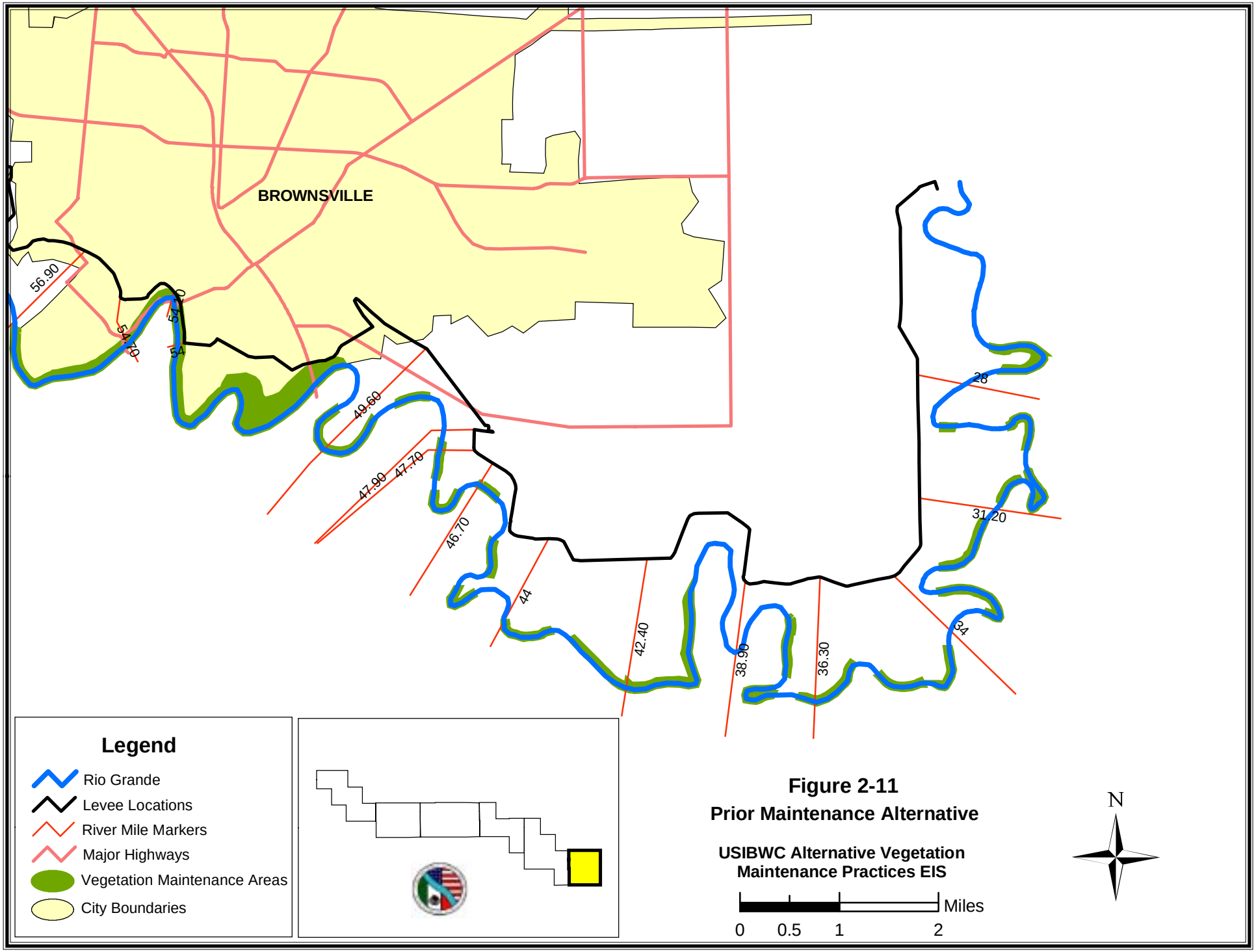


Figure 2-11
Prior Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

Specifically, the Prior Maintenance Alternative reflects vegetation maintenance of the Rio Grande river banks from RM 28.00 to RM 62.50, infrequent vegetation maintenance from RM 62.50 to RM 169.14 (Anzalduas Dam), no vegetation maintenance from RM 169.14 to RM 186.00, a 20 percent expansion in the aerial extent of the LRGV NWR system, and mature/climax vegetation in the National Wildlife Refuge (NWR) land areas. Table 2-2 presents the area measurements for each alternative.

2.4.2 Continued Maintenance Alternative (No-Action)

The Continued Maintenance Alternative calls for no change in the current vegetation maintenance practices that were developed by the USIBWC for the 1993 BA prepared for the USFWS BO, and includes the 20 percent expansion in the LRGV NWR from the Prior Maintenance Alternative. The vegetation management associated with the BO occurs along the 34.5-mile river reach (RM 28.00 to RM 62.50) covering the Brownsville and Matamoros area. Pursuant to the Memoranda of Understanding (MOU) between the USFWS and the USIBWC (MOU No. 1448-00002-96-0816, dated June 11, 1996; MOU No. 1448-20181-02-K917, dated September 17, 2003) included in Appendix H, the USIBWC has the right to enter into properties acquired by USFWS and maintain vegetation pursuant to the provisions in the BO. Upstream of RM 62.50, vegetation maintenance is not currently performed by the USIBWC, and would not regularly be performed under this alternative. However, as a partner in the Rio Grande Wetland Reserve Program Partnership (WRP) through MOU (Contract No. IBM 96-53) with National Fish and Wildlife Foundation, the USIBWC has a right to enter into properties acquired by USFWS under the WRP and maintain vegetation consistent with the BO. Vegetation maintenance provisions of the BO include maintenance within a 75-foot strip along the low banks of the Rio Grande with a 33-foot mature/climax vegetated travel corridor immediately landward of the 75-foot strip. The MOUs are included in Appendix H of this FEIS.

After preliminary environmental analysis of the various alternatives with due consideration of the effects of vegetation on flood stages and impacts for endangered species, the USIBWC has chosen the Continued Maintenance Alternative as the Preferred Alternative. The Continued Maintenance Alternative is a prolongation of the existing vegetation maintenance practices which were formulated in 1993 as a result of Section 7 consultation with USFWS, as expressed in the 1993 BO and the 2003 BO.

Mowing is usually performed between June and August of each year, corresponding to the heavy growth period during the June through October Rio Grande flood period. Under the 2003 BO, USIBWC will attempt to avoid maintenance activities during the migratory bird peak breeding season (March through August). If this not possible, USIBWC will perform migratory bird surveys prior to mowing activities. A 25-50 foot buffer area will surround any active nests located during these surveys. Generally, vegetation is mowed to ground level, in a 75-foot strip starting at the low water's edge, although some exceptions to this apply in small specific areas. Mowing is discontinuous, with most mowing occurring on river bends, on level or low-lying ground. Hand trimming of vegetation on vertical banks is required approximately every five years.

The intent of the current vegetation maintenance practices is to leave a continuous 33-foot (10 meters) strip of mature/climax native vegetation and occasionally, segments of less than mature/climax vegetation. This strip is referred to as a wildlife travel corridor and may be adjacent to the river at the high water level, 75 ft from the water's edge at the low water level, or near the riverside of the project levee, depending on USIBWC right-of-way and agreements. This corridor is not directly adjacent to the pilot channel of the Rio Grande, and is part of the larger LRGV NWR discussed in Section 2.2. The corridor is not confined to USFWS fee-owned property. Contiguous corridors are established through vegetation management agreements negotiated with landowners and easement holders.

The USFWS BO divided the reach along the Rio Grande between RM 28.00 and RM 62.50 into eight segments, and proposed specific maintenance practices and conservation measures for each segment. These are as follows and constitute the current maintenance practices from RM 28.00 to RM 62.50:

Segment A – Lower End, RM 28.00 to RM 40.00

1. Segment A includes approximately 12 river miles, from the lower end of the LRGFCP to the downstream end of the National Audubon's Sabal Palm Sanctuary.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.
4. USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor adjacent to the Rio Grande or mowed areas.

Segment B – Audubon and Vaughan Properties, RM 40.00 to RM 42.40

1. Segment B includes approximately 2.4 river miles, from the downstream end of the National Audubon's Sabal Palm Sanctuary to the downstream end of the USFWS's Boscaje de la Palma Tract.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.
4. USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor adjacent to the Rio Grande or mowed areas.

Segment C – USFWS Property, RM 42.40 to RM 43.50

1. Segment C includes approximately 1.1 river miles, from the downstream to the upstream end of the USFWS's Boscaje de la Palma Tract.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks. To this end, obtain approval from the Refuge Manager at the Lower Rio Grande Valley National Wildlife Refuge.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.
4. In consultation with the USFWS, consider breaching or removing non-LRGFCP levees or other similar structures within the LRGFCP levees.
5. USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor adjacent to the Rio Grande or mowed areas.

Segment D – Canasta Banco Area, RM 43.50 to RM 45.00

1. Segment D includes approximately 1.5 river miles, from the upstream end of the USFWS's Boscaje de la Palma Tract to the downstream end of the Los Tomates Restricted Use Zone (RUZ) established by the United States and Mexico in IBWC Minute No. 285.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.
4. USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor adjacent to the Rio Grande or mowed areas.

Segment E – Los Tomates RUZ, RM 45.00 to RM 54.00

1. Segment E includes approximately 9.0 river miles, from the downstream end of the Los Tomates RUZ to the upstream end of the Fort Brown Golf Course levee.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.
4. USIBWC reserves the right to annually mow vegetation in the area adjacent to the Fort Brown Golf Course levee from the water's edge at the low bank to the high bank, ranging from 75 ft to 200 ft.

5. From RM 45.00 to RM 50.60, USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor. This vegetated wildlife corridor will connect the 33-foot wide mature/climax vegetated wildlife corridor from Segment D to the 33-foot wide vegetated wildlife corridor described in bullet E.6.b below.

6. From RM 50.60 to RM 52.60, USIBWC will implement the mitigation plan set forth in the Cameron County, Texas Supplemental Environmental Assessment, Los Tomates/Matamoros Bridge III, Brownsville, Texas prepared by Traffic Engineers, Inc., August 1992, revised June 4, 1993, which provides for the following:

    a. A 200-foot right-of-way will be established north of and contiguous to the United States boundary of the Los Tomates RUZ defined in IBWC Minute No. 285. The existing LRGFCP levee, which is located farther north of the Los Tomates RUZ, will be transferred to Cameron County and/or the City of Brownsville, and a new LRGFCP levee will be constructed closer to the river within the new right-of-way.

    b. Within the new 200-foot right-of-way, USIBWC will ensure the establishment of a 33-foot wide mature/climax vegetated wildlife corridor, a 15-foot wide strip to be mowed by USIBWC for levee maintenance, and a 152-foot wide zone for levee construction. The wildlife corridor will be located along the southern edge of the new right-of-way, and the new levee will be constructed along the northern edge.

    c. Within the Los Tomates RUZ on the northern portion of the United States floodplain, USFWS will establish an area of mature/climax vegetation that will be no more wide than one-third the width of the Los Tomates RUZ floodplain. The remaining southern two-thirds of the floodplain may be selectively mowed by USIBWC during the period between June through August so that vegetation is maintained at heights no lower than three feet above ground surface.

    d. Cameron County will construct a new international bridge over the Rio Grande, and maintain an access road under the new bridge for surveillance by public safety agencies and for levee maintenance by USIBWC (The new bridge over the Rio Grande has since been constructed: the Los Tomates / Matamoros III International Bridge).

    e. Cameron County, the City of Brownsville, or the United States Government will remove non-LRGFCP levees within the Los Tomates RUZ.

7. From RM 52.60 to RM 54.00, USIBWC with technical assistance from USFWS will provide for planting a series of mature/climax vegetated wildlife corridors throughout the Fort Brown Golf Course (the Fort Brown Golf Course levee was removed as a part of the construction of the Los Tomates / Matamoros III International Bridge).

Segment F – Gateway and B&M Bridges, RM 54.00 to RM 55.20

1. Segment F includes approximately 1.2 river miles, from the upstream end of the Fort Brown Golf Course levee to the B&M Bridge.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC, with technical guidance from USFWS, will ensure the establishment of a minimum 33-foot wide limited vegetated wildlife corridor adjacent to the 75-foot mowed strip. The limited vegetated wildlife corridor may be selectively mowed by USIBWC during the period between June through August so that vegetation is maintained at heights no lower than three feet above ground surface.

Segment G – Amigoland Area, RM 55.20 to RM 58.70

1. Segment G includes approximately 3.5 river miles, from the B&M Bridge to the upstream end of the Amigoland levee.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC, with technical guidance from USFWS, will ensure the establishment of a minimum 33-foot wide limited vegetated wildlife corridor adjacent to the 75-foot mowed strip. The limited vegetated wildlife corridor may be selectively mowed by USIBWC during the period between June through August so that vegetation is maintained at heights no lower than three feet above ground surface.
4. USIBWC will ensure, in perpetuity, a minimum 33-foot wide mature/climax vegetated wildlife corridor with upstream and downstream connections from the limited vegetated wildlife corridor near the river to the "Matamoros Banco No. 121."
5. USIBWC will ensure, in perpetuity, a minimum 33-foot wide mature/climax vegetated wildlife corridor from the upstream end of the "Matamoros Banco No. 121" to the riverside toe of the LRGFCP levee.

Segment H – Upper End, RM 58.70 to RM 62.50

1. Segment H includes approximately 3.8 river miles, from the upstream end of Amigoland levee to the upper end of the 34.5-mile reach, including the USFWS Champion Bend Tract.
2. USIBWC reserves the right to annually mow vegetation in a 75-foot wide strip from the water's edge at the low banks.
3. USIBWC will limit any vegetation clearing along the high bank to trimming the vertical bank vegetation no more often than every five years by hand, cutting the branches overhanging the river that may capture flood debris.

4. USIBWC will ensure, in perpetuity, both the safe passage of the design flood flow and the establishment of a minimum 33-foot wide mature/climax vegetated wildlife corridor adjacent to the Rio Grande or mowed areas.

The 1993 USFWS BO required the preparation of a "Lower Rio Grande Flood Control Project Off-River Wildlife Travel Corridor Plan" by the USIBWC (Appendix D). This plan was submitted on April 13, 1994, to the USFWS. Budget and real estate problems have delayed full implementation of the plan, but USIBWC is working to implement the plan. The reinitiated 2003 BO has stipulations to ensure the required environmental commitments are implemented. Under the 2003 BO, USIBWC will provide regular progress reports and a coordination workgroup comprised of local, state, and federal agencies will be formed to operate toward the implementation of a wildlife travel corridor.

Based on hydraulic studies, IBWC concluded that additional mature vegetation within the interior floodways would not be prudent. Additional vegetative growth could disrupt the flood flow design within the interior floodway system. Hence, the "Lower Rio Grande Flood Control Project Off-River Wildlife Travel Corridor Plan" proposed a travel corridor immediately outside the interior floodway. No alternatives will be considered in this FEIS for the Off-River Floodway System because the current maintenance practices will not be changed.

In summary, the Continued Maintenance Alternative represents the LRGFCP approximately 20 years in the future with: (1) the continuation of the current vegetation maintenance practices from RM 28.00 to RM 62.50; (2) no vegetation maintenance from RM 62.50 to 186.00; and (3) a 20 percent expansion in the aerial extent of the LRGV NWR system, and mature/climax vegetation in the NWR land areas. Figure 2-12 shows the location of the current vegetation maintenance areas along the lower Rio Grande. Table 2-2 compares the current maintenance area measurements with each alternative.

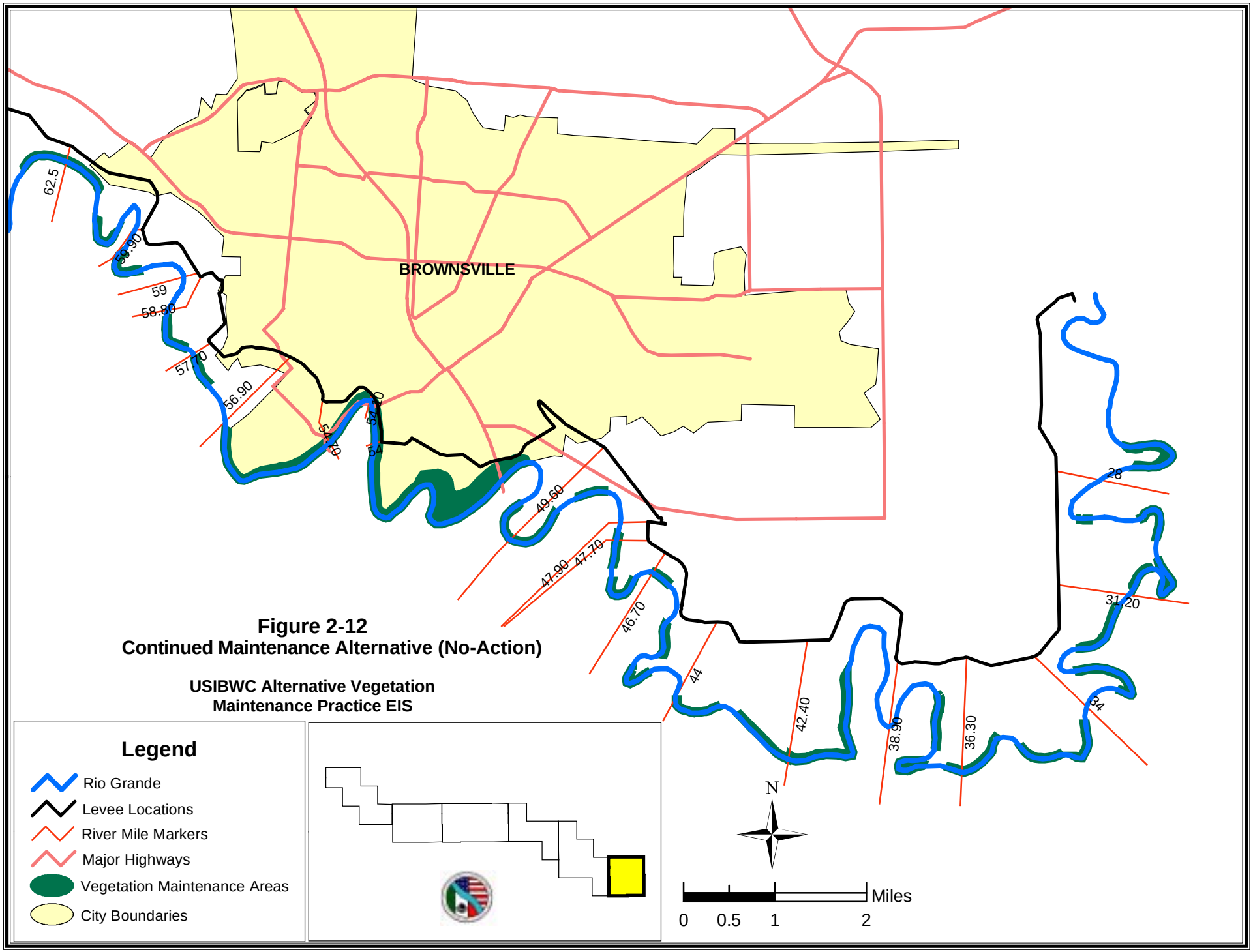


Figure 2-12
Continued Maintenance Alternative (No-Action)

USIBWC Alternative Vegetation Maintenance Practice EIS

2.4.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative involves the suspension of all vegetation maintenance activities from RM 28.00 to RM 186.00, and includes the 20 percent expansion in the LRGV NWR from the Prior Maintenance Alternative. This alternative represents the LRGV approximately 20 years in the future without bank vegetation maintenance of the Rio Grande in the project area.

2.4.4 Expanded Maintenance Alternative

The Expanded Maintenance Alternative considers an expansion of the current vegetation maintenance practices into additional areas upstream of the segment addressed by the USFWS BO. Locations suitable for the expansion of vegetation maintenance were identified based on previous HEC-2 modeling of the project area and flood management experience along the river. These locations were selected for their potential to maximize flood protection. Under this alternative, bank maintenance would be performed at selected locations upstream to RM 186.00. The locations for the potential expansion of vegetation maintenance were identified by the USIBWC using only flood control and conveyance criteria. Therefore, this alternative includes all of the features of the Continued Maintenance Alternative with the addition of vegetation maintenance areas from RM 62.50 to RM 186.00 selected to improve flood flow conveyance. Figures 2-13 through 2-18 show the location of the vegetation maintenance areas that would be maintained for this alternative. Table 2-2 compares the vegetation maintenance area measurements of each proposed alternative.

Table 2-2 Vegetation Maintenance Area Measurements for Each Alternative

Measurement	Prior Maintenance Alternative	Continued Maintenance Alternative	Expanded Maintenance Alternative
Length (miles)	43.3	14.3	78.4
Width (feet)	164	75	75
Total Acreage	1,022*	291*	874*

*Total acreage includes the estimated 161 acres maintained in the Los Tomates RUZ

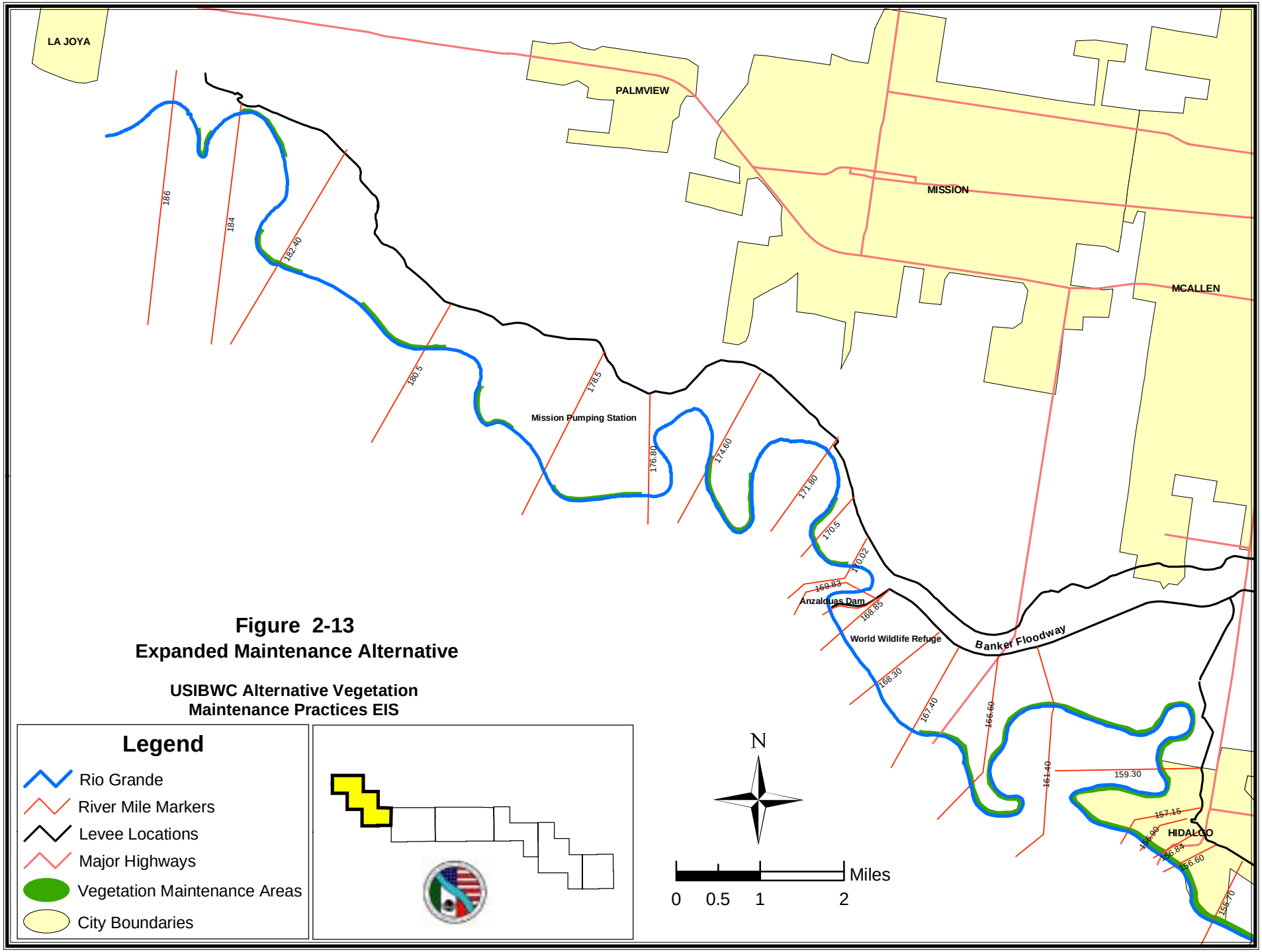


Figure 2-13
Expanded Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS

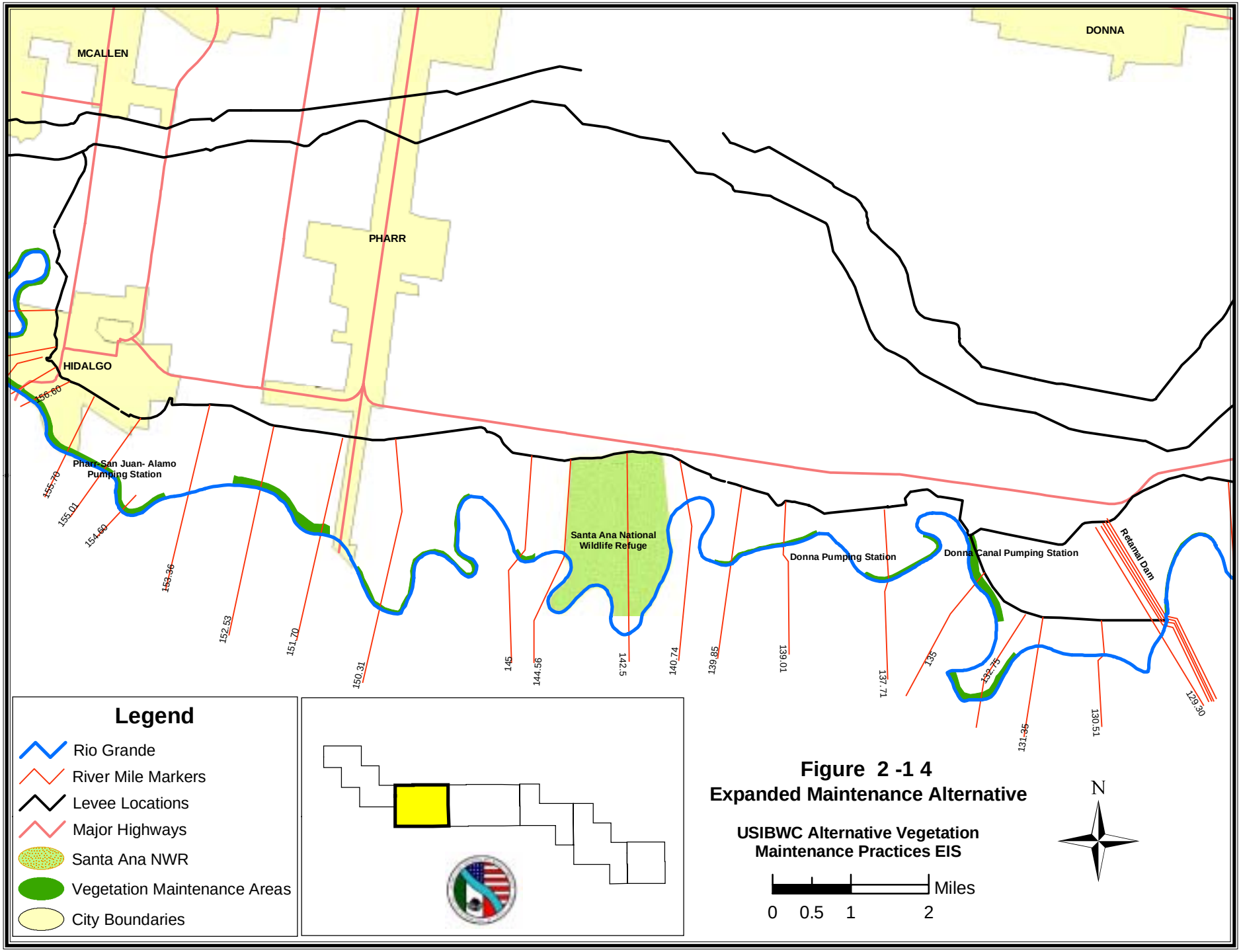
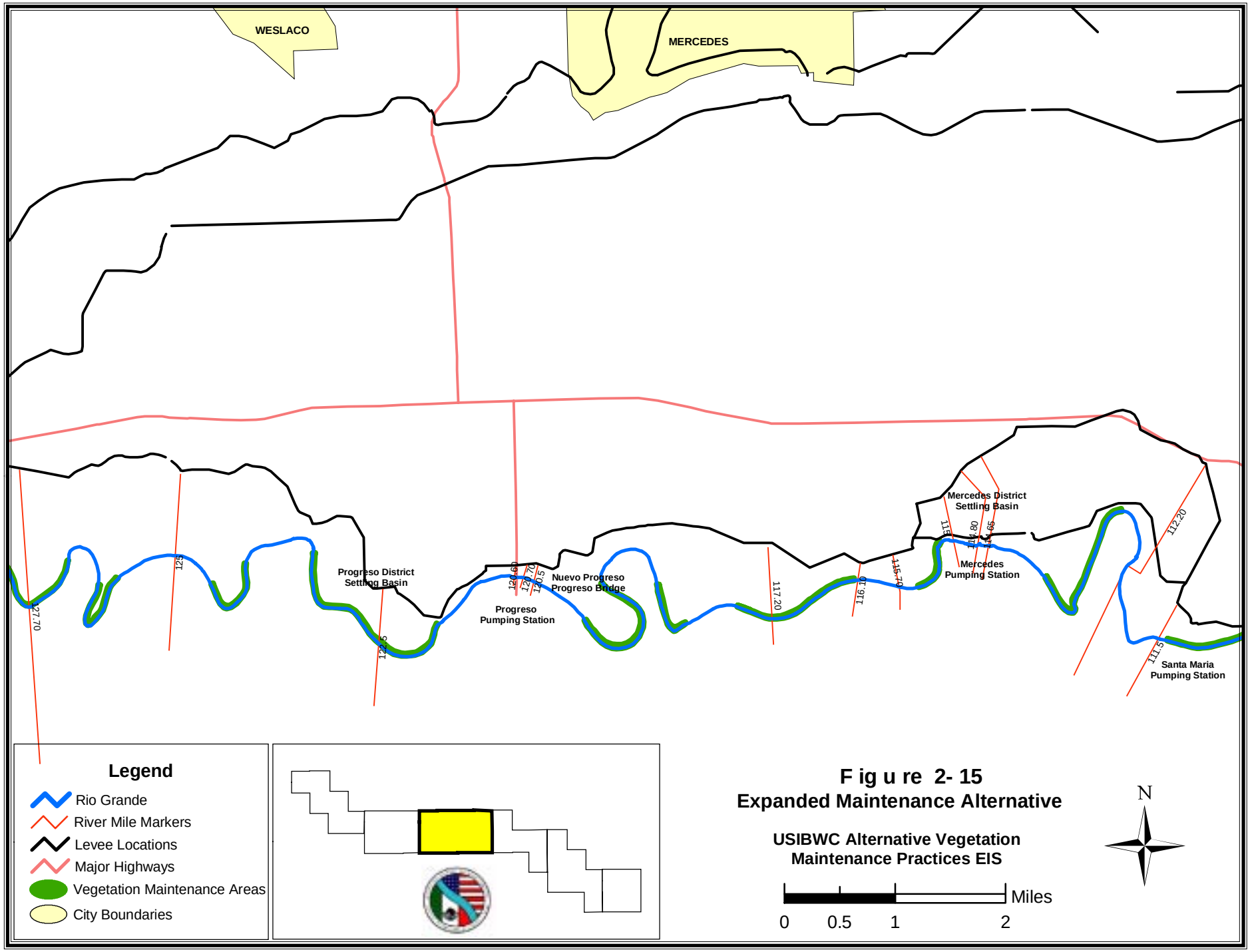
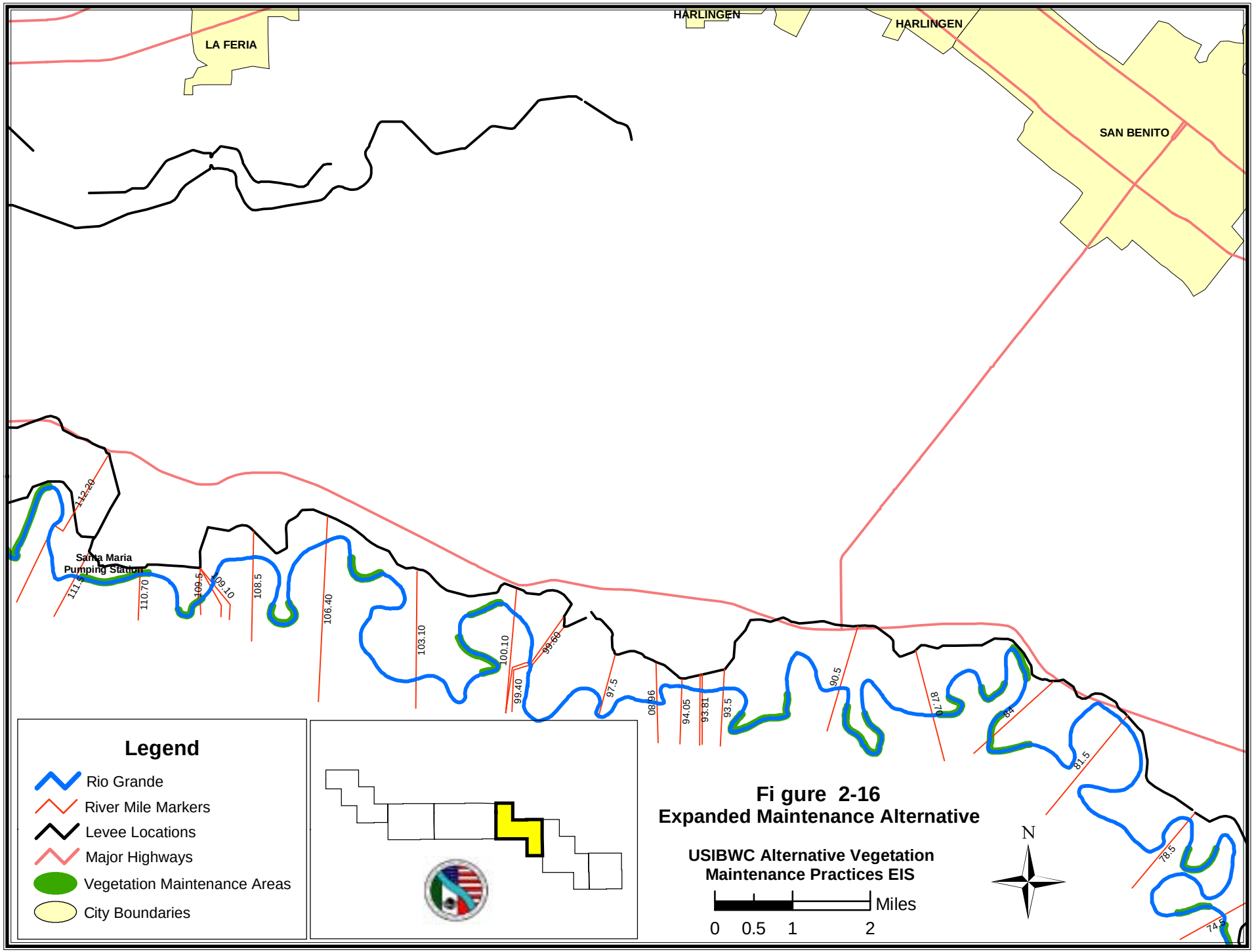


Figure 2 -1 4
Expanded Maintenance Alternative

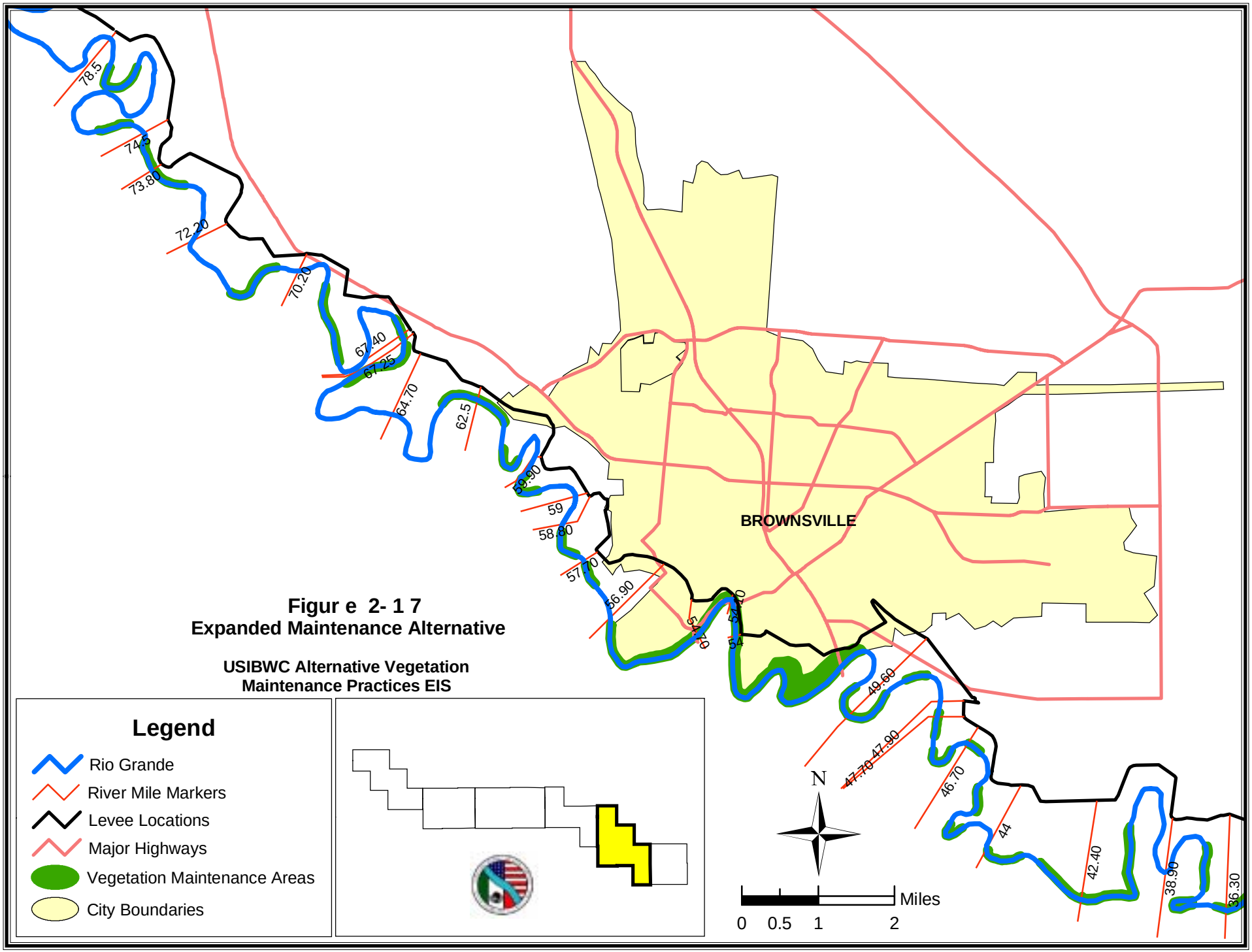
USIBWC Alternative Vegetation Maintenance Practices EIS


WESLACO
MERCEDES
Progreso District Settling Basin
Progreso Pumping Station
Nuevo Progreso Progreso Bridge
Mercedes District Settling Basin
Mercedes Pumping Station
Santa Maria Pumping Station
127.70
125
122.5
124.60
123.70
123.05
117.20
116.10
115.70
114.80
114.65
112.20
111.5
Legend
Rio Grande
River Mile Markers
Levee Locations
Major Highways
Vegetation Maintenance Areas
City Boundaries
F ig u re 2- 15
Expanded Maintenance Alternative
USIBWC Alternative Vegetation Maintenance Practices EIS
Miles
0
0.5
1
2
N



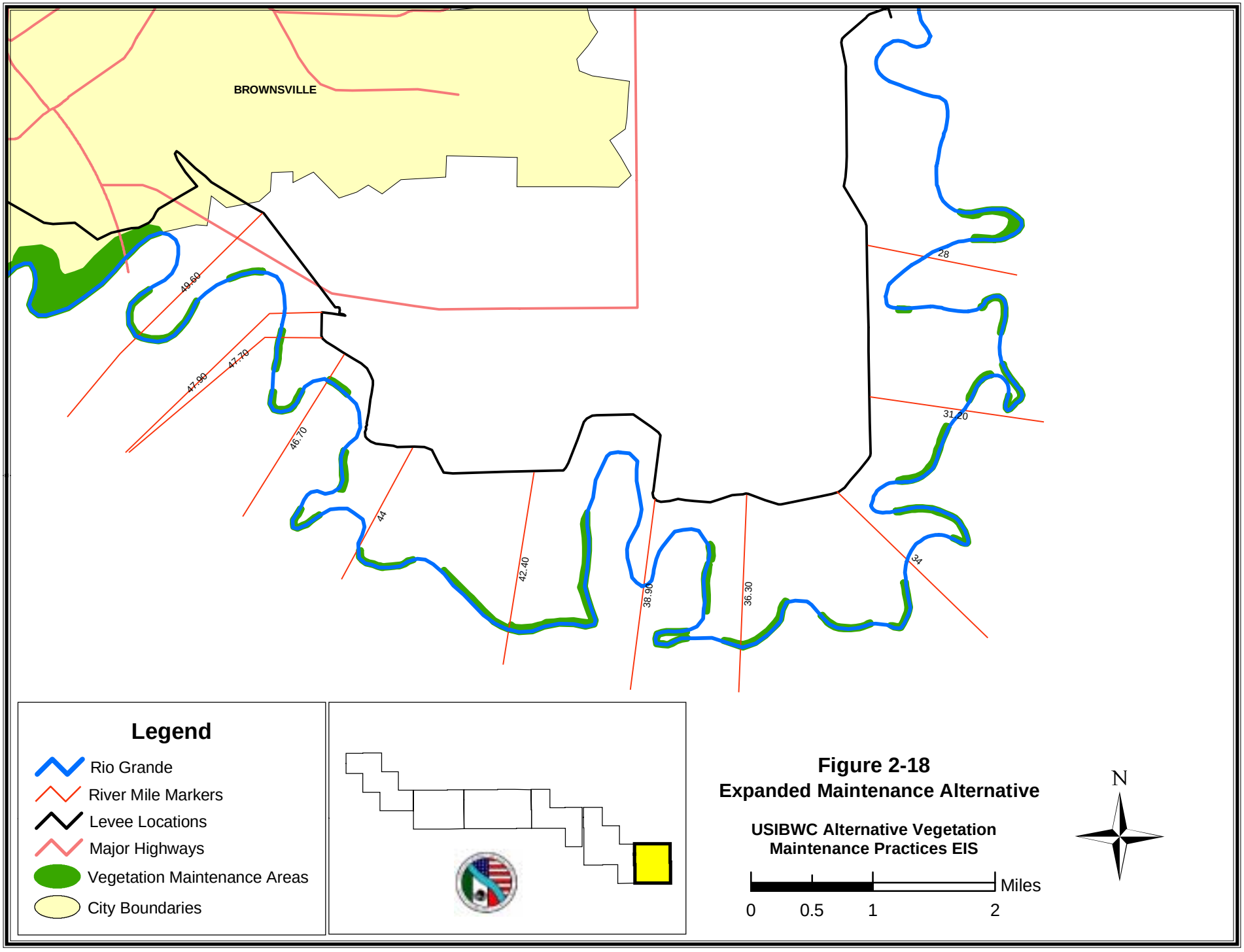
Fi gure 2-16
Expanded Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS



Figur e 2- 1 7
Expanded Maintenance Alternative

USIBWC Alternative Vegetation Maintenance Practices EIS


BROWNSVILLE
49.60
47.90
47.70
46.70
44
42.40
38.90
36.30
34
31.20
28
Legend
Rio Grande
River Mile Markers
Levee Locations
Major Highways
Vegetation Maintenance Areas
City Boundaries
Figure 2-18
Expanded Maintenance Alternative
USIBWC Alternative Vegetation
Maintenance Practices EIS
0
0.5
1
2
Miles
N

2.5 IDENTIFICATION OF ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS

The following alternatives were identified during the scoping process and the development of the EIS, but were not carried forward into this FEIS for reasons provided in the discussion for each alternative below.

2.5.1 Raised Levees Alternative

This alternative would involve the modification of the current project levee system by raising levees and bridges or relocating levees as necessary to contain design flood flows. As noted in Section 2.3, hydraulic modeling indicates that "overtopping" of the levees would occur in the upper reaches of the LRGFCP for all of the selected alternatives, and constitutes a background condition that exists regardless of the vegetation maintenance practices considered in this FEIS.

The purpose of this FEIS is to consider alternative vegetation maintenance practices as required by the Consent Decree of July 31, 1990. Raising the levees would be a structural change in the LRGFCP, not a vegetation maintenance practice. Raising the levees could be considered mitigation for these effects. However, "overtopping" occurs regardless of vegetation maintenance practices, and is not caused by the practices. The considered alternatives only affect the degree to which the levees would be "overtopped," but are not the proximate cause of levee "overtopping."

Furthermore, raising the levees would require changes to both the United States and Mexican levee systems. This FEIS does not consider implementation of any alternatives on the Mexican side of the Rio Grande. Therefore, this alternative was eliminated from further consideration.

2.5.2 Remove Farm Levees Alternative

This alternative would involve the removal of farm levees within the floodplain of the LRGFCP to increase the flow carrying capacity of the lower Rio Grande. Some of the land within the flood plain is used for agriculture, and the levees provide protection from minor floods. The presence of these small levees reduces the ability of the LRGFCP to accommodate the design flood flow.

As with the Raised Levees Alternative, this alternative is a structural change in the LRGFCP, not an alternative vegetation maintenance practice. Therefore, this structural alternative was eliminated from further consideration.

2.5.3 Dredge and/or Channelize the Rio Grande Alternative

This alternative would involve the dredging and/or channelizing of portions of the lower Rio Grande to accommodate the design flood flow. As with the previous two eliminated alternatives, this is a structural change to the LRGFCP, not an alternative vegetation maintenance practice.

Furthermore, dredging and/or channelizing would involve both the United States and Mexican portions of the channel. This FEIS does not consider implementation of any

alternatives on the Mexican side of the Rio Grande. Therefore, this alternative was eliminated from further consideration.

2.5.4 Reduce Design Flood Flow Alternative

This alternative would lower the current design flood flow to a point where the levee system would contain flood flows without "overtopping" as indicated by hydraulic modeling. This would require the diversion of additional floodwaters into the interior floodways and/or an international agreement to use a different flood flow for design purposes.

The LRGFCP is an international project, and the USIBWC would be unable to consider this action unilaterally. Implementation of this alternative would require consultation with the Government of Mexico, through the MxIBWC. Both countries have consistently followed the agreement adopted in IBWC Minute No. 238 that established the design flood flow for the project. This action could also require agreement with affected counties and landowners to divert the floodwaters into the interior floodways at a greater frequency. Furthermore, this alternative is not a vegetation maintenance practice. Therefore, this alternative was eliminated from further consideration.

2.5.5 Alternative Vegetation Maintenance in the Off-River Floodway System

USIBWC did consider other alternatives that would allow for a wildlife corridor along the LRGFCP Off-River Floodway System levee containment area during the development of the MOU with the USFWS (Appendix H) and the Off-River Wildlife Travel Corridor Plan (Appendix D). USIBWC considered widening the pilot channel to compensate for the loss of floodway capacity resulting from a 33-foot wide mature vegetation corridor adjacent to the pilot channel. The raising of the LRGFCP Off-River Floodway System levees was also considered to offset the loss of floodway capacity. However, these alternatives were not economically feasible. The costs for these undertakings, including costs of land acquisition, and costs related to construction and handling of materials were considered to be greater than accepted cost/benefit ratios. Also, authority by the United States Congress may have been required. These alternatives were not considered feasible in comparison to the proposed alternative of encouraging vegetative growth on the outside of the LRGFCP Off-River Floodway System. The MOU plan could create a wildlife travel corridor at lower costs without causing significant impacts on flood control (IBWC, 1994a). No changes to the existing maintenance practices are proposed in the off-river floodways, and therefore this component of the LRGFCP is not considered further in this FEIS.

2.6 OTHER REASONABLY FORESEEABLE CUMULATIVE ACTIONS

For this FEIS, cumulative foreseeable actions should have cumulative environmental impacts with the alternatives considered. The USIBWC reviewed a number of reasonably foreseeable actions and determined that there would be cumulative effects from five different projects:

- Operation Rio Grande by the Immigration and Naturalization Service (INS).
- Brownsville Weir and Reservoir Project (BWR Project).
- A new bridge near Anzalduas Dam.
- A new bridge at Donna.
- A replacement bridge at Progreso.

Operation Rio Grande is currently undergoing the NEPA process and a FEIS was released in February 2003 (INS, 2003). Brownsville Public Utilities Board (BPUB) has submitted an EA to Texas Commission on Environmental Quality (TCEQ), formerly known as Texas Natural Resource Conservation Commission (TNRCC), describing proposed plans for the BWR Project. International bridges (Donna and Anzalduas Dam) were considered in a programmatic EIS by the United States Department of State (USDOS, 1998). NEPA documentation for the replacement bridge at Progreso has not been completed, but the effects are assumed similar to those for the Donna and Anzalduas Dam. Private development associated with the growth in population in the LRGV is also a foreseeable future action. However, the cumulative effects would be limited to socioeconomic resources since no development would occur within the LRGFCP levees where the direct impacts from vegetation maintenance occur.

2.7 COMPARISON OF ENVIRONMENTAL EFFECTS OF ALTERNATIVES

Table 2-3 summarizes the environmental consequences of each alternative for each resource area. This table compares the potential impacts of all four alternatives. The environmental consequences do not require mitigation.

Table 2-3 Comparison of Environmental Effects of Alternatives

Resource Category	Prior Maintenance Alternative	Continued Maintenance Alternative	Suspend Maintenance Alternative	Expanded Maintenance Alternative
Biological Resources	Environmental effects would be greatest for thorn scrub communities. Potential shifts in wildlife guilds could result from a change in habitat. Approximately 27 acres of potential ocelot and jaguarundi (cat) habitat could be lost under this alternative. Additional consultation with USFWS would be required if this habitat could not be avoided. A wildlife travel corridor would not be established.	No loss of cat habitat is expected. No additional USFWS consultation would be required under this alternative. The current maintenance practices are addressed in the BO (Appendix C). A wildlife travel corridor, covering approximately 57 acres would be maintained under this alternative. USIBWC has chosen this alternative as the Preferred Alternative.	Wildlife habitat would increase and near-shore aquatic ecosystems would improve if vegetation maintenance were terminated. Approximately 12 acres of potential cat habitat could be gained under this alternative. With the re-growth of vegetation, the maintenance of a wildlife travel corridor would not be necessary under this alternative.	Environmental effects would be greatest for grassland and thorn scrub communities. Potential shifts in wildlife guilds could result from a change in habitat. Approximately 42 acres of potential cat habitat could be lost. Additional consultation with USFWS would be required if this habitat could not be avoided. A wildlife corridor, covering approximately 314 acres would be established under this alternative.
Socioeconomic Resources	There would be minimal net socioeconomic effects.	There would be no minimal net socioeconomic effects.	The termination of vegetation maintenance would not result in any substantial loss of revenues or job loss.	There would be minimal net socioeconomic effects.
Environmental Justice	The magnitude of flooding events would be reduced under this alternative. Minority and low-income populations would not be affected.	Low-income and minority populations would not be affected.	The magnitude of flooding events would increase under this alternative. Low-income and minority populations could potentially be affected.	The magnitude of flooding events would be reduced under this alternative. Minority and low-income populations would not be affected.
Land Use	The narrow width of maintenance along the banks of the Rio Grande would not affect land use.	Current maintenance practices would not cause changes for land use.	Termination of vegetation maintenance would not affect land use.	The narrow width of maintenance along the banks of the Rio Grande would not affect land use.

Resource Category	Prior Maintenance Alternative	Continued Maintenance Alternative	Suspend Maintenance Alternative	Expanded Maintenance Alternative
Water Resources	The magnitude of flooding events would be reduced under this alternative. Erosion events are not expected; therefore water resources would not be affected.	Continuation of current practices would not affect the magnitude of flooding events or water quality.	The magnitude of flooding events would increase under this alternative. Termination of maintenance would positively affect water quality with re-growth of vegetation.	The magnitude of flooding events would be reduced under this alternative. Erosion events are not expected as a result of isolated grubbing; therefore water resources would not be affected.
Cultural Resources	Vegetation would be maintained aboveground; therefore cultural resources would not be affected.	Current maintenance practices do not affect cultural resources.	Cultural resources would not be affected if vegetation maintenance were terminated.	Vegetation would be maintained aboveground with isolated grubbing to a depth not exceeding 2 meters; therefore cultural resources would not be affected.
Soils and Geology	Soils and geology would not be affected. Erosion events are not expected.	Soils and geology are not affected by the current maintenance practices.	Soils and geology would not be affected.	Erosion events are not expected as a result of isolated grubbing. Soils and geology would not be affected.
Hazardous Materials	Applicable standards would be followed. No environmental effects expected.	Applicable standards would be followed. No environmental effects expected.	No environmental effects expected.	Applicable standards would be followed. No environmental effects expected.
Air Quality	Criteria pollutant emissions would be < 0.002 percent of Cameron and Hidalgo counties emission inventory.	Criteria pollutant emissions would be < 0.001 percent of Cameron and Hidalgo counties emission inventory.	No pollutants would be emitted as a result of this alternative.	Criteria pollutant emissions would be < 0.002 percent of Cameron and Hidalgo counties emission inventory.
Noise	Noise from maintenance operation is consistent with current agricultural practices in the area. Since vegetation maintenance would occur during daytime hours, critical nocturnal activities of jaguarundi and ocelots would not be affected.	This alternative would not cause any changes in noise levels from the current maintenance practices.	The termination of vegetation maintenance would not cause any noise affects.	Noise from maintenance operation is consistent with current agricultural practices in the area. Since vegetation maintenance would occur during daytime hours, critical nocturnal activities of jaguarundi and ocelots would not be affected.

Chapter 3

Affected Environment

CHAPTER 3

AFFECTED ENVIRONMENT

This chapter describes the existing human environmental conditions in the project area that would potentially be affected by the alternatives considered. As stated in 40 CFR 1508.14, the human environment potentially affected is interpreted comprehensively to include the natural and physical resources and the relationship of people with those resources. This information provides a baseline against which each alternative is compared for environmental change and/or impact. From this information, the relevant resources were identified and are described below.

Nine resources were chosen to examine potential impacts of alternative vegetation maintenance practices. These sites include: biological resources, socioeconomic resources and environmental justice, land use, water resources, cultural resources, geology, hazardous materials, air quality and noise.

3.1 BIOLOGICAL RESOURCES

Information presented in this section was obtained from past reports and studies conducted in and near the project area and floral and faunal information obtained during field surveys. General biological resources information was obtained from various state and federal agencies including, but not limited to, the Texas Parks and Wildlife Department (TPWD), United States Fish and Wildlife Service (USFWS), Natural Resource Conservation Service (NRCS), and United States Army Corps of Engineers (USACE).

Aerial photography and soil surveys were evaluated to determine existing vegetation communities within the project area. Particular emphasis was placed upon current maintenance areas and specific tracts identified by the USIBWC as potential areas for expanded maintenance activities. These areas were visited during several field trips to confirm the habitat type, to document the presence of threatened or endangered species and their habitat, and to collect field data used in Habitat Evaluation Procedure (HEP) analysis. This section is further subdivided into discussions regarding biotic provinces, vegetation communities, terrestrial wildlife, aquatic communities, threatened or endangered species, and unique or environmentally sensitive areas.

3.1.1 Biotic Province/Natural Region

Very few places exhibit as much diversity in biological resources as the LRGV of Texas. This diversity is a result of the subtropical climate, which supports species that are at their northern-most range. Thus, within the United States, many of these species

are only found within the LRGV. Remnant populations of unique plants and animals exist in native brush communities that are surrounded by extensive agriculture and urban areas. In order to describe broad natural regions and to serve as a common reference point for characterizing Texas, a classification system was created during a scientific conference in 1978 at Winedale, Texas. The Winedale conference determined that there are 11 Natural Regions of Texas based on unique physiographic or biological differences. These biologic and physiographic differences are the result of interactions between geology, soils, plants, animals, and climate. The natural regions classification system was developed in order to assist in the preservation of natural diversity and locate areas with scenic, unusual, significant, and unique resources. These resources include rare or endangered species, geologic formations, and ecosystems. The Natural Regions of Texas were derived in conjunction with the widely known Biotic Provinces of Texas.

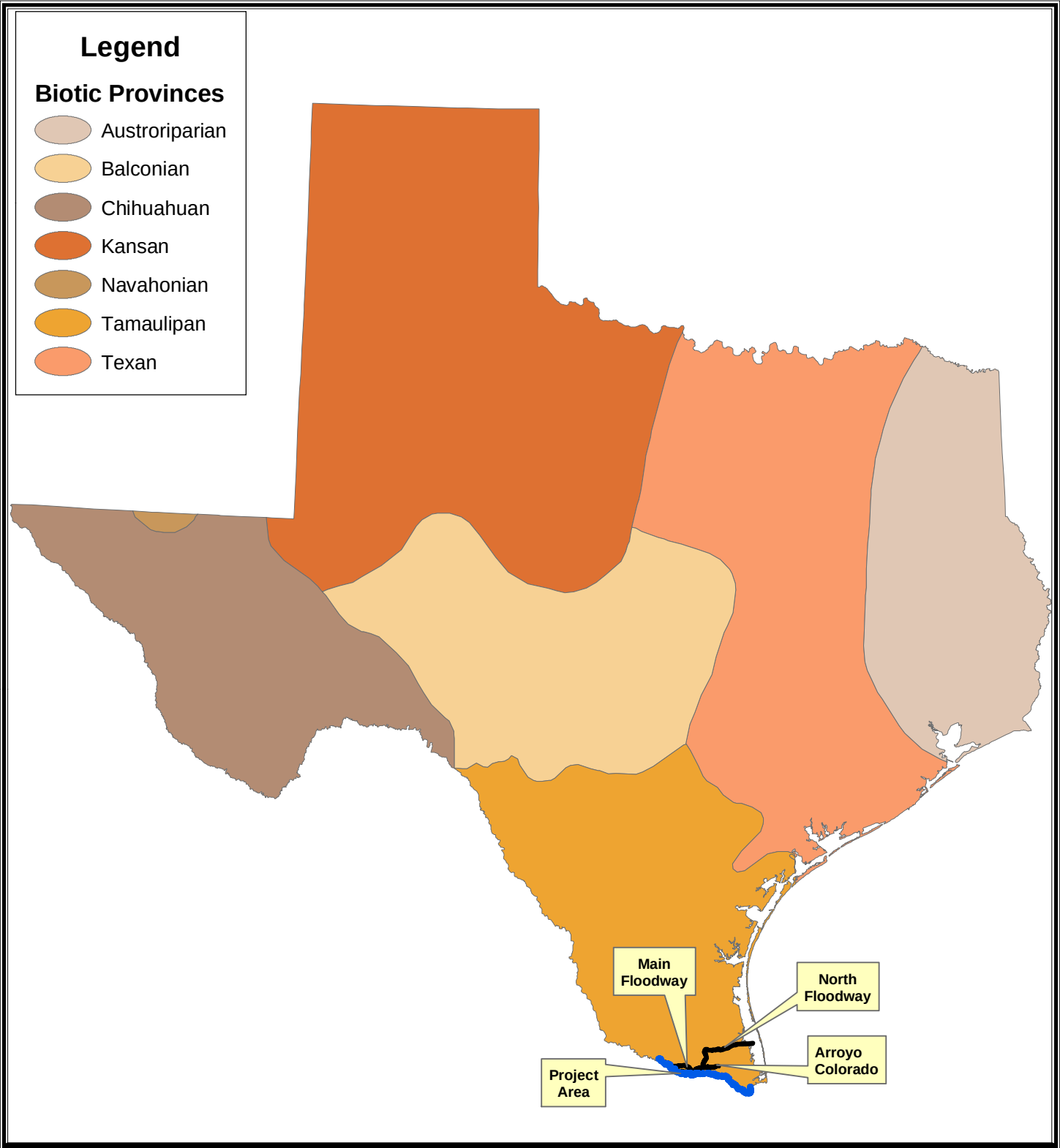
As shown in Figure 3-1, the project area is situated within the Matamoran District of the Tamaulipan Biotic Province (Blair, 1952). The Matamoran District is characterized by semi-arid thorny brush communities on silt loam or silt clay loam soils. As Figure 3-2 illustrates, the project area is located in the South Texas Brush Country Natural Region of the Matamoran District. The South Texas Brush Country is an area of approximately 28,000 square miles of level to rolling terrain. The elevation ranges from sea level to 1,000 feet (ft) above sea level and receives between 16 and 35 inches of annual rainfall. The shallow soil depth, rapid drainage, and clay loam soils support thorny brush which is the predominant vegetation in this region (TPWD, 1999a).

The LRGV contains a wide diversity of habitats that result in an enormous diversity of flora and fauna. Many of these flora and fauna are threatened and endangered species, which are discussed in Section 3.1.5. The diversity present is a result of the subtropical climate, which supports species only found in the LRGV.

3.1.2 Vegetation Communities

The South Texas Brush Country incorporates a combination of subtropical species, desert species, grassland species, and a coastal influence to produce very unique habitats. The South Texas Brush Country is composed of three separate ecological regions: the Subtropical Zone, Brush Country, and Bordas Escarpment. The area along the Rio Grande falls within the Subtropical Zone, which is identified by subtropical plant species such as Texas ebony (*Pithecellobium ebano*) and anacua (*Ehretia anacua*).

As a result of the clearing of native brush for agriculture, relatively small remnant plots of native brush remain. The predominant vegetation in the LRGV at this time consists mainly of agricultural crops such as cotton, grain sorghum, corn, sugarcane, citrus, and vegetables. The native brush throughout the project area is confined to small parcels between agricultural fields and narrow strips along the Rio Grande. For example, western portions of the Arroyo Colorado serve as farmland including open fields and grassland with areas adjacent to the arroyo growing in native brush. Larger tracts of native brush can be found in areas such as the Santa Ana National Wildlife Refuge (SANWR), the Bentsen-Rio Grande Valley State Park, and tracts of the Lower Rio Grande Valley National Wildlife Refuge (LRGV NWR). The LRGV NWR and other unique and sensitive areas are discussed in greater detail in Section 3.1.6.

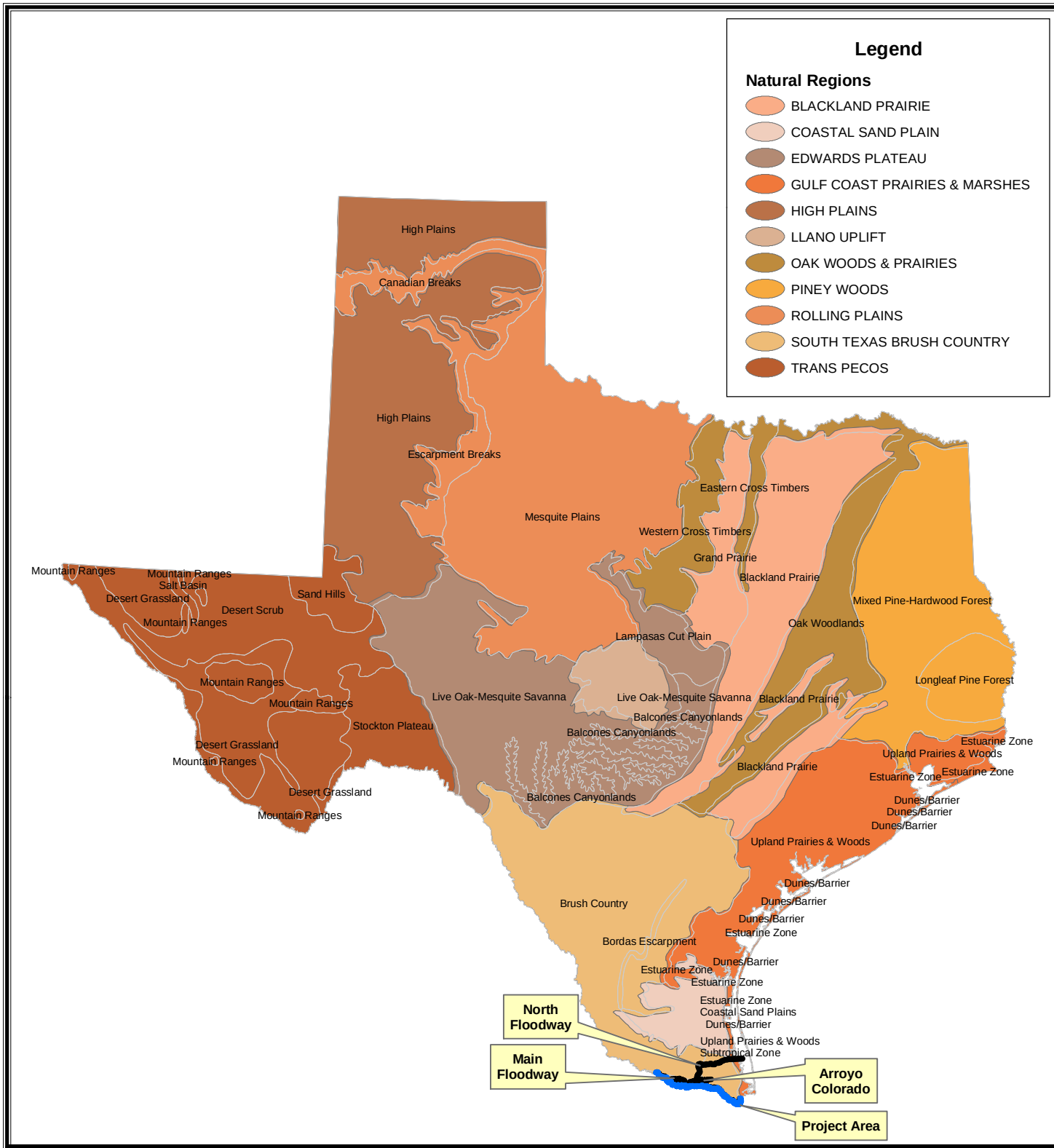


Source: Texas Parks and Wildlife Department, 2001.

Figure 3-1

Biotic Provinces of Texas

USIBWC Alternative Vegetation Maintenance Practices EIS



Source: Texas Parks and Wildlife Department, 2001.

Figure 3-2

Natural Regions of Texas

USIBWC Alternative Vegetation Maintenance Practices EIS

Threats to Vegetation Communities

Numerous changes to the natural communities within the LRGV are continuing as a result of human encroachment. These changes occur as both direct and synergistic effects. As discussed later in Section 3.2.1.1, Hidalgo and Cameron counties are experiencing tremendous population growths that far exceed the state or national growth rates. As the population expands, additional commercial, private and public development is required to support these increases. As more persons populate the project area, more exotic species are brought to the area, some of which have the potential to escape into the wild communities and compete with native species. Flood control and water withdrawal for urban and agricultural needs also continue to affect native vegetation communities by altering the natural hydrologic regime of the area.

In some areas of Cameron County, mixed native grasses, introduced grasses, and forbs can be found on previously disturbed sites. These communities occur on grassland sites or mixed herbaceous communities in areas where the native woody vegetation has been cleared (USDOS, 1998). It has been estimated that more than 99 percent of the riparian vegetation along the United States side of the Rio Grande has been cleared (USFWS, 1997). The controlled flow of the river also encourages the clearing of native vegetation for cropland because these areas can now be used for agriculture, due to the reduced chance of flooding.

In addition to the influence of agriculture, changes in the vegetation composition of the LRGV have been caused by flood and water control projects. Flood and water control projects have been constructed to provide water to areas along the Rio Grande and flood protection for agricultural and urban areas. Extensive water development projects along the Rio Grande have disrupted natural flow and flooding regimes. These changes in flow and control have, in turn, altered the riparian communities and wetlands present along the river. The natural riparian communities that once existed along the river have been partially replaced by drier upland species due to reduced number, duration, and magnitude of flooding events. Regulating flows and flooding events influence the vegetation as the availability of water and the characteristics of the soils change. For example, woody species such as cedar elm (*Ulmus crassifolia*) and Montezuma bald cypress (*Taxodium mucronatum*) are replaced by xeric (extremely dry) species such as mesquite (*Prosopis glandulosa*) when the frequency of flooding declines (Judd, 1985). All of these changes in vegetation have, in turn, affected the availability of habitat for wildlife along the river.

Despite the highly agricultural nature of the LRGV, several types of habitat suitable to wildlife exist in the proposed project area. Several tree and shrub species in the area provide browse and cover for wildlife such as the white-winged dove (*Zenaida asiatica*) and white-tailed deer (*Odocoileus virginianus*). Along the riparian areas, more luxuriant shrub species are found as well as large trees, typically cedar elms, Texas ebony and sugar hackberry (*Celtis laevigata*). Other common trees in the project area include mesquite, Berlandier or Mexican ash (*Fraxinus berlandieriana*), black willow (*Salix nigra*), anacua, and retama (*Parkinsonia aculeate*). Shrubs and small trees commonly found in the project area include huisache (*Acacia smallii*), spiny hackberry (*Celtis*

pallida), Roosevelt weed (*Baccharis neglecta*), pricklypear (*Opuntia lindheimeri*), whitebrush (*Aloysia texana*), blackbrush (*Mimosa biunicifera*), lotebush *(Zizyphus obtusifolia*), cenizo (*Leucophyllum texanum*), anacahuita (*Cordia boissieri*), and mimosa (*Mimosa* spp.).

Lands converted to rangeland are often planted in varieties of bermudagrass (*Cynodon dactylon*) and bluestems (*Andropogon* spp.) because they provide better forage for livestock than other common grasses. Common introduced grasses in the project area include guinea grass (*Panicum maximum*), buffelgrass (*Cenchrus chiliaris*), and common reed (*Phragmites australis*). Various other introduced and native species that are common in the project area include pepper vine (*Ampelopsis arborea*), brasil (*Condalia hookeri*), tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), anacahuita, and mimosa.

Field Reconnaissance

As mentioned previously, aerial photography and field reconnaissance was used to identify the habitat types within the project area. Color infrared aerial photography (scale 1:24,000), flown in 1996, was analyzed first to delineate boundaries of various vegetation communities. Where possible, identification of the community type was included on the map. All areas having similar signatures were classified with the same nomenclature. Site visits were made to select areas to identify the potential presence of protected species and to collect field data for the HEP analysis.

Ten vegetation communities were initially identified within the project area as follows: 1) agricultural land, 2) citrus grove, 3) hackberry/cedar elm forest, 4) riparian zone/willow flat, 5) thorn scrub, 6) grassland, 7) resaca 8) sabal palm forest, 9) open water, and 10) urban/developed land. An additional habitat type, baccharis shrub, was identified during the ground-truthing efforts. The location of these communities are illustrated in Figure 3-3 to 3-8, and described in more detail in the following paragraphs. Table 3-1 summarizes the community type by acreage, within the 43,210 acres of the project area, which includes the area within the levees between RM 28.00 and RM 186.00.

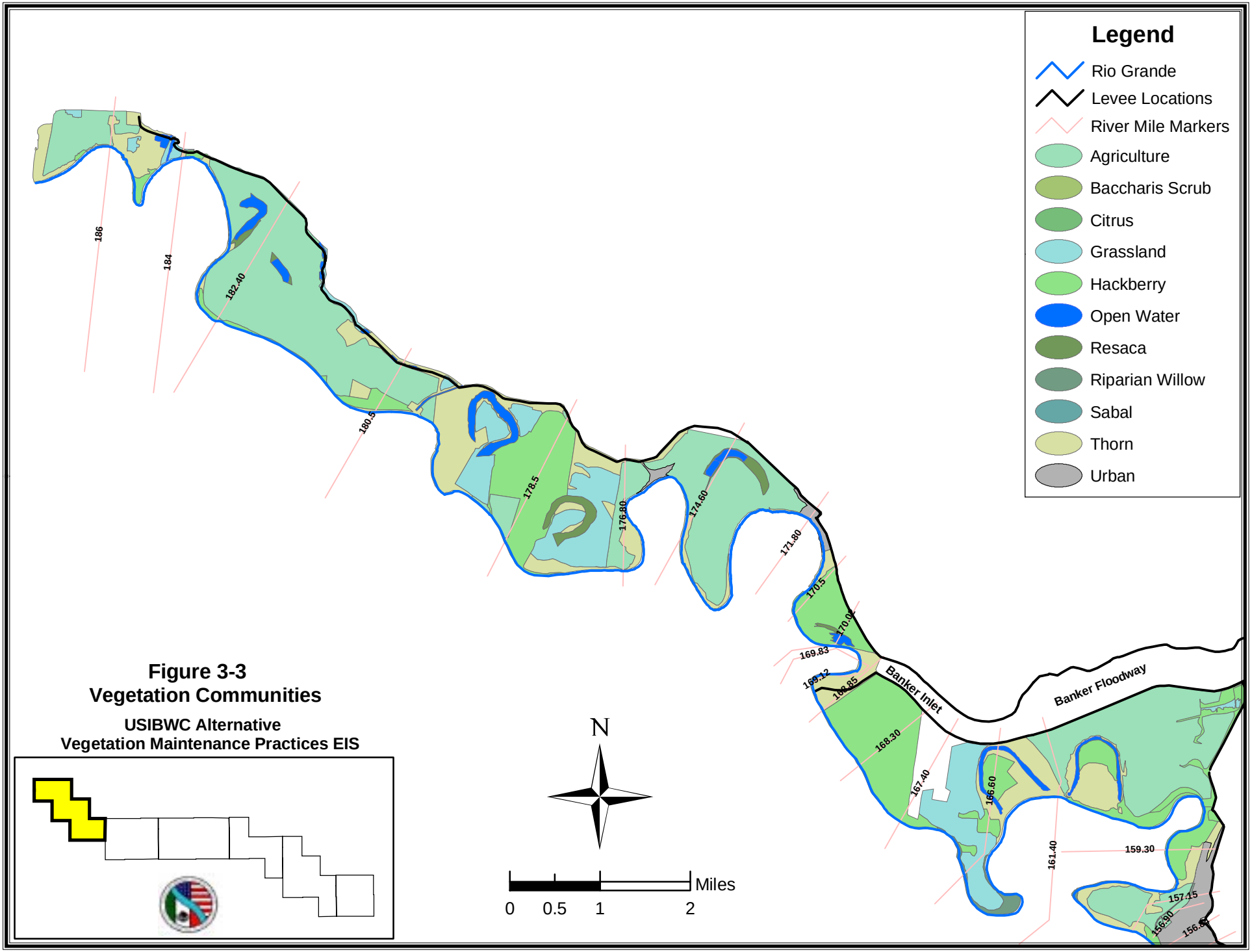


Figure 3-3
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

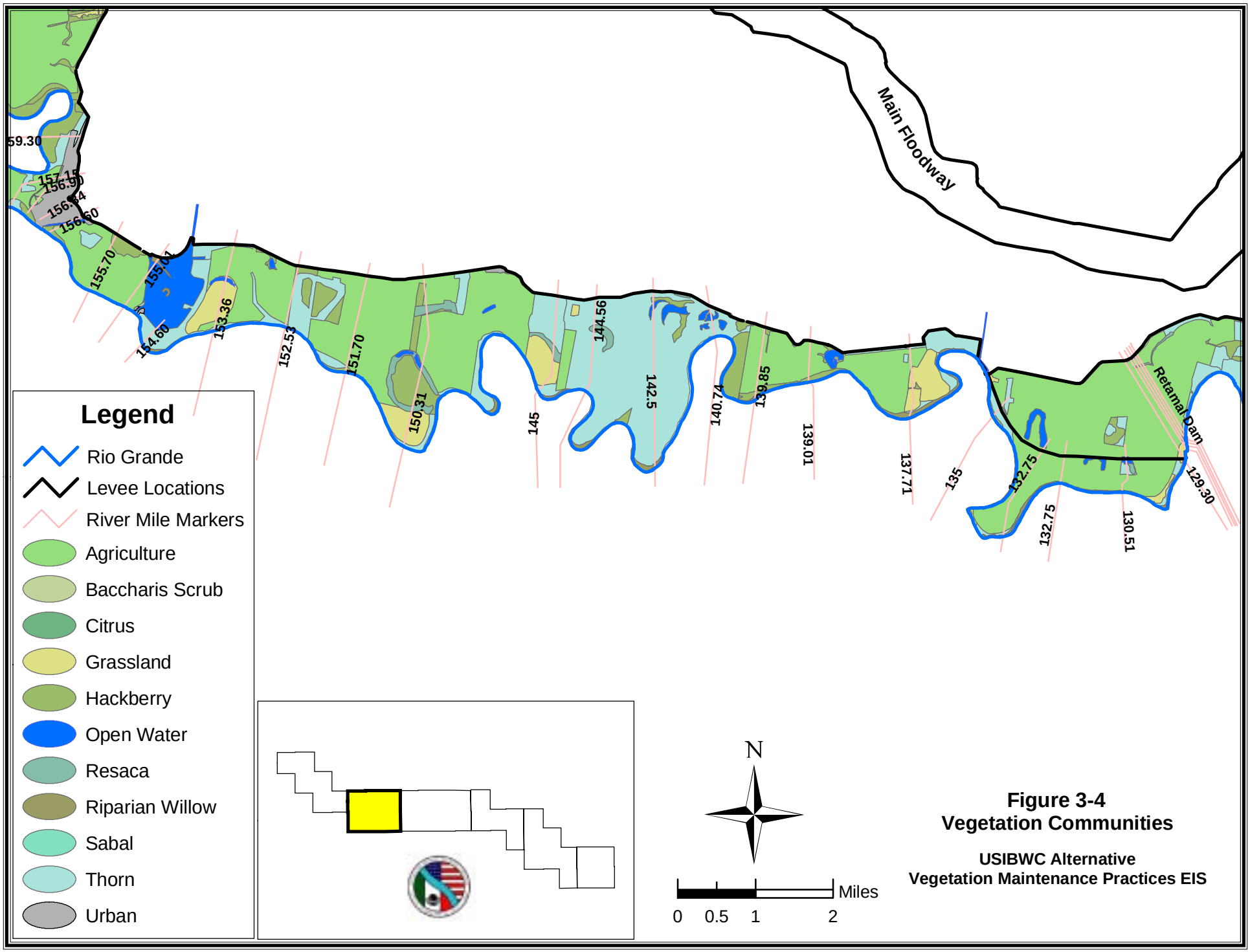


Figure 3-4
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

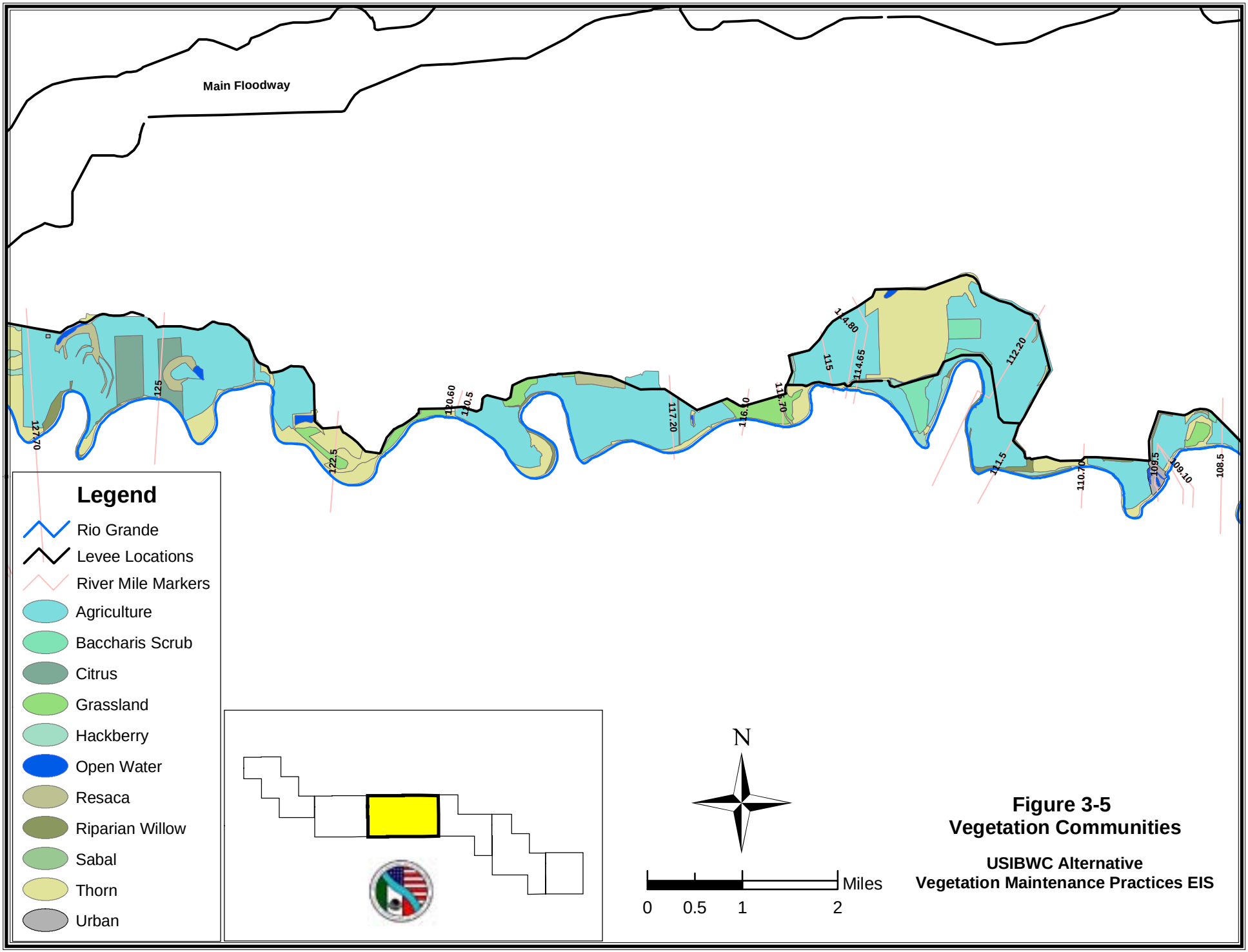


Figure 3-5
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

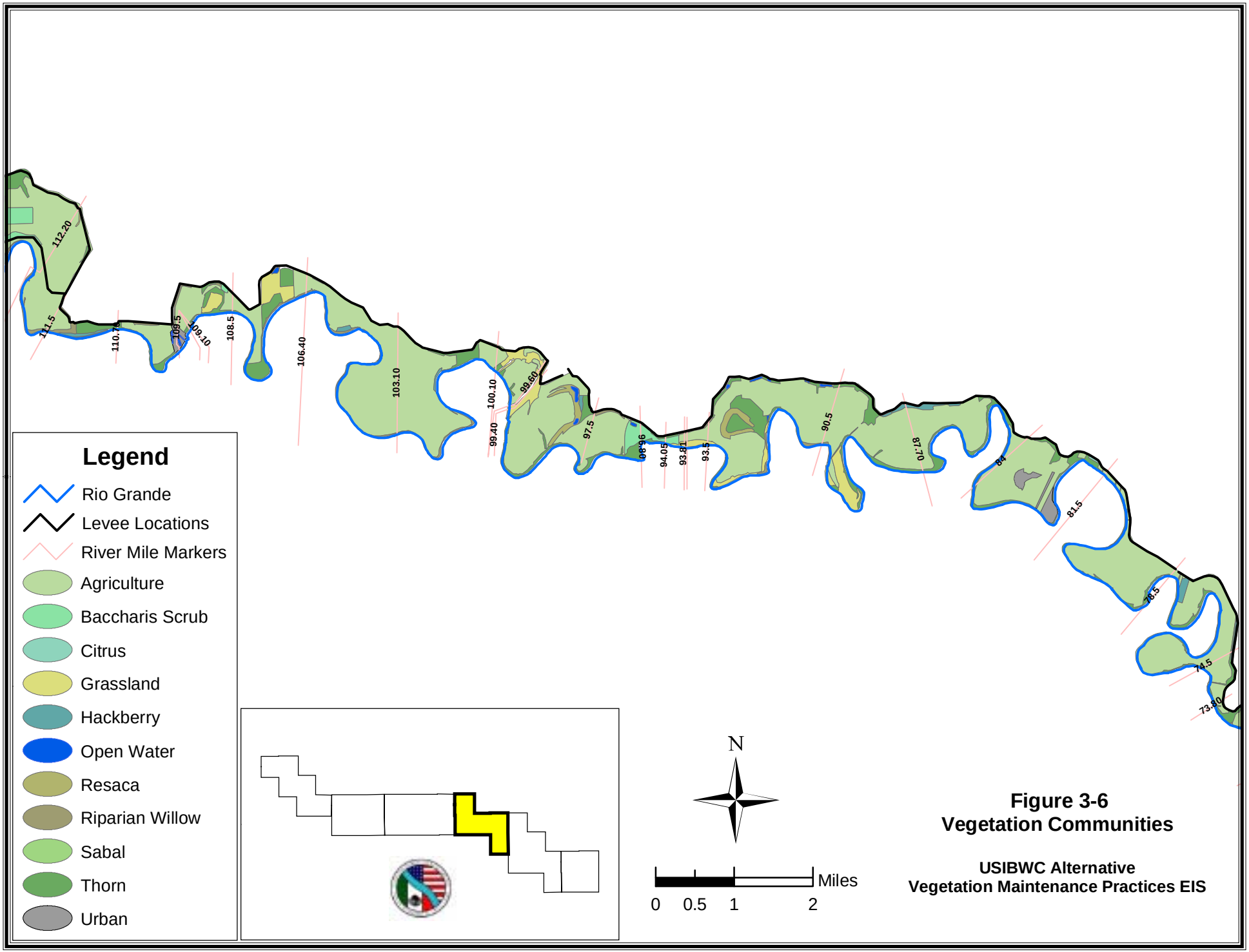


Figure 3-6
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

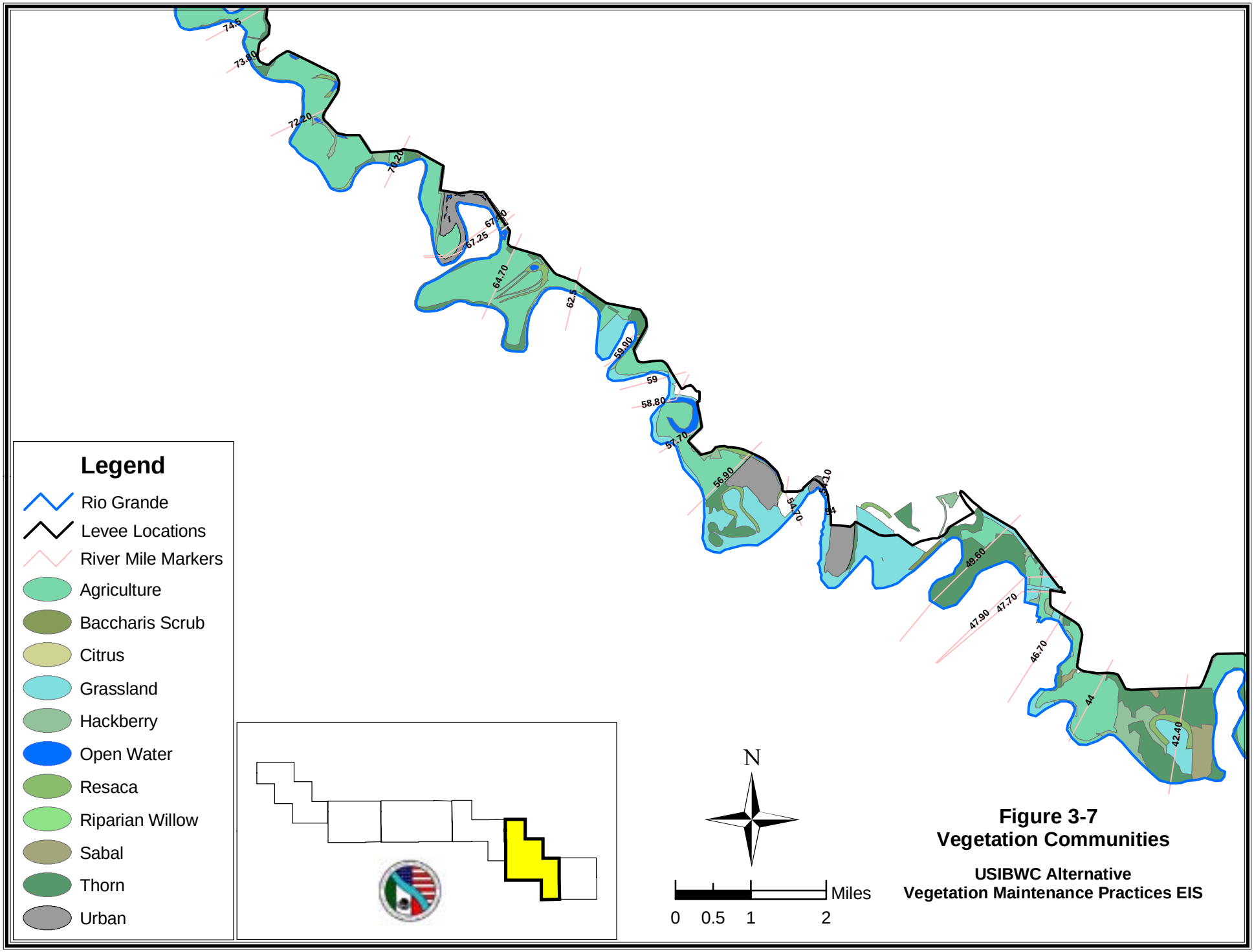


Figure 3-7
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

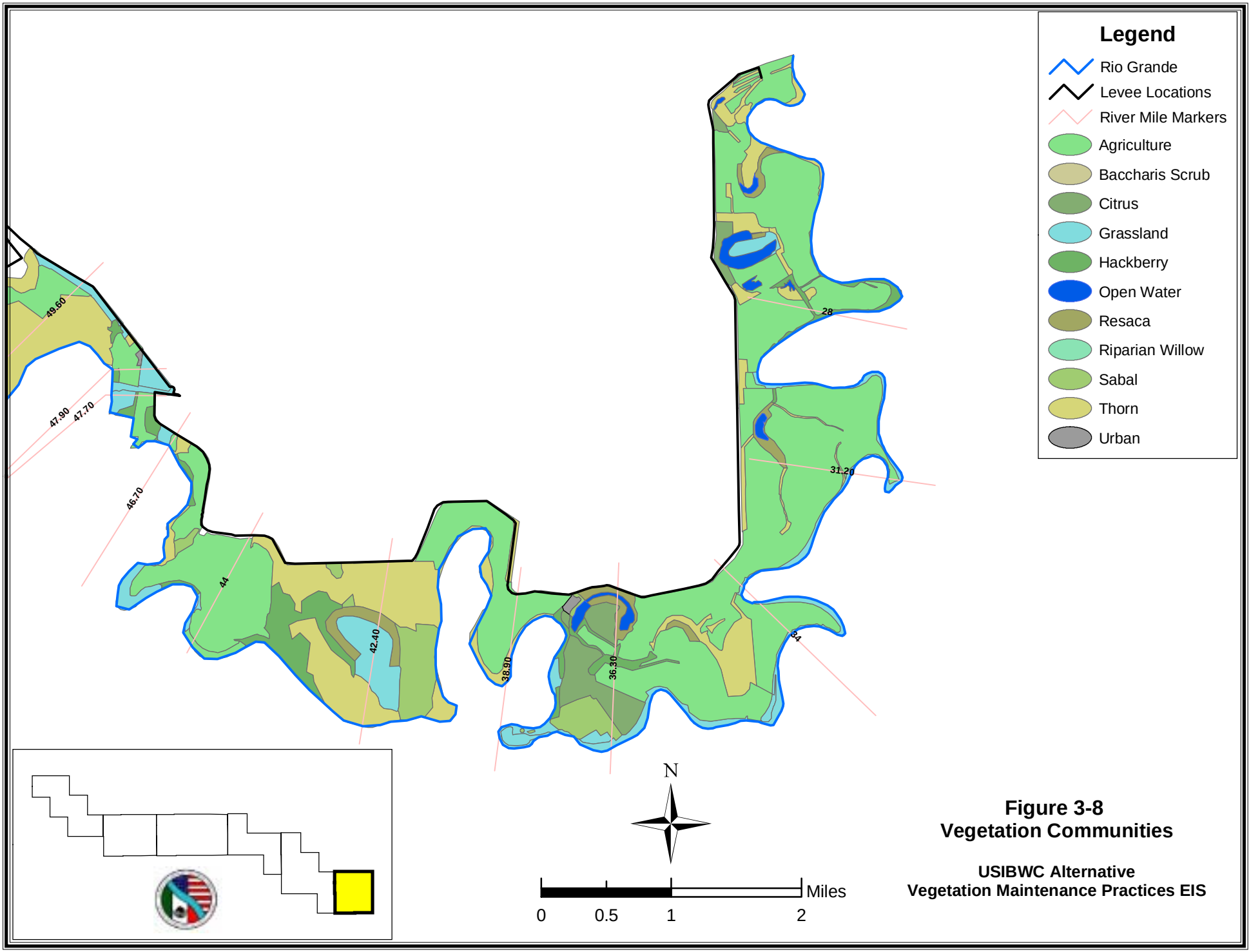


Figure 3-8
Vegetation Communities

USIBWC Alternative
Vegetation Maintenance Practices EIS

Table 3-1 Summary of Vegetation Communities in the Project Area

Vegetation Community	Acreage	Percent of Total Project Area
Agricultural Land	23,403	54.0%
Citrus Grove	393	0.9%
Hackberry/Cedar Elm Forest	3,530	8.0%
Riparian Zone/ Willow Flat	473	1.1%
Sabal Palm	217	0.50%
Baccharis Shrub	222	1.0%
Thorn Scrub	8,448	19.5%
Grassland	3,691	8.5%
Resaca	843	2.0%
Open Water	1,066	2.5%
Urban	924	2.0%
TOTAL	**43,210***	**100%**

Source: USGS DOQQs and GSRC
* Area between USIBWC project levee and the Rio Grande from RM 28.00 to RM 186.00

Agricultural land includes row crops, fallow fields, and any adjoining barns, farmhouses, shops, etc. The row crops include corn, sorghum, millet, sugar cane, onions, okra, tomatoes, and several other fruits and vegetables. The farmlands often abut the riverbank with only a two-track field road separating the crops and the river's steep bank. Fallow fields were still classified as agricultural lands if it was deemed by the team's biologists that the field had been fallow for less than two years. If there were indications that the field had been dormant more than two years (e.g., large shrubs and trees) or had been posted with signs that indicated a transfer of land ownership to a conservation agency or group, the area was classified as either thorn scrub or baccharis shrub, depending upon the predominant species. Many of the areas initially identified by the photo-interpretation as thorn scrub or grasslands had been converted to farmlands since the aerial photography had been taken. Conversely, there were areas that were in agricultural production in 1996 that are now fallow and in various stages of succession. Most of these areas, however, were due to acquisition by the USFWS for inclusion to the LRGV NWR.

Citrus groves are used for the production of citrus crops such as oranges, grapefruits, lemons, and limes. This vegetation type comprised less than one percent of the total land area and two percent of the agricultural lands. One large citrus farm near Brownsville has been recently acquired or transferred to The Nature Conservancy. However, as of January 2002, the groves were still in production.

Hackberry/cedar elm forests are dominated by mature hackberry and cedar elm but typically include Berlandier ash, mesquite, and Texas ebony as common associates.

Understory species include granjeno, mesquite, brasil, colima (*Zanthoxylum fagara*) and lotebush. This community is the major climax forest along the Rio Grande, but due to past land practices, now only occurs in small, isolated patches or as narrow strips along the river. In larger tracts where the community has been allowed to naturally succeed, the result is a dense, tall, relatively closed canopied forest that provides a greater availability of water, nesting sites and wildlife foods. Prime examples of these communities are found in protected lands, such as the SANWR and Bentsen-Rio Grande State Park. However, much of the hackberry/cedar elm forests are now confined to narrow bands along the Rio Grande, resacas, and drainage/irrigation canals. These areas were often interspersed with thorn scrub communities. The field team classified the community as hackberry/cedar elm if there appeared to be more than 50 percent of the canopy comprised by these two species.

Riparian/willow flats are characterized by the presence of permanent or ephemeral surface waters, water flowing through channels, and by the presence of obligate wetland plants. Willow and retama dominate these areas. Understory species are comprised mostly of vines and herbaceous species such as cattails (*Typha* spp.), smartweeds (*Polygonum* spp.), mist flower (*Eupatorium coelestinum*), sharppod morning glory (*Ipomoea trichocarpa*) and peppervine (*Ampelopsis arborea*). This community also contains scattered shrub species including tree morning glory (*Ipomoea aristolochiifolia*), popinac (*Leucaena leucocephala*), and rattlebush (*Sesbania drummondii*). Some riparian areas, however, were comprised of nearly monotypic stands of either giant cane (*Arundinaria gigantea*) or giant reed (*Arundo donax*). These riparian communities were found primarily along the Rio Grande, although similar stands are present along numerous resacas throughout the project area. Salt cedar (*Tamarix* spp.) is also a common associate of the riparian communities, often forming small stands within other larger riparian communities.

Dominant vegetation in thorn scrub areas includes huisache and other acacias, retama, spiny hackberry, mesquite, and prickly pear. This is the dominant native community type within the project area, comprising over 20 percent of the total land area and 46 percent of the wildlife habitat. Some thorn scrub communities form dense, impenetrable thickets. Resacas and abandoned borrow pits used to construct the IBWC project levees were often lined with narrow bands of thorn scrub habitats as early successional communities.

Grasslands are areas dominated by native and/or introduced grasses where woody vegetation has been cleared or comprises less than 15 percent of the canopy. Predominant grass species include buffelgrass, guinea grass, bermudagrass, rhodesgrass (*Chloris gayana*), silver bluestem (*Bothriochloa saccharoides*) and silky bluestem (*Dichanthium sericeum*). The grassland community will often have scattered shrubs and small trees such as retama, huisache, tree morning glory, Roosevelt weed, lead tree (*Leucaena pulverulenta*), tree tobacco, castor bean and popinac.

Resacas are old, abandoned river channels that have formed an oxbow, which may only hold water for part of the year. These communities are valuable habitat for many wildlife species, providing shelter, water, food sources, and travel corridors to other larger contiguous communities. Within agricultural fields, resacas are often cleared right

up to the bank; however, vegetation within the resaca is typically dense and diverse. The bank and slope communities include species typical of both thorn scrub and hackberry/cedar elm habitats. The bottom of the resaca generally contains either open water or dense stands of cattails, giant cane, rushes (*Scirpus* spp., *Juncus* spp.), sedges (*Carex* spp.) water millet (*Echinochloa* spp.), and sprangeltop (*Leptochloa* spp.). Some of the resacas, however, have been drained and are farmed in dry years.

Sabal palm *(Sabal texana)* forests have been almost eliminated from South Texas due to agricultural clearing. The majority of these forests remain on the Sabal Palm Grove Sanctuary near Brownsville, Texas, which is owned by the National Audubon Society. Small, isolated areas of sabal palm groves are located throughout the lower areas of the project area. These areas are not as mature or established as the Sabal Palm Grove Sanctuary. Common associates in this community type include soapbush or guayacan (*Guaiacum angustifolium*), nephthytis (*Syngonium podophyllum*), bushy lippia (*Lippia alba*), granjeno and coma (*Bumelia lanuginosa*).

Baccharis shrub communities are in a transitional state and were typically located on lands that have been recently acquired by the USFWS, TPWD, and/or another conservation agency or group. The lands were used for agricultural or rangeland prior to the transfer of ownership and are now in the early stages of succession. Roosevelt weed and other *Baccharis* species are the predominate woody shrubs, although retama, huisache, lead tree, popinac and tree tobacco are also other common associates.

Open water areas include ditches, streams, ponds, and lakes. These areas contained open water either at the time of the aerial photographs or there was open water present during the field surveys conducted for this project. These water bodies are either man-made (e.g., drainage and irrigation ditches, sewer lagoons, ponds) or natural (resacas, streams, lakes). Open water that exists naturally in resacas and other lakes provides valuable habitat for shorebirds and waterfowl.

Incorporated towns, housing developments, golf courses, and international bridge crossings characterize urban/developed lands. Maintenance activities would be limited in these areas, but could occur along the banks of the river.

3.1.3 Terrestrial Wildlife

Many of the terrestrial wildlife species in the project area are limited in their distribution either partially or entirely to the Tamaulipan Biotic Province, and some are found only within the LRGV. When marine and infrequent species are combined, the approximate number of vertebrate species alone reaches nearly 700 (Jahrsdoerfer and Leslie, 1988). Soils and climatic factors, and the overlap of species at the edges of their respective ranges are the basis of the uniqueness and species richness of the Matamoran District.

There are approximately 67 mammals of potential occurrence in the project area, including species of primary concern, such as the jaguarundi (*Felis yagouaroundi*) and ocelot *(Felis pardalis*). The mammals are dominated by rodents (24 species) and bats (13 species). Some common mammals which may be encountered in the LRGV are the common raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), coyote *(Canis*

latrans), Mexican ground squirrel (*Spermophilus mexicanus*), and the bobcat (*Felis rufus*).

There are approximately 484 species of birds that potentially occur in the project area. The dominant numbers of avifauna are represented by the wood warblers (44 species), geese and ducks (30 species), sparrows and towhees (26 species), raptors (25 species), and tyrant flycatchers (25 species). Some of these species nest in the project area, but most of the 484 species are only seen during spring and fall migration. Many species pass through the LRGV on their way to summer breeding or wintering grounds because of the convergence of two major migratory flyways. The LRGV is the convergence of the Central and Mississippi flyways and the point where many tropical birds reach their northernmost ranges. These factors contribute to the diverse avifauna, which are predominantly concentrated in the remaining native vegetation located in the numerous wildlife refuge tracts along the Rio Grande.

Many rare birds are found along the riparian zones of the Rio Grande. Altamira orioles (*Icterus gularis*), and green jays (*Cyanocorax yncas*) are two species which may exhibit their greatest density in this habitat. Other common birds include the common ground-dove (*Columbia passerina*), golden-fronted woodpecker (*Melanerpes aurifrons*), northern mockingbird (*Mimus polyglottos*), great-tailed grackle (*Quiscalus mexicanus*), and the groove-billed ani (*Crotophaga ani*). Species that are present due to migratory habits or seasonal residence include the indigo bunting (*Passerina cyanea*), orchard oriole (*Icterus spurius*), green heron (*Butorides virescens*), and the black-chinned hummingbird (*Archilochus alexandri*). Winter residents, as well as migrants, include the mallard (*Anas platyrhynchos*), greater yellowlegs (*Tringa melanoleuca*), laughing gull (*Larus atricilla*), belted kingfisher (*Ceryle alcyon*), and the sharp-shinned hawk (*Accipiter striatus*). Strict migrants include the scarlet tanager (*Piranga olivacea*), Mississippi kite (*Ictinia mississippiensis*), broad-winged hawk (*Buteo platypterua*), Wilson's phalarope (*Phalaropus tricolor*), and Franklin's gull (*Larus pipixcan*).

Amphibians and reptiles are also well represented in the project area. There are approximately 80 species of reptiles and amphibians that potentially occur in the project area. The reptiles consist of snakes (31 species), lizards (20 species), turtles (six species), and one crocodile. The amphibians consist of frogs and toads (18 species) and four species of salamanders.

The black-spotted newt (*Notophthalmus meridionalis*) is an endemic species to the area. As mentioned above, there are 18 species of anurans (frogs and toads) that are found in some part of the project area, including several species of true toads (*Bufo* spp.) and true frogs (*Rana* spp.). Terrestrial/freshwater species of turtles are represented by the red-eared slider (*Trachemys scripta elegans*), Texas spiny soft-shelled turtle (*Apalone spinifera*), ornate box turtle (*Terrapene ornata ornata*), Texas tortoise (*Gopherus berlandieri*), and the yellow mud turtle (*Kinosternon flavescens flavenscens*). The American alligator (*Alligator mississippiensis*) has also been recorded in the project area. Species of lizards include whiptails (*Cnemidophorus* spp.), skinks *(Eumeces* spp.), Mediterranean gecko (*Hemidactylus turcicus*), and the green anole (*Anolis carolinensis*). Snakes include water snakes (*Nerodia* spp.), rat snakes (*Elaphe* spp.), and two venomous

snakes, the western diamondback rattlesnake (*Crotalus atrox*) and the Texas coral snake (*Micrurus fulvius tener*).

Sport and Recreationally Important Wildlife Species

Recreational opportunities and the economy of the LRGV are highly dependent upon many wildlife species. These species are important attractions and bring people into the area for hunting, environmental tourism, and fishing.

Hunting in the Rio Grande Valley is a very important economic resource within the project area. Game species, primarily white-tailed deer and white-winged dove, support multi-million dollar industries in the LRGV. Large festivals attract people from around the world, bringing revenue to the area during the white-winged dove season. Other important species include the mourning dove (*Zenaida macroura*), northern bobwhite (*Colinus virginianus*), javelina (*Tayassu tajacu*), and wild turkey (*Melagris gallopavo*). In addition, many species of waterfowl are hunted seasonally, some of these include green- and blue-winged teal (*Anas carolinensis* and *Anas discors*, respectively), pintail (*Anas acuta*), and mallard.

The other major recreationally important species are the numerous bird species that support environmental tourism in the valley. It is estimated that bird watchers visiting the LRGV spend $100 million annually (TPWD, 1999a). Festivals organized by local businesses and communities attract millions of dollars and people from around the world. For example, the SANWR, located in the LRGV, received 99,000 birders in 1994, who spent an estimated $34.5 million, including $14 million in nearby communities (Kerlinger *et al.*, 1995). Texas has approximately 613 bird species that have been recorded within its geographic boundaries and about 484 of these species occur in the project area. The State of Texas has identified approximately 40 species that have been found only in Texas, and most of these are found in the LRGV. The only other state that has more exclusive species within its borders is the state of Alaska.

Threats To Terrestrial Wildlife Communities

As discussed previously in Section 3.1.2, the project area and region have experienced significant reductions in native vegetation communities. As habitat diminishes, wildlife populations are adversely affected. Indeed, the reason most wildlife species are included on the federal listing of threatened or endangered species is loss of suitable habitat. Habitat losses occur as a result of urban development with population increases and as a result of agricultural uses. Shifts in the species composition of habitats, and thus the wildlife species they support, occur due to successful competition from exotic species and changes in the hydrologic regime due to flood control and water withdrawals.

3.1.4 Aquatic Communities

The Rio Grande, resacas, arroyos, reservoirs, ponds, irrigation ditches, and other manmade impoundments throughout the project area combine to create diverse aquatic communities. Variations in habitat within the different communities are primarily due to conditions of the substrate, the presence and extent of rooted vegetation, water-flow

velocity, and basin morphology. In lotic communities (moving waters like the Rio Grande), habitats are most often characterized by sandy or clayey bottoms that have been somewhat scoured. Available nutrients are provided by accumulation of woody debris and leaf litter. These components also serve as areas of refuge and forage, for macroinvertebrates and larger vertebrate species such as fish. Areas of slower moving water may exhibit these qualities, in addition to the presence of muddy substrates that serve as habitat for burrowing species. These species are often an important food source for higher trophic levels.

Lentic communities are typically contained aquatic environments like resacas, lakes and ponds. Substrates within these communities vary according to geomorphology. Sandy or rocky substrates may have existed, but most often thick layers of organic and inorganic deposition cover these. In these communities, phytoplankton is the major source of nutrients in the food chain. These microscopic algal forms are suspended in the water column, and use photosynthesis to acquire energy. These organisms most often form the beginning of the aquatic food chain that, in turn, provides nutrients for each ascending member of the trophic levels.

In both lotic and lentic environments, zooplankton is an important part of the food chain. These organisms feed on phytoplankton, bacteria, protozoa, detritus, and other zooplankton and are, in turn, preyed upon by members higher up in the trophic levels. Benthic macroinvertebrates include insects (larval forms), worms, mussels, and crustaceans (shrimp, crawfishes, etc.). The availability of these macroinvertebrates depends on the type of substrate present. Rocky or gravel/chert areas will harbor species that cling or use deep recesses for cover. Burrowing forms tend to survive better in habitat with sandy, silty, and muddy bottoms. The largest diversity in these species will be found in those areas with somewhat rocky substrate and a moderate water velocity to provide necessary nutrients and respiratory requirements. In ponds and resacas, the greatest diversity is found in the zones along shallow, vegetated shores.

Fish are the most prominent member of the higher levels in the food chain in aquatic communities. Throughout most of their life cycles, fish are able to exploit all levels of the food chain at some point, depending on their respective developmental stage. The diet of most juvenile fish consists mainly of phytoplankton and zooplankton. Further along in the life cycle, diets will change and become more restrictive depending upon the species involved and their niche in the community. For example, large predator fish such as bass (*Micropterus* spp.) will become strict carnivores, while other species such as sunfish (*Lepomis* spp.) will remain omnivorous.

The freshwater fauna most likely consists of smaller forage fish populations including the red shiner (*Notropis lutrensis*), inland silverside (*Menidia beryllina*), Tamaulipas shiner (*Notropis braytoni*), mosquitofish (*Gambusia affinis*), sailfin molly (*Poecilia latipinna*), gizzard shad (*Dorosoma cepedianum*), and threadfin shad (*Dorosoma petenense*). Larger forage fish include carp (*Cyprinus carpio*), buffalo (*Ictiobus* spp.), striped mullet (*Mugil cephalus*), catfishes, and sunfishes. The dominant numbers of fish are represented by the sunfishes (10 species), carps and minnows (nine species), and the drums (eight species). There are approximately 178 species of fish that could potentially occur in the project area.

The fish of the lower Rio Grande have not been well studied according to Edwards and Contreras-Balderas (1991). The fish of the Rio Grande can be separated into two indigenous groups: one is upstream and composed of freshwater species, and the other is downstream and composed of upstream species as well as estuarine and marine species. Although geology and climate primarily have determined these distribution patterns, recent studies of the river indicate that major changes in these two groups have occurred. The upstream fauna has lost many of its native freshwater species to exotic and estuarine species, and the downstream fish populations have shown a decrease in diversity. Edwards and Contreras-Balderas (1991) report that this change is due to decreasing stream flows, increased pollution, and an increase in exotic species.

Sport and Recreationally Important Fish Species

Fishing on the Rio Grande within the project area is very limited because of degraded water quality. No commercial fishing on the Rio Grande is known from the United States side of the river. Limited recreational fishing opportunities exist in the Rio Grande. Recreational species include seven species of sunfish, such as the warmouth *(Lepomis gulosus*) and bluegill (*Lepomis macrochirus*). Other common recreational species include the largemouth bass (*Micropterus salmoides*) and white crappie (*Pomoxis annularis*). Of the five species of catfish, only the channel (*Ictalurus punctatus*) and the flathead catfish (*Pylodictis olivaris*) are considered desirable. In addition to freshwater fishing, eastern portions of the Arroyo Colorado, the Brownsville Ship Channel, and the Gulf of Mexico offer year round recreational saltwater fishing opportunities (SCS, 1977).

Threats To Aquatic Communities

One current problem facing the Rio Grande is the explosive growth of exotic, aquatic weeds. Water hyacinth (*Eichhornia crassipes*) and hydrilla (*Hydrilla verticillata*) are two exotic aquatic plants that are growing so rapidly in sections of the river that they are inhibiting the flow of water. These aquatic plants block the flow of water by growing in a thick mat, often from bottom to surface, across the river for linear stretches recorded up to 6.2 miles. Water hyacinth and hydrilla do not threaten public water supplies, but are disrupting water flow used for irrigation, as well as having negative impacts on the aquatic community as a whole. During periods of drought, water managers try to strictly control the flow of the river by altering the amounts of water being released from Falcon Reservoir. Up to 30 percent more water must be released from Falcon Reservoir in order to get enough water through for irrigation when areas of the river become overgrown with these plants (TPWD, 1999a). An international team working on the problem will consider introducing biological controls such as grass carp *(Ctenopharyngodon idella*), hydrilla flies, and water hyacinth weevils to control the plants. Other means such as mechanically removing the weeds will also be considered because international law prohibits the use of herbicides in international waters (TPWD, 1999a).

3.1.5 Threatened and Endangered Species and Critical Habitats

The Endangered Species Act (ESA) [16 USC. 1531 et. seq.] of 1973, as amended, was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for

their survival. All federal agencies are required to implement protection programs for these designated species and to use their authorities to further the purpose of the Act. Responsibility for the identification of a threatened or endangered species and any potential recovery plans lie with the Secretary of the Interior and the Secretary of Commerce.

The USFWS and the National Marine Fisheries Service (NMFS) share responsibility for administration of the ESA. Generally, the NMFS deals with those species occurring in marine environments and anadromous fish, while the USFWS is responsible for terrestrial and freshwater species and migratory birds. Additionally, the Animal and Plant Health Inspection Service, within the Department of Agriculture, oversees the import and export of listed terrestrial plants.

An endangered species is a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered endangered or threatened if they meet any of the five following criteria:

(1) The current/imminent destruction, modification, or curtailment of their habitat or range;

(2) Overuse of the species for commercial, recreational, scientific, or educational purposes;

(3) Disease or predation;

(4) The inadequacy of existing regulatory mechanisms; and

(5) Other natural or human-induced factors affecting continued existence (Reed and Drabelle, 1984).

In addition, the USFWS further classifies species as candidates (C), proposed threatened (PT), and proposed endangered (PE). The candidate designation includes those species for which the USFWS has identified threats to their continued existence, has sufficient information on hand to support their being listed as either endangered or threatened, and are likely to be proposed for listing in the near future. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered.

One of the primary threats to threatened and endangered species is the destruction or modification of essential habitat areas. Responsibilities of the USFWS under the ESA include: (1) the identification and exportation of listed terrestrial species; (2) the identification of critical habitat for listed species; (3) implementation of research on, and recovery efforts for these species; and (4) consultation with other federal agencies concerning measures to avoid harm to listed species. The ESA also calls for the designation and conservation of critical habitat, which is defined as areas of land, water, and air space that an endangered species specifically requires for its survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior.

As previously described, the project area contains a wide diversity of flora and fauna, some of which are endangered or threatened species. Plants and animals designated as threatened or endangered can be placed on the federal or state list, or both. Federal threatened and endangered species and common habitats for each are summarized by county and can be found in Tables 3-2 and 3-3.

3.1.5.1 Threatened and Endangered Animals

As presented in Table 3-2, a total of 14 federal endangered or threatened animal species occur or potentially occur within Cameron and Hidalgo counties. Eleven species are listed as endangered, three as threatened, and two as delisted (USFWS, 1999). Information pertaining to the distribution and habitat requirements for endangered and threatened species is presented in this table. Although all the animal species presented in this table have the potential to occur in the project area, the USFWS initially indicated that only the jaguarundi (*Felis yagouaroundi*) and ocelot (*Felis pardalis*) are of concern to this project (Reyes, 1998). There are no federally designated critical habitats (land, water, and air) within the project area (USFWS, 1999).

Ocelot

Ocelots are small-sized cats measuring approximately 30 to 41 inches long and weighing 15 to 30 pounds. Ocelots feed on a diet of rabbits, rodents, and birds. Ocelot habitat is primarily dense, thorny, low brush such as spiny hackberry, lotebush, and blackbrush. This habitat type continues to be cleared due to increased demands for farming and urban expansion. Decline of available thick brush habitat is the primary reason ocelots have become an endangered species. It is believed that there are only 30 to 35 ocelots remaining in the thorny shrub lands near Brownsville, Texas (TPWD, 1999b), although Laack (1998) estimated that 100 ocelots may be present in South Texas. Ocelot sightings have been reported from SANWR and the LRGV NWR as well as the Lower Arroyo Colorado (Laack, 1998). In November 1999, an ocelot was trapped and radio-collared by USFWS biologists at the Laguna Atascosa NWR in Cameron County (Reyes, 1999).

Jaguarundi

Jaguarundis are small wildcats weighing approximately eight to 16 pounds. Jaguarundis feed on birds, rabbits, and small rodents. Jaguarundi habitat is primarily dense and thorny shrub land. The destruction of this habitat type, primarily for agricultural purposes and urban growth, has resulted in the jaguarundi's endangered status. Jaguarundis are usually active at night, so it is difficult to establish how many of them actually remain in Texas. The current population in Texas will require extensive protection of their native shrub habitat for future survival. Although the last confirmed record of a jaguarundi in the United States occurred in 1986, numerous unconfirmed sightings have been reported in Hidalgo County at Bentsen-Rio Grande Valley State Park, SANWR, LRGV NWR, and the Anacua Unit of the Las Palomas Wildlife Management Area (WMA). Additionally, unconfirmed sightings have been reported at the Sabal Palm Grove Sanctuary in Cameron County.

Table 3-2 Federally Listed Animals of Potential Occurrence in Cameron and Hidalgo Counties, Texas

COMMON NAME SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	COUNTY Cameron	 Hidalgo	HABITAT DESCRIPTION
Atlantic Hawksbill sea turtle *Eretmochelys imbricata*	E	E	**X**		gulf and bay system
American peregrine falcon *Falco peregrinus anatum*	DL	E	**X**	**X**	potential migrant; nests in west Texas
American Alligator *Alligator mississipiensis*	T		**X**	**X**	large streams, canals, ponds, lakes, and swamps
Arctic peregrine falcon *Falco peregrinus tundrius*	DL	T	**X**	**X**	potential migrant; nests in west Texas
Bald Eagle *Haliaeetus leucocephalus*	T		**X**		large bodies of water with abundant prey (fish and waterfowl) usually with tall trees and/or cliffs
Blackfin Goby *Gobionellus atripinnis*		T	**X**		brackish and freshwater coastal streams
Black Spotted Newt *Notophthalmus meridionalis*		T	**X**	**X**	wet areas such as arroyos, canals, ditches, or shallow depressions; aestivates in the ground during dry periods
Black-Striped Snake *Coniophanes imperialis*		T	**X**	**X**	extreme South Texas; semi-arid coastal plain, warm, moist micro-habitats and sandy soils; proficient burrower; eggs laid April-June
Bluntnose Shiner (extirpated) *Notropis simus*		T		**X**	main river channels, often below obstructions over substrate of sand, gravel, and silt; damming and irrigation practices presumed major factors contributing to decline.
Brown pelican *Pelecanus occidentalis*	E	E	**X**		largely coastal and near shore areas, where it roosts on islands and spoil banks
Cactus Ferruginous Pygmy-owl *Glaucidium brasilianum cactorum*		T	**X**	**X**	riparian trees, brush, palm, and mesquite thickets; roosts in small caves and recesses on slopes of low hills during the day; breeding April to June
Common Black Hawk *Buteogallus anthracinus*		T	**X**	**X**	cottonwood-lined rivers and streams; willow tree groves on the lower Rio Grande floodplain; formerly bred in South Texas
Coues' Rice Rat *Oryzomys couesi*		T	**X**	**X**	cattail-bulrush marsh with shallower zone of aquatic grasses near the shoreline; shade trees around the shoreline are important features; prefers salt and freshwater, as well as grassy areas near water; breeds April-August
Green sea turtle *Chelonia mydas*	T	T	**X**		gulf and bay system
Gulf Coast Jaguarundi *Herpailurus yagouaroundi cacomitli*	E		**X**	**X**	dense and thorny shrub land
Indigo Snake *Drymarchon corais*		T	**X**	**X**	thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter
Interior least tern *Sterna antillarum athalassos*	E	E		**X**	nests along sand and gravel bars with braided streams, rivers and some inland lakes

Table 3-2 Federally Listed Animals of Potential Occurrence in Cameron and Hidalgo Counties, Texas

COMMON NAME SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	COUNTY		HABITAT DESCRIPTION
			Cameron	Hidalgo	
Jaguar (extirpated) *Patherna onca*	E	E	**X**	**X**	dense chaparral; no reliable Texas sightings since 1952.
Jaguarundi *Felis yagouaroundi cacomitli*	E	E	**X**	**X**	thick brush lands, near water favored; six month gestation; young born twice per year in March and August
Kemp's Ridley sea turtle *Lepidochelys kempii*	E	E	**X**		gulf and bay system
Leatherback sea turtle *Dermochelys coriacea*	E	E	**X**		gulf and bay system
Loggerhead sea turtle *Caretta caretta*	T	T	**X**		gulf and bay system
Mexican Tree frog *Smilisca baudinii*		T	**X**	**X**	subtropical region of extreme southern Texas; breeds May-October coinciding with rainfall; eggs laid in temporary pools
Northern aplomado falcon *Falco femoralis septentrionalis*	E	E	**X**		open country, especially savanna and open woodland, and sometimes in barren areas; grassy plains and valleys with scattered mesquite
Northern Beardless-tyrannulet *Camptostoma imberbe*		T	**X**	**X**	mesquite woodlands; near Rio Grande frequents cottonwood, willow, elm, and great leadtree; breeding April to July
Northern Cat-eyed Snake *Leptodeira septentrionalis*		T		**X**	Gulf Coastal Plain south of the Nueces River; thorn brush woodland; dense thickets bordering ponds and streams; semi-arboreal; nocturnal
Ocelot *Felis pardalis*	E	E	**X**	**X**	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breed and raises young June-November
Piping plover *Characrius melodus*	T	T	**X**		wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats
Reddish Egret *Egretta rufescens*		T	**X**	**X**	resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear
Rose-throated Becard *Pachyramphus aglaiae*		T	**X**	**X**	riparian trees, woodlands, open forest, scrub, and mangroves; breeding April to July
Sooty Tern *Sterna fuscata*		T	**X**		predominately "on the wind"; does not dive, snatches small fish and squid with bill as it flies or hovers over water; breeding April-July
Southern Yellow Bat *Lasiurus ega*		T	**X**	**X**	associated with trees, such as palm trees (*Sabal mexicana*) in Brownsville, which provide them with daytime roosts; insectivorous; breeding in late winter
Speckled Racer *Drymobius margaritiferus*		T	**X**	**X**	extreme south Texas; dense thickets near water, Texas palm groves, riparian woodlands; often in areas with much vegetation litter on ground; breeds April-August
Texas Botteri's Sparrow *Aimophila botterii texana*		T	**X**	**X**	grassland and short-grass plains with scattered bushes or shrubs, sagebrush, mesquite, or yucca; nests on ground of low clump of grasses.
Texas Horned Lizard *Phrynosoma cornutum*		T	**X**	**X**	open arid or semi-arid regions with sparse vegetation; grass, cactus, scattered brush or scrubby trees; burrows into soil, uses rodent burrows, or hides under surface cover

Table 3-2 Federally Listed Animals of Potential Occurrence in Cameron and Hidalgo Counties, Texas

COMMON NAME SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	COUNTY		HABITAT DESCRIPTION
			Cameron	Hidalgo	
Texas Tortoise *Gopherus berlandieri*		T	X	X	open scrub woods, arid brush, loams, grass-cactus association; open brush with grass understory preferred; shallow depressions at base of bush or cactus or underground burrow or hides under surface cover
Tropical Parula *Parula pitiayuma*		T	X	X	dense or open woods, undergrowth, brush, and trees along edges of rivers and resacas; breeding April to July
Opossum Pipefish *Microphis brachyurus*		T	X		brooding adults found in fresh or low salinity waters and young move or are carried into more saline waters after birth
Reticulate Collared Lizard *Crotaphytus reticulatus*		T		X	requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite
River Goby *Awaous tajasica*		T	X	X	clear water with slow to moderate current, sandy or hard bottom, and little or no vegetation; also enters brackish and ocean waters
Sheep Frog *Hypopachus variolosus*		T	X	X	grassland and savanna; moist sites in arid areas
South Texas Siren *Siren* sp.1		T	X	X	wet areas such as arroyos, canals, ditches, or shallow depressions; aestivates in ground in dry periods, requires some moisture to remain
West Indian manatee *Trichechus manatus*	E	E	X		gulf and bay system; opportunistic, aquatic herbivore
White-faced Ibis *Plegadis chihi*		T	X	X	prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.
White-lipped Frog *Leptodactylus labialis*		T	X	X	grasslands, cultivated fields, roadside ditches; hides under rocks or in burrows under clumps of grass; incompatible with widespread habitat alteration and pesticide use in South Texas
White-nosed Coati *Nasua narica*		T	X	X	woodlands, riparian corridors and canyons; most individuals in Texas probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade
White-tailed Hawk *Buteo albicaudatus*		T	X	X	near coast it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May
Wood Stork *Mycteria americana*		T	X	X	forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and move to Gulf States in search of mud flats and wetlands, even those associated with forested areas; formerly nested in Texas, no breeding records since 1960.
Zone-tailed Hawk *Buteo albonotatus*		T	X	X	rough, deep, rocky canyons and streamside in semiarid mesa, hill, and mountain terrain; breeding March to July

T-Threatened DL Federally Delisted X - potentially occurs in county Source: TPWD 1999a, TPWD 1999b, TPWD 1999c
E-Endangered * listed under laws preceding the ESA of 1973

Table 3-3 Federally Listed Plants of Potential Occurrence in Cameron and Hidalgo Counties, Texas

COMMON NAME SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	YEAR LISTED	COUNTY Cameron	 Hidalgo	HABITAT DESCRIPTION
Black laced cactus *Echinocereus reichenbachii alberti*	E	E	1979	**X**		openings in dense brush on sandy soils on South Texas Plains; flowering April-June
Texas ayenia *Ayenia limitaris*	E	E	1994	**X**	**X**	woodlands on alluvial deposits on floodplains and terraces along the Rio Grande; flowering throughout the year with sufficient rainfall
Star cactus *Astrophylum asterias*	E	E	1993	**X**	**X**	gravelly saline clays of loams over the Catahoula and Frio formations, on gentle slopes and flats in grasslands or shrub lands; flowering in May
South Texas ambrosia *Ambrosia cheiranthifolia*	E	E	1994	**X**		open prairies and various shrub lands on deep clay soils; flowering July-November
Walker's manioc *Manihot walkerae*	E	E	1991		**X**	periphery of native brush in sandy loam; also on caliche cuestas; flowering April-September

T-Threatened DL Federally Delisted X - potentially occurs in county Source: TPWD 1999a, TPWD 1999b, TPWD 1999c
E-Endangered * listed under laws preceding the ESA of 1973

3.1.5.2 Threatened and Endangered Plants

As presented in Table 3-3, a total of five federally listed plant species occur or potentially occur within the project area. All five-plant species are listed as endangered. Information pertaining to the distribution and habitat requirements for the endangered and candidate species is presented in this table. Although all the above mentioned plant species have the potential to occur in the project area, USFWS initially indicated that only Walker's manioc (*Manihot walkerae*), Texas ayenia (*Ayenia limitaris*), and South Texas ambrosia (*Ambrosia cheiranthifolia*) are of concern to this project (Reyes, 1998). There are no federally designated critical habitats (land, water, and air) within the project area (USFWS, 1999).

Walker's Manioc

Walker's manioc is a perennial herb that grows in fine loamy sands with an underlying caliche layer. Although specific habitat requirements are unknown, Walker's manioc has been found in undisturbed native brush dominated by acacia (*Acacia* spp.), mesquite, colima (*Zanthoxylum fagara*), Texas ebony, and cenizo. Until recently, Walker's manioc was known from two populations in Tamaulipas, Mexico and one population in Hidalgo County, Texas. However, three populations in Hidalgo County have been recently discovered (USACE, 1999). The only known United States populations of this species do not occur on federal land and thus are not afforded official protection. This species is near extinction due to the conversion of its native habitat brush lands to cropland, pasture land, urban, suburbs, and recreational areas. Walker's manioc appears to have an affinity to outcrops where caliche is exposed; such habitat occurs in only one location in the project area; however, this location is not within the footprint of any of the proposed alternatives.

Texas Ayenia

Texas ayenia is a pubescent, subshrub that grows on well-drained soils of riparian terraces supporting climax communities of Texas ebony/anacua. Texas ayenia is found within the drier portions of this plant community and is typically found in openings and along the edges. Texas ayenia is historically known from Cameron and Hidalgo counties and from Mexico. Only one wild population of this plant is known to exist (Hidalgo County, southeast of Weslaco), although Best and Reyes (1999) stated that other populations have been recently reported. No specimens of Texas ayenia were recorded during field surveys at any of the proposed maintenance areas, or at the proposed levee modification and detention basin sites. The major threats facing the species are habitat loss due to agriculture, which has significantly limited the Texas ebony/anacua climax communities.

South Texas Ambrosia

South Texas ambrosia is a perennial plant that grows on low elevations in open clay-loam to sandy-loam prairies and savannas. Like many other species, South Texas ambrosia has suffered due to the loss of native habitat, which has either been converted to agricultural fields or buffelgrass for grazing by livestock. The buffelgrass eventually out

competes and therefore causes displacement of native species. Currently, six populations of South Texas ambrosia occur in Nueces and Kleberg counties, although the species was historically known to occur in Cameron County (USACE, 1999). South Texas ambrosia occurs in coastal areas, which would not be directly affected by the USIBWC activities.

3.1.5.3 State Listed Threatened and Endangered Species

Within the State of Texas, the TPWD maintains computerized records of state endangered and threatened species by county. The state does not have authority at this time to list invertebrates, as does the federal government. The TPWD has three species status categories: endangered in the State of Texas, threatened in the State of Texas, and "rare" (rare, but no regulatory listing). The TPWD lists 18 endangered species (seven plants, three reptiles, four birds, and four mammals), 36 threatened species (six amphibians, nine reptiles, three fish, 15 birds, and three mammals) and 34 rare species (17 plants, two reptiles, five birds, four mammals, five insects, and one mollusk) within the project area. Appendix L lists these endangered, threatened, and "rare" species by county within the project area (TPWD, 1999a; 1999b; and 1999c). These species were not surveyed because they are not afforded any coverage under the 1973 ESA.

3.1.5.4 Federal Listed Threatened and Endangered Species Surveys

The study team coordinated with USFWS representatives to further clarify survey needs and confirm the field methods. Efforts to confirm or refute the presence of the two cat species were beyond the scope of this project; rather, the study team was tasked to identify areas that could provide suitable cat habitat, especially as travel corridors. Although the initial USFWS response indicated concern for the three plant species (Reyes, 1998), further communication with the USFWS revealed that only one plant species (Texas ayenia) really had potential to occur in the areas proposed by USIBWC for additional mowing (Best and Reyes, 1999). These discussions revealed that South Texas ambrosia occurs in coastal areas that would not be directly affected by USIBWC activities. In addition, Walker's manioc appears to have an affinity to outcrops where caliche is exposed; this habitat occurs in only one location in the study area and would not be affected by proposed maintenance actions or other alternatives as presently formulated.

According to Best and Reyes (1999), Texas ayenia requires soils with high clay content at elevations between 100 and 300 ft. The species seems to prefer edges of native brush communities comprised predominately of anacua and Texas ebony. Consequently, the study team focused field survey efforts in areas that satisfied these criteria.

Soils that are predominantly (45 percent) clay or silty clay and occur at elevations between 100 and 300 ft in the project vicinity include the Hidalgo, Mercedes, Matamoros, and Runn series. Areas of anticipated direct project impacts (i.e., proposed maintenance areas) were compared with NRCS soil maps to identify the "impact" areas where the preferred soils occurred. These areas were then compared to a vegetation map. Results from previous USIBWC and USFWS windshield and ground surveys that were conducted to identify potential Walker's manioc habitat (Keyes, 1993) were also considered during the selection of the areas to be surveyed for this project. The

USIBWC/USFWS windshield surveys resulted in seven areas identified as potential habitat, all of which were located in the off-river levee system.

During the week of May 10, 1999, the field team surveyed 22 tracts. Since spring is not the optimum time to survey for Texas ayenia, the field team primarily characterized extant habitat types to identify and further refine sites for survey during the fall. However, the field team also searched specifically for Texas ayenia plants and other similar species. Plants resembling Texas ayenia were flagged so that the team could relocate and positively identify the species during the fall, when the distinguishing characteristics (e.g., velcro-like capsules, flowers arising from common peduncles) of Texas ayenia are present.

Areas deemed to be potential or suitable habitat were revisited during the week of October 18, 1999. This is the time of year when Texas ayenia is most easily identified. The fall survey employed the same field methods used during the spring surveys. The team revisited areas where similar plant species were recorded to positively identify the specimens in question. A total of 14 tracts, encompassing about 400 acres, were intensively surveyed during the fall.

In addition to the spring and fall surveys conducted specifically for threatened or endangered species, efforts to locate species of concern and identify potential suitable habitat also were performed during the collection of Habitat Evaluation Procedures (HEP) field data. The additional surveys were completed during the weeks of April 19 and 26, 1999. HEP field data consisted of numerous variables (e.g., canopy cover, percent shoreline vegetation, presence of high silty clay banks, diameter of hardwood trees) that were collected at randomly placed sample plots within each of the proposed maintenance areas. Biologists walked transects toward the random plots, and while doing so, observed surrounding vegetation and wildlife to identify species of concern, as well as general habitat conditions and wildlife populations. A full description of the HEP data collection and analysis is presented in Appendix M.

Although intensive surveys were conducted during the spring and fall specifically for Texas ayenia, as well as the field efforts completed for the HEP surveys, the study team found no Texas ayenia specimens within the proposed maintenance areas. Suitable habitat was recorded, but the soil series that occurs at known populations was not present at any of the locations. Therefore, it is highly unlikely that Texas ayenia occurs in the areas proposed for vegetation maintenance or any of the riparian communities within the project corridor. If the USIBWC initiates clearing, maintenance, and other ground disturbing activities in areas not previously coordinated with USFWS, other than those currently maintained, additional surveys for Texas ayenia would be required.

Two State Endangered Texas tortoise (*Gopherus berlandieri*) specimens were observed. Both of these specimens were found in the same Texas ebony/anacua community near Penitas, Texas. A detailed description of the survey methods and results is contained in *Threatened and Endangered Species Report in Support of the Environmental Impact Statement for the Maintenance Program of the Lower Rio Grande Flood Control Project* (February 2002 - draft) under separate cover and is included in Appendix L of this FEIS.

3.1.6 Unique or Sensitive Areas

Numerous unique or sensitive areas exist in the project area because of the convergence of subtropic, temperate, coastal, and desert influences all occurring in the southernmost tip of Texas. Other unique or sensitive areas including wetlands and other hydrological features in the project area are critical for the fish and wildlife living within them. This section describes the major unique or sensitive areas existing in the project area.

The LRGV is a culturally and ecologically important and diverse corridor. A binational planning effort, the Caminos del Rio Heritage project, is now underway to conserve the unique natural and cultural heritage along the Rio Grande, from the Laredo/Colombia area to the Gulf of Mexico. With technical assistance from the National Park Service, this "heritage corridor" preservation effort includes two national parks, 196 properties listed on the National Register of Historic Places (NRHP), four state parks, and the LRGV NWR (American Rivers, 1993).

3.1.6.1 Lower Rio Grande Valley National Wildlife Refuge

LRGV NWR is one of the most biologically diverse national wildlife refuges in the continental United States. Habitat types include chaparral, subtropical gallery forests, salt lakes, palm forests, tidal flats, salt marshes, sand dunes, Bordas Escarpment, savannas, and other unique habitats. The objective of the LRGV NWR is to acquire properties along the Rio Grande, identified in the LRGV NWR Acquisition Plan, that will provide riparian habitat as well as travel corridors for wildlife. The LRGV NWR Acquisition Plan has identified key areas, which, although removed from the Rio Grande, will serve as anchor wildlife areas, providing corridors for wildlife species migrating north and south. The plan developed for the LRGV NWR identifies 10 different habitat types: Coastal Brushland Potholes, Loma/Tidal Flats, Woodland Potholes and Basins, Mid-Delta Thorn Forest, Sabal Palm Forest, Mid-Valley Riparian Woodland, Upland Thorn Scrub, Barretal (thicket), Upper Valley Flood Forest, and Chihuahuan Thorn Forest (Falcon Woodland). These habitats not only serve to reflect the natural diversity of the area, but also hold the key to the survival of one or more of the 115 unique vertebrate species in the region that are listed as endangered, threatened, or which occur at the periphery of their range (Jahrsdoerfer and Leslie, 1988; USFWS, 1997).

When completed, the LRGV NWR will incorporate 132,500 acres of land and habitat that have either been purchased or acquired through conservation easements. The refuge will consist of a conglomeration of existing property owned and acquired by TPWD, National Audubon Society, The Nature Conservancy (TNC), and private landowners. The current acreage of the refuge is 89,326 acres as of May of 1999 with tracts located in four counties. There are 46,779 acres in Cameron County; 24,615 acres in Hidalgo County; 9,582 acres in Willacy County; and 8,345 acres in Starr County (Ditto, 1999). Table 3-4 summarizes the acreage of all wildlife refuge tracts by county. Though all four counties are presented, the project area only lies in Cameron, Hidalgo and Willacy counties (refer to Figures 3-16 through 3-21 in Section 3.3). The USFWS estimated that their current landholdings include 44 tracts within the USIBWC levee system, totaling approximately 9,965 acres (Rupert, 2000).

Table 3-4 Distribution of 89,326 Acres within the Lower Rio Grande Valley National Wildlife Refuge

County	Tract Name	Acres		County	Tract Name	Acres
Hidalgo	Sam Fordyce	993		Cameron	Champion Bend	82
Hidalgo	La Parida Banco	44		Cameron	Clark Island	19
Hidalgo	Pate Bend	442		Cameron	Brazos Island	103
Hidalgo	Cottam	1036		Cameron	Loma Preserve	5202
Hidalgo	Gabrielson	703		Cameron	Boca Chica	11950
Hidalgo	Madero	294		Cameron	Palmito Hill	135
Hidalgo	Pharr Settling Basin	644		Cameron	Caja Pinta Banco	10
Hidalgo	Tortuga Banco	17		Cameron	Tulosa Ranch	1846
Hidalgo	El Morillo Banco	651		Cameron	Vista Del Mar	1827
Hidalgo	Loma Verde	13		Cameron	Boscaje de la Palma	418
Hidalgo	Abrams	162		Cameron	Jeronimo Banco	298
Hidalgo	Abrams West	487		Cameron	Bahia Grande	12638
Hidalgo	La Pesquera	2		Cameron	Phillips Banco	338
Hidalgo	Palmview	471		Cameron	Culebron Banco	38
Hidalgo	La Joya	2154		Cameron	Palo Banco	30
Hidalgo	Vela Woods	224		Cameron	Villa Nueva	406
Hidalgo	Havana (N&S)	159		Cameron	Garza-Cavazos	300
Hidalgo	Yturria Brush	1877		Cameron	Tahuachal Banco	175
Hidalgo	Los Ebanos	714		Cameron	Vaqueteria Banco	52
Hidalgo	Zamora Bend	342		Cameron	Capote Banco	88
Hidalgo	Monte Cristo	2702		Cameron	Las Paloma	113
Hidalgo	Goodfields	359		Cameron	Otha Holland	880
Hidalgo	Hidalgo Bend	536		Cameron	Las Sierritas Banco	19
Hidalgo	Otha Holland	408		Cameron	La Gloria	269
Hidalgo	Milagro	208		Cameron	Villitas Banco	7
Hidalgo	La Sal Del Ray	5384		Cameron	Brownsville	17
Hidalgo	Schaleban	1527		Cameron	Rangerville	58
Hidalgo	Relampago	19		Cameron	Santa Maria	18

County	Tract Name	Acres		County	Tract Name	Acres
Hidalgo	Mercedes	37		Cameron	Resaca Del La Gringa	12
Hidalgo	Santa Maria	539		Cameron	La Selva Verde	2504
Hidalgo	Marinoff	431		Cameron	Ranchito	3814
Hidalgo	Monterrey Banco	101		Cameron	Resaca Del Rancho Viejo	2224
Hidalgo	La Coma	715		Cameron	Lantana	35
Hidalgo	Rosario Banco	34		Cameron	Las Yescas	20
Hidalgo	Llano Grande Banco	186		Cameron	Lozano	42
	Total	**24,615**		Cameron	Thompson Road	30
				Cameron	Tiocano Lake	436
Starr	La Puerta	4066		Cameron	San Benito S. B.	82
Starr	Cuevitas	231		Cameron	Noriega	200
Starr	Los Olmos	1425			**Total**	**46,779**
Starr	Rio San Juan	118				
Starr	Los Negros Creek	112		Willacy	Payne	546
Starr	Fronton	29		Willacy	Teniente	5638
Starr	Las Ruinas	223		Willacy	East Lake	1755
Starr	Kepler	1		Willacy	Willamar	1162
Starr	Alto Bonito	312		Willacy	San Perlita	272
Starr	Chapeno	154		Willacy	El Jardin	209
Starr	Garceno	31			**Total**	**9,582**
Starr	Las Velas	583				
Starr	Las Velas West	13		**TOTAL OF ALL COUNTIES: 89,326 ACRES**		
Starr	Chicarra Banco	489				
Starr	Cuellar	45				
Starr	La Grulla	513				
	Total	**8,345**				

Source: Ditto, 1999

3.1.6.2 Santa Ana National Wildlife Refuge

The SANWR is located adjacent to the Rio Grande in Hidalgo County and is contained entirely within LRGFCP levee system. This 2,000-acre refuge provides thorn forest habitat for a variety of wildlife. Over 95 percent of the original thorn forest habitat have been cleared in the LRGV by development, agriculture, and population growth, so the refuge provides a bastion of important wildlife habitat. In fact, the refuge has been designated as one of the most significant bird habitats in the United States. Over 300 species of birds find shelter in the refuge, primarily due to its neotropical climate. The refuge also provides habitat for about one half of all butterfly species found in North America. Furthermore, many federal and state threatened and endangered wildlife species make their homes in the refuge. State threatened species that may potentially occur in the SANWR include the Mexican tree frog (*Smilisca baudinii*), sheep frog (*Hypopachus variolosus*), Texas tortoise, Texas horned lizard (*Phrynosoma cornutum*), black-striped snake (*Coniophanes imperialis*), and the Texas indigo snake (*Drymarchon corais*). Other protected species that may potentially occur within the SANWR include the black-spotted newt (*Notophthalmus meridionalis*), Rio Grande lesser siren, speckled racer (*Drymobius margaritiferus*), ocelot, jaguarundi, brown pelican (*Pelecanus occidentalis*), and peregrine falcon (*Falco peregrinus anatum*).

3.1.6.3 Bentsen-Rio Grande State Park

Bentsen-Rio Grande Valley State Park located in Hidalgo County along the Rio Grande contains approximately 588 acres of subtropical resaca woodlands and thicket brush land. The State Park is located entirely within the USIBWC levee system. The plants and animals of Bentsen-Rio Grande Valley State Park represent a northernmost extension of the subtropics. The park is popular for viewing subtropical birds and birds in spring migration. Unusual birds that can be seen in the park include the pauraque (*Nyctidromus albicollis*), red-billed pigeon (*Columba flavirostris*), green kingfisher (*Chloroceryle americana*), black-bellied whistling duck (*Dendrocygna autumnalis*), clay colored robin (*Turdus grayi*), rose-throated becard (*Pachyramphus aglaiae*), and tropical parula (*Parula pitiayuma*). Other popular species that can be observed at the park include the green jay, blue bunting (*Passerina cyanea*), groove-billed ani (*Crotophaga sulcirostris*), vermilion flycatcher (*Pyrocephalus rubinus*), ringed kingfisher *(Ceryle torquata*), buff-bellied hummingbird (*Amazilia yucatanensis*), and Altamira oriole (*Icterus gularis*).

3.1.6.4 Sabal Palm Grove Sanctuary

The Sabal Palm Grove Sanctuary, located along the Rio Grande southeast of Brownsville, was acquired by the National Audubon Society to preserve the native habitat of the border region. The sanctuary consists of 172 acres of the largest and best-preserved remnant of Texas sabal palm forest in the United States. The sanctuary, which is located totally within the USIBWC levee system, has been working with the communities of the LRGV and municipalities in Mexico to strengthen environmental education and examine the local dimensions of population growth and environmental preservation. The Sabal Palm Grove Sanctuary staff has been active in the pursuit of

strategies to ensure long term protection of local natural resources by building relationships with local community leaders on both sides of the border.

3.1.6.5 Las Palomas Wildlife Management Area

Las Palomas WMA encompasses 7,686 acres within Cameron, Hidalgo, Starr, Willacy, and Presidio counties. The Las Palomas consists of several segregated tracts, of which five are contained within the LRGFCP levee system. These five tracts contain about 864 acres. The Las Palomas WMA consists of native brush vegetation with some farmland and wetlands. The area is managed by the TPWD primarily for white winged doves, but it also supports black-bellied whistling ducks, chachalacas (*Ortalis vetula*), morning doves, and scaled quail (*Callipepla squamata*).

3.1.7 Wetlands

The USACE, acting under Section 404 of the Clean Water Act (CWA), provides a vital function in protecting valuable aquatic resources, including wetlands. The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Under Section 404 of the CWA, the Secretary of the Army is responsible for administering a Regulatory Program that requires permits for the placement of dredged or fill materials into waters of the United States, including wetlands.

Areas regulated under Section 404 are collectively referred to as "waters of the United States." The USACE (1987) and the United States Environmental Protection Agency (USEPA) (CFR, 1980, 40 CFR 230.3(t)) jointly define wetlands as: those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The Supreme Court ruling in the Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers case (SWANCC, Case No. 99-1178) on January 9, 2001 restricted the USEPA and USACE's regulatory authority under the CWA. SWANCC eliminates the Corps jurisdiction over non-navigable isolated, intrastate waters where the only jurisdiction is derived from the Migratory Bird Treaty Act. Waters of the United States that are, or potentially are, affected by the SWANCC ruling include: intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds.

On January 10, 2003, the USACE and the USEPA announced an Advanced Notice of Proposed Rulemaking which included guidance to field staff regarding the extent of jurisdiction in light of the SWANCC decision. That guidance, which is still current, states:

- Field staff should continue to assert jurisdiction over traditional navigable waters (and adjacent wetlands) and generally speaking, their tributary systems (and adjacent wetlands).
- In light of SWANCC, field staff should not assert CWA jurisdiction over isolated waters that are both intrastate and non-navigable, where the sole basis available

for asserting CWA jurisdiction rests on any of the factors listed in the "Migratory Bird Rule."

- In light of SWANCC, field staff should seek formal project-specific headquarters approval prior to asserting jurisdiction over isolated non-navigable intrastate waters based on other types of interstate commerce links listed in the current regulatory definitions of "waters of the U.S."

The Galveston District, USACE, will routinely make jurisdictional determinations on a case-by-case basis unless it involves a unique question regarding interstate commerce.

Wetlands have been identified as being of particular concern because they perform valuable functions in restoring and maintaining the quality of the nation's waters. These functions include flood water storage, sediment trapping, nutrient removal, chemical detoxification, shoreline stabilization, aquatic food chain support, fish and wildlife habitat, and groundwater recharge. In Texas, wetlands are among the most valuable resources. Additionally, these communities provide many economic and ecological benefits, hunting, fishing, and bird watching opportunities (TPWD, 1997). Although wetlands comprise less than five percent of its total land area, Texas has the fourth greatest wetland acreage in the lower forty-eight states following Florida, Louisiana, and Minnesota (Dahl, 1990). Following is a discussion of regulations affecting wetlands, different types of wetlands, their function and value, rates of loss, and wetland acreage within the project area.

3.1.7.1 Functions and Values of Wetlands

Wetlands have considerable environmental and economic value. In river basins, wetlands provide flood retention, bank stabilization, and water-quality maintenance. The tourism industry benefits from the scenic beauty of the state's many and diverse wetlands, which afford opportunities for recreational activities that include hunting, fishing, bird watching, nature photography, camping, and hiking (Tiner, 1984).

Diverse wetland types provide habitat for many plant and animal species. Most freshwater fish depend on wetlands for food, spawning, and nursery grounds (Tiner, 1984). Texas wetland ecosystems are extremely important to wildlife since the state is one of the most important wintering areas for waterfowl in North America (Stutzenbaker and Weller, 1989). Waterfowl utilize wetland plants and animals for food while over-wintering or during migration stopovers. Wetlands are also important breeding areas, and they provide cover for nesting waterfowl and other birds (TPWD, 1997). Among the migrants from Canada that stop at riparian wetlands and over winter in wetlands along the Texas coast are snow geese, Canada geese, and the endangered whooping crane. Wetlands provide habitat for many types of resident and migratory birds. Additionally, about 35 percent of all threatened and endangered animals depend upon wetland habitat (Kusler, 1983).

Vegetation along rivers, streams, and other wetlands helps prevent flood damage by reducing the velocity of floodwaters that travel through the system. However, vegetation also reduces capacity along rivers, streams, and other wetlands. This facilitates retention and infiltration of floodwaters and helps reduce soil erosion. Over time, floodwaters are

slowly released back into the river or stream, the atmosphere, and the groundwater. By reducing the rate and amount of storm water entering the river or stream, wetlands lessen the destructiveness of flood events.

Additionally, wetland vegetation adjacent to rivers helps minimize shoreline soil erosion and intercepts eroded soil from upland areas (TPWD, 1997). Wetlands absorb and filter sediments, nutrients, and other natural and manmade pollutants that would otherwise degrade rivers, streams, and lakes and kill aquatic organisms, including fish. The settling of sediment in rivers and streams increases the costs of maintaining navigation channels (TPWD, 1997).

The USFWS has estimated that from the 1780's to the 1980's, wetland acreage in Texas decreased by 52 percent from about 16 million to about 7.6 million acres (Dahl, 1990). Wetlands of every type have been affected. Some of these losses can be attributed to natural causes, but large percentages of the losses were caused by human activities. In rural areas, losses can be attributed to conversion to cropland, declining water levels due to pumpage for irrigation, and overgrazing of wetland vegetation by livestock, which can increase erosion and evaporation. In urban areas, wetland losses occur due to encroachment by residential and commercial construction and industrial development. Other activities that can cause wetland losses are filling, water diversion, drainage and river channelization, clear-cutting, burning, lowering or disturbing the shallow water table, and the construction of dams, reservoirs, flood-control ditches, levees, irrigation canals, and barge and ship canals. Wetland degradation also has resulted from the discharge of inadequately treated sewage and industrial waste into wetlands (TPWD, 1999d).

Some land use practices have led to the creation of new wetlands or the enlargement of existing wetlands. Rice farming near the Gulf coast has contributed to increases in wetland acreage, and construction of lakes and reservoirs undoubtedly has increased the acreage of lacustrine wetlands and open waters. However, those gains have not offset the losses of natural wetland acreage, function, and value that have occurred in the state.

3.1.7.2 Wetland Types and Acreage in the Project Area

The wetlands once present along the Rio Grande have been altered due to water control projects and the clearing of native vegetation. Construction of dams and reservoirs has changed the flow of the Rio Grande reducing the extent of wetlands, riparian habitat, and wetland vegetation present in the project area. Although the wetlands in the Rio Grande Valley have been altered, various sizes and types of wetlands exist throughout the project area. Wetlands in the project area can be classified into four separate systems: estuarine, lacustrine, palustrine, and riverine. Estuarine systems are tidal wetlands and adjacent deepwater tidal habitats that are occasionally diluted by freshwater runoff from the land. Estuarine wetlands do not occur within the project area, but do exist downstream near the Gulf coast. These systems are associated with sources of saltwater such as the Brownsville Ship Channel.

Wetland acreage of the other three systems was determined using National Wetland Inventory (NWI) maps, aerial photographs, and NRCS soil survey data. Based on these data, approximately 4,178 acres of palustrine, lacustrine and riverine wetland types were

identified within the project area (Table 3-5). Palustrine wetlands cover approximately 3,961 acres (95 percent), lacustrine 165 acres (four percent), and riverine 52 acres (one percent). Palustrine wetlands were further defined into community types: forested, scrub-shrub, emergent, and open water. The palustrine open water type accounts for 638 wetland acres within the project area. The following paragraphs describe each of the community types within the project area as defined by the USFWS wetlands and aquatic habitat classification system.

Table 3-5 Wetlands Identified within the Project Area

Wetland Type	Acres	Percentage
Palustrine		
forested	2,151	52
scrub-shrub	740	18
emergent	432	10
open water	638	15
Lacustrine	165	4
Riverine	52	1
TOTAL	**4,178**	**100**

Source: NWI Maps (1979, 1983)

Palustrine

Palustrine systems are all nontidal wetlands dominated by trees, shrubs, and other vegetation. Palustrine systems constitute the majority of wetlands in the project area and are commonly found around resacas and riparian habitat along the Rio Grande. Good examples of palustrine wetlands can be found at Bentsen-Rio Grande Valley State Park and SANWR. As mentioned above, the palustrine community is further subdivided into four subcommunity types, based primarily on the vegetation type that predominates within the community. These communities are described in the following paragraphs.

Palustrine Forested

The palustrine-forested category includes all freshwater wetlands dominated by woody vegetation greater than 20 ft in height. Water regimes range from brief periodic flooding to near permanent inundation. Bottomland hardwoods are the predominant habitat of this category. Abandoned river channels and oxbows (resacas) support this community type, which are cedar elm, sugarberry and Berlandi ash. These sites, under normal conditions, may be flooded almost continuously. Forested wetlands with intermediate degrees of flooding are an extensive component of the bottomland hardwood spectrum (Moulton *et al.*, 1997).

Palustrine Scrub-Shrub

The palustrine scrub-shrub category includes all freshwater wetlands dominated by woody vegetation less than 20 ft in height. These habitats include formerly forested

wetlands experiencing re-growth or invasion by species such as green ash (*Fraxinus pennsylvanica*) or the introduced Chinese tallow-tree (*Sapium sebiferum*). This category includes shrub-dominated floodplain depressions, beaver ponds, gravel pits, river point-bars, and backwaters of ponds and reservoirs vegetated by species such as swamp privet (*Forestiera acuminata*), brook-side alder (*Alnus serrulata*), black willow, ash *(Fraxinus caroliniana, F. pennsylvanica*), buttonbush (*Cephalanthus* spp.), and planer-tree (*Planera aquatica*). Rattlebush (*Sesbania* spp.) and salt cedar (*Tamarix ramosissima*) are common in depressions and along drainages throughout the coastal plain (Moulton *et al.*, 1997).

Palustrine Emergent

The palustrine emergent category includes all freshwater wetlands dominated by rooted herbaceous (non-woody) plants. Most habitats in this category are freshwater marshes dominated by plants such as cattails (*Typha* spp.), spikerushes (*Eleocharis* spp.), smartweeds (*Polygonum* spp.), and arrowheads (*Sagittaria* spp.). Also included are wet prairies and meadows vegetated by species such as gulf cordgrass (*Spartina spartinae*), sedges (*Carex* spp.), bushy bluestem (*Andropogon glomeratus*), switchgrass (*Panicum virgatum*), seacoast bluestem (*Schizachyrium scoparium var. littoralis*), giant bristle grass (*Setaria magna*), and other grasses (Moulton *et al.*, 1997). Palustrine emergent wetlands are found along the banks of the Rio Grande, resacas, settling basins, and other drainages where the water is shallow.

Palustrine Open Water

This wetland type includes open water areas such as reservoirs, lakes, rivers, oxbows, and resacas. Palustrine open water wetlands cover approximately 638 acres of the project area.

Lacustrine

Lacustrine systems are composed of deepwater habitats and associated wetlands situated in topographic depressions or dammed river channels. Lacustrine wetlands are common in the project area and are associated with the open water of resacas, ponds, lakes, reservoirs, and settling basins.

Resacas are old, abandoned river channels that measure from one to six feet deep and 30 to 150 ft wide. Resacas may hold water forming an oxbow lake or only hold water for part of the year. Oxbow lakes that were formed by the meandering of the Rio Grande are called a “banco.” The term “resaca” is used to describe channels that have considerable linear extent. Some people do not differentiate between the two and use the term “resaca” to describe either situation. Resacas were traditionally refilled when the Rio Grande flooded, but now must rely on rainfall and runoff for recharge. Cattails (*Typha latifolia*) and willows often dominate the resacas. Resacas provide water for irrigation and support numerous wildlife species. The wildlife and human uses of resacas are dependent on the water quality and the permanency of the water. Very little is known about the water quality of resacas, but some may have decreased water quality due to agricultural runoff and release of sewage during flood events. Siltation has become a major problem within resacas due to the absence of scouring and the increase in urban runoff, shoreline erosion, and general degradation of water quality (Ramirez, 1986).

Riverine

Riverine systems are all wetlands and deepwater habitats within a river channel. The Rio Grande is the dominant riverine system in the project area. Small riverine systems associated with canals and ditches also exist in the project area.

Other Waters

It should be noted that man-made waters such as settling basins, ditches, canals, reservoirs, and man-made lakes are abundant throughout the project area. These man-made waters are primarily designed for flood control and irrigation purposes; however, these structures are often lined with dense vegetation that supports wildlife and serve as travel corridors for many species.

3.1.8 Off-River Floodway System

The paragraphs below generally describe the vegetation communities within the off-river floodway system. The four alternatives discussed in this FEIS are not located within the off-river floodway system; however because this area is part of the LRGFCP, a brief description is provided. No changes in vegetation maintenance in the off-river floodway system are proposed.

During significant flood stages, the USIBWC will adjust the floodgates on the Anzalduas Dam to divert floodwaters through the Banker Floodway and into the Arroyo Colorado. The USIBWC is required to divert up to 105,000 cfs through this interior floodway.

Much of the floodway is in agricultural production, with wheat, sorghum, sugar cane and cotton as the primary crops. The USIBWC maintains flow easements within the floodway, which restricts the type of crops that can be grown, in order to ensure that adequate conveyance can be provided.

In several areas along the floodway, small depressions retain water for long periods, forming small ponds and wetlands. Typical vegetation species that occur within these depressions include bulrush (*Scirpus* spp.), cattail (*Typha latifolia*), and soft rush (*Juncus effusus*). Other areas that are not in agricultural production are maintained to ensure that dense growths of woody vegetation do not form. These areas are particularly prevalent in the upper portions of the Arroyo Colorado. Native and non-native grasses predominate these sites. Common species include bermudagrass (*Cynodon dactylon*) bluestems (*Andropogon* spp. and *Bothriocola* spp.), guinea grass (*Panicum maximum*), and buffelgrass (*Cenchrus ciliaris*).

In the lower reaches of the Arroyo Colorado, the floodway is diverted into other smaller channels with more narrow floodplains. The vegetation is not maintained on a regular or routine basis in these channels and has developed into a more natural riparian community. Trees and shrubs dominate many of the stream banks, with species such as black willow, hackberry, Texas ebony, lead tree, retama, granjeno and huisache.

3.2 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

This section describes the socioeconomic activities and environmental justice issues within the region of impact. The region of impact is located within the LRGV and comprises Cameron County and Hidalgo County, Texas. For purposes of impact analysis, countywide data is presented for both counties.

3.2.1 Socioeconomic Resources

This section describes the social and economic activities within the region of impact. The examined socioeconomic activity includes population, employment and characteristics of local industry, housing, and community infrastructure.

3.2.1.1 Population

The total population within the region of impact is estimated as 904,690. Cameron County comprises approximately 37 percent of the population in the region of impact, with 335,227 residents. The population of Hidalgo County is 569,463, or 63 percent of the region of impact (USCB, 2000).

Completion of the proposed project is expected to take approximately 20 years. Therefore, population trends from 1980 were examined, as well as future 20-year projections. Population within the region of impact has grown rapidly over the past 20 years, increasing 83 percent since 1980. Hidalgo County leads with a population increase of 101 percent over the past 20 years. Cameron County population increased 60 percent since 1980 (USCB, 1998). Population projections estimate Cameron County will increase approximately 42 percent to 476,992 by 2020. Hidalgo County projections estimate a population of 879,381, a 54 percent increase (TWDB, 2001). Table 3-6 provides total population data for both counties and the region of impact for 1980, 2000 and 2020 projections.

Table 3-6 Population in Cameron and Hidalgo County

	1980 Total Population[a]	2000 Total Population[b]	2020 Total Population Projection[c]
Cameron County	209,727	335,227	476,992
Hidalgo County	283,323	569,463	879,381
Region of Impact	493,050	904,690	1,356,373

[a]USCB, 1998
[b]USCB, 2000
[c]TWDB, 2001

In Cameron County, Brownsville is the only metropolitan area located directly along the Rio Grande with a population of 139,722. Other towns located along the river are small, dispersed communities. The majority of these communities lie west of

Brownsville with the exception of Villa Pancho and South Point (TWDB, 1996). The United States Census Bureau (USCB) refers to some of these communities as Census Designated Places (CDPs). According to the USCB (2000), CDPs are settled concentrations of populations that can be identified by name, but are not legally incorporated under the laws of the state. These communities do not have elected officials to serve municipal functions. Boundaries are usually defined in cooperation with local or tribal officials and have no legal status. These CDPs are often comprised of colonias (refer to colonias section below; USCB, 2000). Table 3-7 presents population data for cities and communities in Cameron County located within two miles of the Rio Grande.

Table 3-7 2000 Population Data for Cameron County Cities and Communities Located Along the Rio Grande

CAMERON COUNTY	
Cities and Communities	**Population**
Bluetown-Iglesia Antigua (CDP)	692
Brownsville	139,722
Encantada-Ranchito El Cababoz	2,100
La Paloma (CDP)	1,666
Los Indios	1,149
San Pedro (CDP)	668
Santa Maria (CDP)	846
South Point (CDP)	1,118
Villa Pancho (CDP)	386
Total Population	**148,347**

Source: USCB, 2000

Mission, McAllen, and Pharr are the largest cities located near the Rio Grande in Hidalgo County. The total population of cities and communities in Hidalgo County located along the Rio Grande is 209,042 (USCB, 2000). Table 3-8 provides population data for each city and community along the Rio Grande in Hidalgo County.

Table 3-8 Population Data for Hidalgo County Cities and Communities Located Along the Rio Grande

HIDALGO COUNTY	
Cities and Communities	**Population**
Abram-Perezville	5,444
Cuevitas (CDP)	37
Havana (CDP)	452
Hidalgo	7,322
La Joya	3,303
Los Ebanos (CDP)	403
McAllen	106,414
Mission	28,653
Penitas	1,167
Pharr	46,660
Progreso	4,851
Progreso Lakes	234
Relampago (CDP)	104
Sullivan City	3,998
Total Population	**209,042**

Source: USCB, 2000

3.2.1.2 Employment

In the year 2000, the two counties within the region of impact reported 294,989 total employment. Cameron County, with 118,802 employed persons, comprised 40 percent of the total employment for the region of impact. Hidalgo County, with 176,187 employed residents comprised 60 percent of the total employment (TWC, 2000).

Employment within the region of impact increased 76.2 percent from 1980 to 2000. Hidalgo County experienced the greatest employment increase of 83.4 percent, followed by Cameron County at 66.4 percent (USCB, 1998; USCB, 2000).

The 2000 unemployment rate within the project area was higher than the Texas State average. Together, the two counties had 11.7 percent unemployment compared to 4.2 percent in Texas. Hidalgo County had the highest rate of unemployment at 13.6 percent, followed by Cameron County at 8.7 percent (TWC, 2000). Unemployment increased in both counties since 1980 (USCB, 1998). Employment data and unemployment rates for each county are presented in Table 3-9.

Table 3-9 Employment Data for Cameron and Hidalgo Counties and the Region of Impact

		1980[a]	2000[b]	Percent Change
Cameron County	**Labor Force**	77,405	130,113	68.1%
	Total Employment	71,401	118,802	66.4%
	Unemployment Rates	7.8%	8.7%	----
Hidalgo County	**Labor Force**	104,940	203,863	94.2%
	Total Employment	96,053	176,187	83.4%
	Unemployment Rates	8.5%	13.6%	----
Region of Impact	**Labor Force**	182,345	333,976	83.2%
	Total Employment	167,454	294,989	76.2%
	Unemployment Rate	8.2%	11.7%	----

[a]USCB, USA Counties Data, 1998
[b]USCB, Census 2000

A majority of employment within the region of impact lay in the services, trade and government sectors. Each of these industries comprised approximately 22 to 23 percent of the total employment in the region of impact. In Cameron County, employment was also high in the manufacturing and transportation industries, approximately 11 percent and 4 percent, respectively (TWC, 2000). Manufacturing (7 percent), construction (5 percent) and the agricultural (5 percent) industries have relatively high employment in Hidalgo County. Table 3-10 provides 2000 employment data for the major industries in each county and the total region of impact.

3.2.1.3 Agriculture

Approximately 34,277 acres of agricultural land lie in the project area along the Rio Grande in Cameron and Hidalgo counties. Though land is not cultivated immediately along the riverbanks, agricultural land predominates within the floodplain inside the USIBWC levees. Therefore, special consideration is given to this industry when analyzing potential impacts.

Agricultural-related industries comprised 1.3 percent of total employment in Cameron County in 2000. That same year, agricultural-related industries comprised 4.5 percent of the total employment in Hidalgo County. Agricultural related industries make up 3.2 percent of employment within the region of impact (TWC, 2000).

Cameron County had a reported 902 farms in 1997, comprising 368,528 acres. These farms sold an estimated $79,414,000 in products with an average market value of $88,042 per farm. Approximately 2,390 farm workers were employed in Cameron County in 1997, an estimated 2.6 workers per farm (USDA, 1997).

Table 3-10 Major Employment Sectors in Cameron County, Hidalgo County and the Region of Impact

	Cameron County	Hidalgo County	Project Area
Agriculture	1,525	7,965	9,490
Construction	3,950	8,538	12,488
Manufacturing	12,967	12,222	14,189
Transportation	5,250	6,552	11,802
Trade	26,011	42,532	68,543
Finance, Insurance & Real Estate	3,757	5,210	8,967
Services	30,849	38,369	69,218
Federal, State & Local Government	25,046	40,777	65,823

Source: TWC, 2000

In 1997, Hidalgo County had 1,373 farms consisting of 635,884 acres. The farms in Hidalgo County sold an estimated $197,235,000 in products, an average market value of $143,652 per farm. Hired farm workers were reported at 5,335, averaging approximately 3.9 workers per farm (USDA, 1997).

Agricultural industries in the LRGV often hire migrant and seasonal workers. A seasonal worker is an individual whose principal employment (51 percent or more) is on a seasonal basis. The definition of a migrant worker is similar; however, a migrant worker establishes a temporary abode for the purpose of employment. Migrant and seasonal farm workers within the region of impact are estimated at 49,719 (Larson, 2000). This is approximately 15 percent of the total labor force within the region of impact.

There is an estimated 9,219 migrant and seasonal farm workers in Cameron County, comprising approximately seven percent of the county labor force. Eighty-seven percent (8,012) of these workers are migrants, while seasonal workers comprise of 1,207 or 13 percent (Larson, 2000).

Hidalgo County has an estimated 40,500 migrant and seasonal farm workers. These workers comprise approximately 20 percent of the county labor force. In Hidalgo County, 31,894, or approximately 79 percent of these farm workers are migrant, while 8,606 or 21 percent are seasonal workers (Larson, 2000).

3.2.1.4 Income

The USCB defines per capita income as the average income computed for every man, woman, and child in a particular group. Per capita income within the region of impact is lower than both the national and state averages. In 1999, per capita income among the two counties averaged $13,809; approximately 48 percent of the $28,546 national average and approximately 52 percent of the $26,834 Texas State average. Cameron County had the higher per capita income of $14,280, 50 percent of the national average and 53 percent of the Texas State average. With an average of $13,339, Hidalgo County per capita income stood at 50 percent of the state average and approximately 47 percent of the national average (USDC, 1999).

Median household income, as defined by the USCB, is based on individual households, families and unrelated resident individuals of 15 years or older with an income. The median household income in the region of impact was $20,866 in 1999. This was approximately 56 percent of the $37,005 national median household income and approximately 61 percent of the $34,478 Texas state average. Cameron County had a median household income of $21,699, approximately 59 percent of the national average and 63 percent of the state average. Hidalgo County had a median household income of $20,034, approximately 58 percent and 54 percent of the state and national median household income, respectively. The most recent data available for per capita income (1999) and median household income (1997) are provided for each county and the region of impact in Table 3-11.

Table 3-11 Income Data for Cameron and Hidalgo Counties and the Region of Impact

	Per Capita Income[a]	Median Household Income[b]
Cameron County	$14,280	$21,699
Hidalgo County	$13,339	$20,034
Region of Impact	$13,809	$20,866

[a]USDC, Bureau of Economic Analysis, Regional Economic Income System, BEARFACTS, 1999
[b]USCB, Census 2000, 1997 model-based estimate

3.2.1.5 Housing

The total number of housing units within the region of impact was reported as 312,312 in 2000. Among the total housing units, 254,091 (approximately 81.4 percent) were occupied, leaving an 18.6 percent vacancy rate within the region of impact. The percentage of vacant housing units is almost identical for both Cameron and Hidalgo counties, 18.7 percent and 18.6 percent, respectively (USCB, 2000). Total housing units and vacancy rates for each county and the region of impact are presented in Table 3-12.

Table 3-12 Housing Data for Cameron and Hidalgo Counties and the Region of Impact

	Total Housing Units	Occupied Housing Units	Percent of Vacant Housing Units
Cameron County	119,654	97,267	18.7%
Hidalgo County	192,658	156,824	18.6%
Region of impact	312,312	254,091	18.6%

Source: USCB, Census 2000

3.2.1.6 Community Infrastructure

Education

Cameron County has ten public school districts: Brownsville Independent School District, Harlingen Consolidated Independent School District, La Feria Independent School District, Los Fresnos Consolidated Independent School District, Point Isabel Independent School District, Rio Hondo Independent School District, San Benito Consolidated Independent School District, Santa Maria, Santa Rosa and South Texas Independent School District. Approximately 82,398 students were enrolled in these public schools during the 1999-2000 school year. Together, Cameron County school districts had an average student to teacher ratio of 14.3 students per teacher (TEA, 2000).

Hidalgo County has 15 public school districts: Donna Independent School District, Edcouch-Elsa Independent School District, Edinburg Consolidated School District, Hidalgo Independent School District, La Joya Independent School District, La Villa Independent School District, McAllen Independent School District, Mercedes Independent School District, Mission Consolidated Independent School District, Monte Alto Independent School District, Pharr-San Juan-Alamo Independent School District, Progreso Independent School District, Sharyland Independent School District, Valley View Independent School District and Weslaco Independent School District. In Hidalgo County, approximately 138,789 students were enrolled in public schools during the 1999-2000 school year. The student to teacher ratio for Hidalgo County schools was approximately 15 students for every teacher (TEA, 2000).

Police Protection

There are 15 police agencies in Cameron County, including the County Sheriff's Department and police departments of municipalities. There are an estimated 557 commissioned personnel working in police protection (TA, 2001). Approximately one police officer is available for every 602 residents in Cameron County.

Hidalgo County has an estimate of 19 police agencies, including the County Sheriff's Department and police department municipalities. Approximately 894 commissioned

personnel work in police protection (TA, 2001). There is approximately one police officer available for every 637 residents in Hidalgo County.

The McAllen Sector of the United States Border Patrol (USBP) covers 18 counties, including Cameron and Hidalgo counties. Five of the nine stations within the McAllen sector are located within these two counties; including Brownsville, Port Isabel, Mercedes, Harlingen, and McAllen. Approximately 1,500 border patrol officers are stationed within the McAllen Sector, with approximately 900 of these officers working in Cameron and Hidalgo counties. A majority of these officers patrol the border along the Rio Grande (Quevedo, 2002).

Fire Protection

Cameron County is composed of individual fire departments for each city and town. There are approximately 126 firefighters working in the city of Brownsville (BCC, 2001a). Harlingen Fire Department has approximately 102 firefighters and neighboring San Benito has approximately 24 firefighters (Harlingen, 2001; San Benito, 1999). There are a total of 252 firefighters within the major metropolitan areas of Cameron County. With a population of 220,730 within the Brownsville-Harlingen-San Benito metropolitan area, approximately one firefighter is available for every 876 people (USCB, 2000).

Hidalgo County is also composed of individual fire departments for each city and town. The Edinburg Fire Department has an all-volunteer staff of approximately 67 firefighters (EVFD, 2001). The Mission Fire Department has 31 firefighters, including one chief (MFD, 2001). The McAllen Fire Department has 128 certified firefighters (McFD, 2001). With a total of 226 firefighters in the McAllen-Edinburg-Mission metropolitan area (population 183,532), one firefighter is available for every 812 people (USCB, 2000).

Hospitals and Medical Care

Five hospitals serve Cameron County with approximately 1,125 beds, providing one bed for every 298 residents (TA, 2001; TDH, 2001). Healthcare facilities in Cameron County have approximately 401 practicing physicians, or one physician per 836 people. Cameron County has 1,482 Registered Nurses (RN), or one nurse available per 226 residents (TA, 2001).

Hidalgo County has 11 hospitals, including a medical heart hospital, a behavioral health center and a cancer treatment center (TDH, 2001). Together, these facilities have over 1,398 beds, providing one hospital bed for every 407 people. Hidalgo County has approximately 595 practicing physicians, or one doctor for every 957 residents. The healthcare facilities in this county have a total of 2,266 RNs. One nurse is available for every 251 people in Hidalgo County (TA, 2001).

3.2.1.7 Colonias

Concentrated along the United States-Mexico border, colonias are rural and unincorporated subdivisions with substandard housing, comprising poverty pockets. Colonias are characterized by makeshift structures (often of wood, cardboard or crates),

unpaved roads, inadequate plumbing, sewage disposal, and potable water supplies. (TDHR, 1988; HUD, 2000; FRB, 2001).

The remote locations of border colonias make it difficult to acquire accurate and consistent records of residents. Though colonias in Texas have been studied to a greater extent than in other border-states, recent information is still lacking. Texas is known to house more than 1,400 colonias with an estimated population between 340,000 to 400,000 (FRB, 2001; BLIHC, 2001). Approximately 60 percent of Texas colonias are located in the LRGV (BLIHC, 2001).

Hidalgo County has the greatest number of colonias in the state with the largest population of colonia residents. Colonia residents represented approximately 34 percent of the county population in 1994 (Pepin, 1998). With 868 colonias and an estimated population of 136,462, Hidalgo County does not have enough local tax base to provide sufficient water and sewer services (FRB, 2001; TWDB, 1996).

Cameron County houses 111 colonias with a total population of approximately 39,000 (Pepin, 1998). Colonia sizes in Cameron county range from 19 people to the most populated Texas colonia of 3,690 people (TWDB, 1996). Colonia residents represented approximately 15 percent of the Cameron County population in 1994 (Pepin, 1998).

People of Hispanic origin dominate colonias. Ninety-eight percent of colonia residents in the LRGV are Hispanic. Spanish is the primary language for over two-thirds of colonia residents. Education levels are low and dropout rates are high. Approximately 86 percent of colonia residents in the LRGV did not complete high school (TDHR, 1988; BLIHC, 2001).

Many migrant and seasonal workers along the Texas border reside in colonias. Approximately 45.5 percent of employed colonias residents in the LRGV are field workers and approximately 14.4 percent are construction workers. This type of work is often temporary or seasonal resulting in unemployment rises and falls within these communities (TDHR, 1988; BLIHC, 2001).

Median annual income is $7,000 to $11,000 per colonia household (BLIHC, 2001). This is approximately half of the median annual income in the region of impact ($20,866), and less than a third of the state of Texas ($34,478) or the United States median income ($37,005; USCB, 2000). Almost 48 percent of working colonia residents in the LRGV earn $3.35 per hour or less (TDHR, 1988).

Many colonias do not have adequate sewer systems. Approximately 69 percent of colonia residents in the LRGV have septic tanks, 8 percent use cesspools, 12 percent use outhouses, and approximately 11 percent use other means of wastewater disposal. Some colonias do not have access to potable water. Among colonias located in the LRGV, approximately 6 percent drink untreated water and approximately 6 to 7 percent wash dishes and clothes in untreated water. Some colonia residents also bathe and cook with untreated water, approximately 6 percent and 7 percent, respectively. (TDHR, 1988).

Lack of adequate infrastructure make colonias an ideal location for the proliferation of disease and public health affliction. Waterborne diseases are common in colonias. The rate of tuberculosis is 6.1 percent and hepatitis is 9.6 percent. Due to the floodplain

locations of some colonias, incidence of flooding is common, adding to the health threats. Approximately 45 percent of colonia households in the LRGV have reported flooding (TDHR, 1988; FRB, 2001).

3.2.2 Environmental Justice

Under Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, dated February 11, 1994), federal agencies are required to address significant adverse human health and environmental effects on minority and low-income populations. The environmental justice section of this document is reported in compliance with EO 12898.

Relevant demographic data for Cameron County and Hidalgo County, Texas, are provided to assess any disproportionately high minority or low-income populations within the region of impact. Populations within Cameron County and Hidalgo County will be compared with the general population of Texas to determine any disproportionately high minority or low-income populations.

The EO 12898 considers a minority as an individual belonging to one of the following population groups: Hispanic, Black (not of Hispanic origin), American Indian or Alaskan Native, or Asian or Pacific Islander. Under this order, minority populations are to be identified if (i) the minority population within the affected area exceeds 50 percent or (ii) if the minority population percentage is meaningfully greater than the percentage in the general population (CEQ, 1997).

Cameron County and Hidalgo County both have disproportionately high minority populations, exceeding 50 percent. Minority populations comprise 85.7 percent in Cameron County and 89.8 percent in Hidalgo County. These ratios exceed the 46.9 percent minority population in Texas (USCB, 2000).

Minority populations of Hispanic nationality dominate in both Cameron and Hidalgo Counties at 84.3 percent and 88.0 percent respectively (USCB, 2000). Table 3-13 presents the 2000 ethnic percentages for Cameron and Hidalgo Counties and the State of Texas.

The USCB official poverty assessment weighs income before taxes and excludes capital gains and noncash benefits (such as public housing, Medicaid, and food stamps). Poverty rates indicate low-income populations are relatively high within both counties (USCB, 2000). Such counties along the United States-Mexico border are often havens for colonias (refer to socioeconomic section), where significant low-income populations reside (TDHR, 1988). The percentage of people living below poverty in both counties is greater than the 16.7 percent in Texas. Hidalgo County has a 37.6 percent poverty rate followed by Cameron County with a 35.3 percent poverty rate (USCB, 2000). Both Cameron County and Hidalgo County have disproportionately high low-income populations in relation to the state of Texas. The most recent data available for county and state poverty rates (1997) are provided in Table 3-14.

Table 3-13 Minority Population Percentages for Cameron County, Hidalgo County, and Texas

	Cameron County	Hidalgo County	Texas
White	14.5%	10.4%	52.4%
Hispanic	84.3%	88.3%	32.0%
Black	0.5%	0.5%	11.5%
Asian[a]	0.5%	0.6%	2.8%
American Indian[b]	0.4%	0.4%	0.6%
Total Minority	85.7%	89.8%	46.9%

Source: USCB, 2000
[a]Asian includes Pacific Islander and Native Hawaiian
[b]American Indian includes Alaskan Native

Table 3-14 Poverty Rates for Cameron County, Hidalgo County, and Texas

	Cameron County	Hidalgo County	Texas
Percent Persons Below Poverty	35.3%	37.6%	16.7%

Source: USCB, Census 2000, 1997 model-based estimate

3.3 LAND USE

This section summarizes the existing land uses within the project area of Hidalgo and Cameron counties. Land use descriptions will be limited to the project area within the levees of the Rio Grande.

3.3.1 Land Use Classification

The major land uses are categorized as urban or built-up land, agricultural land, rangeland, barren land, forest land, water and wetlands. These major land use categories are defined below.

Urban or Built-up Land- Land uses within this classification include commercial and industrial, typically concentrated in central urban cores along major streets and highways, adjacent to residential areas. Residential areas comprising single-family and

multi-family occupancy are also included in this classification. Other urban land uses include transportation, communication, utilities, mixed and other categories.

Agricultural Lands- Specific land uses within this classification include croplands, pasture, orchards, groves, vineyards, nurseries, ornamental horticulture, confined feeding operations and other land used for agricultural purposes. The land may be irrigated or non-irrigated. Prime farmland may or may not be included depending on its existing and historical land use.

Rangeland- Rangeland use includes the grazing of cattle, horses, sheep, goats and other domestic animals. This is based on the presence of natural herbaceous rangeland, shrubs or brush and mixed rangeland.

Barren Lands- Barren land includes areas with sparse vegetation cover during most of the year. Sand areas, strip mines, quarries, gravel pits and transitional areas are also included.

Forest Land- This land use classification is comprised of deciduous and evergreen stands of vegetation. The forest may or may not be suitable for the commercial harvest of timber. Tree canopy cover would usually exceed 50 percent.

Water- Land identified as water includes streams and canals, naturally occurring and man-made lakes and reservoirs.

Wetland- This land use classification includes forested and non-forested wetlands.

3.3.2 Existing Land Use

A total of 43,210 acres make up the project area. Land uses include well-developed urban centers of commerce, particularly in the region of Brownsville, areas of intensive agricultural activities, forest land and state and federally protected land. The overall proportions of land uses in the project area are illustrated in Figures 3-9 through 3-15. Acreage associated with each land cover category is summarized in Table 3-15.

Agriculture is the largest land use category, accounting for approximately 79.3 percent of the project area. Croplands and pastures, comprising 99 percent of agricultural land use, dominate the project area. Ninety percent of farm cash receipts in Hidalgo County are from crops. Grain sorghums, sugarcane, vegetables, citrus and cotton are the principal crops produced in this county. Cotton and grain sorghums are the principal crops produced in Cameron County.

Figure 3-9
Land Use/Land Cover Classification
USIBWC Alternative
Vegetation Maintenance Practices EIS

Legend

River Mile Markers

Rio Grande

Levee Locations

Land Use Codes

Urban or Built-up Land
- 11 - Residential
- 12 - Commercial and Services
- 13 - Industrial
- 14 - Transportation, Communications, Utilities
- 16 - Mixed Urban or Built-up Land
- 17 - Other Urban or Built-up Land

Agricultural Lands
- 21 - Cropland and Pasture
- 22 - Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticulture
- 23 - Confined Feeding Operations
- 24 - Other Agricultural Lands

Rangeland
- 31 - Herbaceous Rangeland
- 32 - Shrub and Brush Rangeland
- 33 - Mixed Rangeland

Forest Land
- 41 - Deciduous Forest Land
- 42 - Evergreen Forest Land

Water
- 51 - Streams and Canals
- 52 - Lakes
- 53 - Reservoirs

Barren Lands
- 73 - Sand Areas Not Beaches
- 75 - Strip Mines, Quarries, Gravel Pits
- 76 - Transitional Areas

Wetlands
- 62 - Non-Forested Wetland

Source: Texas Natural Resource Information System (TNRIS)

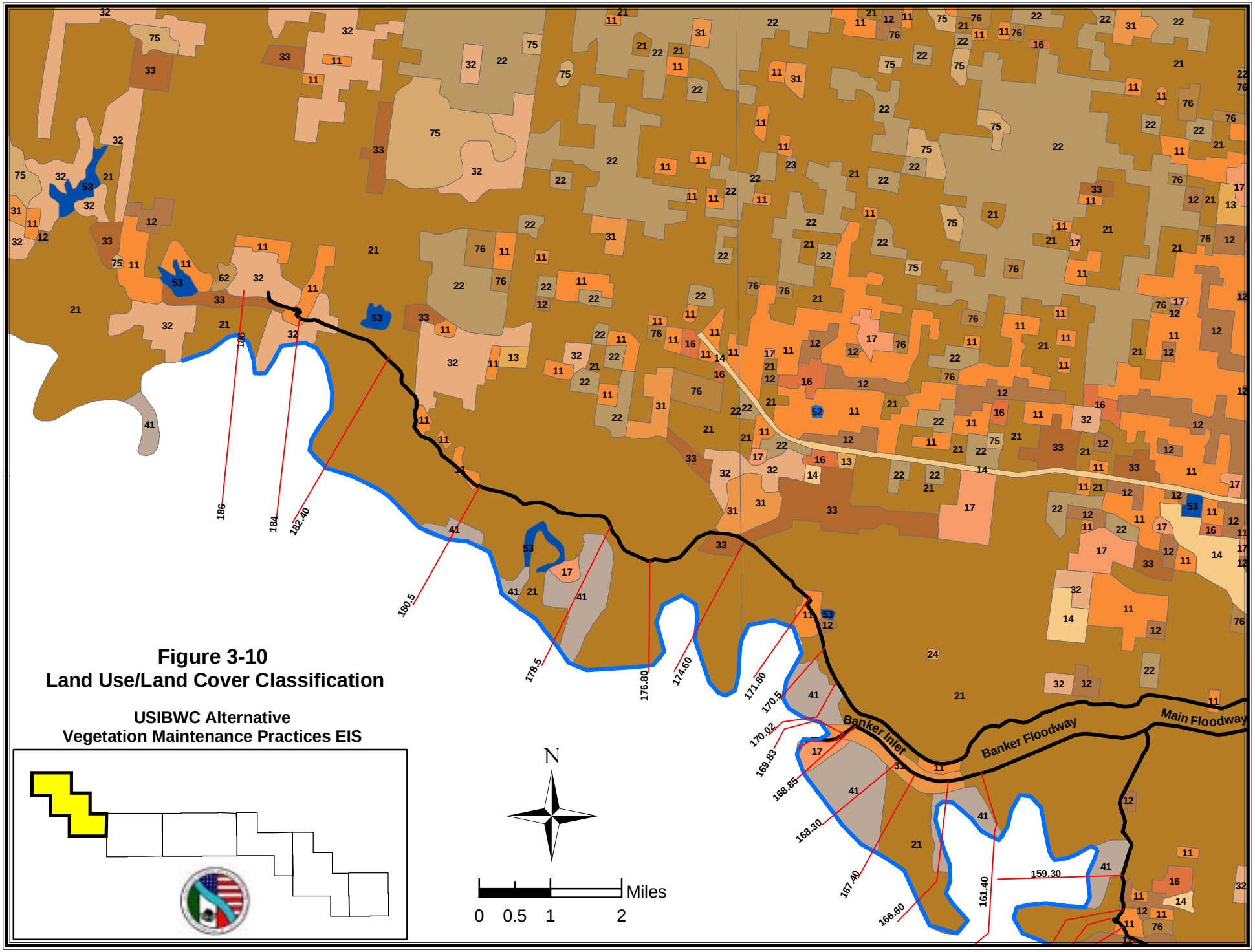


Figure 3-10
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

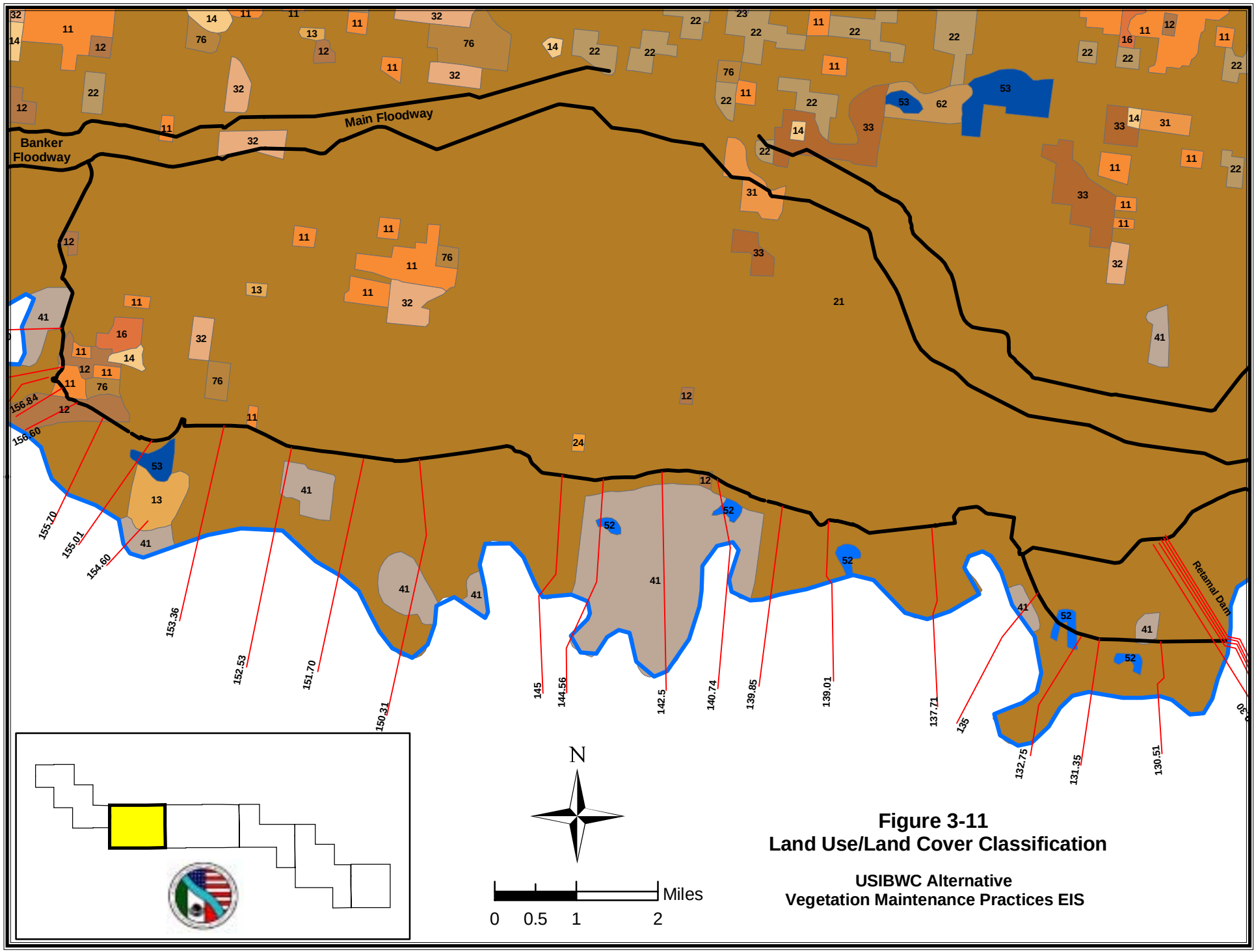


Figure 3-11
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

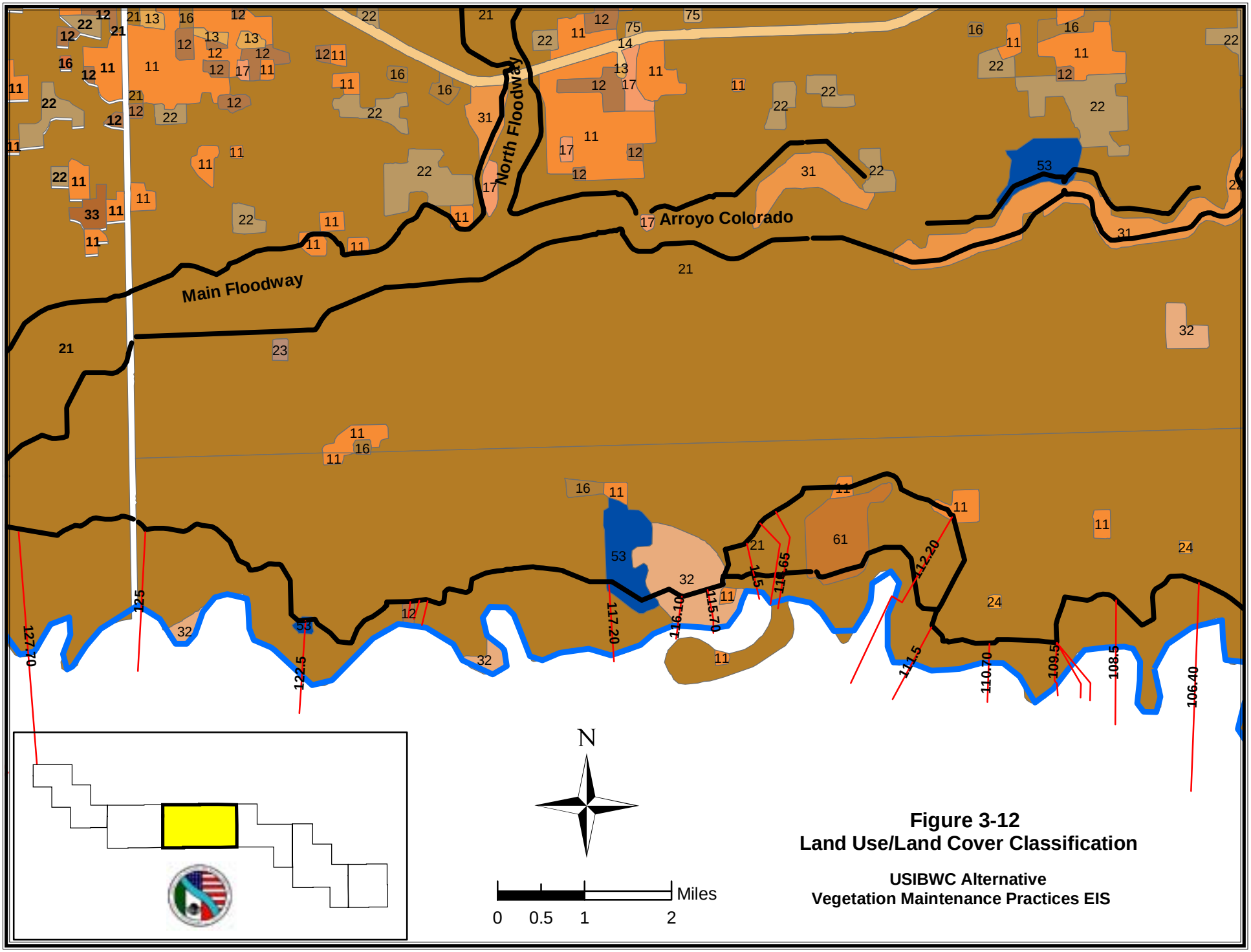


Figure 3-12
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

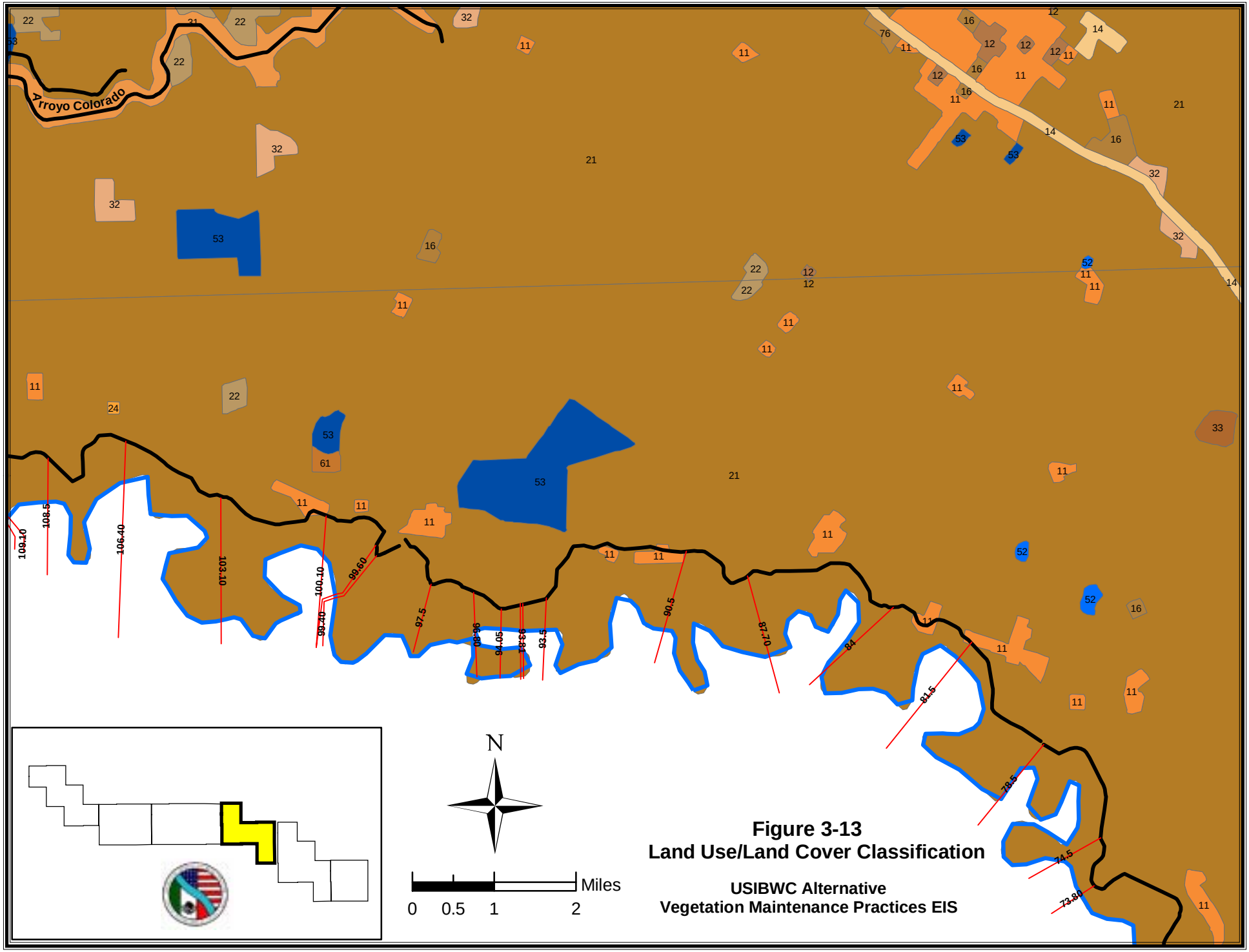


Figure 3-13
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

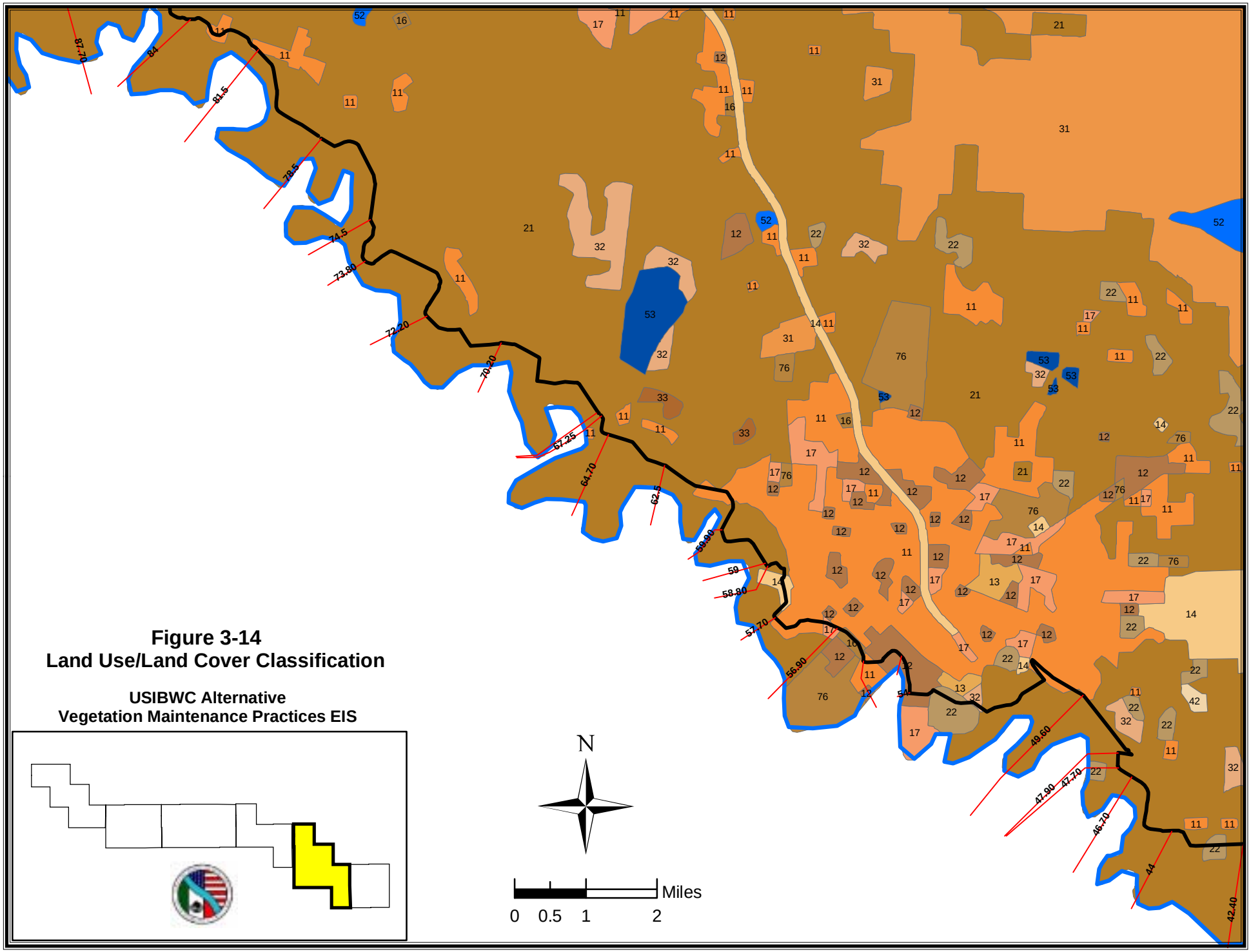


Figure 3-14
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

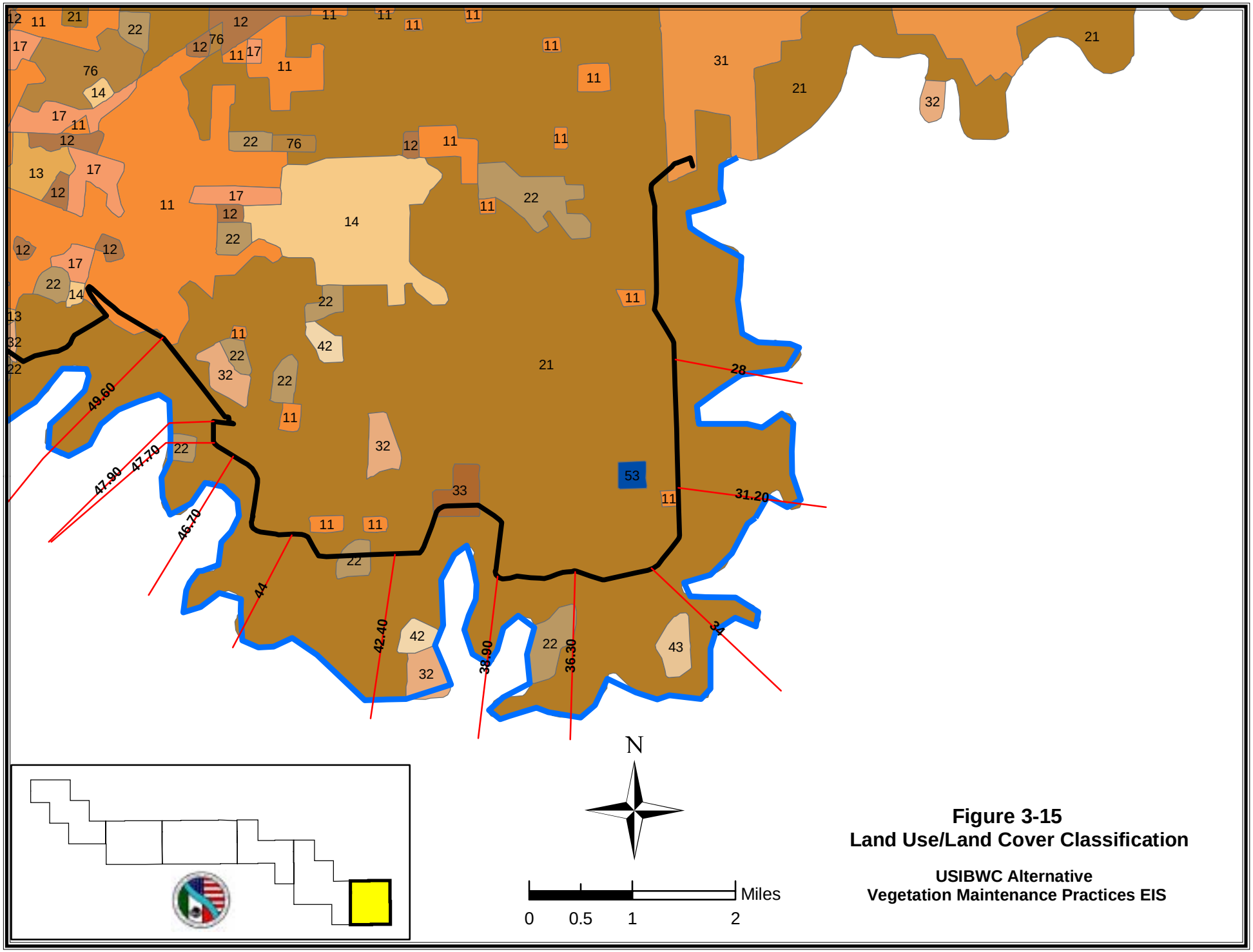


Figure 3-15
Land Use/Land Cover Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

Only 2.4 percent of the project area comprise urban or built-up land. Few residential areas exist within the project area, accounting for approximately 0.2 percent of land use. The second largest land use in the project area, next to agriculture, is forest land.

Table 3-15 Land Use Classification of the Project Area

	Acres	Percent Cover
Agriculture	**34,277**	**79.3%**
(21) Cropland and Pasture	33,917	78.5%
(22) Orchards, Groves, etc.	360	0.8%
Urban or Built-up	**1,024**	**2.4%**
(11) Residential	102	0.2%
(12) Commercial and Services	279	0.7%
(13) Industrial	265	0.6%
(14) Transportation, Communications, Utilities	0.1	0.0%
(17) Other	378	0.9%
Forest Land	**5,961**	**13.7%**
(41) Deciduous Forest	5,808	13.4%
(42) Evergreen Forest	55	0.1%
(43) Mixed Forest	98	0.2%
Rangeland	**641**	**1.5%**
(31) Herbaceous	32	0.1%
(32) Shrub and Brush	550	1.3%
(33) Mixed	59	0.1%
Barren Land	**516**	**1.2%**
(76) Transitional Areas	516	1.2%
Water	**371**	**0.8%**
(52) Lakes	186	0.4%
(53) Reservoirs	185	0.4%
Wetlands	**420**	**1.0%**
(61) Forested Wetlands	420	1.0%
Total	**43,210**	**100%**

Source: Texas Natural Resource Information System (TNRIS), 2001

Among the 43,210 acres within the project area, 8,311 acres consist of federal or state protected lands. Twenty-nine NWRs, three WMAs, and one Texas State Park lie within the project area. Figures 3-16 through 3-21 illustrate the locations of NWRs, WMAs, and Texas State Parks within the project area.

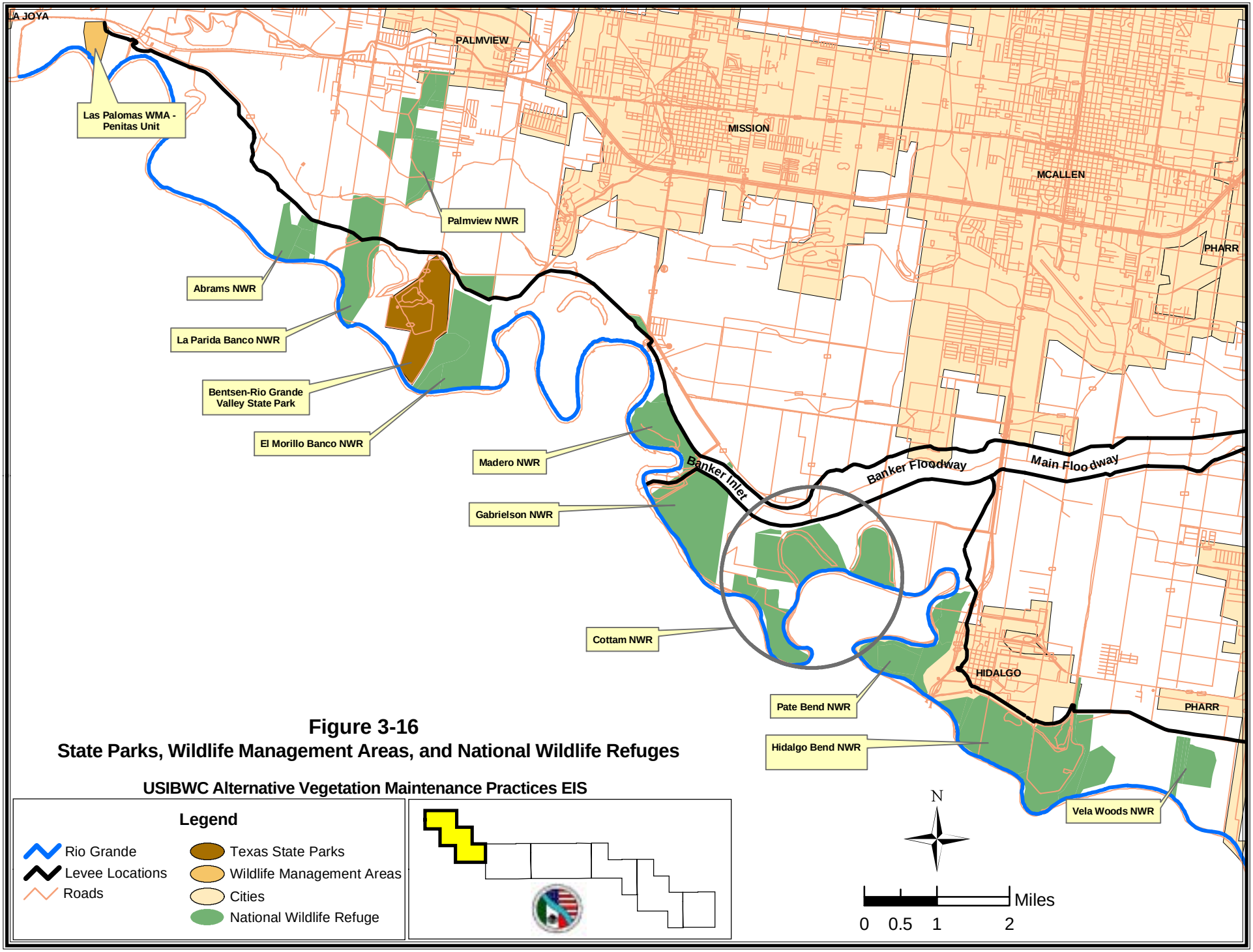


Figure 3-16
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

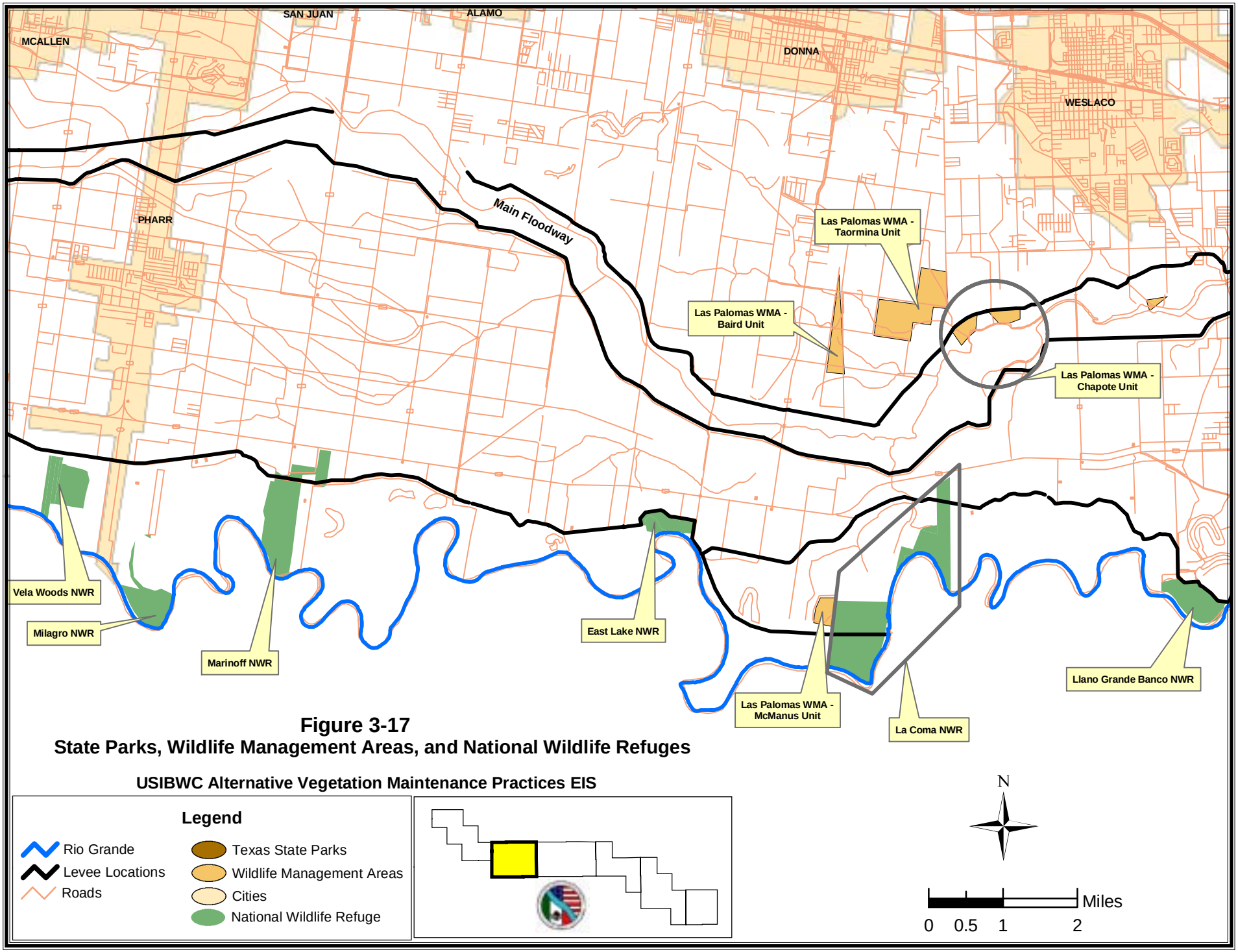


Figure 3-17
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

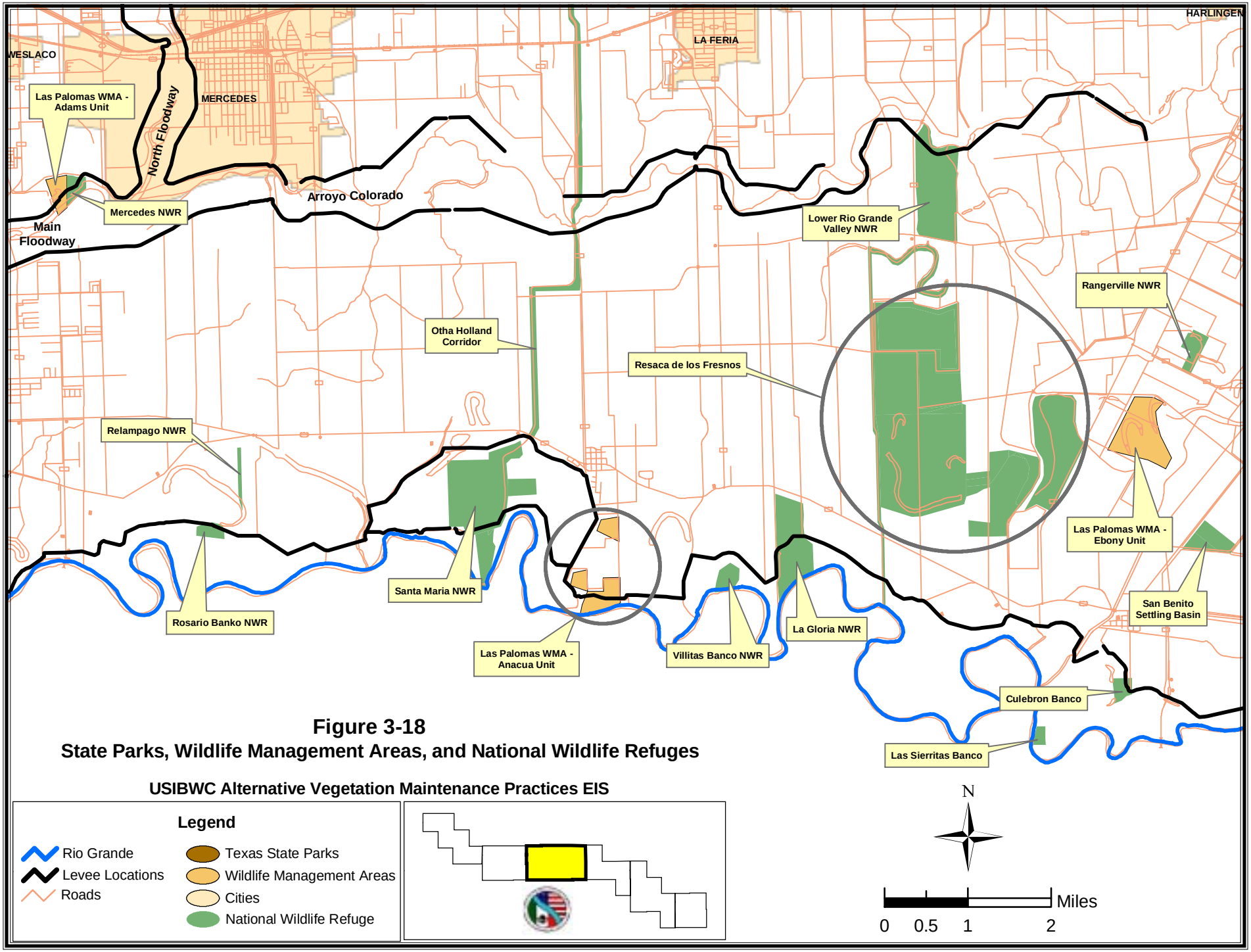


Figure 3-18
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

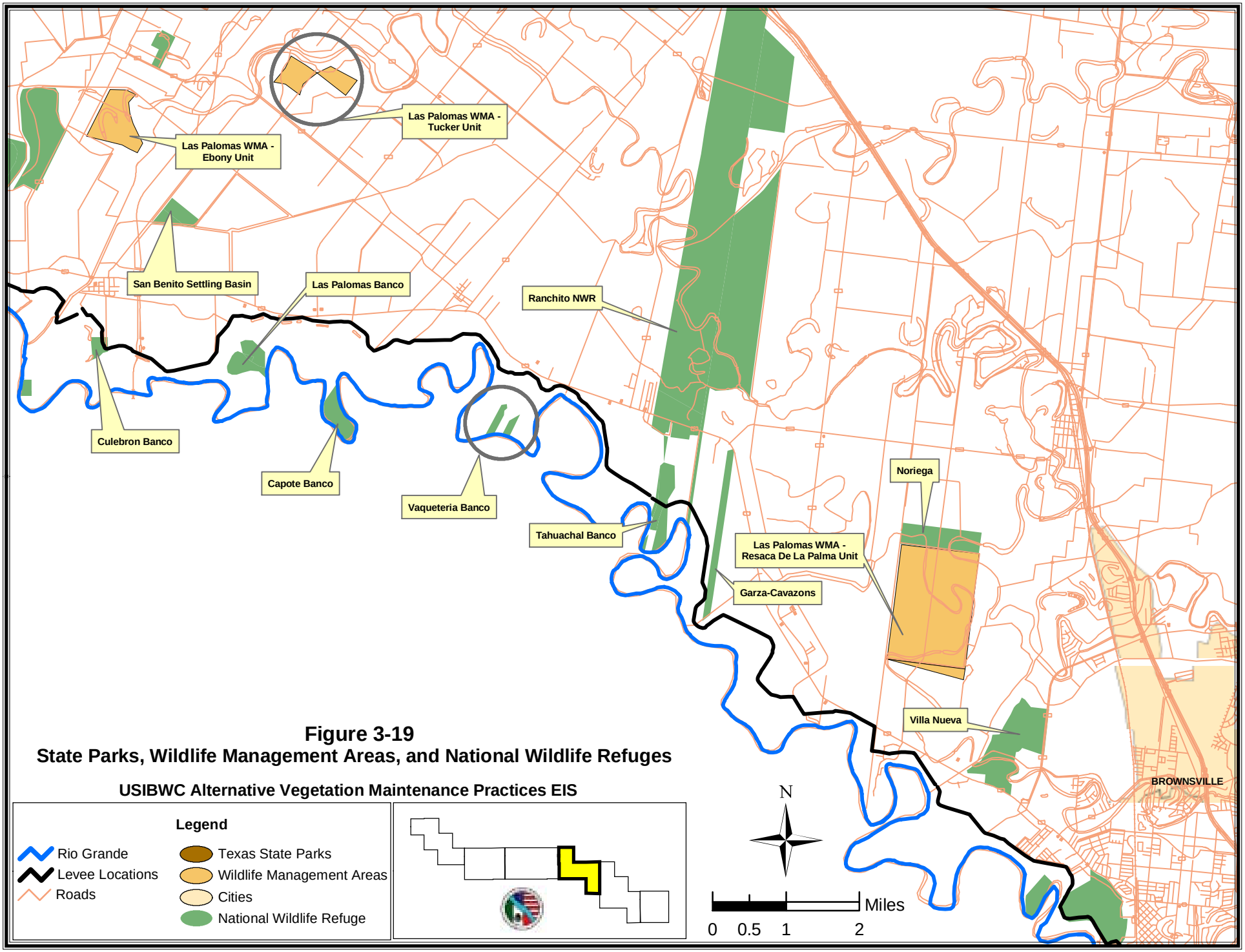


Figure 3-19
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

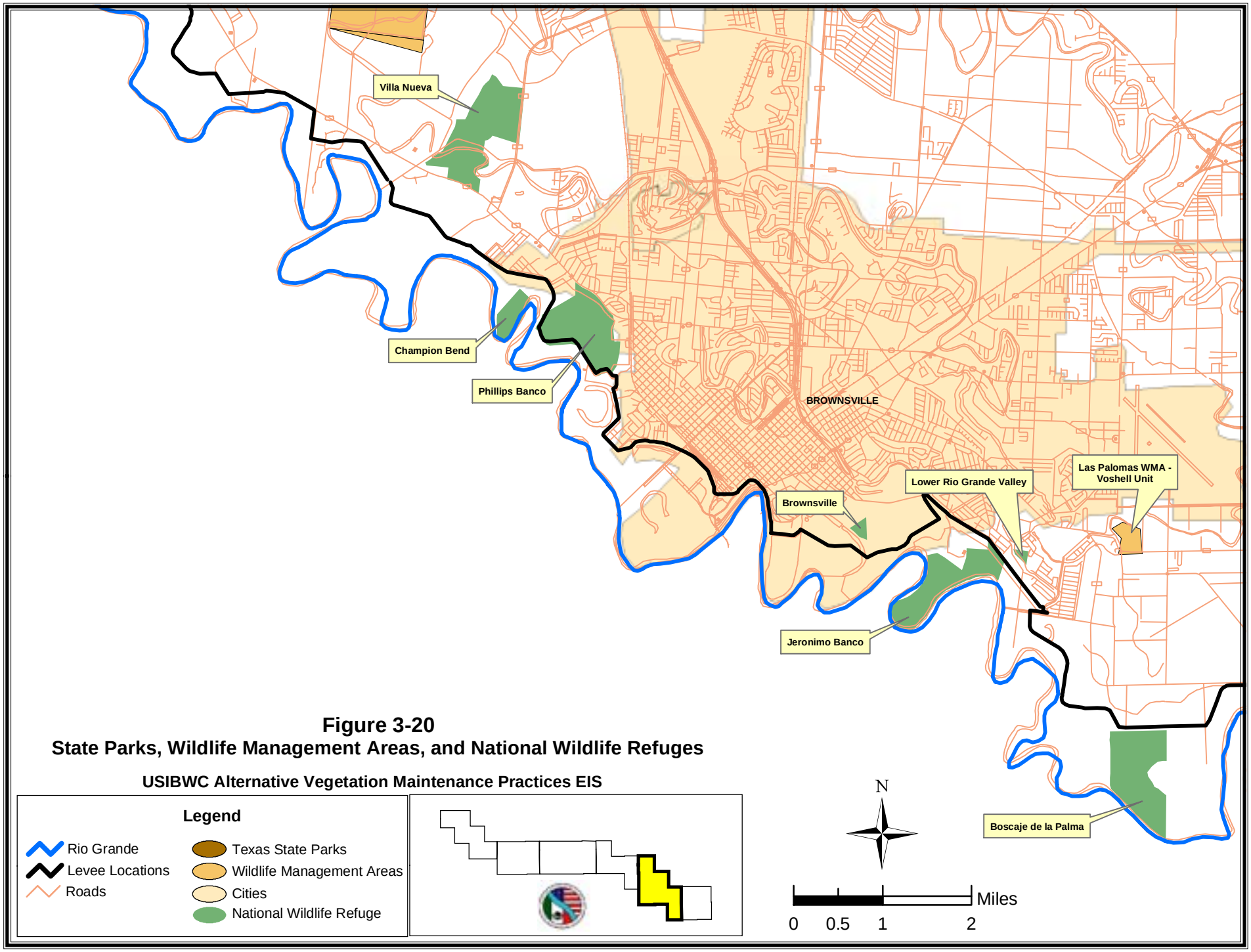


Figure 3-20
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

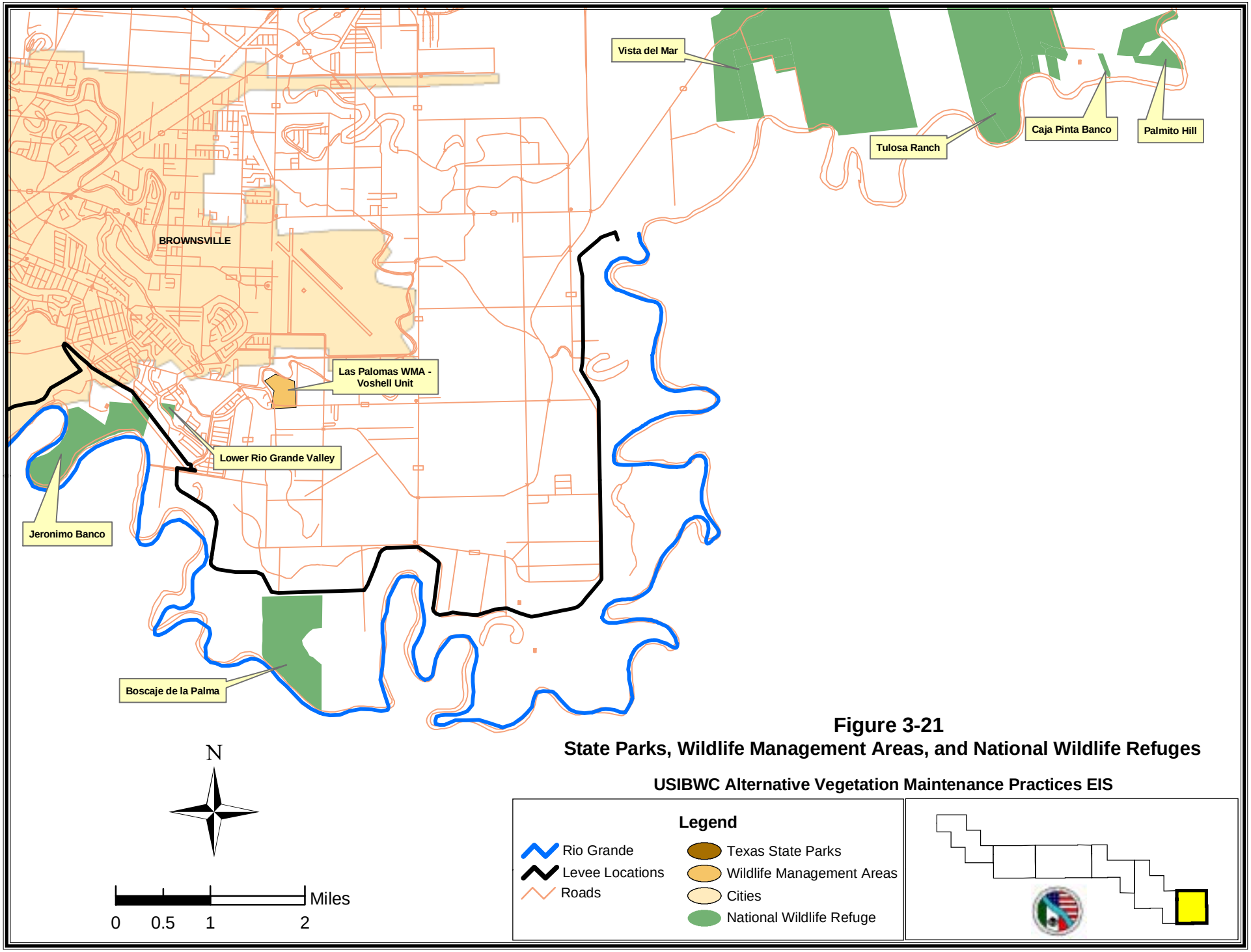


Figure 3-21
State Parks, Wildlife Management Areas, and National Wildlife Refuges

USIBWC Alternative Vegetation Maintenance Practices EIS

3.4 WATER RESOURCES

3.4.1 Major River Basins and Reservoirs/Lakes

The headwaters of the Rio Grande originate in the San Juan Mountains of Colorado and flow approximately 1,888 miles to the Gulf of Mexico. The floodplain is approximately 6.2 miles wide in Hidalgo County and widens into a delta in eastern Cameron County (UT-Pan Am., 1995). A small portion of surface water from the LRGV flows into the Rio Grande. The majority of water flows northeast into storm water systems, which drain into the Laguna Madre.

Three dams constructed across the lower reaches of the Rio Grande affect water resources within the project area. These dams include Falcon Dam, Anzalduas Dam, and Retamal Dam. Falcon Dam is located farthest upriver, outside the project area, but impacts water quantity and quality within the project area. Falcon Reservoir, impounded behind Falcon Dam, has a maximum storage capacity of approximately three million acre-feet (ac-ft; IBWC, 2001a). USIBWC regularly releases water from Falcon Reservoir for domestic, industrial and agricultural uses throughout the LRGV. Falcon Dam and Falcon Reservoir are also operated to provide flood control by storing floodwaters and releasing controlled flows after small and moderate flood events.

Anzalduas Dam and Retamal Dam are both located on the Rio Grande within the project area. Anzalduas Dam is located upstream of Retamal Dam at RM 169.14. Retamal Dam is located at RM 129.22. Anzalduas Dam diverts a nominal volume of water to Mexico for agricultural uses. However, the primary purpose of both dams is to divert flood flows into the United States and Mexico to protect communities along the lower reaches of the Rio Grande. Anzalduas Dam is operated by the USIBWC, diverting flows into the United States interior floodway system. The MxIBWC operates Retamal Dam, diverting flows into the Mexican off-river floodway system. The USIBWC and MxIBWC coordinate the operation of these dams to ensure both dams divert equal flows into the respective countries during significant flood events.

The design flood event for the LRGFCP is an approximate 100-year flood, with a flow of 250,000 cfs at Rio Grande City. During the design flood, both Anzalduas Dam and Retamal Dam will divert 105,000 cfs each into the United States and Mexico, respectively. Flow diversion during the design flood will limit flood flows through the Brownsville-Matamoros region to 20,000 cfs.

The IBWC has measured average daily flow rates for the Rio Grande, the Main Floodway, the North Floodway, and the Arroyo Colorado Floodway. Records dating from 1958 show dramatic variations between the lowest and highest reported flow rates. Table 3-16 presents the extreme low and high flow rates reported between 1958 and 2001.

Table 3-16 Low and High Flow Data for Points in the Rio Grande, Main Floodway, North Floodway, and Arroyo Colorado

Location	Low Flow (m^3/s)	High Flow (m^3/s)
Rio Grande below Falcon Dam near Falcon, Texas	0.50	2160.00
Rio Grande below Anzalduas Dam near Reynosa, Mexico	0.00	3430.00
Rio Grande near Brownsville, Texas (data only available to 1964)	0.00	872.00
Main Floodway south of Weslaco, Texas (very limited data)	5.64	340
North Floodway west of Mercedes, Texas (very limited data)	0.00	1700.00
Arroyo Colorado Floodway south of Harlingen, Texas	0.00	1550.00

Source: IBWC, 2001b; http://www.ibwc.state.gov/wad/histflo1.htm

3.4.2 Surface Water Quality

TCEQ is the regulatory body in the state of Texas in charge of the designation of surface water uses. The TCEQ Surface Water Quality Monitoring Program (SWQMP) recognizes the geologic and hydrologic diversity of the state by dividing major river basins, reservoirs, bays, and estuaries into defined segments (referred to as classified segments). The project area is located in parts of Segments 2301 and 2302. Segment 2301 is designated as "Rio Grande Tidal," extending upriver from the mouth of the river at the Gulf of Mexico, to a point 6.7 miles downstream of the International Bridge at Brownsville, Texas. This segment is characterized as a narrow and flat watershed that extends only a few miles inland on either side of the river (TNRCC, 2001). Segment 2302, designated as "Rio Grande Below Falcon Reservoir," extends 231 miles from a point 6.7 miles downstream of the International Bridge at Brownsville, Texas, to Falcon Dam in Starr County. Flow from the upstream main stem to this segment is regulated by releases from the International Falcon Reservoir (TNRCC, 2001).

TCEQ sets numerical water quality criteria to ensure protection for the assigned uses. The Texas Surface Water Quality Standards (Texas Administrative Code [TAC] 307.1-307.10; TNRCC, 2001) contain general standards that apply to all surface waters in the state. Also, segment-specific standards identify appropriate uses (aquatic life, contact or non-contact recreation, drinking water, etc.) and determine the degree of support (fully, partially, or non-supporting) for these uses. The standards designate upper and lower limits for common indicators (criteria) of water quality, such as dissolved oxygen, temperature, pH, dissolved minerals, and fecal coliform bacteria. Criteria and control procedures are established for specific toxic substances and total toxicity.

The TCEQ SWQMP and the United States Geological Survey (USGS) National Stream Quality Accounting Network (NASQAN) program collect surface water quality data from a series of monitoring stations. There is one monitoring station for Segment 2301 and 12 monitoring stations for Segment 2302.

According to the most recent draft, 2002 State of Texas Water Quality Inventory for the Rio Grande Basin, Segment 2301 is characterized by excessive algal growth. Chlorophyll *a* levels were elevated in one-third of the samples taken 25 miles upstream of

State Highway 4. Other water quality standards, including pH, water temperature, dissolved oxygen and fecal coliform, are fully supported. The segment's designation for overall aquatic life use is also fully supported (TNRCC, 2001).

Concerns within Segment 2302 include elevated nutrient enrichment, particularly total phosphorus, from samples taken 2.5 miles downstream of Falcon Dam to Fronton. Public water supply concerns are an issue from Pharr International Bridge to downstream of the Santa Ana Wildlife Refuge. Excessive chloride, sulfate, and total dissolved solids (TDS) were found in samples taken along this stretch of the segment. Other water quality standards, including pH, water temperature, dissolved oxygen and fecal coliform, are fully supported along Segment 2302. The segment's designation for overall aquatic life use and recreational use is also fully supported (TNRCC, 2001).

Regionally, water quality has been a concern for a number of years. In 1992, a binational and multi-agency effort, comprised of representatives from TCEQ, USEPA – Region 6, USIBWC, MxIBWC and the Mexico National Water Commission, was initiated to characterize the extent of toxic contamination of the Rio Grande/Rio Bravo and its tributaries along the international reach. The Binational Toxic Substances Study was conducted from the New Mexico/Texas/Chihuahua border (El Paso/Ciudad Juarez area) to the Gulf of Mexico (Brownsville/Matamoros area). Contaminants measured in this two-phased study included arsenic, chromium, copper, nickel, lead, silver, zinc, Aroclor 1260 (PCB), and chlordane. Only chromium, nickel, and arsenic were identified as a concern.

3.4.3 Binational Toxic Substances Study

The Rio Grande/Rio Bravo Toxic Substance Study was a binational and multi-agency effort to characterize the extent of toxic contamination of the Rio Grande/Rio Bravo and its tributaries along the international reach (IBWC, 1994b). The study was conducted from the New Mexico/Texas/Chihuahua border (El Paso/Ciudad Juarez area) to the Gulf of Mexico (Brownsville/Matamoros area), a reach which forms the boundary between Mexico and Texas. Since 1992, there have been two phases of this study. This section will address the presence of hazardous substances in the river sediments. A total of 45 stations were sampled during the Phase 1 study (1992-1993). Six of 45 stations sampled were located within the boundaries of this project area. These stations were all located within the Rio Grande (13, 14, 15, 16, 17, and 18); no tributaries in the project area were sampled. A list of the sampling stations follows:

Station 13 – Rio Grande at Los Ebanos, 34 miles upstream from Anzalduas Dam, at RM 204.30

Station 14 – Rio Grande 0.5 miles downstream from Anzalduas Dam, at RM 169.80

Station 15 – Rio Grande at Hidalgo/Reynosa International Bridge (US 281), at RM 159.50

Station 16 – Rio Grande below Anhelo Drain south of Las Milpas, at RM 151.70

Station 17 – Rio Grande 3.9 miles downstream from San Benito pumping plant and 9.5 miles southwest of San Benito, at RM 96.80

Station 18 – Rio Grande 0.2 miles downstream from El Jardin pumping plant and 7 miles downstream from Brownsville/Matamoros International Bridge (US 77), at RM 48.70

The sediment samples were analyzed for 145 toxic chemicals. Within the project area, the chemicals that were found at concentrations above screening levels were chromium, nickel, and arsenic. Chromium was found at concentrations between 1.0 and 2.9 times the aquatic life threshold at all the sites located within the project area. However, data suggest that most of the chromium present is in a highly insoluble form, such as hydroxide or carbonate salts, making it biologically unavailable. Nickel was found at all six sites located within the project area, at concentrations between 1.1 and 2.9 times the aquatic life threshold. Arsenic was found at a single site within the project area (below Anzalduas Dam), at 1.1 times the aquatic life threshold.

Main stem stations were grouped according to potential for toxic chemical impact (high, slight to moderate, little or no) based on water chemistry, sediment chemistry, fish tissue chemistry, toxicity of water, toxicity of sediment eluates, macrobenthic evaluation, and fish community evaluation. Stations 14 and 16 results were within the slight to moderate potential for toxic chemical impact. Station 14 had four toxic chemicals that exceeded screening levels in water and/or sediment, one toxic chemical that exceeded human health criteria in fish tissue, a high ranking for individual components (listed above), and implications of toxic effects from historical information. Station 16 had two toxic chemicals that exceeded human health criteria in fish tissue, a moderate potential for toxic chemical impact as indicated by the fish community, and a relatively high ranking for individual components. Station 13, 15, 17, and 18 results fell into the little to no potential for toxic chemical impact grouping.

Phase 2, conducted from May to December 1995, provided an assessment of both conventional and toxic pollutants (IBWC, 1998). Sampling consisted of toxic and conventional pollutants in water and sediments, toxic substances in fish tissue, a bioassessment of benthic macroinvertebrate communities, and a bioassessment of fish communities.

During the Phase 2 study, 33 stations were sampled. Although sample stations were not exactly the same in the two phases, all of the six stations (13, 14, 15, 16, 17, and 18) in the project area were included in both studies. Sediment samples were analyzed for 161 toxic chemicals. Results revealed the following toxic compounds exceeded screening levels: Station 13 – silver; Station 14 – copper, lead, nickel, silver, and zinc; Station 15 – silver; Station 16 – copper, nickel, silver, and zinc; Station 17 – lead, nickel, silver, and zinc; and Station 18 – silver and zinc. Based on the analysis of water, sediment, fish tissue, and biological data, the stations were ranked according to potential effects of toxic and conventional pollutants found in Phase 2. Stations 13, 14, 15, 17 and 18 were ranked as low to slight concern for potential effects of toxic and conventional pollutants. Station 16 was ranked as moderate concern due to sediment concerns.

3.4.4 Surface Water Uses and Yields

Surface water usage from 1993 to 1997 in Cameron and Hidalgo counties is quantified in Table 3-17. The major use of Rio Grande water in the LRGV is for irrigation purposes, followed by municipal uses.

3.4.5 Groundwater

The Gulf Coast Aquifer is the major aquifer within the LRGV, ranging in age from the Miocene to Recent. The system underlies an area extending from Mexico to Louisiana, approximately 100 miles inland from the coastline. The Gulf Coast Aquifer consists of intermingled beds of sand, silt, clay and gravel and includes the Chicot, Evangeline, and the Jasper aquifer. Large withdrawals for irrigation, public supply and industrial uses have resulted in saltwater encroachment in some coastal areas. Dissolved solids typically range from 300 to 1,000 mg/L (USGS, 1984).

Table 3-17 Surface Water Uses and Quantities (ac-ft) Used in Cameron and Hidalgo Counties between 1993 and 1997

County	Year	Population	Municipal	Manufacturing	Power	Irrigation	Mining	Livestock
Cameron	1993	284,392	50,838	766	1,824	253,613	0	1,293
	1994	292,474	49,646	900	2,426	400,279	0	815
	1995	300,385	55,179	880	2,309	439,846	0	908
	1996	312,064	48,958	977	1,755	311,381	0	812
	1997	316,542	49,113	1,300	2,600	270,931	0	989
Hidalgo	1993	426,940	68,649	2,611	2	665,991	0	460
	1994	458,246	67,769	3,295	1,960	941,121	0	489
	1995	476,235	67,395	2,776	1,376	682,088	400	513
	1996	496,485	69,557	2,521	1,086	419,712	400	475
	1997	511,324	68,071	2,319	1,072	298,267	277	481

Source: TWDB, 1997

3.5 CULTURAL RESOURCES

This section presents the findings of cultural resources surveys, which were conducted in accordance with the National Historic Preservation Act (NHPA) of 1966 and the Archeological Resource Protection Act to identify historic and archeological resources, which may be affected by alternative vegetation maintenance practices. The NHPA of 1966 requires federal agencies to determine the effect of their actions on historical properties and to take certain steps to ensure these resources are located, identified, evaluated, and protected. The Archeological Resources Protection Act protects archeological resources on federal lands. If archeological resources are discovered that may be disturbed during site activities, the Act requires permits for excavating and removing the resource.

3.5.1 Previous Investigations in South Texas

A. E. Anderson, a civil engineer from Brownsville, Texas, conducted the earliest archeological research in the area. Between 1908 and 1940, Anderson recorded information on several hundred sites and collected artifacts from both sides of the Rio Grande (Zavaleta, 1987). Anderson's collection has served as the basis for most of the later archeological interpretations of the area.

Early archeological salvage projects were undertaken during the 1940s and 1950s. These include the discovery of the Ayala site in Hidalgo County (41HG1), which contained several burials located during the excavation of a sewer line. The burials were determined to be Late Prehistoric in origin, but earlier artifacts recovered from the site provided evidence for an Archaic presence as well. In 1952, the Ayala site was revisited, and, later, another Brownsville complex cemetery (the Floyd Morris site) was described in a three-part article (Hester, 1969).

During the 1950s, the Falcon Reservoir project was undertaken upstream of the project area, and the University of Texas conducted survey, testing, and mitigation efforts. A total of 51 sites were recorded during the survey (Krieger and Hughes, 1950); 18 sites were tested (Cason, 1952), and three were excavated (Hartle and Stephenson, 1951), including two Spanish colonial sites and one prehistoric site.

Archeological work since the 1970s has primarily involved reassessments of previous efforts and survey projects. In 1976, the Texas Historical Commission (THC) conducted a survey for a proposed USACE floodwater channelization project in Hidalgo and Willacy counties (Mallouf *et al.*, 1977). The project documented 49 archeological sites and provided predictive environmental-cultural modeling for future work. A second, similar project was conducted by Prewitt and Associates, Inc., for the USACE in Hidalgo and Willacy counties in 1980, documenting 63 sites (Day *et al.*, 1981). Smaller surveys including Hall and Grombacher (1974), Bousman *et al.* (1990), Kibler and Freeman (1993), and Boyd *et al.* (1994) have added to the limited body of knowledge existing within this region. A large study of human adaptation in South Texas (Hester *et al.*, 1989), sponsored by the Southwest Division of the USACE in the mid-1980s, generated an overview of the existing data base and set out pertinent research questions for the LRGV (Black, 1989). Recent Phase II test excavations of prehistoric sites in Hidalgo and Willacy counties (Bousman *et al.*, 1990), limited excavations at 41WY50 and 41WY60 (Kibler, 1994), and investigations related to the Pharr-Reynosa International Bridge (Boyd *et al.*, 1994) have provided much-needed, although preliminary, geomorphological information on the LRGV.

3.5.2 Regional Chronology

Archeological investigations in the LRGV of South Texas have been limited in scope and few in number compared to most other areas of the southwest. In general, the South Texas Plains is one of the least known areas of the state (Black, 1989). In addition, natural and cultural factors have acted to obscure the archeological record. The following sections present a regional chronology developed from the known archeological resources and a summary of previous archeological investigations in the LRGV.

3.5.2.1 Lower Rio Grande Valley Prehistory

The majority of the archeological sites within the LRGV of South Texas consist of assemblages with few temporally diagnostic materials. The prehistoric cultural sequence for South Texas can be separated into three temporal categories: Paleo-Indian, Archaic, and Late Prehistoric (Table 3-18). The dates for this chronology are based on a comprehensive study of existing regional research conducted by Black (1989).

Table 3-18 Regional Chronology of South Texas

Period	Date
Paleo-Indian	ca. 9500 - 6000 B. C.
Archaic	6000 B.C - A. D. 800
Early Archaic	6000 - 2500 B. C.
Middle Archaic	2500 - 400 B. C.
Late Archaic	400 B. C. - A. D. 800
Late Prehistoric	A. D. 800 - 1600 (1519)
Historic Aboriginal	A. D. 1600-1800

Source: Black, 1989

Paleo-Indian Period

Based on limited paleoenvironmental data and lithic assemblages, the Paleo-Indian period (ca. 9500–6000 B. C.) is typically characterized as the period when small nomadic groups hunted Late Pleistocene megafauna. Though few regional data exist regarding this period, Paleo-Indian lifeways probably included a much greater use of both plants and animals than the current understanding and artifact assemblages indicate. Paleoenvironmental data for neighboring regions such as south central Texas have indicated that temperatures in general during this time period were cooler and the humidity higher (Bousman *et al.*, 1990). The Paleo-Indian period peoples likely hunted now-extinct species such as the mastodon, mammoth, large tortoise, and long-nosed peccary, as well as species such as bison that no longer inhabit the area (Black, 1989; Bousman *et al.*, 1990).

There are few data to contribute to an understanding of how Paleo-Indian peoples used the landscape in the LRGV. However, at this time, it is assumed that the Rio Grande, a large regional drainage, was an important resource in the Paleo-Indian period, as it is in later periods. Estuarine and coastal resources most likely played a greater role in the Paleo-Indian use of the lower Rio Grande area than the present evidence indicates; however, the critical data lie buried beneath the deltaic flood deposits or beneath the coastal waters.

The only well-defined Paleo-Indian locality in the LRGV is the Perdida site, located approximately seven miles north of Rio Grande City along Arroyo Los Olmos (Weir, 1956). The site's surface assemblage contained several projectile point types, including six Plainview, one Meserve, four Angostura, three Scottsbluff, and one Clovis.

Subsurface investigations were not conducted at this site, despite the documentation of 289 projectile points from several temporal periods. Thus, the site was not given a formal Paleo-Indian designation until it was examined by Newton in 1968.

During the Falcon Reservoir surveys of 1950–1953, the partial remains of several mammoths were observed. No tools were found to be associated on the United States side of the river, with the possible exception of the Evans site where one flint tool was tentatively associated with the mammoth bones (Mallouf *et al.*, 1977). While that discovery was never fully confirmed, supporting evidence might be available from the Mexican side of the Rio Grande. In 1951 Luis Aveleyra Arroyo de Anda reported the discovery of mammoth bones with associated flint debitage and one flint tool (Mallouf *et al.*, 1977). In 1953 a Plainview point was recovered in an occupation level along the Rio Salado, a tributary of the Rio Grande in northern Tamaulipas, Mexico (south of Falcon Reservoir; Mallouf *et al.*, 1977). Isolated Paleo-Indian artifact discoveries include points from sites such as the Berger Bluff and Buckner Ranch sites in Willacy and Goliad counties, respectively.

Archaic Period

Early Archaic

The Early Archaic period (6000 B. C.–2500 B. C.) has been suggested as being a shift from a nomadic hunting and gathering lifestyle to a less mobile subsistence strategy. A reduction in large game species caused by depredation and/or environmental factors may have forced the use of a greater diversity of plant and animal resources. The reasons for the transition from Paleo-Indian lanceolate points to the Early Archaic stemmed dart points are not yet understood, but this technology change appears to mark the end of the Paleo-Indian period.

As in the Paleo-Indian period, few Early Archaic period (6000–2500 B. C.) data exist for the LRGV. Extrapolations from inland and coastal areas some 100 miles north of the project area indicate that groups during this time remained small in size and moved across wide expanses of landscape (McKinney, 1981). The earliest example of subsistence data from an Early Archaic site in South Texas is found at 41LK31/32, which dates to ca. 3,400 B. C. (Black, 1989). Remains from this site include freshwater mussels, land snails, turtle bones, and freshwater drum bones (Scott and Fox, 1982). The earliest shell midden in South Texas is the McKenzie site (Ricklis, 1986). Both of these sites are located along the Nueces River, near Corpus Christi, Texas, approximately 150 miles to the north.

Middle Archaic

Little evidence of Middle Archaic (2500–400 B. C.) assemblages exists within the LRGV. Existing evidence is limited mostly to triangular projectile point types used also during the Late Archaic period. However, site 41WY67 has yielded a Middle Archaic date (4,495 ± 350 B. P.) from human bone (Bousman *et al.*, 1990). While the dating of bone should be viewed with caution, this date provides information that could put human occupation in the LRGV well into the Middle Archaic.

Late Archaic

Late Archaic period sites (400 B. C.–A. D. 800) are more common within the LRGV and are often observed in association with Late Prehistoric period assemblages. This association may reflect either a long-standing projectile point tradition being carried into the ceramic period or a reuse of site locations.

The greater abundance of Late Archaic sites provides more subsistence data for this period. Sites along coastal areas contain a wide variety of fish, shellfish, and small mammals, suggesting a greater emphasis on collection rather than hunting and gathering. Farther inland, a variety of plant species and small mammals (rabbits, rodents, etc.) were used. Population densities were higher during this period, a fact that may reflect population growth that began during the Middle Archaic (Black, 1989). Late Archaic cemetery sites have been reported throughout the south and central Texas coastal region (Hall, 1981; Lukowski, 1987). Trade between inland and coastal groups is suggested by the presence of shell pendants some distance inland (Hall, 1981).

Late Prehistoric Period

The Late Prehistoric period (A. D. 800–1600) is probably the best understood of the prehistoric sequence, because the remains are more numerous and better preserved than those of previous periods. Radiocarbon dates from this period are more common, allowing for more precise temporal definitions. Several Late Prehistoric period cemetery sites have been documented in the LRGV area. Two of the larger, better-studied sites are the Floyd Morris site (41CF2; Collins *et al.*, 1969) and the Ayala site (41HG1; Campbell and Frizzell, 1949; Hester and Rodgers, 1971; Hester and Ruecking, 1969). These sites are discrete cemeteries and appear not to be associated with habitation areas. Many of the graves contain quantities of funerary items, and the human remains are usually in bundled or flexed positions. Cremated remains and skeletons covered in red ochre have also been located (Campbell and Frizzell, 1949; Hester, 1969). The formal cemetery sites, the shell industry, and the Huastecan-like ceramics may indicate a strong possibility for semi-sedentary subsistence strategies during the Late Prehistoric period.

Historic Aboriginal Period

The discovery and subsequent exploration of the area by the Spanish and others beginning in 1519 made European goods (both traded and discarded) available to aboriginal groups. Later, Spanish settlements traded with these groups and educated them in such skills as wheel-turned pottery making. As a result, the historic aboriginal sites often contain artifacts such as glass or metal projectile points, trade beads, or wheel-made ceramics. Four Historic aboriginal sites have been located within the LRGV, including 41CF8 (not in the current project area) and three others discovered by A. E. Anderson (Kibler, 1994).

3.5.2.2 Lower Rio Grande Valley History

The LRGV has long been settled and is rich in history. The history of the United States portion of the lower Rio Grande is also intermeshed with the history of Mexico. This history has been discussed in detail elsewhere (e.g.**,** Kelley, 1986; Fontana, 1994;

Graham, 1994; Perttula *et al.*, 1997; Sánchez, 1994; Alonzo, 1998; Tijerina, 1998); consequently, only an overview will be presented here.

Early Exploration

Although European exploration of the Gulf of Mexico began in the early sixteenth century and was further spurred on by the rumors of the establishment of a settlement somewhere on the Gulf Coast of Texas by the Frenchman René Robert Cavalier, Sieur de La Salle, it was the end of the sixteenth century before three missions and the presidio of San Juan Bautista were established near the present-day village of Guerrero, Coahuila (approximately 140 miles upriver from the project area). These developments, along with the establishment of San Francisco de los Tejas, opened the southern Texas area to more regular traffic, and serious consideration was given by Spanish colonial administrators to starting permanent establishments in the LRGV.

Colonial Settlement

The Spanish colonial administrators in New Spain originally intended for settlements in Texas and Nuevo Santander to be established as a line of northern defense. They called this protective line of defense the "...frontera, and their strategy was to settle the frontera with a hearty stock of people who would serve as a buffer colony protecting Monterrey and Saltillo from the hostile American Indians of Texas" (Tijerina, 1998). The man who was eventually chosen to head these settlements was Juan de Escandôn. Over a span of four years, primary settlements were founded along the south bank of the Rio Grande: La Villa de Santa Ana de Camargo (Camargo), established 1749; Nuestra Señora de Guadalupe de Reynosa (Reynosa), established 1749; Villa de San Ignacio de Revilla (Revilla), later known as Guerrero, established 1750; and Lugar de Mier (Mier), established 1752 (Sánchez, 1994).

Settlement efforts to the north of the Rio Grande were not undertaken as quickly as those to the south. In general, the land was not considered to be as favorable because of limited amounts of water and a much greater chance of Indian hostilities. However, in 1750, José Vasquez Borrego became the first Spaniard to establish a settlement north of the river. This settlement, known as Nuestra Señora de los Dolores (Dolores), was located upriver from the project area. It began as a rancho and then continued as a small community until 1815, when continuous attacks by Indians, especially the Comanche, forced abandonment of the settlement.

European settlement eventually took hold north of the Rio Grande. Around 1755, Don Tomás Sánchez de la Barrera y Garza established Laredo, the first major municipality north of the Rio Grande.

Tides of Change

Large-scale ranching operations continued to provide the primary occupation in the project area for many years. However, significant political changes occurred that affected the area from ca. 1800 to 1920 because the LRGV was often disputed territory. These impacts were reflected directly throughout the project area in the form of troop movements and numerous battles. Beginning in 1821 with Mexican independence from

Spain, the area was in political upheaval until Texas achieved statehood in 1846. Both the Republic of Texas and Mexico laid claim to the region, just as the United States and Mexico would do later. Even after statehood, the area was the setting for various conflicts including the Mexican-American War (1846–1848), the escapades of Juan Nepomuceno Cortina (1859–1860), the American Civil War (1861–1865), and the Mexican political upheavals and revolution (1865–1918).

The Treaty of Guadalupe Hidalgo contained language that had a direct bearing on the project area. The first provision made the United States responsible for containing marauding Indians, and the second provision made the Rio Grande an "International Waterway," recognizing Mexico's right to use the river for transportation (Carlson *et al.*, 1990). The first provision had the immediate result of upgrading Fort Brown, located across the river from Matamoros. A new fort was laid out about one-half mile upriver from the original fortifications. Fort Brown, in various configurations, continued to be maintained until it was deactivated in the mid-twentieth century. In 1948, the former military facility became part of the campus of Texas Southmost College.

Many encounters between the Confederate and Union forces during the Civil War occurred in the LRGV. Several of these encounters took place in and around Brownsville.

From the American Civil War until the early twentieth century, the LRGV experienced military presence and numerous small, armed conflicts. Although there were sporadic conflicts, the situation calmed somewhat along the border for a period under the Mexican leader Porfirio Diaz from the 1880s to 1911. After his resignation, a period of revolt started in Mexico and on numerous occasions spilled onto or at least impacted United States territory. It is estimated that more than 20 men and women were killed on the United States side of the border during the conflicts from 1911–1915. After Francisco Villa's declared revolt in late 1914, more United States citizens were killed. In the period of 1915 to 1916, there were numerous small skirmishes and conflicts that resulted in the deaths of both civilians and military personnel on both sides. Along with the armed conflicts and accounts of murder, there are numerous reports of robbery, train derailment, and bridge burning.

Nineteenth Century Settlements within the Project Area

At the time of the initial construction of Fort Texas (predecessor to Fort Brown) in 1846, the area around present-day Brownsville was only sparsely settled. The entire area that would one day become Brownsville was part of the 1781 grant of 59 leagues to José Salvador de la Garza. Early in the 1800s a number of squatters, mostly herders and farmers, built huts in the general area, and General Taylor found these nondescript structures when he arrived in 1846. After the establishment of Fort Brown in 1848, however, a town with substantial buildings quickly followed.

The Garza property passed through several hands before it was eventually purchased in 1848 by Charles Stillman, who, with his partner Samuel Belden, laid out a town they called Brownsville (Garza and Long, 1999). The town site of Brownsville included 4,676 acres. When Cameron County was created in 1848 by the Texas legislature from a

portion of Nueces County, Brownsville was named its county seat in January 1849. The town quickly grew, and by 1850 the census showed a population of 519.

Members of Escandôn's colony initially settled the community of Hidalgo in Hidalgo County in 1749. The community was known by three different names: La Habitación, Rancho San Luis, and San Luicito (Garza, 1999). In 1852, a Scotsman named John Young settled in the area and renamed the community Edinburg. When Hidalgo County was created in 1852, Edinburg was made county seat. The town of Edinburg was later moved north to its present location, but a small contingent remained at the original site. This original location was called Hidalgo. A ferry operated in this location until an international bridge was built in 1926. The bridge was a suspension type and tolls were collected. A new suspension bridge replaced this one ca. 1940.

The La Lomita Mission and the community of Mission in Hidalgo County have a history that is intertwined. La Lomita, which means "little hill," is the historical site of a former mission and rancho headquarters maintained by the Oblate priests of Mary Immaculate. The Oblate priests are given credit for being the first to plant citrus trees in the valley.

Economy in the Project Area

At the time of the Escandôn settlements in the late eighteenth century, most of the project area would have been described as open, somewhat dry, grasslands. The major uses of the area were for cattle range and some minor farming that took place along the edge of the river where irrigation was possible. After the development of communities in the mid-nineteenth century, some sectors of the economy were based on trade between Texas and Mexico.

From the time the Rio Grande was first encountered by explorers and settlers, an interest was generated in using its waters for transport and trade. The first steamship to make an attempt to travel upriver was owned by Col. Juan Davis Bradburn and Stephen McL. Staples around 1828 (Kelley, 1986). Shortly thereafter, an enterprising native of Maine named Alpheus Rackliffe began a flatboat business in 1829 that ran a regular route as far upriver as Presidio Del Rio Grande situated on the south side of the river and across from present-day Eagle Pass.

Finally, after the annexation of Texas to the United States in 1846, regular river traffic developed. This was facilitated by the construction of a shipyard located near the mouth of the river that could both build and repair ships. When regular steam traffic was initiated, the town of Roma became the head of navigation on the Rio Grande. Steamboats continued to be a profitable pursuit until the coming of the railroad in the 1880s. There is one known steamboat wreck (41CF177) within the project area close to Brownsville, as well as numerous reports of boats lost in the Rio Grande.

The greatest impact on the LRGV, however, came from the railroads—an impact that was much greater by far than that from the steamships. Railroad lines began penetrating the area by 1865 with the arrival of the Federal Army under Gen. P. H. Sheridan. General Sheridan had the first rail lines laid to help move troops and supplies. A great spurt of railroad construction took place in the 1870s and 1880s, and by around

1900 the area was thoroughly connected by rails. With the advent of the railroad and expanded irrigation, the economy changed dramatically to one based on agriculture—an economy that continues to the present, with the Rio Grande valley rich in citrus trees and other varieties of produce.

Irrigation on the Rio Grande

In the early twentieth century, as the potential for agriculture in the LRGV became apparent, several irrigation districts were developed. The San Benito Land and Water Company and the American Rio Grande Land and Irrigation Company are only two of these. The latter district was most prominent in the project area. The main accomplishment of this company was the process of integrating the development of irrigation with the sale of farmland, the coming of the railroad, and the establishment of the town of Mercedes. By 1920, the system consisted of three large canals, five pumping plants, reservoirs and settling basins, and extensive drainage networks. The Water and Control District No. 9 in Hidalgo and Cameron counties was formed in 1927 by the farmers who owned land in the district, and in 1929 they purchased the irrigation portion of the company. This company is still in existence today.

Levee Building on the Rio Grande

Flood control on the Rio Grande was initiated by a series of treaties and agreements between the United States and Mexico. The treaty of 1906 provided for the construction of Elephant Butte Dam and Reservoir in New Mexico, which gave some protection down river from flooding. The Rio Grande Rectification Project of 1933 helped relieve flood dangers to the El Paso-Juarez valley. An act of Congress on June 4, 1936, authorized a canalization project (Rio Grande Canalization Project) between El Paso and Caballo Dam and Reservoir, features of which were completed by 1947 (Timm, 1999).

Along the LRGV, considerable damage has occurred from periodic heavy floods. Bond issues in 1924 and 1925 resulted in levee construction from Donna to Brownsville. A devastating flood in 1932 demonstrated that levees built only on the American side of the river could not provide adequate protection (Timm, 1999). On September 3, 1932, the International Boundary Commission (renamed the International Boundary and Water Commission in 1944) recommended the construction of floodways on both sides of the river. Agreements in 1932 between the Mexican and American governments provided for a coordinated plan for flood protection and for each country to perform the work within its own borders, at its own expense. Construction of the features in the United States was initiated with funds made available by the Public Works Administration under provisions of Title II of the National Industrial Recovery Act of June 13, 1933. The LRGFCP was authorized by the act of August 19, 1935 (49 Stat. 660) and subsequent appropriations were granted for construction and maintenance by the Secretary of State acting through the United States Commissioner for the USIBWC.

The LRGFCP was constructed in the 1930s without the present Rio Grande diversion dams. The counties turned over to the United States government titles or interests to the levee system. The United States government received titles or interests to the river floodway levees but did not obtain title or interest to the lands subject to inundation

between the river levee system and the Rio Grande. The LRGFCP was improved after major Rio Grande flooding resulted from heavy localized rains in 1958 and Hurricane Beulah in 1967. The improvements, which included diversion dam constructions and vegetation-clearing programs, were based on United States and Mexico revisions of the original 1932-coordinated flood control plan.

The United States and Mexico, in the water treaty of 1944, agreed to the distribution of the waters of the Rio Grande from Fort Quitman to the Gulf of Mexico. That treaty provided for the international development of major multiple purpose reservoirs on the Rio Grande, including flood control as one of the purposes. The construction of Falcon Dam in Zapata and Starr counties was part of this work. Amistad Dam and Reservoir, located just north of Del Rio at the confluence of the Rio Grande and the Devil's River, was begun in August 1963 and was completed in 1968 (Timm, 1999). Amistad, in combination with Falcon Dam, provides protection from Rio Grande floods originating above Falcon Dam.

3.5.3 Current Studies

The current cultural resources investigations consisted of three components: (1) archival research for historic and prehistoric resources, (2) a geoarcheological assessment of the potential for archeological contexts in the near surface deposits of the Rio Grande embankment, and (3) a vehicular reconnaissance survey of the Rio Grande floodway. The detailed findings of this effort are presented in *An Assessment of Potential Effects to Historic Properties within the Lower Rio Grande Flood Control Project by Proposed Maintenance Activities of the United States International Boundary Water Commission* (Cooper *et al.*, 2002).

3.5.3.1 Archival Research

Prior to fieldwork, archival research concerning all historic properties was conducted. This involved gathering pertinent site forms, records, and reports from the following repositories: the General Land Office, Division of Archives and Records, Austin; the Center for American History, University of Texas at Austin; the Texas Natural Resource Information Systems, Austin; the Texas State Archives, Austin; Texas State Genealogical Library, Austin; the Archives of the Texas Historical Commission, Division of Antiquities Review, Austin; the USIBWC Archives, Mercedes Office; Library of the National Park Service, Palo Alto National Historic Site, Brownsville; Cameron County Courthouse, Brownsville; Hidalgo County Courthouse, Edinburg; Willacy County Courthouse, Raymondville; Hidalgo County Historical Museum, Edinburg; and the Port Isabelle Museum.

The cultural resources investigations were designed to assess the potential of the alternative actions, as defined in 1999 (including raising of the levees), to affect historic properties within the LRGV. Since the original alternatives considered for this EIS study included raising of the existing levees, the study area for cultural resources was expanded appropriately. The river floodway levee and the off-river floodway levees were buffered to include known sites and high probability areas (i.e., those areas identified on historic maps as early historic-era structures) that fall within approximately 402.4 m (0.25 mi) of the exterior of the river and off-river levee systems. As discussed in Chapter 2, raising of

the existing levees is not considered in this FEIS since it would involve structural modifications to the LRGFCP rather than alternative vegetation maintenance practices.

3.5.3.2 Geoarcheological Study

In February 1999, investigators excavated 60 backhoe trenches along the north bank of the Rio Grande from near Penitas on the upstream end to below Brownsville on the lower river. The trenches were irregularly spaced and attempted to conform to the projected areas of continued and future vegetation alteration by USIBWC. Whenever possible, locations that offered a depositional context where the preservation of occupational surfaces would be most likely (e.g., high cutbanks or levee deposits instead of low point bars or back swamp deposits) were preferred.

The geoarcheological study was designed to examine the near-surface sediments to determine the depositional environment, the relative ages of sediments, and the relationship between sediment strata. The geoarcheological work resulted in the location of one low-density surface and subsurface historic scatter and one deeply buried (>3 m) feature. Nine soil samples that appeared to contain sufficient organic materials to return accurate dates were sent to Beta Analytic Radiocarbon Dating Laboratory for accelerator mass spectrometry (AMS) technique dating.

3.5.3.3 Vehicular Reconnaissance

Between March 29 and April 2, 1999, an archeologist performed a reconnaissance survey along the Rio Grande levee. This resulted in the identification of areas of potential concern for cultural resources and potential areas of impact on cultural resources that were not identified during the archival research and were not located on the modern USGS quadrangle maps. The vehicular reconnaissance survey included the visual inspection of many of the areas identified during the archival research and the identification of other potential historic properties in the project area. This survey further allowed investigators to better determine modern impacts to the project area and visually inspect specific landforms. The survey involved accessing and driving the levee system and attempting to identify the locations of known cultural properties and to locate new, previously unidentified potential cultural resources. Many of the known and potential cultural properties were photographed and current land use practices were noted.

3.5.3.4 Results of Archival Research and Reconnaissance Survey

The archival research and reconnaissance survey resulted in the identification of 194 cultural resource properties (either location already recorded or location derived from archival sources): four documented prehistoric sites (Texas Archeological Research Laboratory [TARL] site forms); 14 National Register of Historical Places/Registered Texas Historic Landmark (NRHP/RTHL) properties and/or districts; two cemetery sites; 39 historic archeological sites (TARL site forms); three locations of shipwreck sites (archival research); and 132 locations that may represent undocumented historic archeological sites (identified from the reconnaissance survey and historic maps of the area).

Prehistoric Sites

The prehistoric sites that were identified during the archival research were inspected from the levee system during the reconnaissance survey. This inspection and the analysis of topographic maps of the area have resulted in the development of preliminary prehistoric/historic land-use patterns. Most known prehistoric and historic properties are associated with differentiated landforms. The most frequently utilized landforms between the main river levee and the Rio Grande, both in the past and present, are old bancos and resacas (old meanderbelt scars) and natural river levees that buffer the old channels. Utilized landforms in the off-river areas are somewhat different. In the off-river areas, low hills/ridges and arroyo or natural drainage edges are most heavily used. However, in both the near-river area and the off-river area, many of these once recognizable landforms have been subjected to land leveling and other agricultural management practices used in the lower Rio Grande region.

The lack of known prehistoric sites in near-surface contexts along the Rio Grande main stem can be attributed, at least in part, to the fact that few archeological surveys have been conducted along the main stem in the USIBWC lower Rio Grande project area. An important exception to this pattern is the two multi-component sites (41HG153 and 41HG158) found by Boyd *et al.* (1994) during work on the Pharr-Reynosa International Bridge. These sites were associated with an old banco or river channel and do indicate some potential for near-surface prehistoric cultural remains between the main river levee system and the river. Four samples from different proveniences at 41HG153 returned an uncorrected date range of 560 ± 190 to 4,030 ± 70 years B. P. (Boyd *et al.*, 1994).

Although there are few recorded prehistoric sites in the project area, one area of prehistoric concern is the very western limit of the project area and levee system. The area around Penitas and Abrams has eight recorded prehistoric sites within two kilometers (km) of the levee system. According to the site forms, some of the sites are quite substantial for the region. Site 41HG142 is noted as the largest site in Hidalgo County known to the recorder. All but one of the sites are located outside of the current project area, but the presence of such a large number of sites in proximity indicates that this region is an area of high probability of containing significant prehistoric sites. There is a high terrace (about 12 m above the riverbank), potentially a source of lithic material in the form of river gravels, in proximity to the river. Although this terrace would have been an extremely favorable context for well preserved Early to Middle Holocene occupation surfaces, the terrace has unfortunately been the location of a borrow pit or gravel/sand extraction area and a later trash disposal area. The result has been the destruction of the only site (41HG143) in this area that falls within the described project boundary.

NRHP/RTHL Sites

Nine sites that are currently listed on the NRHP are present within the Area of Potential Effects (APE) or the project area. These properties include the Charles Stillman house, the Browne-Wagner house, La Nueva Liberto, the Old Hidalgo Courthouse, the Old Hidalgo school, the Hidalgo store, Fort Brown, the Brulay Plantation (41CF116), and

La Lomita Historic District (see Cooper *et al*., 2002). These properties, except for La Lomita Historic District, are located in Brownsville or Hidalgo. La Lomita is located due south of Mission and adjacent to the river. The Landrum House, which was recorded as a Registered Texas Historical Landmark (RTHL) in 1978, is located east of Los Indios and north of the main river floodway. The structure is a two-story, gabled, late Victorian house constructed of adobe brick in 1902 by Frances and James Lambert. It is located on a portion of the 1781 Conception de Carricitos Grant (Sanchez, 1994). This property, the Brulay Plantation, located southeast of the Brownsville International Airport, and La Lomita Historic District, located southeast of Madero are all immediately adjacent to the present levee structures. Of these ten properties, only two (La Lomita and Fort Brown) are associated with property that could be impacted by the alternative actions as currently presented. The remaining sites are located within the buffer zone created for the cultural resources study.

Historic Cemeteries

One important property type noted during the archival research and the field reconnaissance is that of historic cemeteries. Family or ranch cemeteries appear to be the standard mortuary practice in this region. In addition to two cemeteries unassociated with a building complex, seven others are associated with historic period sites identified through map research. Additional historic family/ranch cemeteries may be present but not documented in the LRGV, for they might no longer be marked, known, or display headstones. In a region like the lower Rio Grande that possesses no available supply of stone, graves were often marked with wooden head/foot markers (e.g., see Perttula *et al.*, 1996) which ultimately decay and leave little to indicate the presence of burials.

Historic Archeological Sites

Of the 39 historic archeological sites presently documented within the project area, 24 have been evaluated and/or mitigated by previous investigations. Consequently, no further work is required at these sites (Table 3-19). One of these sites, the Cantu home site, was investigated and as an archeological site was determined to be ineligible for inclusion in the NRHP by Boyd *et al.* in 1994. However, Boyd *et al.* (1994) recommended that the structure be documented and evaluated for eligibility for inclusion in the NRHP as an architectural property. The 21 historic period sites whose eligibility for inclusion in the NRHP is either “unknown” or “potentially eligible” represent home sites, early communities, ranch complexes, and industrial complexes.

Table 3-19 Documented Archeological Sites Within the Proposed Project Area

Prehistoric Period Sites	Historic Period Site	
(Eligibility Unknown)	(Eligibility Unknown)	(Not Eligible)
41HG143	41HB32	41HG152
41HG170	41HB33	41HG153
41CF179	41HB156	41HG154
Anderson-AEA 51.7	41HG180	41HG157
	41CF95	41HG158
	41CF148	41HG159
	41CF165	41HG160
	41CF166	41HG162-41HG169
	41CF167	41VG149-41CF157
	41CF169-41CF173	
	41CF178	

Shipwreck Sites

While location information is sparse for the nineteenth century, the THC has listed 28 vessels lost in the river in Cameron County and at least four in Hidalgo County. One, the *Enterprise*, exploded at Reynosa in 1846, and five lives were lost. The archival work shows three areas of special concern near Brownsville. One area is the known and recorded sunken boat, site 41CF177 (THC shipwreck number 1964; Arnold, 1998; Zavaleta, 1987). This sunken vessel, the identity of which is not known, is located approximately 400 m downstream of the Gateway Bridge and immediately west of Fort Brown Resaca. B. Arnold, T. Fort, A. Hall, and A. Zavaleta revisited this site on June 12, 1998. Some have speculated that this wreck is the remains of the *Corvette*, a boat used by General Taylor in 1846; others suggest that the remains are from the *Rio Bravo*, a Navy steamer transferred to the Army in 1880 (Arnold, 1998). Due to the robust size of the timbers, the remains are believed to be those of the *Rio Bravo*, a larger boat. Additionally, an early twentieth-century author, who was a ship's yeoman on the *Rio Bravo*, relates that it blew a boiler north of Brownsville in 1876. It was then floated downstream on floodwaters and tied up in front of the quartermaster's building at Fort Brown. It was reportedly sunk near that spot to serve as a breakwater (Pierce, 1917).

Pierce (1917) states that the remains of the *Corvette* could be seen in the river channel 500 yards west of the International Bridge. Although the 1898 USIBWC map does not show a wreck in this position, this does not mean that the remains are not there, for this map illustrates the river changes and jetty positions. Therefore, it is possible that only those boats purposefully sunk and used as bank stabilizers were plotted. Three more sunken boats are indicated on the USIBWC map of 1898 in this area. They appear to be situated just west of Gateway Bridge on the north side of the river (Zavaleta, 1987). Pierce (1917) relates that three boats were sunk in this position to act as erosion control

and that in 1917 they were under the St. Louis, Brownsville & Mexico railroad yards. Additionally, a ferry crossing is plotted very near the location of Gateway Bridge on the USIBWC 1898 map.

Because existing data regarding riverboats/wreck sites are very sparse, boat wreckage, landings/wharves, and associated sites could be most anywhere in the project area along the Rio Grande. This situation is further compounded by the variable changes in the river channel between the mid-nineteenth century and present times. Some areas of the river channel have experienced little channel shift, while others display large alterations. The areas that have experienced little shift are more likely to still contain boats or associated materials. However, this does not rule out other near-river locations as areas of potential buried archeological resources.

Undocumented Historic Archeological Sites

The examination of archival sources and historic maps revealed the potential existence of 132 undocumented archeological sites dating to the historic period. As the reconnaissance survey revealed, standing structures may also be associated with these undocumented sites. These undocumented sites represent the full range of occupation of the LRGV from 1800 to the early twentieth century. Of particular interest are the five pump stations and the Kiln Waterworks and Electric Plant along the river that are potentially eligible for inclusion in the NRHP for their role in the development of agriculture within the valley. These structures may also be eligible as examples of engineering design for the time period. The pump stations include the 1912 Hidalgo irrigation and pump station and elevated irrigation ditch remains near Hidalgo; the Pharr-San Juan pump in Hidalgo; the Donna pump station; La Feria pump station; and the pump at Los Fresnos. Many of the pump stations were constructed shortly after the turn of the century. Some of these pump stations, like the Pharr-San Juan Pump, have attracted the attention of conservators and are currently being preserved and maintained.

The Existing Levee System

As discussed earlier, the construction of levees began early in the twentieth century as a means of controlling the floodwaters of the Rio Grande. The levees were important for the protection of lives, property, and valuable croplands and orchards. The levee system is an integral part of the agricultural economy of the LRGV; consequently, the levee system is potentially eligible for inclusion in the NRHP for its association with the development of the agricultural industry and possibly for representing a particular method of construction. The levee system would not be affected by any of the vegetation maintenance alternatives.

3.5.3.5 Potential for Buried Archeological Contexts

The 30 localities tested indicate that the Rio Grande meanderbelt is complex and that most near-surface sediments adjacent to the present cutbank of the Rio Grande are quite young in age (Cooper *et al.*, 2002). Good prehistoric contexts are not likely preserved in the near-surface deposits adjacent to the present channel. Given that there is a considerable thickness of sediment in this channel belt below the depth visible in the river's cutbanks, it is likely that older deposits exist in this area that may contain cultural

materials. A survey of the Rio Grande cutbanks would be an important preliminary step in determining the age of these lower sediments and their potential for retaining cultural deposits. However, the cultural sites contained in them would be extremely deeply buried, difficult to locate, and difficult to investigate. Areas along abandoned river channels either north of the active meanderbelt or farther east where the Rio Grande's fluvial-deltaic plain widens would appear to offer greater promise for preserving stratified cultural materials buried at lesser depths. The former Holocene deltas of the Rio Grande and their associated fluvial deposits would appear to offer inviting targets for further investigation. The older Pleistocene surfaces lying north of the Holocene fluvial-deltaic plain may also offer some potential, but there the emphasis should be placed on examining the younger eolian and alluvial deposits resting on those surfaces.

Along the river and river floodway levee system the potential for finding buried site deposits is high in the areas adjacent to the bancos and resacas, an apparent focus of both prehistoric and historic occupations. The prediction of the locations of buried cultural resources in these areas is extremely difficult, for even though the 60 trenches were excavated in areas thought to most likely contain buried deposits, only one encountered a buried cultural feature. The discovery of site 41CF179 also indicates that many of the near-surface deposits along the cutbanks are of modern age and appear to have a limited potential for containing cultural resources. The calibrated radiocarbon results of dating ash from a feature at a depth of 3.15 m below surface at 41CF179 indicate a date range of A. D. 1490–1650. There were also multiple encounters of barbed wire or other historic debris at depths of 1–2 m below surface. It should be noted, however, that these data do not suggest that all near-river deposits are so recent that they cannot contain potentially significant cultural resources; rather, they clearly indicate that most near-surface deposits (<2 m) are very recent in age and have a low probability of containing significant cultural deposits with contextual integrity.

3.6 SOILS AND GEOLOGY

3.6.1 Soils of the Southern Gulf Coastal Plains Physiographic Province

3.6.1.1 General Soils Association

The Southern Gulf Coastal Plains Province consists of nearly level to undulating soils of the Rio Grande Plain. Loamy soils and cracking clayey soils of the Rio Grande floodplain (Rio Grande-Matamoros soils) are found along the river from Brownsville to the Falcon Reservoir, while the Harlingen soil association forms the Rio Grande terraces in Cameron and parts of Hidalgo counties (Godfrey *et al.*, 1973).

Rio Grande-Matamoros-Camargo, Runn-Reynosa-Harlingen, Laredo-Olmito-Cameron, Galveston-Mustang-Coastal Dunes, and Harlingen general soil associations are located within the project area. Rio Grande-Matamoros-Camargo soils are found in the bottomlands along the Rio Grande floodplain. These soils, as well as Laredo-Olmito-Cameron soils, are made up of intermingled pockets of nearly level to gently sloping, moderately to slowly permeable, loamy and clayey soils of floodplains and low terraces. Runn-Reynosa-Harlingen soils form the terraces to the north. Runn-Reynosa-Harlingen soil associations are also dominated by nearly level, loamy and clayey soils. The

Harlingen soils are level to gently sloping, very slowly permeable, clayey soils of low terraces. Galveston-Mustang-Coastal Dune soils are found along the Rio Grande floodplain, downstream toward the mouth of the river. This association consists of nearly to gently sloping, permeable, loose and fine sandy soils (SCS, 1977; 1981). Figure 3-22 illustrates the generalized soil classifications within the project area.

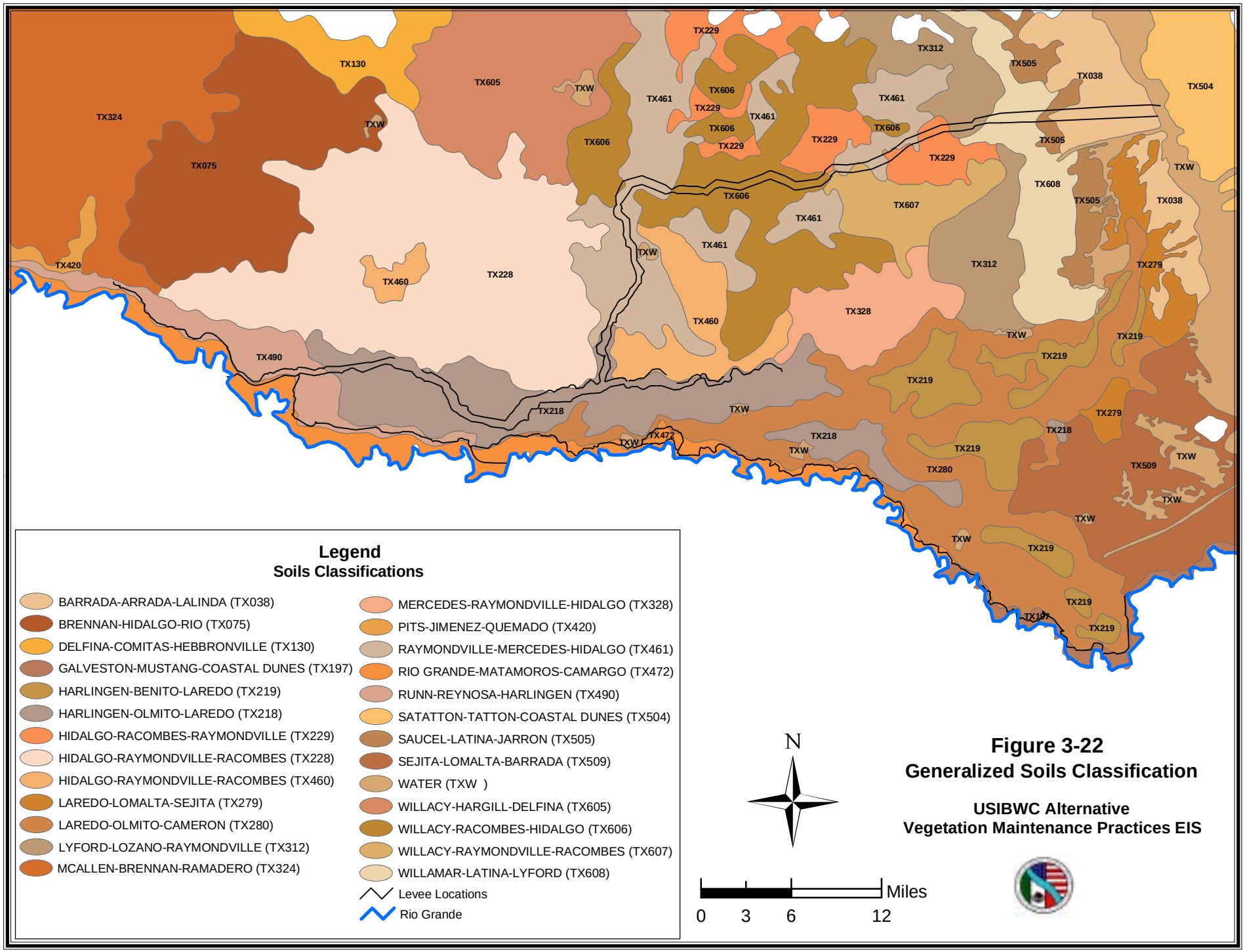


Figure 3-22
Generalized Soils Classification

USIBWC Alternative
Vegetation Maintenance Practices EIS

3.6.1.2 Prime Farmlands

The Farmland Protection Policy Act (FPPA) was enacted as a subtitle of the 1981 Farm Bill to minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses (USDA, 1999). The FPPA requires agencies to analyze their impacts to farmland by completing a Farmland Conversion Impact Rating Form before federal projects are approved. Potentially affected farmlands are given a numerical rating according to the Land Evaluation and Site Assessment System (LESA). LESA systems have two components. The Land Evaluation (LE) element rates soil quality and the Site Assessment (SA) element measures all factors that affect the farm's viability (FIC, 1998). On the basis of this analysis, a federal agency may (but is not required to) deny assistance to the evaluated project.

Farmland, as defined in the FPPA, includes prime, unique land, and land of state or local importance. To be classified as prime, the land must meet specific criteria. The land must be the best combination of physical and chemical characteristics for producing agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed (including water management) according to acceptable farming methods. Unique farmland is used for the production of specific high-value food or fiber crops, such as citrus, tree nuts, olives, cranberries, fruits and vegetables (CFR, 2000). However, the state of Texas does not recognize unique farmland (Brown, 1999). The NRCS (formerly the Soil Conservation Service [SCS]) determines farmland of state or local importance using the Farmland Conversion Impact Rating Form.

Approximately 30,296 acres of prime farmland soils are located within the project area. Table 3-20 presents acreage of each prime farmland soil type within the project area. Some soil types are only classified as prime land by a particular county.

3.6.2 Geology

3.6.2.1 Topography

The topography of Cameron County consists of a flat plain sloping gently toward the northeast. An alluvial plain or delta of the Rio Grande dominates most of Cameron County (SCS, 1977). The delta is marked by portions of abandoned river channels, known as "resacas." The resacas located in the project area are long, shallow depressions (USACE, 1982a). The average elevation in this region is approximately 45 ft, ranging from sea level to 70 ft (SCS, 1977).

Hidalgo County topography is nearly flat to gently sloping. Elevation ranges from 40 ft above sea level on the eastern portion of the county, to 375 ft above sea level on the western side. General drainage is to the northeast with the exceptions of areas around La Joya Creek in the southwest (drainage to the south) and the Rio Grande floodplain (drainage to the east; SCS, 1981).

3.6.2.2 Geology

The geology of the project area consists mainly of alluvium and terrace deposits with some sandstone and clay outcrops. The alluvium deposits are divided into sections that are predominantly mud, silt and sand, or a combination of all three. The sand is mostly quartz and the silt is dark gray to dark brown and calcareous. The fluvial terrace deposits are composed of gravel, sand, silt, and clay, similar in composition to the contiguous alluvium (UTBEG, 1976).

The undivided alluvial deposits and the terrace deposits are located between Falcon Reservoir and a point just below Los Ebanos. Downstream, the deposits consist of alluvium, either predominantly mud or silt and sand. The sandstone and clay outcrop in some portions along the river between Falcon Reservoir and a point approximately 18-river miles downstream (UTBEG, 1976).

Table 3-20 Prime Land Soils Types within the Project Area

Soil Types	Acres in Project Area
Camargo silt loam	2,257
Camargo silty clay loam	1,885
Cameron silty clay	13
Harlingen clay* (Cameron County only)	290
Laredo silty clay loam (Hidalgo County only)	98
Laredo silty clay loam, 0 to 1 percent slopes (Cameron County only)	219
Laredo silty clay loam, 1 to 3 percent slopes (Cameron County only)	2
Laredo-Olmito complex* (Cameron County only)	59
Laredo-Reynosa complex, 0 to 1 percent slopes (Cameron County only)	22
Matamoros silty clay	8,663
Matamoros-Rio Grande complex (Cameron County only)	726
Olmito silty clay*	334
Raymondville clay loam, 0 to 1 percent slopes (Cameron County only)	604
Reynosa silty clay loam, 0 to 1 percent slopes (Cameron County only)	10,714
Rio Grande silt loam*	3,878
Rio Grande silty clay loam	532
Total Prime Farmland in Project Area	**30,296**

Source: USDA-NRCS, 2001
* Considered prime farmland only if irrigated.

The sandstone and clay outcrops are from the Jackson Group and the Yegua and Laredo Formations. The Jackson Group is approximately 360 ft thick. The sandstone of the Jackson Group is commonly laminated and cross-bedded, white, gray, greenish brown or light brownish yellow, and fossiliferous. The clay deposits are sandy, calcareous, and greenish gray, pink, or red. Silicified wood is abundant in the Jackson Group. Some beds of white volcanic ash are present and limestone concretions are common. The

Yegua Formation is approximately 400 ft thick and consists mostly of clay deposits. These deposits are chocolate brown to reddish brown and lighten upward. They produce a dark-gray soil. The sandstone is mostly quartz with some chert and weathers to loose, yellow-orange and reddish-brown soil. The Laredo Formation is approximately 620 ft thick and consists of thick, very fine to fine grained sandstone members in the upper and lower parts with clay in the middle. The sandstone members are predominantly red and brown. The clay weathers orange-yellow. Dark gray limestone concretions are common (UTBEG, 1976).

3.6.2.3 Mineral Resources

Mineral resources in Cameron and Hidalgo Counties include oil and gas, burning clay, sand, and gravel. Caliche is another resource found only in Hidalgo County (UTBEG, 1943; UTBEG, 1962). Primarily small and moderate sized companies mine these materials along the Rio Grande. However, Texas does not require permits for the mining of some materials, including sand, gravel, and caliche. Due to the lack of regulation and available statistical information, it is difficult to precisely determine the volume of mining in the project area.

3.7 HAZARDOUS MATERIALS

A review of regulatory database information from both federal and state agencies was conducted to identify hazardous wastes and hazardous substances within the project area. Hazardous materials were identified with the use of the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list, Resource Conservation and Recovery Information System (RCRIS) violation and corrective action list, and the leaking underground storage tanks (LUST), solid waste landfills (SWLF), registered underground storage tanks (UST), and registered above ground storage tanks (AST) databases. These databases are used to identify materials that pose a risk for human health and the environment.

The CERCLIS provides a list of hazardous substances defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601, and those reported on the National Priorities List (NPL). The CERCLIS, created by the Federal Superfund legislation identifies sites contaminated by hazardous substances and implements procedures for remediation. The NPL includes sites that pose the gravest threats to human health and the environment.

The RCRIS is regulated under the Resource Conservation and Recovery Act (RCRA), 42 USC 6901 et seq. where violations and/or corrective actions have been reported. The RCRA regulates the generation, treatment, storage, and disposal of hazardous waste. Violations of this act can include deviation from regulations or provisions of compliance orders, consent agreements, consent decrees, permit conditions, or manifests. Corrective actions can include groundwater and surface water monitoring, closure and post-closure activities, compliance studies, and remedial actions. In Texas, a treatment, storage, or disposal (TSD) facility must obtain a RCRA permit from the TCEQ. The RCRA-TSD and RCRA-Corrective Actions (CORRACTS) environmental databases were searched for the project area.

Subtitle I of RCRA includes provisions for regulating hazardous substances as defined in CERCLA and petroleum, oil, and lubricants (POL) stored in USTs. The TCEQ has adopted these regulations and has included regulations covering ASTs. These regulations form the regulatory framework for UST systems that store hazardous materials and petroleum products. The regulations establish minimum standards and procedures for the protection of groundwater and surface water in the event of a release from a UST system. The protection of human health and the environment is also regulated. LUST, SWLF, UST, AST, as well as other potential hazardous material sites were all searched under the pertinent environmental databases.

A total of 24 sites with 33 environmental database listings were identified in an environmental database search report, including 19 LUST, 11 UST, two SWLF, and one CERCLIS/No Further Remediation Action Planned (NFRAP) listing. Nineteen of the sites with 28 listings were found in the Brownsville area. The other five sites were found in the Penitas area (one solid waste landfill), in the Reynosa/McAllen area (three LUST sites), and in Harlingen near Santa Maria (one solid waste landfill).

No hazardous material sites are located within the area of vegetation maintenance. The closest site to the project area is a LUST located in Brownsville, over 650 ft from the Rio Grande. An incident was reported for this site in 1996. Groundwater was impacted, but currently there are no apparent threats or impacts to receptors. Continual monitoring is being performed at this site. No UST, SWLF or CERCLIS/NFRAP sites are located within or appear to impact the project area (TNRCC, 2002). Cameron and Hidalgo counties do not have any sites listed under the NPL.

3.8 AIR QUALITY

The following sections discuss the affected environment or baseline conditions within the project area. This discussion includes Cameron and Hidalgo counties and the regional areas that have the potential to impact air quality within the project area. As discussed below, the project area is in attainment as defined by air quality regulations.

3.8.1 Air Quality and Regulations

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is not only determined by the types and quantities of atmospheric pollutants, but also by surface topography, the size of the air basin, and by the prevailing meteorological conditions.

The Clean Air Act (CAA) of 1970, as amended by the CAA amendments of 1990, directed the United States Environmental Protection Agency (USEPA) to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). The promulgation of the CAA was driven by the failure of nearly 100 cities to meet the NAAQS for ozone and carbon monoxide and by the inherent limitations in previous regulations to effectively deal with these and other air quality problems. The USEPA established both primary and secondary NAAQS under the provisions of the CAA.

Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (i.e., soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS are currently established for six air pollutants (known as "criteria air pollutants") including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_X, measured as sulfur dioxide, SO_2), lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and 2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Only PM_{10} is regulated by the rule.

The CAA does not make the NAAQS directly enforceable. However, the Act does require each state to promulgate a state implementation plan (SIP) that provides for implementation, maintenance, and enforcement of the NAAQS in each air quality control region (AQCR) in the state. The CAA also allows states to adopt air quality standards that are more stringent than the federal standards. As promulgated in the Texas Administrative Code, Title 30, Subchapter A, the State of Texas has adopted NAAQS as the Texas standards listed in Table 3-21.

Table 3-21 National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]
Carbon Monoxide	8-hour 1-hour	9.5 ppm (10 mg/m^3) 35.5 ppm (40 mg/m^3)	9.5 ppm (10 mg/m^3) 35.5 ppm (40 mg/m^3)
Lead	Quarterly	1.55 µg/m^3	1.55 µg/m^3
Nitrogen Dioxide	Annual	0.0543 ppm (100 µg/m^3)	0.0543 ppm (100 µg/m^3)
Ozone	1 hour	0.125 ppm (235 µg/m^3)	0.125 ppm (235 µg/m^3)
PM_{10}	Annual 24-hour	51 µg/m^3 155 µg/m^3	51 µg/m^3 155 µg/m^3
Sulfur Oxides (measured as SO_2)	Annual 24-hour 3-hour	0.035 ppm (80 µg/m^3) 0.145 ppm (365 µg/m^3) No standard	No standard No standard 0.55 ppm (1,300 µg/m^3)

PM_{10} Particles with aerodynamic diameters less than or equal to a nominal 10 micrometers

a The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

b The NAAQS are based on standard temperature and pressure of 25 Celsius and 760 millimeters of mercury.

c National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the state implementation plan is approved by the USEPA.

d National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the state implementation plan is approved by the USEPA.

3.8.2 Meteorology

Brownsville is characterized by a semi-tropical climate. The average annual temperature is approximately 74 degrees Fahrenheit (°F), with a winter average of 59°F and a summer average of 85°F. Though temperatures average approximately 85°F during June through August, temperatures can reach up to at least 95°F. Relative humidity averages approximately 75 percent annually (BCC, 2001b; NWS, 2001).

Average precipitation for the year 2000 was approximately 16.5 inches in Brownsville. The month of August received the most rainfall with an average of 4.3 inches. February received the least rainfall with an average of 0.19 inches (NWS, 2001). Despite the low rainfall in 2000, it has been reported that Brownsville typically receives approximately 25 inches of rainfall each year (BCC, 2001b).

Surface winds normally blow in a south-southeasterly direction for most of the year. During the winter months, winds predominantly blow northward. Wind speed ranges throughout the year from approximately 4 to 15 knots (NWS, 2001).

3.8.3 Regional Air Quality

The USEPA classifies the air quality within an AQCR according to whether or not the concentrations of criteria air pollutants in the atmosphere exceed primary or secondary NAAQS. All areas within each AQCR are assigned a designation of attainment, nonattainment, unclassifiable attainment, or not designated attainment for each criteria air pollutant. An attainment designation indicates that the air quality within an area is as good or better than the NAAQS. Nonattainment indicates that air quality within a specific geographical area exceeds applicable NAAQS. Unclassifiable and not designated indicates that the air quality cannot be or has not been classified on the basis of available information as meeting or not meeting the NAAQS and is therefore treated as attainment. Before a nonattainment area is eligible for reclassification to attainment status, the state must demonstrate compliance with NAAQS in the nonattainment area for three consecutive years and demonstrate, through extensive dispersion modeling, that attainment status can be maintained in the future even with community growth.

Federal actions must comply with the USEPA Final General Conformity Rule published in 40 CFR 93, subpart B (for federal agencies) and 40 CFR 51, subpart W (for state requirements). The Final Conformity Rule, which took effect on January 31, 1994, requires all federal agencies to ensure that proposed agency activities conform to an approved or promulgated SIP or federal implementation plan (FIP). Conformity means compliance with a SIP or FIP for the purpose of attaining or maintaining the NAAQS. Specifically, this means ensuring the federal activity does *not*: 1) cause a new violation of the NAAQS; 2) contribute to an increase in the frequency or severity of violations of existing NAAQS; 3) delay the timely attainment of any NAAQS; or 4) delay interim or other milestones contained in the SIP for achieving attainment.

The Final General Conformity Rule *only* applies to federal actions in designated nonattainment or maintenance areas. The rule requires that total direct and indirect emissions of nonattainment criteria pollutants, including ozone precursors, be considered in determining conformity. The rule does not apply to actions that are *not* considered

regionally significant and where the total direct and indirect emissions of nonattainment criteria pollutants do not equal or exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.153(b). A federal action would be considered regionally significant when the total emissions from the proposed action equal or exceed 10 percent of the nonattainment area's emissions inventory for any criteria air pollutant. If a federal action meets *de minimis* requirements and is *not* considered a regionally significant action, then it does not have to go through a full conformity determination. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions above the *de minimis* levels as the result of the federal action.

The project area is located in Cameron and Hidalgo Counties within the Brownsville-Laredo Interstate AQCR. This AQCR is located completely within the state of Texas, covering Cameron County, Hidalgo County, Jim Hogg County, Starr County, Webb County, Willacy County and Zapata County (CFR, 2001). The Brownsville-Laredo Interstate AQCR comprised a total population of 648,865 in 1997 (USEPA, 1997). As of August 2001, the USEPA has designated the air quality within all counties of the Brownsville-Laredo Intrastate AQCR, under attainment status for all criteria pollutants (USEPA, 2001).

3.8.4 Air Emissions Sources

The transport of air pollutants from industrial sources in Mexico and the Texas Gulf Coast area has been implicated in air quality degradation episodes. Area sources of urbanization and industrialization can contribute considerably to air quality problems by emitting large quantities of particulate matter and carbon monoxide (CO). Another concern is the emission of volatile organic compounds (VOCs) from plants manufacturing electronic and electric equipment, transportation equipment, and furniture. Along with nitrogen oxides (NO_x), VOCs are major precursors of ozone formation and may be toxic substances (USEPA, 1992).

TCEQ has identified twenty-one companies in Hidalgo County and 16 companies in Cameron County as contributors of point source emissions. Potential stationary sources of criteria pollutant and hazardous air pollutant emissions within Cameron and Hidalgo counties include several oil mills and refineries, manufacturing and electronics companies, and utilities and gasoline facilities (TNRCC, 1999). The permitted stationary point source emission inventory for Cameron and Hidalgo Counties is presented in Table 3-22.

Table 3-22 Stationary Point Source Emissions Inventory for Cameron County and Hidalgo County

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_X (tpy)	SO_X (tpy)	PM_{10} (tpy)
Cameron and Hidalgo Counties Emissions Inventory[a]	4,747.66	1,669.6	4,317.18	9.75	465.63

tpy tons per year
[a]Source: TNRCC,1999

3.9 NOISE

Noise is defined as "unwelcome or unwanted" sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or diminishes the quality of the environment.

Land-use and zoning classifications in the area surrounding the project area provide an indication of potential noise impact. Land use in the levee areas is predominantly agricultural. Due to the flood-prone nature of land within the levees, no sensitive noise receptors are located within the levees. These would include schools, churches, and medical facilities. The major noise sources in the project area are associated with agricultural activities

When high noise is experienced inside or outside people's homes, as may occur from the over-flight of aircraft or the operation of mechanical equipment, a feeling of annoyance may result. The noise may also interfere with the performance of various activities such as conversation, TV watching, etc. The degree to which there is annoyance and/or activity interference depends on the magnitude of the intruding noise, the frequency with which it occurs, and the time of day of occurrence. When describing sound and its effects on human populations, A-weighted (dBA) sound levels are typically used to account for the response of the human ear. Common outdoor noise sources such as a gas lawn mower at 100 ft, or a diesel truck at 50 ft are approximately 70 dBA and 88 dBA, respectively. Indoor noise sources such as a vacuum cleaner at 10 ft and a garbage disposal at 3 ft are approximately 70 dBA and 80 dBA, respectively. Equipment used for vegetation maintenance would be approximately 82.5 dBA at 50 ft (CERL, 1978).

Chapter 4

Environmental Consequences

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

This chapter describes the potential environmental consequences of the four alternatives considered in this FEIS relative to the nine resource areas described in Chapter 3. Both the Continued Maintenance Alternative and cumulative impacts from other projects identified in Chapter 2 are addressed.

4.1 BIOLOGICAL RESOURCES

4.1.1 Prior Maintenance Alternative

4.1.1.1 Vegetation Communities

The impacts to vegetation communities as a result of implementation of the Prior Maintenance Alternative would affect about 1,022 acres. Thorn scrub communities would experience the greatest impacts under this alternative. Grassland communities and agricultural lands would be the other two vegetation types that would be primarily affected.

Impacts by vegetation community type and alternative are presented in Table 4-1 and each alternative is discussed in more detail below. The Suspended Maintenance Alternative is not referenced in the table since vegetation maintenance would be terminated under this alternative.

Table 4-1 Impacts to Vegetation Communities (in acres) by Alternative

Vegetation Type	Expanded Maintenance	Continued Maintenance	Prior Maintenance
Agriculture	34.8	7.0	150.1
Citrus	0	0	0.5
Hackberry/Elm	122.5	20.7	72.8
Riparian/Willow	111.1	7.7	86.4
Thorn scrub	295.1	21.6	376.9
Grassland	300.5	233.9	331.3
Resaca	0.2	0.0	0.2
Sabal Palm	4.9	0	0.2
Baccharis scrub	1.3	0	0
Urban/Developed	3.5	0.0	3.6
Total	874.0	291.0	1022.0

The locations of these maintenance areas are depicted in Figures 2-7 through 2-18. It should be noted that the vegetation communities are based on recent reconnaissance of the project area and might appear to be in conflict with the purposes of the LRGFCP. For instance, the data in Table 4-1 indicate that prior activities had mowed/cleared about 150 acres of agricultural lands. These lands are currently in agricultural production but were comprised of native vegetation in the past. USIBWC does not mow or clear agricultural crops for floodwater conveyance.

4.1.1.2 Wildlife

A Habitat Evaluation Procedures (HEP) analysis was performed for this project in an attempt to quantify the impacts to the terrestrial and semi-aquatic wildlife that exist along the Rio Grande (Appendix M). HEP is a system that uses stratified random sampling of available habitats to assess extant and future habitat conditions, compare project alternatives, and analyze mitigation measures to offset project impacts. HEP uses selected wildlife species to represent a guild of wildlife that would use the various habitats. The habitat conditions are assessed relative to these evaluation species. The HEP results indicated that habitats and the wildlife populations they support would be impacted under each of the maintenance alternatives. The magnitude of impacts and species affected would vary among the alternatives, as is discussed in the following paragraphs. However, each of the alternatives would result in transition of the existing community to a grassland community, with a consequent shift in wildlife guilds.

In HEP, habitat units (HUs) are a function of habitat quality and habitat area (acres). One HU represents one acre of optimal habitat. The results of the HEP analysis will be discussed in terms of average annual habitat units (AAHUs). AAHUs are a function of HUs annualized over the life of the project. It should be noted, that no changes in the AAHUs would occur for the fox squirrel because the model indicates that fox squirrel habitat is limited by a lack of hardmast tree species in the project area. Table 4-2 summarizes the net changes in AAHUs by species and alternatives when compared to the Preferred Continued Maintenance Alternative.

Table 4-2 Net Changes in AAHUs by Species and Alternative

Species	Prior Maintenance	Expanded Maintenance	Suspended Maintenance
Beaver	-3.6	-2.9	147.0
Slider turtle	-365.0	-289.5	147.0
Belted kingfisher	-146.0	-115.8	37.0
Fox squirrel	0	0	0
Total combined AAHUs	-514.6	-408.2	331.0

Some direct adverse effects to animals that are not highly mobile or that are burrowing species could occur as a result of the mowing operations. Amphibians, reptiles, and smaller mammals would be the most susceptible to the mowing activities. Nesting and fledgling birds would also be affected if the mowing occurred during the nesting season (typically March through September). Larger, more mobile species (e.g., coyotes, deer, shorebirds, etc.), would likely avoid the area by relocating to adjacent

suitable habitats. Since these activities would occur only once per year, any losses of individual specimens would not be considered a significant effect to the wildlife population.

A return to maintaining the same areas that were used prior to the Consent Decree would have similar impacts as the Expanded Maintenance Alternative discussed below; however, the magnitude of the effects would vary. More acres of thorn scrub and grasslands would be mowed and/or cleared, but less acreage of hackberry/elm and riparian/willow communities would be affected. Approximately 150 acres that was previously maintained is now under agricultural production, which accounts for 15 percent of the total lands comprising the Prior Maintenance Alternative. These lands would probably remain in agricultural production if this alternative is implemented and thus, little or no effect, beneficial or adverse, to wildlife species would be experienced, depending upon the type of crop(s) produced.

The HEP results indicated returning to the prior maintenance routine would result in a net loss of 514.6 AAHUs (40 percent) for all species. This loss of AAHUs is primarily seen in a loss by the slider turtle and the belted kingfisher. This alternative represents the greatest acreage of mowing and therefore the greatest loss of AAHUs when compared to the other alternatives.

4.1.1.3 Aquatic Communities

No direct physical changes to the aquatic communities along the riverbank would be expected to occur under the Prior Maintenance Alternative. Erosion would not be expected to measurably increase under this alternative.

4.1.1.4 Threatened and Endangered Species

Plant Species

As indicated in Appendix L, the USFWS verified that Texas ayenia was the only plant species that had the potential to occur within the project area. USFWS were consulted regarding appropriate survey methodology for the Texas ayenia. Intensive surveys for this species were conducted by trained biologists during two seasons. In addition, efforts to locate this species and other plant species of concern were made during the HEP field surveys. Although suitable habitat was located, no specimens of Texas ayenia or other plant species of concern were found. Therefore, no impacts to threatened or endangered plant species would be expected as a result of implementation of the Prior Maintenance Alternative.

Animal Species

No specific surveys were conducted for the ocelot or jaguarundi, as the USFWS assumes that these species have the potential to occur in any suitable habitat along the Rio Grande. Potential cat habitat for these two species includes dense thorny shrub land and low brush such as granjeno, lotebush, and blackbrush (GSRC, 2003). The last documented sighting of a jaguarundi was in 1986, although several unconfirmed sightings have been reported within the various management units of the Santa Ana and LRGV NWRs, as well as the Bentsen Rio Grande State Park. Ocelots have been reported

from these areas, with the last confirmed sighting in 1999 at the Laguna Atascosa NWR, southeast of Brownsville.

While any additional loss of habitat could possibly be considered an effect to these species, only a few areas proposed for vegetation maintenance are considered potential habitat for either cat species. The criteria used to determine potential habitat included the community size and juxtaposition to other similar sized tracts, vegetation species composition and density, and proximity to urban or developed areas. Details regarding these criteria are found in Appendix L. Figures 4-1 and 4-2 illustrate the location of potential cat habitat compared to proposed vegetation maintenance areas for all alternatives within the project area.

Cat habitat could potentially be affected by vegetation maintenance. The Prior Maintenance Alternative risks the loss of approximately 27 acres of potential cat habitat. Loss under the Prior Maintenance Alternative would not be compensated with the establishment of a wildlife travel corridor. If prior maintenance requirements do not allow these areas to be avoided, the USIBWC would perform additional consultation with USFWS. Table 4-3 illustrates the changes in cat habitat that could result from the implementation of each alternative.

Table 4-3 Changes in Potential Cat Habitat Under Each Maintenance Alternative

	Continued Maintenance	Prior Maintenance	Suspended Maintenance	Expanded Maintenance
Change in Cat Habitat (acres)	0	- 27	+ 12	- 42
Wildlife Travel Corridor Habitat (acres)	+ 57	0	+291	+ 314

As noted in Chapter 2, after preliminary analysis the USIBWC chose the Continued Maintenance Alternative as the Preferred Alternative. This alternative is a continuation of the current vegetation maintenance practices formulated in the 1993 BO and the 2003 BO.

4.1.1.5 Unique and Sensitive Areas

Maintenance activities that are proposed on any tract owned or managed by the TPWD, USFWS or other conservation organizations (e.g., The Nature Conservancy, Audubon Society, etc.) require prior approval from the agency or organization. Implementation of the Prior Maintenance Alternative activities would potentially impact nine NWR tracts, located primarily between Mercedes and Brownsville. The majority of these have been recently acquired and, thus, climax communities have not yet become established.

4.1.1.6 Wetlands

Maintenance activities under the Prior Maintenance Alternative would involve mowing with bush hogs and hand-clearing overhanging vegetation and therefore, are not subject to a Section 404 permit. As such, no actions would occur that would result in the loss of wetlands.

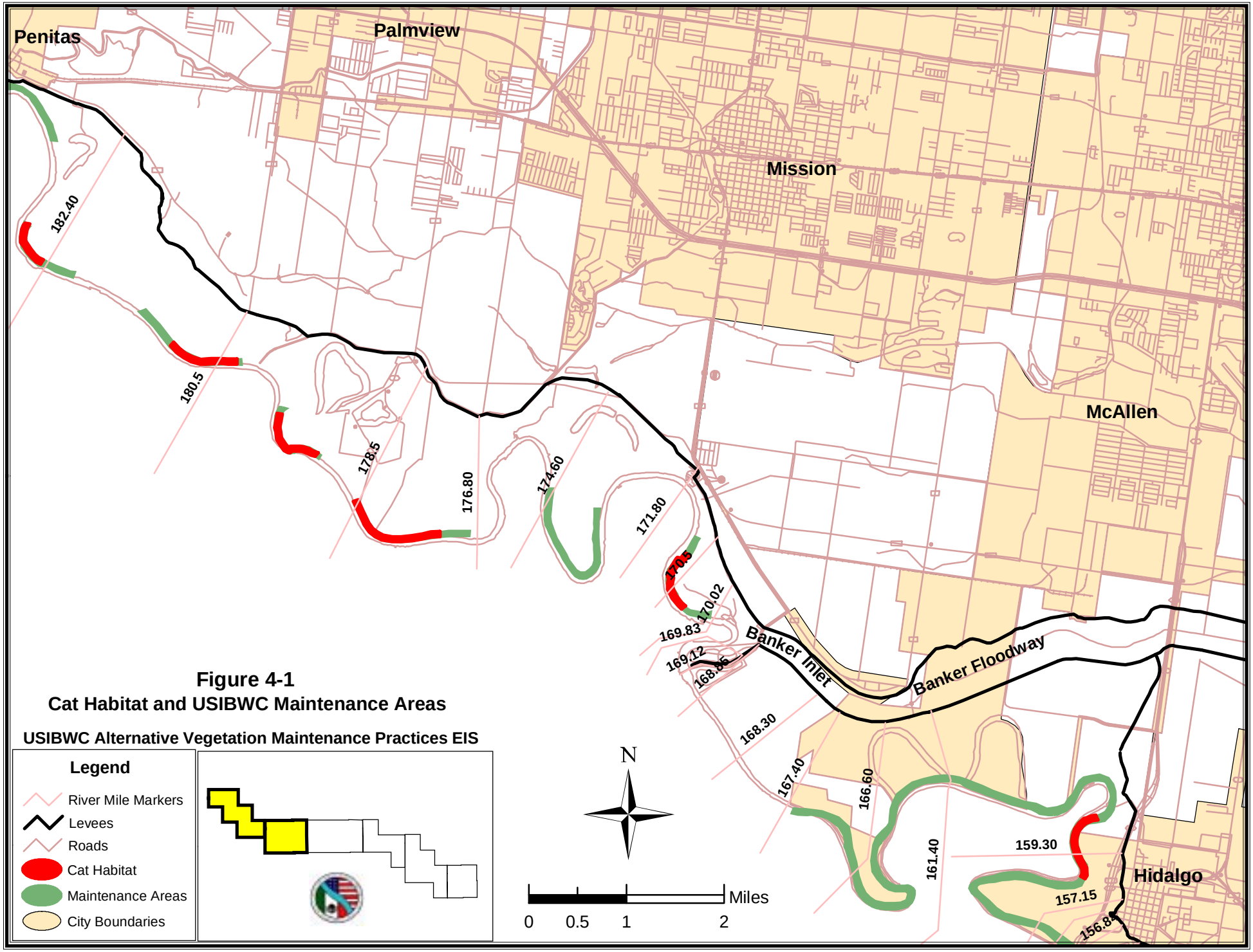


Figure 4-1
Cat Habitat and USIBWC Maintenance Areas

USIBWC Alternative Vegetation Maintenance Practices EIS

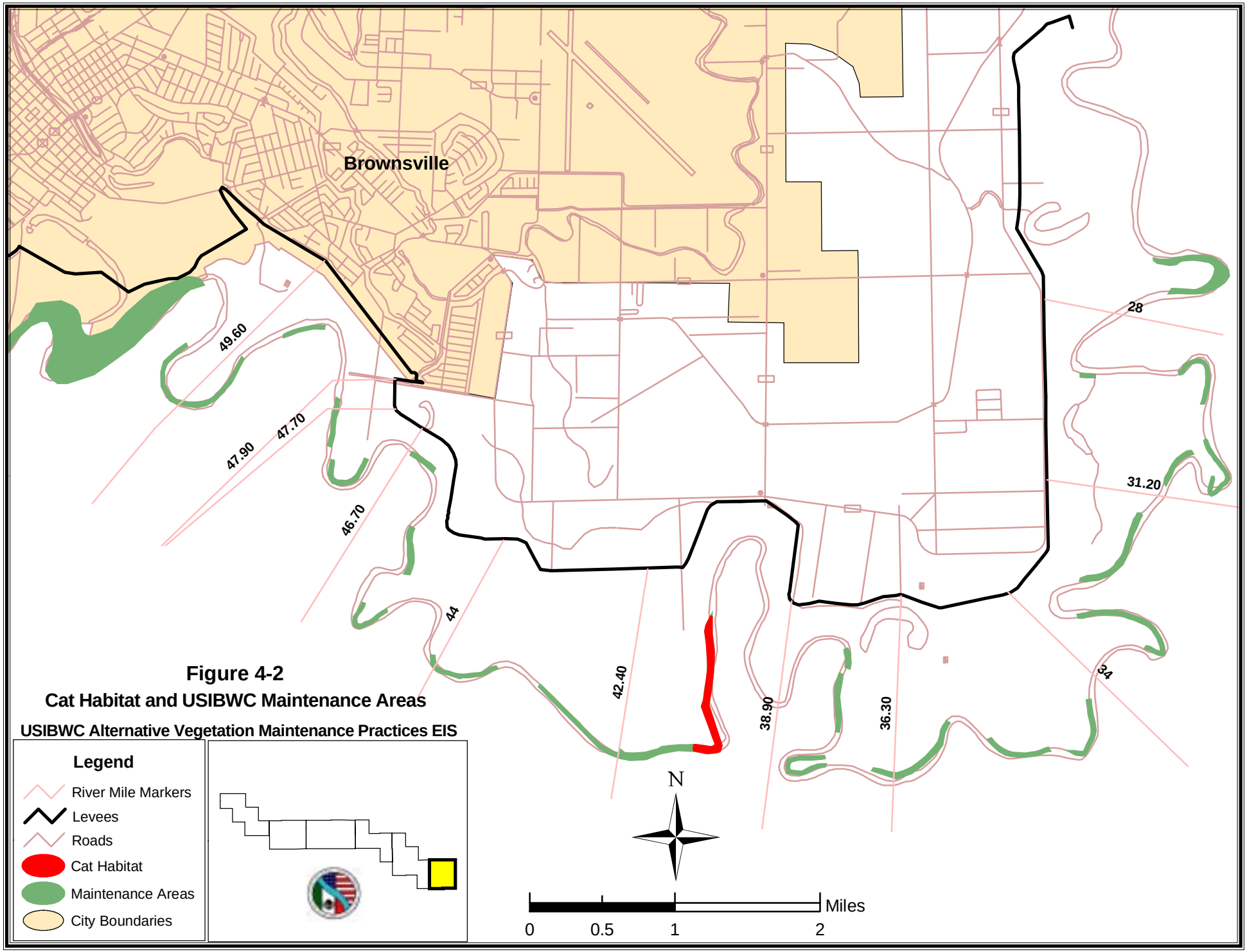


Figure 4-2

Cat Habitat and USIBWC Maintenance Areas

USIBWC Alternative Vegetation Maintenance Practices EIS

4.1.2 Continued Maintenance Alternative (No-Action)

4.1.2.1 Vegetation Communities

Under the Continued Maintenance Alternative, USIBWC would proceed to maintain about 291 acres along the riverbank, mostly around Brownsville. The USIBWC current maintenance practices are addressed in the USFWS 1993 BO and the 2003 BO (Appendix C). The majority of habitat affected by the current operations is grassland (81 percent). The other two primary affected habitats are the thorn scrub and hackberry/elm communities. Combined, these three communities comprise approximately 95 percent of the habitats that would continue to be affected under the Continued Maintenance Alternative. Table 4-1 presents impacts by vegetation type for each alternative.

4.1.2.2 Wildlife

The Continued Maintenance Alternative would not result in any additional impacts to terrestrial or semi-aquatic wildlife populations. Any shift in species diversity would have already occurred under the Continued Maintenance Alternative since maintenance activities would not change from the current practices. These practices have been negotiated with and approved by the USFWS as described in the BO. That is, shifts in wildlife guilds occurred once the woodlands and thorn scrub habitats were converted to grassland areas that were maintained on an annual basis. The wildlife populations that occupy the maintained areas have presumably become stabilized since these areas have incurred maintenance actions for over 12 years.

The baseline conditions measured in the HEP analysis are representative of the Continued Maintenance Alternative, which indicated that the area would support 207.3 AAHUs. These AAHUs consist of 1.5 AAHUs for the beaver, 147.0 AAHUs for the slider turtle, 58.8 AAHUs for the belted kingfisher, and no AAHUs for the fox squirrel.

4.1.2.3 Aquatic Communities

No direct physical changes to the aquatic communities along the riverbank would be expected to occur under the Continued Maintenance Alternative. Aquatic communities are not impacted by the current maintenance practices, and therefore would not be affected by the Continued Maintenance Alternative.

4.1.2.4 Threatened and Endangered Species

Plant Species

As indicated in Appendix L, the USFWS verified that Texas ayenia was the only plant species that had the potential to occur within the project area. Despite intensive surveys conducted during two seasons, no specimens of Texas ayenia or other plant species of concern were found. Therefore, no impacts to threatened or endangered plant species would be expected as a result of implementation of the Continued Maintenance Alternative.

Animal Species

As presented in Table 4-3, the Continued Maintenance Alternative would not present any additional effects for ocelot and jaguarundi (cat) habitat. Only a small stretch of potential cat habitat (approximately 12 acres) lies between RM 28.00 and RM 62.50 (Figure 4-2). Vegetation along this strip is currently mowed within 75 feet (ft) of the river in accordance with the BO. No additional loss of habitat would result from the Continued Maintenance Alternative.

A wildlife corridor, covering approximately 57 acres, would be established under this alternative, providing a potential benefit for the ocelot and jaguarundi. Negotiations with private landowners would be used to establish easements between wildlife refuges and preserved areas. The easements would provide habitat for the ocelot and jaguarundi to travel between potential habitat areas. The Continued Maintenance Alternative would not result in any reduction of cat habitat and therefore, has been chosen as the Preferred Alternative

4.1.2.5 Unique and Sensitive Areas

Under the Continued Maintenance Alternative, three NWR tracts would be impacted. These tracts, known as the Champion Bend, Jeronimo Banco and Boscaje de la Palma units, are located near Brownsville. These tracts were recently incorporated into the NWR system. Vegetation maintenance within 75 ft of the Rio Grande would be expected to continue.

4.1.2.6 Wetlands

Maintenance activities involving mowing with bush hogs and hand-clearing overhanging vegetation are not subject to a Section 404 permit. As such, no actions would occur under the Continued Maintenance Alternative that would result in the loss of wetlands.

4.1.3 Suspended Maintenance Alternative

4.1.3.1 Vegetation Communities

The Suspended Maintenance Alternative would result in an increase of all habitat types, assuming that private landowners would not continue maintenance actions on their own. The areas currently maintained as grasslands would naturally succeed to their climax vegetation communities of thorn scrub and hackberry/elm forests. This alternative would increase the available wildlife habitat by about 291 acres.

4.1.3.2 Wildlife

Implementation of the Suspended Maintenance Alternative would result in overall benefits to the wildlife populations inhabiting the LRGV. There would be some shift in wildlife guilds where grassland communities are allowed to succeed to climax communities. The areas currently maintained could be incorporated to the NWR parcels and/or the wildlife corridor, which would expand travel corridors for numerous larger mammals and birds by approximately 291 acres.

The HEP results indicate that with the suspension of maintenance activities, there would be a gain of 331.0 AAHUs (63 percent) for the species evaluated. The suspension of maintenance activities would result in an increase in available habitat in the LRGV. Table 4-2 summarizes the net changes in AAHUs by species and alternatives when compared to the Continued Maintenance Alternative.

4.1.3.3 Aquatic Communities

The Suspended Maintenance Alternative would allow re-establishment of vegetation communities along the riverbank and, thus, would improve quality of the near-shore aquatic ecosystems. Climax communities would provide more structure along the bank, decrease water temperatures and improve water quality by acting as a filter and sediment trap for storm water runoff.

4.1.3.4 Threatened and Endangered Species

Plant Species

Although suitable habitat was located, no specimens of Texas ayenia or other plant species of concern were found in the project area. Therefore, implementation of the Suspended Maintenance Alternative would not be expected to affect the protected plant species, either beneficially or adversely. Suitable habitat occurs within the project area now and, yet, only a very few sites have been reported where these species grow.

Animal Species

Termination of vegetation maintenance through the Suspended Maintenance Alternative could result in the addition of approximately 12 acres of ocelot and jaguarundi (cat) habitat. The Suspended Maintenance Alternative would allow the areas currently being maintained to grow through succession to climax communities. Development of such areas could beneficially impact the cats, by providing more potential habitat and a contiguous travel corridor along the riverbank. Figures 4-1 and 4-2 illustrate the location of potential cat habitat compared to proposed vegetation maintenance areas within the project area. Table 4-3 illustrates the changes in cat habitat that could result from the implementation of each alternative.

4.1.3.5 Unique and Sensitive Areas

Implementation of the Suspended Maintenance Alternative would provide additional benefits to the unique and sensitive resources within the project area by potentially increasing the available habitat. In particular, cessation of the maintenance areas within and near the Champion Bend, Jeronimo Banco and Boscaje de la Palma NWR tracts would enhance the quality of habitat in these units and expand travel corridors on either side of the tracts.

4.1.3.6 Wetlands

Since vegetation maintenance would be terminated under the Suspended Maintenance Alternative, no impacts to wetlands would occur and Section 404 permitting would not be required.

4.1.4 Expanded Maintenance Alternative

4.1.4.1 Vegetation Communities

The Expanded Maintenance Alternative would result in a 296 percent increase over the total acreage being maintained under the Continued Maintenance Alternative. Of the 874 acres that would be maintained under the Expanded Maintenance Alternative, the majority of the acreage (34 percent) would be grassland communities and thorn scrub (34 percent), followed by hackberry/elm forests (14 percent) and riparian/willow communities (13 percent). Although Table 4-1 indicates that over five acres of sabal palm habitat would be affected; it should be noted that USIBWC does not intend to remove any sabal palms. These areas are on the fringes of the sabal palm communities and likely consist of lead tree, baccharis, and mimosa. USIBWC would coordinate with the USFWS and/or TPWD prior to clearing in these areas to ensure avoidance of sabal palms.

4.1.4.2 Wildlife

Wildlife species would be affected mostly by the alteration of thorn scrub, riparian/willow, and hackberry/elm communities, which comprise 61 percent (529 acres) of the total lands that would be maintained under this alternative. Species such as Altamira oriole, golden-fronted woodpecker, groove-billed ani, and scarlet tanager are birds that would be the most affected by the conversion of woodland and scrub habitats to grasslands. However, bird species such as red-winged blackbirds, savannah sparrow, indigo bunting, and loggerhead shrike would benefit from the creation of additional grasslands, provided other life requisites are present nearby.

Mammal populations would experience a shift in guilds as well. The conversion could adversely affect species such as raccoon, white-tailed deer, fox squirrel, bobcat and various bats. Cottontail rabbits and smaller rodent species such as fulvous harvest mouse and hispid cotton rat, could potentially benefit from the maintenance activities, thus, increasing the prey base for predators, including raptors.

The conversion of the woodlands and scrub habitats would also impact, beneficially and adversely, various amphibian and reptilian species. Species such as six-lined racerunner, box turtle and Woodhouse's toad, would likely benefit from the maintenance activities. Others, such as Texas tortoise, coral snake, and tree frogs would be adversely affected by the loss of woodland and scrub habitats.

The HEP results indicated the expanded maintenance alternative would result in a loss of 408.2 AAHUs (51 percent). As seen in the Prior Maintenance Alternative, this loss is primarily in AAHUs for the slider turtle and the belted kingfisher. This alternative represents less net loss when compared to the Prior Maintenance Alternative. Table 4-2 summarizes the net changes in AAHUs by species and alternatives when compared to the Continued Maintenance Alternative.

4.1.4.3 Aquatic Communities

No direct physical changes to the aquatic communities along the riverbank would be expected to occur under the Expanded Maintenance Alternative. Indirect effects would include minor changes in water temperature in those areas where overhanging trees and

shrubs are removed. These effects would be greatest under this alternative since larger tracts of hackberry/elm and riparian/willow communities would be cleared.

Erosion would not be expected to measurably increase under the Expanded Maintenance Alternative. For the most part, vegetation clearing would affect aboveground portions of the vegetation and would not require heavy equipment that would disturb and denude the soil. Minor sedimentation could occur with isolated grubbing, causing concomitant effects to water quality (e.g., increased turbidity, lower dissolved oxygen, and increased temperatures) and the health of aquatic organisms. Increased turbidity can affect egg buoyancy, clog gills and filtering mechanisms of sessile organisms, and hinder visibility for predators. These effects would be expected to be temporary since grassland communities would begin to return within one year and would not be affected by the clearing activity.

4.1.4.4 Threatened and Endangered Species

Plant Species

The USFWS indicated that Texas ayenia was the only plant species that had the potential to occur within the project area (Appendix L). Intensive surveys for this species were conducted during two seasons. In addition, efforts to locate this species and other plant species of concern were made during the HEP field surveys. USFWS was consulted regarding methodology to ensure appropriate techniques were used and thorough surveys were conducted. Although suitable habitat was located, no specimens of Texas ayenia or other plant species of concern were found. Therefore, no impacts to threatened or endangered plant species would be expected as a result of implementation of the Expanded Maintenance Alternative.

Animal Species

While any additional loss of habitat could be considered a possible effect to these species, only a few areas proposed for clearing/mowing are considered potential habitat for the ocelot and jaguarundi. Figures 4-1 and 4-2 illustrate the location of cat habitat compared to proposed vegetation maintenance areas within the project area.

Cat habitat could be affected by the Expanded Maintenance Alternative. Approximately 42 acres of cat habitat could be impacted under this alternative. If this cat habitat could not be avoided, the USIBWC would perform additional consultation with USFWS. A wildlife travel corridor covering approximately 314 acres would be established under the Expanded Maintenance Alternative. The wildlife corridor would be established through easements with private landowners to preserve land for travel between wildlife refuges and preserved areas. Table 4-3 illustrates the changes in cat habitat that could result from the implementation of each alternative.

4.1.4.5 Unique and Sensitive Areas

Maintenance activities that are proposed on any tract owned or managed by the TPWD, USFWS or other conservation organization (e.g., The Nature Conservancy, Audubon Society, etc.) require prior approval from the agency or organization. Several tracts of land recently acquired by the USFWS as part of the LRGV NWR would be

affected. The Expanded Maintenance Alternative would have the greatest impact on conservation lands, affecting 14 NWR tracts. As with the other alternatives, these tracts have all been recently acquired and thus, no climax communities, considered unique or sensitive would be affected. Prior approval from the land manager would be required to mow/clear on these lands.

4.1.4.6 Wetlands

Maintenance activities involving mowing with bush hogs and hand-clearing overhanging vegetation are not subject to a Section 404 permit. The Expanded Maintenance Alternative could require isolated grubbing subject to Section 404 permitting. Mechanical vegetative clearing processes that result in discharge of dredged or fill materials into waters of the United States would require a Section 404 permit providing the area can be established as jurisdictional waters of the United States and if a wetland determination verifies the presence of a wetland. Impacts to areas determined to be jurisdictional waters/wetlands would require a Section 404/401 permit prior to initiation of the clearing activities. Mitigation measures would also have to be developed and implemented, including compensation at ratios of 2:1 to 5:1, depending upon the wetland type. Therefore, prior to implementation of any mechanical vegetative clearing processes, consultation with the USACE will occur relative to Section 404 permitting.

4.2 SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE

4.2.1 Socioeconomic Resources

4.2.1.1 Prior Maintenance Alternative

The Prior Maintenance Alternative calls for vegetation maintenance along a wider strip of land than the current maintenance practices. As a result, 731 acres would be maintained in addition to the 291 acres currently mowed. The average width to be mowed under this alternative, 164 ft, was determined by the acreage and length of land along the Rio Grande maintained by the USIBWC. Table 2-2 presents the dimensions of the project area under each alternative.

Five tractors with 15-foot mower attachments are currently used by USIBWC to mow approximately 8,000 acres. An additional 731 acres is only a fraction of the area covered by these mowers. Therefore, no additional equipment would be required for the Prior Maintenance Alternative.

The price of fuel is an additional cost of implementing this alternative. The tractors are estimated to use 0.875 gallons per mile. The additional vegetation maintenance, required under this alternative, would cost approximately $500 in fuel, about $400 more than the Continued Maintenance Alternative. With an income multiplier of 1.26 (Minnesota IMPLAN Group, Inc., 2002), the price of fuel would contribute approximately $630 to the local economy.

Additional workers would not be required for the Prior Maintenance Alternative. The five tractor operators currently employed by IBWC would be sufficient for the maintenance of an additional 731 acres. Each of the five workers currently earn $18.63

per hour. In Hidalgo and Cameron counties, the salary of these five workers, with an income multiplier of 1.26 (Minnesota IMPLAN Group, Inc., 2002), generate approximately $244,128 for the local economy. This alternative would generate approximately $244,760 annually, including fuel and salary costs. This is only 0.002 percent of the $11,834,925,000 total income for Hidalgo and Cameron counties.

Together, Hidalgo and Cameron counties have an unemployment rate of 11.7 percent (USCB, 2000). Since there would not be a need for additional workers, there would be no impacts on employment rates. The population would remain unchanged by the Prior Maintenance Alternative. This alternative would not cause people to relocate to the area, therefore housing and community structure would not be impacted. Schools, healthcare facilities and public safety would not be affected by this alternative.

The Prior Maintenance Alternative would not disrupt the activities of the USBP. Vegetation maintenance in additional areas along the Rio Grande could potentially be beneficial. Trimming additional vegetation would provide better visibility for officers patrolling the border along the river. Compared to the current maintenance activities, the Prior Maintenance Alternative would improve visibility and enhance law enforcement efforts.

4.2.1.2 Continued Maintenance Alternative (No-Action)

Under the Continued Maintenance Alternative, the current vegetation maintenance program would not change. Therefore, no additional equipment or personnel would be required if the current maintenance practices were continued.

Since there would not be a need for additional workers, there would be no impacts on population or employment rates. The Continued Maintenance Alternative would not cause people to relocate to the area; therefore housing and community structure would not be impacted. The current activities of the USBP would not be affected under this alternative.

The five workers currently employed by USIBWC earn $18.63 per hour. In Hidalgo and Cameron counties, the salary of these five workers, including an income multiplier of 1.26, generate approximately $244,128 for the local economy. The current maintenance practices generate approximately $244,260 including fuel and salary costs. This is only 0.002 percent of the total income for Hidalgo and Cameron counties.

4.2.1.3 Suspended Maintenance Alternative

The 291 acres that would no longer be maintained under the Suspended Maintenance Alternative is only a fraction of the total mowing workload for the five USIBWC tractor operators. The termination of vegetation maintenance would not result in any job losses.

The current $18.63 per hour salary of the USIBWC workers would not change. The salary of these five workers, with an income multiplier of 1.26, would generate approximately $244,128 for the local economy. Approximately $130 in fuel revenues would be lost if the Suspended Maintenance Alternative were implemented. The Suspended Maintenance Alternative would generate approximately $244,128 for the local economy, 0.002 percent of the total income for Hidalgo and Cameron counties.

Since the operator positions would not be jeopardized, the local population and employment rates would remain unaffected. The Suspended Maintenance Alternative would not result in the relocation of workers, and therefore housing and community structure would not be affected.

Terminating maintenance activities would result in greater vegetative growth. This could potentially reduce visibility along the Rio Grande. Additional vegetation could affect the visibility and mobility of Border Patrol officers, potentially hampering law enforcement activities.

4.2.1.4 Expanded Maintenance Alternative

Maintenance practices under the Expanded Maintenance Alternative extend from RM 28.00 to RM 186.00, incorporating an additional 583 acres over the 291 acres of the current maintenance practices. An average width of 75 ft along the Rio Grande was estimated based on the length and acreage of the Expanded Maintenance Alternative and assuming maintenance of a wildlife corridor and techniques similar to the Continued Maintenance Alternative. Since mowing has not previously been performed in the areas beyond RM 62.50, vegetation would need to be cleared prior to mowing.

This alternative would likely require a local contractor to clear any vegetation too thick to be mowed. With an estimate of 200 acres per year, clearing activities would take approximately three years. The cost of a contractor to clear this area would be approximately $2,000 per acre or $400,000 per year for three years. With a local income multiplier of 1.26, the cost of a contractor would provide approximately $504,000 to the local economy each year for the first three years.

Five tractors with 15-foot mower attachments are currently used by USIBWC to mow approximately 8,000 acres. An additional 583 acres is only a small fraction of the area covered by these mowers. The IBWC has the necessary resources to mow the additional area and would not require the purchase of additional equipment.

Additional workers would not be required for the Expanded Maintenance Alternative. The five tractor operators currently employed by IBWC could maintain the additional 583 acres. These five workers currently earn $18.63 per hour. In Hidalgo and Cameron counties, the salary of these workers, including an income multiplier of 1.26, generate approximately $244,128 for the local economy.

Fuel costs for this alternative would be higher than the current maintenance practices. The tractors are estimated to use 0.875 gallons per mile. The additional vegetation maintenance, required under this alternative, would cost approximately $500 in fuel, about $400 more than the Continued Maintenance Alternative. With an income multiplier of 1.26, the price of fuel would contribute approximately $630 to the local economy.

The Expanded Maintenance Alternative would generate approximately $748,760 annually for the first 3 years, including the contractor, fuel and salary costs. This is only 0.006 percent of the $11,834,925,000 total income for Hidalgo and Cameron counties. After three years, this alternative would generate approximately $244,760 in fuel and

salary costs, 0.002 percent of the total income. Under a 20-year project design, the Expanded Maintenance Alternative would generate an average of $320,360 annually.

Together, Hidalgo and Cameron counties have an unemployment rate of 11.7 percent (USCB, 2000). There would be no impacts on employment since this alternative does not require additional workers. The population would also remain unchanged. People would not relocate to the area as a result of this alternative, therefore housing and community structure would not be impacted. Schools, healthcare facilities and public safety would not be affected by this alternative.

The Expanded Maintenance Alternative would not disrupt the activities of the USBP. Vegetation maintenance in additional areas along the Rio Grande could potentially be beneficial for the USBP. Clearing additional vegetation would provide better visibility and mobility for Border Patrol officers. Compared to the current maintenance activities, the Expanded Maintenance Alternative would likely enhance law enforcement efforts with frequent maintenance along 124 additional river miles.

4.2.2 Environmental Justice

4.2.2.1 Prior Maintenance Alternative

The Prior Maintenance Alternative would not disproportionately affect low-income or minority populations. An additional $500 in fuel revenues would be contributed to the local economy and provide a positive impact for these populations. Employment opportunities and income would not be impacted. Sectors that disproportionately employ low-income or minority populations would also be unaffected.

As discussed in Chapter 3, colonias are dominated by minority and low-income populations. Additionally, 45 percent of colonia residents in the LRGV have reported incidents of flooding (TDHR, 1988). The hydraulic modeling analysis indicates that water surface elevations under the design flood flow event for this alternative would be less than the Continued Maintenance Alternative (WLA, 2001). Therefore, a disproportionate adverse effect would not occur for colonia residents.

4.2.2.2 Continued Maintenance Alternative (No-Action)

There would be no change from the current maintenance practices under this alternative. Therefore, the situation for minority and low-income populations would remain unchanged.

The Continued Maintenance Alternative represents existing conditions. Flooding currently affects local colonias, negatively impacting minority and low-income populations. However, there would be no change in the effects under this alternative.

4.2.2.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative would not jeopardize the positions of any USIBWC tractor operators. The local economy would only lose approximately $130 in fuel costs annually. This would not affect the minority and low-income populations within Cameron or Hidalgo counties. Sectors that disproportionately employ low-income and minority populations would also remain unaffected.

As noted previously, colonia residents are subject to high incidents of flooding. The hydraulic modeling analysis indicates that water surface elevations under the design flood flow event for this alternative would be greater than the Continued Maintenance Alternative (WLA, 2001). Therefore, the Suspended Maintenance Alternative could affect minority and low-income colonia residents to a greater extent than the current maintenance practices.

4.2.2.4 Expanded Maintenance Alternative

The Extended Maintenance Alternative would generate an additional $504,000 during the first three years of the project. This could potentially be beneficial for low-income and minority populations. After three years, an additional $500 in fuel costs would be contributed to the local economy. Despite the additional costs of this alternative, income and employment opportunities would not change. This includes no changes to employment sectors with disproportionately high low-income and minority workers.

The hydraulic modeling analysis indicates that water surface elevations under the design flood flow event for this alternative would be less than the current maintenance practices (WLA, 2001). Therefore, a disproportionate adverse effect would not occur for minority and low-income colonia residents.

4.3 LAND USE

4.3.1 Prior Maintenance Alternative

Under the Prior Maintenance Alternative, vegetation maintenance would incorporate 731 acres in addition to the 291 acres of the current practices. Beyond RM 62.50, maintenance would consist of periodic clipping and trimming of vegetation, rather than annual mowing. Vegetation maintenance would occur along agricultural lands, shrub and rangelands, and near a small residential area.

Despite the increased maintenance, land use would not be impacted under this alternative. Mowing of vegetation would only occur along the banks of the Rio Grande and within an average width of an estimated 164 ft from the water's edge. Agriculture in the region does not typically extend within 164 ft of river; therefore cultivated land would not be impacted. Though the project area falls within a residential land use area, these lands would not be affected since there are no residential homes located within the levees. The vegetation maintenance practices would not disrupt shrub and rangeland areas and are consistent with USIBWC vegetation maintenance practices prior to 1990. Land use would not change under this alternative.

4.3.2 Continued Maintenance Alternative (No-Action)

Under the Continued Maintenance Alternative, vegetation maintenance along the Rio Grande would not change from the current practices. Maintenance activities only occur along 291 acres of agricultural lands, with an average width of approximately 75 ft along the river. Cultivated lands do not lie within the vegetation maintenance areas; therefore agricultural land use would not be impacted under the Continued Maintenance Alternative.

4.3.3 Suspended Maintenance Alternative

Land use would not be affected by the Suspended Maintenance Alternative. If maintenance operations were to cease, the current land use practices would remain unaffected.

4.3.4 Expanded Maintenance Alternative

The Expanded Maintenance Alternative would extend annual vegetation maintenance by approximately 583 acres more than the current practices. Maintenance activities would fall within land uses designated agricultural lands, deciduous forests, shrub and rangelands, commercial and residential areas.

Despite the increased maintenance, land use would not be impacted or changed under this alternative. Mowing of vegetation would only occur along the bank within an estimated 75 ft of the Rio Grande. Agricultural practices do not extend along the banks of the river; therefore cultivated land would not be impacted. Though the project area falls within areas identified as residential and commercial land use areas, the use of these lands would not be affected by vegetation maintenance activity along the Rio Grande. No residential or commercial buildings are located within the levees; therefore current land use would not change. No land use category within the project area would be compromised or changed by the growth of new climax vegetation along the wildlife corridor.

4.4 WATER RESOURCES

4.4.1 Prior Maintenance Alternative

Though the maintenance activities would occur at a greater distance from the Rio Grande in a larger area than current activities, the Prior Maintenance Alternative would not affect water quality. Vegetation is maintained to an aboveground level, thus mowing and trimming vegetation would not expose soil and result in significant erosion. The areas subject to infrequent vegetation maintenance would have limited presence of tractors and vehicles in the area, which could potentially contribute to erosion during operation. Also, since maintenance is performed during the dry period between June and August, erosion potential would generally not be amplified by precipitation. Even during substantial periods of precipitation, erosion would not be significant since topsoil would not be disturbed. These factors suggest surface water quality would not be affected under this alternative.

Since this alternative does not require the acquisition of water or water rights, surface water uses and yields would not be affected. Maintaining vegetation along the banks does not present any risk for groundwater contamination. Groundwater would continue to be unaffected under this alternative.

As discussed in Chapter 2, “overtopping” of the levees in the upper reaches of the LRGFCP occurs under the design flood flow event regardless of the vegetation maintenance practices implemented by the USIBWC, particularly near the Hidalgo-Reynosa and Pharr bridges. Encroachment of the 3-foot design freeboard for the levees occurs even more extensively. The results of hydraulic modeling for the Prior

Maintenance Alternative show levee overtopping beginning at RM 139.01 with a depth of 0.14 ft. Levee overtopping would occur at most of the cross sections upstream of RM 139.01 with a maximum of 4.08 ft at RM 156.93, near the Hidalgo-Reynosa bridges. Levee overtopping at the Pharr Bridge at RM 151.25 would be 1.62 ft. The low chords of the bridges are below the height of the IBWC levees and thus serve as obstructions to water flow at the design flood flow event. Downstream from Anzalduas Dam at RM 169.14, levee overtopping would be 1.65 ft (WLA, 2001).

Based on the hydraulic modeling, levee freeboard encroachment would begin at RM 135.00 and occur at every cross section upstream except RM 154.60. The degree of freeboard encroachment generally parallels the degree of levee overtopping at the upstream cross sections, with a maximum encroachment of 6.65 ft at the Hidalgo-Reynosa bridges (WLA, 2001).

As noted in Chapter 2, the alternative vegetation maintenance practices considered in this FEIS do not cause levee overtopping or freeboard encroachment, but reduce the degree to which these effects would occur under the design flood flow event. The Prior Maintenance Alternative would provide greater flood protection than any of the alternatives except the Expanded Maintenance Alternative, but would not include a wildlife travel corridor.

4.4.2 Continued Maintenance Alternative (No-Action)

The Continued Maintenance Alternative would not result in any change from the current vegetation maintenance practices. No significant erosion occurs with the current maintenance activities; therefore, there would be no change in water quality. Water uses would not change from the existing operation. Groundwater would continue to be unaffected under this alternative.

The results of hydraulic modeling for the Continued Maintenance Alternative (the Current Maintenance model in the hydraulic modeling report) show levee overtopping beginning at RM 139.01 with a depth of 0.31 ft. Levee overtopping would occur at most of the cross sections upstream of RM 139.01 with a maximum of 4.52 ft at RM 156.93, near the Hidalgo-Reynosa bridges. Levee overtopping at the Pharr Bridge at RM 151.25 would be 1.79 ft. The low chords of the bridges are below the height of the IBWC levees and thus serve as obstructions to water flow at the design flood flow event. Downstream from Anzalduas Dam at RM 169.14, levee overtopping would be 2.03 ft (WLA, 2001).

Based on the hydraulic modeling, a minor degree of levee freeboard encroachment would occur at RM 74.50 and RM 78.50, but cease both downstream and immediately upstream from these cross sections. Extensive freeboard encroachment would begin at RM 132.75 and occur at every cross section except RM 154.60. The degree of freeboard encroachment generally parallels the degree of levee overtopping at the upstream cross sections, with a maximum encroachment of 7.52 ft at the Hidalgo-Reynosa bridges (WLA, 2001).

As noted in Chapter 2, the alternative vegetation maintenance practices considered in this FEIS do not cause levee overtopping or freeboard encroachment, but reduce the degree to which these effects would occur under the design flood flow event. The

Continued Maintenance Alternative reflecting current maintenance practices would generally provide slightly improved flood protection compared to the Suspended Maintenance Alternative, but less than either the Prior Maintenance Alternative or the Expanded Maintenance Alternative.

4.4.3 Suspended Maintenance Alternative

The termination of vegetation maintenance under the Suspended Maintenance Alternative would improve water quality due to the re-growth of vegetation and consequent reduction of sediment run-off and deposition. Since no acquisition of water or water rights is required, the Suspended Maintenance Alternative is not expected to affect water uses. Re-growth of vegetation along the banks would affect the capacity of the LRGFCP to convey the design flood flow.

The results of hydraulic modeling for the Suspended Maintenance Alternative show levee overtopping beginning at RM 139.01 with a depth of 0.55 ft. Levee overtopping would occur at most of the cross sections upstream of RM 139.01 with a maximum of 4.52 ft at RM 156.93, near the Hidalgo-Reynosa bridges. Levee overtopping at the Pharr Bridge at RM 151.26 would be 1.85 ft. The low chords of the bridges are below the height of the IBWC levees and thus serve as obstructions to water flow at the design flood flow event. Downstream from Anzalduas Dam at RM 169.14, levee overtopping would be 2.04 ft (WLA, 2001).

Based on the hydraulic modeling, a minor degree of levee freeboard encroachment would occur at RM 74.50 and RM 78.50, but cease both downstream and immediately upstream from these cross sections. Extensive freeboard encroachment would begin at RM 132.75 and occur at every cross section upstream except RM 154.60. The degree of freeboard encroachment generally parallels the degree of levee overtopping at the upstream cross sections, with a maximum encroachment of 7.52 ft at the Hidalgo-Reynosa bridges (WLA, 2001).

As noted in Chapter 2, the alternative vegetation maintenance practices considered in this FEIS do not cause levee overtopping or freeboard encroachment, but reduce the degree to which these effects would occur under the design flood flow event. From a flood protection standpoint, the Suspended Maintenance Alternative would provide only slightly less protection than the Continued Maintenance Alternative, which reflects current maintenance practices, including a wildlife travel corridor.

4.4.4 Expanded Maintenance Alternative

Despite increased maintenance practices under the Expanded Maintenance Alternative, mowing would only occur within an average 75 ft of the water's edge. Though the maintenance is considered frequent, it remains an annual activity during the summer months of June through August. As in the Prior Maintenance Alternative, vegetation is cut to an aboveground level and therefore significant erosion is not likely to occur from mowing.

This alternative may require clearing of vegetation prior to mowing. The clearing could potentially involve grubbing or uprooting of trees in isolated areas. Uprooting would be performed for maintenance purposes, rather than construction. Therefore,

according to storm water regulators (Larsen, 2002), a construction permit or preparation of a Storm Water Pollution Prevention Plan (SWPPP) pursuant to a Texas Pollutant Discharge Elimination System (TPDES) permit would not be required. This is true even if the uprooted areas exceed five acres.

Since this alternative does not require the acquisition of water or water rights, surface water uses and yields would not be affected. Maintaining vegetation along the banks does not present any risk for groundwater contamination. Also, groundwater use is not necessary for the operation of this project.

The results of hydraulic modeling for the Expanded Maintenance Alternative show levee overtopping beginning at RM 150.31 with a depth of 0.34 ft. Levee overtopping would occur at many of the cross sections upstream of RM 150.31 with a maximum of 2.31 ft at RM 156.93 near the Hidalgo-Reynosa bridges. Levee overtopping at the Pharr Bridge at RM 151.26 would be 0.96 ft. The low chords of the bridges are below the height of the IBWC levees and thus serve as obstructions to water flow at the design flood flow event. Downstream from Anzalduas Dam at RM 169.14, levee overtopping would be 0.05 ft (WLA, 2001).

Extensive levee freeboard encroachment would begin at RM 137.71 and occur at every cross section upstream except RM 154.60 and RM 155.01. The degree of freeboard encroachment generally parallels the degree of levee overtopping at the upstream cross sections, with a maximum encroachment of 5.31 ft at the Hidalgo-Reynosa bridges (WLA, 2001).

As noted in Chapter 2, the alternative vegetation maintenance practices considered in this FEIS do not cause levee overtopping or freeboard encroachment, but reduce the degree to which these effects would occur under the design flood flow event. The Expanded Maintenance Alternative would provide the greatest flood protection benefit of any of the alternatives considered, and would also provide for a wildlife travel corridor.

4.5 CULTURAL RESOURCES

The archival research, the geoarcheological investigations, and the reconnaissance survey indicate that the number of both listed and unknown historic properties within the LRGFCP is high. There is a strong probability of contextual integrity and high research value at many of the locations revealed by archival research. The proposed project area forms over one-third of the Los Caminos del Rio Heritage Project corridor designated by the Texas Historical Commission (THC) in 1990. Significant historical themes (colonial river settlements, ranching, river trade route, agriculture, and the military) of regional, national, and international importance characterize the corridor (Sanchez, 1994:3-7). The combined results of the archival research, reconnaissance survey, and the geoarcheological investigations revealed that only two National Register-listed sites are present within the APE between the river and the levee. These sites include La Lomita Historic District and Fort Brown (41CF96). However, as noted by Cooper *et al*. (2002), there are numerous sites and high probability areas adjacent to the river that have not been fully evaluated; consequently, they are all of unknown eligibility. Table 4-4 presents those sites and high probability areas that are immediately adjacent to the Rio

Grande and may be in areas that could be affected by the Expanded Maintenance Alternative. None of the other alternatives would affect any of these sites.

Table 4-4 Known Sites and High Probability Areas in Regions Potentially Affected by the Expanded Maintenance Alternative

NRHP-Listed Sites	Sites of Unknown Eligibility	High Probability Areas (Cooper *et al*., 2002)
La Lomita Historic District	41HG180	MCAP – Hidalgo Irrigation Pump Plant
Fort Brown (41CF96)	41CF95	Boyd 1 – de la Vina Ranch
	41CF96	47SO1
	41CF129	B4-2 – Rabb Plantation
	41CF169	
	41CF170	
	41CF171	
	41CF177	

The geoarcheological investigations indicate that the Rio Grande meanderbelt is complex and that most near-surface sediments adjacent to the present cutbank of the Rio Grande are quite young in age (Cooper *et al*., 2002). Along the river and river floodway levee system the potential for finding buried site deposits is high in the areas adjacent to the *bancos* and *resacas*, an apparent focus of both prehistoric and historic occupations. The prediction of the locations of buried cultural resources in these areas is extremely difficult, for even though 60 trenches were excavated in areas thought to most likely contain buried deposits, only one encountered a buried cultural feature (Cooper *et al*., 2002). The discovery of site 41CF179 also indicates that many of the near-surface deposits along the cutbanks are of modern age and appear to have a limited potential for containing cultural resources. The results of dating ash from a feature at a depth of 3.15 m below surface at 41CF179 indicate a date range of A. D. 1490–1650. There were also multiple encounters of barbed wire or other historic debris at depths of 1–2 m below surface. It should be noted that this data does not suggest all near-river deposits are so recent they cannot contain potentially significant cultural resources; rather, they clearly indicate that most near-surface deposits (<2 m) are very recent in age and have a low probability of containing significant cultural deposits with contextual integrity.

4.5.1 Prior Maintenance Alternative

The Prior Maintenance Alternative has the potential to impact reaches of the river that have not been cleared recently to facilitate vegetation maintenance. To a lesser extent, the proposed infrequent bank maintenance of the area of RM 62.50 to RM 169.14 under the Prior Maintenance Alternative would potentially involve new reaches of the river that had not been recently cleared of vegetation. Since vegetation is not cut to below ground level, the mowing or clipping would not affect any buried cultural

resources. Therefore, the Prior Maintenance Alternative should have no effects on historic properties.

4.5.2 Continued Maintenance Alternative (No-Action)

Continuation of the current action (Continued Maintenance Alternative) or vegetation maintenance involving mowing and/or the removal of small saplings within the present maintenance areas should not impact either known or unknown historic properties. The near-surface contexts along the cutbanks of the Rio Grande are very recent in age and exhibit a low probability of containing archeological contexts with contextual integrity (see above discussion). Therefore, continued vegetation maintenance, or the Continued Maintenance Alternative, within the area of current maintenance would not affect historic properties.

4.5.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative would not affect cultural resources within the project area. With no vegetation maintenance along the reaches of the Rio Grande, any historic resources would remain undisturbed.

4.5.4 Expanded Maintenance Alternative

The Expanded Maintenance Alternative has the potential to impact reaches of the river that have not been cleared recently to facilitate vegetation maintenance. Despite the extension of vegetation maintenance into new areas, vegetation would not be cut below ground level and the impacts of mowing or clearing would not affect buried cultural resources. Isolated grubbing would similarly have no effect on historic properties. As discussed above, only one of the 30 localities tested yielded an archeological context with good contextual integrity (below 2 m in depth); therefore, the Expanded Maintenance Alternative would not affect historic properties.

4.6 SOILS AND GEOLOGY

4.6.1 Prior Maintenance Alternative

The soil types, mineral resources, topography or geology would not change under the Prior Maintenance Alternative. These characteristics form over a geologic time scale and therefore, annual maintenance practices could not affect the soil types, topography or geology. The only risk for soils is erosion. However, as discussed in Section 4.4, erosion is not expected to be significant under the Prior Maintenance Alternative since vegetation will not be cut below ground level.

Approximately 30,296 acres of prime farmland lie within the project area. Though maintenance would be performed on soils classified as prime farmland, the use of these areas for agriculture would not be affected since maintenance would occur along the banks of the Rio Grande.

4.6.2 Continued Maintenance Alternative (No-Action)

The continuation of current maintenance practices would not affect the existing soils and geology in the project area. Though prime farmland lies within the project area, the maintenance practices do not impact the soils or disrupt any agricultural activity.

Maintenance occurs along the banks of the Rio Grande and vegetation is mowed to an aboveground level. There is no significant erosion or compaction of soils due to the current maintenance practices.

4.6.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative would not affect the soils or geology of the region. Soils would be unaffected by the termination of the current maintenance practices.

4.6.4 Expanded Maintenance Alternative

Despite the expanded vegetation maintenance, soil types and geology would not change under the Expanded Maintenance Alternative. These characteristics form over a geologic time scale and therefore, annual maintenance practices could not affect the soils and geology. As discussed in Section 4.4, erosion from mowing and clearing is not expected to be significant. Although uprooting and grubbing may occur in isolated areas to allow for mowing, it would not be substantial enough to cause significant erosion. A construction permit or Storm Water Pollution Prevention Plan (SWPPP) pursuant to a Texas Pollutant Discharge Elimination System (TPDES) permit would not be required.

Prime farmland soils are found within areas that would be maintained under the Expanded Maintenance Alternative. Though maintenance would be performed on soils classified as prime farmland, activities would not affect agricultural activities since maintenance would occur along the bank of the river.

4.7 HAZARDOUS MATERIALS

4.7.1 Prior Maintenance Alternative

Mobile service trucks, carrying approximately 350 gallons of diesel, refuel the tractors used for vegetation maintenance on site. The bulk fuel is stored in a 6,000 gallon UST at the USIBWC yard in Mercedes, Texas. This tank is registered with the TCEQ, and the TCEQ records do not indicate any compliance issues. Required storage and refueling procedures minimize the potential for spills.

The maintenance of vegetation along the banks would not disrupt any facilities or sites in the project area since these facilities are not located along the banks of the Rio Grande. The closest site to the project area is a LUST over 650 ft from the Rio Grande, listed as no apparent threat (TNRCC, 2002). Since vegetation is only mowed aboveground, at an average width of 164 ft along the riverbanks, this LUST site would not be impacted. Though the Prior Maintenance Alternative expands the area of maintenance, this alternative does not present risks of contacting or disrupting any existing facilities or sites.

4.7.2 Continued Maintenance Alternative (No-Action)

Hazardous material practices of the USIBWC are in compliance with applicable standards under the current vegetation maintenance practices. Storage of diesel fuel and refueling of the tractors is performed in compliance with applicable state and federal standards. No hazardous materials sites are currently affected by vegetation

maintenance. Therefore, a continuation of these practices through the Continued Maintenance Alternative would not affect hazardous materials handling, nor any facilities or sites in the project area.

4.7.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative would not affect hazardous materials handling, hazardous materials facilities or sites.

4.7.4 Expanded Maintenance Alternative

Though the Expanded Maintenance Alternative incorporates 583 additional acres of vegetation maintenance, diesel storage and refueling would still be performed in compliance with applicable regulations.

Despite the expansion of vegetation maintenance areas, the Expanded Maintenance Alternative would not disrupt any facilities or sites in the project area. The closest site to the project area is a LUST located in Brownsville, over 650 ft from the Rio Grande (TNRCC, 2002). This site is located downstream of RM 62.50; therefore any isolated grubbing would occur far from this LUST site. Also, under this alternative, vegetation maintenance would be performed within 75 ft of the riverbanks and therefore this LUST site would not be disrupted or impacted. Though the Expanded Maintenance Alternative incorporates additional maintenance areas, this alternative does not present risks of contacting or disrupting any existing facilities or sites.

4.8 AIR QUALITY

4.8.1 Prior Maintenance Alternative

Emissions of concern for light duty diesel tractors are VOC, CO and NO_x. Exhaust emissions from the Prior Maintenance Alternative would be higher than the current maintenance practices as a result of the additional acreage to be maintained. The quantity of emissions from these tractors would be dependent upon the area of maintained vegetation. To account for margin of error, a conservative estimate of 1,000 miles was used for the annual distance covered by the five tractors. Emission rates for VOC, CO, and NO_x, based on USEPA emission studies, were 0.440, 1.350, and 1.020 grams per mile, respectively (USEPA, 2000). Table 4-5 compares the estimated emissions for the Prior Maintenance Alternative with the emissions inventories for Cameron and Hidalgo counties.

Ground disturbance from mowing would generate fugitive dust. Dust generated by maintenance activities would vary depending on vegetation height and weather conditions. Specific emission rates for ground disturbance from mowing are not currently available; therefore PM_{10} was estimated using emission factors from a similar operation of harvesting grain sorghum (USEPA, 1988). Harvest of grain sorghum has an emissions factor of 6.5 pounds per square mile and field transport accounts for 1.2 pounds per square mile, totaling 7.7 pounds per square mile (USEPA, 1988). A conservative estimate of 3.125 square miles (2,000 acres) was used for the area to account for margin of error. Using this estimate, the Prior Maintenance Alternative

would emit approximately 24 pounds, or 0.011 tons, of PM_{10} each year. Table 4-5 presents estimated emissions for PM_{10}.

Table 4-5 Estimated Emissions of the Prior Maintenance Alternative

Air Pollutant Emission Source	CO (tpy)	VOC (tpy)	NO_X (tpy)	PM_{10} (tpy)
Cameron and Hidalgo Counties Emissions Inventory[a]	4,747.66	1,669.6	4,317.18	465.63
Prior Maintenance Alternative Annual Emission Totals	0.00135[b]	0.00044[b]	0.00102[b]	0.011[c]
Percent Increased Emissions In Cameron and Hidalgo Counties	< 0.001	< 0.001	< 0.001	0.002

tpy - tons per year
[a]TNRCC, 1999
[b]USEPA, 1988
[c]USEPA, 2000

4.8.2 Continued Maintenance Alternative (No-Action)

Continued Maintenance Alternative emissions were calculated just as the Prior Maintenance described above. However, this alternative covers a smaller area, with a conservative estimate of 200 miles. Continued Maintenance Alternative emissions are not expected to change from the current practices since the maintenance activities cover the same area and use the same equipment. The VOC, CO and NO_x emissions estimates are illustrated in Table 4-6.

Fugitive dust emissions from mowing could be generated from the Continued Maintenance Alternative. However, this alternative does not include any additional maintenance area; therefore fugitive dust would not vary from the current practices. Estimates for PM_{10} emissions were also calculated using emission factors from the harvesting of grain sorghum (USEPA, 1988). The Current Maintenance Alternative covers an area of approximately 0.469 square miles (300 acres). With an emissions factor of 7.7 pounds per square mile, this alternative would generate an estimated 3.6 pounds per year or 0.0016 tons per year (tpy) (USEPA, 1988). Table 4-6 compares emissions from the Current Maintenance Alternative with the emissions inventory for Cameron and Hidalgo counties.

Table 4-6 Estimated Emissions of the Continued Maintenance Alternative

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_X (tpy)	PM_{10} (tpy)
Cameron and Hidalgo Counties Emissions Inventory[a]	4,747.66	1,669.6	4,317.18	465.63
Continued Maintenance Alternative Annual Emission Totals[b]	0.0002 [b]	0.000088[b]	0.000204[b]	0.0016 [c]
Percent Increased Emissions in Cameron and Hidalgo Counties	< 0.001	< 0.001	< 0.001	< 0.001

tpy -tons per year
[a]TNRCC, 1999
[b]USEPA, 1988
[c]USEPA, 2000

4.8.3 Suspended Maintenance Alternative

The Suspended Maintenance Alternative would terminate all vegetative maintenance activities. This alternative would not require any tractors to mow the area; therefore CO, VOC, or NO_x emissions would not be a concern. Fugitive dust would not be generated without mowing activity. There would not be any impacts on air quality by implementing the Suspended Maintenance Alternative.

4.8.4 Expanded Maintenance Alternative

The Expanded Maintenance Alternative would require the clearing of approximately 600 acres of vegetation to allow for mowing activity at sites that have not previously been maintained. IBWC would likely hire a contractor to clear these sites. Clearing could take approximately three years with an estimate of 200 acres cleared per year. The clearing activity would require approximately two additional light duty diesel vehicles along with the five tractors used for mowing. To obtain a conservative estimate, emissions were calculated with the assumption that the seven diesel vehicles would cover 1,000 miles during the first three years. Only five vehicles would be required after 3 years. Table 4-7 lists the estimated CO, VOC, and NO_x emissions resulting from clearing and mowing activity for the Expanded Maintenance Alternative.

Fugitive dust would be generated by maintenance activities of the Expanded Maintenance Alternative. Clearing could involve grubbing of soils in some areas. The minimal grubbing and clearing activities would be comparable to mowing; therefore fugitive dust emissions would be similar along the entire maintenance area. The PM_{10} emissions from clearing and mowing were estimated using emission factors from harvesting grain sorghum (USEPA, 1988). These activities are similar to the clearing and mowing operations. A conservative estimate of 2,000 acres, or 3.125 square miles, was used to calculate emissions to account for any margin of error. Vegetation maintenance within a 2,000-acre area would result in approximately 24 pounds of PM_{10} per square mile per year, or 0.011 tpy. Table 4-7 provides the estimated PM_{10} emissions for the Expanded Maintenance Alternative.

Table 4-7 Estimated Emissions of the Expanded Maintenance Alternative

Air Pollutant Emission Source	CO (tpy)	VOC (tpy)	NO_X (tpy)	PM_{10} (tpy)
Cameron and Hidalgo Counties Emissions Inventory[a]	4,747.66	1,669.6	4,317.18	465.63
Expanded Maintenance Alternative Emission Totals (Clearing and Mowing Activity[b])	0.00189[b]	0.000616[b]	0.001428[b]	0.011[c]
Expanded Maintenance Alternative Emission Totals During Exclusive Mowing Activity[b]	0.00135[b]	0.00044[b]	0.00102[b]	0.011[c]
Percent Increased Emissions in Cameron and Hidalgo Counties	< 0.001	< 0.001	< 0.001	0.002

tpy -tons per year
[a]TNRCC, 1999
[b]USEPA, 1988
[c]USEPA, 2000

Vegetation cleared under this alternative would be discarded through either burning or landfill disposal. On-site burning of trees, brush and other plant growth for right-of-way maintenance, land clearing operations, and maintenance along water canals is permitted when no practical alternative exists. Outdoor burning activities require compliance with specific TCEQ guidelines and prior notification of intent to the appropriate commission regional office (§§111.209-.219, TNRCC,1996). Landfills provide another option for disposal of cleared vegetation. Trees, shrubs, and brush are accepted at local landfills in Cameron County and Hidalgo County. A number of these landfills have mulching programs to reuse the disposed brush (Gardener, 2002).

4.9 NOISE

The vegetation maintenance practices discussed in this FEIS involve the use of tractors, bush hogs, and some isolated clearing activity. The nearest possible noise receptors would be located beyond the levees, which are located at various intervals away from the vegetation maintenance areas. The maintenance activities would occur once a year, which would avoid a permanent noise disturbance for the areas located near the levees. The equipment used in the maintenance alternatives described by this FEIS emit approximately 82.5 dBA of noise at 15 m (50 ft) (CERL, 1978).

4.9.1 Prior Maintenance Alternative

Under this alternative, the closest distance from the center of the vegetation maintenance areas to the top of the levee is approximately 50 ft. At this distance the noise from maintenance activities would have attenuated to approximately 82.5 dBA.

The levee structure would also serve to further attenuate noise levels experienced for any receptors beyond the levee. Vegetation maintenance would only occur during daytime hours. Since the endangered jaguarundi and ocelot are most active at night, these animals would not be impacted by noise from vegetation maintenance. The noise from vegetation maintenance activities would be consistent with the noise levels from agricultural practices.

4.9.2 Continued Maintenance Alternative (No-Action)

The Continued Maintenance Alternative is a continuation of the current vegetation maintenance practices and therefore, would not cause a change in noise levels. Under this alternative, the closest distance from the center of the vegetation maintenance areas to the top of the levee would be approximately 70 ft. At this distance the noise from maintenance activities would have attenuated to approximately 75.8 dBA. The levee structure would also serve to further attenuate noise levels experienced for any receptors beyond the levee. The noise from vegetation maintenance activities would be consistent with the noise levels from agricultural practices.

4.9.3 Suspended Maintenance Alternative

Noise annoyance would not be an issue with this alternative because vegetation maintenance activities would cease.

4.9.4 Expanded Maintenance Alternative

Under this alternative, the closest distance from the center of the vegetation maintenance areas to the top of the levee would be approximately 70 ft. There are areas where potential isolated clearing activities could occur in addition to maintenance activities, which would increase the mechanical activity in these areas. At a distance of 70 ft the noise from maintenance activities would have attenuated to approximately 75.8 dBA. The levee structure would also serve to further attenuate noise levels experienced for any receptors beyond the levee. Vegetation maintenance activities would only occur during the daytime hours. The jaguarundi and ocelot are most active at night and therefore these species would not be affected by noise from maintenance activities. The noise from vegetation maintenance activities would be consistent with the noise levels from agricultural practices.

4.10 CUMULATIVE IMPACTS

The Brownsville Public Utilities Board (BPUB) is considering the construction of the Brownsville Weir and Reservoir Project (BWR Project). This project anticipates the construction and operation of a weir structure spanning the river channel approximately eight miles downstream of the International Gateway Bridge in Brownsville, Texas at RM 46.60 (BPUB, 1999). NEPA analysis for this project is near completion, but a draft report has not been released at this time.

The Immigration and Naturalization Service (INS) and USBP are also proposing Operation Rio Grande, to aid in the reduction of illegal immigration and drug trafficking along the Rio Grande corridor. As part of this project, areas along a USBP station in the McAllen sector could be mowed twice a year, during the months of February/March and

October/November, if necessary. This mowing would conform to restrictions placed on IBWC mowing. NEPA analysis for this project has not been completed, but a DEIS was released in February 2003 (INS, 2003).

The proposed construction of international bridges in Donna and Progreso and near the Anzalduas Dam falls within the project area of the LRGFCP vegetation maintenance alternatives. The bridges would be constructed between the tops of the levees on each side of the Rio Grande. However, stockpiles and equipment would be present within the surrounding area during construction, including areas within the levees. Since these projects occur within the reach of the project area addressed in this FEIS, cumulative impacts will be considered for each resource area.

As noted in Chapter 2, private development associated with the growth in population in the LRGV is also a foreseeable future action. However, the cumulative effects would be limited to socioeconomic resources since no development would occur within the LRGFCP levees where the direct impacts from vegetation maintenance occur.

4.10.1 Biological Resources

The BWR Project could potentially affect biological resources along the Rio Grande. Construction would result in increased turbidity and potentially decrease the aquatic habitat value downstream of the site. Approximately 11 acres of riverine habitat would be removed completely. Ten miles of riverine habitat upstream of the weir site would be permanently converted to reservoir habitat. Increased frequency of inundation would impact approximately 32 miles of habitat. Eighty-four acres of vegetation would be removed during construction, though 51 acres would be re-vegetated after use. Loss of habitat could potentially displace wildlife species. Hydraulic modeling for this project indicates dissolved oxygen, downstream of the weir, would remain at acceptable levels. Within the estuarine reach of the river, the salinity gradient would extend 50 percent rather than 25 percent of the reach as a result of reduced flows. Though downstream flow would be reduced, impacts to wildlife and fisheries are expected to be minimal (BPUB, 1999).

International bridge construction affects, on average, approximately 143 acres per bridge of vegetation communities, including riparian habitat, thorn scrub and upland areas. Construction could cause temporary disturbances for wildlife. The physical barriers of such bridges could potentially impede wildlife travel corridors. Though evidence has not been documented, bridge construction could result in habitat fragmentation and human encroachment, consequently affecting jaguarundi and ocelot habitat. The least tern is another endangered species potentially impacted by bridge construction through alteration of natural habitat and impacts on water quality (USDOS, 1998). The bridges would be designed to extend from levee top to levee top, placing the structures above the wildlife corridors maintained by USIBWC.

Operation Rio Grande could present minor, short-term impacts on aquatic systems from erosion and run-off during construction. Though construction calls for little permanent vegetation removal, wildlife could be impacted by construction and habitat alteration. During operation, the proposed lighting would impact nocturnal and migrating animals. Mowing practices could occur more often than the current IBWC operation;

however additional areas, relative to current IBWC practices, would not be maintained (INS, 2003).

Each project, including the vegetation maintenance alternatives, involves mowing or clearing vegetation; therefore, eliminating potential wildlife habitat. The Preferred Continued Maintenance Alternative would not clear or maintain any additional areas. There would be no additional loss of habitat for the threatened and endangered ocelot and jaguarundi (cat). Under this alternative, a wildlife travel corridor covering approximately 57 acres, would be established. The construction of international bridges is not expected to have any direct impacts on cat habitat. The proposed bridge construction is not located within cat habitat areas (USDOS, 1998). The BWR Project is also located outside cat habitat areas and minimal impacts are anticipated (BPUB, 1999). The majority of construction for Operation Rio Grande is confined to roads and levees; very little vegetation would be permanently removed. Despite some temporary indirect effects from construction noise and human activity, impacts on the endangered cats are expected to be minimal. Cats are nocturnal animals and would likely avoid the additional illuminated areas. The addition of fencing in some areas could restrict the north-south migration of the cats (INS, 2003).

Together, the BWR Project, the international bridge constructions, and Operation Rio Grande would clear approximately 600 acres of vegetated land. This is approximately one percent of the total 43,210-acre project area. The Preferred Continued Maintenance Alternative does not affect any additional areas; therefore this alternative would not result in any cumulative impacts. Consultation with the USFWS would be required if construction or operation of any project involves the destruction of cat habitat.

4.10.2 Socioeconomic Resources and Environmental Justice

4.10.2.1 Socioeconomic Resources

The BWR Project would take an estimated one-year to construct, utilizing 50 workers. Operation of the project during the following years would only require two workers. This new employment would not present any cumulative impacts with vegetation maintenance since there would not be any additional positions under all four alternatives. It is estimated that as a result of project construction, $27.2 million (80 percent of the $34 million cost) would be spent at the local level. Alone, this is 0.23 percent of the total income of the area (BPUB, 1999). The costs generated from both the BWR Project and the vegetation maintenance alternatives, would remain approximately 0.23 percent of the total income.

The implementation of Operation Rio Grande may cause the local area to experience positive benefits with a decrease in crime, as noticed in the Brownsville area after installation of lighting in 1997. Since the costs of each vegetation maintenance alternative would not change the current economy or socioeconomic resources, this project would not present any cumulative impacts with Operation Rio Grande.

The construction of three international bridges could contribute to the economy through local employment and construction costs. As past studies have indicated, the construction of an international bridge could result in future population increases causing

changes in the economy and other socioeconomic resources (USDOS, 1998). However, since the LRGFCP vegetation maintenance alternatives do not affect the local socioeconomic resources, no cumulative impacts are expected.

Private development in the LRGV would occur to support the projected 50 percent increase in population from 2000 to 2020. Since the vegetation maintenance alternatives do not affect the local socioeconomic resources, no cumulative impacts are expected.

4.10.2.2 Environmental Justice

The BWR Project anticipates an increased water supply to low-income and minority colonia residents, providing a positive benefit for these populations (BPUB, 1999). The proposed construction of international bridges would not have any disproportionate impacts on local minority or low-income populations (USDOS, 1998), nor would Operation Rio Grande (INS, 2003). The project addressed in this FEIS would not disproportionately affect minority or low-income populations; therefore no cumulative impacts are expected.

4.10.3 Land Use

Though short-term effects from construction may impact land use, no significant land use impacts or changes during operation are expected for the BWR Project or Operation Rio Grande. International bridge construction could result in a physical loss of prime farmland, though effects would be limited to the immediate project area (USDOS, 1998). The LRGFCP alternative maintenance practices would not impact land use; therefore, these projects would not present any cumulative impacts for land use.

4.10.4 Water Resources

Construction of the BWR Project would result in changes in hydrology and sedimentation during significant storm events (BPUB, 1999). Construction of Operation Rio Grande could potentially cause minor, short-term disturbances to water resources as a result of erosion and run-off (INS, 2003). Erosion, increased turbidity from run-off, and potential dredging could affect water quality during construction of the international bridges (USDOS, 1998). Though erosion from these projects could impact surface water quality, erosion from the LRGFCP alternative maintenance practices is not significant enough to contribute to these issues or create any cumulative impacts.

The BWR Project would increase the degree of levee overtopping and freeboard encroachment upstream of the weir. Specific hydraulic modeling of the Rio Grande with the weir included has not been performed, but the placement of an obstruction in the pilot channel of the river would reduce the flow capacity at that cross section with a consequent impact upstream due to backwater effects. As discussed in Chapter 2 and Chapter 4.4, vegetation maintenance practices conducted by the USIBWC serve to maintain the flood carrying capacity of the lower Rio Grande, and do not cause levee overtopping or freeboard encroachment. Therefore, the cumulative effect of the USIBWC vegetation maintenance practices would be to mitigate to a certain extent the decrease in flow capacity that would be caused by construction of the BWR Project.

4.10.5 Cultural Resources

The BWR Project anticipates potential impacts on cultural resources during construction, and with possible water fluctuations during operation (BPUB, 1999). There is limited potential for impacts on historic properties under Operation Rio Grande (INS, 2003). Construction of international bridges could affect cultural resources in or near the construction site; however, mitigation plans would be developed (USDOS, 1998). The LRGFCP alternative maintenance practices would not impact cultural resources; therefore, effects from the BWR Project or bridge construction would not present any cumulative impacts.

4.10.6 Soils and Geology

Construction of the BWR Project could result in short-term soil compaction and erosion. Soil compaction and erosion are also potential construction impacts for Operation Rio Grande (INS, 2003). International bridge construction could cause erosion and potential alternations of drainage patterns at each construction site (USDOS, 1998). Though these projects may cause potential impacts for the project area, erosion from the LRGFCP alternative maintenance practices is not expected to be significant. Therefore, no cumulative impacts on soils or geology are expected for this project.

4.10.7 Hazardous Materials

There are no effects from hazardous materials expected with the construction and operation of Operation Rio Grande (INS, 2003). Applicable standards for hazardous materials safety would be used during construction of international bridges (USDOS, 1998). Hazardous materials are not addressed in the draft BWR Project EA (BPUB, 1999). Since these projects, as well as the LRGFCP alternative maintenance practices do not anticipate any impacts from hazardous materials, no cumulative impacts are expected.

4.10.8 Air Quality

During the construction of the BWR Project, dust from disturbed soils, unpaved roads, storage piles and construction could potentially affect air quality. Other construction emissions include smoke from clearing and burning, exhaust, and particulates. These emissions would be mitigated with dust suppression techniques and windbreaks (BPUB, 1999). Construction of the international bridges could release fugitive dust and exhaust emissions, potentially affecting air quality. These effects would be mitigated with the use of electric powered equipment, minimal hauling of backfill material, and watering of soil surfaces (USDOS, 1998). A temporary increase in vehicle emissions and fugitive dust are anticipated during construction of Operation Rio Grande (INS, 2003).

Though the air quality impacts from these projects were not quantified, any potential effects are not expected to present cumulative impacts with vegetation maintenance. Emissions from each vegetation maintenance alternative do not represent a significant percent of the emission inventories for Cameron and Hidalgo counties (< 0.001 percent; Table 4-5 through Table 4-7). According to these estimates, air quality would not be

significantly impacted by the alternative maintenance practices; therefore no significant cumulative impacts would be created.

4.10.9 Noise

The BWR Project anticipates potential short-term effects on noise levels during construction. These effects are expected to be minimal for local residences and any impacts will cease during operation (BPUB, 1999). Noise levels within the study area of Operation Rio Grande could range from 40 dBA to 65 dBA, though measurements indicate levels between 52 dBA and 57dBA. These levels would not cause any adverse effects for local communities (INS, 2003). Noise impacts are not addressed for international bridge construction (USDOS, 1998). Since the vegetation maintenance alternatives would not present any impacts regarding noise levels, no cumulative impacts are expected.

Chapter 5

Texas Coastal Zone Consistency Determination

CHAPTER 5

TEXAS COASTAL ZONE CONSISTENCY DETERMINATION

5.1 INTRODUCTION

The Coastal Zone Management Act of 1972, as amended (CZMA) (16 USC 1451 et. seq.), was passed by Congress to protect coastal resources. This act encourages individual states to develop comprehensive coastal management programs to protect their resources. These programs are administered by the Secretary of Commerce who has delegated the National Oceanic and Atmospheric Administration's (NOAA) Office of Ocean and Coastal Resource Management to handle the responsibility. Currently there are 29 states that have approved coastal management programs.

The Texas Coastal Management Program (TCMP) was submitted to NOAA for review and approved in 1996. Federal approval of coastal management plans requires that federal actions within the TCMP boundary be consistent with the goals and policies of the TCMP. Federal agencies are responsible for compliance, and must submit a consistency determination to the state for review. This FEIS analyzes various vegetation management alternatives along the Rio Grande. All alternatives include part of the Coastal Zone (between RM 28.00 and RM 54.10) and a consistency determination is required. This consistency determination was prepared in accordance with the Texas Coastal Management Program, Final Environmental Impact Statement, dated August 1996 (CCC, 1996). Details of the USIBWC alternative vegetation maintenance practices are presented in previous sections of this FEIS and referenced in this determination.

5.2 IMPACTS ON COASTAL NATURAL RESOURCE AREAS

There are 16 Coastal Natural Resource Areas (CNRAs) listed at Title 31 §501.3 Texas Administrative Code. Each of the CNRAs are discussed below. It should be noted that although the inward limit of the Coastal Zone under the TCMP extends inland to the Gateway Bridge at RM 54.00, Water Quality Segment 2301, Rio Grande Tidal, only extends to RM 47.30. Therefore, discussions relative to the Coastal Zone will extend to RM 54.00, while discussions relative to tidal influence will extend to RM 47.30. Methods to minimize or avoid potential impacts to the CNRAs will be addressed following a brief description.

5.2.1 Coastal Barriers

Coastal barriers are not located in the project area along the Rio Grande from RM 28.00 and further upstream. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.2 Coastal Historic Area

Coastal historic areas are sites listed or eligible for the NRHP, or state archeological landmarks (SAL). The National Historic Preservation Act of 1965 (NHPA), as amended, provides guidelines for compliance with the TCMP. The coastal historic sites, in addition to non-coastal historic sites, are discussed in the cultural resource sections of Chapters 3 and 4 regarding their characteristics and the impacts that could occur, respectively. There are two coastal historic areas located within the project area: Fort Brown (41CF96) and the Brulay Plantation (41CF116). Of these two sites, only Fort Brown may have archeological deposits that extend into the proposed vegetation maintenance zone. Limiting the clearing activities to aboveground cutting of saplings and brush, the proposed vegetation maintenance practices would not impact coastal historic areas. The Brulay Plantation is situated on the north side of the levee and will not be impacted. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.3 Coastal Preserves

Coastal preserves include state lands and parks. The project area does not include any of these areas and does not impact this category of CNRA.

5.2.4 Coastal Shore Areas

The extent of the project area addressed in this FEIS begins at RM 28.00 and extends upstream. No coastal shore areas occur in the project area. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.5 Coastal Wetlands

The Coastal Zone portion of the project area has been included in the vegetation maintenance program of the USIBWC since the 1960s, with clearing and mowing occurring on the banks of the Rio Grande. None of the alternatives propose changes from historic practices within the Coastal Zone. Therefore, the activities covered in this FEIS will have no additional impacts to this category of CNRA.

5.2.6 Critical Dune Areas

There are no critical dune areas present in the project area due to its location being near RM 28.00 and continuing upstream. The activities covered in this FEIS do not impact this category of CNRA.

5.2.7 Critical Erosion Areas

Critical erosion areas include gulf and bay shoreline areas designated by the Land Commissioner. No gulf or bay shorelines occur in the project area. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.8 Gulf Beaches

The project area begins at RM 28.00 and continues upstream, containing no gulf beaches. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.9 Hard Substrate Reefs

There are no hard substrate reefs in the project area. This project begins at RM 28.00 and continues upstream away from hard substrate reefs. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.10 Oyster Reefs

Since the project area begins at RM 28.00 and continues upstream, there are no oyster reefs. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.11 Special Hazard Areas

Special hazard areas include low-lying, flood-prone areas shown on Flood Insurance Rate maps. The area between the river and the USIBWC levee falls into Zone A (flood-prone area). The vegetation maintenance practices discussed in this FEIS are performed for flood control purposes. Therefore, the activities covered in this FEIS will have minimal impact on this category of CNRA.

5.2.12 Submerged Land

The activity described by this FEIS involves vegetation maintenance along the banks of the Rio Grande. There will be no disturbance of submerged land from these activities. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.13 Submerged Aquatic Vegetation

No submerged aquatic vegetation will be compromised by the activities described by this FEIS because there will be no vegetation maintenance in inundated areas. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.14 Tidal Sand and Mud Flats

There are no tidal sand or mud flats present in the project area. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.15 Waters of the Open Gulf of Mexico

Since the project area begins at RM 28.00 and continues upstream, water of the open Gulf of Mexico is not present. Therefore, the activities covered in this FEIS do not impact this category of CNRA.

5.2.16 Waters Under Tidal Influence

The lower portion of the project area is under tidal influence. None of the alternatives in this FEIS involve a change from historic practices in the Coastal Zone. Therefore, the activities covered in this FEIS will have minimal impact on this category of CNRA.

5.3 COMPLIANCE WITH GOALS AND POLICIES

Compliance with the following goals and policies of the TCMP is required for the project to be determined consistent with the Act.

- §501.14(e) Prevention, Response and Remediation of Oil Spills
- §501.14(g) Nonpoint Source (NPS) Water Pollution
- §501.14(o) Alteration of Coastal Historic Areas
- §501.14(r) Appropriations of Water
- §501.14(s) Levee and Flood Control Projects
- §501.15 Policy for Major Actions

5.3.1 Compliance with §501.14(e) Prevention, Response and Remediation of Oil Spills

Refueling of mechanical equipment used for vegetation maintenance occurs under procedures designed to prevent spills. Therefore, refueling activities are in compliance with this section. The petroleum storage tank used to store diesel is properly registered with TCEQ and no compliance issues are noted in TCEQ records.

5.3.2 Compliance with §501.14(g) Nonpoint Source Water Pollution

The procedures for vegetation maintenance do not involve soil disturbance or the use of substances that would cause nonpoint source pollution of the Rio Grande. Therefore, the vegetation maintenance practices are in compliance with this section.

5.3.3 Compliance with §501.14(o) Alteration of Coastal Historic Areas

The coastal historic areas present in the Coastal Zone are addressed in Chapters 3 and 4 of this FEIS. These areas would not be impacted by the vegetation maintenance practices. Therefore, the vegetation maintenance practices are in compliance with this section.

5.3.4 Compliance with §501.14(r) Appropriations of Water

Conservation and development of the state's natural resources include the control, storage, preservation, and distribution of the state's storm and floodwaters and the waters of its rivers and streams for irrigation, power and other purposes (Texas Administrative Code §501.14(r)). The vegetation maintenance practices covered in this FEIS assist the USIBWC in fulfilling this mandate. Therefore, the vegetation maintenance practices are in compliance with this section.

5.3.5 Compliance with §501.14(s) Levee and Flood Control Projects

The project addresses vegetation maintenance and does not require the drainage of wetlands. In addition, there will not be any structural altering of, or construction on the levees. Therefore, the project is in compliance with this section.

5.3.6 Compliance with §501.15 Policy for Major Actions

Levee improvement and flood control projects are addressed in §505.11 constituting a major action. Therefore, a federal EIS is required under NEPA, 42 USC, § 4321 et seq. State and federal agencies have met and coordinated with the USIBWC regarding the vegetation maintenance practices. This portion of the FEIS demonstrates consistency with the TCMP for the alternative vegetation maintenance practices.

5.4 CONSISTENCY DETERMINATION

The alternatives considered in this FEIS have been reviewed for consistency with the goals and policies of the TCMP. CNRAs located in the project area have been identified and evaluated for potential impacts from the project activities. Based on this analysis, the USIBWC finds that the vegetation maintenance practices are consistent with the goals and policies of the TCMP to the maximum extent practicable. Upon correspondence with Coastal Coordination Council (CCC) Permitting Assistance, it has been determined that no further action is necessary since the project would not require State or Federal permits and does not pose an impact on any CNRA. On August 22, 2003, the CCC concurred with the determination that the project is consistent with the TCMP.

Chapter 6

Public Involvement

CHAPTER 6

PUBLIC INVOLVEMENT

The public involvement program for this project included two public scoping meetings, a public meeting, and coordination with various agencies throughout the preparation of this FEIS.

6.1 PUBLIC SCOPING MEETINGS

A Notice of Intent (NOI) to prepare this EIS was first published in the *Federal Register* (FR) on November 19, 1990 (55 FR 48176-48177) to fulfill the conditions of the 1990 Consent Decree. A scoping meeting notification was issued on December 17, 1990 (55 FR 51777), scheduling the public meeting for January 8, 1991 in Weslaco, Texas. A second NOI was published in the FR on August 26, 1998 (63 FR 45518-45519), after funding for preparation of this EIS was received by the USIBWC. The USIBWC conducted a second scoping meeting on September 10, 1998, in Weslaco, Texas. The public scoping period began with the publication of the NOI and concluded after 60 days on October 26, 1998. Comments from both scoping meetings were used to formulate the scope of this EIS. A summary of both scoping meetings is included in Appendix G.

Detailed proceedings of the 1991 meeting were not recorded or preserved, nor were the numbers of attendees. However, the summary of the meeting and the mailing list generated from the meeting and comment period indicates that up to 48 people actively participated in the scoping process. Issues raised at this meeting included:

1. Native habitat protection for unique habitat within the LRGV, and establishment of the wildlife corridor.
2. Impacts of the project on the Rio Grande Valley Municipal Water Conservation Project, water quality, the restricted use zone, and projected population growth.
3. The detriments and benefits of flood control.
4. The impacts of the LRGFCP on threatened and endangered species, marine species, and freshwater inflows to bays and estuaries.
5. Cumulative effects including bridges, channel control dams, and levee relocations.
6. Suggestions for additional studies including mowing, increased use of floodways, retention of vegetation free paths at bridges, and no flood diminishing alternatives.

At the 1998 meeting an overview of the NEPA process as it was being utilized to prepare this EIS and a listing of the cooperating agencies was presented. A short presentation of the project history was provided and the floor was opened for public comment. Individual comments were recorded and later transcribed. A summary of the public comments is presented in Appendix G.

There were approximately 16 attendees at the 1998 meeting. This included federal, state, and local officials, as well as environmental group representatives and individuals with no affiliations. Comments were received verbally and on response forms. A 60-day public written comment period was also provided; however, no additional comments were received. Issues raised at this meeting included:

1. Potential impacts from growth of the United States Border Patrol and their proposed operational improvements, including: boat ramps; permanent lighting; portable lighting; vegetation control; road improvements; and towers for remote cameras.
2. How can the scope of maintenance projects be increased to aid law enforcement activities as they relate to the United States Border Patrol?
3. General concerns about abnormal adiabatics, desertification, habitat fragmentation, loss of pollinators, and groundwater recharge.
4. Questions about a study of design flood flows below Retamal Dam. Consider diverting additional flood flow into interior floodways. Also consider the use of areas with islands of brush left for wildlife and cleared swaths for flood flow.
5. General concerns over changes in transpiration due to vegetation control and increased erosion along the river due to mowing, along with increased sedimentation in the estuary.
6. Coordination with the other agencies affecting wildlife habitat – i.e. USFWS and the USBP, to assess cumulative impacts and mitigate. Adjustment of figures (flow, flood assessment) to accurately reflect current reality.
7. Will mowing of brush downstream of Hidalgo Bridge be required? Will USFWS be allowed to plant trees upstream from Retamal Dam in the 300-acre easement area where USIBWC now keeps vegetation mowed?

6.2 AGENCY COORDINATION

Initial agency coordination and contact was by mail and telephone. Letters were sent to all agencies that were involved in the 1991 scoping meeting. The following agencies were contacted:

- Federal Emergency Management Agency
- United States Army Corps of Engineers
- Natural Resources Conservation Service
- United States Fish and Wildlife Service

- Texas Parks and Wildlife Department
- National Oceanic and Atmospheric Administration
- Immigration and Naturalization Service
- Advisory Council on Historic Preservation
- United States Bureau of Reclamation
- Environmental Protection Agency
- United States Geological Survey

Only two of the federal and state agencies responded to the request for cooperating agencies, the USFWS and the TPWD. Both agencies have ongoing land management programs in the LRGV, and are therefore interested in this project. Several of the agencies contacted indicated that they would review the document at the draft stage.

6.3 PUBLIC REVIEW OF DRAFT EIS

The Draft EIS (DEIS) was made available for public review and a Notice of Availability (NOA) was published in the Federal Register dated July 11, 2003. The DEIS was also provided to various federal, state and local agencies and congressional delegations for review and comment. The initial 45-day comment period ending August 29, 2003, was extended to October 9, 2003, at the request of the U.S. Department of the Interior. A public meeting was held on July 30, 2003, in Weslaco, Texas, and a summary report of the meeting is included in Appendix K. Appendix J includes all comments received along with USIBWC's responses to those comments. This FEIS incorporates all agency and public comments that were received during the DEIS comment period.

6.4 FINAL EIS

The FEIS has been provided to libraries within the study area to provide the general public opportunity for review. A NOA will be published in the Federal Register, and a Record of Decision (ROD) will not be signed until at least 30 days after publication. All public comments received on the DEIS as well as the public agency responses are included in this FEIS.

Chapter 7

List of Preparers

CHAPTER 7

LIST OF PREPARERS

Name	Agency/Organization	Discipline/Expertise	Experience	Role in Preparing FEIS
Ms. Linda Ashe	USACE Ft. Worth District	Biology/Aquatic Ecology	4 years EA/EIS studies	Development of scope of work and contract award.
Mr. Eben Cooper	Geo-Marine, Inc.	Anthropology	5 years	Cultural Resources
Ms. Linda Eaker	LOPEZGARCIA GROUP	Administrative Assistant	30 years administrative experience	FEIS review and production
Mr. Doug Echlin	USIBWC	Environmental Specialist	27 years environmental studies	Project coordinator, Study review
Ms. Deborah Evans	LOPEZGARCIA GROUP	Environmental Sciences	4 years aquatic biology, 2 years environmental sciences	Appendices review and coordinator, Texas Coastal Zone Consistency Determination
Mr. Victor Gibbs	Geo-Marine, Inc.	Archaeology	15 years of archaeology	Cultural Resources
Mr. Chris Ingram	Gulf South Research Corporation	Biology/Ecology	22 years NEPA and related environmental studies	Project Manager
Ms. Suna Knaus	Gulf South Research Corporation	Wildlife/Forestry	14 years NEPA and related studies	FEIS Review
Mr. Jason Knowles	Gulf South Research Corporation	GIS/Graphics	2 years data/theme development, cartographic analysis	GIS and graphics
Mr. James Landry	LOPEZGARCIA GROUP	Civil Engineering	6 years project experience in engineering	Hydraulic Modeling Report
Mr. Craig McColloch	LOPEZGARCIA GROUP	Environmental Management	23 years environmental impact assessment	Project Manager, Chapter 1, Chapter 2, Review, QA/QC

Name	Agency/Organization	Discipline/Expertise	Experience	Role in Preparing FEIS
Ms. Sharon Newman	Gulf South Research Corporation	GIS/Graphics	8 years GIS analysis	GIS and graphics
Mr. Duane Peter	Geo-Marine, Inc.	Anthropology	25 years archaeology	Cultural Resources
Ms. Nancy Reese	Geo-Marine, Inc.	Historical Archaeology	15 years historic archaeology	Cultural Resources
Mr. David Shanabrook	Geo-Marine, Inc.	Geophysics/Geology	21 years geology	Cultural Resources
Mr. Mike Schulze	Gulf South Research Corporation	Environmental Studies	4 years natural resources and NEPA studies	HEP field survey and analysis
Mr. Mike Sipos	LOPEZGARCIA GROUP	Wildlife Biology	7 years biological sciences and 10 years GIS mapping analysis	GIS mapping and analysis
Ms. Janelle Stokes	USACE Galveston District	Anthropology	21 years in archeological investigations and 5 years NEPA and related environmental studies	Technical Coordination, NEPA and Cultural Resources review
Mr. Dwayne Templet	Gulf South Research Corporation	Forestry	10 years biological investigations and NEPA studies	Habitat Evaluation Procedures, Biological Resources, and Study Review
Ms. Susan Tuxbury	LOPEZGARCIA GROUP	Biology/Aquatic Ecology	4 years biological sciences	Baseline and impact analysis of Socioeconomic Resources, Environmental Justice, Land Use, Water Resources, Soils and Geology, Hazardous Materials, and Air Quality

Chapter 8

References

CHAPTER 8

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Appendix A

Consent Decree

Appendix B

IBWC Minutes

Appendix C

Section 7 Consultation/Biological Opinion

Appendix D

Off-River Wildlife Travel Corridor Plan

Appendix E

Notices of Intent and Notices of Availability

Appendix F

Scoping Meeting Notices

Appendix G

Scoping Meeting Summaries

Appendix H

Memoranda of Understanding

Appendix I

International Considerations

Appendix J

Agency Correspondence / Public Comments

Appendix K

Public Meeting Summary Report

Appendix L

Threatened and Endangered Species Report

Appendix M

Habitat Evaluation Procedure Report