Final Report on the Ten-Year Implementation of the "Record of Decision on River Management Alternatives for the Rio Grande Canalization Project": 2009 to 2019

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June 17, 2019

Executive Summary

After nearly ten years of coordination and collaboration with stakeholders, the International Boundary and Water Commission, United States Section (USIBWC) Commissioner Ruth signed the *Record of Decision (ROD) for the River Management Alternatives for the Rio Grande Canalization Project* (RGCP) on June 4, 2009. The ROD committed the USIBWC to continuing the mission of flood control and water deliveries of the RGCP while implementing environmental measures that would enable the sustainable management of the river corridor over a ten-year period.

The ROD commitments included levee improvements, elimination of grazing leases, implementation of 553 acres of habitat restoration and 1,983 acres of managed grasslands, development of an Environmental Water Transaction Program to provide water for restoration, updating the River Management Plan, development of a channel maintenance monitoring program, mitigation measures for construction and management, and adaptive management.

From 2009 to 2019, USIBWC worked diligently to implement the goals set forth in the ROD. The USIBWC developed and established collaborative partnerships with multiple stakeholders and agencies, establishing many interagency agreements and memorandums of understanding to formalize the collaborative partnerships. ROD activities would not have been possible without the support, commitment and collaboration from the many stakeholders who provided input, attended meetings, reviewed documents, conducted site tours, and pushed the progress.

From 2009 to 2019, USIBWC and its partners planted over 109,000 native trees and shrubs at 22 habitat restoration sites on over 500 acres. USIBWC and its partners developed an Environmental Water Transaction Program which allowed the USIBWC to acquire nearly 48 acres of surface water rights, with more in the works. USIBWC, the United States Fish and Wildlife Service (USFWS) and the Elephant Butte Irrigation District (EBID) worked to construct irrigation infrastructure that allowed the supplemental irrigation of five habitat restoration sites, all of which target the creation of habitat for threatened or endangered species.

The USIBWC also conducted two Endangered Species Act Section 7 consultations during the ROD implementation regarding potential impacts to threatened and endangered species resulting from ROD activities. USIBWC worked to implement reasonable and prudent measures set forth by the USFWS and incorporate the measures into project activities and the River Management Plan.

The USIBWC collaborated with key stakeholders to develop several iterations of the River Management Plan, establish channel maintenance policy, and come to agreements on priorities and actions for the management of the river corridor. USIBWC incorporated pending ROD commitments into the River Management Plan.

The USIBWC conducted outreach throughout the ROD timeframe to inform stakeholders and the public on USIBWC activities. The agency is committed to meeting its statutory requirements for the operations and maintenance of the RGCP while sustainably managing the river corridor to maintain habitat and address stakeholder concerns. The USIBWC's accomplishments under the ROD are summarized in Table E-1. This report documents USIBWC's actions to implement ROD activities during the ten years from 2009 to 2019.

Table E-1. Record of Decision Accomplishments 2009 to 2019
• Established cooperative agreements with USFWS, NM State Parks, EBID, USBR • 22 habitat restoration sites on 508 acres (9 by USFWS and 13 by USIBWC environmental contractors) • Planted over 109,000 trees and shrubs from 2011-2019 • Cleared over 500 acres of saltcedar • Conducted 4 prescribed burns for saltcedar debris piles • Installed and monitored a network of 55 shallow groundwater monitoring wells • Monitoring protocol established for habitat restoration sites, No Mow Zones, and wells • Developed an Environmental Water Transaction Program • Acquired almost 48 acres of EBID-administered surface water rights • Irrigated 5 restoration sites (11 times at LEL WW8 site in Las Cruces, twice at Mesilla East, twice at Crow Canyon B, once at Trujillo, and once at Yeso East) • Established over 1,500 acres of No Mow Zones • Completed Endangered Species Act Section 7 consultations • Phased out grazing within RGCP • Resurveyed 160 cross sections • Established priority channel maintenance locations • Completed a Channel Maintenance Alternatives Study • Initiated the Sediment Control Initiative Federal Workgroup • Finalized and implemented several iterations of the River Management Plan • Implemented mitigation for construction activities • Implemented Adaptive Management strategies

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Cover photo: planting native tree poles at Broad Canyon Arroyo Restoration Site, February 2013

Acronyms

Ac-ft	Acre-feet
BLM	Bureau of Land Management
CMA	channel maintenance alternative
Cuckoo	yellow-billed cuckoo
DOJ	U.S. Department of Justice
EBID	Elephant Butte Irrigation District
EIS	Environmental Impact Statement
EPCWID#1	El Paso County Water Improvement District #1
ESA	Endangered Species Act
EWTP	Environmental Water Transaction Program
Flycatcher	southwestern willow flycatcher
GSA	General Services Administration
LRGMU	Lower Rio Grande Management Unit (for flycatchers)
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NMDGF	New Mexico Department of Game and Fish
NMSU	New Mexico State University
RGCP	Rio Grande Canalization Project
ROD	Record of Decision
RMP	River Management Plan
SANWR	San Andreas National Wildlife Refuge
SHPO	State Historic Preservation Officer
SOW	Statement of Work
SWEC	Southwestern Environmental Center
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USIBWC	International Boundary and Water Commission, U.S. Section

Final Report on the Ten-Year Implementation of the "Record of Decision on River Management Alternatives for the Rio Grande Canalization Project" 2009 to 2019

1. INTRODUCTION

In June 2009, the International Boundary and Water Commission, U.S. Section (USIBWC) signed the *Record of Decision* (ROD) *on River Management Alternatives for the Rio Grande Canalization Project*. The ROD had a ten-year implementation timeline to implement the commitments for sustainable management of the river corridor. This report documents the activities USIBWC undertook for the ROD implementation from June 2009 to June 2019.

2. BACKGROUND

2.1. Rio Grande Canalization Project

The Rio Grande Canalization Project (RGCP), located in Doña Ana and Sierra Counties in New Mexico and El Paso County, Texas, extends for 105.6 miles along the Rio Grande from Percha Diversion Dam in New Mexico, to approximately 200 feet downstream from American Diversion Dam where the Rio Grande begins to form the international boundary at El Paso, Texas and Ciudad Juarez, Chihuahua (see Figure 1). The RGCP is designed to provide flood protection against a 100-year flood and assures releases of Rio Grande Project waters to the U.S. and Mexico from the upstream Elephant Butte and Caballo Reservoirs, in accordance with the 1906 Convention between the United States and Mexico. The USIBWC was granted authority to construct, operate, and maintain the RGCP through the Act of June 4, 1936, 49 Stat. 1463, Public Law No.648.

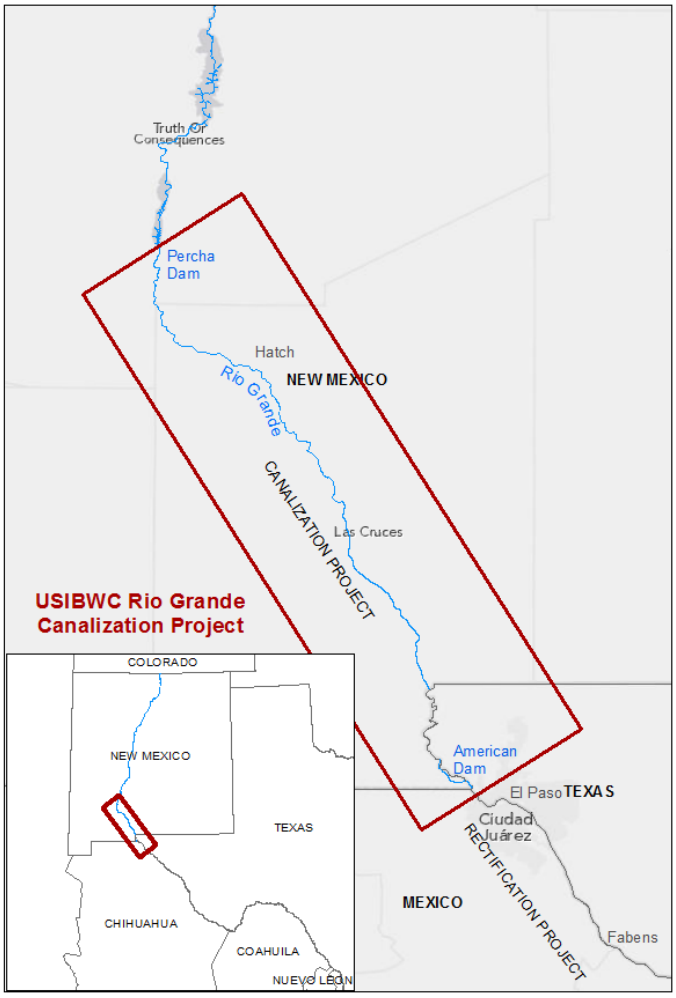


Figure 1 Rio Grande Canalization Project

2.2. Record of Decision

In May 1998, the USIBWC received a notice of violation of the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA) regarding the management of the RGCP. Among the settlement commitments, in 1999, the USIBWC began a public scoping and consultation process to develop alternatives for an Environmental Impact Statement (EIS) on river management of the RGCP. In 2001, an Alternatives Formulation Report was issued, and in 2003, the Reformulation of River Management Alternatives Report (Parsons 2003a) was issued, leading to the release of the Draft EIS (Parsons 2003b) in December 2003 for public comment. The Final EIS was published in July 2004 (Parsons 2004c).

The RGCP EIS evaluated four long-term River Management Alternatives: a) No Action, b) Flood Control Improvement, c) Integrated Land Management, and d) Targeted River Restoration. The goals were to accomplish flood control, water delivery, and operation and maintenance activities in a manner that would enhance or restore the river ecosystem. The USIBWC drafted a preliminary Record of Decision in July 2004; however, on August 3, 2004, New Mexico Governor Bill Richardson, U.S. Senators Jeff Bingaman and Pete Domenici, and other stakeholders from New Mexico requested a delay in signing the ROD in order to address concerns of stakeholders.

From 2004 to 2009, the RGCP Collaborative, a group of stakeholders working with USIBWC on the RGCP, revisited aspects of the EIS, biological assessments, hydraulic modeling, and technical assessments to address stakeholder concerns. The USIBWC worked with the Albuquerque District of the U.S. Army Corps of Engineers (USACE) and local stakeholders to identify areas for habitat restoration which were published in a Conceptual Restoration Plan (USACE 2009). Following a multi-year consultation process with stakeholders, the USIBWC selected a slightly modified version of the Integrated Land Management Alternative, and the RGCP ROD was finally signed by USIBWC Commissioner Ruth on June 4, 2009 (USIBWC 2009).

The ROD committed USIBWC to a 10-year implementation of the Integrated Land Management Alternative. The first Phase (2009 to 2014) included formulation of cooperative agreements, planning, studies, pilot projects of restoration sites, and the creation of an environmental water rights transaction framework. The second Phase (2014 to 2019) included completing the implementation of the remaining restoration sites, obtaining water rights, and finalizing channel maintenance and river management plans. Adaptive Management would guide the implementation of environmental measures.

The total cost was estimated initially at just over $5 million. USIBWC later estimated the total cost to be closer to $11.1 million.

Major components of the ROD were the following:

1. Implementation of up to 30 conceptual riparian habitat restoration sites totaling 553 acres. The principal objectives of the restoration were to enhance river-floodplain hydrologic connectivity; reduce exotic vegetation; restore endangered species habitat; and reestablish riparian habitat. Twelve sites would implement habitat for the endangered southwestern willow flycatcher. Restoration work would follow the 2009 Conceptual Restoration Plan (USACE 2009).

2. Development and implementation of an Environmental Water Transaction Program (EWTP), a voluntary, cooperative, market based program to acquire or lease water rights. The EWTP would offset increased consumption of water resulting from restoration activities, with 450 acre feet (ac ft) of water rights. The EWTP would also provide water for 227 ac ft of supplemental irrigation and/or to simulate overbank conditions.
3. Cease mowing on 1,983 acres to implement managed grasslands.
4. Phase out grazing leases.
5. Implement a peak restoration flow once every 3 to 10 years during spring, if deemed feasible by irrigation districts and the U.S. Bureau of Reclamation.
6. Establish a science-based channel maintenance program.
7. Update the River Management Plan (RMP) in collaboration with the key stakeholders.
8. Implement mitigation actions for construction activities.
9. Adopt adaptive management strategies for implementation.

The Integrated Land Management Alternative addressed the following issues:

- Continued RGCP Mission – USIBWC would continue mission operations of water delivery and flood control, as well as levee improvements to meet flood capacity;
- Water Use and Environmental Water Transactions – USIBWC would acquire or lease water to offset depletions from evapotranspiration as a result of increased vegetation at restoration sites;
- Maintaining Farmland in production – Nearly all measures would be implemented on USIBWC property, and the remaining measures would only take place through voluntary cooperative agreements with private landowners;
- Environmental Improvements – USIBWC would balance its mission while improving the environmental quality of the river as well as enhancing recreation;
- ESA Liability – USIBWC would comply with ESA to provide regulatory assurances to stakeholders for listed species;
- Channel Maintenance – USIBWC would update the river management plan to incorporate new strategies for channel maintenance; establish a data collection and evaluation program for channel maintenance; update and evaluate river cross section data and hydraulic model (in 4-5 year cycles); and conduct in-channel enhancements; and
- Floodway Vegetation Management – USIBWC would restore 553 acres on up to 30 conceptual restoration sites within the floodplain, minimize or reduce mowing at these sites, make permanent three “no-mow” zones from a 1999 agreement; reduce grazing by phasing out grazing leases, implement up to 1,983 acres of managed grasslands, and actively remove and control salt cedar and Russian thistle.

3. ROD IMPLEMENTATION STAKEHOLDER INVOLVEMENT

Throughout the ROD implementation, USIBWC involved key stakeholders for input on the restoration activities and meeting the ROD requirements. In October 2010, the ROD Implementation Committee (later renamed the ROD Implementation Stakeholder Group) convened in El Paso to support ROD implementation.

Key stakeholders meet regularly (at varying frequencies throughout the years) to discuss aspects of ROD implementation, such as restoration work, channel maintenance, the EWTP, the Biological Opinion, and more. Key stakeholders include:

- irrigation districts (Elephant Butte Irrigation District (EBID) and El Paso County Water Improvement District #1 (EPCWID#1)),
- environmental groups (Audubon New Mexico, Southwest Environmental Center, Paso del Norte Watershed Council),
- other agencies (U.S. Bureau of Reclamation (USBR), USFWS),
- representatives of elected officials (New Mexico Senators Heinrich and Udall and Texas Senator Rodriguez), and
- USIBWC staff from various divisions (Operations and Maintenance Division, Engineering Services Division, Water Accounting Division, and Environmental Management Division).

Table 1 lists the formal meetings that were held with stakeholders. Some meetings were facilitated by Senators' representatives, and later meetings were facilitated and organized by USIBWC.

In addition to stakeholder meetings, USIBWC made the following efforts to ensure that stakeholders were involved:

- requested input and formal comments from stakeholders on:
    - a 2013 white paper for a channel maintenance pilot project to excavate sediment at chronic sediment locations (Tonuco Drain and Montoya Drain)
    - multiple iterations of the River Management Plan and Channel Maintenance Plan
    - the 30% and 90% Design meetings for the Channel Maintenance Alternatives Study and the Thurman I and II Sediment Control Structures
- emailed documents such as draft and final River Management Plan, photographs, factsheets, and meeting minutes
- provided email updates on ROD implementation activities,
- frequently updated the ROD website, including posting relevant documents, and
- frequent outreach such as talks and presentations.

Furthermore, USIBWC conducted countless meetings throughout the years with individual stakeholders (such as EBID, USFWS, USBR, NM State Parks, City of Las Cruces, EPWU, and EPCWID#1) to discuss and develop project-specific aspects on restoration, endangered species, water transactions, and more.

Table 1. Summary of stakeholder meetings on ROD implementation		
Type of meeting	Dates/Location	Location
ROD Implementation Group meetings	June 5, 2017	El Paso, TX (USIBWC Conference Room)
	October 17, 2016	Las Cruces, NM (EBID Conference Room)
	April 5, 2016	El Paso, TX (USIBWC Conference Room)
	January 21, 2015	Las Cruces, NM (EBID Conference Room)
	October 7, 2014	El Paso, TX (USIBWC Conference Room)
	April 22, 2014	Las Cruces, NM (EBID Conference Room)
	August 19, 2013	El Paso, TX (USIBWC Conference Room)
	July 11, 2013	Las Cruces, NM (NMWRRI, NMSU)
	April 2, 2013	El Paso, TX (USIBWC Conference Room)
	February 5, 2013	Las Cruces, NM (EBID Conference Room)
	November 28, 2012	El Paso, TX (USIBWC Conference Room)
	October 3, 2012	Las Cruces, NM (EBID Conference Room)
	August 1, 2012	El Paso, TX (USIBWC Conference Room)
	May 10, 2012	El Paso, TX (USIBWC Conference Room)
	April 3, 2012	El Paso, TX (USIBWC Conference Room)
	October 5, 2011	El Paso, TX (USIBWC Conference Room)
	August 16, 2011	El Paso, TX (USIBWC Conference Room)
	May 9, 2011	Las Cruces, NM (EBID Conference Room)
	January 27, 2011	El Paso, TX (USIBWC Conference Room)
	December 13, 2010	Las Cruces, NM (EBID Conference Room)
	November 4, 2010	Radium Springs, NM (Radium Springs Community Center)
	October 7, 2010	El Paso, TX (USIBWC Conference Room)
	October 29, 2009	Las Cruces, NM (NMSU Physical Science Lab)
	October 23, 2009	EL Paso, TX
Site Visits	November 14 and 15, 2018	Site tours for RMP Environmental Assessment Scoping
	January 17-18, 2017	Site tour with USFWS and ROD stakeholders
	April 18, 2013	Site tour on sediment plugs and restoration sites
	May 1-2, 2012	Site tour with USFWS and ROD stakeholders
Sediment Control Meeting	March 27, 2013	El Paso, TX (USIBWC Conference Room)
Channel Maintenance Alternatives Study	September 23, 2014	Kickoff Meeting El Paso, TX (USIBWC Conference Room)
	March 31, 2015	30% Report Presentation El Paso, TX (USIBWC Conference Room)
	September 11, 2015	90% Report Presentation El Paso, TX (USIBWC Conference Room)
Design of Thurman I and II Channel Maintenance Alternatives	October 20, 2016	Kick-off Meeting El Paso, TX (USIBWC Conference Room)
	November 3, 2017	90% Design Presentation El Paso, TX (USIBWC Conference Room)
Flycatcher Restoration Group	September 17, 2010	Las Cruces (EBID Conference Room)
	November 9, 2010	Las Cruces (EBID Conference Room)

4. ENDANGERED SPECIES ACT COMPLIANCE

4.1. Section 7 Consultations

The USIBWC prepared a biological assessment in 2004 (Parsons 2004a) as part of the EIS process, and concluded formal consultation with the USFWS in 2005 in compliance with Section 7 of the Endangered Species Act. The 2005 Fish and Wildlife Coordination Act Report (USFWS 2005) provided recommendations to minimize impacts to fish and wildlife resources from the actions documented in the EIS alternatives.

Beginning in 2006, USIBWC and EBID worked under agreement IBM06A0020 to investigate the options for safe harbor protections. The agreement was extended through July 31, 2009 and reimbursed expenses for EBID legal representation to participate in discussions on endangered species protections.

The ROD noted that farmers were concerned that delivery of Rio Grande Project water to sites that target the creation of endangered species habitat could give rise to potential liability under the Endangered Species Act and restrict water deliveries for crop irrigation, especially during low water years. The ROD suggested that regulatory assurances for the irrigation districts and its customers could be available through Safe Harbor Agreements or Section 7 consultations.

After the signing of the ROD, in September 2009, the USIBWC, EBID and USIBWC met regarding the potential to establish a Safe Harbor Agreement to protect EBID constituents if endangered species began breeding at USIBWC restoration sites irrigated with EBID water. However, stakeholders were not in agreement with that direction and recommended a more adaptive strategy be formulated under Section 7 consultation.

In late 2010, USIBWC and ROD stakeholders established that updating the Biological Assessment, to assess impacts on listed species as a result of the updated action, was a ROD implementation priority. In May 2011, USIBWC awarded a task order to SWCA to prepare a biological survey (SWCA 2011a) and a subsequent biological assessment (SWCA 2011b). In August 2009, the USIBWC requested formal Section 7 consultation with the USFWS regarding the potential effects on listed species for the implementation of the actions documented in the ROD. In September 2011, the USIBWC submitted the draft biological assessment to the USFWS and met in Albuquerque with USFWS staff. USIBWC submitted the final biological assessment in November 2011 under Consultation Number FWS # 2-22-00-I-025.

Meanwhile, in August 2011, USFWS proposed critical habitat for the flycatcher which included areas within the RGCP. In October 2011, the USIBWC formally requested an exclusion of critical habitat in the New Mexico Lower Rio Grande Management Unit under Section 4(b)(2) of the Endangered Species Act, based on collaborative efforts under the ROD.

USFWS issued the USIBWC a draft Biological Opinion in March 2012. USIBWC and USFWS mutually agreed to extend the consultation timeline in order to deliberate, review drafts, and address concerns from USIBWC and two key stakeholders (Audubon New Mexico and EBID), particularly regarding the Environmental Water Transaction Program and the potential for critical habitat. The irrigation district was concerned that there were no protections for EBID constituents if restoration sites being irrigated with EBID-administered water rights supported endangered species habitat and feared that water could be taken from farmers to support endangered species habitat during water shortage years. The

discussions involved providing assurances for water rights holders and for USIBWC to share water shortages along with other EBID constituents during low-water years. If critical habitat was designated in this area, the irrigation district would not have protections and would not be able to participate in the EWTP. A series of meetings and email discussions ensued regarding the Incidental Take Statement proposed by USFWS. On May 1 and 2, 2012, the USIBWC and USFWS held a site tour of the pilot projects being implemented (see Figure 2), as well as a summary meeting for USFWS staff and stakeholders.

Figure 2 USFWS SANWR manager Kevin Cobble discusses restoration activities at the Leasburg Extension Lateral WW8 site during the May 2012 site tour for the Biological Opinion

In July 2012, the USFWS published the proposed rule for designation of revised critical habitat for the flycatcher (USFWS 2012b). In the proposed rule, USFWS indicated that the RGCP was being considered for exclusion based on established collaborative relationships. USFWS felt that issuing the Biological Opinion before the final critical habitat designation was determined would benefit the case for exclusion. During this timeframe, EBID passed a policy, "Use of Rio Grande Project Water for Native Vegetation Habitat Restoration Sites in Elephant Butte Irrigation District" in June 2013 (EBID 2013). The policy required that irrigated habitat sites be covered under an incidental take statement. Additionally, USIBWC and EBID drafted a Memorandum of Understanding to collaborate on the establishment of the EWTP (a draft of which was provided to USFWS and used to support the exclusion), and the final agreement (IBM13A0007) was signed and executed in March 2013. See Section 7 for more information on the EWTP.

USFWS issued the final Biological Opinion on August 30, 2012 (USFWS 2012d). USIBWC sent a comment letter in September 2012 outlining the reasons for exclusion, including the Reasonable and Prudent Measures in the 2012 Biological Opinion. USFWS concurred and excluded the RGCP in the final critical habitat designation (USFWS 2013a).

The 2012 Biological Opinion required the USIBWC to implement a minimum of 53.5 acres of flycatcher habitat by 2017 and up to 119 acres by 2019. It also required the USIBWC to draft and implement a flycatcher management plan and annually quantify the existing flycatcher breeding habitat throughout

the corridor. After being reviewed by USFWS and stakeholders, in November 2014, USIBWC finalized its flycatcher Management Plan as Section 3 of the River Management Plan. See Section 11 for more information on the RMP.

In October 2013, the USFWS proposed to upgrade the yellow-billed cuckoo (cuckoo) from a candidate species to a listed threatened species (USFWS 2013b), and a year later issued the final rule (USFWS 2014). USIBWC's 2012 Biological Opinion specifically stated that USIBWC would need to reinitiate consultation if a new species was listed. In July 2016, the USIBWC awarded a contract to update the Biological Assessment. The updated Biological Assessment would include the cuckoo as well as an evaluation of a changed proposed action that incorporated channel maintenance projects documented in a 2015 Channel Maintenance Alternatives Study (Tetra Tech 2015) and USIBWC's updated River Management Plan, which was draft at the time and finalized in December 2016.

The Biological Survey Report was completed in September 2016 (IDEALS 2016), and the draft Biological Assessment was completed in November 2016, which USIBWC provided to USFWS in the same month. USFWS provided substantial feedback in December 2016. USIBWC coordinated a field visit and summary meeting on January 17, 18, and 19, 2017 with USFWS, stakeholders, and the contractors working on the assessment (see Figure 3). The tour provided USFWS and stakeholders the opportunity to view restoration sites, No Mow Zones, and channel maintenance areas and discuss key elements of the Biological Assessment.

USFWS comments were incorporated into the draft, and the updated Biological Assessment was completed in March 2017 (IDEALS 2017). In March 2017, the USIBWC provided the final Biological Assessment to USFWS and requested to initiate formal Section 7 consultation. USFWS provided draft versions of the Reasonable and Prudent Measures and conservation measures in June and July 2017 and provided the USIBWC with a pre-final Biological Opinion in August 2017. USIBWC provided comments on the prefinal in September 2017, which were incorporated into the draft, and USFWS issued the final Biological Opinion in November 2017 (USFWS 2017).

Figure 3 USFWS, USIBWC, and stakeholders discuss restoration work near Selden Point Bar during the Biological Opinion site tour, May 2017

The 2017 Biological Opinion incorporated the commitments that USIBWC made in its flycatcher management plan (Section 3 of the River Management Plan) and other sections of the 2016 River Management Plan, including the implementation of a dozen restoration sites that target the establishment of flycatcher breeding habitat. Additionally, instead of requiring a minimum acreage of flycatcher breeding habitat as the 2012 Biological Opinion did, the 2017 Biological Opinion had a limit of acreage that USIBWC could adversely impact (no more than 51 acres of suitable habitat and no more than 9 territories over each 5-year period until 2032). For channel maintenance actions impacting vegetated islands with documented territories, the USFWS required USIBWC to move the vegetation to the adjacent bank or to restoration sites.

Each year from 2014 to 2019, USIBWC submitted annual progress reports to USFWS under the two Biological Opinions. Information reported in the annual reports has been incorporated into this report.

4.2. Listed Species Surveys

In 2010 and 2011, USIBWC contracted flycatcher and cuckoo surveys at USIBWC restoration sites (TRC 2011c), as noted in Section 5.1. Biologists detected eight resident flycatchers each year and several cuckoos each year at restoration sites. The data provided an important baseline of presence/absence at USIBWC restoration sites. The data from these surveys was site-specific prior to implementation of restoration work and was not meant to be indicative of how the flycatchers were doing within the entire RGCP corridor.

In the summer of 2012, the USBR, Upper Colorado Region, conducted formal surveys of the flycatcher and incidental surveys of the cuckoo within Caballo Reservoir and the RGCP below Caballo. Full nest monitoring was not conducted in 2012. Flycatcher detections exceeded the recovery goal of 25 territories for the Lower Rio Grande Management Unit (LRGMU) set by USFWS (USFWS 2000).

In April 2013, the USIBWC and the USBR signed an Interagency Agreement (IBM13A0017) to collaborate on biological surveys and restoration projects within RGCP. In May 2013, the USIBWC issued a work order to USBR to conduct flycatcher and yellow billed cuckoo surveys for USIBWC (pursuant to the 2012 Biological Opinion and USBR's flycatcher management plan (USBR 2012)). USBR conducted surveys according to the survey protocol, as well as full nest monitoring, for all potentially suitable habitat within the RGCP and upstream of RGCP in the Caballo Dam area, since it was part of the LRGMU. For the second straight year, the recovery goal for the LRGMU was exceeded.

Pursuant to the agreement and the flycatcher management plans for both agencies to alternate years of survey responsibility, USIBWC issued work orders to USBR for surveys in 2015 (IBM15W0014), in 2017 (IBM17W0020), and in 2019 (191BWC19F0034). USBR conducted and paid for the surveys in 2014, 2016, and 2018.

In May 2017, USIBWC and USBR conducted pre-survey reconnaissance visits to ensure that USIBWC restoration sites were included in the survey efforts (see Figure 4). In the 2017 survey season, USIBWC staff conducted flycatcher surveys in the Sunland Park restoration area prior to restoration implementation, with no detections. USBR conducted surveys in the rest of the RGCP. Results of USIBWC surveys were incorporated into USBR's final report.

Figure 4 USFWS, USBR, and USIBWC conduct a site visit of Broad Canyon Arroyo restoration site during the flycatcher pre-season reconnaissance surveys, May 2017. The crew discusses the willow trees that USFWS recently planted along the arroyo.

Table 2 lists the flycatchers documented throughout the years. The recovery goal for flycatchers (25 territories) was met every single year when full surveys were conducted from 2012 to 2018. Additionally, there is consistently an increase in the number of flycatchers detected every year, particularly in the Hatch reach.

Table 2 Summary of Documented Flycatchers from 2010 to 2018

Year	Total Flycatchers detected	Residents	Migrants	Territories	Unpaired male Territories	Pairs	Pairs Confirmed by Nesting	# of Nests Produced/ Nests successful	Area Surveyed
2010	8	8	0				1		195.7 acres (selected USIBWC restoration sites)
2011	18	8	10						
2012	66	50	16	**28**	6	22	19	19/2[1]	Caballo delta and suitable habitat within RGCP
2013	73	67	6	**38**	9	29	26	37/12	
2014	87	66	21	**41**	16	25	21	30/6	
2015	92	72	20	**45**	18	27	21	32/11	
2016	105	75	30	**50**	25	25	24	34/18	
2017	154	116	38	**68**	20	48	43	68/41	
2018	198	154	44	**84**	14	70	68	108/57	

[1] – only incidental nest monitoring was completed in 2012 and the fate of 12 nests was unknown

In 2014, the yellow billed cuckoo was changed from a candidate species to a listed threatened species. In 2014, USBR conducted the first full surveys of cuckoos. Prior to that, surveys had been incidental or in certain larger stretches with more suitable habitat. USIBWC included cuckoo surveys in the subsequent work orders with USBR. Table 3 lists the documented cuckoos over the years, including the Caballo delta outside of RGCP.

Table 3 Summary of Documented Cuckoos from 2012 to 2018

Year	Total cuckoos detected LRGMU	Total Territories delineated LRGMU	Detections within RGCP	Territories delineated within RGCP
2010			3	
2011			4	
2014	37	10	8	2
2015	63	20	15	5
2016	87	24	25	9
2017	110	28	38	10
2018	136	32	78	19

5. PHASE I IMPLEMENTATION

The ROD proposed a two-phase approach to implementation. The first 5-year phase would include on-site data collection, development of implementation plans, development of interagency and other cooperative agreements, undertaking voluntary land transactions with willing landowners, development of the environmental water transaction program with initial voluntary transactions, and implementation of selected pilot projects. The second 5-year phase would implement the remaining projects.

5.1. Phase I Baseline Studies

In 2010, USIBWC solicited and awarded an environmental task order to TRC (IBM10T0022) to conduct baseline studies to gather more information on each of the restoration sites in the 2009 Conceptual Restoration Plan, before implementing any of the habitat restoration projects. The following studies were conducted:

1. Soils surveys – TRC evaluated soil at 25 of the 30 conceptual sites and created soil maps of each restoration site. The report determined major limitations were salinity, wetness, and poor drainage. Four sites were identified as having higher salinity levels. The report also identifies soils that had a deeper water table that could require more supplemental irrigation (TRC 2010a).
2. Groundwater levels investigation – TRC evaluated shallow groundwater levels at 24 conceptual restoration sites during June and July 2010. The report concluded that at most sites the groundwater elevations are roughly two feet below the river elevations, indicating that the river is losing flow to the groundwater in the floodplain at the sites (TRC 2010b).

3. Cultural Resources investigations – TRC conducted cultural resource investigations at restoration sites, including architectural and archaeological resources (TRC 2011a). USIBWC obtained State Historic Preservation Officer (SHPO) concurrence from both Texas and New Mexico.
4. Endangered Species surveys – TRC conducted presence/absence surveys of the endangered southwestern willow flycatcher (flycatcher) and the then-candidate species yellow-billed cuckoo at the conceptual restoration sites (TRC 2011c).
5. Site Implementation Plans – TRC re-evaluated the 2009 Conceptual Restoration Plan and prepared Site Implementation Plans for 23 sites. The plans recalculated evapotranspiration, summarized data from the other baseline studies, estimated costs for each site, and recommended permit options (TRC 2011b).

5.2. Phase I Property Acquisition

The 2009 Conceptual Restoration Plan proposed several sites for restoration that were not federal government property, including Lack Property, Pasture 18, Broad Canyon Ranch, Selden Point Bar, Bailey Point Bar, and NeMexas Siphon.

In 2010, USIBWC contractors could not obtain permission from the owner of the Lack Property conceptual restoration site for entry onto the property for flycatcher surveys. USIBWC also understood that the property was not for sale and USIBWC did not pursue any acquisition of the Lack property. The site later became part of habitat restoration under an EBID project.

In 2011, the USIBWC issued a contract for real estate services with Keres to pursue the purchase of the Selden Point Bar and the Bailey Point Bar parcels, both of which were sites in the Conceptual Restoration Plan. In 2011, the USIBWC acquired the Selden Point Bar. In the same year, the USIBWC attempted to acquire the Bailey Point Bar but was unable to negotiate with the seller.

In 2014, the USIBWC issued a contract for real estate services with Keres to pursue the purchase of the NeMexas Siphon parcel and re-attempt to acquire the Bailey Point Bar. The preliminary title search revealed that the NeMexas Siphon parcel had a property ownership dispute. USIBWC Legal recommended backing out of sale proceedings until the two entities that claimed ownership (Boy Scouts Yucca Council and the City of Sunland Park) could resolve the dispute. USIBWC met with both entities several times in 2014 and 2015 but the ownership was not settled via a quiet claim legal action, and USIBWC was unable to acquire the property.

The USIBWC continued to pursue the Bailey Point Bar purchase; however, this site does not have legal access, and the Department of Justice recommended that the USIBWC acquire legal access in conjunction with the purchase of the property. The USIBWC worked with Keres to work with the sellers on legal access to the property. The sellers attempted to acquire a railroad crossing from Burlington Northern Santa Fe Railroad, but the cost was estimated at around $50,000. USIBWC could not successfully negotiate with the sellers and was unable to acquire the Bailey Point Bar property.

In 2012, USIBWC attempted to acquire a different property in Selden Canyon, which was four parcels totaling 88 acres owned by Ted and Carolyn Horner. The property had groundwater and surface water rights. The property was held under an Option Agreement by the National Audubon Society. In 2011 Audubon New Mexico conducted soil investigations on the Horner property to determine the potential

for habitat restoration. In April 2012, Audubon had an appraisal done on the property and water rights. Audubon approached USIBWC regarding the agency's interest to buy the parcel for habitat restoration.

In July 2012, the parcels owned by Ted Horner were removed by the landowner from consideration. USIBWC decided to continue with the acquisition of the parcels owned by Carolyn Horner. In August 2012, Ms. Horner signed an offer to sell the property. Under the work order with USFWS-NFWF-Audubon (IBM11W0022) USIBWC worked with Audubon on the acquisition of the property, including conducting a Phase I environmental site assessment (August 2012), a property survey, a legal memorandum from New Mexico Environmental Law Center on the validity of the water rights (September 2012), a stipulated subfile order from the Third Judicial District Court (September 2012).

On September 24, 2012, USIBWC cultural resources specialist Mark Howe finalized a cultural survey for the property (USIBWC 2012). On September 27, 2012, the U.S. Department of Justice completed a Preliminary Opinion of Title for the purchase of 29.92 acres of land. USIBWC worked with General Services Administration on the acquisition. USIBWC held weekly meetings with the team working on the acquisition, including Audubon, GSA, and USIBWC Environmental, Legal, Acquisitions, Realty, Planning offices.

Despite all the work towards the acquisition of the property, on October 10, 2012 USIBWC informed Audubon that the agency would not move forward with the acquisition of the property for a handful of reasons. The landowners had reduced the original riverfront acreage for sale, and later requested an additional tract of property be added to the purchase agreement amendment which would require redoing the survey and legal description, new title commitment and title, revised preliminary title opinion, etc. Additionally, USIBWC anticipated that the salty soils would require remediation, and the wells would require redrilling or maintenance. USIBWC determined that the property acquisition was not in the best interest of the Government.

5.3. Phase I Pilot Restoration Sites

Starting in October 2009 and into 2010, USIBWC held a series of meetings with stakeholders to prioritize the habitat restoration sites for Phase I implementation.

USIBWC implemented a No-Mow policy at all USIBWC habitat restoration sites beginning in 2011. On July 20, 2011, USIBWC Environmental Management Division (EMD) held a meeting in El Paso to brief USIBWC staff from Operations and Maintenance and other divisions on the EIS and the ROD, as well as immediate changes in mowing. In a few instances in December 2011, USIBWC operations crews mowed restoration sites, including Mesilla East and Leasburg Extension Lateral Wasteway #8 sites. EMD continued coordination with operations crews on the requirement to cease mowing at restoration sites, and No Mow Zone maps were drafted in 2012 and 2013.

In April 2011, USIBWC and the U.S. Fish and Wildlife Service (USFWS), Southwest Regional Office Region 2 in Albuquerque, NM signed an interagency agreement (USIBWC IAA No. IBM11A0002/FWS No. 22521-B-IBWC) to assist each other in carrying out responsibilities and roles related to improving fish and wildlife resources and work together on the habitat improvement projects within the RGCP.

Also in April 2011, under that interagency agreement, USIBWC issued an Individual Work Order (IBM11W0020) for *Riparian Habitat Restoration on Crow Canyon A and B, Broad Canyon Arroyo,*

Leasburg Extension Lateral, and Mesilla East: Phase I – Pilot Project Implementation. Under that work order, USFWS would begin restoration implementation on 5 pilot project sites totaling 207 acres. Work included saltcedar removal and control, soil stratigraphy and texture delineation, native plantings, and NEPA compliance.

Additionally, USIBWC designed and ordered two kinds of signs to post at habitat restoration sites, shown in Figure 5 Signs posted at initial habitat restoration sites. Signs were posted at several sites beginning in December 2011.

Implementation of habitat restoration is described in more detail in Section 6.

Figure 5 Signs posted at initial habitat restoration sites

5.4. Phase I Environmental Water Transaction Program

Under the Interagency Agreement IBM11A0002, the USIBWC issued the USFWS a second Individual Work Order (IBM11W0022) to establish the Environmental Water Transaction Program under a tri-party arrangement between the USIBWC, the USFWS, and the National Fish and Wildlife Foundation (NFWF). The statement of work included a proposed two-year workplan to cultivate relationships, identify transaction targets and water rights holders, evaluate possible transactions, and negotiate and implement transactions of water rights. The work order was modified in January 2012 to expand the statement of work and include the irrigation districts. The Environmental Water Transaction Program is discussed in more detail in Section 7.

6. HABITAT RESTORATION IMPLEMENTATION

In the ROD, USIBWC committed to restoring 553 acres of riparian habitat, targeting a mosaic of habitat types, on up to 30 conceptual restoration sites, documented in the 2009 Conceptual Restoration Plan (USACE et al 2009). Preliminary planning for restoration is discussed in Section 5. This section describes USIBWC's on-the-ground efforts to implement the habitat restoration sites.

6.1. Refinement of the Conceptual Restoration Plan

As discussed in Section 5.1, USIBWC contracted the development of Site Implementation Plans (TRC 2011b), which, together with the 2009 Conceptual Restoration Plan, guided the implementation of the habitat restoration sites. USIBWC used adaptive management to expand, remove, or add habitat sites (See Section 13 for more information on adaptive management). For example, under USFWS Work Order IBM11W0020, USFWS expanded the Leasburg Extension Lateral Wasteway #8 Restoration Site from 4.1 acres to 30 acres, expanding to visible landmarks both upstream (the highway) and downstream (the lateral). Since the original site was intended to target the creation of dense riparian shrub habitat suitable for the flycatcher, the expanded site created a buffer for the bird that improved the overall habitat and the likelihood of success.

Changes to restoration sites from the Conceptual Restoration Plan include:

- Addition of USIBWC Broad Canyon Arroyo parcel (+28.5 acres)
- Addition of Rincon Siphon C (+ 5.3 acres) and D (+ 5.9 acres)
- Expansion of Leasburg Extension Lateral Wasteway #8 (+26 acres)
- Expansion of Mesilla East (+56 acres)
- Expansion of Mesilla Valley Bosque State Park to include the entire USIBWC parcel within the park (+4.5 acres)
- Addition of Crow Canyon C parcel (+3.4 acres)
- Removal of Lack Property (-51 acres)
- Removal of Broad Canyon Middle site (-13.8 acres) and Broad Canyon South site (-20.6 acres) since implementation was being done by Interstate Stream Commission and USBR
- Removal of NeMexas Siphon site (-16.7 acres) and Bailey Point Bar site (-16.6 acres) since the acquisition of the properties was unsuccessful
- Removal of Pasture 18 since the Conceptual Plan said this had "low potential for developing riparian communities that meet the study objectives" and because the property did not belong to USIBWC
- Removal of Clark Lateral site (-6.1 acres) for a variety of reasons (site is inside City of Las Cruces lease and has a paved trail near river, which is not compatible with the target to create habitat for endangered species; the site is a small parcel that requires supplemental irrigation; no significant native vegetation growth in 7 years of no mowing)
- Change of habitat type for Yeso West from aquatic to flycatcher habitat, and then to partial wetland and partial flycatcher habitat
- Creation of a terrace at Broad Canyon Arroyo
- Minor changes to individual site implementation as documented in the Site Implementation Plans
- Changes to sites following implementation, documented in Sections 6.3 to 6.7.

6.2. Overall Restoration Work

USIBWC implemented 22 habitat restoration sites (some with multiple parcels) covering over 509 acres out of the ROD's anticipated 553 acres. Locations of active habitat restoration sites are shown in Figure 6. Twelve sites totaling 95 acres are targeting flycatcher habitat. Table 4 lists the active restoration sites,

and Table 5 summarizes the work done at the sites through interagency agreements or contracts. From 2011 to March 2019, USIBWC partners and contractors planted a total of 99,218 trees and 10,572 shrubs, and they have treated or excavated over 500 acres of saltcedar. Appendix 1 shows photos of the restoration activities, and Appendix 2 has maps of the restoration work at each site.

USIBWC anticipates additional plantings in late 2019 including replants of some willows and cottonwoods.

For some restoration sites, the Conceptual Restoration Plan included bank cuts and floodplain lowering. In 2012, USIBWC coordinated with USACE for required permits and/or concurrence for this work under SPA-2012-00529-LCO. Work above the ordinary high water mark in New Mexico did not require a permit. USIBWC determined, USACE concurred, that other bank cuts were excavation only. However, not all sites with anticipated bank cuts were implemented.

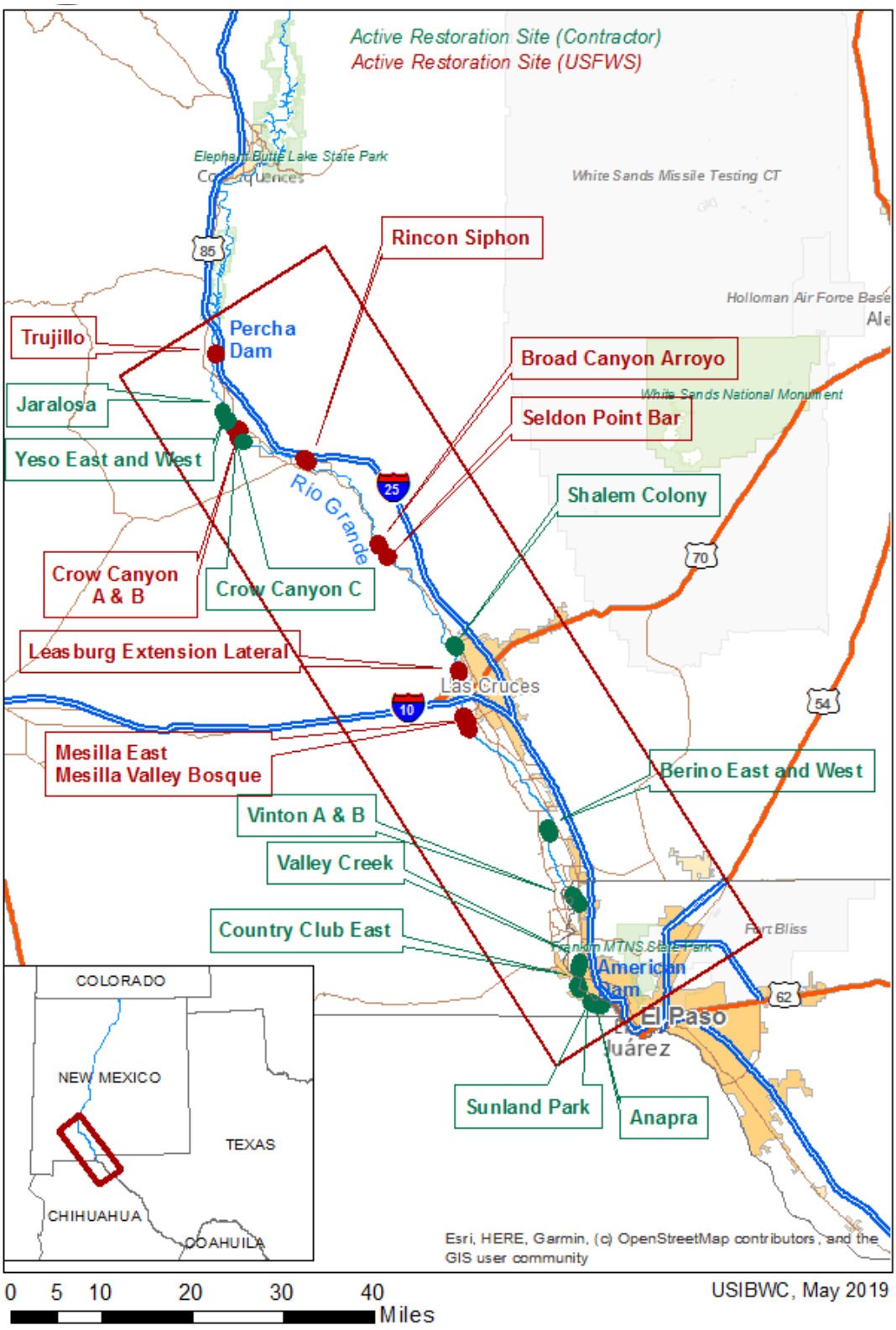


Figure 6 USIBWC Active Habitat Restoration Sites

Table 4 Active USIBWC Restoration Sites for RGCP				
Site Name	**River Mile/ Bank**	**Acres**	**Target Habitat Type(s)**	**Comments**
Trujillo	103 W	14	Dense riparian shrubs, woodland	Implemented by USFWS beginning 2013 Irrigated in 2019
Jaralosa	94.9 E	4.5	Open riparian woodland	Implemented by GSRC/SWCA beginning 2016
Yeso East	93.7 E	9.7	Open riparian woodland	Implemented by GSRC/SWCA beginning 2016 Irrigated in 2019
Yeso West	93.5 W	1.6	Aquatic Habitat	Inset floodplain; Implemented by GSRC/SWCA beginning 2016
Crow Canyon A	92 E	90	Riparian savanna & shrubland	Implemented by USFWS beginning 2011
Crow Canyon B	90.5 E	25.6	Dense riparian shrubs, meadow	Implemented by USFWS beginning 2011 Irrigated started in 2018
Crow Canyon C	90 E	3.4	Dense riparian shrubs	Implemented by GSRC/SWCA beginning 2016
Rincon Siphon A, B, and C	82.5 E	21.6 (Original A & B 16.3 acres expanded to 21.6 with C)	Dense riparian shrubs	Implemented by USFWS beginning 2013
Rincon Siphon D	82.5 W	5.9	Dense riparian shrubs	Implemented by USFWS beginning 2013
Broad Canyon Arroyo	68 E	30	Dense riparian shrubs, saltgrass meadow	Implemented by USFWS beginning 2011
Selden Point Bar	66 E	7.7	Dense riparian shrubs	Land acquired in 2011; Implemented by USFWS beginning 2013
Shalem Colony	50.5 E	14.2	Screwbean mesquite & riparian grassland	Implemented by IDEALS beginning 2017
Leasburg Extension Lateral WW 8	47.8 E	30 (Original 4.1 acres expanded to 30)	Dense riparian shrubs	Site expanded. Implemented by USFWS beginning 2011. First site to be irrigated, beginning in 2014.
Mesilla Valley Bosque State Park	41.5 W	31.8	Riparian forest, shrubland, meadow and grassland	Implemented by USFWS beginning in 2013. Park transferred to NMDGF in 2018 and transferred back in 2019; renegotiation of lease.
Mesilla East	41 E	15.8 (expanded to 70)	Dense riparian shrubs	Site expanded. Implemented by USFWS Irrigated starting in 2018
Berino West	25.5 W	10.3	Dense riparian shrubs and forest	Implemented by SWCA
Berino East	24.5 E	9.5	Dense riparian shrubs	Implemented by SWCA
Vinton A	17 W	14.7	Riparian forest	Implemented by IDEALS beginning 2017
Vinton B	16 W	20	Riparian woodland	Implemented by IDEALS beginning 2017
Valley Creek	9W	22	Riparian woodland	Through City of El Paso river park trail system
Country Club East	6.8 E	29	Riparian forest & woodland	Implemented by IDEALS beginning 2017
Sunland Park	4E	28.8	Riparian woodland	Partially under lease to City of Sunland Park through river park trail system; lease modifications were recommended in 2018/2019 to remove the non-trail portion of the site from the lease. Implemented by IDEALS beginning 2017
Anapra Bridge	3 E	11	Open riparian woodland	Under lease to City of Sunland Park; Through river park trail system. Implemented by IDEALS beginning 2017
Total Acreage		509.9		

Table 5 Work completed at Restoration Sites 2011-2019							
Site	**Entity**	**2011-2013**	**2014-2015**	**2016**	**2017**	**2018**	**2019**
Trujillo	USFWS		18 acres of saltcedar excavated or treated	1,510 COYW 70 GW 440 COT Prescribed burn			
Jaralosa	GSRC/ SWCA				1,260 COYW 110 GW 72 COT 60 LS Excavated 714 CY	54 GW replants 38 COT replants	
Yeso East	GSRC/ SWCA				820 COYW 59 GW 490 COT 518 LS Excavated 1,196 CY	59 GW replants 115 COT replants	
Yeso West	GSRC/ SWCA				1,790 COYW 50 GW 20 COT Excavated 5,540 CY	High mortality; no replants	
Crow Canyon A & B	USFWS	Trees Planted: 187 GW 40 COT 195 acres of saltcedar treated; retreatments	Saltcedar retreatments			225 LS	
Crow Canyon C	GSRC/ SWCA				1,140 COYW 415 GW 107 COT 45 LS	60 GW replants 31 COT replants	
Rincon Siphon A, B, and C	USFWS						6,000
Rincon Siphon D	USFWS/ IDEALS		Approximately 15 acres of saltcedar excavated	Prescribed burn	110 GW 60 COT	460 COYW 325 LS	20,955
Broad Canyon Arroyo	USFWS	Trees planted: 399 GW 989 COYW 105 COT 20 acres of saltcedar excavated; retreatments. Prescribed burn	Trees planted: 2014: 600 MW 2015: 2,280 MW/ COT New 1/2 acre terrace created along north portion; Retreatment		7620 COYW 540 GW 530 COT Grass seeding in upland terrace	200 LS	
Selden Point Bar	USFWS		Approximately 7 acres of saltcedar excavated Prescribed burn	5,021 COY 430 GW 200 COT			
Shalem Colony	IDEALS						50 COYW 10 GW

							10 COT 50 LS
Site	**Entity**	**2011-2013**	**2014-2015**	**2016**	**2017**	**2018**	**2019**
Leasburg Extension Lateral	USFWS	381 GW 420 COYW 99 COT 26 acres of saltcedar treated; 4 acres along bank; retreatments	2014: 1,000 MW/ COT 2015: 2,210 MW Retreatment Prescribed burn			615 COYW 270 GW 90 COT 250 LS	
Mesilla East	USFWS	Trees planted: 323 GW 35 COYW 293 COT 77 acres of saltcedar treated; bank extraction; retreatments	Retreatment			200 GW 30 COT 275 LS	
Mesilla Valley Bosque State Park	USFWS/ NMSU		NMSU planted: 600 COT 120 DW (high mortality) Placed gravel along the trail by river				
Berino East	MWH/ SWCA		3,850 COYW 800 GW 250 COT 573 LS 1.5 acres excavated				
Berino West	MWH/ SWCA		4,500 COYW 750 GW 250 COT 504 LS 2.5 acres excavated				
Vinton A						Saltcedar extraction	2970 COYW 441 GW 1029 COT 1470 LS 10 OTHERT
Vinton B						Saltcedar extraction 1327 COYW 15 COT	1734 COYW 200 GW 785 COT 1600 LS 10 OTHERT
Valley Creek						Bank saltcedar extracted 1290 COYW 220 GW 440 COT	1000 LS 10 OTHERT
Country Club East						4000 COYW 440 GW	2320 LS 10 OTHERT

						1620 COT	
Sunland Park						3585 COYW 2055 GW 400 COT	705 GW 1152 LS 10 OTHERT
Anapra						795 COYW 55 GW 110 COT	330 LS 10 OTHERT
Totals		**SubTotal 2011-2013**	**SubTotal 2014-2015**	**SubTotal 2016**	**SubTotal 2017**	**Subtotal 2018**	**Subtotal 2019**
	USFWS	3,271 trees planted; 322 acres of saltcedar plus retreatments	6,810 trees planted 40 acres treated; retreatment	7,671 trees	8,860 trees	1,665 trees 1,275 shrubs	6,000 trees
	Contractors		10,400 trees planted 1,077 shrubs planted 4 acres excavated		8,193 trees 623 shrubs 19 acres excavated	16,709 trees 117 acres excavated	28,954 trees 7,922 shrubs
Total 2011-2019	**99,218 Trees** **10,572 Shrubs**						

GW – Gooddings willow COYW – coyote willow OTHERT – other trees (Arizona ash, desert willow) COT – cottonwood
DW – desert willow MW – mixed willows (COYW and GW) CY – cubic yards LS – longstem shrub

6.3. USFWS Restoration Work

USFWS was instrumental in conducting habitat restoration work for USIBWC, including the first pilot projects and achieving major milestones with irrigating sites. USFWS implemented nine restoration sites totaling 331 acres for USIBWC under Interagency Agreement IBM11A0002, under two work orders. USFWS conducted ongoing saltcedar removal and subsequent prescribed burns during several years at various sites throughout their work order. From 2011 to 2019 USFWS planted nearly 34,300 trees and 1,275 shrubs. Table 5 includes work completed at the restoration sites implemented by USFWS from 2011 to 2019.

As discussed in Section 5.3, in April 2011, USIBWC issued work order IBM11W0020 under Interagency Agreement IBM11A0002 for the implementation of 5 pilot restoration projects. The 5 sites were Broad Canyon Arroyo, Leasburg Extension Lateral Wasteway #8, Mesilla East, Crow Canyon A, and Crow Canyon B.

As part of this work, the USFWS prepared an Environmental Assessment and Finding of No Significant Impact for restoration work on USIBWC and Bureau of Land Management lands along the Rio Grande (USFWS 2012c), which included USIBWC's Broad Canyon Arroyo parcel that was not evaluated in the Conceptual Restoration Plan.

In September and October 2011, EBID, Audubon New Mexico and USIBWC hosted growers' meetings to meet with USFWS staff to identify issues and concerns associated with upcoming restoration activities and weed management at Crow Canyon, one of the five pilot project restoration sites.

USFWS employed fairly new techniques for planting native cottonwoods and willows that were being promoted for the desert southwest by various groups, including NRCS. Initial work included salt cedar removal, either cut by chain saw, by a skid steer loader with a forester cutter head, or extracted entirely

including the rootball using an excavator, and chemical treatment on stump cuts. USFWS conducted saltcedar excavation of nearly the entire Broad Canyon Arroyo parcel, which was dominated by mature saltcedar. USFWS conducted prescribed burns at Broad Canyon Arroyo in January 2012 to eliminate the saltcedar debris. The first pole plantings were done at all five sites between March and April 2012. Pole plantings were planted initially with an 8-foot auger down to moist or wet soil. USFWS documented the first year of work at the pilot restoration sites in a 2012 report (USFWS 2012a).

In April 2013, the ROD stakeholder group wrote a letter to USFWS Regional Refuge Director thanking the Refuge System for their support of USIBWC restoration work and acknowledging the USFWS San Andres National Wildlife Refuge staff for their contributions. The letter also expressed the desire to continue future collaboration with the new refuge manager.

USIBWC and USFWS had discussions regarding workload and possibilities for additional work, and USFWS committed to doing more sites for endangered species. In September 2013, USIBWC issued a second work order to USFWS (IBM11A0002/IBM13W0015) continuing work on the previous 5 sites and adding work at 4 new sites (Trujillo, Rincon Siphon A-D, Selden Point Bar, and Mesilla Valley Bosque State Park).

In 2014, USFWS planted additional trees at the Leasburg Extension Lateral Wasteway #8 site with high density for flycatchers, in anticipation of planned first irrigation. USFWS worked with USIBWC and EBID to prepare the site for irrigation. USFWS assisted the USIBWC with the historic first irrigation and ceremony to commemorate the event on June 30, 2014. See Sections 7.1 and 7.8 for more information on the irrigation events at this site.

In 2015, USFWS removed saltcedar at Mesilla Valley Bosque State Park and made improvements to the trail on USIBWC's parcel, including clearing and placing gravel. More details on work at Mesilla Valley Bosque are in Section 6.5.

Efforts at Broad Canyon Arroyo were highly successful in the lower terraces; however upland areas were scarred from burns, and soils created harsh conditions, including high soil salinity after the saltcedar removal and higher clay content. USFWS planted cottonwoods strategically in low-lying and gully areas within the upper terraces, but these cottonwoods did not survive. In 2015, USFWS and USIBWC worked together to excavate a larger terrace at the north end of Broad Canyon Arroyo Restoration site that widened the original lower terrace by about 16 feet. USFWS planted willows in the new terrace with greater success than in the rest of the upland area, and while not all willows survived, most of the willows within the first 8-foot width of the new terrace survived. USFWS also seeded the upland area with native grasses in 2017. The upland portion of Broad Canyon Arroyo site appears to have high clay and salt content that impacts native species survival.

In 2016, USFWS removed the remaining saltcedar along Broad Canyon Arroyo that had not been removed in 2011 due to a cuckoo observation. In 2017, USFWS planted nearly 8,000 coyote willows along the arroyo and over 1,000 Gooddings willows and cottonwoods. Except for a small section at the base of the arroyo at the confluence of the Rio Grande, these trees had exceptional survival rates (see Figure 7). The area along the arroyo has high potential for cuckoo and flycatcher habitat.

Figure 7 Gooddings willows and cottonwoods along Broad Canyon Arroyo, June 2018

USFWS carried out at saltcedar activities at Rincon Siphon parcels on multiple years. The Rincon Siphon site was logistically more difficult due to access issues. The added site of Rincon Siphon C appears to have been a previous sediment disposal area and was not conducive to planting based on multiple pilot trenches that were not reaching groundwater. In 2018, USFWS completed the saltcedar removal at Rincon Siphon A (see Figure 8) and planted coyote willow trees in 2019. USFWS planted shrubs and trees in the Rincon Siphon D site in 2017 and 2018. Rincon Siphon D site showed highly favorable groundwater conditions. Rincon Siphon D has had three small brush fires which have impacted the vegetation.

In July 2017, USIBWC extended the period of performance for the current work order with USFWS until September 2019. The work order modification increased funds to plant additional trees and assist with irrigation at several sites, including earthwork or grading at restoration sites that were planned for irrigation.

In winter 2017-2018, USFWS planted approximately 1,665 native trees and 1,275 longstem riparian shrubs. In fall of 2017, USFWS had a fire crew assist with saltcedar resprout treatments. In May 2017, USFWS planted grass seeds at the upper terrace of Broad Canyon Arroyo site.

In 2017, USFWS assisted USIBWC with three irrigation events at the Leasburg Extension Lateral Wasteway #8 site. USIBWC conducted site visits with USFWS to the Mesilla East site in October 2017 and the Crow Canyon B site in April 2018 to discuss irrigation of those new sites. USFWS planned and implemented logistics for irrigating additional sites, including designing the irrigation area into several irrigable cells, purchasing a piping system, and installing the irrigation pipes and check gates. In 2018, USFWS prepared two new restoration sites to receive irrigation water, the Crow Canyon B site and the

Mesilla East site, and facilitated the irrigation of those site in June and July 2018. In 2018, USFWS conducted 5 irrigation events at three sites, and in 2019, USFWS prepared the Trujillo site for irrigation and facilitated the first irrigation through the Trujillo Lateral in June 2019. Irrigation is discussed in Section 7.8.

Figure 8 USFWS saltcedar removal at Rincon Siphon A site, September 2018

In November 2017, USFWS reported brush fires at two restoration sites. At the Leasburg Extension Lateral Wasteway #8 site, a fire occurred sometime between September 19 (the last irrigation event) and the end of November 2017. USIBWC conducted a site visit in December 2017 to assess the damage. The fire was entirely contained within the irrigation berm of the restoration site. Evidence of campfires nearby were found, although there was no evidence that the campfire was the direct cause. Because the ground conditions were moist due to the late irrigation, the fire appeared to be a quick, cool grass fire that appeared to do minimal damage. USIBWC conducted additional site visits in February and April 2018. Many willows were resprouting from their bases in April 2018. However, USFWS reported another fire at the Wasteway #8 site that occurred sometime between February and April 2019.

At Rincon Siphon C, a fire occurred on December 12, 2017. The Rincon Siphon C site also had a fire in the same location in March 2017. The December fire appeared to kill USFWS' recent cottonwood plantings. USIBWC efforts for enforcement, partially in response to these events, are discussed in Section 14.

In February 2019, USFWS hired an American Conservation Experience crew to assist with planting. The team was able to plant 6,000 coyote willows at the Rincon Siphon A site in just over one week. In 2019, USFWS also made earthwork preparations for irrigation of the Trujillo Restoration site in the 2019 summer irrigation season.

From 2013 to 2019, USFWS conducted monitoring of the restoration sites and groundwater wells approximately every other month in the growing season. Data, photographs, and field sheets were

submitted to USIBWC about every 6 months or so. USFWS made qualitative observations on the success of the restoration sites and abundance of certain species.

USFWS work on USIBWC habitat sites has been crucial for the USIBWC to meet ROD obligations. They have implemented a third of USIBWC restoration sites and planted about a third of the plantings over the last eight years. They have assisted USIBWC to irrigate five habitat sites from 2014 to 2019. USFWS' work has been the leading example for habitat restoration efforts in the Rio Grande in New Mexico in the past decade.

In 2019, USIBWC anticipates working with the USFWS on another work order to conclude construction improvements at the restoration sites, including planting more trees to meet target habitat densities, and to train USIBWC staff to assist in the transition of operations and maintenance of the restoration sites.

6.4. Contracted Restoration Work

In addition to restoration work being implemented by USFWS, the USIBWC has implemented many restoration sites under contracts with environmental contractors.

In August 2014, USIBWC awarded Task Order IBM14T0011 to MWH for the implementation of Berino East and West Restoration Sites. MWH, as proposed, subcontracted the restoration work to SWCA. Saltcedar removal and floodplain excavation was subcontracted to Restoration Solutions (see Figure 9). SWCA and team excavated swales that would provide better drainage and localized groundwater conditions for plantings. SWCA and team planted more than 10,000 trees and more than 1,000 longstem shrubs. The trees had overall survival rate of 90% while the shrubs had overall survival rate of less than 10%. SWCA's work is documented in their final monitoring report (SWCA 2015). The low survival rate of shrubs led USIBWC to mandate replantings for mortality rates higher than 15% in subsequent contracts.

Figure 9 USIBWC contractors excavate saltcedar at Berino West Restoration Site, January 2015

In September 2016, USIBWC awarded Task Order IBM16T0019 to GSRC and subcontractor SWCA for the implementation of four restoration sites north of Hatch, NM (Crow Canyon C, Yeso East, Yeso West, and Jaralosa). The work totaled 19.2 acres and included the planting of 5,010 coyote willow poles, 634 Goodding's willow poles, 689 cottonwood poles, and 623 tall pot shrubs across all sites. A native grass/forb seed mix was seeded in disturbance areas. Final survival rates across all sites, accounting for replacement plantings were 76.5% for coyote willow, 83.4% for Goodding's willow, 79% for cottonwood, and 96.5% for native shrubs.

Two sites are inset floodplains (Yeso West and Crow Canyon C) which were targeting flycatcher habitat. Yeso West was a pilot project to lower the floodplain level to create moist conditions and possibly overbank flows for flycatcher habitat. In February 2017, contractors lowered the floodplain several feet, removed thousands of cubic yards, and planted almost two thousand willows. GSRC/SWCA created two inlets to allow the river water to enter the site during high flows; both inlets were at or above the ordinary high water mark. Unfortunately, flow records from the downstream Hayner's Bridge gage show that high monsoon flows above 3,500 cfs raged through the area in July 2017, and the strong flows wiped out more than half of the trees. USIBWC believes the flows were higher than the ordinary high water mark, and the site would have inundated regardless of whether bank inlets were excavated or not. In addition to strong flood flows, the site also experienced herbivory from beavers and cattle grazing as well as salt precipitation in the soil. GSRC/SWCA requested not to do any replants of the high mortality required under their contract due to the harsh conditions at the Yeso West site, and redistributed the replants to other sites.

USIBWC conducted site monitoring at Yeso West in April 2019. The site has salt concentrations on the soil surface, with minimal coyote willows that survived. However, the site has abundant baccharus and is showing signs of possible wetland conditions, including a large portion of the middle of the site covered in cattail (see Figure 10). USIBWC will continue to monitor the Yeso West site to see if the remaining willows persist through strong monsoon flows and other site conditions.

Figure 10 Yeso West has developed a large area of cattails in the middle of the site, April 2019

Crow Canyon C is a natural inset floodplain. The soil is rocky and may have been historically used by USIBWC as a sediment deposit site. USIBWC only had one groundwater well at the site, which showed that groundwater depths were as high as 10 feet below the ground. During planting, the groundwater conditions were highly variable and were as high as 14 feet. Contractors GSRC/SWCA were hesitant to plant many trees at this site, but ended up planting close to 1,600 total trees, most of which are doing well. In March 2018, GSRC/SWCA subcontractors replanted cottonwoods and Gooddings willows that had died the previous year. This site, particularly the southern portion, appears to have good potential to sustain flycatcher habitat.

GSRC/SWCA's other two sites (Yeso East and Jaralosa) are old river meanders that were cut off when the Rio Grande Canalization Project was constructed in the late 1930s. EBID constructed a check structure at Yeso East in April and May 2019, and the site is slated to receive irrigation water in summer 2019. Both sites target riparian woodlands which should benefit the cuckoo. Contractors excavated large swales at both sites. In September 2017, contractors planted longstem shrubs at Crow Canyon C, Yeso East and Jaralosa, and in March 2018, contractors planted about 300 more cottonwoods and Gooddings willows to make up for those species that had died above 15% in the previous year across all four sites. Contractors also planted grass and wildflower seeds in summer 2017. The northern part of Yeso East has thriving cottonwoods with near 100% survival rates (see Figure 11). GSRC/SWCA's work is documented in their final report (GSRC and SWCA 2018).

Figure 11 Thriving cottonwoods at the north end of Yeso East, May 2018

In September 2017, USIBWC awarded two task orders to IDEALS-AGEISS (IBM17T0011 and IBM17T0012) to implement a total of seven restoration sites, mostly in the El Paso/Sunland Park stretch of the river. The sites were Anapra, Sunland Park, Country Club East, Valley Creek, Vinton A, Vinton B, and Shalem Colony.

Several sites enhance recreational trails leased to the City of Sunland Park (Anapra, Sunland Park sites) and the City of El Paso (Valley Creek) by planting trees and creating open woodland habitat along the hike and bike trails. Shalem Colony is a mesquite forest that was enhanced with additional native plantings and removal of exotics. Vinton A and B are riparian woodlands and have the potential to eventually create breeding habitat for the cuckoo.

Five acres of flycatcher habitat is being created at Sunland Park site. This site had previous detections of flycatchers in 2010-2011, prior to drought conditions that decimated the willows. The site has significant potential to support flycatcher breeding habitat. IDEALS transplanted thousands of island coyote willows via trenches and filled in areas with Gooddings willows. Transplanted willows were placed with their rootball in 6 to 10 foot trenches and exhibited near 100% survival rates. The Sunland Park site has promising groundwater conditions, and the site currently supports a lot of mature cottonwoods that are being enhanced with additional plantings.

Country Club East is targeting riparian woodland and riparian forest. The original 2009 Conceptual Restoration Plan called for two bank cuts which would allow high flows (at 3,500 cfs) to enter into the site in order to establish river-floodplain connectivity. IDEALS developed an excavation plan to create four bank cuts instead of two, and these are connected by a series of “swales” and “ponds” (see Figure 12). Drainage channels connect larger excavated open areas where IDEALS planted cottonwoods. Under normal and low flows, the site will not inundate but the excavated open areas will create better localized groundwater conditions for the plantings. Country Club East may eventually benefit both flycatchers and cuckoos. IDEALS installed gages at each of the bank cuts to include water levels in the monitoring events, in order to ensure that the bank cuts were adequate but not too low.

Figure 12 Excavation of swales at Country Club East by USIBWC Contractor IDEALS-AGEISS, March 2018

In January 2018, IDEALS finalized restoration plans for both task orders and began on-the-ground work the same month. IDEALS employed a method of transplanting native willows from vegetation islands by taking approximately 12 inches of the rootball and associated topsoil along with the entire willow branch and transplanting in trenches down the groundwater level (about 8-10 feet). Transplanting methods showed enormous success (near 100% survival rates) and were mimicked for future restoration and mitigation statements of work. Between January and April 2018, IDEALS crews planted over 16,000 native trees. IDEALS also planted almost 8,000 longstem shrubs and potted trees in October and November 2018. IDEALS also planted about 7,900 trees in February 2019, and any replants will be planted in Fall 2019. IDEALS finalized annual interim reports for each task order in February 2019 (IDEALS 2019a, IDEALS 2019b).

6.5. Mesilla Valley Bosque

In 2013, USIBWC coordinated with the management at Mesilla Valley Bosque State Park regarding implementing the habitat restoration site and implementing the appropriate projects specified in the 2008 Mesilla Valley Bosque State Park Management Plan (Blue Earth 2008) on USIBWC's parcel. Restoration work at Mesilla Valley Bosque State Park was included in the work order IBM13W0015 with USFWS, issued in 2013. USFWS's work at USIBWC's parcel within the park included sporadic saltcedar removal and placing gravel on the trail.

USIBWC, USFWS, the Mesilla Valley Bosque State Park, and New Mexico State University (NMSU) collaborated on plantings at the park. NMSU Professor Amy Ganguli obtained a grant from Dutch company Land Life to conduct experimental restoration using watering pot technology. Beginning in

2014, NMSU used the USIBWC parcel to plant desert willows and cottonwoods in seedling form using two different kinds of arid pots ("donuts" and "cocoons") as well as controls without the pots. The experiment continued through 2017 but exhibited high mortality on all plantings due to herbivory, salinity, high temperatures, later irrigation releases, and competition with invasive species. The team did not observe significantly lower mortality rates with the Dutch pot technology.

As discussed in Section 7.6.1, USIBWC and New Mexico Environment, Minerals, and Natural Resources Division, State Parks Division (New Mexico State Parks) began developing an agreement in 2013 to collaborate on restoration work with the Mesilla Valley Bosque State Park; the agreement (IBM14A0021) was signed in September 2014. USIBWC, Mesilla Valley Bosque State Park staff (principally Jan Kirwin, superintendent) and State Parks Division staff (Judy Kowalski, Chief of Design and Development Bureau) held numerous discussions over the years from 2014 to 2016 to discuss ways of collaborating under this agreement, including investigation of water rights as discussed in Section 7.6.1. In March 2016, USIBWC and Jan Kirwin conducted a site visit of potential restoration areas such as arroyo mouths in the southern portion and the old mitigation bank which appeared to be part of USIBWC property. However, apart from the work done by USFWS and NMSU on USIBWC's parcel, no additional on-the-ground work was completed. Many complicated challenges prevented any water rights transfers or restoration work done outside of USIBWC's parcel, including change in staff at the park, the long process of transferring the park to a different state agency, conflicts with irrigation district, and the varying ownership of parcels within the park each with different requirements.

In September 2017, USIBWC met with representatives of the New Mexico Department of Game and Fish (NMDGF) to discuss restoration possibilities at the Mesilla Valley Bosque State Park, which at the time was being considered for transfer from New Mexico State Parks to NMDGF. NMDGF issued a contract to revise the 2008 management plan for the park and evaluate restoration possibilities (NMDGF 2018). NMDGF expressed interest in working with USIBWC on potential habitat restoration if the park were transferred to them. In various stakeholder meetings, EBID also expressed support for possible restoration projects along the Picacho Drain within the park. Work within the park is on hold until the transfer of land is complete.

Other stakeholders also have been in favor of additional habitat improvements at Mesilla Valley Bosque. A 2018 report proposed several options for aquatic habitat restoration within the Mesilla Valley Bosque State Park (Propst and Bixby 2018). In September 2018, USIBWC awarded a task order for an environmental assessment and design of aquatic habitat restoration sites, and the conceptual aquatic habitat projects in SWEC's proposal as well as others from the 2008 Management Plan (Blue Earth 2008) were included as possible alternatives. See the following section.

6.6. Aquatic Habitat Restoration

The 2009 Conceptual Restoration Plan identified several sites that targeted aquatic habitat restoration by destabilizing the river banks to encourage river migration at three arroyos (Yeso, Placitas, and Angostura Arroyos).

In 2016, the Paso del Norte Watershed Council awarded a small grant using USBR funding to the Southwestern Environmental Center (SWEC) in Las Cruces for a fish study. SWEC completed the draft

report in October 2017, which proposed several aquatic habitat projects on USIBWC property. USIBWC rigorously reviewed the report and provided substantial comments, which SWEC incorporated in the report and completed in 2018 (Propst and Bixby 2018). The alternatives on USIBWC property include options at Mesilla Valley Bosque, the Las Cruces Effluent wetland and/or fish passage, and enhancements at the mouth of Broad Canyon Arroyo. The Mesilla Valley Bosque alternative includes a few options for both fish and wetlands, such as deepening Resaca pool habitats, creating a side channel, and/or Picacho Drain modification.

In September 2018, USIBWC awarded a task order to GSRC with subcontractors SWCA and GeoSystems Analytics (GSA) (Task Order # 191BWC18F0101) for an Environmental Assessment for aquatic habitat restoration. In Phase I of the task order, the contractors evaluated the No Action Alternative and six alternatives with various conceptual aquatic habitat restoration areas, including the original arroyo sites from the 2009 Conceptual Restoration Plan and the three conceptual plans on USIBWC property in the SWEC fish study (Mesilla Valley Bosque, Las Cruces effluent, and Broad Canyon Arroyo). The contractors also identified other alternatives. Stakeholder scoping meetings were held in November 2018. Site visits were conducted in November 2019 with USIBWC and the contractor. The team also discussed the potential for the area downstream of Courchesne Bridge in El Paso, Texas (see Figure 13), a portion of which is being considered for USIBWC mitigation site for levee improvements at the Power Plant Levee. Additional sites being considered include Selden Point Bar and the Montoya Intercepting Drain.

GSA conducted field work November to March 2019. In February 2019, USIBWC, GSA and EBID met at Mesilla Valley Bosque to discuss options for the Mesilla Valley Bosque Park. In April 2019, GSA submitted the final technical report (GSA 2019a) and the final wetland delineation report (GSA 2019b), both of which would accompany GSRC's EA.

The Draft EA was completed in May 2019 and made available for public comment the month of June 2019, and the final EA is anticipated for August 2019. The USIBWC anticipates selecting two of the top sites in the EA decision document for construction design, although USIBWC may choose more than two alternatives if feasible. In Phase II of the task order, the contractors will develop a detailed design for the two Preferred Alternatives that will include construction specifications for implementation.

Any selected and implemented aquatic habitat restoration sites will be incorporated into a future revision of the River Management Plan.

Figure 13 Wetland vegetation on the floodplain south of Courchesne Bridge in El Paso, TX November 2018, one of the potential sites for development or enhancement of aquatic habitat

6.7. Restoration Sites for Endangered Species

The 2009 Conceptual Restoration Plan included 12 habitat restoration sites that targeted the creation of dense riparian shrubs for flycatcher breeding habitat. Some of the original sites were dropped while a few others were added. According to the 2017 flycatcher surveys, Trujillo, Crow Canyon A, Crow Canyon B, and Rincon Siphon C have existing flycatcher territories or migratory detections. Table 6 identifies restoration sites with flycatcher detections and the acreage of flycatcher habitat per the 2016 USBR habitat classification. Most restoration sites targeting the creation of flycatcher habitat have not yet developed suitable habitat; however, many of the sites have exhibited potential for breeding habitat in several years, including Leasburg Extension Lateral Wasteway #8, Trujillo, Crow Canyon C (see Figure 14), Broad Canyon, and Sunland Park. Potential flycatcher breeding habitat along Broad Canyon Arroyo, where planted Gooddings willows and cottonwoods are thriving, is shown in Figure 15. Berino East and West have good progress in the small patches of areas with dense willows, and USIBWC will evaluate whether to contract additional plantings at these sites.

USIBWC has prioritized the application of water rights (per the 2017 Biological Opinion) to several of the flycatcher sites (Trujillo, Crow Canyon B, and Mesilla East) as well as a cuckoo site where irrigation water is able to be diverted to the floodplain (Yeso East).

Figure 14 Dense riparian shrub habitat suitable for flycatcher breeding at Crow Canyon B, June 2018

Figure 15 Gooddings willow and cottonwood plantings aside existing vegetation along Broad Canyon Arroyo at the Broad Canyon Restoration Site, June 2018

USIBWC has several restoration sites that have the potential to benefit the threatened yellow-billed cuckoo, and these sites are listed in Table 7. Sites that target riparian woodland or forest, particularly sites with plantings of cottonwoods and willows in association with overbank lowering, bank cuts, natural levee breeches, secondary channels, bank destabilization, and construction of inset floodplains, have the potential to benefit the yellow-billed cuckoo (SWCA 2011, USIBWC 2017a). Yellow-billed cuckoos have been recorded at or near several of the proposed restoration sites (Trujillo, Crow Canyon

A and B, Rincon Siphon A, Broad Canyon Arroyo) (TRC 2011b, USBR 2018). Cuckoos were also documented in adjacent parcels outside of USIBWC property near Berino East and Berino West sites (TRC 2011b). Initial excavation work at Broad Canyon left approximately 8 acres of saltcedar intact in order to protect the habitat where an incidental cuckoo detection had been recorded in 2010; this area of saltcedar was removed in 2016 and replaced by native plantings (See Figure 15).

Table 6 Active Restoration Sites Targeting Flycatcher Habitat					
	Minimum Acres of Targeted Flycatcher Habitat	Total Restoration Site Acres	Flycatcher detections 2010-2018	Acres of Flycatcher Suitable Habitat (Class 3-4 per USBR 2016)	Acres of Unsuitable but potentially suitable habitat (Class 1-2 per USBR 2016)
Trujillo	10	14	X	2.2	
Jaralosa		4.5			
Yeso West	1.7	1.7			
Yeso East		9.7			
Crow Canyon A		90	X	1.8	
Crow Canyon B	10.6	25.6	X	2.7	
Crow Canyon C	3.4	3.4		0.5	
Rincon Siphon (4 parcels A, B, C, D)	18	28	X	3.3	
Broad Canyon Arroyo	4	28			7
Selden Point Bar	6.9	7.7			
Shalem Colony		14.2			2
Leasburg Extension Lateral WW 8	4.1	30			0.5
Mesilla East	15.8	70	X (migrants)		2.4
Mesilla Valley Bosque State Park		36.3			1.6
Berino West	10.3	10.3			0.5
Berino East	5	9.5			0.9
Vinton A		14.7			
Vinton B		20			
Valley Creek		22			
Country Club East		29			1.41
Sunland Park	5	28.8	X		6.3
Anapra Bridge		11			0.79
Total Active Acres	**94.8**	**508.4**			

Table 7 Restoration sites with YBCU Potential Habitat					
Site Name	**YBCU Potential Habitat Acreage**	**Total Acreage of Site**	**Target Habitat**	**Cuckoo detections 2010-2018**	**Comments**
Trujillo	10	41		X	
Jaralosa	4.5	4.5	Open riparian woodland		Buffered with a large No-Mow Zone; located near several other SWFL and YBCU sites; irrigation is challenging but may be required for successful restoration
Yeso East	9.7	9.7	Open riparian woodland		Slated for irrigation in 2019; buffered with a large No-Mow Zone; located near several other SWFL and YBCU sites
Crow Canyon A	49	90	Riparian savanna and shrubland	X	Irrigation is challenging but may be required for successful restoration
Rincon Siphon B	4.5	16.3	Dense riparian shrubs and screwbean mesquite	X	Northern part of this site was a previous agricultural lease that was left fallow and has developed mature screwbean mesquite forest
Broad Canyon Arroyo				X	Portion along arroyo has successful Gooddings and cottonwood plantings
Shalem Colony	14.2	14.2	Screwbean mesquite		Site already has existing mature mesquites
Vinton A	14.7	14.7	Riparian forest		Buffered with a large No-Mow Zone; located near other YBCU sites
Vinton B	20	20	Riparian woodland		Buffered with a large No-Mow Zone; located near other YBCU sites
Country Club East	29	29	Riparian forest and woodland		Buffered with a large No-Mow Zone; located near other YBCU sites
Sunland Park	28.8	70	Riparian woodland	X	Buffered with a large No-Mow Zone; located near other YBCU sites
Total	**136**	**268.4**			

6.8. Long-term management of restoration sites

At the ROD implementation stakeholder meetings, the idea of transferring restoration sites for endangered species to the USFWS came up many times, including the concept of a National Wildlife Refuge along the Rio Grande in southern NM and West Texas.

In May 2015, USIBWC sent letters to the USFWS National Wildlife Refuge System Region Chief and other USFWS management to invite discussions of long-term management of USIBWC riparian habitat restoration sites along the RGCP, particularly sites with endangered species. The concept was that USIBWC could transfer restoration site land to USFWS and retain some flood easement and access for levee maintenance, and any water rights would also transfer with the land, so that USFWS could exercise their authority and expertise to maintain the endangered species habitat.

On March 15, 2016, USFWS Refuge System Regional management toured several USIBWC habitat restoration sites and held a meeting to discuss the possibilities (see Figure 16). USFWS informed the USIBWC that the strategic planning documents were in the process of being updated for expanding refuges. USFWS was adopting a policy of the landscape design approach to expand or create a new refuge. This was a long process that was stakeholder driven to evaluate the landscape needs of a region. Additionally, USFWS expressed concern of having limited budget and resources to sustain the management of additional lands.

In April 2016, Audubon New Mexico coordinated an initial meeting of the Landscape Conservation Design on the Rio Grande in New Mexico. This initial meeting involved a variety of stakeholders across the state to discuss the possibility of starting a Landscape Conservation Design Initiative on the Rio Grande, including to identify the science approach and applications. A follow-up meeting was held in October 2016; however, the statewide stakeholders had other priorities and a group was not able to form a steering committee or initial working group.

In subsequent ROD stakeholder meetings, Senator Heinrich's field representative Dara Parker indicated that the other possible route for the formation of a refuge was through Congressional action, which could be pursued if there was enough interest and support. In November 2018, USIBWC held scoping meetings for the River Management Plan Environmental Assessment, and long-term protection status for the restoration sites was considered as a preliminary alternative. In December 2018, Heinrich's office indicated that the Senator and his colleagues would support such legislation. USIBWC had meetings with staff from with USFWS Regional office in Albuquerque, USFWS SANWR, and Senator Heinrich's office to discuss the options and feasibility. USFWS expressed concerns about resources for managing a new refuge, and there would have to be details discussed for appropriations, impacts on USIBWC operations and maintenance budget, realty logistics, law enforcement, and more.

In March 2019, USIBWC held internal discussions with USIBWC's newly appointed Commissioner Harkins and management. There were concerns about overlapping federal agency jurisdiction with such an alternative as well as potential impacts to access for operations and maintenance of the levee and river channel. Long term official protection of restoration sites is included as an alternative in the 2019 EA for the Continued Implementation of the River Management Plan but is not a preferred alternative.

Figure 16 USFWS Regional staff view recently transplanted willows at Selden Point Bar site, March 2016

6.9. Groundwater Monitoring Wells

In 2013, USIBWC awarded a task order to HDR to construct a network of 55 shallow groundwater monitoring wells at 20 locations including 19 restoration sites. Two originally planned wells were unable to be constructed. In March 2014, the contract was modified to add two more wells below Mesilla Dam. In July 2014, four wells were redrilled due to obstructions or damaged wells (see Figure 17). The total network is 55 wells at 21 locations. HDR completed a final report of the well construction and initial data collection (HDR 2014).

USIBWC deployed 21 automated loggers that collect daily pressure and temperature data, one at each restoration site, and the rest of the wells had manual monitoring. The manual monitoring program frequency varied on the site. Active restoration sites had monthly monitoring by USFWS or contractors. Contractors collected water level measurements in fall and winter of 2016-2017 while preparing for restoration work at Jaralosa, Yeso East, and Crow Canyon C. The rest of the wells were monitored at least twice annually – once prior to irrigation releases and once during irrigation season.

USIBWC and USFWS staff and contractors have collected groundwater level data from 2013 to 2019, including discrete measurements of groundwater data and downloading continuous data from the loggers.

Beginning in 2014, USIBWC had to trouble-shoot some of the wells. For example, cabling HDR used to deploy the sondes began to corrode, breaking in some wells, leading to the sonde falling to the bottom of the well. USIBWC switched the cabling to a vinyl-coated galvanized steel of more threads to withstand corrosion effects. In addition, USIBWC replaced the locks to tamper-resistant locks. In summer 2014, the wells at the Selden Point Bar wells were vandalized, with locks broken and the sonde at this site stolen. USIBWC submitted a report to the Dona Ana County Sheriff for this stolen property in 2015. Some of the wells collapsed or became obstructed. Prior to their contract being completed, HDR reconstructed four wells, but additional wells collapsed due to the unconsolidated sediment of the floodplain.

Figure 17 Drilling and installing a groundwater monitoring well at Valley Creek in July 2014 (Left); USIBWC's Nereida Cora deploying an automated logger in the new well (right)

In September 2017, USIBWC awarded a contract to EGC, Inc. under IBM17C0007 to assess and repair the damaged monitoring wells. In December of 2018, USIBWC contractors EGC conducted a well assessment and recommended rehabilitation of 21 wells and redrilling of 9 wells. In February and March of 2018, EGC rehabbed 20 wells and redrilled 8 wells that were obstructed or destroyed. Rehabilitation included removal of accumulated sediment, root cutting, retrieval of lost sondes, and repainting well names. In September 2018, USIBWC issued a modification to EGC's contract to redrill four additional wells. EGC conducted the fieldwork in November 2018. EGC submitted a draft version of the final report for the well rehabilitation and reconstruction in late December 2018 during the partial government shutdown, and USIBWC reviewed the report in March 2019. USIBWC survey crew surveyed the last 4 wells in April 2019, and EGC finalized their report in April 2019 (EGC 2019).

USIBWC has used the data collected at groundwater wells to evaluate restoration sites and planting depth at restoration sites. At sites below Leasburg Dam, poles should be planted at depths greater than 10 feet to survive the drops in water levels. Some sites show groundwater levels as low as 15 feet below the surface. USFWS planted poles at the Leasburg site at depths of 10 and 12 feet in 2014 and 2015. All USIBWC contracts required contractors to plant poles at least 10 feet below the surface.

The groundwater data has shown that groundwater depths near the river are significantly affected by surface flow, irrigation schedules, and drought. The duration of flow in the river is correlated to the groundwater levels under the restoration sites. Generally, the longer the irrigation season, the shallower the groundwater level stays beneath the floodplain during the non-irrigation season.

A white paper reporting the groundwater data is targeted for release in 2019.

6.10. Monitoring Protocol

USIBWC established a monitoring protocol for restoration sites. USIBWC created field sheets in order to have consistent data collection by both USFWS, USIBWC contractors, and USIBWC staff. Field sheets were created for Pre-implementation of a site, planting, and on-going monitoring at active restoration sites. Pre-implementation sheets document conditions prior to beginning restoration work. Planting sheets document number and type of trees planted, the location, and the stock of the trees. On-going monitoring sheets document conditions of active restoration sites, such as survival rate of trees, cover of native and non-native species, and other current conditions for field visits. The monitoring protocol also calls for the establishment of photo points. The monitoring program was initiated on a trial basis in the summer of 2013. USFWS implemented the monitoring protocol at their sites, and USIBWC required all contractors to use USIBWC field sheets for subsequent restoration work.

6.11. Restoration Lessons Learned

Over the ten-year project, USIBWC, USFWS, and USIBWC contractors employed various techniques for restoration. Some of the lessons USIBWC learned are discussed below.

- For planting poles via augering methods, trees were more successful when planted at depths of 10 feet or more and when care was taken to ensure augered holes were completely backfilled, leaving little air pockets.
- Cottonwoods did better in sandy soils (example Yeso East, Leasburg Extension Lateral WW8) than in sites with some clays (Broad Canyon Arroyo)
- Trench planting with poles saw increased density when poles survived, but trenches with poles had highly variable success rates and likely depended on backfilling. Trench planting with willows harvested with root balls (see Figure 19) had near 100% success rates. USIBWC contractors employed this method as suggested by USFWS in the Biological Opinion in order to harvest and transplant willows from islands within the river, and USIBWC later required Thurman mitigation contractors to use this method due to its increased success rates as well as increased density and coverage.
- Shrubs that were allowed to grow into extra tall pots (see Figure 18) had higher success. Shrubs that were planted in the fall or early winter had better success than those planted in late winter or early spring. Shrubs were the most difficult to keep alive, and natural recruitment is a more effective method.
- Areas seeded with native grasses and forbs had little success.
- Sites with supplemental irrigation and/or nearby water source (ex: Selden Canyon area) had better success.
- Soil salinity was an issue at many sites, including the excavated inset floodplain at Yeso West. Despite multiple collections of soil salinity data, site variations did exist and more soil sampling could be beneficial.
- Poles that were cut at the base had increased density on a faster scale because the plant doesn't expend energy to the top of the pole, but resulted in shorter trees for longer periods than those

there were uncut. Many poles that dried out above the surface or were cut by beavers began sprouting at their bases (see Figure 20).

- Survival rates varied highly across sites and across species. Calculating exact survival rates across sites was difficult due to limited resources for full counts of all planted trees at the sites. While USIBWC established a monitoring protocol which recommended counting survival rates in random and fixed plots, the monitoring was not conducted at full force at all sites. USIBWC contractors conducted full monitoring and reported survival rates at those sites (GSRC and SWCA 2018; IDEALS 2019a; IDEALS 2019b; SWCA 2015).

Figure 18 Shrubs planted from extra tall pots at the Yeso East site, September 2017

Figure 19 Transplanting island vegetation at Anapra Restoration site, January 2018. Left: Excavator creates trences about 8 to 10 feet deep to groundwater; middle: a bucket of island willows with about 1 foot of topsoil; right: willows with roots are dropped into excavated trenches and backfilled.

Figure 20 Regrowth of stressed plantings. Left: a shrub at Yeso East Restoration site resprouting from its base, May 2018. Middle: A Gooddings Willow resprouting from its base at Leasburg Extension Lateral WW 8 in 2013; Right: beaver-cut tree recovering at Broad Canyon Arroyo, May 2013.

7. ENVIRONMENTAL WATER TRANSACTION PROGRAM

7.1. Initial Establishment

In order to begin the development of the Environmental Water Transaction Program (EWTP), the USIBWC issued the USFWS an Individual Work Order (IBM11W0022) under the Interagency Agreement IBM11A0002 to establish the EWTP under a tri-party arrangement between the USIBWC, the USFWS, and the National Fish and Wildlife Foundation (NFWF). The statement of work included a proposed two-year workplan to cultivate relationships, identify transaction targets and water rights holders, evaluate possible transactions, and negotiate and implement transactions of water rights. The work order was modified in January 2012 to expand the statement of work and include the irrigation districts.

The NFWF subcontracted to Audubon New Mexico to implement many of the preliminary tasks for the EWTP. Audubon New Mexico began discussions in 2012 with EBID to negotiate terms under which USIBWC could obtain and use EBID surface water.

As discussed in Section 4.1, USIBWC's Endangered Species Act Section 7 Consultation was intertwined with the initial discussions of the EWTP. Principally, the irrigation district needed assurances that Rio Grande Project water being used to irrigate USIBWC restoration sites supporting endangered species would not adversely impact other farmers during years of low water supply. The EWTP was a large part of the lengthy discussions with USFWS on the 2012 draft Biological Opinion. USFWS accepted shared shortages of any irrigation water and clarified its Incidental Take Statement accordingly. The 2012 Biological Opinion required the USIBWC to establish and maintain a minimum of 53.5 acres of flycatcher breeding habitat. EBID advised USIBWC to separate restoration sites into "core sites" consisting of those 53.5 acres, and USIBWC would not be allowed to use EBID-administered water rights on those core acreages. USFWS clarified that incidental take associated with the EWTP is covered by the Incidental Take Statement when and where those conditions described are being met.

USIBWC and EBID had discussed entering into a collaborative agreement for many years, even before the signing of the ROD. As USFWS' decision loomed regarding critical habitat designation or exclusion, USFWS and EBID drafted a Memorandum of Understanding to collaborate on the establishment of the EWTP, a draft of which was provided to USFWS in August 2012 and used to support the exclusion. USIBWC and EBID signed the final agreement (IBM13A0007) in March 2013.

In June 2013, EBID passed a policy, "Use of Rio Grande Project Water for Native Vegetation Habitat Restoration Sites in Elephant Butte Irrigation District" (EBID 2013). The policy was a landmark one because it essentially classified the irrigation of native habitat as an agricultural use, allowing for the use of Rio Grande Project water on USIBWC restoration sites, and therefore in accordance with the 1902 Reclamation Act which authorized the dam projects for agricultural purposes. The EBID policy also had specific requirements for lands classified for irrigation use, including that the lands must be irrigable, must be within EBID boundaries, must be covered under an Incidental Take Statement, and must receive an equal allotment per acre as other EBID water righted lands. The result of the 2013 EBID policy was that USIBWC would become a farmer of native vegetation; the USIBWC would become an EBID constituent, pay annual assessment fees like any other farmer, and received shared shortages like any other farmer.

The USFWS-contracted team working on the development of the EWTP (NFWF, Audubon New Mexico, and Ecosystem Economics) began working out logistics on how the USIBWC could acquire water rights, how much to pay for them, and how to apply them to federal land.

The USIBWC reached out to other federal agencies who had acquired water rights, including several conference calls with the USFWS in Nevada. The USFWS provided information and resources on the steps necessary for acquisition. The USIBWC also reached out to General Services Administration (GSA) on the acquisition process and USBR to see if they could assist the USIBWC to implement the program under an agreement. USIBWC and GSA began to work out an interagency agreement to assist with the acquisition process, but this agreement was never finalized.

The team investigated sales prices of other EBID water rights from information that was publicly available, such as purchases of water rights from the City of Las Cruces. Based on this information, the team established a minimum price for water rights (NFWF et al. 2015).

The team located two willing sellers of water rights totaling 5.61 acres. Neither seller needed their water rights -- one seller was a development business and the other was a private landowner who had converted his small farm to xeriscape. The EWTP team worked with USIBWC to put offers to purchase the water rights based on the estimated minimum prices. USIBWC sent offer letters to the sellers in December 2013.

Water rights in New Mexico are real property, so USIBWC's acquisition of water rights had to follow federal requirements for the acquisition of real property, including title records, appraisal standards, acquisition guidelines, and regulations. During the 2014 acquisition, these requirements were scattered in various documents, some outdated. Department of Justice updated the requirements in 2016 (DOJ 2016). USIBWC worked with GSA and DOJ regarding the regulations.

The team discovered there are many complicated regulations that govern the federal acquisition of real property (water rights). For example, 40 U.S.C.A. § 3111 requires the approval of sufficiency of title prior to acquisition. 49 CFR Part 24 has the implementing regulations for "Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-Assisted Programs." The team identified a checklist and step-by-step procedures for the acquisitions, including contingencies required for closing. One contingency was that EBID approved of the transfer of the water rights to federal property.

In May 2014, the EBID Board approved the first two water rights transfers to USIBWC lands under their 2013 policy which classified irrigation of native trees as agriculture. In June 2014, the USIBWC closed on a 4-acre parcel of water rights for one seller. The water rights for the second seller were held up from lien releases, and the USIBWC worked out a short-term lease in order to use the water during the 2014 irrigation season while the sale was being completed.

In May and June 2014, EBID and USFWS collaborated with USIBWC to construct an earthen irrigation turnout to the site from the Wasteway 8, as well as a berm for flood irrigation. On June 30, 2014, the USIBWC irrigated the first restoration site, the Leasburg Extension Lateral Wasteway 8 site in Las Cruces. The USIBWC worked with partnering entities to hold a ceremony commemorating the historic irrigation event. Speakers at the ceremony included the USIBWC Commissioner, representatives from New Mexico elected officials, a water rights seller, the Bureau of Reclamation, Audubon New Mexico, and EBID. There was also wide local and national media coverage of the ceremony, including television, radio,

newspaper, and magazines. The irrigation ceremony is in Figure 21 and the team members of partnering entities are in Figure 22.

Figure 21 USIBWC Commissioner Ed Drusina speaking at the June 2014 Irrigation Ceremony

Figure 22 EWTP cooperating team members stand in front of the irrigated habitat area (from left: Elizabeth Verdecchia, USIBWC; Beth Bardwell, Audubon NM; Dr. Phil King, Lee Peters, Gary Esslinger, EBID; Commissioner Ed Drusina, Gilbert Anaya, USIBWC)

USIBWC, through the ETWP team, brokered additional water rights of 5.6 acres for a second irrigation of the Leasburg site in late July 2014.

In December 2014, USIBWC closed on the second tract of water rights, of 1.61 acres. These water rights were leased from the seller in summer of 2014 while the closing on the sale transaction was delayed, and irrigation in June included these leased water rights.

The acquisition of the first water rights, the transferring to USIBWC property, and the physical application of the water on the restoration site were all possible only because of the efforts by USFWS, NFWF and its subcontractors Audubon New Mexico and Ecosystem Economics, and collaborations with EBID. NFWF and team completed a final EWTP Framework document in March 2015 (NFWF et al. 2015). The final document comprehensively reports on the activities of the program, provides lessons learned and recommendations on moving forward, and describes the procedures and rules for the USIBWC to acquire or lease water rights. It also provides template documents and references for water rights acquisition. This work order with USFWS to develop the ETWP expired March 30, 2015.

7.2. Legal Concerns

During and after the USIBWC acquisition of the two tracts of water rights in 2014, USIBWC attorneys expressed concerns brought up by DOJ regarding the possibility that the acquisition of water rights by the USIBWC would compromise the federal government's position in the pending litigation in New Mexico on priority dates. After the closing of the water rights, DOJ advised the USIBWC not to pursue additional acquisitions of water rights until the priority date case could be resolved.

USIBWC and DOJ also initially had concerns that the Supreme Court case of Texas vs. New Mexico could also impact USIBWC interests in water rights.

7.3. Leasing Water Rights

In 2014, USIBWC Commissioner directed staff to pursue options to lease water rights in lieu of acquisition, in response to some of the legal concerns and in response to leased water for Minute No. 319 peak flows on the Colorado River. In 2014 and 2015, the USIBWC held several meetings with irrigation districts and USBR to discuss potential leasing. Irrigation districts indicated there was no mechanism to lease water rights, because each water right was adjudicated to a parcel and the parcel was part of the allowable irrigable acreage, which could not be exceeded.

The NFWF team identified a possible path for a "term-limited transfer" of water rights that would serve (for all practicable purposes for the Government) as a lease, while meeting USBR and EBID requirements to not exceed its irrigable acreage (NFWF et al. 2015). In 2016, USIBWC began discussions with El Paso Water on potentially leasing New Mexico surface water rights that they had acquired but could not use for municipal water in Texas. EBID's 2013 policy indicated that "temporary water transfers out of these sites will be allowed but temporary water transfers in will be allowed" (EBID 2013). In 2016, EBID indicated that the term-limited transfer would be consistent with USBR and EBID policy. However, in 2017, El Paso Water indicated they were no longer interested in such an agreement. In 2017, USIBWC reached out to the City of Las Cruces to propose a potential lease and/or term-limited transfer of water rights. Audubon New Mexico had initially discussed the idea with the City of Las Cruces in 2013. USIBWC met with the Utilities Department staff and lawyers in person, via phone, and through email discussions throughout 2017, 2018, and 2019. Several iterations of the draft agreement were routed back and forth. USIBWC also conferred with EBID on such an agreement in informal discussions. During ongoing discussions, the City has indicated they are in favor of working out an agreement for 146 acres of surface

water rights. USIBWC will continue to pursue this agreement, or alternatives, as committed in the River Management Plan.

7.4. How Many Water Rights?

7.4.1. ROD Requirements

The ROD stated: "Water for restoration will be needed to offset associated increases in water depletion on an annual basis resulting from an increase in evapo-transpiration, evaporation, infiltration, floodplain storage losses, supplemental irrigation, and any periodic restoration peak releases. Increases in evapo-transpiration from changes in vegetation at proposed restoration sites are estimated at 450 ac-ft of water per year. Supplemental irrigation in the amount of 227 ac-ft per year is recommended for at least six (6) proposed restoration sites and may be advisable at an additional nineteen (19) proposed restoration sites especially if future periodic restoration peak flows are deemed not feasible."

Therefore, the minimum water rights USIBWC committed to acquiring or leasing was 450 ac-ft.

7.4.2. NFWF Recommendations

The NFWF team created a Program Water Budget to estimate how many water rights USIBWC would be required to obtain in order to meet ROD commitments. The NFWF team evaluated various scenarios (low volume, mid volume lease, mid volume, high volume lease, and high volume) based on restoration site classification and ET offset classes, surface or combined ground and surface water rights, cost assumptions, and water budgets. The NFWF team proposed that the minimum number of water rights required under a low volume scenario (base rights to offset the ET, as stated in the Conceptual Plan) was 475 acres (equivalent to approximately 1,436 ac-ft in EBID surface water rights). The NFWF proposed amount was more than twice the quantity than stated in the ROD.

In a June 2012 memo (Audubon 2012) to USIBWC, Audubon New Mexico indicated that under the original guideline, USIBWC was required to acquire water rights in an amount sufficient to offset net increase in depletions across all restoration sites and the three 1999 Green Zones. Under that guideline, the net increase in depletions was estimated around 450 ac-ft per year (as stated in the ROD), plus supplemental irrigation water rights totaling 270 more ac-ft. However, they proposed a new guideline that would require USIBWC to acquire and transfer a base water right to individual restoration sites that increase net depletions from the pre-restoration condition to the post-restoration condition. The modification was estimated to double the amount of water for offsets for a total of 888 ac-ft per year. They stated that the justification for the new guideline was because:

1. Water righting an entire site was administratively straightforward. Crediting changes in evapotranspiration across sites would introduce complexity in terms of EBID administration and accounting of water righted acreage, since water rights are appurtenant to land within the project.
2. EBID wanted to promote parity across users including USIBWC. The modified rule was consistent with standard district water accounting rules for farmers. Farmers are required to have a base

water right on all acreage even though some fields may have low water use crops compared to others.

3. It would be easier to administer. Once a restoration site had a base water right, USIBWC's administrative obligations would be satisfied, even if the annual allotment was less per acre than the net increase in depletions per acre. EBID would not require temporary transfers of additional water even though the increase in evapotranspiration might exceed the total annual water allocation for the site (actual depletions might be more than the annual allotment in low water years).
4. During years of greater supply, USIBWC could temporarily transfer water from offset sites to increase available supply for irrigation at irrigation sites.

Later, in 2013, EBID's policy (EBID 2013) required that restoration sites that increased net evapotranspiration, "the entire site shall be water righted." This was based on previous discussions with Audubon.

7.5. USIBWC determination of Required Water Rights

In 2018, the USIBWC determined that the original commitments made in the ROD still stood regarding the volume of water required for offsets and supplemental irrigation.

The ROD committed the USIBWC to acquiring or leasing 450 acre feet of water annually and up to 227 acre feet of supplemental irrigation. Table 8 lists the calculations of water rights needed in New Mexico and Texas to meet USIBWC ROD obligations. USIBWC commits to acquiring or leasing 183.11 acres of New Mexico water rights and 27.3 acres of Texas water rights. As of 2019, USIBWC has acquired 47.36 acres of EBID water rights (143.2 acre feet), representing approximately 21% of ROD-required water.

With the 146 acres from the City of Las Cruces term-limited transfer, the USIBWC will meet 100% of its ROD-required water rights offsets for New Mexico. Still pending are the water rights offsets in Texas.

Table 8 Restoration Sites Requiring Water Rights for Offset of Net Depletions or Recommended Supplemental Irrigation

Site Name	Acres	ET difference (ac-ft)[1]	Offset Water Right Required by ROD?	Offset Acreage[2]	Supplemental Irrigation Acres	**Total WR needed to meet ROD obligations**		**Water Rights Obtained (acres)**	Supplemental Irrigation Recommended?
						NM	**TX**		
Trujillo	14	0	NO	0	10.8	**10.8**		**10.8**	YES
Jaralosa	4.5	5.0	YES	1.65	0	**1.65**			YES
Yeso Arroyo	10.6	-26.5	NO	0	0	**0**			NO
Yeso East	9.7	10.7	YES	3.54	9.62	**9.62**		**9.62**	YES In Lieu of Peak Release
Yeso West	2.5	-6.3	NO	0	0	**0**			YES In Lieu of Peak Release
Crow Canyon A	90	81.4	YES	26.92	0	**26.92**			YES
Crow Canyon B	25.6	17	YES	5.62	5.62	**5.62**		**5.62**	YES In Lieu of Peak Release
Crow Canyon C		0	NO	0	0	**0**			NO
Placitas Arroyo	21.8	-14	NO	0	0	**0**			NO
Rincon Siphon A & B	16.3	31	YES	10.25	10.25	**10.25**			YES In Lieu of Peak Release
Rincon Siphon C	5.4	0	NO	0	0	**0**			
Rincon Siphon D	14.75	14.75	YES	4.88	0	**4.88**			NO

Angostura Arroyo	15.4	-16.9	NO	0	0	**0**			NO
Broad Canyon Arroyo	28	0	NO	0	0	**0**			NO
Selden Point Bar	6.9	0	NO	0	0	**0**			YES In Lieu of Peak Release
Shalem Colony	14.2	5	YES	1.65	0	**1.65**			NO
Leasburg Extension Lateral WW 8	4.1	10.3	YES	3.41	4.1	**4.1**		**12.82**	YES
Leasburg Extension Lateral WW 8 Expansion	25.9	64.75	YES	21.41	8.72	**21.41**			
Mesilla Valley Bosque State Park	31.8	14.4	YES	4.76	0	**4.76**			NO
MVBSP Expansion	4.5	4.5	YES	1.49	0	**1.49**			
Mesilla East	15.8	39.5	YES	13.06	8.5	**13.06**		**8.5**	YES In Lieu of Peak Release
Mesilla East Expansion	54.2	54.2	YES	17.92	0	**17.92**			
Berino West	10.3	25.8	YES	8.53	0	**8.53**			YES In Lieu of Peak Release
Berino East	9.5	23.3	YES	7.71	0	**7.71**			YES In Lieu of Peak Release
Vinton A	14.7	25.7	YES	8.5	0	**0**	**8.5**		NO
Vinton B	20	22	YES	7.28	0	**0**	**7.28**		NO
Valley Creek	22	22.9	YES	7.57	0	**0**	**7.57**		NO
Country Club East	29	51.4	YES	17.0	0	**13.07**	**3.93**		YES In Lieu of Peak Release
Sunland Park	28.8	31.7	YES	12	0	**12**			YES In Lieu of Peak Release
Anapra Bridge	11	5.5	YES	1.82	0	**1.82**			YES In Lieu of Peak Release
Green Zone Shalem to Picacho	17.7	17.7	YES	5.85	0	**5.85**			
Future Aquatic Habitat sites	Up to 45	TBD	YES	TBD	TBD	**TBD**	**TBD**		
Total Water Rights Needed				192.8	57.61	**183.11**	**27.28**	**47.36**	

[1] from USACE 2009 for original sites; for new sites, based on USIBWC site estimate of pre-restoration conditions and post-restoration targets using USACE 2009 methods

[2] using ac-ft from USACE 2009 and converting to ac using EBID's full allotment of 3.024 ac-ft/acre

7.6. Continued EWTP Development Efforts

In order to lease or acquire sufficient water rights, the USIBWC pursued various options throughout the years. USIBWC evaluated many of the recommendations presented by contractors in the final EWTP framework (NFWF et al. 2015) on strategies for moving forward with meeting the obligations for water rights and water. USIBWC also pursued options that were not documented in the final EWTP framework. Some efforts were unsuccessful while others were successful. USIBWC efforts are described in the following sections.

7.6.1. Mesilla Valley Bosque State Park water rights

In September 2013, USIBWC was contacted by the law office of Kyle Moberly who was representing Katerina, Inc. and Irasema G. Philippou on the potential sale of 79.58 acres of EBID surface water rights. USIBWC and EBID met with the representatives who submitted an inquiry with interest in selling. These water rights were originally slated for Mesilla Valley Bosque State Park, and the sellers were interested in having USIBWC keep as many water rights on the park parcel as possible. USIBWC determined that

some water rights could be kept on the USIBWC parcel of the park and others could be distributed to other restoration sites. In December 2013, USIBWC submitted an offer to purchase based on a 2006 appraisal the seller provided. In April 2013, USIBWC prepared a statement of work to obtain an updated appraisal and real estate services to assist with the acquisition.

USIBWC began coordinating with New Mexico Environment, Minerals, and Natural Resources Division, State Parks Division (NM State Parks) to discuss the history of the water rights and the logistics of applying water rights to USIBWC parcel and possibly New Mexico parcels within the park. In November 2013, USIBWC and NM State Parks began developing an agreement to work together on restoration, including water rights acquisition. The agreement began as a general agreement but developed into a specific agreement for work only within Mesilla Valley Bosque State Park. The agreement was finalized in September 2014 (IBM14A0021).

During the development of the agreement, USIBWC and NM State Parks continued the discussions of the Katerina/Philippou water rights. Some of the water rights had previously been transferred by EBID to the park on New Mexico Department of Game and Fish property. In July 2014, the state of New Mexico provided some documentation on the water rights such as offers of judgement from 2005 and 2006; however, some records remained unclear. When the legal concerns arose (Section 7.2) after the 2014 acquisition of other USIBWC water rights, USIBWC Legal Department requested that the service contracts for acquisition of these water rights be put on hold until USIBWC could confer with the Department of Justice. In August 2014, USIBWC de-obligated the funds to acquire the water rights and real estate services. USIBWC continued to work with NM State Parks on the logistics and specifics. New Mexico State Parks investigated whether they could assist with the acquisition of the water rights under the agreement.

In August 2015, the sellers contacted USIBWC to see if the agency was still interested, but USIBWC water rights acquisition program was still on hold. In November 2015, the law firm indicated they were anxious to sell and would pursue other buyers. USIBWC notified the sellers that the timeline would depend on the ability of NM State Parks to be able to acquire the water rights on behalf of USIBWC. Discussions with NM State Parks included amending the agreement to include transfer of funds for water rights acquisitions and bringing in Department of Game and Fish, who owned much of the land within the park, and talks continued into February 2016 and through August 2016. Discussions also included ownership of the park, as well as discussions with EBID on how to apply water rights on Department of Game and Fish property through the original agreement between the state agencies. However, around this point in late 2016, the park was being discussed for a possible transfer of ownership from state agencies (State Parks to Game and Fish), and efforts to move forward stalled. The sellers of the water rights found different sellers, and USIBWC was unable to acquire these water rights.

7.6.2. Suspended Water Rights

As part of its work order IBM11W0022, NFWF and Audubon New Mexico made an attempt to tap into the delinquent water rights market. In 2013, the team investigated options to acquire water rights that were at risk of being suspended due to 3 years of unpaid assessment fees by their owners, in accordance with Section 73-13-4 of the New Mexico Statues Annotated (NMSA). The team investigations included deriving at a fair and reasonable price to pay for such water rights. They drafted letters for USIBWC signature to about a dozen water rights holders that were on the list of delinquent water rights that

would be suspended if their assessment fees were not paid by a certain date. In August 2018, USIBWC sent the batch of letters to acquire those water rights and pay the back fees. However, USIBWC did not receive any interested responses to the letters. See the analysis of this approach in the 2015 EWTP Framework Report (NFWF et al. 2015).

In September 2016, USIBWC, USFWS, EBID and Audubon New Mexico conducted a tour of USIBWC restoration sites to assess the feasibility of irrigating sites. On October 11, 2016, USIBWC had a meeting with Congressional representatives, at their request, and other ROD stakeholders to discuss water rights acquisition. At this meeting, EBID notified USIBWC that EBID was willing to make over 40 acres of suspended water rights available for USIBWC restoration purposes. These water rights were involuntarily suspended by EBID in September 2016, and EBID can hold on to suspended water rights for special uses instead of immediately reclassifying them per NMSA Section 73-11-48(C). In the discussion, EBID indicated that USIBWC had to pay the unpaid assessment fees (approximately $75 per acre), so the USIBWC could obtain these water rights at well below fair market value. USIBWC conducted an internal ROD compliance meeting at the beginning of November 2016. USIBWC Commissioner agreed to the acquisition, and USIBWC and EBID began to develop a purchase and sale agreement. EBID's general counsel prepared an opinion of legality of the water rights in late 2016, stating that the suspension of the delinquent water rights was conducted according to the state statues and the water rights were free and clear of any encumbrances.

In January 2017, USIBWC and EBID signed a purchase and sale agreement for 41.75 acres of suspended water rights. At the January 2017 EBID Board meeting, EBID transferred those rights to USIBWC property, pending approval of the acquisition from the DOJ. In March 2016, EBID and USIBWC signed an extension of the purchase and sale agreement pending the DOJ review. USIBWC and EBID signed two more amendments to extend the deadline in May and July 2017. DOJ indicated that they were understaffed on subject matter experts after the retirement of the title reviewer who had reviewed the water rights acquisitions from 2014; therefore, in May 2017, USIBWC Legal Department prepared a draft preliminary title opinion, identifying missing documentation. EBID and USIBWC worked to obtain required documentation to support a title opinion. USIBWC finalized the preliminary title opinion in June 2017 and submitted to DOJ for their review and approval. With great pressure from USIBWC due to the pending close of the fiscal year, DOJ provided the approval of the preliminary title opinion in September 2017. In October 2017, USIBWC transferred the funds to EBID, and USIBWC and EBID finalized the sale of the water rights. These are the water rights used to irrigate the new restoration sites in 2018 and 2019.

7.6.3. Discussions of leasing

As discussed in Section 7.3, USIBWC worked with other entities for additional offset-only water rights in compliance with the ROD, in the form of a lease or a term-limited transfer, in lieu of permanent acquisition. USIBWC worked for many months in 2016 and 2017 with one water rights holder (El Paso Water) on a potential lease of almost 150 acres of water rights; and after that particular effort fell through, USIBWC pursued a similar course of action with a different entity (City of Las Cruces). The potential agreement would assist USIBWC to meet its ROD commitment for the remainder of USIBWC offset water rights in New Mexico.

7.6.4. La Tuna water rights

In October 2016, USIBWC began to pursue the option of transferring federal water rights from U.S Bureau of Prisons adjudicated to La Tuna Federal Correctional Institute in Anthony, NM. This idea came from previous work by USIBWC planning, realty and technical staff starting in 2000 through 2004 to investigate water rights in Texas owned by the federal Government and, specifically, any rights owned by USIBWC. The USIBWC reached out to La Tuna officials in October, November, and December 2016 with local facility staff. USIBWC was able to communicate with Bureau of Prisons (BOP) general counsel for real estate in April and May 2017, with a conference call held on May 24, 2017. The water rights are maintained by USBR, so USIBWC held a follow-up call with USBR and BOP on June 12, 2017. Based on those discussions, the team concluded that USIBWC would need to have its restoration sites designated by EPCWID#1 as irrigable acreage before any agreement can be made with BOP regarding the La Tuna rights. USBR committed to investigating the additional water rights referenced in the 1930s agreement that appear to not have been transferred. BOP expressed interest in cooperating with USIBWC to come up with an agreement to use water that BOP doesn't need on a given year. USIBWC would need a backup plan, such as a credit system or other available water rights, in the event that BOP needed all their water in a year. USBR confirmed that BOP pays them annual assessment fees for the rights, and USBR pays EPCWID#1.

Additionally, USBR indicated that EPCWID#1 has a pool of water rights that aren't being used that could be put towards USIBWC sites, such as acres for which farmers haven't paid their assessment fee.

Through the discussions, it appeared that USIBWC may need to make the BOP agreement for water in Texas the Plan B and make working with EPCWID#1 the Plan A. USIBWC requested USBR's assistance to engage EPCWID#1.

7.6.5. Efforts with Texas portion of EWTP

USIBWC's EWTP also required offsets for Texas habitat restoration sites, which required discussions with EPCWID#1. At the beginning of the ROD, EPCWID#1 was not interested in participating in ROD stakeholder groups nor in the EWTP.

Engaging and working with EPCWID#1 was part of the statement of work that NFWF/Audubon New Mexico worked under to develop the EWTP. However, minimal efforts were made and minimal progress made. Although throughout the years, USIBWC had separate discussions with EPCWID#1 on channel maintenance and continued its coordination with EPCWID#1 on routine water management and binational delegations at the IBWC.

In May 2017, USIBWC sent a letter to EPCWID#1 to engage them in the discussion of creating a Texas portion of EWTP, and this was followed by email correspondence. USIBWC and EPCWID#1 met on June 27, 2017 for an introductory meeting to discuss options for environmental water in Texas. EPCWID#1 agreed to assist USIBWC with developing the EWTP in Texas. In the remainder of 2017, USIBWC and EPCWID#1 had numerous meetings and conference calls. Discussions included possible parcels of water rights that might be available for purchase. The first thing that USIBWC would have to do is petition the district to reclassify USIBWC habitat restoration sites as irrigable acreage within the district, and pay the district back assessment fees back to 1938 when it could have first been deemed irrigable (Texas Water

Code Title 4 Sec 55.677). Reclassifying USIBWC land as irrigable could cost $155,000 or more, plus $1,000 for the application fee. USIBWC also had communication with staff from the Rio Bosque Wetlands which also worked through the reclassification process for water rights. EPCWID#1 also indicated there is a possibility of USIBWC owning a parcel of property with water rights near the old Fabens POE.

During the discussions, there were several challenges tossed around. First, EPCWID#1 expressed concerns regarding increased roughness coefficients from the resulting vegetation growth from restoration sites, as well as concerns about sediment accumulation and island growth in the lower reaches of the RGCP. USIBWC shared reports and data with the district. Secondly, in subsequent discussions, EPCWID#1 indicated that their Board might not approve of irrigating in the floodplain inside the levees. Third, there was a different conception of "offsets" as discussed in the ROD. According to USIBWC, the Texas sites are offset sites—meaning the sites were never intended for supplemental irrigation in the ROD, and USIBWC's commitment for these sites was only to offset the increased evapotranspiration from conditions before and after the restoration implementation.

During the discussions between USIBWC and EPCWID#1, the participants came up with a potential solution to meet ROD offset requirements without acquiring water rights while assuring the district of our channel maintenance activities. Dr. Al Blair from EPCWID#1 believed that the increase in ET from all the plantings at the Texas sites would be minimal in comparison to the savings of ET from vegetation removal (both nonnative saltcedar and native willows) in the islands and on the floodplain. They expressed the interest to explore an agreement between EPCWID#1 and USIBWC where USIBWC committed to implementing channel maintenance as documented in the River Management Plan in exchange for EPCWID#1's approval that no water rights are required for offsets. Such an agreement would be a win-win solution. The USIBWC would assure the district of plans for sediment excavation as documented in the RMP, and the district allowed the USIBWC to implement restoration sites in Texas without water rights acquisition.

In December 2017, the USIBWC began drafting a preliminary version of an agreement to document that proposal. A draft was routed internally, and the draft was distributed to EPCWID#1 in early February 2018. At the end of March 2018, EPCWID#1 indicated that they did not agree with the preliminary agreement. USIBWC made attempts to reconvene discussions and negotiate terms of an agreement. USIBWC is committed to continuing discussions with EPCWID#1 to develop an agreement that will work for all parties involved, and has documented this commitment in the River Management Plan.

7.6.6. Coordinating with County of El Paso

EPCWID#1 recommended that USIBWC contact El Paso County regarding possible parcels with water rights, including near the Fabens Port of Entry. In July 2017, USIBWC reached out to the County of El Paso to discuss water rights leasing, transfer or acquisition. USIBWC had preliminary discussions with the County Attorney's office to discuss collaboration. Further discussions were put on hold pending collaboration with EPCWID#1.

7.7. Primary Groundwater Rights

In the early 2000s, USIBWC began coordinating with the New Mexico Office of the State Engineer (NMOSE) on possible primary groundwater rights owned by the USIBWC. A list of possible water rights, including some that listed USIBWC as owner, was created but not acted upon immediately.

In the development of the EWTP, the statement of work under work order IBM11W0022 included evaluation of groundwater rights and possible acquisition of groundwater. The final EWTP framework report (NFWF et al. 2015) included an inventory of possible primary groundwater rights for acquisition.

In 2014, USIBWC began to look towards groundwater rights as a real alternative to the use of surface water after DOJ asked the USIBWC to halt additional surface water acquisition. The USIBWC began coordinating again with NMOSE on the original list of water rights from the early 2000s and possible other water rights that appear in the 2000 hydrographic survey to be appurtenant to USIBWC right of way. NMOSE confirmed that several water rights file numbers were indeed belonging to the USIBWC. USIBWC included the groundwater rights in the 2014 Endangered Species Management Plan Drought Contingency Plan (Section 3.1.18.2.b of the RMP) to protect flycatcher habitat.

In April 2015, USIBWC applied to NMOSE for a permit to change an existing water right. The NMOSE reviewed the application and prepared a public notice, which USIBWC had published in the Las Cruces Sun in August 2015. The application proposed to move 23.83 acres of primary groundwater rights under Water Rights File Numbers LRG-12710-2 and LRG-12725-2 under Subfile No. LRR-28-004-0056. The water rights would be moved to 3 different habitat restoration sites outside of EBID district boundaries (Selden Point Bar, Rincon Siphon A and B, and Broad Canyon Arroyo Restoration Sites) and create four new Points of Diversion by drilling four new wells to irrigate the four parcels of restoration sites. No protest was received during the comment period. However, in subsequent ROD stakeholder meetings and in email correspondence in 2016, EBID staff indicated that EBID had considered protesting as they did not agree that the wells adjacent to the river would not have an adverse impact on the diversion, but that they did not file a formal protest because of the ongoing collaborative efforts they had with us to work on the EWTP for ROD commitments.

In April 2016, USIBWC received approval from the New Mexico Office of the State Engineer for the permit application, for a change in the place of use and new points of diversion for existing (and unused) USIBWC groundwater rights. USIBWC began investigating logistics for drilling wells and drafted a statement of work. However, initially USIBWC delayed any new groundwater supply wells because of the initial construction cost, ongoing operations and maintenance costs, and potential issues with the ongoing water litigation involving groundwater pumping. USIBWC also investigated the potential use of adjacent private wells.

In June 2017, USIBWC coordinated with NMOSE regarding the potential to transfer some of the water rights to aquatic habitat restoration sites, such as the City of Las Cruces Effluent proposed wetland. NMOSE was not willing to provide input without an application filed proposing a plan. Additionally, NMOSE indicated that groundwater rights must have beneficial use and could not be used for offset only.

While drafting the dried-up land maps required under the approved permits, USIBWC found that there were conflicts with the boundaries of adjacent parcels from the Dona Ana County parcels and the

USIBWC records. In July 2017, USIBWC requested an extension to send NMOSE the dried-up acreage maps, which was approved in August 2017 and the deadline was extended to April 2019.

USIBWC coordinated with its internal divisions including the Legal Division to discuss whether the USIBWC should move forward on a contract to drill wells and use the groundwater. USIBWC had internal discussions and updated the statement of work. However, Commissioner Drusina recommended that because of the developments of the TX vs. NM Supreme Court case, that USIBWC hold off on drilling groundwater rights.

In April 2018, USIBWC filed a request with NMOSE for extension of time (two years) to drill irrigation wells, pending further developments with the TX vs. NM Supreme Court case, after the Supreme Court ruled in March 2018 that the federal government can intervene in the case as a plaintiff to defend "distinctively federal interests," and USIBWC must now confer with U.S. Department of Justice regarding whether the case has any implications on the USIBWC's development of groundwater resources. NMOSE concurred and granted an extension until 2021.

USIBWC also coordinated with BLM regarding the possibility of transferring water rights that NMOSE indicated belonged to BLM, although BLM did not concur that they owned any groundwater rights. In 2017, USIBWC determined that the water rights were appurtenant to USIBWC property, not BLM property. USIBWC has plans to submit a change in ownership to NMOSE; however, Dona Ana County property records do not coincide, and USIBWC needs to record the deeds in the County as well. This is a pending item, and as groundwater use is currently on hold, the straightening out of property records is also on hold.

7.8. Supplemental Irrigation

As discussed in Section 7.1, USIBWC did acquire EBID-administered surface water rights in 2014 and 2017. Using these water rights, USIBWC was able to irrigate habitat restoration sites. From 2014 to 2018, the Leasburg Extension Lateral Wasteway #8 restoration site in Las Cruces, NM was irrigated 11 times (see Figure 23). In 2014, Audubon assisted the USIBWC to "broker" additional water through the EBID annual leasing program. In 2015 and 2016, USFWS assisted USIBWC to broker more water for additional irrigation events. In 2018, USIBWC and USFWS irrigated the Crow Canyon B and Mesilla East Restoration Sites for the first time, and in 2019, Yeso East and Trujillo were irrigated for the first time. Table 9 lists the irrigation events and volume of water used.

Table 9 Irrigation Events held and volume of water used (ac-ft)						
Site	2014	2015	2016	2017	2018	2019
Leasburg Extension Lateral WW 8	June 2.48 July 6.53	June 7.52 July 2.46	June 4.46 Aug 3.52	May 4.96 Aug 3.42 Sept 2.97	June 5.54 July 7.56	Anticipated
Mesilla East					June 4.37 July 3.26	Anticipated
Crow Canyon B					June 1.99	June 2.98
Yeso East						June 1.64
Trujillo						June 2.32
Total	9.01 ac-ft	9.98 ac-ft	7.98 ac-ft	11.35 ac-ft	22.72 ac-ft	6.94 ac-ft

Figure 23 The 11th Irrigation of the Leasburg Extension Lateral Wasteway #8 Restoration Site, July 17, 2018

In September 2016, USFWS, USIBWC, EBID and Audubon conducted a site visit of a number of restoration sites to discuss the feasibility of supplemental irrigation to the sites. EBID and USIBWC worked together to identify the priority sites that could be easily irrigated with limited modifications to existing irrigation infrastructure. Such sites included Trujillo, Yeso East, Crow Canyon B and C, and Mesilla East.

In January 2018, USIBWC and EBID and signed Amendment No. 1 to the agreement IBM13A0007 which extended the timeframe of the agreement, updated the background information, and most importantly, provided a mechanism for USIBWC to pay EBID to construct check structures to deliver irrigation water at the priority restoration sites. This is consistent with EBID policy for other farmers within the District who need irrigation infrastructure. USIBWC also ensured this was consistent with federal acquisitions regulations for sole-source award.

In May 2018, USIBWC issued work order 191BWC18F0058 to EBID for irrigation infrastructure work at two restoration sites (Crow Canyon B and Mesilla East). Beginning in April 2018, EBID began construction on a check structure on Garfield Canal in Hatch to irrigate Crow Canyon B Restoration Site (see Figure 24). USIBWC, EBID and USFWS used the structure for the first time during the successful June 2018 irrigation.

Figure 24 (Left) Check Structure at Garfield Canal built by EBID in April 2018 to irrigation Crow Canyon B; (right) Irrigation of Crow Canyon B via irrigation piping and then earthen V-ditch in June 2018

Under the same work order, EBID facilitated the irrigation at Mesilla East Restoration Site via California Lateral WW13 by constructing a ramp on the lateral and purchasing an electromagnetic flow meter for USFWS to monitor pumping from the lateral. In May 2018, USFWS installed a network of 12-inch PVC piping and gates to irrigate three cells at Mesilla East. USFWS irrigated the Mesilla East Restoration Site in June and again in July 2018 using USIBWC's gator pump (see Figure 25). Although the lateral is downstream of the site, the piping system and the gator pump pressurized the water enough to push the water upstream and irrigate several acres (see Figure 26).

Figure 25 USIBWC's gator pump and tractor enabled Mesilla East site to be irrigated from the California Lateral (left); USFWS reads the meter during the June 2018 irrigation (right).

Figure 26 Mesilla East middle irrigation cell with Gooddings willow plantings in the foreground, June 2018

In September 2018, USIBWC awarded two more work orders (191BWC18F0072 and 191BWC18F0075) to EBID to construct irrigation infrastructure to be able to irrigate Trujillo restoration site via the Trujillo Lateral and Yeso East restoration site via the Palmer Lateral. EBID began construction of the box at Trujillo Lateral in December 2018 (see Figure 27). EBID, USFWS, and USIBWC conducted a site visit to both sites in December 2018 to discuss irrigation logistics and final plans to connect the structure to the sites, and another site visit to Yeso East in April 2019 to finalize plans for the Palmer Lateral structure. EBID installed the structure at Yeso East in May 2019. USFWS facilitated the irrigation events of the Trujillo site (Figure 28) and the Yeso East site (Figure 29) in June 2019.

Figure 27. Left: EBID constructing a box at Trujillo Lateral in Dec 2018. Middle: Site visit of the structure with USFWS and EBID in late December 2018. The structure will allow irrigation of the Trujillo site in 2019. Right: completed structure May 2019.

Figure 28 Trujillo Restoration Site first irrigation event June 13, 2019. Left: Tyler from USFWS inspects the earthen diversion channel that USFWS constructed throughout the northern part of the site; Right: water gushes into the restoration site from the pipe connected to the Trujillo Lateral.

Figure 29 Cottonwoods at Yeso East Restoration Site receiving their first irrigation, June 7, 2019

7.9. Future EWTP Work

USIBWC anticipates continued collaboration with EBID on New Mexico surface water rights and irrigation.

As discussed in Section 7.6.5, USIBWC anticipates continued collaboration with EPCWID#1 to develop the Texas portion of the EWTP.

USIBWC also anticipates continued collaboration with the City of Las Cruces to finalize an agreement for a term-limited transfer of the remaining surface water rights for New Mexico.

USIBWC will also continue discussions with DOJ regarding drilling groundwater supply wells per NMOSE permit requirements. USIBWC would prefer to use the primary groundwater rights to support aquatic habitat or support habitat on restoration areas outside of EBID service boundaries. Additionally, USIBWC must resolve groundwater issues related to property boundaries and resolve issues with other possible groundwater rights belonging to USIBWC.

8. NO MOW ZONES

The ROD called for the creation of 1,983 acres of managed grasslands by stopping mowing and managing exotic species in these areas. No-Mow Zones were delineated in 2012 and implemented in the mowing season of 2012-2013. Therefore, 2013 represents the first year of growth from no mowing within these areas. No-Mow Zones maps are included in Park 6 of the RMP (USIBWC 2016). As described in the River Management Plan Section 2.3.6, No-Mow Zones were created to include the following:

- all restoration sites (except for aquatic habitat sites which will target a river meander)
- 1,543 acres out of 1,983 acres in the ROD of managed grasslands
- 15-foot wide band of riparian vegetation along the banks of the river
- 100-foot buffers around restoration sites
- 1/4-mile buffers around flycatcher territories documented from 2010-2012
- connectivity no-mow zones to connect flycatcher buffers or restoration sites

The ROD envisioned these No Mow Zones to be managed grasslands, with invasive vegetation being controlled. Within one year of ceased mowing, saltcedar bushes were already starting to take over the areas, such as the area shown in Figure 30.

In 2012, USFWS conducted a training for USIBWC Operations and Maintenance staff on methods to treat or remove saltcedar. In fall of 2013, USIBWC Operations and Maintenance Staff began a pilot maintenance program to manage saltcedar within a selected No-Mow Zone. However, the field office lacked the equipment to adequately control the fast-growing shrubs.

In summer of 2016, USIBWC Las Cruces field office conducted a pilot removal of an area north of the Salem Bridge in Hatch, NM. The crews completed 2.1 miles of saltcedar removal totaling 78 acres on both east and west banks, from April 27 to June 15, 2016, for a total of 25 actual working days on 8 hours per shift. The pilot project used 578 gallons of fuel, 1 excavator with grappling hook, and 1 engineering equipment operator. The Las Cruces field office crew continued to work in the area to

remove more saltcedar in September 2016 after the end of cuckoo breading season, as shown in Figure 31. Saltcedar debris was left in the floodplain (see Figure 32).

Figure 30 Within one year after USIBWC established the No Mow Zones, saltcedar bushes were prolific in certain areas, such as here in Hatch, August 2013

Figure 31 USIBWC Las Cruces Field Office crew removing saltcedar with an excavator in a No Mow Zone on the west floodplain north of Hatch, NM, September 29, 2016

Figure 32 No Mow Zone on the east floodplain north of Hatch, NM after USIBWC crews removed saltcedar in 2016. Here the saltcedar debris piles were photographed in March 2017.

Figure 33 Saltcedar beetle has attacked saltcedar bushes in this No Mow Zone in Hatch, NM, August 2017

Saltcedar beetle has been documented in various locations of the No Mow Zones (see Figure 33), which will facilitate the control of saltcedar expansion. Repeated seasons of beetle defoliation will eventually leave dead saltcedar bushes in the floodplain that will have to be removed.

The USIBWC will continue to evaluate costs and needed resources for the continued control of saltcedar and in order to modify, as necessary, the management of the No Mow Zones. Saltcedar management of the No Mow Zones was included in on-going maintenance requirements of the November 2018 draft of the River Management Plan, which USIBWC will finalize in 2019. In Section 2.6.4 of the RMP, USIBWC committed to creating a 5-year plan for ongoing maintenance requirements for ROD commitments.

In addition, USIBWC Engineering conducted preliminary hydraulic analysis on the No Mow Zones to evaluate their potential impact on levees and flood capacity of the RGCP. In 2013, USIBWC ESD staff (Dr. Padinare Unnikrishna) analyzed all No-Mow Zones for hydrologic and hydraulic impacts using FLO-2D modeling software.

9. GRAZING LEASES

Shortly after the ROD was signed in 2009, USIBWC began to eliminate the reissuance of grazing leases that came up for renewal. Within several years, most of the grazing leases had been cancelled. USIBWC also stopped issuance of any new grazing leases.

In general, the ban on grazing was generally complied with by USIBWC and grazing proponents. There were some locations that continued grazing despite having no lease (see Figure 34). However, due to staffing issues and competing priorities, the Boundary and Realty Office was limited on its enforcement actions for violations on grazing leases.

Figure 34 After grazing leases were phased out, grazing occurred without a lease in some cases, such as here near the Doña Ana and Sierra County line, August 2012

In September 2013, BLM sent USIBWC a letter noting concern for the lack of plans to put up fencing, since many of the USIBWC lands used under grazing adjacent to BLM lands were using both BLM and USIBWC grazing permits. In late 2013 and early 2014, BLM and USIBWC coordinated on alignment of fencing along BLM's Picacho Peak Allotment. Planning efforts including field trips continued for this fence project into 2016.

In 2014, USIBWC received complaints regarding cattle grazing onto private farmlands in Hatch and north of Hatch. Cattle were crossing the river during low flow periods. Additionally, in 2014, USIBWC experienced issues from cattle trespassing onto USIBWC land, particularly habitat restoration sites (including the Crow Canyon Restoration Sites), as reported by USFWS crews in the field. USIBWC coordinated again with BLM to brainstorm ways to prevent the issue. However, because New Mexico is a fence-out state, it would be the responsibility of USIBWC to put up fences to keep cattle out of the floodplain. While this is not feasible throughout much of RGCP, it could be an option in site-specific locations, assuming USIBWC had information on where the cattle were coming from.

In November and December 2015, USIBWC BRO conducted a review of the status of grazing leases. There were 5 possible remaining leases that required investigation. In May 2017, BRO reported that there were no remaining grazing leases.

USIBWC will continue to evaluate fencing issues and other concerns regarding grazing leases.

10. PEAK RESTORATION FLOW

10.1. Background on Peak Restoration Flow

The 2009 ROD committed USIBWC to enhance the river floodplain hydrologic connection within the RGCP through a periodic restoration flow release from Caballo Dam. The ROD stated that, if deemed feasible by irrigation districts, the USBR and other interested parties, a periodic restoration peak release could occur once every 3 to 10 years for a minimum of four days between April 24th and June 7th and would need 9,500 ac-ft per augmentation event to augment irrigation releases to achieve a 3,500 cfs release. USIBWC would purchase or lease water rights under the EWTP for the additional environmental water. If not feasible, USIBWC could irrigate restoration sites or augment irrigation releases with environmental water to achieve overbank inundation at select restoration sites.

Environmental flows were evaluated in a 2008 Technical Memo (Paramatrix 2008), which recommended the season of early spring to promote recruitment of native riparian vegetation. Environmental flows were also evaluated in the 2009 Conceptual Restoration Plan (USACE 2009), where a range of restoration flows from 2,250 cfs to 3,500 cfs was discussed. The lower target flow of 2,250 cfs was reached or exceeding during the primary window of April 24 to June 7 in 11 of the 57 years analyzed (1951 to 2007), see Figure 35.

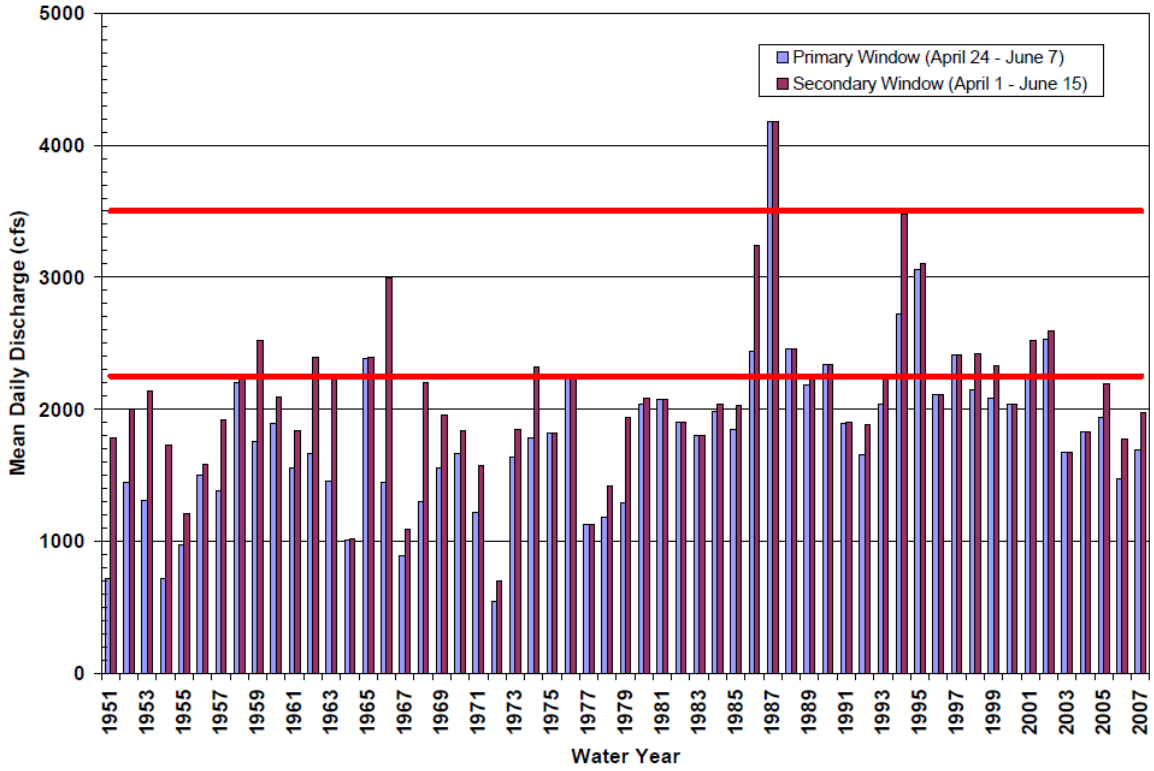


Figure 35 Maximum mean daily flow release from Caballo Dam in the primary and secondary target restoration release windows during the period from water years 1951 through 2007 (from USACE 2009)

10.2. Coordinating Efforts

Legal and logistical barriers to implementing the peak restoration flow were discussed in the 2015 Environmental Water Transaction Program Final Framework Report (NFWF et al. 2015). The report cited, among other difficulties, the "ongoing drought, lack of stored water in Elephant Butte and Caballo Reservoirs, meager surface water allocations to EBID irrigators, and contentious political environment related to the Texas v. NM litigation in the U.S. Supreme Court" (NFWF et al. 2015, p.18).

At the June 2017 ROD Stakeholder meeting, environmental stakeholders (Audubon New Mexico and SWEC) requested that USIBWC convene a subcommittee to consider the functional elements needed to implement a future restoration peak flow and potentially establish the procedures for when the basin conditions are better.

On July 20, 2017, USIBWC convened a brief meeting following a binational 1906 Allocation Committee meeting at the USBR office to begin brainstorming the approach and who needed to be involved in discussions. Participants included USBR Bert Cortez, EPCWID#1 Jesus Reyes, and USIBWC's Elizabeth Verdecchia and Billy Finn. The group discussed that USIBWC is responsible for flood floods above 100,000 acre feet. A restoration flow would likely require a Miscellaneous Purposes Act documentation, and the volume of water would need to be acquired from the districts. The participants concluded that the required people that should be involved would likely be the same people that serve on the

allocation committee, so it was suggested to have a meeting following an Allocation Committee meeting.

On September 12, 2017, USIBWC hosted a meeting with the irrigation districts and USBR to discuss restoration flows. Participants included EPCWID#1 (Jesus Reyes, Jay Ornelas, Dr. Al Blair, and Maria O'Brien), EBID (Gary Esslinger, Zack Libbin, and Dr. Phil King), Reclamation (Bert Cortez and Yvette McKenna), and USIBWC (Adrian Cortez and Elizabeth Verdecchia). A list of questions (logistical, science, legal, and policy) was used as a starter for discussion. The irrigation districts strongly expressed concerns regarding implementation of a restoration flow that included potential damage to their infrastructure, the requirement to purposely enter into flood operations mode, and the true ability of the flood control project to retain the flood capacity. The Districts also questioned the science in the 2009 Conceptual Plan, stating there would be more water required than proposed to meet the objectives. The modeling was extremely difficult for such a quick release. There also wouldn't be recharge of the local aquifers that the farmers depend on in EBID. USBR and USIBWC asked if sediment transport would be a benefit of the peak release, but the Districts were not interested in using this as a pilot project for sediment removal because it would end up at their infrastructure and associated irrigation canals (Mesilla Dam, American Dam). The Districts also brought up logistical and legal issues. Additionally, they indicated that they had never been onboard with the concept of a peak restoration flow but had agreed to the language in the ROD that stated, "if deemed feasible." The irrigation districts agreed to draft up their concerns and responses to the brainstorming questions.

In July 2018, USIBWC met with EBID on ROD compliance, and the discussion included concerns about the restoration flow. In August 2018, USIBWC sent letters to USBR, EBID, and EPCWID#1 requesting that they draft their concerns in writing. EBID sent a response dated January 4, 2019, indicating the peak release was dangerous, irresponsible, and contrary to the primary objectives of the RGCP. They also noted that more water was required to reach the proposed release for four days, that no logistical mechanism exists to conduct it, and that costs could be as high as $3 million for water alone.

Based on the current conditions and severe objections from the key implementation players (irrigation districts), USIBWC has determined that in the current conditions, a peak restoration flow is not feasible. However, USIBWC included the 2018 River Management Plan that USIBWC would continue long-term discussions and possible future investigations of science and logistics of a possible peak restoration flow. Any eventual implementation of a peak restoration flow would require additional discussions and analysis, to include modeling, water rights calculations, agreements, acquisition or lease of water rights, as well as discussion of potential damages from high flows and other legalities and logistics.

In November 2018, USIBWC conducted scoping for an Environmental Assessment for the continued implementation of the River Management Plan. In the scoping documents, USIBWC proposed to continue evaluation of the restoration flow as an alternative. However, scoping comments continued to address the concerns regarding feasibility, and USIBWC dropped the alternative from evaluation in the draft EA in May 2019, noting that it was considered but not carried forward.

10.3. Independent Studies

In 2015, the University of Texas at El Paso's Center for Environmental Resource Management received a multi-million-dollar U.S. Department of Agriculture grant in conjunction with other universities

(including Michigan Tech University (MTU) and Texas Agriculture and Mining University (TAMU) in El Paso Texas) for the "Sustainable water resources for irrigated agriculture in a desert river basin facing drought and competing demands: From characterization to solutions." In November 2017, the group held its first environmental focus group meeting to discuss the Bucket Model, preliminary climate projections, and to identify scenarios for riparian habitat restoration and environmental flows that could be evaluated with their models. USIBWC attended this meeting and discussed the ROD habitat restoration and peak restoration flow commitments.

In 2018, UTEP, MTU, and the USIBWC had various discussions on the environmental flows. USIBWC shared information such as related research and ROD documentation. The group began discussions shortly after the November 2017 meeting of the focus group, and began more in-depth discussions in February 2018, continuing sporadically from March through June 2018. The UTEP-led group is conducting independent scientific analysis and modeling of climate scenarios and the impact of climate on a possible restoration flow.

On December 17, 2017, the UTEP team held a focus group meeting with stakeholders to discuss preliminary climate scenarios and gage stakeholder input on modeling and the potential impact of climate on environmental water. The focus group meeting was also intended to brainstorm and discuss environmental flows. Preliminary analysis shows that all climate models, regardless of how wet or dry they predict the future to be, on average, they predicted a decrease in local water availability, both surface and ground. Such results make planning for environmental flows above a full allotment a challenge at best.

UTEP will share results with USIBWC and other stakeholders when the study is complete to assist with future decision-making. These additional studies will include climate modeling, economic impact analysis, and investigation of feasibility and logistics. The team anticipates preliminary results in 2019 and final results in 2020.

10.4. Simulation of Overbank Conditions in Lieu of Peak Restoration Flow

The ROD stated that supplemental irrigation would be advisable at 19 proposed restoration sites if future periodic restoration peak flows were deemed not feasible. Table 10 lists the active restoration sites that were identified in the Conceptual Restoration Plan as having partial or full overbanking and the corresponding flows. Some sites required bank cuts to facilitate the river-to-floodplain connectivity. [Additional removed restoration sites identified in the Conceptual Restoration Plan for overbanking include Bailey Point Bar, Broad Canyon Middle and South, Lack Property, and Pasture 18.]

The Conceptual Restoration Plan included enhancement of river-floodplain hydrologic connectivity as a primary restoration objective. The plan stated, "The functionality of the riparian system in the RGCP has been limited by channelization, channel incision, reduction in sediment supply and the elimination of seasonal high flows. The resulting marginal river-floodplain hydrologic connectivity does not adequately sustain or expand healthy native riparian ecology. The primary focus of this plan is to identify locations where the frequency and duration of overbank inundation can be enhanced through a combination of channel and floodplain restoration projects and potential flow augmentation without jeopardizing downstream water delivery requirements and public safety" (USACE 2009, p 3.1).

USFWS observed Selden Point Bar Restoration Site overbanking on 8/11/16. Flows at the Hayners Bridge gage upstream measured a peak of 3,203 cfs (90.7 cms) at 5am that day, which approximately matches the modeling in the Conceptual Restoration Plan that indicated the site would begin inundating at 3,500 cfs.

Yeso West called for the construction of an inset floodplain to hydrologic connectivity; the terrace was lowered by several feet and about 5,000 CY, which was removed in February 2017. The entire lowered terrace overbanked in monsoon flows in July 2017.

USIBWC could acquire or lease water rights to simulate overbank conditions at the active restoration sites in lieu of the peak release; however, there is limited irrigation infrastructure near or adjacent to most of the sites, and simulating overbank conditions is not practical or feasible at many of the sites. Table 10 also lists the nearby infrastructure. An addition challenge is in years of water shortage, the irrigation releases may be delayed until after the target timeframe.

USIBWC has acquired water rights and worked on logistics for irrigation at Mesilla East and Crow Canyon B. Peak restoration flow can be simulated at these sites as long as the irrigation season starts to allow for irrigation within the target timeframe of late April to early June. In years when irrigation is allowed that early, USIBWC will order water within the target timeframe to simulate the peak restoration flow. USIBWC will evaluate and monitor the progress and success. If successful, USIBWC may in the long-term evaluate the benefit to simulating overbank conditions other sites.

Table 10 Active restoration sites with overbank prescriptions

	At what flow (cfs) will the site begin to overbank?	Fully inundated at what flow?	River Floodplain Connection	Existing Irrigation infrastructure to simulate over bank conditions
Anapra Bridge	2750	3500		None
Berino East		4500	Overbank lowering	None
Berino West		4500	Overbank lowering	None
Country Club East	3000	4000	Bank Cut and channels	None
Crow Canyon B	4500	5000	Bank Cut	Garfield Canal; site has irrigation rights and overbanking will be simulated
Mesilla East	3250	5000	Overbank lowering	California Lateral #13; site has irrigation rights and overbanking will be simulated
Mesilla Valley Bosque SP	5000			Picacho Drain
Rincon Siphon A and B	4000		Bank Cut	None
Selden Point Bar	3500		Bank Cut	None; site overbanked in monsoon flows August 2016 at 3200
Sunland Park	3250	3500		None
Valley Creek	2750	3500		La Union Lateral
Vinton A	3250	4000		Rowley Lateral
Vinton B	2500	4000		None
Yeso West		3500	Construction of an inset floodplain	None; lowered site overbanked with monsoon flows July 2017

11. RIVER MANAGEMENT PLAN

The ROD required the USIBWC to update the 2004 River Management Plan (RMP), which was prepared as part of the EIS process (Parsons 2004b) but never implemented. Additionally, the 2012 Biological Opinion required the USIBWC to create a Flycatcher Management Plan by October 1, 2015.

USIBWC drafted the RMP in-house with the principal author in the Environmental Management Division (Elizabeth Verdecchia). The first draft mainly included the Floodplain Management Plan (Part 2) and the Endangered Species Management Plan (Part 3), as well as the Introduction (Part 1), Field Guide (Part 5), and No Mow Zone Maps (Part 6). The draft was distributed to different divisions for internal review in February 2013. USIBWC submitted the draft RMP to the USFWS for preliminary review on April 30, 2013. All USFWS preliminary comments were incorporated, and then in July 2013 the revised draft was submitted to a small group of ROD stakeholders who agreed to review the preliminary draft of the RMP. USIBWC received stakeholder comments in October 2013. A preliminary draft of Channel Maintenance Plan (Part 4) was also put together by USIBWC EMD Natural Resources Specialist Elizabeth Verdecchia, and Part 4 was distributed for internal review in November 2013 and distributed to stakeholders in December 2013. Comments were received by stakeholders in January and March 2014.

USIBWC worked internally and with stakeholders at the ROD stakeholder meetings to address comments. USIBWC decided to finalize Parts 2 and 3 but continue to work on addressing comments for Park 4. A revised draft of the partial RMP (Parts 1, 2, 3 and 5) was distributed to internal divisions in September 2014 for final review. Also in September 2014, the pre-final draft was distributed again to USFWS and ROD stakeholders (this time the entire stakeholder distribution list). USIBWC finalized the partial River Management Plan November 2014.

The USIBWC continued to work with stakeholders on the Channel Maintenance Plan (Part 4) and contracted the Channel Maintenance Alternatives and Sediment Transport Study in 2014. USIBWC incorporated results of the 2015 final CMA Study into Part 4 and distributed again for internal review in July 2016. USIBWC provided a draft for stakeholder review in August 2016. The RMP was updated and the entire RMP (all sections except for draft No Mow Zones Part 6) was finalized in December 2016 (USIBWC 2016).

In September 2018, USIBWC updated all Parts of the RMP, including updating the Endangered Species Management Plan (RMP Part 3) to incorporate the new 2017 Biological Opinion. USIBWC submitted a draft to USFWS and stakeholders in November 2018 for review. USIBWC received stakeholder comments in January 2019 and into May 2019. USIBWC anticipates finalizing the updated RMP in 2019.

Section 18.4 discusses USIBWC's Environmental Assessment for the Continued Implementation of the River Management Plan.

12. CHANNEL MAINTENANCE

USIBWC committed in the ROD to evaluating and modifying channel maintenance actions in the river corridor and to comply with USIBWC's mission by better integrating river ecosystem health, water deliveries and flood control in long-term river management planning.

Key points in the ROD regarding channel maintenance are as follows:

- To ensure efficient water delivery, the selected alternative allows for maintenance of the river, removal of obstructions from the river, and dredging under an adaptive management program.
- The question of the overall necessity of channel dredging will be investigated through additional monitoring and modeling.
- USIBWC, in consultation with stakeholders, including EBID and EPCWID, will update the May 2004 RMP.
- Establish a data collection and monitoring program, the purpose of which will be to identify assumptions and gaps in current understanding, establish baseline conditions of the river, implement site-specific projects to test hypotheses, collect and analyze data, monitor site specific projects and sensitive reaches, evaluate site-specific and cumulative impacts, and recommend any annual channel maintenance, channel stabilization or destabilization activities and in an iterative cycle, evaluate the effect of those activities in meeting the RMP goals and objectives.
- USIBWC will utilize the 145 cross-sections in the RGCP, resurveying the cross-sections on the average of once every four to five years and more frequently in local reaches following large flood events.

12.1. Cross Sections

The ROD required that USIBWC update cross sections for the RGCP at least every 4 to 5 years. In 2011, the ROD Implementation Group requested that USIBWC survey an additional 15 cross sections in addition to the 145 surveyed in 2004 by Tetra Tech during the development of the RGCP hydraulic model.

In 2013, USIBWC determined that the cross sections would be surveyed in-house with USIBWC survey crew. USIBWC crews were unable to schedule the work in winter 2013-2014 due in part to work being rescheduled due to the Government shutdown, although the crews conducted a lot of preparation work such as locating control points and cross-referencing the 2004 surveys. In September 2014, USIBWC began preparation and scheduling to survey the cross sections; however, change in staff and other survey requirements prevented USIBWC from completing the surveys in winter 2014-2015. In May 2015, USIBWC EMD drafted a statement of work (SOW) to contract out the surveying work; however, lack of a survey crew prevented the review of the SOW, which was pushed to January 2016 with the hiring of a new surveyor. The SOW was finalized in early 2016 and solicited in May 2016; however, responses to proposals were much higher than anticipated and was placed on hold, subject to availability of funding. In September 2016, USIBWC awarded a contract to Arcadis to resurvey 160 cross sections. The cross sections were completed from October to December 2016, with a final report completed in January 2017 (FXSA 2017).

USIBWC crews conducted partial surveys in specific locations throughout the RGCP as part of the data collection and monitoring program. Cross section surveys were targeted for either before or after (preferably both) channel maintenance activities in order to evaluate sediment buildup. USIBWC crews conducted surveys of the Rincon and Placitas Arroyos in December 2013 and of Mesilla Dam in February 2016.

12.2. Channel Maintenance Planning

As documented in Part 4 of the RMP (Channel Maintenance Plan), USIBWC decreased and channel maintenance activities after the signing of the ROD in order to discuss the channel maintenance with stakeholders and come up with a science-driven plan, as required in the ROD.

In March 2013, EBID gave a presentation to USIBWC management to discuss chronic sediment issues within the RGCP and present possible solutions. EBID indicated that the areas at the Rincon/Tonuco Drain and Montoya Drain were among the top two issues for them. USIBWC's decrease in channel maintenance work coupled with the low river flows were exacerbating the sediment issues which were adversely impacting U.S. water users by decreasing efficiency of deliveries and a number of other issues. They urged USIBWC to address the chronic sediment issues with a variety of recommended excavation and alternative methods.

Environmental stakeholders in the ROD implementation group were very opposed to channel maintenance. In April 2013, ROD stakeholders conducted a site visit to the sediment hot spots, including Montoya and Rincon/Tonuco Drain. Environmental stakeholders requested a justification for channel work, per the ROD data collection and monitoring program and science-based channel maintenance commitments. USIBWC evaluated cross section data from 2011 Lidar and 2004 cross sections to determine sediment accumulation. USIBWC also evaluated the sediment accumulation in the HEC RAS model. In July 2013, USIBWC completed a white paper on the excavation at the two drains (USIBWC 2013) and provided to ROD stakeholders for review and comment. USIBWC received comments in July 2013 from Audubon New Mexico, Paso del Norte Watershed Council, and SWEC. In August 2013 USIBWC drafted comments to stakeholder comments but the response spreadsheet was never finalized, Instead, comments and responses were incorporated into the RMP.

In July 2013, USIBWC drafted a preliminary draft of the Part 4 Channel Maintenance Plan and submitted to stakeholders for review. Several iterations were sent to stakeholders, with the final interim draft in December 2013, which USIBWC used as a working draft to begin implementing it while conflicts could be resolved and USIBWC could issue contracts for additional studies to address stakeholder concerns.

USIBWC began the planning for the Channel Maintenance Alternatives Study discussed in the next section.

12.3. Channel Maintenance Alternatives

In the ROD, the USIBWC committed to evaluating the overall necessity of dredging and to evaluate alternatives. In May 2014, USIBWC began drafting objectives and a statement of work to evaluate sediment transport and channel maintenance alternatives to address concerns raised during the drafting of the Channel Maintenance Plan in the RMP and to meet the ROD requirement to evaluate the necessity of dredging. The contract was awarded to Tetra Tech in September 2014. The study would include surveying of targeted cross sections, hydraulic and sediment transport modeling for five different channel maintenance alternatives in six sample locations, and evaluation of channel maintenance strategies. ROD stakeholders were invited to the kickoff meeting in September 20154 where they expressed concern that the project did not include analysis of critical locations, such as

Mesilla Dam. USIBWC discussed internally and agreed to amend the contract to add analysis at three additional locations recommended by ROD Stakeholders. The contract modification was executed in January 2015. At the end of March 2015, ROD Stakeholders were invited to participate in the 30% Report and submit comments, as well as provide comments on the 90% in September 2015. Tetra Tech finalized the report for Channel Maintenance Alternatives study in October 2015 (Tetra Tech 2015). The report evaluated three sediment excavation alternatives and two non-sediment excavation alternatives for all 9 project locations where chronic sediment issues occur. Conceptual alternatives to channel excavation included installation of dikes or spurs, island destabilization, sediment traps, vortex weirs, and projects proposed by EBID for Mesilla Dam.

USIBWC incorporated the results of the Channel Maintenance Alternatives (CMA) study in Part 4 of the December 2016 River Management Plan.

In 2015 and 2016, USIBWC internally evaluated the proposed conceptual projects identified by Tetra Tech. Discussion included whether USIBWC could implement the alternatives at Mesilla Dam, but USIBWC determined that it could not fund those projects because the dam belonged to USBR. USIBWC coordinated with USBR on property information and agency roles.

In early 2016, USIBWC began conducting preliminary environmental compliance for the proposed sediment traps, including site visits for cultural and natural resources and preliminary coordination with USACE. USIBWC decided to move forward with a pilot project of sediment traps at Thurman I and II Arroyos, as proposed the Channel Maintenance Alternatives Study (Tetra Tech 2015). In February 2016, USIBWC began drafting a statement of work to award the design of Thurman I and II CMAs. In May 2016, USIBWC sent out the request for bids to engineering firms; award was delayed in order to re-evaluate the statement of work requirements and negotiate down the higher-than-anticipated proposed costs. The contract for the design services was awarded to URS in September 2016 (IBM16T0018). USIBWC stakeholders were invited to the kick off meeting held in October 2016.

During the design process, URS proposed that the conceptual sediment trap of mesh with rebar be modified to a sediment basin for several reasons, including that the mesh-based traps would not withstand scour forces from large boulders, as well as easier maintenance and more efficient sediment trapping. USIBWC concurred with the change in concept, and the design moved forward with sediment basins instead of sediment traps. The design was finalized in June 2018 (URS 2018).

USIBWC began coordinating with USACE on permitting requirements for this project in 2016, including a site visit in 2016, and discussions on impacts based on the 90% Design began in June 2017. Based on limited impacts, USACE determined this could be permitted under a Nationwide Permit 43 as stormwater infrastructure or a general permit. USIBWC requested the USACE to be a cooperating agency on the Thurman I and II Environmental Assessment in August 2017, but USACE declined as they anticipated an Individual Permit would not be required.

USIBWC completed the Draft Environmental Assessment for Thurman I and II in October 2017, with few public comments received during the public comment period. The EA included a preliminary plan for mitigation. The EA and FONSI were completed and signed in December 2017 (USIBWC 2017). The USIBWC completed a draft Compensatory Mitigation Plan and application for permit and submitted to USACE in March 2018. In May 2018, the USACE approved of the Mitigation Plan and issued a Nationwide

12.4. Channel Maintenance Activities

From 2009 to 2013, after the signing of the ROD, USIBWC stopped almost all channel maintenance with the exception of sediment excavation at the gates of American Dam. Lack of channel maintenance and low flows caused by drought conditions led to numerous sediment plugs and issues that required the USIBWC's attention. In December of 2013, USIBWC drafted a preliminary working draft of this Channel Maintenance Plan and distributed to ROD stakeholders for review. The draft proposed that during 2014-2015, USIBWC continue with some activities conducted before the signing of the ROD while the USIBWC evaluated alternatives and conducted further discussions with stakeholders. During 2014-2015, USIBWC implemented the preliminary working draft of the channel maintenance plan. This included resuming channel excavation activities from the 5-year Plan. USIBWC coordinated work through regulatory agencies and generally conducted work as excavation only, as discussed in the permits section of the RMP. USIBWC crews stockpiled sediment in the floodplain and removed it to approved locations in the non-irrigation season (see Figure 38).

From September 2014 to October 2015, USIBWC contractors conducted a *Channel Maintenance Alternatives* (CMAs) *and Sediment Transport Study for the RGCP* (henceforth referred to as the "2015 CMA Study"). The final report and recommendations are discussed in Section 4 of the River Management Plan. The Channel Maintenance Plan was revised in summer 2016 to incorporate recommendations from that study as well as comments received on the December 2013 preliminary working draft of the Channel Maintenance Plan.

During 2014-2016, USIBWC continued some pre-ROD maintenance activities as defined in the RMP, conducted the 2015 CMA Study, and began implementing the monitoring program. The USIBWC finalized the channel maintenance plan in December 2016. The USIBWC conducted formal ESA Section 7 consultation with the USFWS on the updated RMP, including the channel maintenance actions of island removal, in 2017. In November 2018, USIBWC updated the RMP with the 2017 Biological Opinion and other updates.

USIBWC's channel maintenance activities are summarized in the RMP Section 4. Table 11 shows the total volumes of sediment excavated from the RGCP by USIBWC O&M crews. In FY 19, the numbers jumped substantially due to the contracting of 150,000 cubic yards in Hatch with the Thurman I and II construction, in addition to O&M crews working.

Table 11 Channel Maintenance Activities (Sediment Removal in CY) FY 2009 to 2018

	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Total	4,000	0	14,055	0	400	58,019	97,650	99,546	52,974	178,973	421,818

Permit 43 for the project under Action No. SPA-2018-00084-LCO. In September 2018, USIBWC awarded a task order to IDEALS-AGEISS for the implementation of the Compensatory Mitigation Plan and mitigation for channel maintenance in the river in the Thurman to Placitas Arroyo reach.

In August 2017, USIBWC Master Planning Office incorporated the conceptual CMAs into the draft Rio Grande Fund Capital Plan. In September 2018, USIBWC awarded a contract to Kirkland Construction to construct the sediment basins at Thurman I and II and do Long Excavation for nearly $5 million. The structures were completed in May 2019 (see Figure 36 and Figure 37).

The RMP and the EA for the Continuation of the RMP both include consideration of other CMAs for the RGCP.

Figure 36 Construction of the endwall at Thurman I Arroyo Sediment Basin, March 2019

Figure 37 Thurman I Sediment Basin after construction and after a storm event June 2019

Figure 38 USIBWC crews create a temporary sediment stockpile in the floodplain of excavated sediment near Rincon Arroyo, March 2014

12.5. Sediment Control Initiative

In April 2014, U.S. Commissioner Ed Drusina sent letters to the Rio Grande Compact Commissioners and Compact stakeholders to solicit regional support for a collaborative sediment control initiative that could explore alternatives to intercept sediment prior to reaching the Rio Grande. While beneficial to USIBWC, such alternatives in the watershed outside of the levees would generally fall outside USIBWC's jurisdiction. Stakeholders receiving these letters included the Compact Commissioners in TX, NM, and CO, irrigation districts, and other federal agencies (USBR, NRCS, and USGS). Minimal feedback was received at the time.

In July 2016, the USIBWC sent a second set of letters to an expanded list of stakeholders noting the adverse impacts of sediment inflows on the RGCP, summarizing USIBWC's efforts to conduct channel maintenance, USIBWC's sediment transport study, and RMP updates for channel maintenance. The letter asked to engage local partners to implement alternatives to prevent sediment from reaching the river. The letter highlighted previous efforts to control sediment including sediment control dams built in the 1970s by USDA with local partners. Stakeholders for this letter included the Compact Commissioners in TX, NM, and CO, irrigation districts, Interstate Stream Commission, county flood commissions, soil and water conservation districts, local municipalities and utilities, state agencies, environmental groups, other federal agencies (USBR, NRCS, USGS, USACE, USFWS, and BLM), and elected officials. While some positive feedback and interest was received, informal discussions with some stakeholders showed that the requests were viewed negatively, as if USIBWC was redirecting our mission requirements to other entities.

In January 2017, USIBWC coordinated a Federal Workgroup of the Sediment Control Initiative. USIBWC sent letters to USBR, NRCS, USACE, BLM, USGS, and USFWS to begin discussions of a watershed approach to addressing sediment issues and the formation of a federal workgroup as a mechanism to support local and regional stakeholder programs. The federal agencies met on February 2, 2017 at

USIBWC offices in El Paso to discuss each agency's respective interests, objectives, needs, authorities, resources and possible contributing roles in a Federal Workgroup. The meeting was well attended with all federal agencies well represented, and the representatives expressed interest in pursuing future collaboration.

USIBWC held a follow-up meeting of the Federal Workgroup in April 2017 in Las Cruces, NM, where each agency provided information about their respective watershed projects and authorities and expressed interest in a multi-agency agreement. A third meeting was held in El Paso on May 9, 2018, with additional agencies represented (USFS). The agencies shared ongoing projects, discussed a preliminary draft of an agreement, and brainstormed collaborative research projects and other methods for collaboration, including supporting local efforts such as the Stormwater Coalition.

In July 2018, USIBWC sent a preliminary draft multi-agency agreement for each agency to review and provide comments, with a follow-up sent in late 2018.

USIBWC is committed to continuing coordinating this Federal Workgroup and eventually working towards a larger, inclusive stakeholder-driven Sediment Control Initiative to address sediment coming into the Rio Grande from the upland portions of the watershed.

Additionally, in August 2017, U.S. Commissioner Ed Drusina indicated that USIBWC was joining the El Paso Water, EPCWID#1, and other stakeholders from Texas and New Mexico in the Rio Grande Sediment Removal and Control Task Force to study how to remove and control sediment that has been accumulating in the river's channel. USIBWC's new management is committed to addressing sediment issues.

13. LEVEE IMPROVEMENTS

As specified in the 2004 EIS, part of the action for USIBWC included levee improvement projects throughout the RGCP. Throughout the ROD implementation timeframe, USIBWC has continued on designs and construction of various segments of the levees. The USIBWC has rehabilitated several sections of RGCP levees. Initial funding was from the American Recovery and Reinvestment Act (2009). USIBWC continues to fund levee projects with annual funding allotted for construction of such projects. For example, the Vado levee improvement project was completed in 2015 and filled a gap in the flood control protection in the Vado, NM area.

The USIBWC has completed the submittals of several packages representing rehabilitated levee segments to FEMA for levee accreditation, to meet standards set in 44 CFR 65.10. Submittals to FEMA include Canutillo Phase I, Hatch West Levee, Mesilla Phase I, and Mesilla Phase II all in Doña Ana County.

In conjunction with these projects, USIBWC completed a Programmatic Agreement with the State Historic Preservation Office of New Mexico in December 2017 that covered levee improvements as well as other ROD-related activities such as channel maintenance, habitat restoration, and sediment placement.

USIBWC continues to finalize complicated design projects for Courchense-NeMexas, Sunland Park, Canutillo Phase II, and other levee gaps.

14. ADAPTIVE MANAGEMENT

The ROD stated that "an adaptive management strategy will be used in implementing river management alternatives" (USIBWC 2009). Adaptive management is a science-based decision process which allows for the outcomes of the management actions to be monitored, and the results could lead to adjusted management decisions. It is an experimental approach to making decisions which facilitates continuous learning from the results. It allows for scientific information and experimentation to guide management decisions. Adaptive management requires ongoing effort, funds, and staffing to support monitoring and related science programs, evaluation of strategies, and management adjustment (Daily 2006).

USIBWC has incorporated the use of adaptive management strategies in the River Management Plan. Adaptive management strategies include considering input from the stakeholders (to include ROD stakeholders, technical experts such as contractors or interagency staff, Paso del Norte Watershed Council members, or others) and modifying policy to adapt to new information or science, to address a new issue or concern, to address an inefficient policy, or to increase efficiency or productivity in work load. Changes to current policies resulting from adaptive management strategies should not increase the financial burden of the agency.

Examples of adaptive management implemented in ROD activities include:

- Restoration site changes. USIBWC has made modifications to restoration sites, including adding or eliminating sites, or expanding boundaries of sites, due to local conditions, logistics, or other reason. In the River Management Plan, USIBWC included the flexibility to change, add, or drop restoration sites as appropriate. USIBWC expanded several sites including Leasburg Extension Lateral, Mesilla Valley Bosque State Park, and Mesilla East. Broad Canyon Arroyo, Crow Canyon C, and Rincon Siphon C and D were added as restoration sites after the original Conceptual Plan. Alternate sites still fell within the acreages outlined in the ROD. Section 6.1 discusses the changes made to the original 2009 Conceptual Restoration Plan.
- Restoration techniques. Different planting methods, different species, planting timing (season), and plant preparations were employed by USIBWC and its partners, depending on success of plantings and local conditions.
- Channel Maintenance areas. As conditions in the riverbed change over time due to sediment accumulation, USIBWC has adapted plans for required channel maintenance. Some areas were added or removed from the activities listed in River Management Plan for channel maintenance based on local conditions that year.
- Frequent review (at least every 2 years) of the River Management Plan to include advancing science and lessons learned in management.

Additionally, adaptive management was used for lessons learned regarding internal communication and coordination with other divisions. For example, over the years there were a few mowing mistakes by USIBWC crews. USIBWC improved its communication to O&M supervisors and area managers, and the crews learned to ask questions or call EMD if there was a habitat area nearby. Coordination among divisions was improved by frequent meetings including discussions before bird nesting season and planning meetings for the annual channel work. EMD also shared data, such as flycatcher and cuckoo locations and habitat data with other divisions, facilitating review and decision-making.

15. ENFORCEMENT

USIBWC had typically left enforcement within the RGCP to the local Sheriff via a letter granting jurisdiction and access. During the NEPA process for establishing avian hunting areas within RGCP around 2014, stakeholders expressed concerns about the lack of enforcement. USIBWC began to enter into discussions with law enforcement groups, including state, local, and federal entities. The meetings recommended formal agreements.

In December 2017, USFWS reported a fire had occurred at the Leasburg Extension Lateral Wasteway #8 Restoration Site in the weeks prior (see Figure 39). USIBWC reconvened internal discussions regarding the enforcement agreements. Public meetings at the Rio Grande Citizens Forum also brought up repeated issues with unauthorized activity and no action from the local law enforcement. USIBWC reconvened meetings with law enforcement entities. In September 2018, USIBWC, the District Attorney, and the Dona Ana County Sheriff signed an agreement for enforcement assistance within RGCP. USIBWC ordered new signs clearly noting authorized and unauthorized activities for various locations. Similar agreements are in the works for City and County of El Paso law enforcement and State of New Mexico and Texas game wardens.

Figure 39 Campfire near the location of the brushfire at Leasburg Extension Lateral WW8 Restoration Site, December 2017

16. OUTREACH

Throughout the ROD implementation timeline, the USIBWC conducted outreach efforts to inform the public and stakeholders on ongoing ROD activities. The following is a list of some of the outreach activities conducted from 2009 to 2019:

- Site tours of restoration sites:
    - Site tour of restoration sites and channel maintenance areas for scoping for RMP EA, November 2014 (see Figure 40)
    - New Mexico Water Resources Research Institute 63rd Annual New Mexico Water Conference, October 2018
    - Site tour of Leasburg Extension Lateral Wasteway 8 restoration site in Las Cruces with representatives from Senator Heinrich's office, April 2017
    - Groundwater monitoring with UTEP undergraduate students at Valley Creek and Anapra restoration sites, October and November 2017
    - Rio Grande Citizens Forum Board members field trip to Leasburg Lateral Wasteway 8 restoration site in Las Cruces, May 2016
    - Site tour of Sunland Park restoration sites and groundwater monitoring with UTEP Upward Bound STEM high school students July 2016
    - A demonstration of the groundwater monitoring for UTEP hydraulic engineering students in November 2015
    - Rio Grande Basin Stakeholders Meeting at UTEP that included a tour of the restoration sites, December 2012
- USIBWC Upper Rio Grande Citizen's Forums Presentations on ROD-related activities https://www.ibwc.gov/Citizens_Forums/CF_URG.html
    - July 11, 2019, El Paso, TX
    - April 2018, Las Cruces, NM
    - October 2015, Las Cruces, NM
    - April 2014, Las Cruces, NM
    - July 2012, Las Cruces, NM
    - January 2012, Las Cruces, NM
    - September 2009, El Paso, TX
    - December 2009, Las Cruces, NM
- Other Presentations on the ROD restoration activities:
    - Southern New Mexico Wetlands Roundtable, Las Cruces, March 2019
    - UTEP environmental science senior seminar class, March 2018
    - Rio Grande Compact Engineering Advisors meeting, March 2018
    - Rio Grande Compact Commission, March 2018
    - South Central New Mexico Stormwater Coalition April 2018
    - Rio Grande/Rio Bravo Binational Forum on November 7-8, 2017 at the University of Texas at El Paso (UTEP)
    - House of Representatives Subcommittee February 2017
    - Texas Garden Club District IX Fall Meeting, November 2016
    - UTEP environmental science senior seminar class, October 2016

    - Rio Grande Compact Engineering Advisors meeting, February 2016 and February 2017
    - Rio Grande Compact Commission, April 2016 and 2017
    - Participation in Save Our Bosque Task Form Tamarisk Leaf Beetle on the Rio Grande, NM Roundtable Discussion, October 2016
    - Collaboration with several UTEP and NMSU Masters students and faculty for data sharing, including groundwater data and vegetation data 2016
    - Paso del Norte Watershed Council (PdNWC) July 2015
    - Paso del Norte Watershed Council 2014
    - Provided input on restoration work to City of Las Cruces application for Sustainable Tools for Assessing and Rating Communities (STAR) application in January 2014
    - New Mexico Water Resources Research Institute 58th Annual New Mexico Water Conference in Albuquerque, NM, November 2013
    - Rio Grande Basin Management Meeting December 2012
- Conference Posters
    - 63rd Annual New Mexico Water Conference at the Tipping Point: Water Scarcity, Science and Policy, Las Cruces NM, October 2018 (see Figure 41)
    - 2016 Tamarisk Coalition's Tamarisk Beetle and Restoration Workshop in Albuquerque, NM, June 2016
    - 2015 Tamarisk Coalition's 12th annual conference
    - New Mexico Water Resources Research Institute 58th Annual New Mexico Water Conference in Albuquerque, NM, November 2013
    - River Management Society/Tamarisk Coalition Conference, Grande Junction, CO, March 2013
- Outreach Publications
    - Article in USIBWC newsletter The Boundary Marker, summer 2018 https://ibwc.gov/Files/June%202018_newsletter.pdf
    - Restoration factsheet periodically updated
    - Factsheets and interactive maps on case studies, in coordination with the Desert Landscape Conservation Center, USFWS, USBR WWW.DESERTLCC.ORG/RESOURCE/CCAST
        - Irrigation of Riparian Habitat Restoration along the Rio Grande Canalization Project November 2018 https://usbr.maps.arcgis.com/apps/MapSeries/index.html?appid=277b5e89dae748bd923bf3421d415ea9 (see Figure 42)
        - Rio Grande Environmental Water Transaction Program: Providing Water for Restoration January 2019 https://usbr.maps.arcgis.com/apps/MapSeries/index.html?appid=bc53bf7cefc0437289026a09c691a82a
    - IN 2018, USIBWC created a 5-minute outreach video documenting restoration activities. The video can be viewed on You Tube at https://youtu.be/FWS70bLtxss
- Media Coverage
    - USIBWC Press release February 2018 notifying citizens of ongoing restoration work in areas with high recreation, including trail areas https://www.ibwc.gov/Files/Press_Release_021418.pdf

- USIBWC Press release March 2018 with the Citizens Forum agenda https://www.ibwc.gov/Files/Press_Release_032918.pdf
- Local news KVIA interviewed Elizabeth Verdecchia and IDEALS contractor Margaret Dubbin on restoration efforts and island vegetation salvage, February 2018. http://cbs4local.com/news/local/habitat-restoration-work-happening-along-rio-grande
- A radio spot on regional PBS stations on the EWTP and restoration activities in April 2015. Several regional radio stations aired the collaborative interview.
- Joint Press Release on the first irrigation of a restoration site June 2014 https://www.ibwc.gov/Files/Press_Release_063014.pdf

Figure 40 Site tour of channel maintenance area at Shalem Colony Bridge for RMP EA, November 2018

Figure 41 Conference poster on habitat restoration work, October 2018

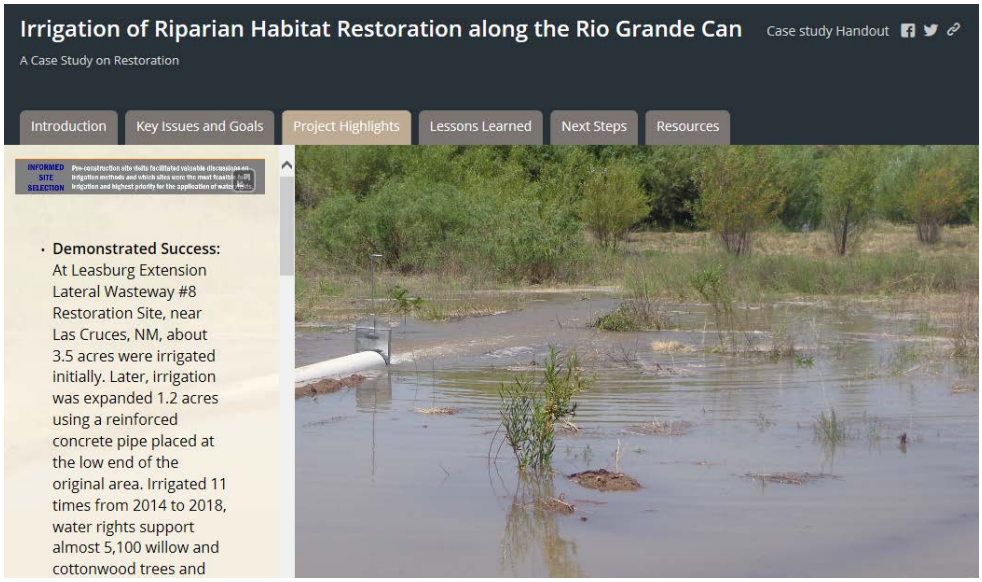


Figure 42 Screenshot of the LCC Case Study on irrigation on the CCAST website, 2019

17. COST OF IMPLEMENTATION

The ROD stated, “Six percent (6%) of funds made available to USIBWC for rehabilitation of its Rio Grande Flood Control levees will be programmed to implement the environmental measures outlined in this Record of Decision, as well as, annual appropriations to USIBWC for construction and operation and management.” That statement raised a lot of questions when USIBWC received $120 million in American Recovery and Investment Act funds in 2010. In March 2011, Senators Bingaman and Udall requested that USIBWC establish a budgeting process that clearly allocated funding for ROD implementation.

In 2009, the USIBWC estimated that the 10-year implementation of the ROD would cost $11.1 million. In February 2010, stakeholders assisted in identifying priorities and estimated costs at $9.1 million. As of May 2019, $11.1 million has been obligated or spent, including the $4.8 million construction of the sediment basin pilot project at Thurman I and II. Table 12 lists the actual costs of all ROD-related actions.

Table 13 lists anticipated costs for the short-term in Fiscal Year 2019 and 2020 to complete ROD commitments, which are tentative but could be over $1.3 million. Additionally, in the future USIBWC will set aside operations and maintenance funds, as available, for the ongoing management of ROD commitments.

Table 12 ROD Implementation Contracts and Costs					
Fiscal Year	CONTRACT	Task Order	Contractor	Description	Actual Cost
2010	IBM09D0010	IBM10T0022	TRC	Cultural Resources, Site Implementation Plans, Flycatcher Surveys	$258,729.00
2010	IBM09D0010	IBM10T0022	TRC	Cultural Resources, Mod to add Levee Segments	$137,512.00
2011	IBM09D0010	IBM10T0022	TRC	Flycatcher Surveys	$22,426.00
2011	IBM11A0002	IBM11W0020	USFWS	Pilot Restoration	$207,336.00
2011	IBM11A0002	IBM11W0022	USFWS/NFWF/ Audubon	Environmental Water Rights Framework	$390,160.00
2011	IBM11A0002	IBM11W0022	USFWS/NFWF/ Audubon	Environmental Water Rights Framework MOD 2 add irrigation districts	$143,381.00
2010	IBM09D0011	IBM11T0009	MWH	Biological Assessment	$40,845.00
2011	IBM10P0180	NA	Keres	Real Estate Consulting for Bailey and Selden Point Bar Acquisition	$70,535.52
2011	IBM11N0001	NA	Martinez	Selden Point Bar Land Acquisition	$11,072.58
2012	23094201001	NA	Voss Signs	Habitat Restoration Signs	$3,927.70
2012	23094201002	NA	Voss Signs	Habitat Restoration Signs	$2,885.00
2013	IBM11A0002	IBM13W0015	USFWS	Restoration at 4 new sites	$398,303.00
2013	IBM11A0002	IBM11W0022	USFWS/NFWF/ Audubon	Environmental Water Rights Framework, Scope Mod	$138,765.88
2013	IBM09D0012	IBM13T0011	HDR	Groundwater Monitoring Wells	$194,705.77
2013	IBM13A0017	IBM13W0024	USBR	Flycatcher Surveys	$86,504.00
2013	GS-23F-0026T	IBM13F0099	Keres	Real Estate Services for NeMexas and Bailey properties	$62,863.20
2014	IBM09D0012	IBM13T0011	HDR	Groundwater Monitoring Wells Mod4	$20,930.20
2014	IBM09D0012	IBM13T0011	HDR	Groundwater Monitoring Wells Mod5	$4,602.31
2014	IBM09D0011	IBM14T0011	MWH/SWCA	Restoration work for Berino E & Berino W	$321,059.13
2014	IBM09D0006	IBM14T0016	Tetra Tech	Channel Maintenance Alternatives and Sediment Transport Study	$311,562.00
2015	GS-23F-0026T	IBM13F0099	Keres	MOD 004 to investigate access	$26,192.87
2015	GS-23F-0026T	IBM13F0099	Keres	MOD 005 to fix MOD 004	-$16,632.03
2015	IBM13A0017	IBM15W0014	USBR	Flycatcher Surveys	$135,950.00
2015	IBM09D0006	IBM14T0016	Tetra Tech	Channel Maintenance Alternatives and Sediment Transport Study Mod 1	$109,740.00
2016	IBM15D0001	IBM16T0017	Arcadis	Cross Section Surveys	$192,967.09
2016	IBM15D0005	IBM16T0019	GSRC/SWCA	Restoration Sites Jaralosa, Yeso E & W, CCC	$339,601.87
2016	IBM15D0005	IBM16T0019 M001	GSRC	Cultural Work at Yeso West	$43,256.97
2016	IBM15D0003	IBM16T0018	Arcadis	Thurman I and II Design	$226,559.59
2016	IBM09D0012	IBM13T0011	HDR	Latent Defects settlement	-$35,366.00
2017	IBM17P0081	IBM17P0081	EBID	suspended water rights acquisition	$30,729.55
2017	IBM13A0017	IBM17W0020	USBR	Flycatcher and cuckoo Surveys	$137,600.00
2017	IBM15D0006	IBM17T0011	IDEALS	Restoration at Shalem, Vinton, Valley Creek	$432,165.52
2017	IBM15D0006	IBM17T0012	IDEALS	Restoration at Sunland, Anapra, Country Club East	$505,841.45
2017	IBM11A0002	IBM13W0015 M003	USFWS	Restoration Sites	$99,000.00

2017	IBM17C0007		EGC	Groundwater Well Assessment and Rehab	$171,504.94
2018			EBID	2017 Assessment Fee	$3,175.25
2018	IBM17C0007		EGC	MOD 001 to well rehab - Bond Fee	$5,587.60
2018	IBM17C0007		EGC	MOD 002 to well rehab - five additional well rehab	$4,528.08
2018	IBM15D0005	191BWC18F0101	GSRC	Aquatic Habitat Restoration Environmental Planning & Design	$270,760.61
2018	IBM13A0007	191BWC18F0058	EBID	Construction of check structures at CCB and Mesilla E sites	$6,557.90
2018	IBM13A0007	191BWC18F0072	EBID	Construction of check structure at Trujillo	$23,558.55
2018	IBM13A0007	191BWC18F0075	EBID	Construction of check structure at Yeso/Palmer	$15,335.70
2018	IBM15D0006	191BWC18F0103	IDEALS	Environmental Assessment for Continued Implementation of the River Management Plan	$71,956.00
2018	IBM17C0007		EGC	Rehabilitation/Reconstruction of Existing Shallow Groundwater	$26,562.01
2018	IBM15D0006	191BWC18F0105	IDEALS	Compensatory Mitigation for Thurman I and II Sediment Basins	$381,018.00
2018	191BWC18C0006		KIRKLAND Construction	Thurman I and II Construction	$4,853,651.00
2019	IBM11A0002	IBM13W0015 M004	USFWS	MOD for Completion of SOW tasks	$36,175.98
2019	IBM13A0017	191BWC19F0034	USBR	Flycatcher and cuckoo Surveys	$169,784.00
2019	IBM15D0006	IBM17T0011 M002	IDEALS	mastication of vegetation debris	$37,656
2019	IBM15D0006	IBM17T0012 M002	IDEALS	mastication of vegetation debris	$9,862
				Total Obligated or Spent	$11,143,385.79

Table 13 Anticipated Contracts and Costs

Fiscal Year	Contractor	Description	Anticipated Cost
2019	USFWS	Construction Improvements of Habitat Restoration Sites with Endangered Species Habitat	$140,000
2019	City of Las Cruces	Term-limited transfer of water rights	$11,000
2020	To be determined	Design of sediment structures	$400,000
2020	To be determined	Aquatic Habitat Restoration Construction	$700,000
2020	USBR	Cost-share for Annual Flycatcher and Cuckoo Surveys	$80,000
2020	To be determined	Back-up water rights acquisition	TBD

18. Overall ROD Compliance and Future Work

18.1. Overall ROD Compliance

USIBWC has implemented approximately 92% of ROD restoration site overall acreage and 100% of ROD flycatcher acreage. In addition, USIBWC has acquired 21% of ROD water rights.

Table 14 summarizes the key commitments in the ROD and USIBWC's compliance status.

18.2. USIBWC Internal ROD Compliance Meetings

Beginning in February 2016, the USIBWC began coordinating internal ROD Compliance meetings among the various divisions involved in the ROD implementation, U.S. Commissioner Ed Drusina, and the principal engineers in order to discuss pending ROD compliance items and how to meet USIBWC ROD commitments. Additionally, meetings were also held with U.S. Commissioner Jane Harkins in 2019. The following internal meetings were held:

- February 5, 2016
- March 3, 2016
- April 12, 2016
- June 13, 2016
- August 17, 2016
- November 2, 2016
- December 13, 2016
- April 4, 2017
- March 22, 2018
- March 27, 2019

18.3. Future Work

All USIBWC commitments from the ROD have been incorporated into the River Management Plan. Table 14 discuses commitment status for each major ROD commitment. USIBWC commits to the following future work, as funding permits:

1. For restoration sites in New Mexico, completing lease or acquisition of water rights with EBID and/or transfer (and beneficial use) of primary groundwater rights with New Mexico Office of the State Engineer
2. For restoration sites in Texas, completing lease or acquisition of water rights and/or agreement with EPCWID#1 for water rights offsets
3. Evaluation and implementation of aquatic habitat restoration sites
4. Continued implementation of the River Management Plan to continue long-term maintenance and management of ROD actions. Such commitments include:
    a. Maintenance of restoration sites and No Mow Zones

b. Continuation of Reasonable and Prudent Measures in the Biological Opinion and protection measures for listed species
c. Continuation of data collection and monitoring for channel maintenance
d. Implementation of channel maintenance alternatives
e. Continuation of monitoring, assessment, and evaluation of restoration projects and sediment control projects

5. Regular updates of the River Management Plan, as necessary, including to incorporate any decisions from the Environmental Assessments discussed in Sections 6.6 and 17.4, and
6. Continuation of USIBWC's statutory mission within the RGCP, with consideration of ecological and environmental resources for the sustainable management of the river corridor.

18.4. Beyond the ROD timeframe

The USIBWC rolled all ROD commitments into the River Management Plan. USIBWC commits to continuing ongoing management and maintenance in the spirit of the Record of Decision via the River Management Plan.

In anticipation of the expiration of the ROD in June 2019, USIBWC awarded task order 191BWC18F0103 to IDEALS-AGEISS in September 2018 to conduct NEPA analysis on continuing implementation of the River Management Plan. The scoping period for stakeholders was held in November and December 2018. The Environmental Assessment evaluated the No Action, which was that USIBWC would continue implementing the 2016 version and updated 2018 draft of the River Management Plan. Additional alternatives outside of the ROD, or areas that needed additional analysis, were also considered, including new recreational opportunities, additional sediment excavation, construction of sediment control structures, official protection for the restoration sites, and replacing acreage of unsuccessful habitat restoration to new potential areas outside of USIBWC property. The draft EA was completed in May 2019 and posted for public comment during the month of June 2019. The final EA is anticipated in August 2019. Any decisions will be incorporated into a future revision of the River Management Plan. The EA will replace the ROD in its entirety.

Table 14 Summary of ROD Commitments and Overall Compliance				
Item #	Topic	Commitment	Progress	Comments
1.	Grazing Leases	**Ban on issuing new grazing leases and a ban on renewing existing leases that expire during the term of this management plan**	COMPLETE	• Incorporated into River Management Plan
2.	Habitat Restoration	**USIBWC will implement up to 30 habitat restoration sites totaling 553.2 acres**	IN PROGRESS / ONGOING	• 509.2 acres of active restoration on 22 sites • Some sites were expanded in area so there will be less than 30 sites • Aquatic habitat sites - need 44.5 acres of aquatic habitat, pending EA/Design task order
3.		**USIBWC will curtail mowing at the restoration sites on 368 acres**	COMPLETE	• Incorporated into No Mow Zones
4.	No Mow Zones	**Green Zones from 1999 MOU will be made permanent**	COMPLETE / ONGOING	• Requires ongoing maintenance
5.		**USIBWC will implement managed grasslands to replace current mowing on 1,983 acres.**	ONGOING	• Requires ongoing maintenance • Need to finalize No Mow Zones
6.	Environmental Water Transaction Program	**USIBWC will implement a cooperative, voluntary environmental water transactions program with EBID or EPCWID and willing water rights holders to lease or permanently acquire water rights**	IN PROGRESS	• continue talks with EPCWID#1 and possible agreement
7.		**USIBWC will purchase or lease water rights (450 acre feet of offset water and 227 acre feet of supplemental irrigation)**	IN PROGRESS	• USIBWC has acquired 47.36 acres of EBID surface water (143 ac-ft) • Construct groundwater irrigation wells at sites outside of EBID boundaries (Rincon Siphon) • Suspension and transfer agreement with City of Las Cruces for 146 additional acres of EBID surface water rights
8.	Periodic Restoration Flow	**Once every 3 to 10 years, conduct a periodic restoration peak flow for a minimum of 4 days between April 24th and June 7th using an estimated 9,300 ac-ft, if deemed feasible by the irrigation districts and Bureau of Reclamation.**	LIMITED PROGRESS / ON GOING	• Determined unfeasible • Independent studies/analysis (UTEP/MTU Sustainable Water Resources project) • Included as a possibility in RMP for long-term evaluation • Could acquire additional water rights to simulate overbank conditions at other restoration sites
9.	Endangered Species Act Liability	**Implement 12 restoration sites for the endangered Southwestern willow flycatcher totaling 149 acres.**	COMPLETE / ONGOING	• 2017 Biological Opinion has 90 acres minimum (and up to 129 acres) of flycatcher habitat • USIBWC has 12 sites targeting 95 acres
10.	Channel Maintenance	**Evaluate the overall necessity of channel dredging through monitoring and modeling and evaluate channel maintenance through an adaptive management program**	COMPLETE / ONGOING	• 2015 Tetra Tech study complete • Conduct monitoring of Thurman I/II Sediment Basins • Sediment Control Initiative Workgroup
11.		**Establish a channel management data collection and monitoring program to**	COMPLETE / ONGOING	• Incorporated into RMP • Sharepoint established

		support River Management Plan goals.		• Continue interdepartmental coordination for monitoring/analysis
12.		**USIBWC will resurvey the 145 cross sections once every 4 to 5 years and more frequently in local reaches following large flood events**	COMPLETE	• Incorporate cross sections into modeling • Collect in future years as part of ongoing data collection program in RMP
13.	River Management Plan	**Update the 2004 River Management Plan (RMP)**	COMPLETE	• Updated RMP to be finalized 2019 • Continue coordination for RMP implementation
14.	Mitigation Measures	**USIBWC will implement mitigation actions for construction activities presented in Table 1 of the ROD, and mitigation actions for vegetation treatments presented in Table 2 of the ROD**	COMPLETE / ONGOING	• Continue implementation of measures set forth in RMP and construction specs • Continue coordination with O&M on BMPs
15.	Implementation	**USIBWC will adopt an adaptive management strategy for implementation**.	ONGOING	• Continue to monitor progress and evaluate effectiveness of policies and implementation strategies • Modify RMP as needed
16.		**USIBWC will implement the ROD in 10 years**	COMPLETE	• EA to continue long-term management as specified in the RMP • ROD commitments incorporated into RMP
17.		**USIBWC will make 6% of funds available for ROD implementation**	COMPLETE	• Nearly $11 million in funds were made available for priority projects throughout the ROD cycle

18.5. Additional Resources and Contacts

USIBWC has placed documentation such as reports, factsheets, surveys, and other public records completed during the Record of Decision on the USIBWC website:

https://www.ibwc.gov/EMD/Project_Documentation.html

Questions regarding the ROD implementation, this report, or other related activity can be directed to the following points of contact:

- Elizabeth Verdecchia, Natural Resources Specialist, USIBWC Elizabeth.verdecchia@ibwc.gov, 915-832-4701
- Gilbert Anaya, Division Chief, Environmental Management Division, USIBWC Gilbert.Anaya@ibwc.gov, 915-832-4702

Questions regarding the continuing operations and maintenance of the RGCP and the implementation of the River Management Plan may be directed to:

- Daniel Avila, P.E., Principal Engineer, Operations Division, USIBWC Daniel.Avila@ibwc.gov, 915-832-4118

19. REFERENCES

Audubon 2012 — Audubon New Mexico Memorandum to E. Verdecchia: Objectives, Targets and Water Accounting under the Rio Grande Water Transaction Program—Summary and Conclusions. Dated June 30, 2012. Under Work Order No. IBM11W0022.

Blue Earth 2008 — "Final Mesilla Valley Bosque State Park Resource Management Plan." Prepared by Blue Earth Ecological Consultants, Santa Fe, NM. March 2008.

DOJ 2016 — Regulations of the Attorney General Governing the Review and Approval of Title for Federal Land Acquisitions (2016). U.S. Department of Justice Environment and Natural Resources Division Land Acquisition Section. https://www.justice.gov/enrd/page/file/922431/download

EBID 2013 — "Use of Project Water for Native Vegetation Habitat Restoration Sites in Elephant Butte Irrigation District." Engineering Policy, Policy Number 2013-ENG14. June 12, 2013. https://www.ebid-nm.org/policies/policies/2013-ENG14.pdf

EGC 2019 — "Final Well Reconstruction/Rehabilitation Report for USIBWC Groundwater Monitoring Wells Identified in the Well Condition Assessment Report." Prepared for USIBWC by EGC, Inc. under IBM17C0007. April 2019. https://www.ibwc.gov/Files/FINAL_REPORT_USIBWC_Well_Rehab_Reconstruct_Report_IBM17C0007_April2019.pdf

FXSA 2017 — "IBWC Rio Grande Canalization Project (RGCP) Cross Section Survey Surveyor's Report." Prepared for USIBWC by FXSA INC. under contract with Arcadis, under USIBWC Contract IBM15D0001 Task Order IBM16T0017. January 18, 2017

GSA 2019a — "Rio Grande Canalization Project Aquatic Habitat Restoration Site Alternatives and Conceptual Designs." Prepared for: USIBWC and Gulf South Research Corporation Prepared by: GeoSystems Analysis, Albuquerque, NM. April 2019.

GSA 2019b — "Technical Memo: Wetland Delineation Results from Four Proposed Aquatic Habitat Restoration Sites." William Widener and Chad McKenna, Geosystems Analysis, Inc. to GSRC and USIBWC, April 17, 2019.

GSRC/ SWCA 2018 — "Riparian Habitat Restoration at Four Sites in Doña Ana County, New Mexico: Jaralosa, Yeso East, Yeso West, and Crow Canyon C: Final Monitoring Report". Prepared by Gulf South Research Corporation and SWCA Environmental Consultants. Contract # IBM15D0005/TASK ORDER # IBM16T0019. JULY 2018. https://www.ibwc.gov/Files/GSRC_SWCA_FINALMR_Yeso_Jaralosa_CCC_071318.pdf

HDR 2014 — "Groundwater Monitoring Well Installation and Groundwater Level Monitoring Report." Prepared for UISBWC by HDR, Inc. under IBM13T0011. October 2014. https://www.ibwc.gov/EMD/CanalizationWebpage/FINAL_RGCP_Gwater_Well_Report_Oct2014.pdf

IDEALS 2016 — "Biological Survey Report for the Rio Grande Canalization Project." Prepared for USIBWC by IDEALS-AGEISS, LLC. Under Contract number IBM15D0006 Task Order Number IBM16T0016, September 2016.

IDEALS 2017 — "Updated Biological Assessment for Long-Term River Management of the Rio Grande Canalization Project". Prepared for USIBWC by IDEALS-AGEISS, LLC under IBM15D006/IBM16T0016. March 2017. https://www.ibwc.gov/Files/Updated_Biological_Assessment_RGCP_032017.pdf

IDEALS 2019a — Riparian Habitat Restoration at Shalem Colony, Vinton A and B, and Valley Creek Restoration Sites Final Interim Annual Report Oct 2017 to Oct 2018, February 2019 https://www.ibwc.gov/Files/2018_final_interim_annual_report_ShalemVintonVC_020419.pdf

IDEALS 2019b — Riparian Habitat Restoration at Country Club East, Sunland Park, and Anapra Bridge Restoration Sites Final Interim Annual Report Oct 2017 to Oct 2018, February 2019 https://www.ibwc.gov/Files/2018_final_interim_annual_report_CCESunlandAnapra_020419.pdf

NMDGF 2018 — "Mesilla Valley Bosque - Transition Report." New Mexico Department of Game & Fish, May 11, 2018. Prepared by Discovery Exhibits Inc, Santa Fe, NM. http://www.wildlife.state.nm.us/wpfb-file/17-mesilla-valley-bosque-pdf/ Last accessed August 1, 2018

NFWF et al. 2015 — "Rio Grande Canalization Project Environmental Water Transactions Program Final Framework and Program Report." Prepared for the USIBWC in cooperation with the USFWS. Prepared by National Fish and Wildlife Foundation, Mentor Law Group, Audubon New Mexico, Ecosystem Economics, under USFWS Interagency Agreement IBM11A0002 Work Order IBM11W0022. March 13, 2015.

Paramatrix 2008 — "Technical Memo: Canalization Reach - Environmental Flows," dated February 11, 2008 from Todd Caplan from Paramatrix issued to Beth Bardwell with the World Wildlife Fund. https://www.ibwc.gov/EMD/CanalizationWebpage/TechnicalMemo.pdf

Parsons 2003a — "Reformulation of River Management Alternatives for the Rio Grande Canalization Project." Prepared for USIBWC by Parsons under Contract IBM020002, Task Order 3. August 2003.

Parsons 2003b — "Draft Environmental Impact Statement: River Management Alternatives for the Rio Grande Canalization Project." Prepared for USIBWC in cooperation of USBR, by Parsons under Contract IBM020002. December 2003. https://www.ibwc.gov/EMD/RGCP_DEIS/USIBWC_RGCP_DEIS.html

Parsons 2004a — BIOLOGICAL ASSESSMENT: River Management Alternatives for the Rio Grande Canalization Project. Prepared for USIBWC by Parsons under Contract IBM020002, Task Order 3. January 2004. https://www.ibwc.gov/Files/RGCP_BA_final.pdf

Parsons 2004b — "2004 River Management Plan, Rio Grande Canalization Project." Prepared for USIBWC by Parsons. http://www.ibwc.gov/Files/Final_RMP_May2004.pdf.

Parsons 2004c — "Final Environmental Impact Statement: River Management Alternatives for the Rio Grande Canalization Project." United States Section, International Boundary and Water Commission (USIBWC) with cooperation from U.S. Department of Interior Bureau of Reclamation. June 2004. http://www.ibwc.gov/EMD/USIBWC_RGCP_FEIS.html.

Propst & Bixby 2018 — CONSERVING NATIVE RIO GRANDE FISHES IN SOUTHERN NEW MEXICO AND WEST TEXAS: A CONCEPTUAL APPROACH. Funded by the U.S. Bureau of Reclamation, through the Paso del Norte Watershed Council and Texas A&M University. Authors David L. Probst, PhD and Kevin Bixby, M.S. September 2018. http://smiley.nmsu.edu/pdnwc/docs/Conserving%20Native%20Rio%20Grande%20Fishes%20in%20Southern%20NM%20and%20West%20TX.pdf

SWCA 2011a — "Biological Survey of 30 Proposed Restoration Sites Along the Rio Grande Canalization Project Reach Final Report." Prepared for USIBWC by SWCA Environmental Consultants under Contract IBM09D0011, Task Order IBM11T0009. June 2011.

SWCA 2011b — "Final Biological Assessment Integrated Land Management for Long-Term River Management of the Rio Grande Canalization Project." Prepared for USIBWC by SWCA Environmental Consultants in Association with MWH Americas under Contract IBM09D0011, Task Order IBM11T0009. October 2011. https://www.ibwc.gov/EMD/documents/Final_IBWC_RGCP_BA2011.pdf

SWCA 2015 — "Berino East and West Site Restoration Final Monitoring Report." Prepared by SWCA Environmental Consultants for MWH Americas, Inc. and the USIBWC under IBM14T0011. June 2015. https://www.ibwc.gov/Files/Berino_Restoration__Monitoring_Report_06192015.pdf

Tetra Tech 2015 — "Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project: Final Report." Prepared for USIBWC by Tetra Tech under Contract No. IBM09D0006 Task Order No. IBM14T0016. October 2015. https://www.ibwc.gov/Files/RGCP_CMA_Study_Final_10-19-15.pdf

TRC 2010a "Soils Survey Resource Report for Rio Grande Canalization Project River Restoration Implementation Plan." Prepared for USIBWC by TRC Environmental Corporation under Contract IBM09D0010 Task Order IBM10T0022, August 2010. https://www.ibwc.gov/EMD/documents/USIBWC_Soils_Survey.pdf

TRC 2010b "USIBWC Rio Grande Canalization Project River Restoration Depths to Groundwater at Restoration Sites." Prepared for USIBWC by TRC Environmental Corporation under Contract IBM09D0010 Task Order IBM10T0022, October 2010. https://www.ibwc.gov/Files/TRC_RioGrande_GWReport-final_102010.pdf

TRC 2011a "USIBWC Rio Grande Canalization Project River Restoration Implementation Plan: Cultural Resources Management Task." Prepared for USIBWC by TRC under Contract IBM 09D0010 Task Order IBM10T0022. TRC Project Number 176152, NMCRIS Activity No. 119699, March 2011.

TRC 2011b "Site Implementation Plans - Rio Grande Canalization Project River Restoration Implementation Plan." Prepared for USIBWC by TRC Environmental Corporation under Contract IBM09D0010 Task Order IBM10T0022, October 2011. https://www.ibwc.gov/EMD/documents/SiteImplementationPlansReportRevised_FINAL_reducedsizeOct2011_000.pdf

TRC 2011c "Southwestern Willow Flycatcher and Yellow-billed Cuckoo Surveys for 2010 and 2011, Rio Grande Canalization Project River Restoration Implementation Plan." Prepared for USIBWC by TRC Environmental Corporation under Contract IBM09D0010 Task Order IBM10T0022, November 2011.

URS 2018 "Design for the Construction of Channel Maintenance Alternatives within the Rio Grande Canalization Project Doña Ana County, New Mexico Design Summary Report Final Submittal." Prepared by URS for USIBWC under Contract No. IBM15D0003 Order No. IBM16T0018. June 14, 2018.

USACE 2009 "Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande - Caballo Dam to America Dam, New Mexico and Texas". Prepared for USIBWC by US Army Corps of Engineers, Albuquerque District, with Mussetter Engineering Inc and Riada Engineering, Inc., under Memorandum of Understanding IBM 92-21, Individual Work Order No. 31. March 2009. https://www.ibwc.gov/EMD/CanalizationWebpage/RestPlanMarch2009.pdf

USBR 2012 "Southwestern Willow Flycatcher Management Plan for the Rio Grande Project." Bureau of Reclamation Albuquerque Area Office, Albuquerque, NM. Developed in cooperation with the U.S. Fish and Wildlife Service, September 2012.

USFWS 2000 "Flycatcher Recovery Plan Southwestern Willow Flycatcher (*Empidonax traillii extimus*)." Prepared By Southwestern Willow Flycatcher Recovery Team Technical Subgroup For Region 2 U.S. Fish and Wildlife Service Albuquerque, New Mexico. August 2002

USFWS 2011 Proposed Rule. "Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Southwestern Willow Flycatcher." Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17 [Docket No. FWS-R2-ES-2011-0053: MO 92210-0-0009]. Federal Register Vol. 76, No. 157 p.50542. August 15, 2011. https://www.federalregister.gov/documents/2011/08/15/2011-19713/endangered-and-threatened-wildlife-and-plants-designation-of-revised-critical-habitat-for

USFWS 2012a "Rio Grande Habitat Restoration Work Conducted by San Andres National Wildlife Refuge, October, 2009 to Present." San Andres National Wildlife Refuge, 5686 Santa Gertrudis Dr., Las Cruces, New Mexico 88012. May 3, 2012.

USFWS 2012b Proposed Rule. "Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Southwestern Willow Flycatcher." Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17 [Docket No. FWS-R2-ES-2011-0053: 4500030114]. Federal Register Vol. 77, No. 132 p.41147. July 12, 2012. https://www.federalregister.gov/documents/2012/07/12/2012-16990/endangered-and-threatened-wildlife-and-plants-designation-of-revised-critical-habitat-for-the

USFWS 2012c "Final Environmental Assessment for Non-Native Plant Control and Reestablishment of Riparian Habitats Along the Rio Grande River on US International Boundary and Water Commission and Bureau of Land Management Lands". United States Fish and Wildlife Service, San Andres National Wildlife Refuge. Prepared for USIBWC and BLM partially under USIBWC IBM11A0002/IBM11W0020. August 2012. http://www.ibwc.gov/Files/BLM_Final_wAppendices2.pdf.

USFWS 2012d "Biological and Conference Opinion on the Effects of USIBWC Integrated Land Management Alternative for Long-Term Management for RGCP". USFWS New Mexico Ecological Services Field Office. Consultation No. 02ENNM00-2012-F-0016. August 2012. https://www.ibwc.gov/EMD/documents/RGCP_BiolOpin_final_2012.pdf

USFWS 2013a Final Rule. "Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Southwestern Willow Flycatcher." Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17. Docket No. FWS-R2-ES-2011-00534500030114. Federal Register Vol. 78, No. 2 p.344. January 3, 2013. https://www.federalregister.gov/documents/2013/01/03/2012-30634/endangered-and-threatened-wildlife-and-plants-designation-of-critical-habitat-for-southwestern

USFWS 2013b Proposed Rule. "Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Proposed Rule." Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17. Federal Register 61622, Vol. 78, No. 192. October 3, 2013. https://www.federalregister.gov/documents/2013/10/03/2013-23725/endangered-and-threatened-wildlife-and-plants-proposed-threatened-status-for-the-western-distinct

USFWS 2014 Final Rule. "Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Final Rule." Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17. Federal Register 59992, Vol. 79, No. 192. October 3, 2014. https://www.federalregister.gov/documents/2014/10/03/2014-23640/endangered-and-threatened-wildlife-and-plants-determination-of-threatened-status-for-the-western

USFWS 2017 "Final Biological Opinion for U.S. International Boundary and Water Commission Long-Term River Management of the Rio Grande Canalization Project, New Mexico". Consultation # 02ENNM00-2017-F-0367. Cover letter dated November 3, 2017. https://www.ibwc.gov/Files/IBWC_BO_2017_FINAL.pdf

USIBWC 2009 "Record of Decision - River Management Alternatives for the Rio Grande Canalization Project." http://www.ibwc.gov/EMD/CanalizationWebpage/ROD_EIS%20June2009.pdf.

USIBWC 2012 "Horner Farm Land Class II Cultural Survey." Mark L. Howe, Cultural Resources Specialist, USIBWC. September 24, 2012.

USIBWC 2013 "Sediment Excavation Rio Grande below Montoya and Rincon Drains: A White Paper." July 2013.

USIBWC 2016 River Management Plan for the Rio Grande Canalization Project https://www.ibwc.gov/Files/USIBWC_RGCP_River_Management_Plan_FINAL_December_8_2016_reduced.pdf

USIBWC 2017 "Final Environmental Assessment and Finding of No Significant Impact: Channel Maintenance Alternatives at Thurman I and II Arroyos in Hatch, NM, Rio Grande Canalization Project." December 2017. https://www.ibwc.gov/Files/FINAL_Environmental_Assessment_Thurman_120617.pdf

Appendix 1
Photos of Restoration Activities 2011-2019

Trujillo Restoration Site (USFWS)

Willows along the access road at Trujillo, August 2012

The interior of the site is a mix of saltcedar and native brush and grasses, August 2012

Sporadic saltcedar before restoration work begins, October 2012

USFWS begins saltcedar excavation, November 2013, photo credit USFWS.

USFWS conducts chemical treatment of cut saltcedar bushes, November 2013

Site after large stands of saltcedar were excavated, December 2013. USFWS photo credits.

	
Trujillo saltcedar debris piles and remaining stands of native vegetation, May 2014	USIBWC conducting groundwater level monitoring prior to irrigation releases, May 2014
	
Trench planting at Trujillo, March 2016	Depth to water during trenching in March 2016 shows favorable groundwater conditions
	
USFWS monitoring after prescribed burns, March 2016	USFWS monitoring near well #3 March 2016. Area has native shrubs and willows

Willows and cottonwoods from trench plantings during a site visit with EBID, USFWS SANWR, and Audubon to discuss irrigation feasibility, September 2016.

Trench plantings, September 2016

Naturally regenerating willows and native vegetation, along with saltcedar beetle defoliation, Sept 2016

Mature willows at the south end of the site, September 2016.

Native grasses in the northern end of the site, September 2016

After prescribed burns in the central part of the site, September 2016

willows in trenches, Jan 2017

Native shrubs and willows in the background at Well #1 from USFWS monitoring March 21, 2017.

Planted willows along the bank near MW 1. Site visit with USBR May 11, 2017.

From MW 1, looking south at the willows at the lower southern portion, May 2017.

Willows planted along bank (right side) near Trujillo MW 1, May 2017.

EBID constructing a box at Trujillo Lateral in Dec 2018

Site visit of the structure with USFWS and EBID in late December 2018. The structure will allow irrigation of the Trujillo site in 2019.

	
Completed turnout structure, May 2019	Operating the turnout during the irrigation on June 13, 2019
	
USFWS' Tyler Rogers checks out the distribution channel at the north end of the site, June 2019	Water entering the site, June 13 2019
	
Successful water distribution channel constructed by USFWS, June 2019	USFWS follows the irrigation water throughout the site, June 2019

Jaralosa Restoration Site (GSRC/SWCA)

Overview of site from levee, August 2012. The old river meander curve is visible.

Site conditions from monitoring at the site in May 2015.

Site conditions at the start of contractor work, prior to saltcedar removal, February 2017

After saltcedar removal, contractors began excavating swales for planting, February 2017.

Saltcedar was removed on the banks, February 2017

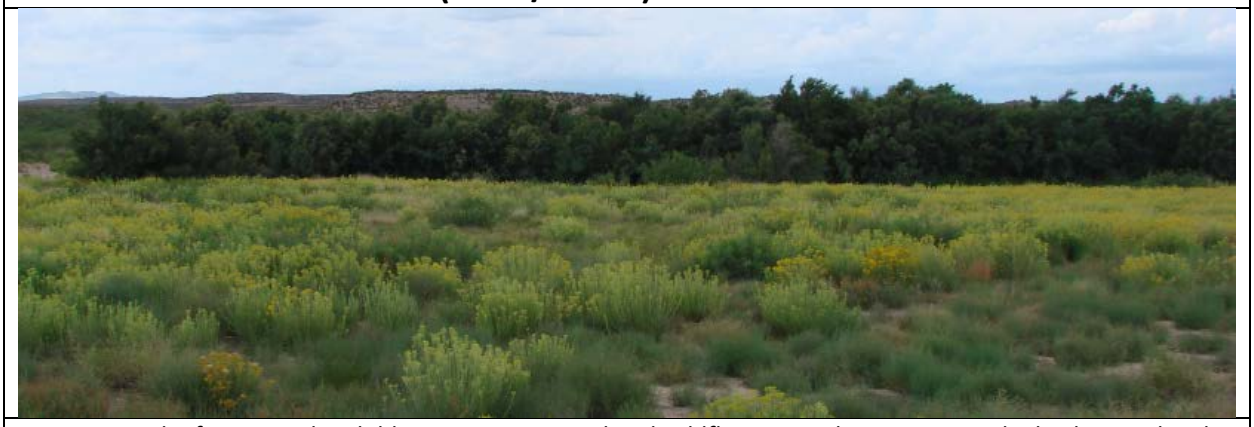
Excavated swale, March 2017.

Overview of site from levee, May 2017. One excavated swale in middle right.

Cottonwood at Jaralosa, December 2018. Jaralosa had fewer plantings than other sites

Longstem shrubs are surviving at this site, Dec 2018.

Yeso West Restoration Site (GSRC/SWCA)



Yeso East in the foreground with blooming arrowweed and wildflowers, and Yeso West in the background with mature saltcedar, August 2012

Southern end of Yeso West before restoration work, September 2016

Saltcedar at the site prior to restoration work, view from landside looking towards river, Jan 2017

Southwern end of Yeso West from Yeso East. Contractors begin saltcedar removal, Feb 2017.

Saltcedar excavation February 2017

Contractor has begun removing a large swath of saltcedar. Contractors/ USIBWC meet to discuss excavation work, Feb 2017

Saltcedar extraction and beginnings of sediment removal at the north end of the site, February 2017

View of the site from Yeso East after saltcedar removal and initial excavation, March 2017.

Saltcedar was matiscated on site at the northern end of the site to prevent erosion from high flows, March 2017

Two inlets were created to allow high flows to enter the site, March 2017

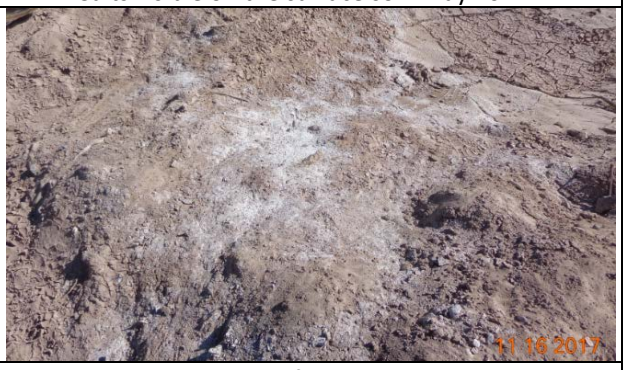
Excavation work includes lowering the inset floodplain by several feet. Contractors hauled away over 5,000 cubic yards of material, March 2017

Plantings in the newly excavated terrace, March 2017

Plantings in the excavated inlet to stabilize the sediment, March 2017

Dense plantings at the southern end of the site, March 2017

From Yeso East, looking towards Yeso West at the excavated inlet channel which is allowing some water to enter the site during normal flows at the beginning of irrigation season. May 2017

	
Cattle are on the site in May 2017, seen from Yeso East.	Water at normal flows entering the inlet at the site. Salts visible on the surface soil. May 2017.
	
Monsoon floods wiped out most of the planted trees, particularly on the north end. November 2017	Salt precipated on the surface, November 2017.
	
Southern end of inset floodplain at Yeso West has native shrubs and some successful pole plantings, May 2018 from opposite bank.	Northern end of inset floodplain has fewer successful poles but more wetland vegetation, May 2018 from opposite bank.
	
Baccharus, wolfberry, and cattails in the northern end, April 2019	Cattails dominate the middle portion of the site, with some willows and baccharus, April 2019.

Yeso East Restoration Site (GSRC/SWCA)

Site conditions at monitoring well #1, May 2015

Irrigation infrastructure adjacent to the site that will allow for easy irrigation, September 2016

Site overview September 2016. Yeso West is in the background

Contractor has started saltcedar removal, Feb 2017

Saltcedar excavation February 2017

Excavated swale, February 2017

Masticator mulching the saltcedar along an old road near the riverbank, March 2017

Cottonwood plantings in an excavated swale, March 2017

Harvested coyote willows, March 2017

Coyote willow plantings March 2017

Plantings in a swale near the river bank, March 2017

Contractor crews planting March 2017.

Cottonwood trees in the northern part of the site are doing exceptionally well, August 2017.

Cottonwoods in the middle and southern swale have mixed success, August 2017.

Contractor conducting shrub planting, September 2017.

Subcontractor grew shrubs in extra tall pots in large PVC tubes and planted in augered holes. Sept 2017

Shrub planting amongst the thriving cottonwoods, September 2017.

Site visit with contractor during monitoring, Nov 2017.

Contractor watering shrubs, November 2017.

View from the irrigation lateral where irrigation water will be delivered to the cottonwood plantings in the background. Taken during a site visit May 2018

Thriving cottonwoods at the north end of Yeso East, May 2018.

Conditions are harsher at the southern end of the site where plantings are not as vibrant but still surviving. May 2018

Blooming desert willow shrub planted in Sept 2017, taken May 2018.

Site visit to the Palmer Lateral to discuss irrigation logistics and turnout structure with USIBWC, USFWS, and EBID, December 2018.

Groundwater monitoring, December 2018. Area near well 2 is devoid of thriving vegetation.

Cottonwoods near well #1 at the northern end of the site, Dec 2018.

First irrigation of Yeso East, June 7, 2019

Irrigation water reaching cottonwoods planted about 700 feet into the site. June 2019

Irrigation of the cottonwoods, June 2019

One week following the irrigation, channel to the trees is still moist. This pictures show the berm constructed to keep the water from going back into the Palmer Lateral. June 2019

	
The earthen ditch that carried the water to the site from the Palmer Lateral, one week after irrigation. June 2019.	Check gate constructed by EBID on the Palmer Lateral used to irrigate the Yeso East site. June 2019

USIBWC Crow Canyon A and B Restoration Sites (USFWS)

Crow Canyon B is a site where the floodplain was previously mowed; since mowing has ceased in 2011, native willows are returning along the bank and have developed into potential flycatcher habitat, June 2012

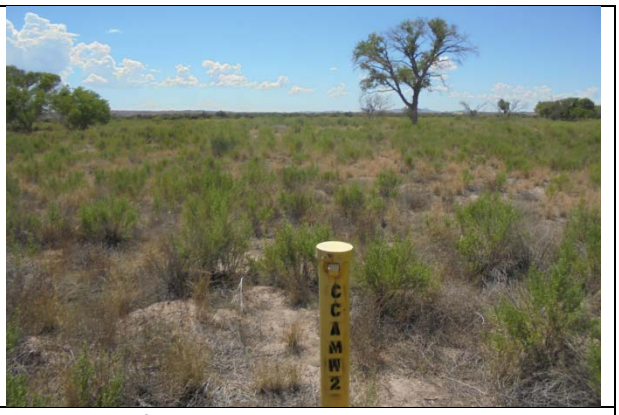
Wetland vegetation, native grasses, and native shrubs and plants have also returned to the area creating a mosaic of habitats, August 2012

Native bulrushes and a planted willow growing along the bank where saltcedar had been treated the previous winter at Crow Canyon B, August 2012

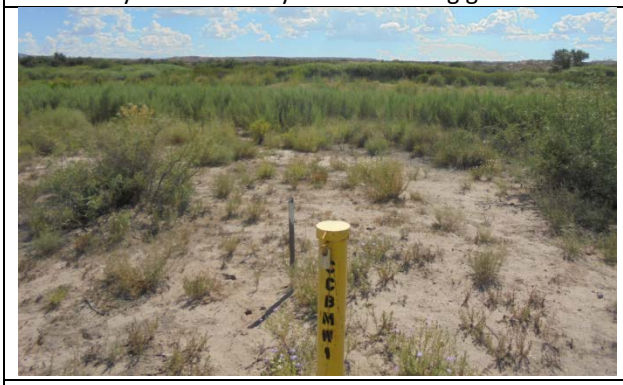
Planted cottonwoods blooming along an old river meander at the Crow Canyon A site, August 2012

Crow Canyon B was hit hard by drought conditions. There are several stands of dead willows, June 2013

Dry floodplain conditions, August 2013



Crow Canyon A site is dry and not having great success. Photos above from September 2015.



Crow Canyon B, September 2015. Willows in the background are thriving, but the uplands in the foreground are suffering in the drier conditions.

A parcel downstream of Crow Canyon B has potential for flycatcher habitat, September 2015

USFWS site monitoring, Crow Canyon A, Mar 2016

USFWS site monitoring, Crow Canyon B, Mar 2016

Crow Canyon B site overview from the levee, March 2017. The willows (background) are making a comeback. This site is slated as a priority site to receive irrigation water.

Crow Canyon B site overview from the levee, May 2017.

Crow Canyon B willows supporting flycatcher territories, and sporadic Gooddings willows planted by USFWS in 2012. Photo from levee, September 2017.

Crow Canyon A native grasses and some willows and native brush. USFWS retreated the saltcedar resprouts in winter 2018. Photo from Levee September 2017

Crow Canyon B site, April 2018. Foreground is dry upland vegetation, background is willows supporting flycatchers. In between is a wetland area with bulrush that is seasonally wet during high flows that back up at the Hatch Siphon.

Site visit with USFWS April 2018 to discuss irrigating Crow Canyon B site. Background are Gooddings willows planted in 2012 that survived the dry years in 2013 and 2014.

	
Check structure at Garfield Lateral to constructed by EBID in April 2018 to irrigate Crow Canyon B site.	Site visit was conducted with USFWS in May 2018 prior to delivery of irrigation water to discuss logistics and see the setup of the piping that USFWS had installed.
	
USFWS installed 12” irrigation piping to deliver the water via pressure against gravity to the site upstream of the Garfield Lateral turnout.	Piping system effectively conveyed water upstream to the site, during the first and only irrigation event in June 2018.
	
The piping system was continued by an earthen V-ditch throughout the site.	Native grasses being irrigated in June 2018.

The connection between the check and he irrigation piping leaked some water, and USFWS fixed the leak the following week. The water was still beneficial to the plantings near the siphon. June 2018

Irrigation water reached USFWS' cottonwood and Gooddings willow plantings throughout the southern portion of Crow Canyon B site.

Irrigation of CCB site, June 7, 2019

USIBWC Crow Canyon C Restoration Sites (GSRC/SWCA)


Crow Canyon C Before restoration work, September 2015.

Crow Canyon C, March 8 2017 (left) and March 21, 2017, after saltcedar excavation.

Crow Canyon C, March 21 2017 during planting.

Site after saltcedar excavation, March 2017.

Saltcedar excavation at CCC, March 2017

New trees were planted both with trenches and augers. March 2017

Pole plantings after the irrigation water was released (left and right), April 2017.

	
Plantings in the middle portion of the site, August 2017.	Southern portion had highest success and is filling in with native shrubs and trees. Aug 2017
	
USIBWC contractor planted longstem shrubs in September 2017.	Overview of middle section of site and plantings. September 2017.
	
Successful new plantings, September 2017	Crow Canyon C Site, particularly the southern portion, has the potential to be flycatcher habitat. Sept 2017.

Plantings are doing well, November 2017.

Coyote willow plantings along the bank where saltcedar was excavated. November 2017

Buds on plantings from 2017. March 2018.

Groundwater monitoring well being redrilled using a track mounted geoprobe to limit disturbance to plantings. March 2018

Crow Canyon C plantings starting to bloom, April 2018.

Pole plantings in the central part of the site, April 2018.

Trench-planted willows in the southern portion of the site are thriving, May 2018

Pole plantings in the central portion of the site, June 2018

Longstem shrubs planted in fall of 2017, during site visit June 2018

Trench-planted willows along the banks, December 2018. At this location, the river still has ponded and slow-moving water during this non-irrigation season.

Groundwater monitoring December 2018.

Rincon Siphon A through D Restoration Sites (USFWS)

Saltcedar and native willows on the banks of Rincon Siphon restoration site, August 2012.

The new Rincon Siphon D site is thin linear site in the narrow floodplain across the river from the other parcels, August 2012. This site has been mowed for many years until 2013.

The interior of Rincon Siphon has a mix of saltcedar and native vegetation, October 2012

Mature stand of native willows at Rincon Siphon C, approximately where flycatchers are nesting, October 2012.

USFWS began removing sporadic saltcedar, January 2014

	
The northern part of Rincon Siphon B was an old agricultural lease left fallow for close to a decade, and is now a mesquite forest, May 2013	Groundwater monitoring near Rincon Siphon B, May 2013
	
Rincon Siphon site at monitoring well RS-MW-4 is thriving with native grasses, May 2015	Saltcedar piles at Rincon Siphon C near the railroad bridge, March 2016
	
Site visit at Rincon Siphon with USFWS Regional staff, March 2016	John Gahr from USFWS stands in the dry riverbed between Rincon Siphon C and D sites, March 2016.

Site visit with EBID, Audubon, and USFWS to discuss irrigation at Rincon Siphon C, September 2016

Willows near the river at Rincon C, September 2016

USFWS prescribed burns at Rincon Siphon C, September 2016

Native grasses and mesquite at Rincon Siphon D in March 2017, where groundwater levels are shallow and USFWS planted Goodings willows and cottonwoods in the last week of March 2017

Brush fire at Rincon Siphon C site, December 2017 which appeared to kill the recent plantings.

Trench plantings done by USFWS in winter 2018 at Rincon Siphon D, taken April 2018.

Shrub plantings at Rincon Siphon D, April 2018.

Garcia Arroyo delta, April 2018 from the opposite bank. Site visit with USFWS and USIBWC to discuss removal of this island which is deflecting flows towards the railroad bridge on the opposite bank. Flycathers are routinely nesting near this area.

USIBWC contractor IDEALS removed willows from the Garcia island at Rincon Siphon C and transplanted to Rincon Siphon D. IDEALS biologists flagged flycatcher territories and contractors avoided the area with nests. February 2019.

	
Groundwater monitoring at RS-MW-4, December 2018, prior to additional work by USFWS and contractors	Multiple rows of trench plantings were done by USIBWC contractors in January by extracting willows from nearby islands and transplanting at Rincon Siphon D. Taken Feb 2019.
	
Brushfire at Rincon Siphon D at well 4 likely killed the shrubs that USFWS had planted. Taken Feb 2019.	Trench plantings along the bank at Rincon Siphon D, Feb 2019. USIBWC contractors planted about 20,000 willows at this site in January 2019 from island extraction.

USFWS saltcedar extraction at Rincon Siphon A, September 2018. Photo USFWS.

Piles from saltcedar removal at Rincon Siphon A and B by USFWS in winter 2018. Feb 2019

Coyote willow trench plantings at Rincon Siphon A by USFWS and ACE crew. Feb 2019

Piles from saltcedar removal at Rincon Siphon A and B by USFWS in winter 2018. Feb 2019

Coyote willow trench plantings at Rincon Siphon A by USFWS and ACE crew. Feb 2019.

Trench plantings at Rincon Siphon A, Feb 2019.

Trench plantings at Rincon Siphon A, Feb 2019.

USFWS and ACE crew planting willows, February 2019. Photo USFWS

USIBWC Broad Canyon Arroyo Restoration Site (USFWS)

Dense monotypic non-native salt cedar stands in summer of 2011

20 acres of saltcedar were removed with an excavator in spring 2012

Monotypic saltcedar was removed with an excavator March 2012

Debris was placed into piles so the material would dry out to prepare for prescribed burns.

Dry debris piles were burned by a burn team in January 2013

Several weeks later the burns had cooled and the ground was ready for planting, and cottonwood poles were planted in low drainage areas, February 2013

Coyote willow and Gooddings willow poles were planted by the river using an 8 foot auger in February 2013.

Coyote willow and Gooddings willow poles beginning to bloom in the summers of 2012 and 2013, along with native riparian vegetation.

Gooddings willow and cottonwood poles along the northern lower terraces, May 5, 2014

Willows along the southern lower terraces are blooming, May 21, 2014

Willows blooming along the bank, as well as seep willow and other native shrubs beginning to outcompete nonnative weeds, August 2014

Lowering the floodplain to create a larger lower terrace to plant willows for flycatcher habitat, October 2014

Poles harvested for planting at Broad Canyon and stored at Broad Canyon Ranch, December 2014

USFWS begins to plant willows on the new terrace in the northern section of Broad Canyon site, Feb 2015.

Dense willows on the lower terraces of Broad Canyon Arroyo are doing well, October 2015

willows and cottonwoods on the new terrace on the northern part of the site are having mixed success October 2015

Willows on the lower terrace, May 2015 (left); view of the northern upper terrace October 2015 (right).

USFWS harvesting willows near Broad Canyon February 2016

Storing clean poles at Broad Canyon Ranch February 2016

Willows on the lower terrace, September 2016

Willows along the southern lower terrace, Jan 2017

Saltcedar removal along Broad Canyon arroyo, Jan 2017.

Willows along the northern portion of the lower terrace, which was expanded a couple years ago, Jan 2017.

USFWS seeding native seeds in the upper northern terrace, May 2017

In winter of 2017, USFWS planted thousands of willows behind the berm by the arroyo. May 2017

	
Pole plantings next to Broad Canyon Arroyo with fences to protect from beavers, May 2017	Site visit with USFWS, US Bureau of Reclamation staff from Denver and Albuquerque, May 2017
	
Willows along lower terrace, May 2017, during a site visit with USBR and USFWS.	Due to beaver herbivory at this site, USFWS included wire cages around the trees.
	
Grass was seeded on the upper terrace in the norther portion, with willows in the lower terrace, May 2017	Willows along the southern lower terrace along the river, May 2017.

Willow plantings on the lower terrace on the northern end of the site, June 2018.

Willow plantings on the lower terrace at the central part of the site at well 1, June 2018. Liz is standing at well 1 for height reference. Trees are thriving.

Trench plantings along the Broad Canyon Arroyo, June 2018.

Patch of Gooddings willows and cottonwoods at the base of the Broad Canyon Arroyo that did not survive, possibly due to long inundation during 2018, or from high salt content on this terrace. Taken June 2018. USIBWC is considering excavating here for a potential aquatic habitat area.

Further up the Broad Canyon Arroyo, Gooddings willows and cottonwood plantings had higher success rates. Taken June 2018.

	
Wetland habitat along the arroyo. June 2018	Successful Gooddings willing plantings along the arroyo, June 2018.
	
Reconstructed well #2 at the north end of the site, during groundwater monitoring November 2018.	Cottonwoods along the Broad Canyon Arroyo, Nov 2018.

Selden Point Bar Restoration Site (USFWS)

Saltcedar in the interior of Seldon Point Bar, summer 2011

Saltcedar along the bank, August 2012

Selden Point Bar saltcedar on bank, October 2012

Willows on bank, October 2012

USFWS begins saltcedar excavation, February 2014, photo credit USFWS

Saltcedar piles March 2014

	
Monitoring groundwater levels at the new Selden Point Bar wells with contractor, May 21, 2014	Saltcedar piles from across the river, May 2014.
	
Prescribed burns at Selden Point Bar May 2015	Trench planting February 2016
	
Coyote and Gooddings willows planted at Selden Point Bar, February 2016	Site visit with USFWS Regional staff to discuss long-term management of the restoration sites, March 2016

Coyote and Gooddings willows planted at Selden Point Bar, February 2016

Site visit with USFWS Regional staff to discuss long-term management of the restoration sites, Mar 2016

Willow plantings along the bank at Selden in the background, photo taken from the opposite bank, Sept. 2016.

Willows along the bank at Selden in the background, photo taken from the opposite bank, January 2017.

Native willows along the bank at Selden Point Bar, May 2017. No work was done at this site in 2017-2018.

Selden Point Bar from the opposite bank, June 2018.

Unsuccessful pole planting in the northern end of Selden Point Bar, November 2018. Few plantings are surviving in the north end.

Salt concentrations on the surface near the river, and saltcedar regrowth. Nov 2018.

	
Salt concentrations on the soil surface, Nov 2018.	During groundwater monitoring, November 2018. Sparsely vegetated at well 2 area.
	
Burn scar from the prescribed burn several years back, Nov 2018.	Unsuccessful trench plantings from winter 2016, Nov 2018.
	
Patches of wetland vegetation (bullrush and cattails) throughout the site, Nov 2018. Selden Point Bar is now being considered as a conceptual aquatic habitat enhancement site.	Large cattail patch at northern end of site. Nove 2018

	
New monitoring well being redrilled at northern boundary of site, Nov 2018.	Baccharus patch, Nov 2018.

Shalem Colony Restoration Site (Contractor IDEALS)

Shalem Colony prior to restoration work, April 2017

Shalem Colony prior to restoration work, April 2017

Shalem Colony prior to restoration work, August 2017. Site is a mesquite forest with some saltcedar, here impacted by saltcedar beetles. Contractor will remove saltcedar and have minimal plantings at this site.

Mesquite forest visible after saltcedar was removed by USIBWC contractors. Feb 2019.

Shalem Colony site has a mix of mesquites, native shrubs, and willow patches. Minimal plantings are scheduled for this site. Feb 2019.

Leasburg Extension Lateral Wasteway #8 Restoration Site (USFWS)

Small stands of saltcedar were removed on 100 acres at the Mesilla East and Leasburg Extension Lateral Wasteway #8 Restoration Sites in winter of 2012 using excavators (left) and skid steers with a forestry attachment (right).

Small saltcedar sprouts were treated with herbicide using the basal bark method (left), and saltcedar mulched with the forestry attachment was also treated (right).

Large saltcedars which were mixed with native willows along the riverbanks were selectively removed with a chainsaw and treated with aquatic-safe herbicide in winter 2012 and 2013 (left); isolated saltcedar bushes near native vegetation stands were also selectively cut with a chainsaw and treated with herbicide (right).

	
Budding Cottonwood pole and native saltgrass, May 2012	Planting dense willows for flycatcher habitat, February 2013
	
USFWS and USIBWC staff install Environmental Stewardship Program signs, August 2012	Gooddings Willows July 2012. Mowing ceased at this site in 2011, and native plants and grasses are returning
	
Willows and cottonwoods May 21, 2014 just before irrigation releases in the Rio Grande and before site irrigation	Trees during June 30, 2014 historic irrigation of the site. The river had had about one month of flows and trees were beginning to bloom.

Trees in early September 2014 after two irrigation events. Site has native grasses and shrubs in the understory

Newly planted trees in February 2015 which will benefit from irrigation releases in the summer

Dormant trees in the irrigated area, March 2015

Site visit with USFWS to discuss monitoring protocol, March 2015

Newly planted coyote willows March 2015

Irrigation on June 8, 2015

Second irrigation on July 23, 2015

Cottonwoods and willows at monitoring well LE-MW-2 (left) and (right). October 2015.

At monitoring well LE-MW-1, october 2015

USFWS measures groundwater levels at the monitoring at the north end of the site, March 2016

Site tour with USFWS and Rio Grande Citizens Forum Board members, May 2016.

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>EBID hydrologist collects flow data to estimate water deliveries, June 2016</td><td>USIBWC and USFWS monitor the irrigation event, June 2016</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Cottonwoods near monitoring well #2, June 2016</td><td>Cottonwoods and willows planted in 2011, June 2016.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Site during the second irrigation event of the season, August 2016</td></tr>
</table>

Site visit with staff from Senator Heinrich's office and USIBWC, April 2017.

EBID constructed a new turnout structure at WW 8 for USIBWC to irrigate this site. April 2017.

USBR staff was impressed with the willow shoots throughout the site and felt it had the potential to fill in very densely in a few years. May 2017.

Cottonwoods, Gooddings, and coyote willow are thriving at this site. May 2017

Cottonwood trees near monitoring well LEL-MW-1, on a site visit with USBR May 2017.

Irrigation event, May 2017.

Irrigation event, May 2017, at LEL-MW-2.

New turnout structure breached and irrigation had to stop. May 2017. Turnout was repaired by EBID in the following month.

Second irrigation event, August 2017.

Trees at this site are thriving. August 2017.

Young willows, August 2017.

Trees by LEL-MW-1 during third irrigation event, September 2017.

Site visit December 2017 to assess damage from a fire that occurred in October or November 2017.

	
Trench planting by USFWS, December 2017.	USFWS planting shrubs, January 2018.
	
Shrubs were planted as long stems about 2-3 feet deep. January 2018	USFWS watered the shrubs after planting.
	
Site visit in April 2018 to assess damage from fires. Trees recovering somewhat from fire damage, April 2018.	Some trees appear to have died during the fire, April 2018.

Some areas have trees sprouting from their bases, April 2018.

Shrubs are doing well, April 2018.

Trees at MW-1 had minimal or no fire damage. April 2018

Some affected Gooddings willows are showing signs of recovery, April 2018.

In this area, the individual trees appear to have died but many trees sprouts are coming up inbetween the planted trees. April 2018

Cottonwoods at well 1, June 2018.

Gooddings willos and cottonwoods at well 1, June 2018.

Irrigation event June 6, 2018.

Shrub plantings receiving irrigation water, June 2018.

Habitat recovering from the Nov 2017 fire.

USFWS and USIBWC check out the new pipe connection to the new irrigated cell, June 2018

USFWS prepare to fix gopher holes in the irrigation berm to prevent leaks, June 2018

KFox local tv media crew interview Tyler from USFWS on the restoration site activities during the June 2018 irrigation.

EBID taking flow measurements during the July 2018 irrigation event.

Second irrigation event of 2018, during July. New USFWS trench plantings on the permiter of the berm.

Trees at well 2, July 2018.

Water entering the second irrigation cell via the RCP, July 2018

Second cell irrigated for the first time in 2018. New plantings done by USFWS include shrubs and Gooddings willows. July 2018.

New Gooddings willow plantings in the second cell, July 2018.

Three-leaf sumac shrub being irrigated in the second cell, July 2018.

Trees in the center of the irrigation berm being flooded, July 2018.

EBID turnout structure being closed after the irrigation is complete, July 2018.

Panoramic view of trees at well 1.

New well 4 drilled outside of the tree planting area to avoid damage to the well. Feb 2019

Willow offshoots throughout the site, Feb 2019.

Mesilla East Restoration Site (USFWS)

Screwbean mesquite and willows, July 2012

Closeup of cottonwood pole, July 2012

Planted poles in the southern portion of the site, July 2012

Willows along bank and planted willows at the northern end of the site near the Calle del Norte Bridge, September 2012

USFWS and USIBWC staff plant poles, February 2013

Native grasses at Mesilla East during USFWS monitoring, Sept 2015

	
At MW 3, September 2016	At MW 2, September 2016
	
USFWS monitoring at well #3 shows willows on the bank. Plantings need irrigation water, March 2017	USFWS monitoring at well #2 shows willows on the bank, March 2017
	
Site visit with USFWS to discuss logistics of irrigating Mesilla East site. This is an overview of the site form the levee, October 2017.	Irrigation will be done via the Californa Wasteway #13 at the southern end of the site, pumped upstream in pipes against gravity and irrigated via valves. Oct 2017

Plantings at the southern end of the site, October 2017.

USFWS installing irrigation piping system at Mesilla East, May 2018.

USIBWC's gator pump and tractor enabled Mesilla East site to be irrigated from the California Lateral, June 2018

USFWS reads the meter during the June 2018 irrigation

Mesilla East middle irrigation cell with Gooddings willow plantings in the foreground, June 2018

T-pipe connection to second irrigation cell, June 2018

V-ditch outlining the permiter of the site to prevent irrigation water from flowing into the river, June 2018

Gooddings willows planted in 2012 receiving irrigation water, July 2018.

Shrub plantings from the previous winter, July 2019.

Cottonwoods at well 2, November 2018

New well #1, Nov 2018

Irrigated area at southern end of site, Nov 2018.

Mesilla Valley Bosque State Park Restoration Site (USFWS/NMSU)

Willows along the bank at Mesilla Valley Bosque State Park, looking from opposite bank, July 2012

NNMSU students planting trees using Dutch technology on USIBWC tract of Mesilla Valley Bosque, May 2014

Most shrubs planted by NMSU using Dutch technology had little success. March 2016

Area of tree and shrub plantings by NMSU. March 2016

	
Old mitigation bank within the park is a potential flycatcher area. March 2016	USFWS installed gravel along the old trail within the park. March 2016
	
Site visit with USFWS and NMDGF to discuss restoration, October 2017.	Trail on USIBWC property that USFWS put gravel down in 2015. Trail could use maintenance. Oct 2017.
	
Trees and shrubs planted by NMSU on USIBWC property, through USFWS and the State Park, had high mortality. NMSU was researching a Dutch technology for arid planting pots. October 2018	Old mitigation bank was discussed as a possible area for restoration. October 2017

Old mitigation bank near visitor's center, during a site visit with USIBWC contractors and EBID to discuss aquatic habitat and restoration possibilities at the park, Feb 2019.

View from the riverbank looking toward the park. Discussion of creating a connection from the river to Picacho Drain through here. Feb 2019.

Discussion with EBID to create a connection from the river here to Picacho Drain, Feb 2019.

Berino East Restoration Site (Contractors MWH/SWCA/Restoration Solutions)

Sporadic saltcedar, some native grass, and willows along the bank, November 2012

Restoration site sign installation January 2015

Sporadic saltcedar was excavated in January 2015

Contractors excavated sediment to create swales to plant willows where groundwater conditions were favorable, February 2015

Contractors discovered that Berino East had highly variable groundwater levels. Here, willows are planted in a trench but groundwater was not found for about fourteen feet below the surface, February 2015

Contractors excavated trenches for willow planting, February 2015

Saltcedar removed and mulched, and longstem shrubs planted at Berino East, April 2015

Willows in a swale, Berino East June 2015

Longstem shrubs exhibited high rates of mortality after the second season, May 2016

Successful techniques to increase density coverage included multiple poles per auger hole and lopping poles to sprout from the ground, May 2016.

Swales of plantings at Berino East, May 2016 (left and right).

Contractors redrilled groundwater monitoring well that was obstructed at Berino East, March 2018.

Willows and cottonwoods thriving inside an excavated swale at Berino East, July 2018.

Successful plantings at Berino East, July 2018.

Successful plantings at Berino East, November 2018.

New well #1 at Berino East, November 2018. Conducting groundwater monitoring.

Berino West Restoration Site (Contractors MWH/SWCA/Restoration Solutions)

Site conditions at Berino West show sporadic saltcedar, along with lots of mesquite in the floodplain and more saltcedar along the bank than Berino East, with few willows, November 2012

Saltcedar along the bank and four wheel drive road by the river, November 2012

Contractor from HDR conducts groundwater monitoring, September 2013

site conditions May 2014

Saltcedar excavation, January 2015

Extracted saltcedar was masticated on site to provide organic material, and was spread on compacted or disturbed areas, such as on the old four wheel drive road by the river, February 2015

Saltcedar was removed from the bank and here the first of longstem shrubs were planted, February 2015

Contractors plant longstem riparian shrubs, February 2015

Longstem shrubs included baccharus, fourwing saltbush, and three leaf sumac, February 2015

Willow poles were stored in the riverbed in a pond of water from the upstream Vado wastewater treatment plant, February 2015

Contractors planted dense coyote willows in an old abandoned irrigation ditch via trench planting, February 2015 (left and right).

Contractors used an auger to plant sporadic poles where conditions were apt, February 2015

Willow poles were planted along the bank in areas where there was little or no rip rap

Newly planted willows along the bank at Berino West, June 2015

willows planted with trench planting in an excavated swale at Berino West, June 2015

Plantings within the site, native brush, and saltcedar resprouts, May 2017

Planted willows along the bank, May 2017

Berino West has roads throughout that contractors attempted to prevent use with large mulch, but the roads are continued to be used. May 2017.

Rows of trench plantings at Berino West are doing well, May 2017. Site visit with USBR.

Berino West, March 2018. In the background are the planted willows from 2015 that are doing well. Site could be enhanced with additional plantings.

Drilling new well at Berino West, Nov 2018.

Successful plantings at Berino West, November 2018.

Vinton A and B (Contractor IDEALS)

Vinton A during groundwater monitoring, March 2017. Site has mixed areas of native grasses, saltcedar, and mesquite.

USIBWC contractors using chainsaws to selectively remove saltcedar in between large mesquite bushes at Vinton A. Contractor wanted to minimize disturbance to native grasses and shrubs. March 2018

USIBWC well contractor EGC is rehabbing well at Vinton B and retrieving the sonde from the well, March 2018.

Vinton A has dense thickets of brush, March 2018.

IDEALS crews are mulching saltcedar on site at Vinton B, March 2018.

Chainsaw crews are slowly working through the 35 acres at Vinton A and B removing saltcedar, March 2018.

Coyote willows transplanted from nearby islands, March 2018.

Piles of saltcedar debris along the levee road will later be hauled off. March 2018.

Contractor pole storage at Vinton B, February 2019

Shrub planting, November 2018.

Shrub planting, November 2018.

IDEALS crew watering shrubs, November 2018.

	
Cottonwood and Gooddings willow pole plantings, February 2019.	Trench planting of coyote willows harvested from nearby islands, February 2019.

Valley Creek (Contractor IDEALS)

UTEP students and professor conduct water monitoring November 2017.

Minimal saltcedar removal was done on the river banks. January 2018

Contractors transplanted willows from nearby islands in late February. Here in April 2018 they are blooming.

Planting cottonwoods in trenches, April 2018

Teams of equipment operators planting cottonwoods and Gooddings in clusters along the recreational path, using both auger and trench methods, April 2018. This site is a park maintained by City of El Paso.

The plantings will enhance recreational activities at this site as well as provide for habitat. April 2018

USIBWC contractors conduct biological monitoring, May 2018. Here they check out the success of the transplanted coyote willows, which appear to have near 100% success.

Valley Creek had pole plantings throughout the recreation area, with mixed results. May 2018.

Cottonwood plantings at Valley Creek had mixed success, June 2018.

	
USIBWC contractors conduct grass seeding in disturbed areas, August 2018.	Shrubs planted at Valley Creek, October 2018.
	
Tree plantings along the trail are starting to bloom, April 2019	Surviving shrub plantings around the bench seats, April 2019

Country Club East Restoration Site

At well 1 July 2015

At well 2 July 2015

Near well 1, May 2016

At Well 2 May 2016

In May 2017, USIBWC visited the Country Club East site with USBR before restoration work. Site had mixed natives and nonatives. Saltcedar beetle damage is visible on young saltcedar.

Native grasses are dominant here, taken during groundwater monitoring November 2017, before restoration work began.

Site during IDEALS saltcedar removal activities, January 2018.

IDEALS has marked the locations of swales to be excavated, January 2018.

IDEALS crews harvest coyote willows from a nearby island, February 2018.

IDEALS crews transport the harvested willows, including root and entire tree, up the bank to the site. Feb 2018

Harvested willows are transplanted in trenches along the bank of the restoration site, Feb 2018.

Heavy equipment crews transplanting harvested willows, February 2018.

Two weeks after transplanting the willows, IDEALS continues to water the transplants to ensure their survival. February 2018.

Willows are resprouting naturally along either side of the river trail, showing conditions are favorable here. Feb 2018.

USIBWC well contractor EGC redrilling well at Country Club East, February 2018.

IDEALS begins excavation of swales at the site, March 2018.

	
Excavation of large swales continues, March 2018.	Monitoring water level at one of the four bank cuts just after irrigation releases, March 21, 2018.
	
IDEALS prepares to plant cottonwood poles, March 2018.	Cottonwood poles planted within an excavated swale, April 2018.
	
IDEALS crews planting cottonwoods and Gooddings in the excavated swales with trenches, April 2018.	Female cottonwood blooms, April 2018. USIBWC and its contractors hope the late planting will still be successful due to earlier irrigation releases and favorable groundwater conditions.

Transplanted salvaged willows are blooming, April 2018

Monitoring water levels at another bank cut, April 2018.

USIBWC Contractors conduct monitoring of the Country Club East site, May 2018.

Cottonwood plantings inside the excavated swale, May 2018.

Pole plantings outside the swales have high mortality rates, May 2018.

Stressed or dead poles, June 2018.

	
Gages installed at each of the four bank cuts that for monitoring water levels at the bank cuts. July 2018	Pole plantings have mixed success, August 2018
	
Excavated swale collected rainwater, August 2018	Cottonwoods in an excavated swale, August 2018.
	
Saltcedar debris piles are still remaining to be removed, August 2018.	Some poles were damaged by recreationists or maintenance crews. September 2018

	
Country Club East native grasses and successful poles, September 2018.	Contractor planted 10-20 potted trees (Ash and desert willow) at each site. October 2018

Sunland Park Restoration Site

Site conditions May 2014

Monitoring at well #3, April 2015

Native grasses and mature saltcedar, January 2017

Stakeholders and USFWS tour the restoration sites, January 2017

Mature saltcedar and mesquite, May 2017

Cottonwood with mistletoe, May 2017

Russian olive, May 2017

Native willows along riverbank, May 2017

Existing flycatcher habitat along river bank, May 2017

Sunland Park restoration site, May 2017 prior to restoration work.

Areas of large saltcedars throughout the site would later be removed by USIBWC contractors. May 2017.

USIBWC contractors removed the large mature saltcedar first by cutting the bush/tree with chainsaws and then extracting the root with an excavator. January 2018

	
Native mesquite remains between the saltcedar removed, January 2018.	Contractors harvested willows from large islands in the river below Racetrack Drive, February 2018.
	
Crews transplant willows from islands at Sunland Park site in the flycatcher targeted ara, Feb 2018.	Media coverage on the island salvage efforts, and restoration work in Sunland Park, Feb. 2018.
	
IDEALS crews planting cottonwood poles, March 2018	IDEALS storing cottonwood poles on site, March 2018.

	
Cottonwood poles planted 2 weeks prior are blooming, April 2018	This is an area where IDEALS transplanted island willows into numerous trenches to create dense riparian habitat. Transplanted willows are suriving well. Here, IDEALS crews fills in the coyote willow area with Goodddings willow poles. April 2018
	
Goodings willow poles fill in another area of trenched transplants of island coyote willows. April 2018	Goodings willows and transplanted coyote willows. April 2018
	
IDEALS continued to plant Gooddings willow and cottonwood poles into the third and fourth week	Cottonwoods planted throughout site, April 2018.

of April 2018, later than USIBWC has ever planted. Temperatures are high but contractors are optimistic that favorable water conditions will help their survival.	
	
Transplanted willows and poles are blooming in late April 2018.	Planting poles in the flycatcher area, April 2018.
	
IDEALS fills in open areas near the river banks with Gooddings willows for flycatcher habitat. April 2018	
	
Contractor reported a fire occurred at Sunland Park site in July 2018. Some damage to mature cottonwoods.	Sunland Park had high mortality of cottonwood plantings. August 2018.

	
Gooddings willow poles had higher success rates at the Sunland Park site, August 2018.	Flycatcher habitat area with successful Gooddings willows and successful transplants of coyote willows. August 2018

Anapra Bridge Restoration Site

Site conditions at Well 2 May 2014

Hike and bike trail at Anapra, May 2014

Site conditions at Well 2 August 2015. Native willows in the background

Site conditions at Well 1 May 2016

Groundwater monitoring in November 2017, before restoration work begins. This site is along a recreational trail and is leased to the City of Sunland Park, who has not mowed the site in several years. The City has also planted numerous trees over the years, with mixed success.

Some areas of the site have precipated salt on the surface which will limit restoration potential. November 2017

	
Contractors EGC conduct well assessment, November 2018.	Site visit with IDEALS to discuss island salvage, January 2018. On the right is an island below Sunland Park Drive; on the left is the river bank at the Anapra site.
	
Island harvesting at Sunland Park, January 2018	Transporting the entire coyote willows that are harvested, including root and stems, with a front end loader. January 2018
	
Willows are transplanted into excavated trenches which hit the groundwater table. At Anapra, this was about seven feet below surface. January 2018.	Entire willows including roots are dropped into the excavated trenches for transplanting, January 2018.

	
Trenches are filled in and the transplanted willows have dense cover. January 2018	Contractors EGC and their subcontractors conducting well rehab by removing sand obstruction in AB-MW-2, February 2018.
	
USIBWC crews removing island sediment after IDEALS salvaged the vegetation. February 2018	Pole plantings are budding, April 2018
	
Transplanted willows on the bank north of Sunland Park bridge, April 2018.	Pole plantings along the trail, April 2018.

	
Saltcedar beetle documented on site, August 2018	USIBWC contractors conduct biological monitoring of the site and evaluate survival rate and vigor of plantings, August 2018.
	
Plantings along the trail have mixed results, August 2018	Unsuccessful cottonwood pole, August 2018

Other Project Implementation

In 2013 and 2014, USIBWC contractors constructed 55 groundwater monitoring wells at restoration sites throughout the Rio Grande Canalization Project. Here, contractors cap a well at Mesilla East June 2013

Contractors train USIBWC on groundwater monitoring and sonde data retrieval at the same site, June 2013

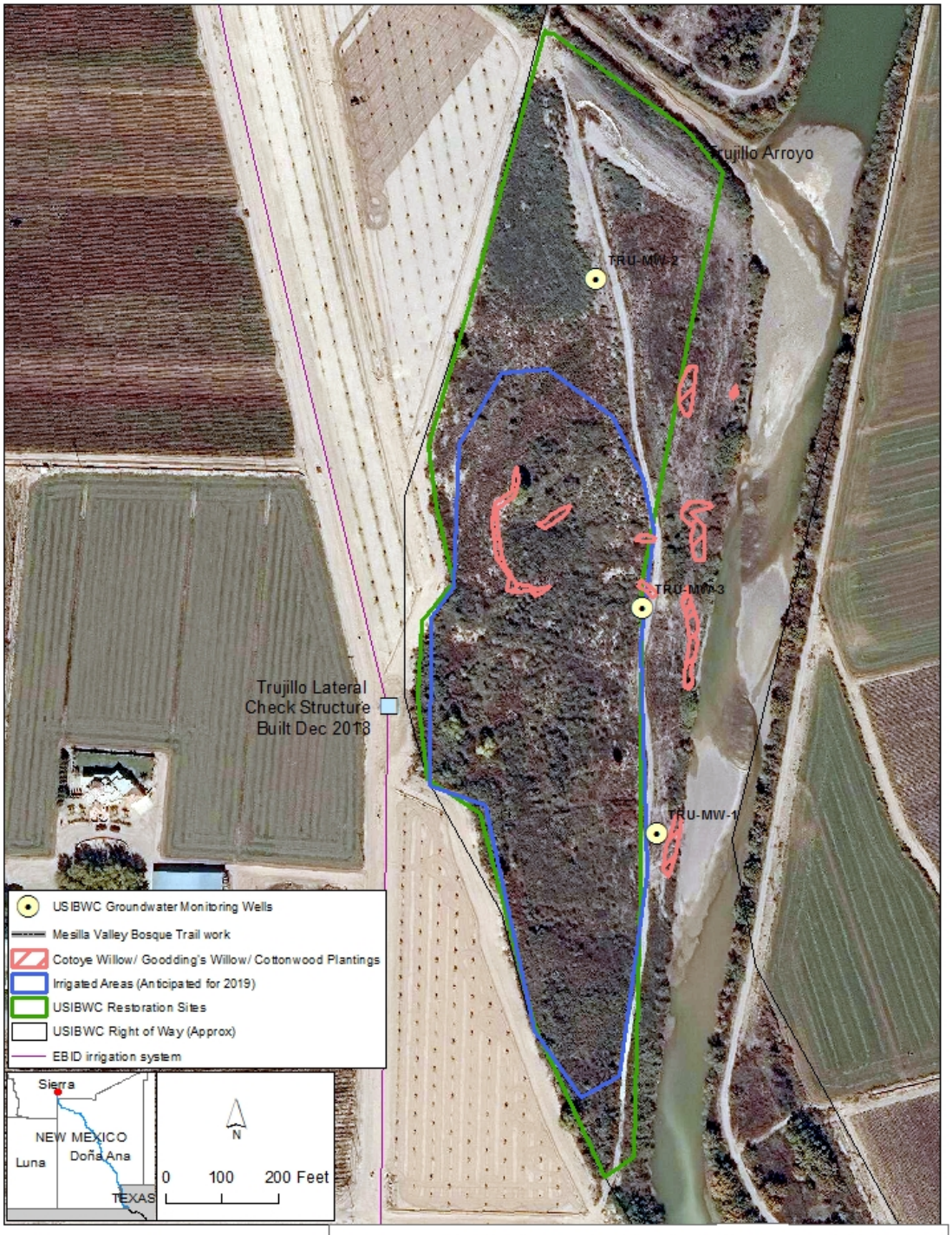
USFWS and USIBWC post signs at restoration sites, August 2012

USFWS provided vegetation management training to USIBWC Operations and Maintenance field office staff in October 2012 and included both classroom and field training.

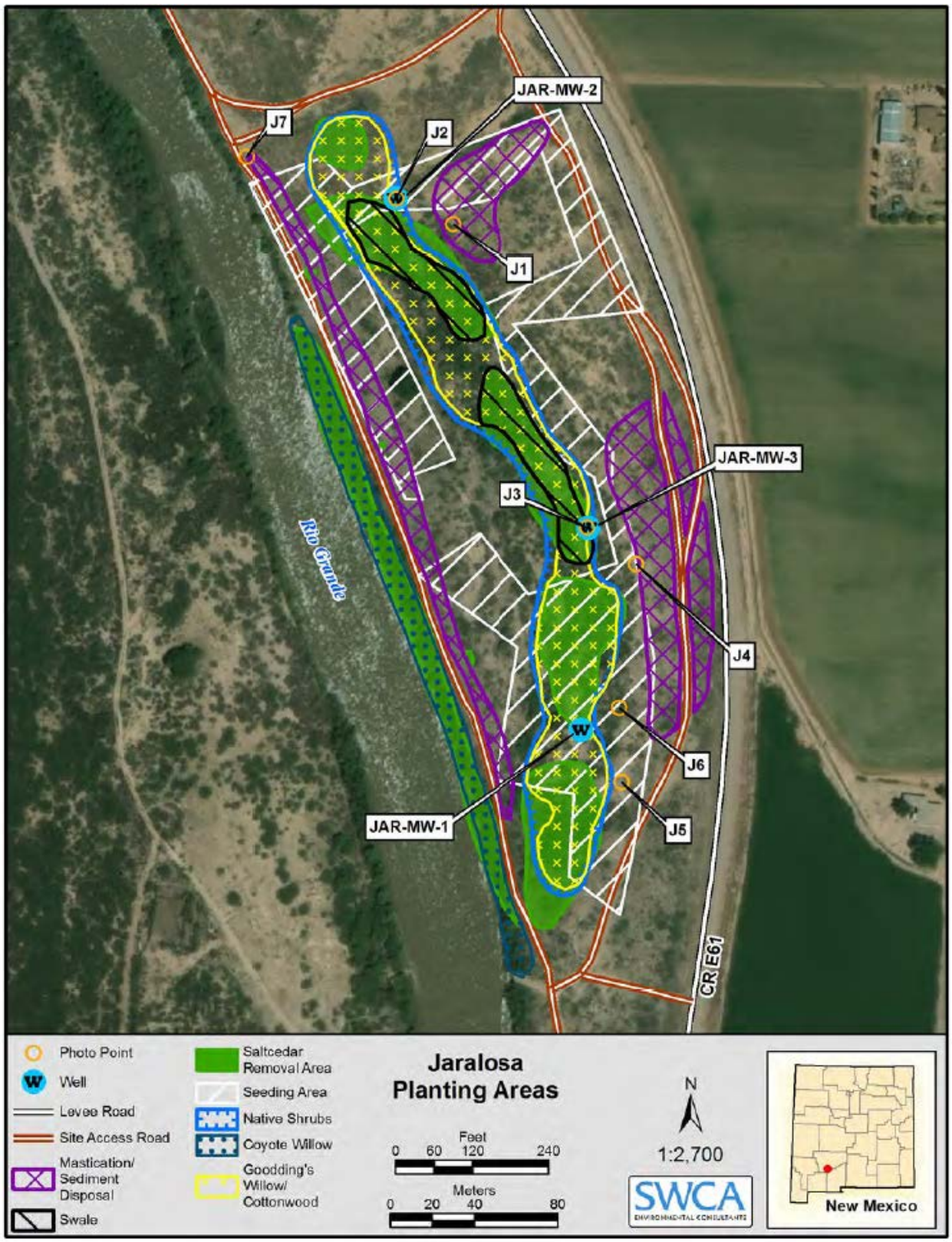
USIBWC Operations and Maintenance crews from the Upper Rio Grande Flood Control Project field office after a bird nesting survey protocol refresher training, March 2019

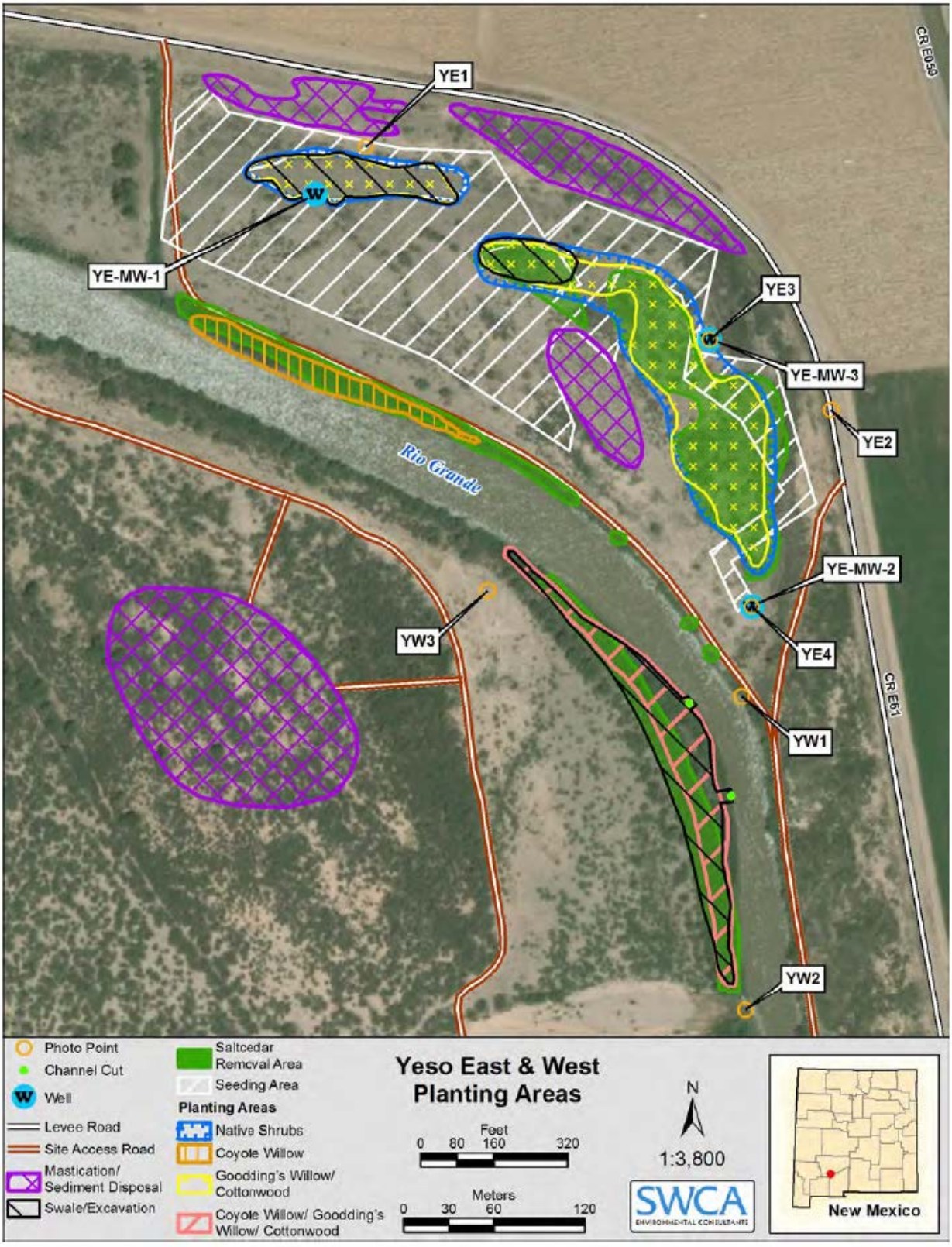
Appendix 2
Maps of Implemented Restoration Sites

Trujillo Habitat Restoration Site - After Restoration 2018

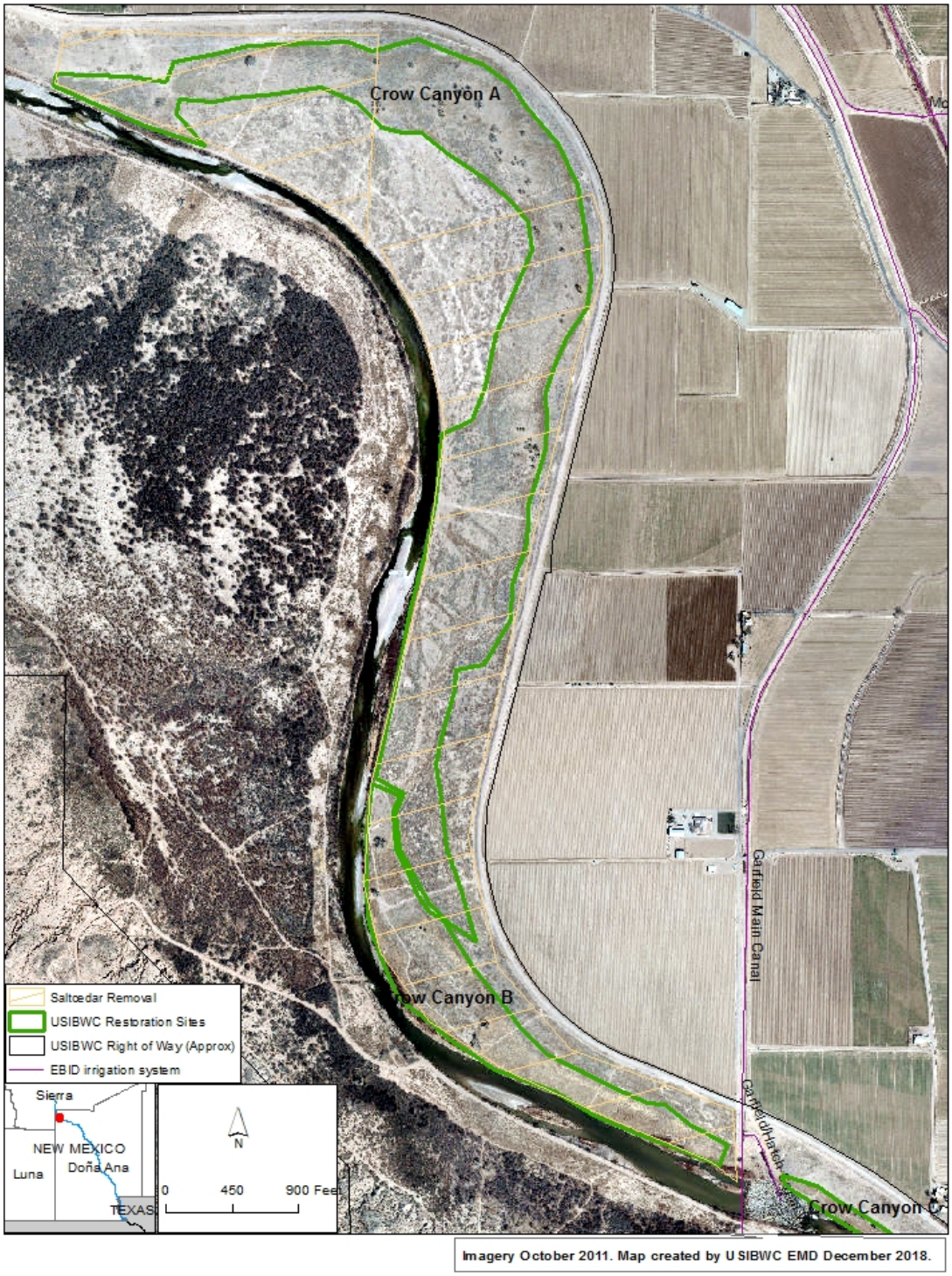


Digital Globe Imagery November 12, 2018. Map created by USIBWC EMD December 2018.

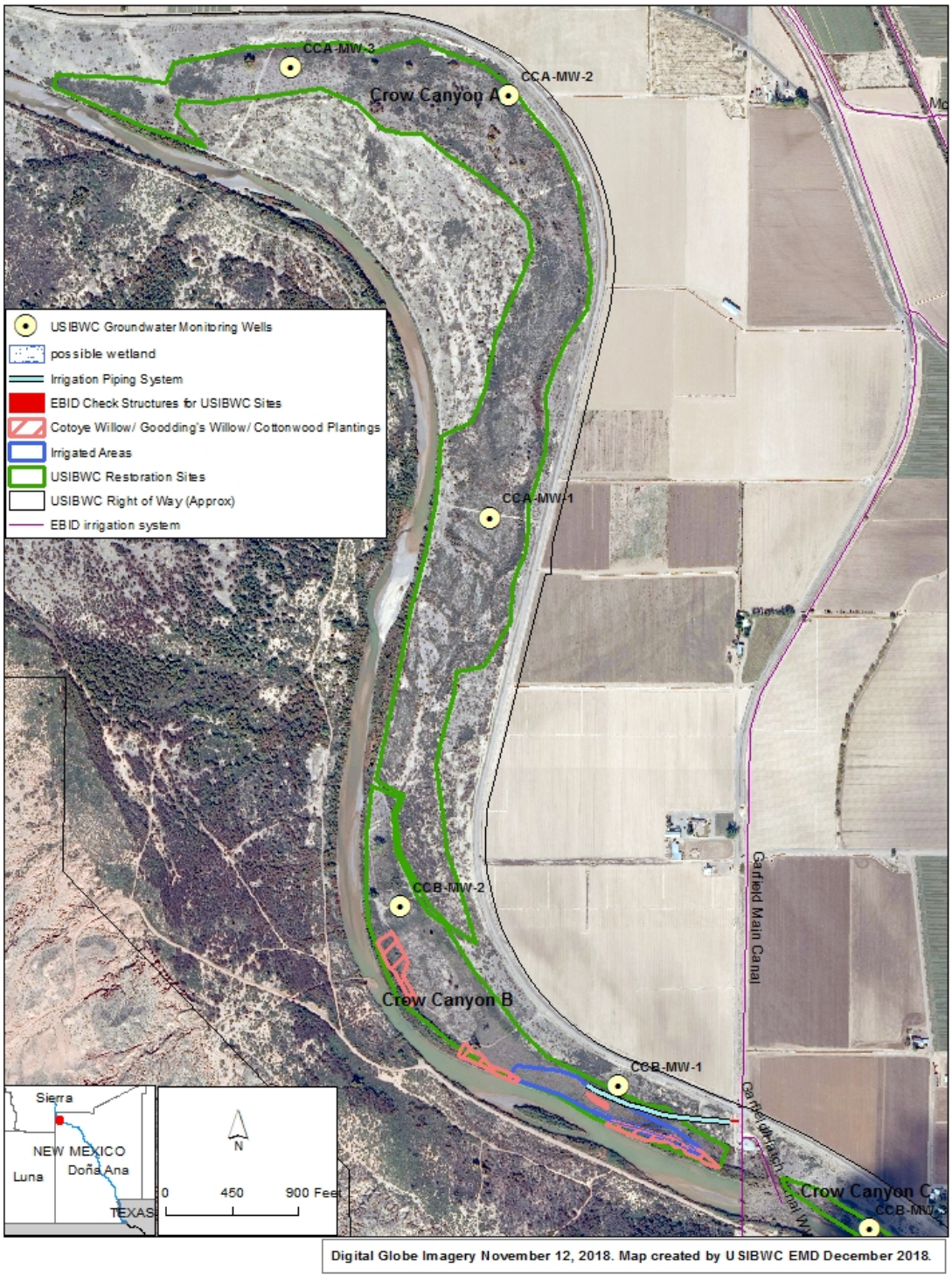

JAR-MW-2
J7
J2
J1
JAR-MW-3
J3
Rio Grande
J4
J6
JAR-MW-1
J5
CR E61
Photo Point
Well
Levee Road
Site Access Road
Mastication/ Sediment Disposal
Swale
Saltcedar Removal Area
Seeding Area
Native Shrubs
Coyote Willow
Goodding's Willow/ Cottonwood
Jaralosa Planting Areas
Feet
0 60 120 240
Meters
0 20 40 80
N
1:2,700
SWCA
New Mexico

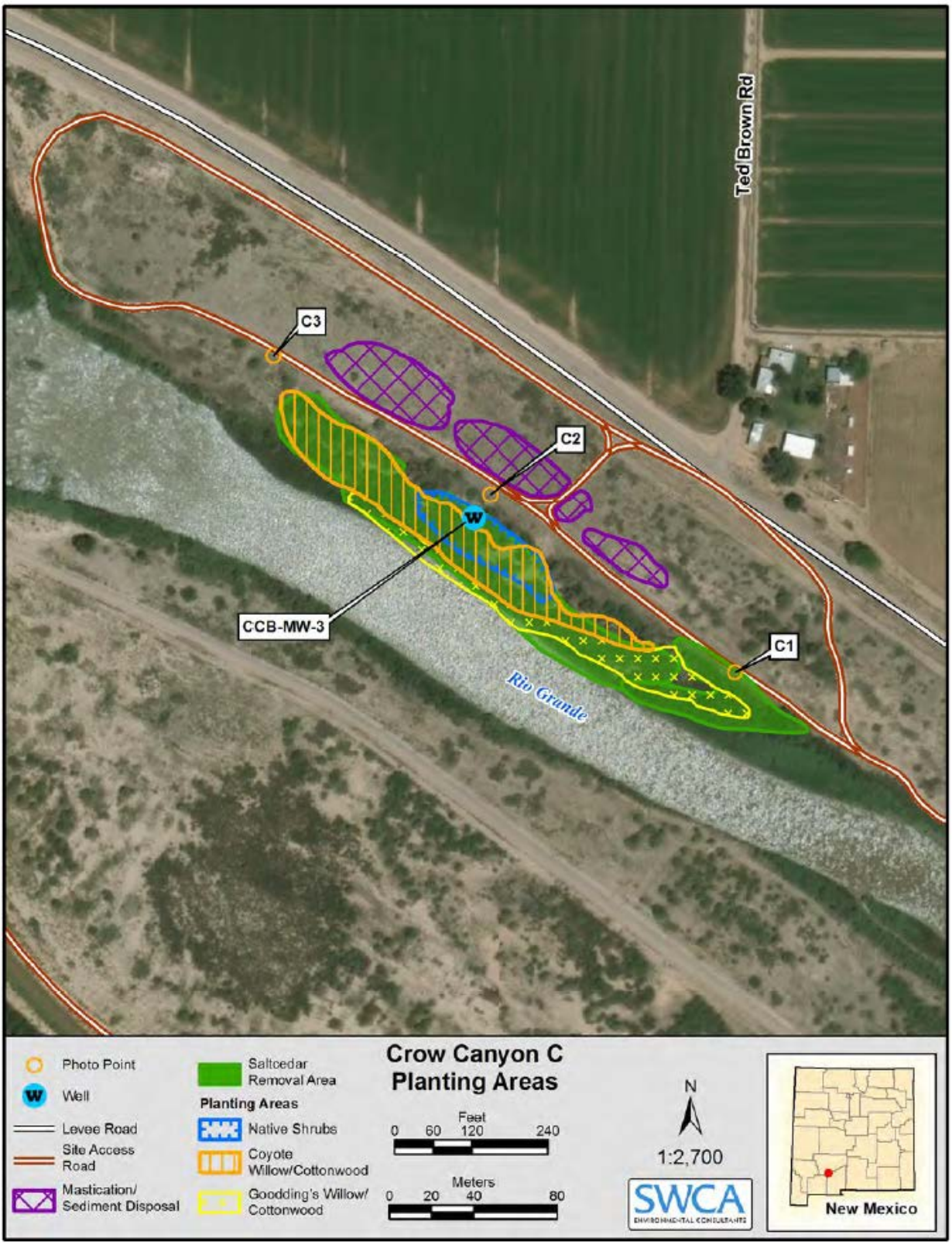

YE1
YE-MW-1
YE3
YE-MW-3
YE2
Rio Grande
YE-MW-2
YW3
YE4
YW1
YW2
CR E59
CR E61
Photo Point
Channel Cut
Well
Levee Road
Site Access Road
Mastication/ Sediment Disposal
Swale/Excavation
Saltcedar Removal Area
Seeding Area
Planting Areas
Native Shrubs
Coyote Willow
Goodding's Willow/ Cottonwood
Coyote Willow/ Goodding's Willow/ Cottonwood
Yeso East & West Planting Areas
Feet
0 80 160 320
Meters
0 30 60 120
N
1:3,800
SWCA
New Mexico

Crow Canyon A and B Habitat Restoration Sites - Before Restoration 2011

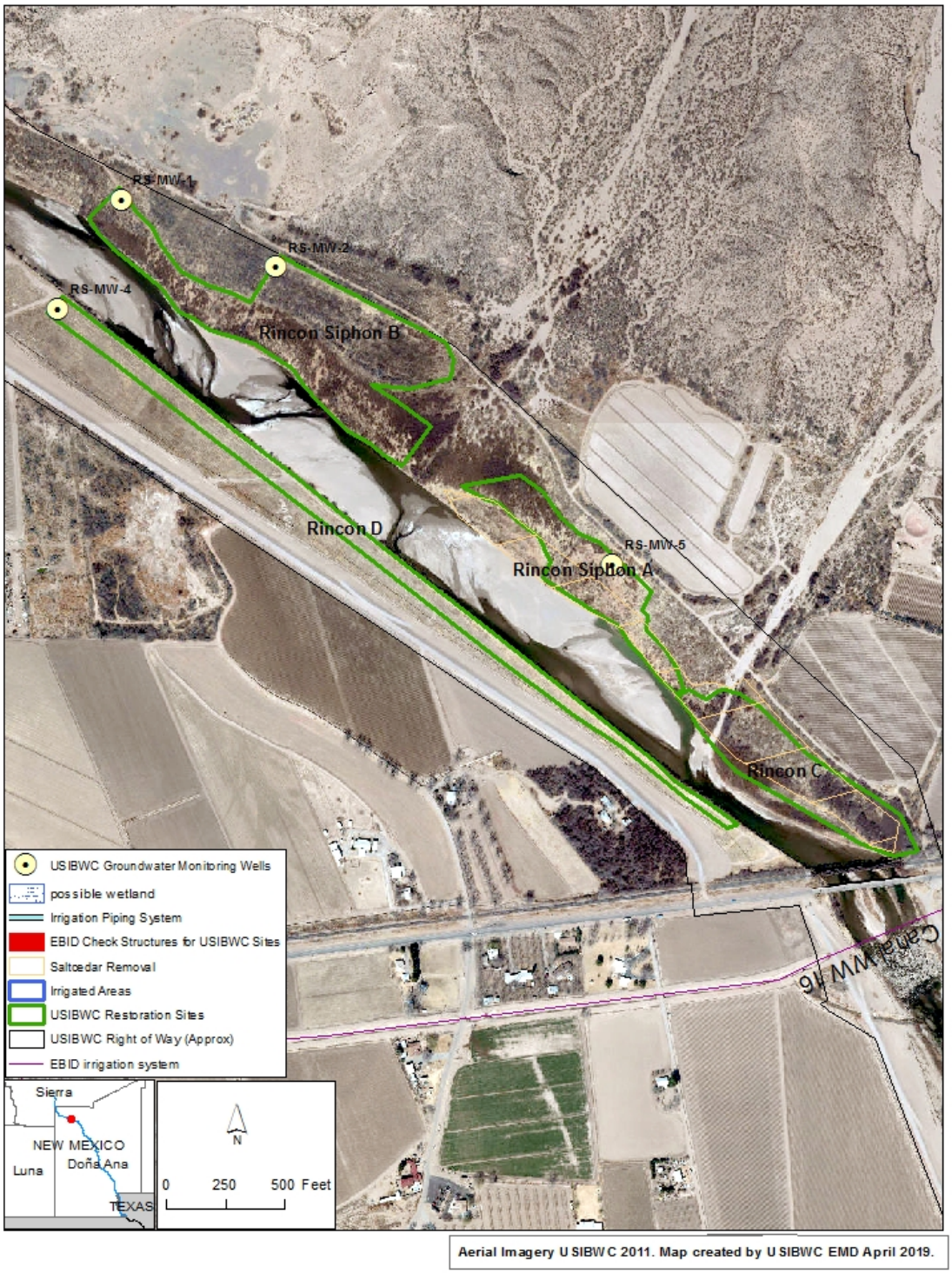


Crow Canyon A and B Habitat Restoration Sites - After Restoration 2018

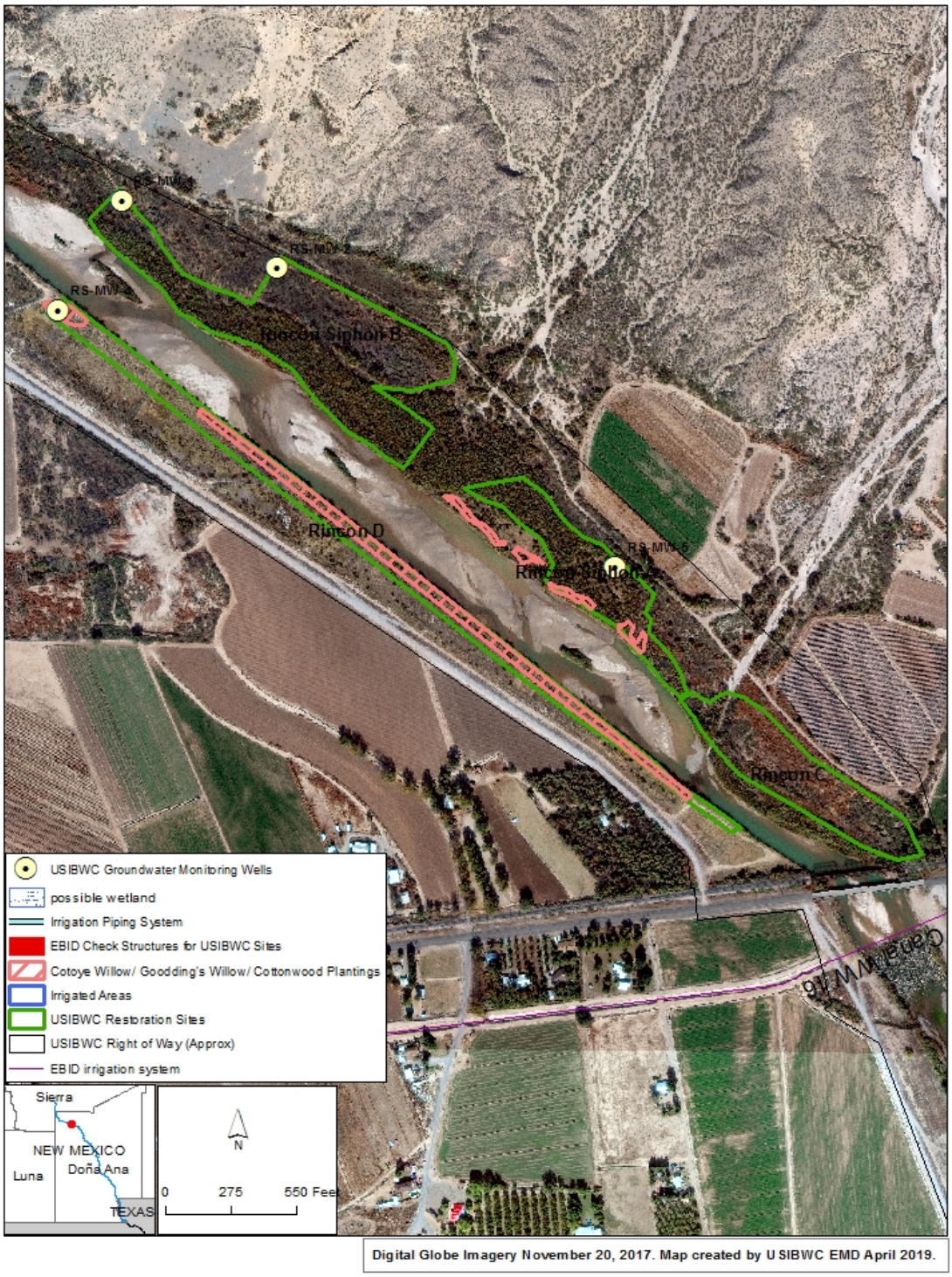



Ted Brown Rd
C3
C2
CCB-MW-3
C1
Rio Grande
Photo Point
Well
Levee Road
Site Access Road
Mastication/ Sediment Disposal
Saltcedar Removal Area
Planting Areas
Native Shrubs
Coyote Willow/Cottonwood
Goodding's Willow/ Cottonwood
Crow Canyon C Planting Areas
Feet
0 60 120 240
Meters
0 20 40 80
N
1:2,700
SWCA
New Mexico

Rincon Siphon Restoration Site (A to D) - 2011



Rincon Siphon Restoration Site (A to D) - 2019

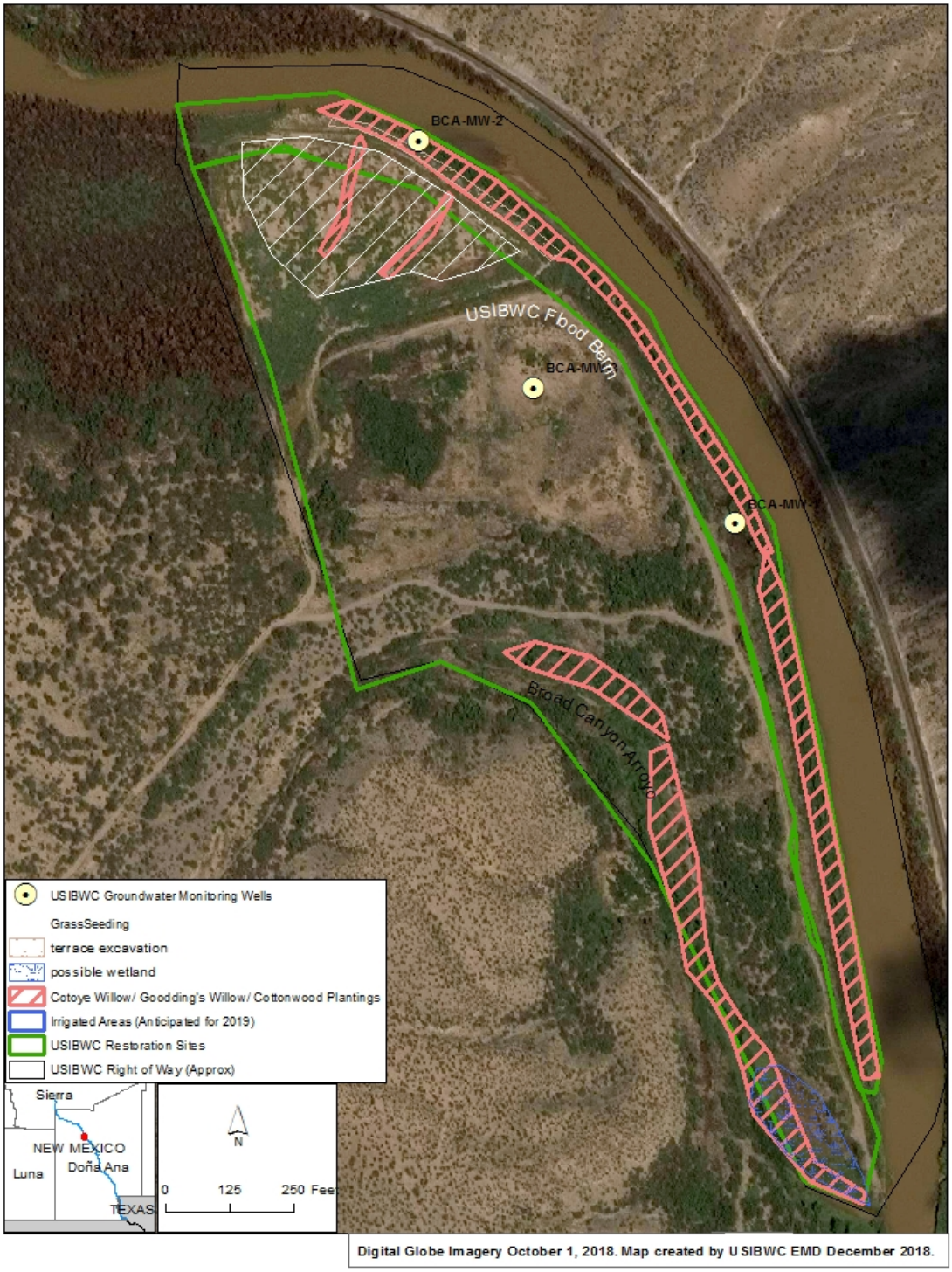


Digital Globe Imagery November 20, 2017. Map created by USIBWC EMD April 2019.

Broad Canyon Arroyo Habitat Restoration Site - Before Restoration 2011

Imagery October 2011. Map created by USIBWC EMD December 2018.

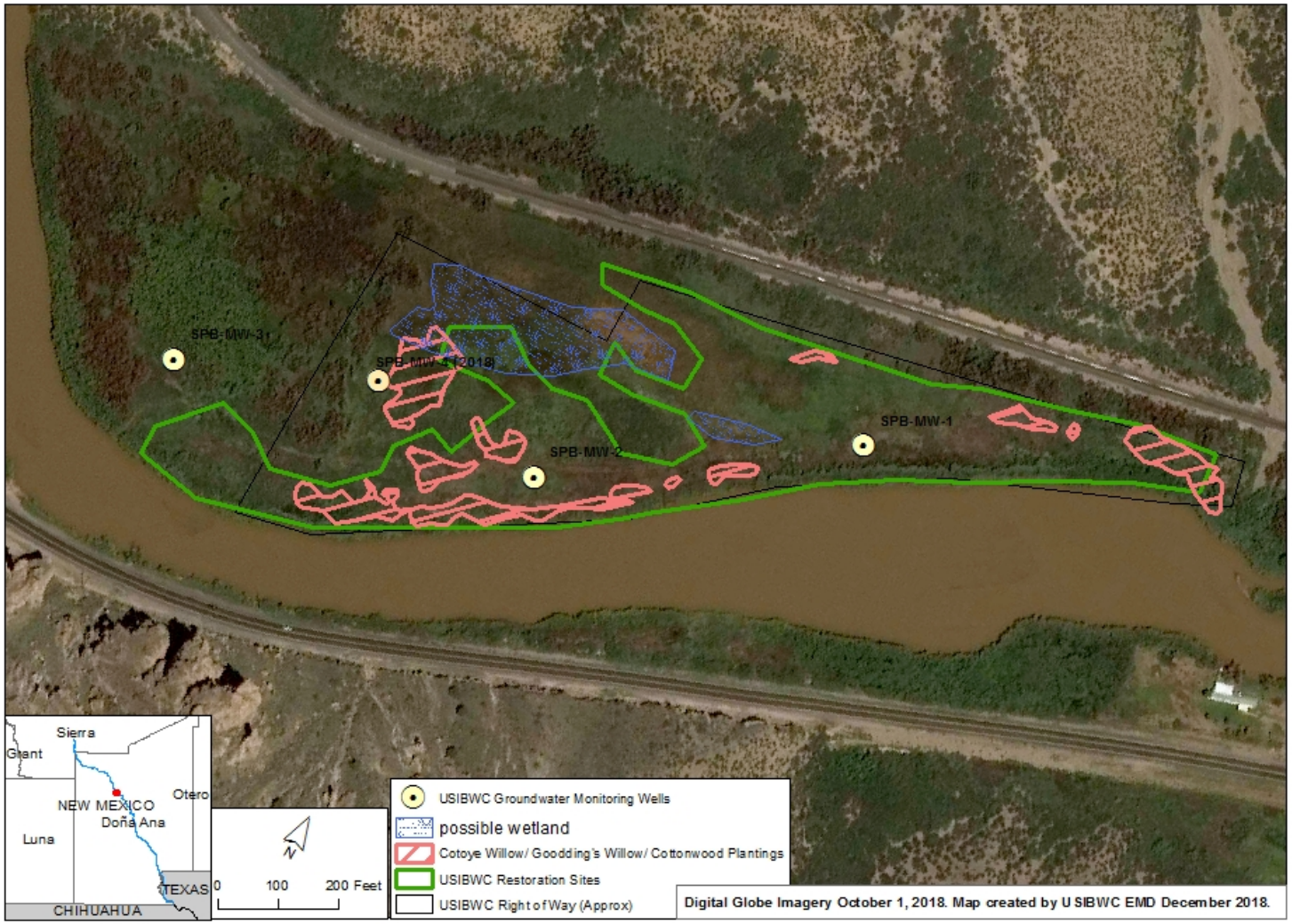
Broad Canyon Arroyo Habitat Restoration Site - After Restoration 2018



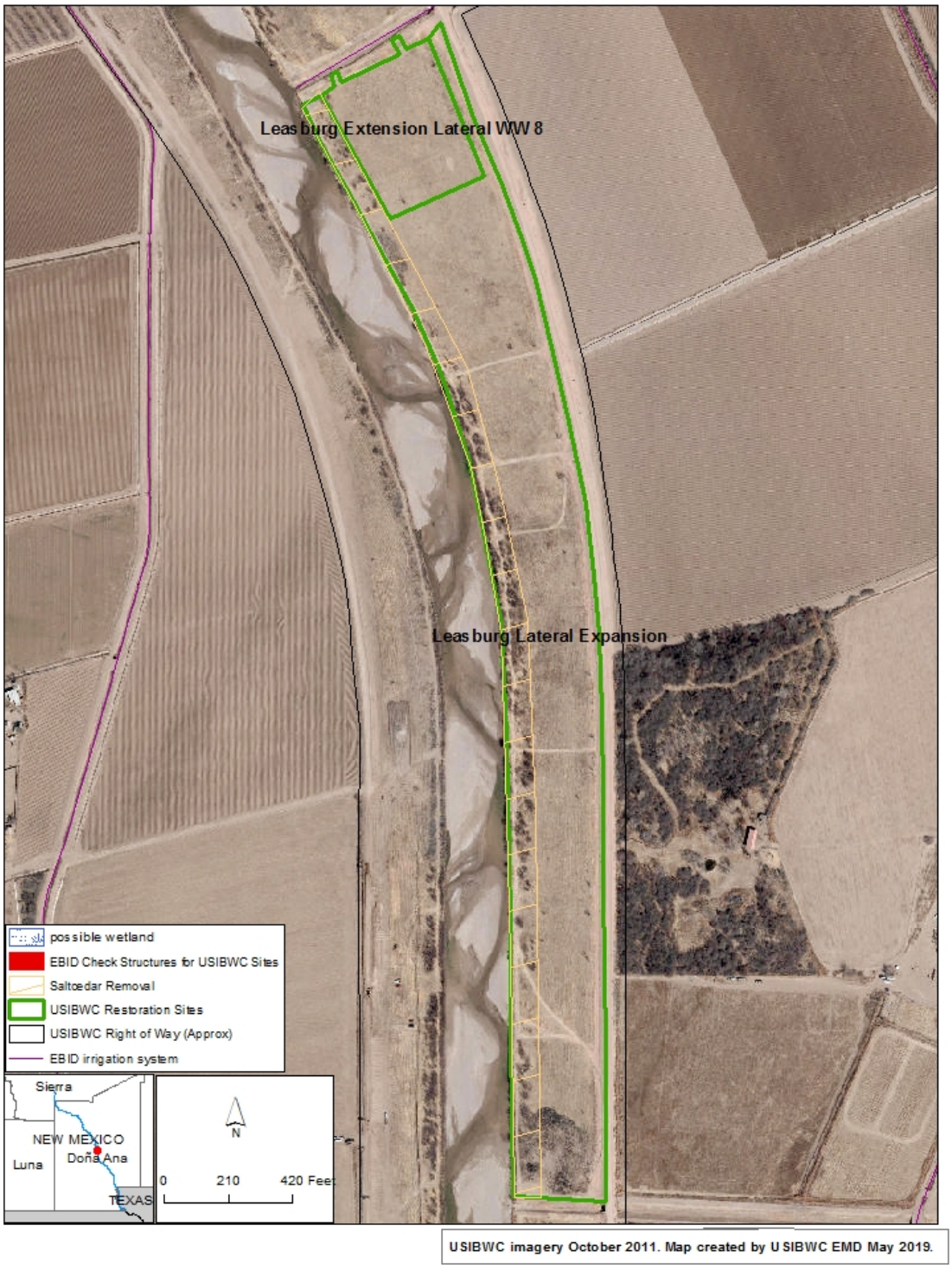
Digital Globe Imagery October 1, 2018. Map created by USIBWC EMD December 2018.

Selden Point Bar Habitat Restoration Site - Before Restoration 2011

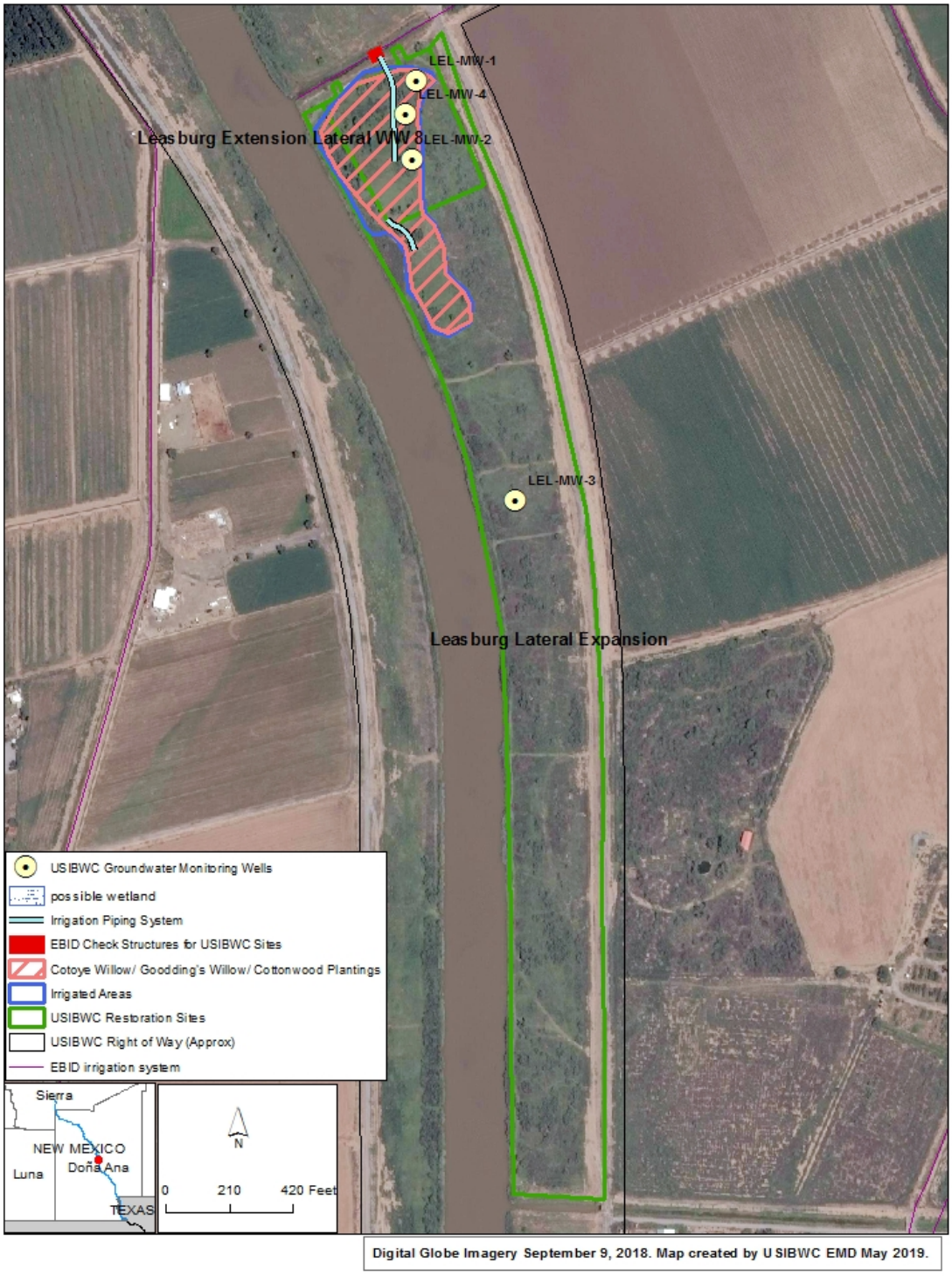
Selden Point Bar Habitat Restoration Site - After Restoration 2018



Leasburg Extension Lateral Wasteway #8 Restoration Site 2011

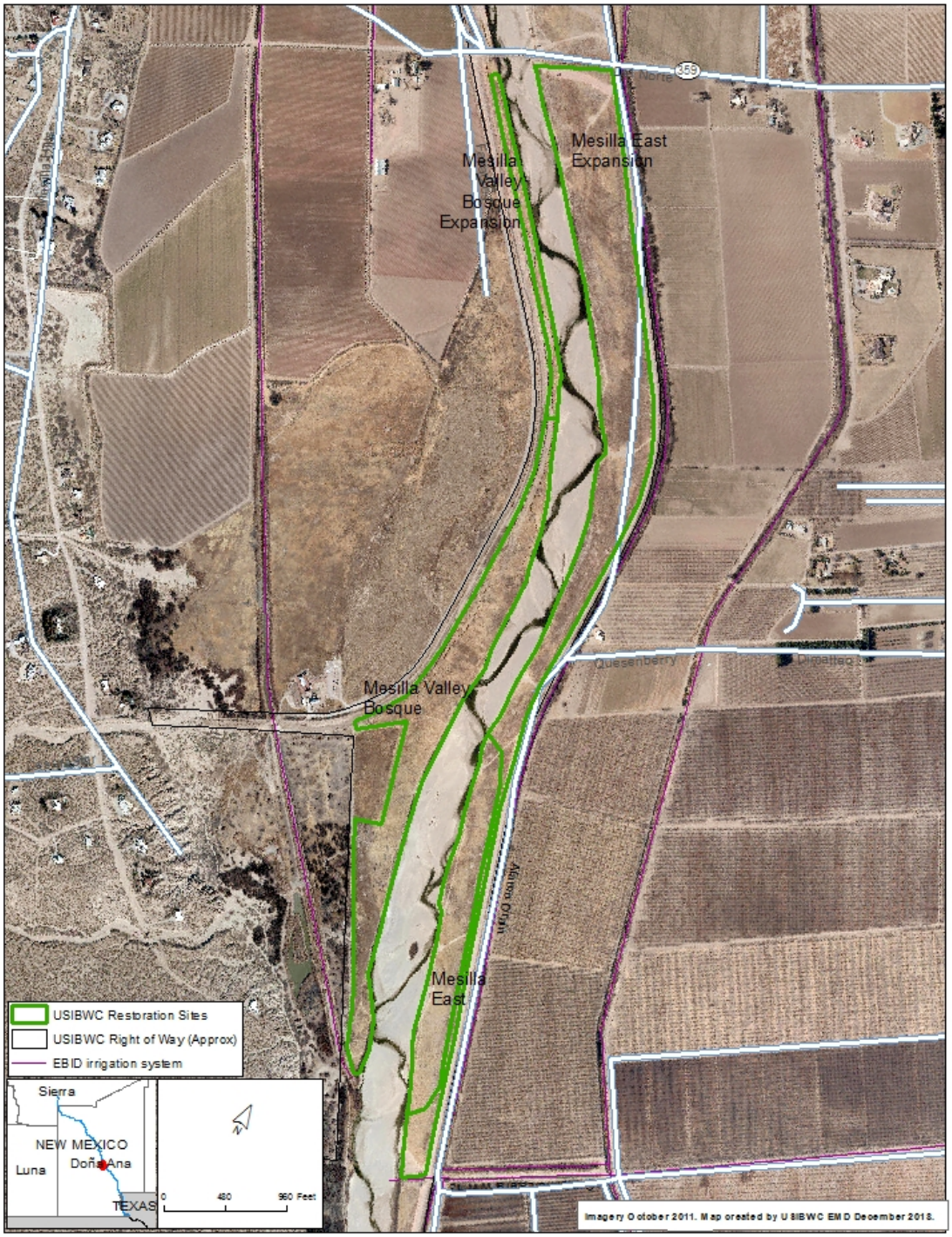


Leasburg Extension Lateral Wasteway #8 Restoration Site 2018

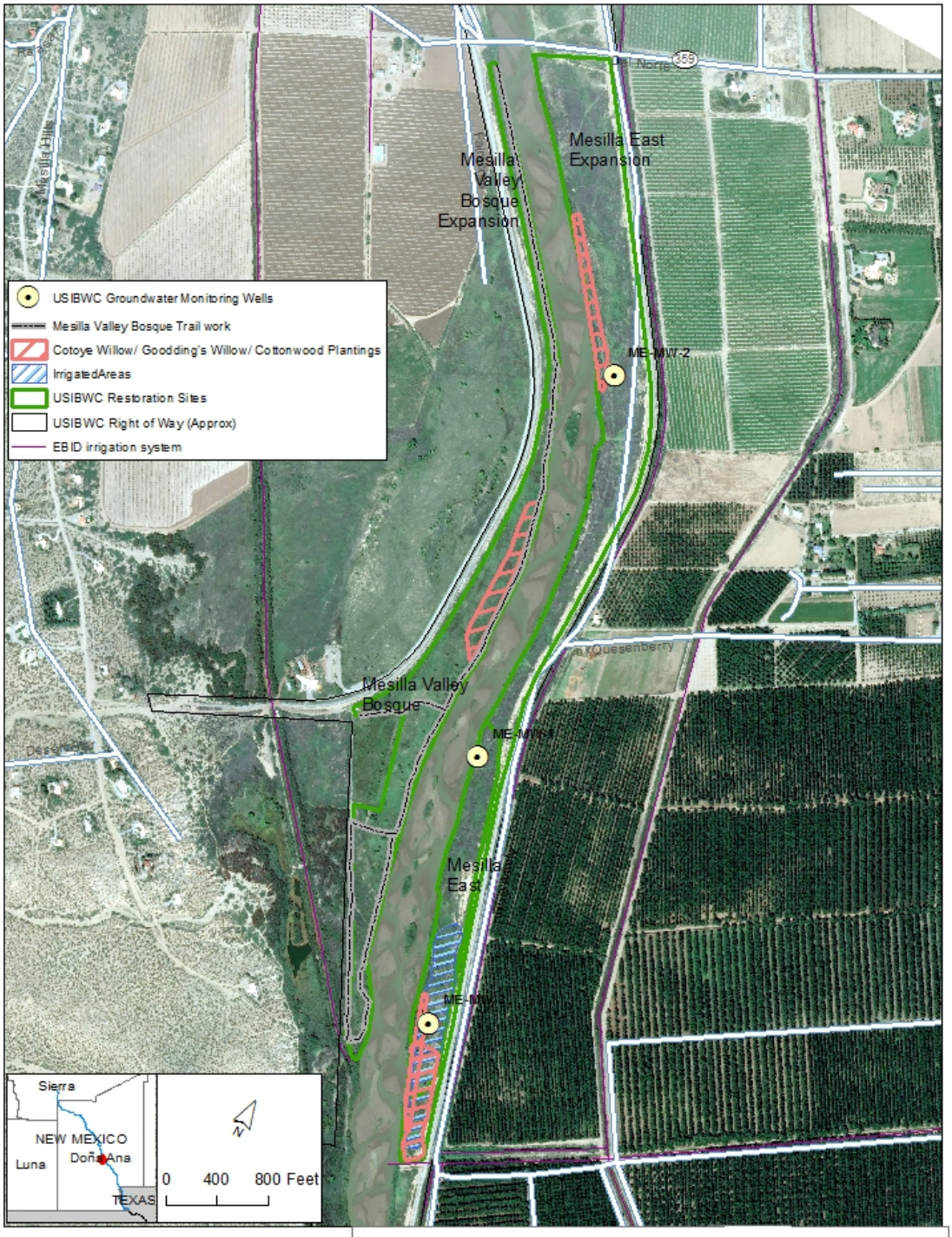


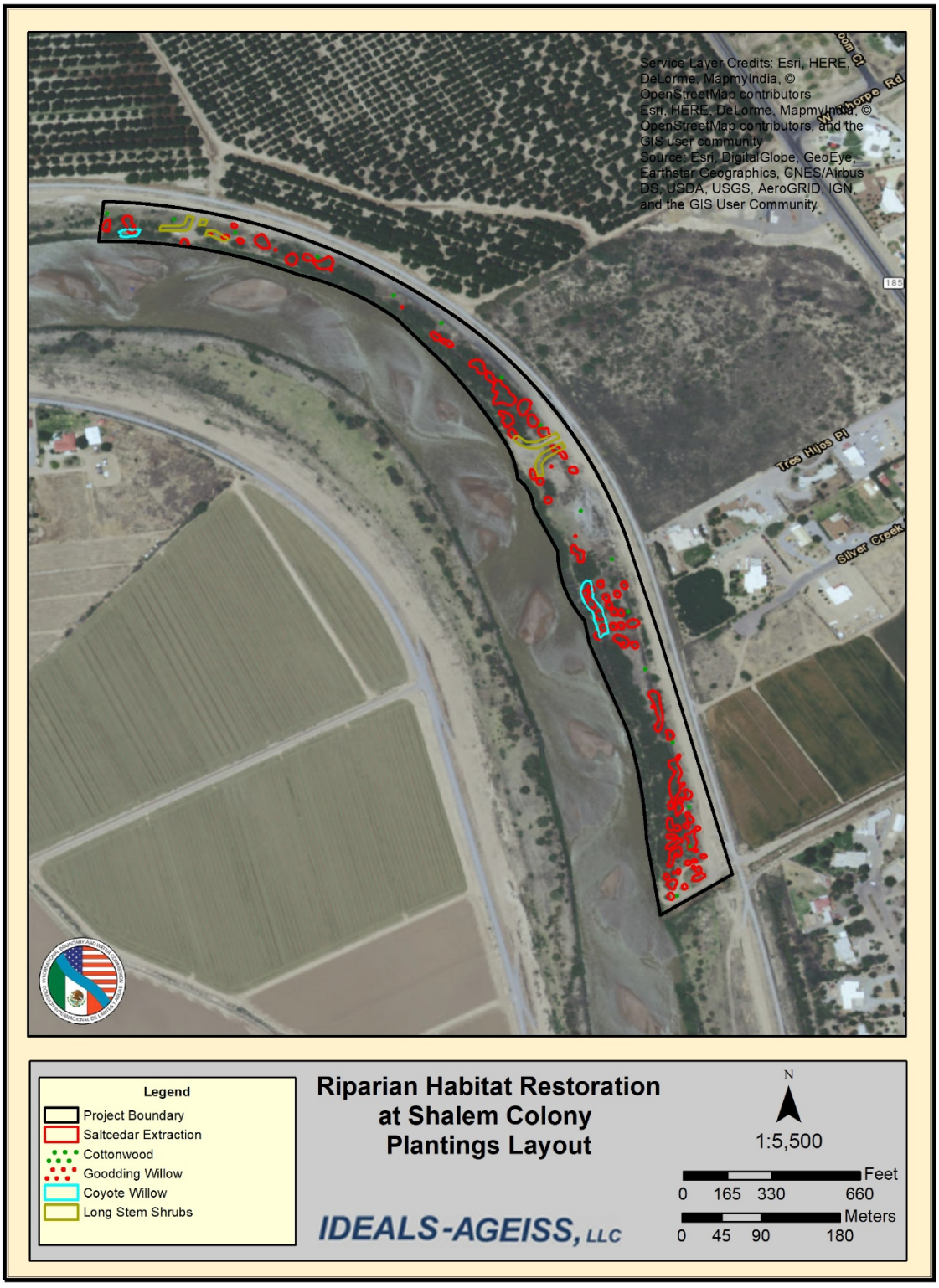
Digital Globe Imagery September 9, 2018. Map created by USIBWC EMD May 2019.

Mesilla East Habitat Restoration Site - Before Restoration 2011

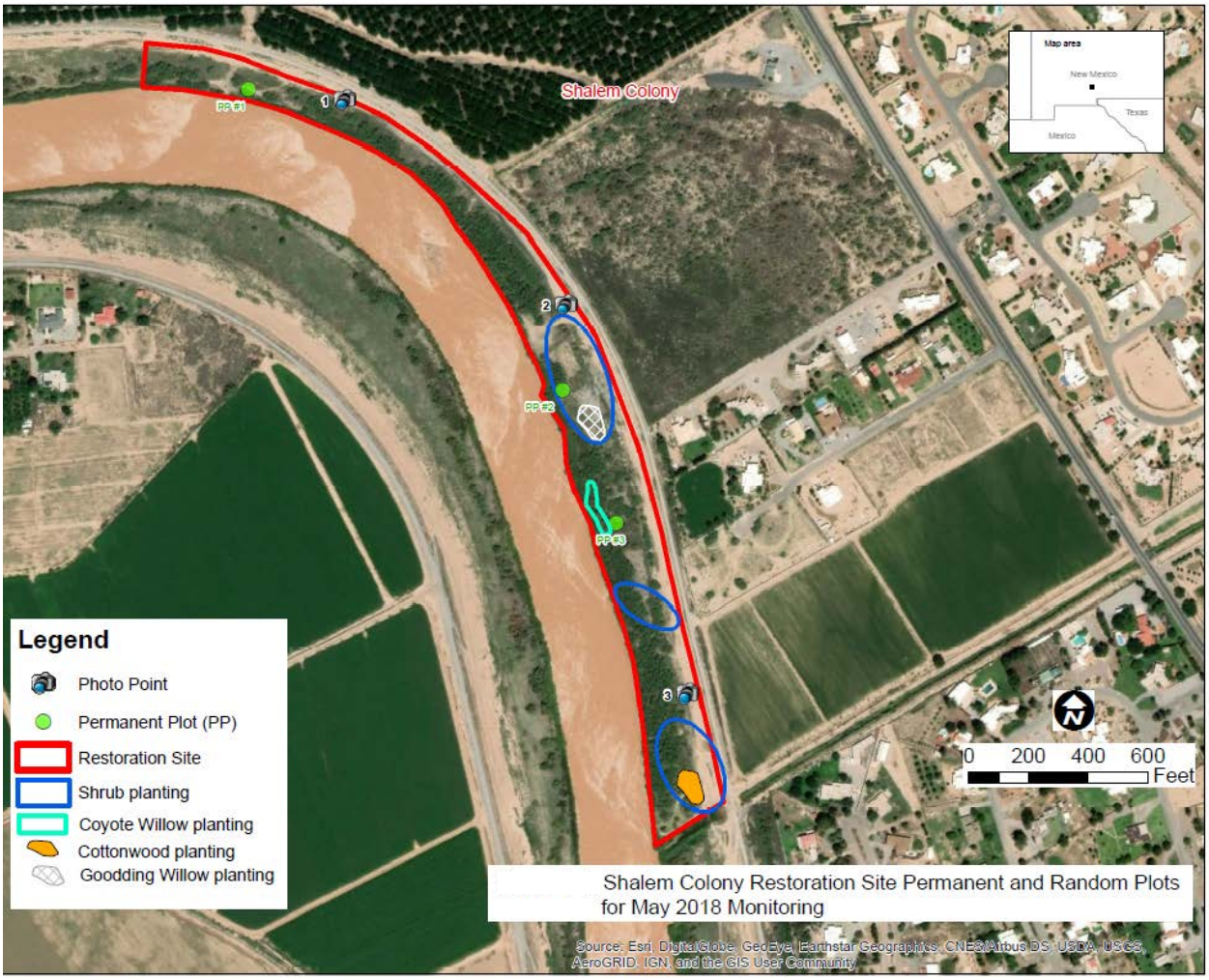


Mesilla East and Mesilla Valley Bosque Habitat Restoration Sites - After Restoration 2018

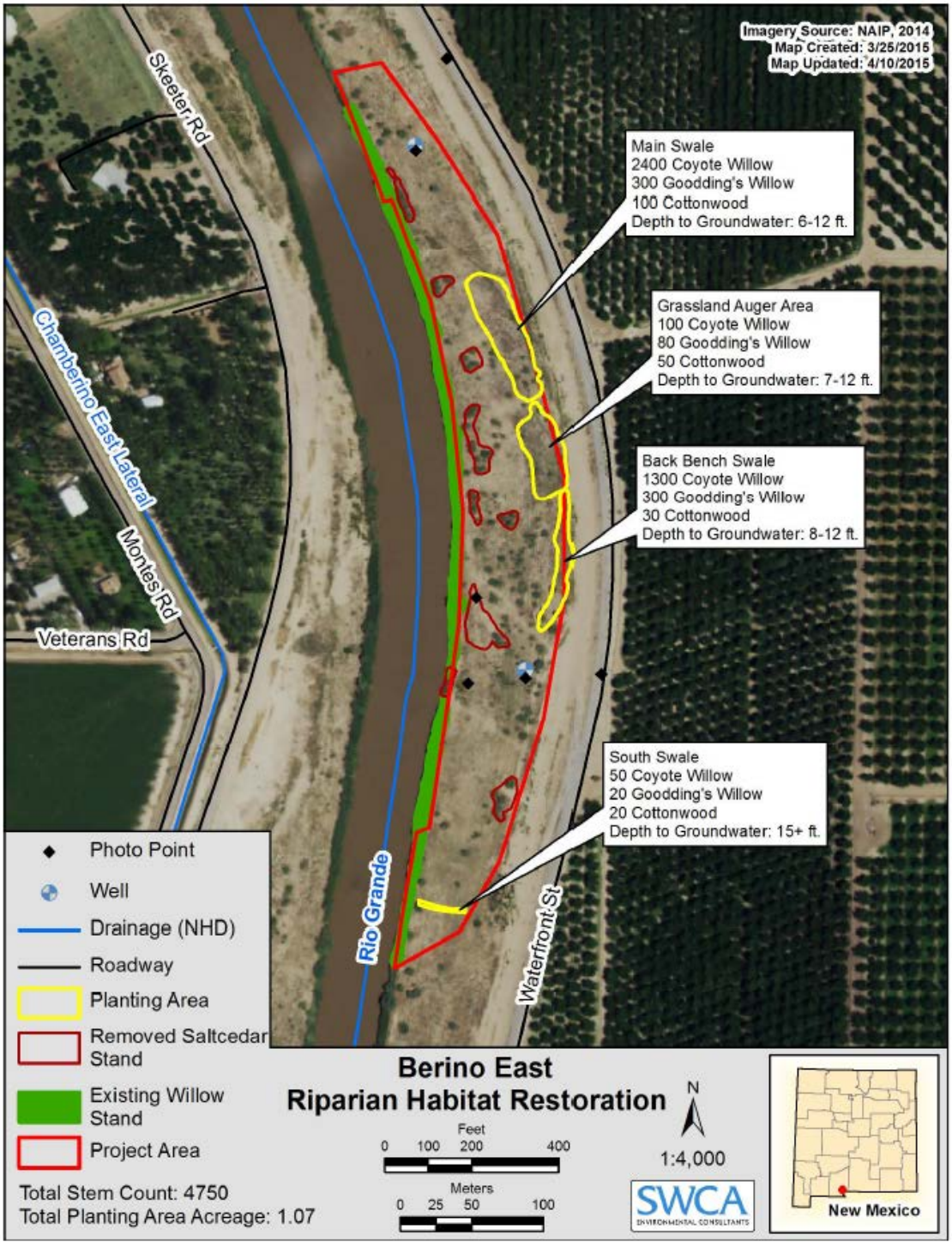



Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Tres Hijos Pl
Silver Creek
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Riparian Habitat Restoration at Shalem Colony Plantings Layout
IDEALS-AGEISS, LLC
N
1:5,500
Feet
0 165 330 660
Meters
0 45 90 180

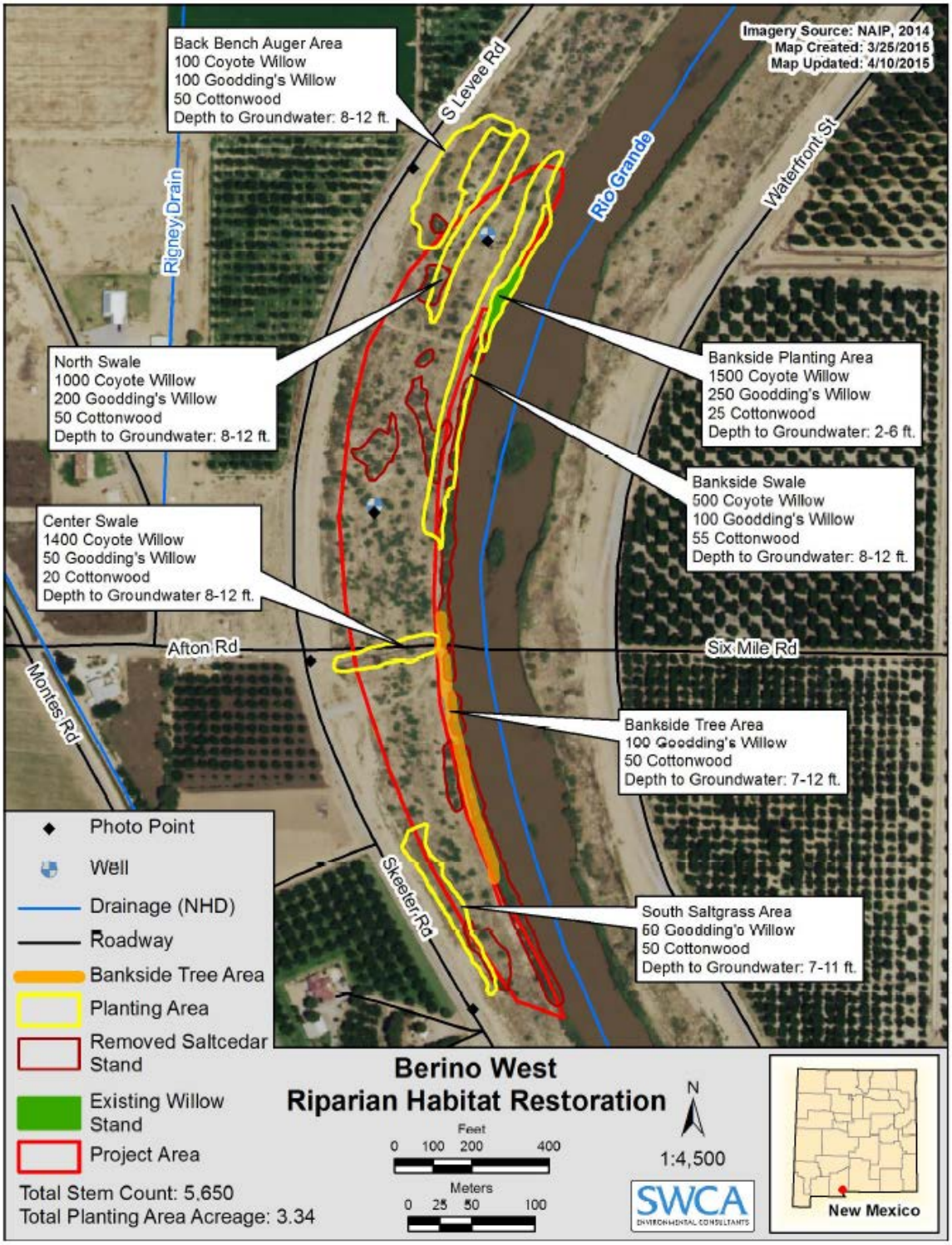
Shalem Colony Habitat Restoration Site 2019



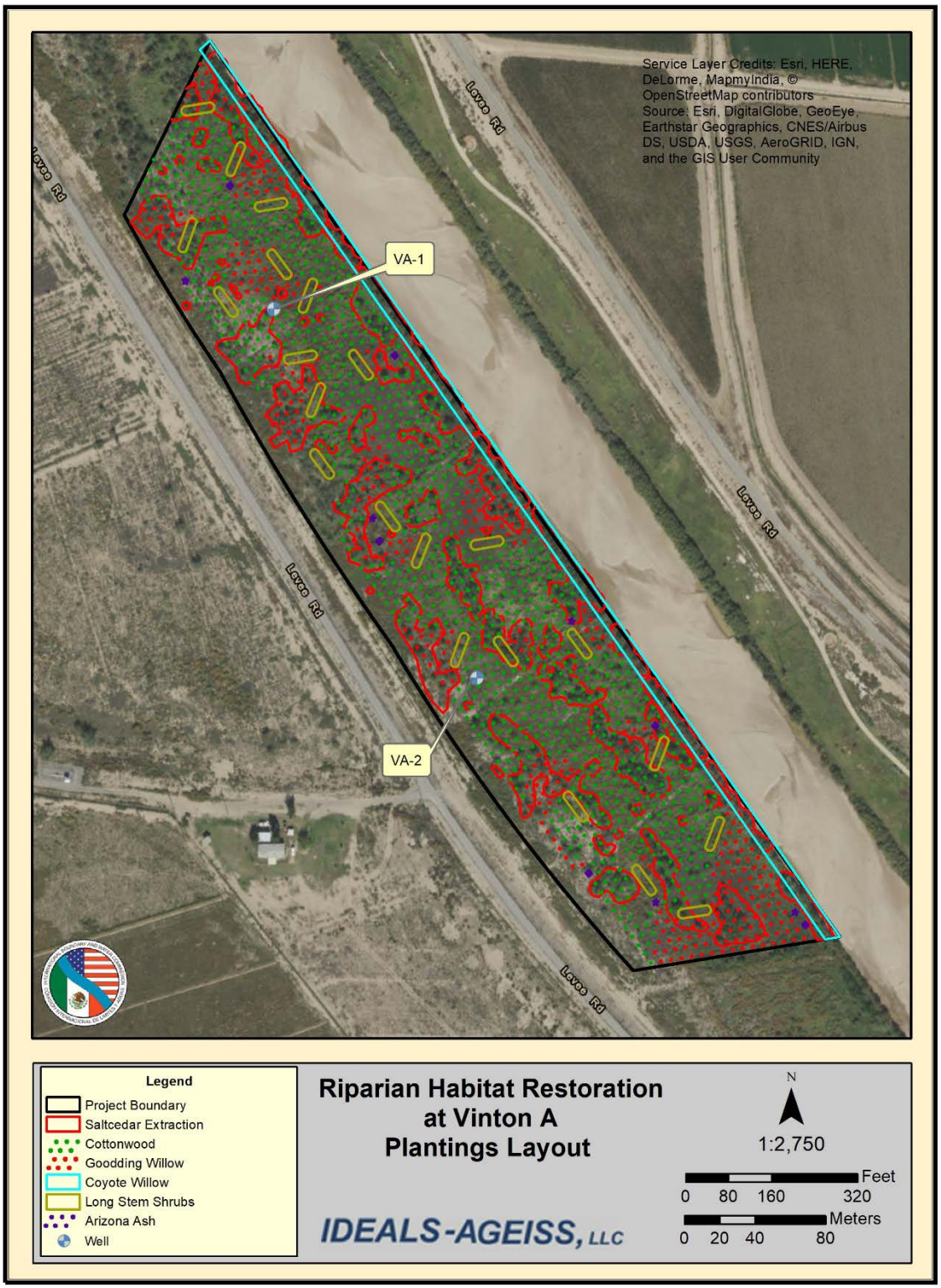
Berino East Habitat Restoration Site 2015



Berino West Habitat Restoration Site 2015

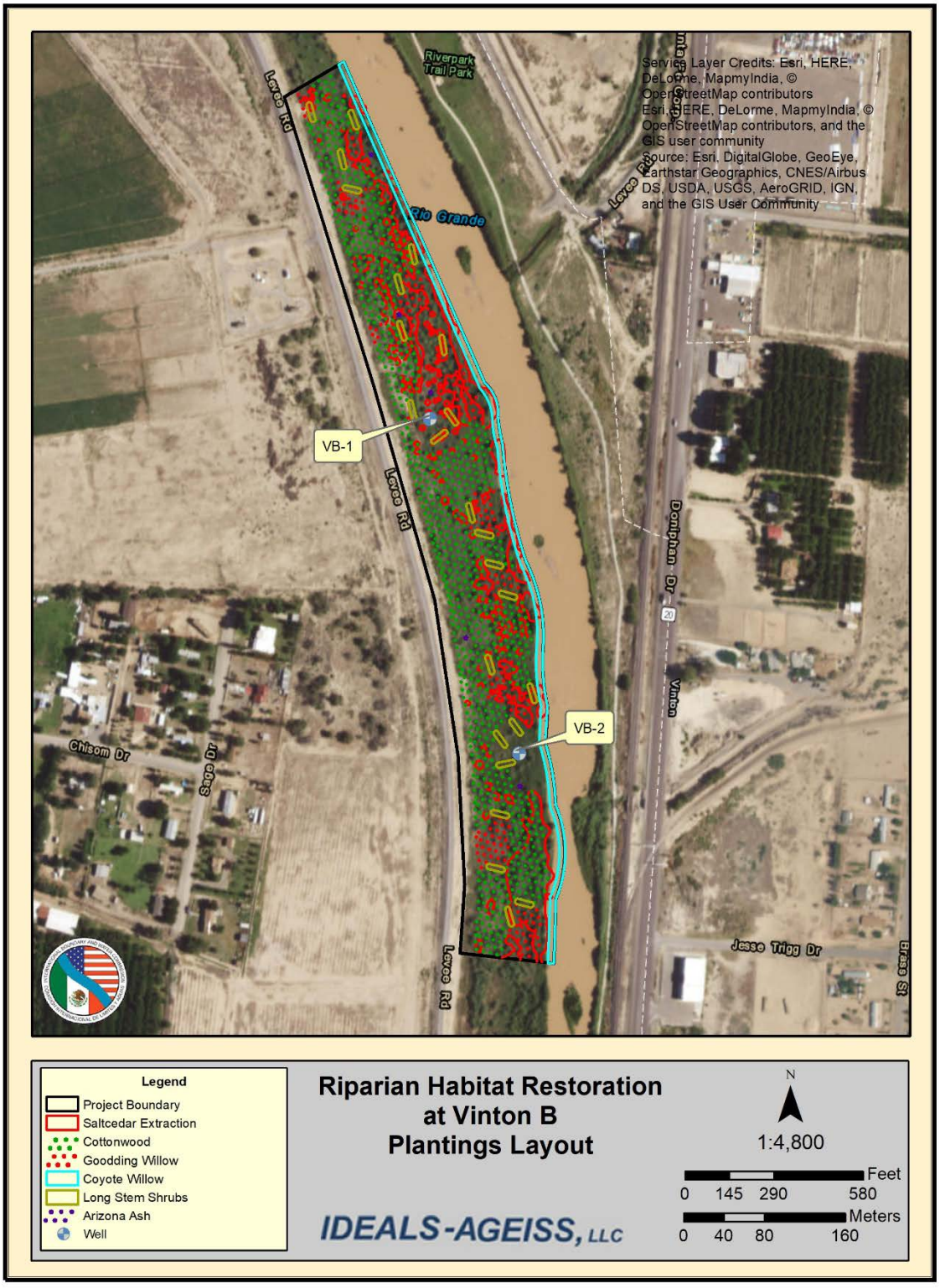


Vinton A Habitat Restoration Site 2017

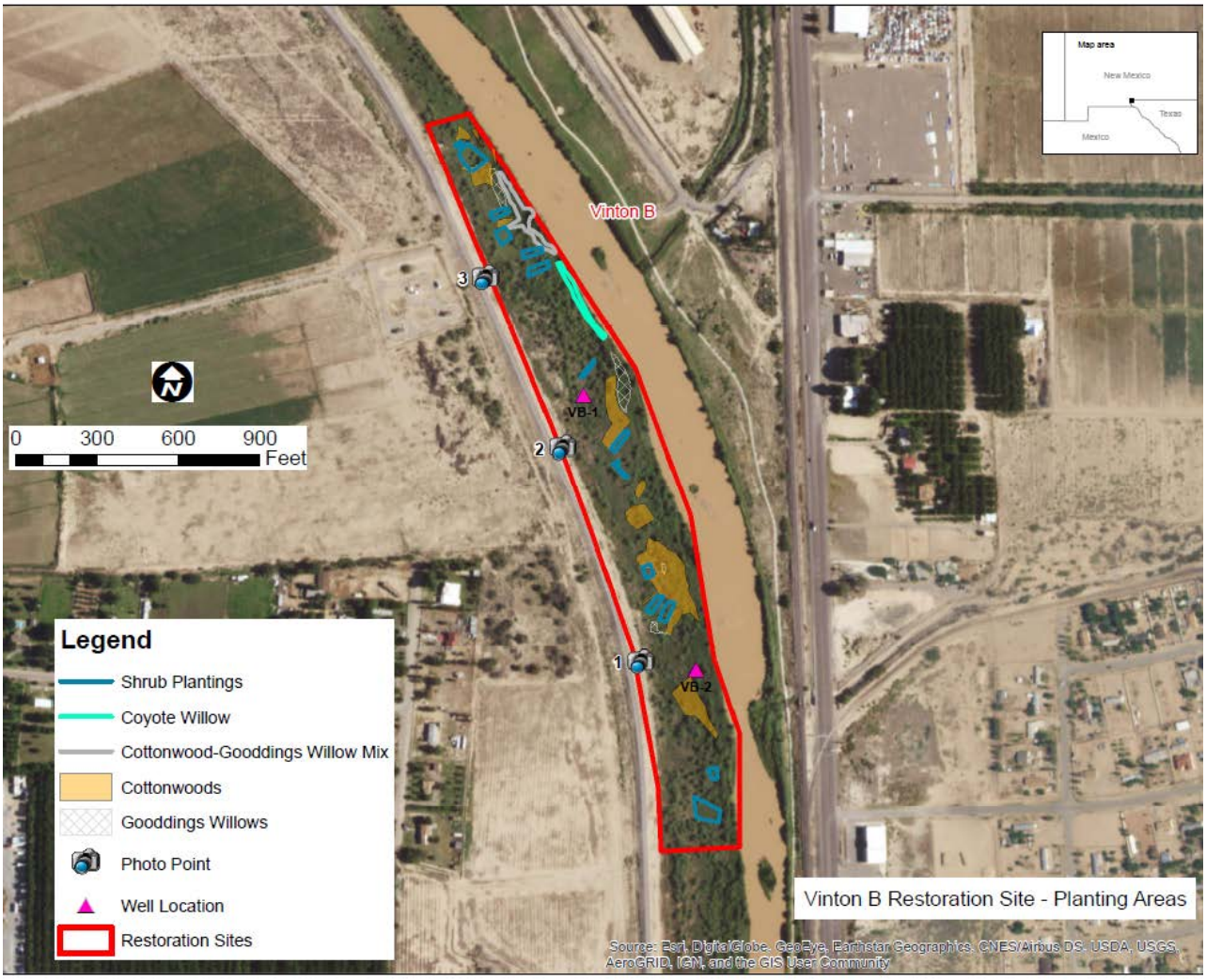


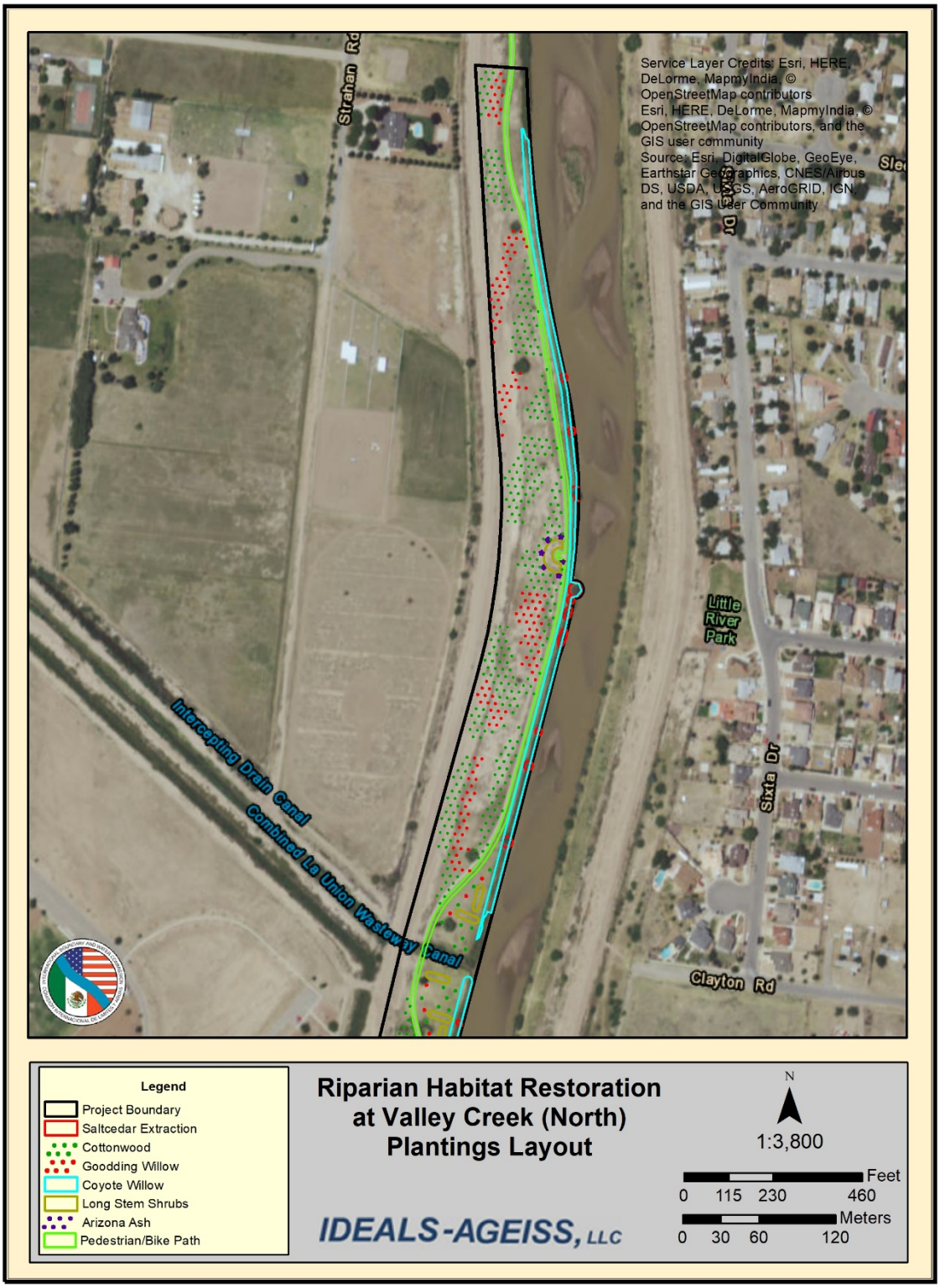
Vinton A Habitat Restoration Site 2019

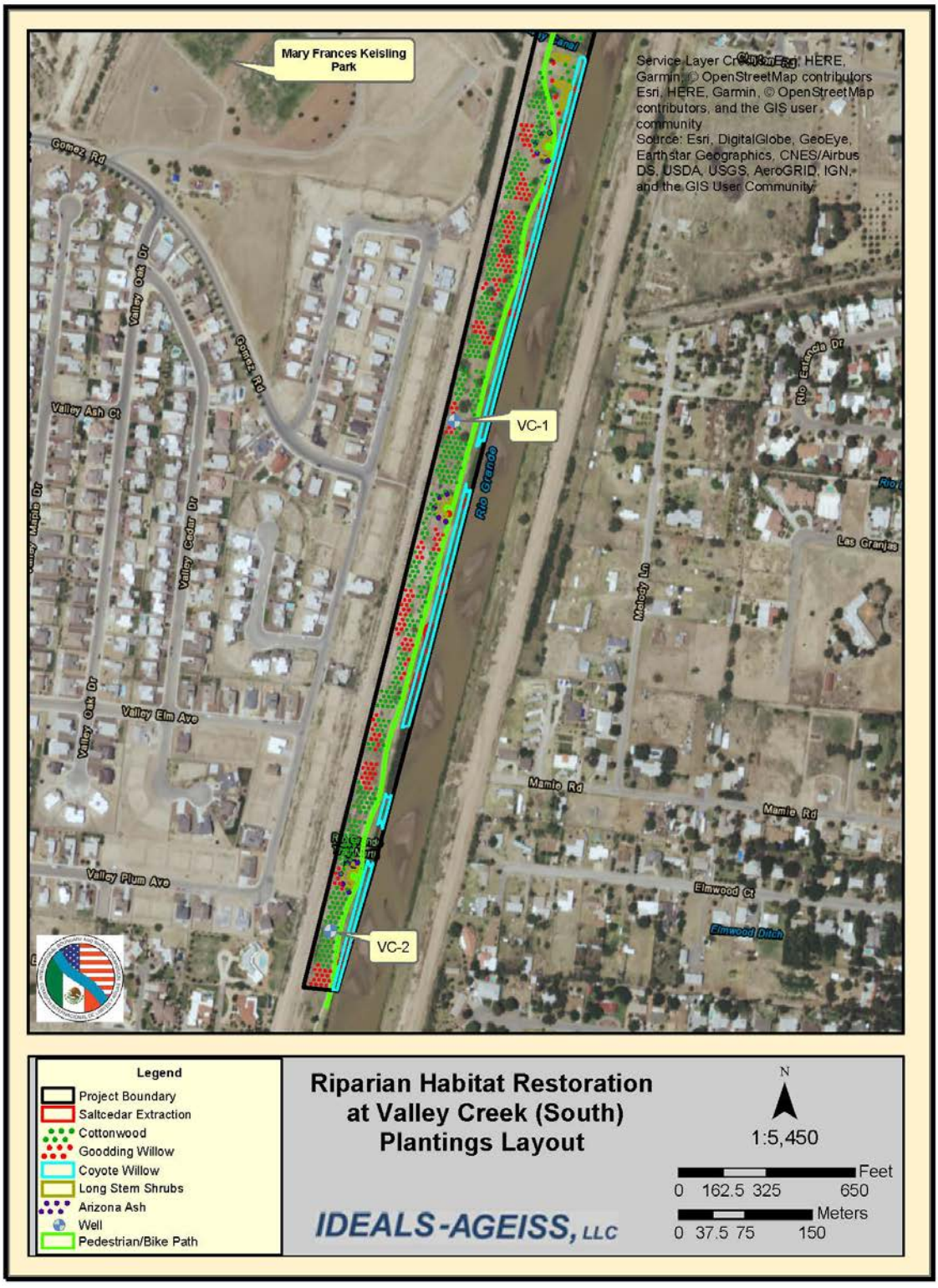
Vinton B Habitat Restoration Site 2017

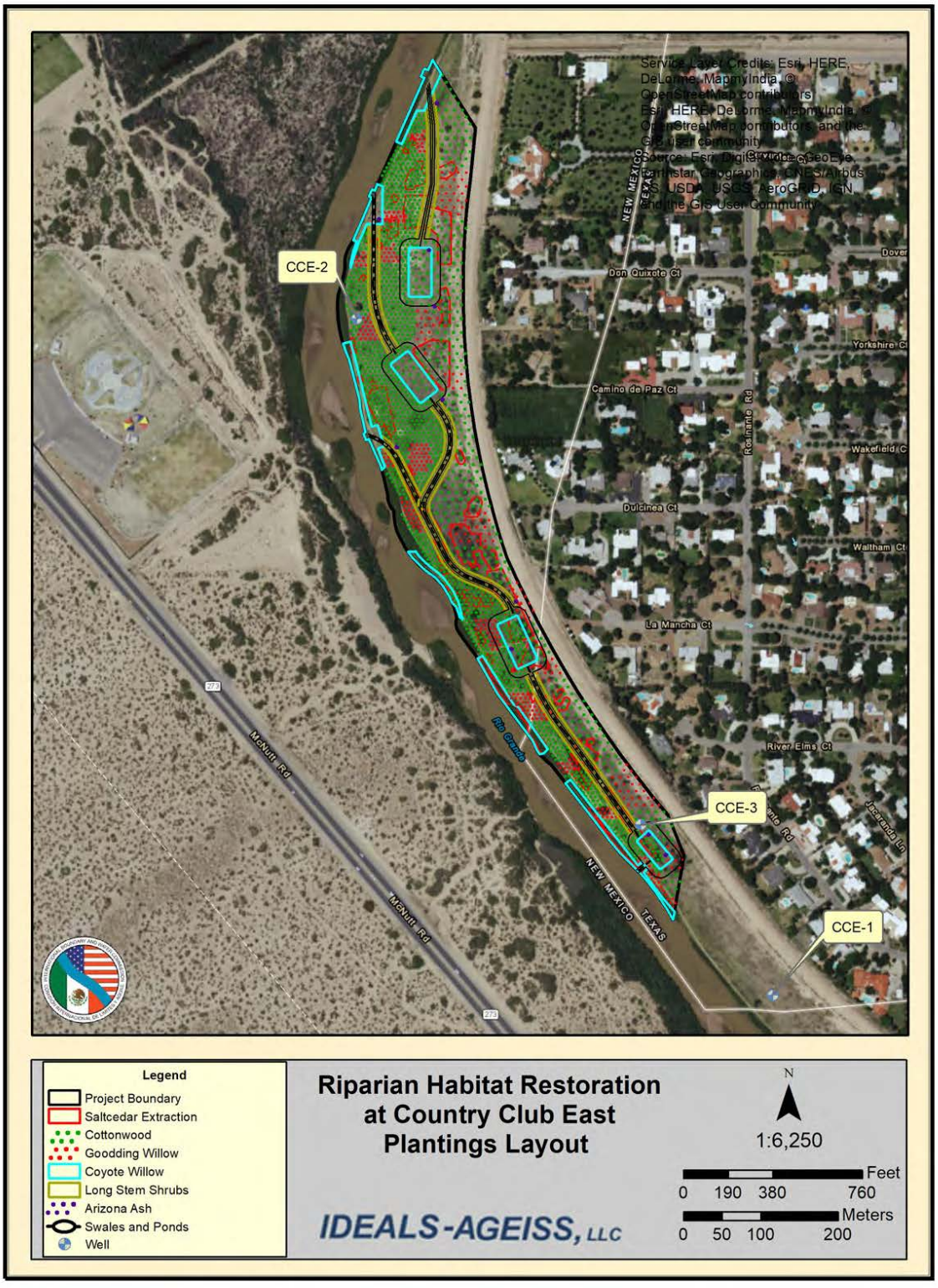


Vinton B Habitat Restoration Site 2019

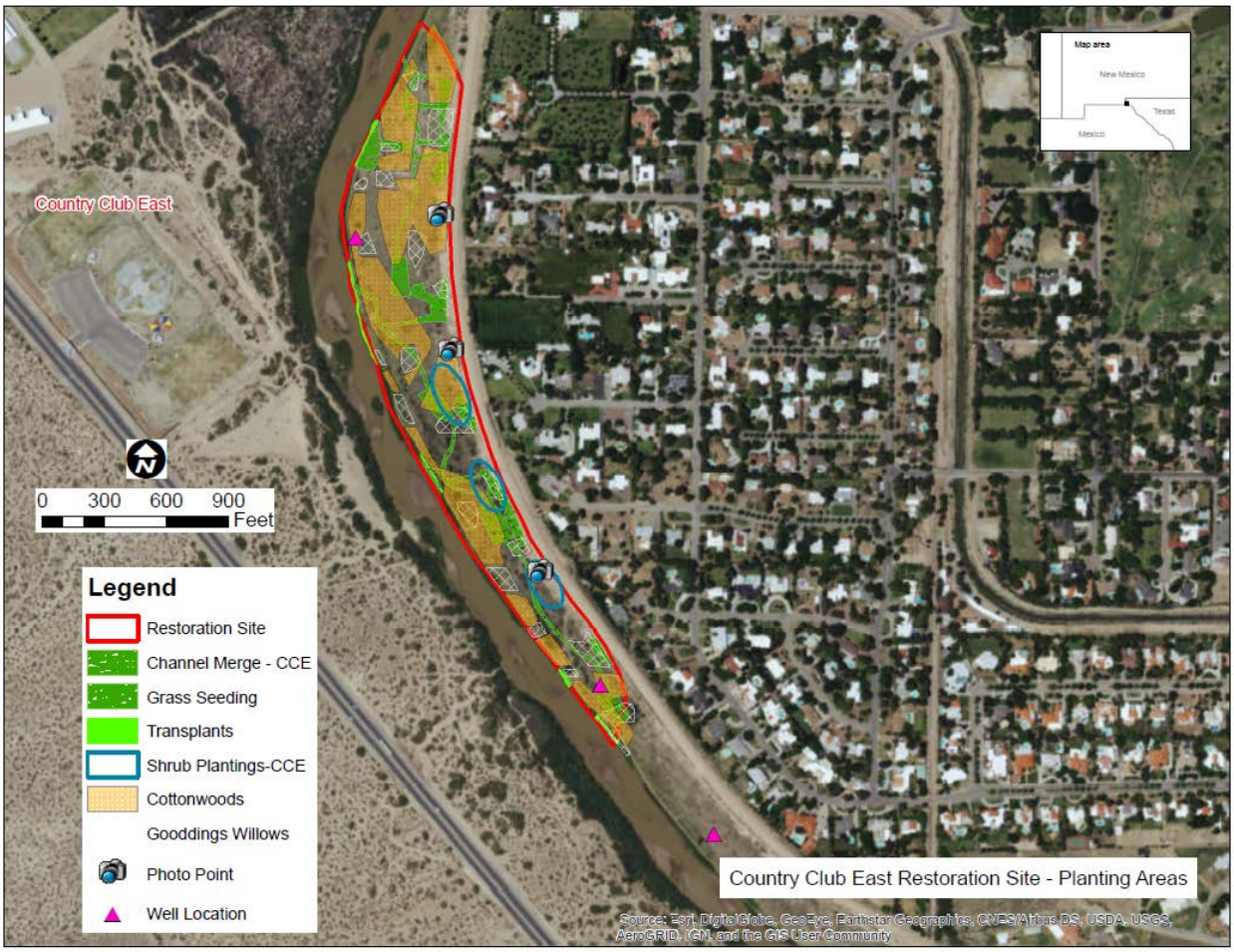


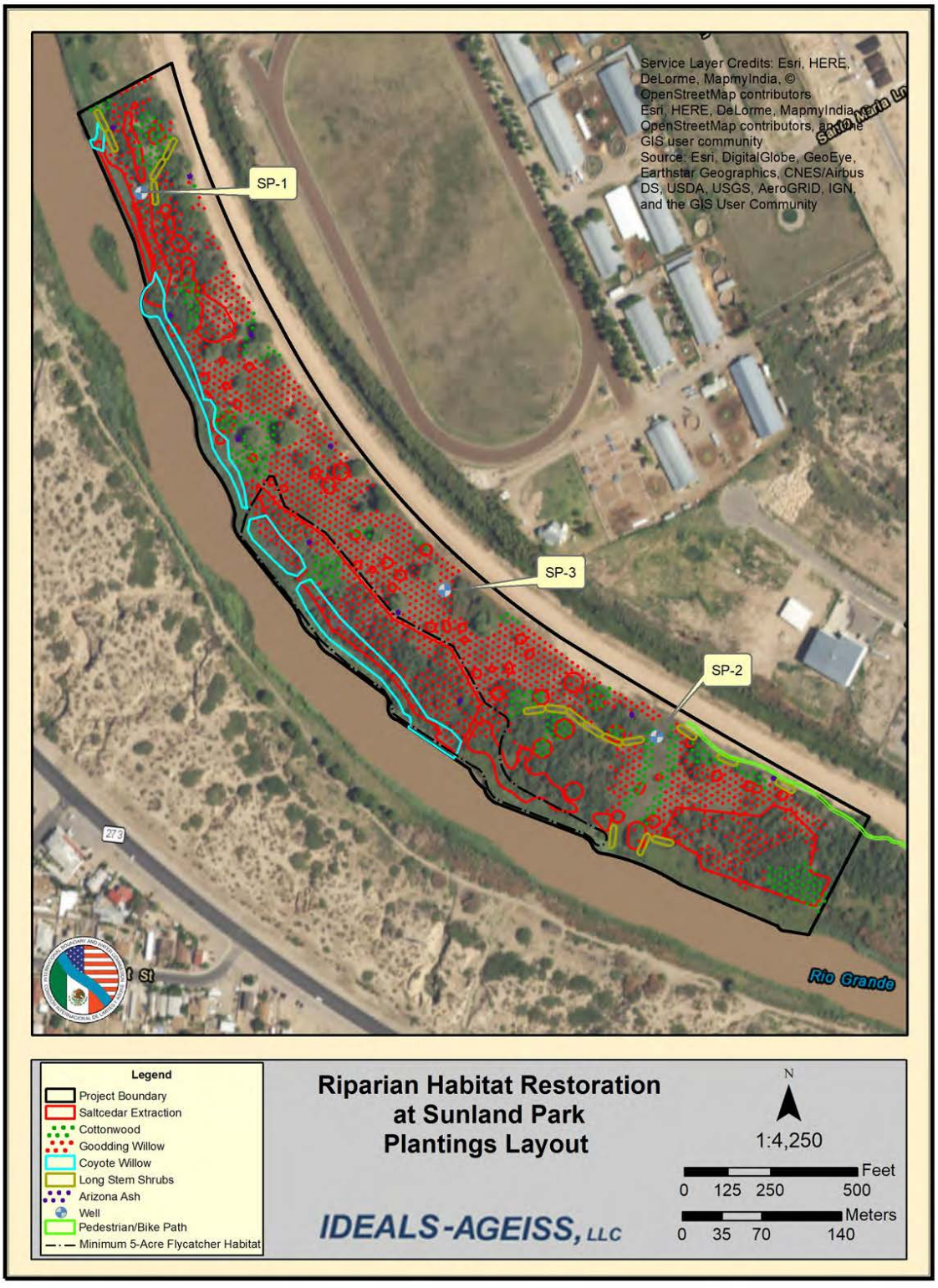

Strahan Rd
Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Little River Park
Intercepting Drain Canal
Combined La Union Wasteway Canal
Sixta Dr
Clayton Rd
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Arizona Ash
Pedestrian/Bike Path
Riparian Habitat Restoration at Valley Creek (North) Plantings Layout
IDEALS-AGEISS, LLC
N
1:3,800
Feet
0 115 230 460
Meters
0 30 60 120


Mary Frances Keisling Park
Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Gomez Rd
Valley Oak Dr
Valley Ash Ct
Valley Maple Dr
Valley Cedar Dr
Valley Elm Ave
Valley Plum Ave
VC-1
VC-2
Rio Grande
Rio Estancia Dr
Las Granjas
Maloy Ln
Mamie Rd
Elmwood Ct
Elmwood Ditch
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Arizona Ash
Well
Pedestrian/Bike Path
Riparian Habitat Restoration at Valley Creek (South) Plantings Layout
IDEALS-AGEISS, LLC
N
1:5,450
Feet
0 162.5 325 650
Meters
0 37.5 75 150


Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
CCE-2
CCE-3
CCE-1
Don Quixote Ct
Dover
Yorkshire Ct
Camino de Paz Ct
Rosinante Rd
Wakefield Ct
Dulcinea Ct
Waltham Ct
La Mancha Ct
River Elms Ct
Jacaranda Ln
Rio Grande
NEW MEXICO
TEXAS
McNutt Rd
273
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Arizona Ash
Swales and Ponds
Well
Riparian Habitat Restoration at Country Club East Plantings Layout
IDEALS-AGEISS, LLC
N
1:6,250
Feet
0 190 380 760
Meters
0 50 100 200

Country Club East Habitat Restoration Site 2019




Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
SP-1
SP-3
SP-2
273
Rio Grande
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Arizona Ash
Well
Pedestrian/Bike Path
Minimum 5-Acre Flycatcher Habitat
Riparian Habitat Restoration at Sunland Park Plantings Layout
IDEALS-AGEISS, LLC
N
1:4,250
Feet
0 125 250 500
Meters
0 35 70 140

Sunland Park Habitat Restoration Site 2019

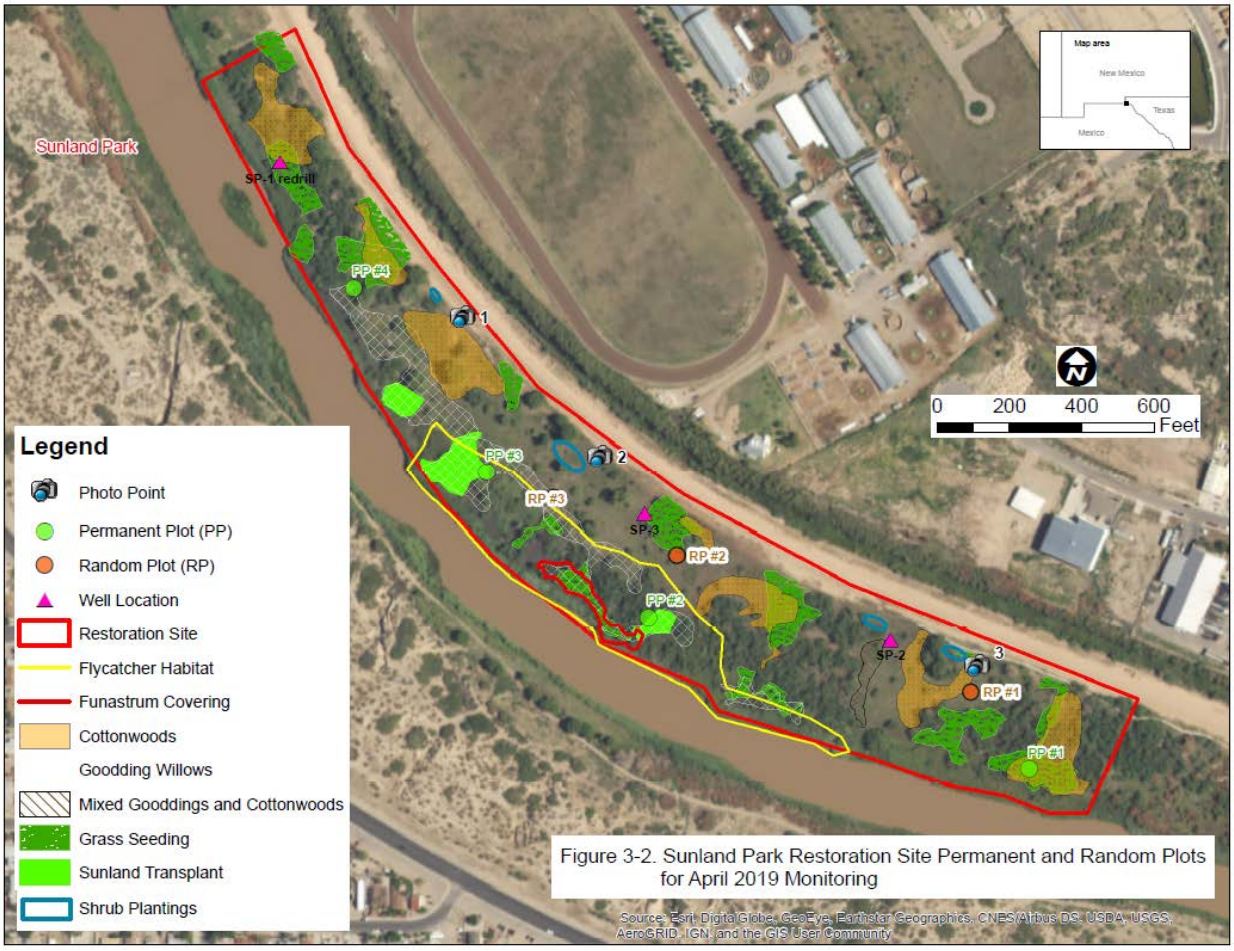
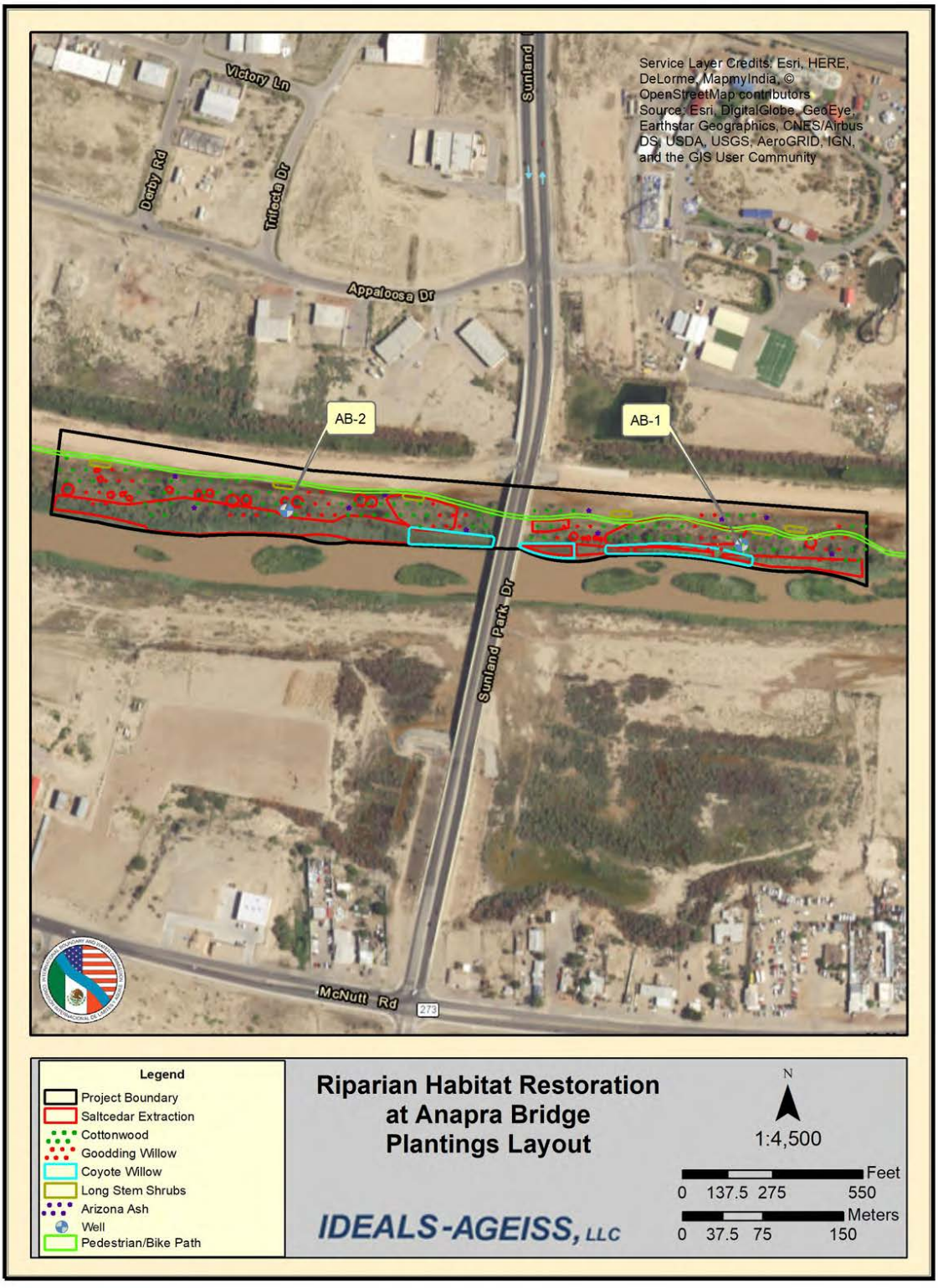


Figure 3-2. Sunland Park Restoration Site Permanent and Random Plots for April 2019 Monitoring


Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Victory Ln
Derby Rd
Trifecta Dr
Sunland
Appaloosa Dr
AB-2
AB-1
Sunland Park Dr
McNutt Rd
273
Legend
Project Boundary
Saltcedar Extraction
Cottonwood
Goodding Willow
Coyote Willow
Long Stem Shrubs
Arizona Ash
Well
Pedestrian/Bike Path
Riparian Habitat Restoration at Anapra Bridge Plantings Layout
IDEALS-AGEISS, LLC
N
1:4,500
Feet
0 137.5 275 550
Meters
0 37.5 75 150

Anapra Habitat Restoration Site 2019