Riparian Habitat Restoration at Three Sites in New Mexico and Texas: Country Club East, Sunland Park, and Anapra Bridge Restoration Sites

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LIST OF ABBREVIATIONS / ACRONYMS

BA	Biological Assessment
BO	Biological Opinion
EIS	Environmental Impact Statement
GPS	Global Positioning System
RGCP	Rio Grande Canalization Project
ROD	Record of Decision
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USIBWC	U.S. Section of the International Boundary and Water Commission
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

Historically, the Rio Grande in southern New Mexico was characterized by a wide, active floodplain with numerous marshes, backwater, oxbow pools, and a fringe forest of cottonwoods (*Populus* spp.), willows (*Salix* spp.), and shrubby phreatophytes (USFWS 2005). Stream flows, although subject to great fluctuations, were believed to be perennial in all years. By 1880 however, most of the land along the river that could be irrigated was under development. Between 1938 and 1943, the United States (U.S.) Section of the International Boundary and Water Commission (USIBWC) constructed the Rio Grande Canalization Project (RGCP) spanning a 105-mile reach of the Rio Grande from Percha Diversion Dam, New Mexico to American Dam in El Paso, Texas. The RGCP was constructed to facilitate compliance with equitable allocation of water between the United States and Mexico under the U.S.-Mexico Convention of 1906 (Act of June 4, 1936, PL 648; 49 Stat. 1463), and to provide flood protection against a 100-year flood event. The RGCP straightened and channelized the river, armored the riverbanks, constructed levees, and cleared the floodplain. RGCP construction and subsequent floodplain and channel maintenance have significantly reduced the occurrence and extent of aquatic, riparian, and wetland habitat.

Riparian and wetland habitats support a variety of floral and faunal species and are an important habitat found along the floodplains of Rio Grande River system. These habitats support threatened and endangered species including the southwestern willow flycatcher (*Empidonax traillii extimus*). Changes and reductions to riparian systems including the removal or reduction of riparian vegetation, reductions in water flow, alteration of flow patterns, and physical modifications to waterways have caused decline of some riparian species' populations. A reduction in occurrence and extent of wetland and riparian habitat is evident along the RGCP.

The USIBWC recognized the need to accomplish flood control, water delivery, and operation and maintenance activities in a manner that enhanced or restored the riparian ecosystem. On June 4, 2009, the USIBWC issued a Record of Decision (ROD) on long-term management of the RGCP. The ROD authorized restoration of aquatic habitat and a mosaic of native riparian plant communities at 30 sites totaling more than 550 acres over 10 years (through 2019). The principal objectives of the restoration are to enhance river-floodplain hydrologic connectivity; reduce exotic vegetation; restore endangered species habitat; and reestablish riparian habitat. The RGCP *Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande-Caballo Dam to American Dam, New Mexico and Texas* (2009) was developed in coordination with the U.S. Army Corps of Engineers (USACE 2009). The plan focused on restoring healthy riparian function, improving terrestrial wildlife habitat at sites, and enhancing the natural riverine process. As part of the *Final Environmental Impact Statement (EIS): River Management Alternatives for the Rio Grande Canalization Project*, the 2009 USIBWC ROD on long-term management of the RGCP (USIBWC 2004, 2009) identified a phased implementation approach for restoration measures. Phase I included the collection of additional site-specific data and design of site-specific implementation plans, which was documented in the 2011 *Site Implementation Plans for the Rio Grande Canalization Project Restoration Implementation Plan* (TRC 2011). The Conceptual Restoration Plan and Site Implementation Plans will be guides for restoration site implementation, including the site improvement for flycatcher breeding habitat.

The 2011 Biological Assessment (BA) for implementation of the ROD included site-specific information and species data collected during the phased implementation (SWCA 2011). The U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BO) in August 2012, which provides Reasonable and Prudent Measures that the USIBWC would undertake to ensure the protection of the flycatcher including establishing and maintaining breeding habitat (USFWS 2012). Since the 2012 BO, restoration activities have included cessation of mowing on 1,838 acres of No Mow Zones (which include most restoration sites) and the active management and restoration of 15 sites. In 2017 (IDEALS-AGEISS 2017), the BA was updated with information on the ROD implementation, changes in listed species status and critical habitat, and channel maintenance activities discussed in the River Management Plan (USIBWC 2016). In 2017, USIBWC consulted with the USFWS on the potential impacts to threatened and endangered species as a result of channel maintenance activities documented in USIBWC's River Management Plan for RGCP (USIBWC 2016), and USIBWC has been issued an updated BO for the actions (USFWS 2017).

In September 2017, USIBWC awarded Task Order IBM17T0012 to IDEALS-AGEISS for the implementation of a total of 68.8 acres of riparian habitat at three restoration sites along the RGCP in compliance with the ROD as well as the 2011 and 2017 BAs. Restoration efforts are concentrated at two sites in New Mexico (Sunland Park and Anapra Bridge), and one in New Mexico/Texas (Country Club East; Figure 1-1). Specifically, habitat restoration goals were to:

- Develop riparian forest (15 acres) and woodland habitat (14 acres) at Country Club East restoration site
- Develop open riparian woodland and dense riparian shrub habitat for the endangered southwestern willow flycatcher (*Empidonax traillii extimus*; flycatcher) at Sunland Park
- Develop open riparian woodland habitat at the Anapra Bridge restoration site (Table 1-1)

This annual report describes the current conditions, the restoration monitoring activities, and results from October 2017 to October 2018 at the Anapra Bridge, Sunland Park, and Country Club East restoration sites.

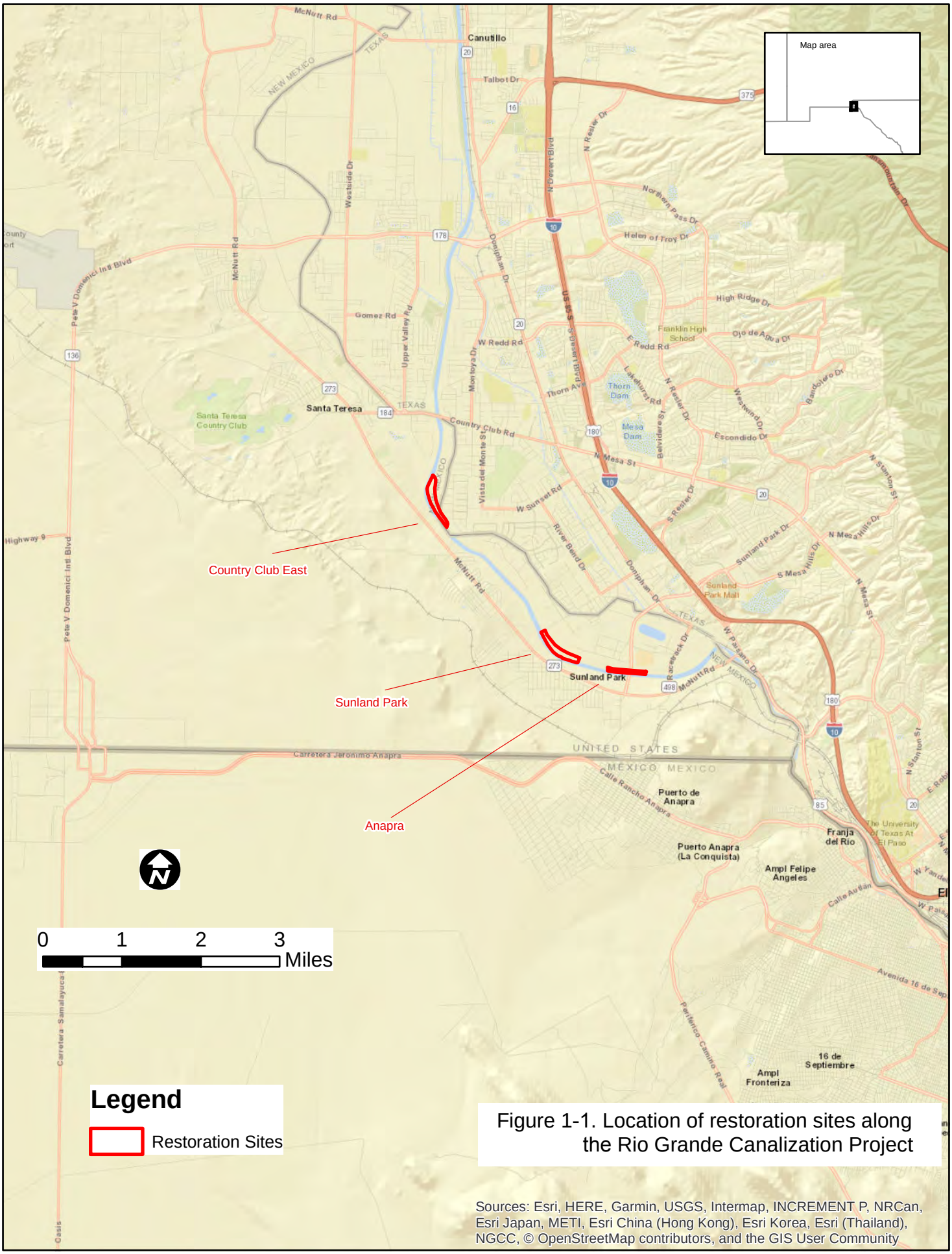

Figure 1-1. Location of restoration sites along the Rio Grande Canalization Project

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Table 1-1. Summary of Work Planned and Implemented at Habitat Restoration Sites

Site	Acres	Targeted Habitat	Planned Restoration Work	Restoration Work Implemented 2017-2018
Country Club East	29	Riparian forest (15 acres) and woodland (14 acres)	Targeted habitat includes creating alternating zones of closed canopy habitat and open woodland. The implementation plan suggested two 5-acre and one 4-acre open woodland patches separated by three 5-acre closed canopy forest habitats. However, to eliminate fragmenting the habitat, the planting regime was altered to produce a transition from the closed canopy forest to open woodland (IDEALS-AGEISS 2018).	Channel cuts and floodplain excavation of swales were implemented at the site. Transplanted coyote willows were placed along the river banks to supplement areas where saltcedars were removed. Cottonwoods were concentrated in the swales. Goodding's willows and cottonwoods were densely planted adjacent to the river bank, and the more open woodland areas were planted closer to the levees. Grass seeding occurred on 5.5 acres in the open woodland habitat.
Sunland Park	28.8	Open riparian woodland and dense riparian shrub habitat	This site is targeted for open riparian woodland and approximately 5 acres of dense riparian shrub habitat for flycatchers.	The northern end of the site, which already contains some riparian habitat, was further augmented with coyote and Goodding's willows to provide for the dense riparian habitat preferred by flycatchers. Cottonwoods were planted in clusters while avoiding the native vegetation and along portions of the trail to provide shade. Approximately 3.5 acres of grass seeding was conducted.
Anapra Bridge	11	Open riparian woodland	To create open riparian woodland habitat, cottonwoods would be spaced throughout this linear site. In addition, cottonwoods would be spaced along the trail to provide shade. Longstem shrubs would be planted in six areas along the trail section with a 10-foot buffer between the trail and the vegetation	Transplanted coyote willow clumps were placed along the bank and intermixed with remaining native vegetation. Cottonwoods were planted to create open woodland habitat. A smaller number of Gooding's willows were intermixed with the cottonwoods. Approximately 0.27 acre of grasses seeding was conducted.

2.0 RESTORATION METHODOLOGY

Prior to conducting any work, the field crew established a minimum of three camera points for each restoration site (Table 2-1). Each camera point has a Global Positioning System (GPS) location and is permanently marked for future reference. Three photo points for each camera point (where the camera is located) were established and permanently marked (fencepost or rebar). The distance between camera and photo point and the azimuth was noted and an identification number was assigned to each photo and camera point. The points were given an adequate view of the site to document the anticipated growth of revegetated areas and to monitor the stability of in-stream work. Photo point information was collected during five periods of the project: pre-implementation monitoring, pre-restoration monitoring, and three times during post-restoration events. Additional photos were taken of any significant changes and points of interest. Photos were documented in accordance with Federal and National Archives and Records Administration regulations. Each photo meets the USIBWC requirements for pixel array and was uniquely numbered and labeled for identification. Qualitative monitoring field sheets developed by USIBWC were used to document conditions at each site during each monitoring period.

Table 2-1. Established Photo Points for Each Restoration Site

Restoration Site[1]	Photo Point 1		Photo Point 2		Photo Point 3	
	UTM E	UTM N	UTM E	UTM N	UTM E	UTM N
Country Club East	348007	3523023	348022	3522824	348154	3522498
Sunland Park	350406	3519904	350522	3519787	350840	3519610
Anapra Bridge	352217	3519296	351825	3519320	351638	3519347

[1] Specific bearings from each photo point are contained in Appendix A.
UTM Universal Transverse Mercator

2.1 Site Preparation

Prior to implementation of the restoration effort, two types of signage were posted within the restoration properties. Within each restoration site, two steel post signs and flexible delineator posts were maintained at approximately 200 to 400 feet apart.

To protect native vegetation identified at the site, vegetation was flagged prior to site preparation. Exotic species were then removed in order to increase the current native habitat. Saltcedar (*Tamarisk spp*.) plants were cut near the base of the plant with a chainsaw, these branches were then run through a wood chipper with the woodchips being dispersed throughout the site. Following removal of the branches and trunks, a backhoe and excavator with a bucket and grappler (clasping thumb) attachment was used to extract the large root masses including the root crown. This removal process was used for saltcedars along the stream bank and throughout the restoration sites within the floodplain. Other low-growing noxious weeds (e.g., Russian thistle [*Salsola tragus*]) were grubbed using a small tractor with a mower attachment. Site preparation began in December 2017, continued in concurrence with planting activities at other restoration sites, and was completed in April 2018.

**Saltcedar extraction and chipping at Sunland Park,
13 February 2018**

New invasive species growth identified during the monitoring phase and outside of the 30-foot buffer of the river channel or seasonal pond was treated with chemical application of herbicides. Identified species were treated in areas where mechanical methods are inaccessible or not appropriate. A Commercial Applicator, licensed by the New Mexico Department of Agriculture, determined the application concentrations and rates of the herbicide. Saltcedar re-sprouts were treated with Garlon® 4 herbicide in September outside the migratory bird nesting season (March 1 to August 31).

2.2 Native Planting

IDEALS-AGEISS developed restoration plans (IDEALS-AGEISS 2018) based on guidance from the RGCP Conceptual Restoration Plan (USACE 2009) and RGCP River Restoration Site Implementation Plans (TRC 2011). Planting activities in the field followed IDEALS-AGEISS' planting plans (Appendix C). The following changes to the project were approved by USIBWC:

1. Coyote willows were transplanted from the islands being removed for channel maintenance.

2. The timing of the transplants necessitated completing the remaining pole plantings in winter 2018.

3. In hopes to increase survivorship, longstem shrub and potted tree planting occurred in fall 2018.

The 2017 BO allows the USIBWC to remove some vegetation within the channel that is suitable for the flycatcher as long as USIBWC continues to implement riparian habitat restoration and follows other requirements and recommendations (USFWS 2017). In the 2017 BO, the USFWS recommended that USIBWC transplant vegetation from islands slated for removal in the channel. Several islands in the El Paso area were slated for removal as part of the island channel maintenance. USIBWC worked with IDEALS-AGEISS to incorporate the vegetation transplant activities as part of this restoration task order.

Prior to USIBWC crews removing the island sediment, IDEALS-AGEISS extracted coyote willows from islands designated for removal and transplanted them to all the restoration sites. IDEALS-AGEISS crews used a front-end loader to extract clumps of coyote willows with the root balls, approximately 25 stems per bucket load, and placed them in excavated trenches within the floodplain along the riverbank. The trenches were dug deep enough such that the root balls will be in contact with groundwater during the winter months when the water table is at its lowest. Once the willows and root balls were placed in a trench, it was then backfilled taking care to not damage newly transplanted willows and to eliminate any voids within the backfill material. Coyote willows from the islands were transplanted from January to March 2018.

Removing coyote willows for transplanting at Anapra Bridge, February 2018

Coyote willow transplants in open ditch at Anapra Bridge, February 2018

Cottonwood poles and Goodding's willow (*Salix gooddingii*) nursey stock for planting was purchased locally from Santa Ana Native Plants Bernalillo, New Mexico (cottonwoods) and Hydra Aquatic Albuquerque, New Mexico (Goodding's willows). Cottonwood poles and Goodding's willows were 12- to 16-feet long and approximately 2- to 3-inches in diameter. An auger was used to plant cuttings after the cuttings soaked for approximately 2 weeks. Planting was conducted in late winter/early spring months (February through March). Due to the timing for the transplants, not all sites were planted in the spring.

Based on other restoration sites, fall plantings for the long-stem shrubs seem to promote better survivorship; therefore; plantings of these species were moved to late fall 2018. Shrub planting began in October 2018.

Site specific planting maps based on the recommended plantings (see Table 2-2) were developed for each restoration site in the Restoration Plan (IDEALS-AGEISS 2018).

Augering holes for cottonwood pole planting at Sunland Park, 21 March 2018

Shrub planting at Anapra Bridge, 15 November 2018

**Cottonwood poles being soaked,
27 February 2018**

Table 2-2. Planting Requirements for the Three Restoration Sites

Planting	Country Club East	Sunland Park	Anapra Bridge
Coyote willow poles	3,480	3,440	330
Gooding's willow poles	440	2,350	55
Cottonwood poles	1,620	400	110
Longstem riparian shrubs	2,320	1,152	330
Arizona ash and/or Arizona ash	10	10	10
Grass and forb seeding	5.15 acres	3.5 acres	0.27 acre
Original conditions	Mowing has been discontinued at the site. Mixed stands of native and nonnative vegetation occurred, including coyote willow along the banks, saltcedar, mesquite, arrow-weed and brush, including nonnative kochia and Russian thistle. The southern end of this site contains good patches of screwbean mesquite with a thin coyote willow component along the river bank and a few cottonwoods.	Unmaintained with large cottonwoods and mature mesquite, willows, and saltcedar. Site contains isolated Russian olives. Saltcedar beetle damage is evident.	Mowing has not occurred in several years; however, mowing may continue along bike path. The site contains large saltcedars (with evidence of beetle damage) and Russian olives. Surface salt areas occur throughout the site.

2.3 Groundwater Monitoring

During each monitoring period and assessment, groundwater levels were collected and analyzed at the existing USIBWC shallow groundwater monitoring wells at the restoration sites and the information will be used to supplement the groundwater monitoring data from the past several years. Groundwater measurements were taken to the top of the polyvinyl chloride casing inside the steel protector.

2.4 Restoration Monitoring

A pre-implementation monitoring assessment was conducted on 16 October 2017, prior to any work at the sites in support of the restoration plan. Field crew identified and mapped the distribution of invasive species for removal and riparian habitat (specifically the willow species of interest) to be protected during restoration efforts. Wildlife species and floral species observed on the site were documented.

Once the noxious vegetation was removed, and the site prepped for planting, a pre-restoration assessment of the three sites was conducted. This assessment documented the remainder of the native vegetation on each site and the baseline habitat prior to planting and was conducted in February 2018.

Three post-restoration assessments were conducted in May, August, and October of 2018. During post-restoration efforts, native and non-native species were noted as well as approximate cover. Both random and fixed plot approaches (1/10th-acre plots) were used to approximate the type and percent of ground, brush, and canopy cover. The circular plots measure 37.2 feet in diameter. Immediately after planting, three to four fixed plots were established within each restoration site. In addition, during each monitoring session, three additional random plots were chosen and monitored. During the October 2018 monitoring session, all planted cottonwood poles and willows were counted to determine survivorship. Percent cover and species composition were recorded on each site's field monitoring sheet (Appendix A). In addition, any changes in vegetation condition were noted on the field monitoring sheet, as well as stream bank conditions and any wildlife sightings.

3.0 RESULTS

3.1 Groundwater Monitoring

Groundwater levels are historically lower at the Anapra Bridge site compared to the other two sites except during irrigation release periods when they are similar (Appendix A). The wells at Sunland Park (SP-MW-1) and Country Club East (CCE-MW-2, CCE-MW-3) were re-established in March 2018. Table 3-1 presents information tabulating current groundwater levels at the Country Club East, Sunland Park, and Anapra Bridge restoration sites.

Table 3-1. Groundwater Monitoring Well Data

Site	Well ID	Site Visit Dates and Depth to Water from Surface in Feet							
		Pre-implementation 2017	Pre-restoration 2018	Post-restoration 2018/2019					
		11/10/2017	2/5/2018	May 2018	Aug 2018	Oct 2018	April 2019	July 2019	Oct 2019
Anapra	AB-MW-1	4.09	3.83	4.5	2.43	7.40			
	AB-MW-2	5.15	2.17	1.52	2.17	8.90			
Sunland Park	SP-MW-1	Destroyed	Destroyed	2.68	3.97	8.76			
	SP-MW-2	5.42	3.42	4.87	3.64	11.8			
	SP-MW-3	3.08	2.75	4.58	7.09	9.00			
Country Club East	CCE-MW-1 (TX)	6.55	6.46	5.22	6.49	7.60			
	CCE-MW-2	4.38	Obstructed	2.68	2.79	7.90			
	CCE-MW-3	Obstructed well	Obstructed at 4.06	4.08	3.94	5.80			

3.2 Post-Restoration Site Conditions

Native forbs and grasses were found throughout all three restoration sites and made up a large part of the ground cover (Appendix A). Dominant vegetation at the three sites varied (Table 3-2). Kochia (*Kochia scoparia*) and Bermuda grass (*Cynodon dactylon*) were the most common non-native species to dominate the sites during the August monitoring (when the largest diversity and covering of species was documented). These species were prevalent in the disturbed areas where saltcedars were removed, and kochia was prevalent in the coyote willow (*Salix exigua*) transplant areas of Sunland Park and Country Club East. Approximately 15.9 acres of saltcedar was removed: Country Club East 5.17 acres, Sunland Park 7.18 acres, and Anapra Bridge 3.55 acres. From September 19-21, 2018, IDEALS-AGEISS treated saltcedar re-sprouts with Garlon® 4 herbicide at the restoration sites.

Table 3-2. Dominant Vegetation Cover Observed at the Three Restoration Sites, August 2018

Common Name	Scientific Name	Estimated Percent Cover		
		Anapra	Sunland Park	Country Club
Native Species				
Coyote willow	*Salix exigua*	5-10	<5	<5
Cottonwood	*Populus deltoides*	-	1	1
Screwbean mesquite	*Prosopis pubescens*	<5	5	5
Salt grass	*Distichlis spicata*	<5	-	<1
Willow baccharis	*Baccharis salicina*	<1	-	1
Silverleaf nightshade	*Solanum elaeagnifolium*	-	8	15
Alkali sacaton	*Sporobolus airoides*	<3	-	5
Squirreltail	*Elymus elymoides*	-	-	1
Milkweed	*Asclepias spp.*	-	5	15
Bulrush	*Typha spp.*	-	-	1
Crotaluria	*Crotalaria spp.*	<1	-	1
Spiny chloracantha	*Chloracantha spinosa*	<1	1	-
Iodine bush	*Allenrolfea occidentalis*	<1	-	-
Goosefoot	*Chenopodium spp.*	<5	-	-
Purple aster	*Symphyotrichum ascendens*	<1	-	-
Funastrum	*Funastrum cynanchoides*	-	1	-
Fogfruit	*Phyla lanceolata*	-	1	-
Sunflower	*Helianthus spp.*	-	1	-
Guara	*Guara spp.*	-	5	-
Non-Native Species				
Saltcedar	*Tamarix chinensis*	<1	<1	1
Bermuda grass	*Cynodon dactylon*	40	40	40
Kochia	*Kochia scoparia*	-	-	5
Giant cane	*Arundo donax*	-	-	1

3.2.1 Country Club East

USIBWC discontinued mowing along the Country Club East site in 2011. The southern end of the site has moderate patches of screwbean mesquite (*Prosopis pubescens*) with a thin coyote willow component along the river bank and a few cottonwoods (*Populus deltoides*). Away from the river there are some mixed native and non-native vegetation patches with scattered Siberian elm (*Ulmus pumila*) and cottonwood amongst severely stressed saltcedar. Prior to restoration efforts, ground cover vegetation was dominated by alkali sacaton (*Sporobolus airoides*) and pigweed (*Amaranthus spp.*). Habitat at this site has the potential to provide suitable flycatcher habitat within the next few years with the additional restoration efforts.

Restoration efforts for the site focused on creating alternating zones of closed canopy habitat and open woodland. IDEALS-AGEISS conducted two types of excavation work at the Country Club East site: channel cuts and floodplain excavation of swales and ponding areas. The bank cuts were constructed by lowering the elevation of the existing embankment through the use of 4H:1V side slopes progressing to a

depth of approximately 18 inches at flowline. The three upstream bank cuts located along the embankment of the river are considered inlets and are intended to allow flows from the river to encroach and travel within the restoration area. The bank cuts along the river transition to a V-shape swale that meanders throughout the restoration site providing additional moisture and improving plant growth. Located at the south end of Country Club East restoration site is an additional bank cut that is intended to release low flow runoff conditions back to the stream channel of the river. Meter gauges were placed at each cut to monitor the water level.

Cut bank area at Country Club East, 21 March 2018

In addition, drainage swales were created at the site approximately 18 inches deep at the embankment of the Rio Grande and reach depths up to 2 feet at the water retention ponding areas. Cottonwoods were planted within these swales and ponding areas and the areas were seeded.

Drainage swales created at Country Club East, 28 August 2018.

Planting locations are shown in Figure 3-1. Approximately 4,000 coyote willows (3,480 required) were transplanted along the bank at the Country Club East site. In addition, 440 Goodding's willows and 1,620 cottonwoods were also planted. Native grass seed using a combination of alkali sacaton (*Sporobolus airoides*), sand dropseed (*S. cryptandrus*), and inland saltgrass (*Distichlis spicata var. spicata*) was spread on the disturbed areas throughout the site, along the swales, and within the ponding areas. Grass seed was also applied to temporary access roads created during the saltcedar removal (5.5 acres). Grass seeding was performed the week of 5 August 2018. As of August, minimal saltcedar (less than 1 percent) remained at the site and consisted of small re-growth sporadic individuals. August monitoring documented that screwbean mesquite and coyote willows dominate the canopy layer while milkweed (*Apocynaceae*) and silverleaf nightshade (*Solanum elaeagnifolium*) and Bermuda grass dominated the forb/grass layer. Several other forb species make up the grass and forb vegetation cover on the site (Table 3-2). In October, non-native species such as Bermuda grass dominated the cover.

3.2.2 Sunland Park

The Sunland Park site, part of a recreation lease to the City of Sunland Park, was left unmaintained for many years, allowing for the growth of large cottonwoods and mature mesquite and willows. Mowing was discontinued at the Sunland Park restoration site. The southern end of the site has well developed riparian habitat and was augmented with coyote willows and Goodding's willow to develop the 5-acre dense riparian shrub habitat for the flycatcher. Several rows of transplanted coyote willows were planted in the area to promote the flycatcher habitat. Approximately 3,585 coyote willows (3,440 required) were planted along the banks where the saltcedar was extracted as well as in the flycatcher habitat areas (Figure 3-2). In addition, Goodding's willows (2,055 Goodding's willows of the required 2,350) were planted throughout the site but primarily concentrated in the flycatcher habitat area. The remainder of the Goodding's will be planted in the winter of 2018. All 400 cottonwoods were planted at the site per the

planting plan (Appendix C). Grass seeding occurred during the week of 5 August 2018 in open areas throughout the site (3.5 acres) that sustained disturbance during restoration (Figure 3-2).

Planting in the flycatcher habitat at Sunland Park, 4 April 2018

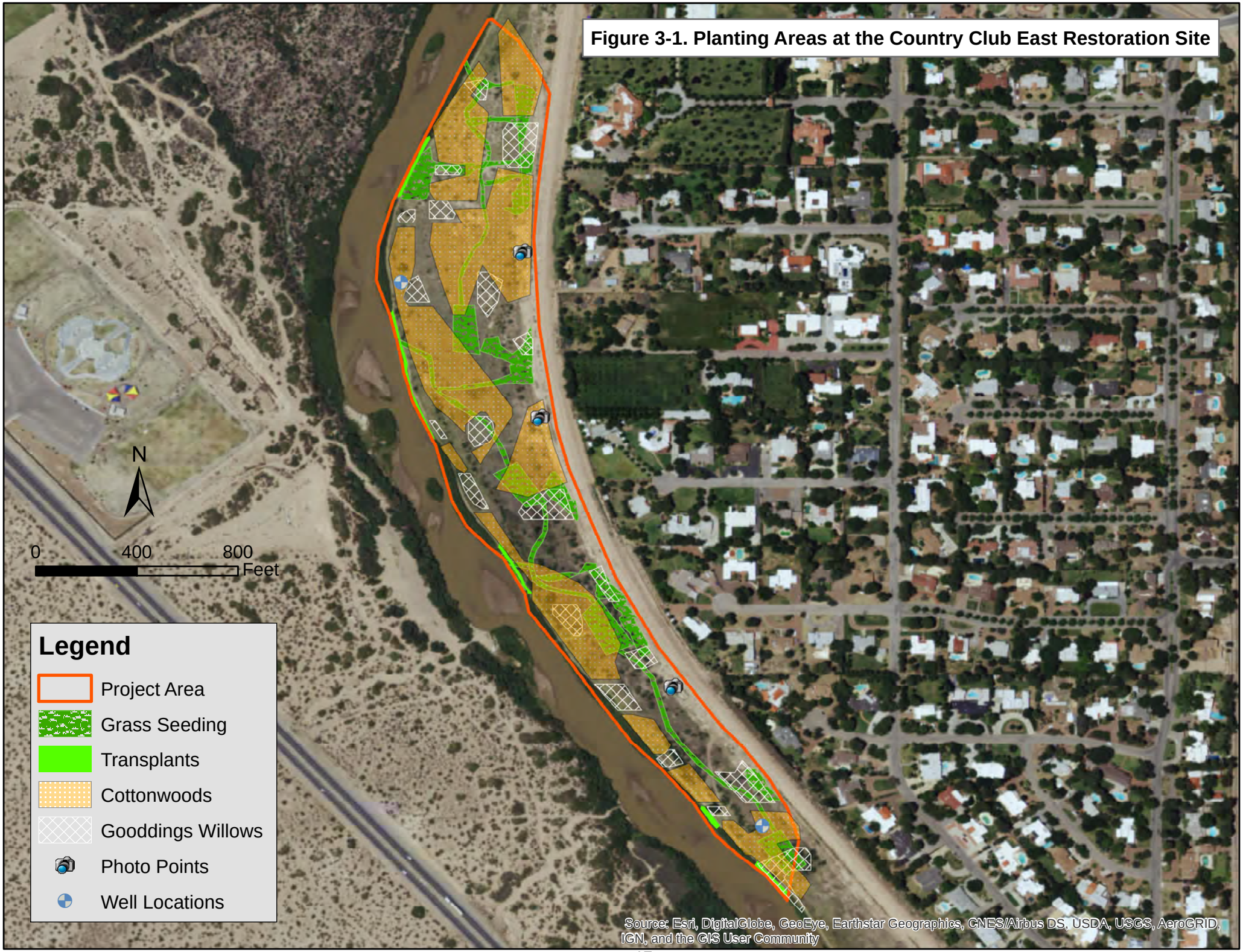
Figure 3-1. Planting Areas at the Country Club East Restoration Site
N
0
400
800
Feet
Legend
Project Area
Grass Seeding
Transplants
Cottonwoods
Gooddings Willows
Photo Points
Well Locations
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

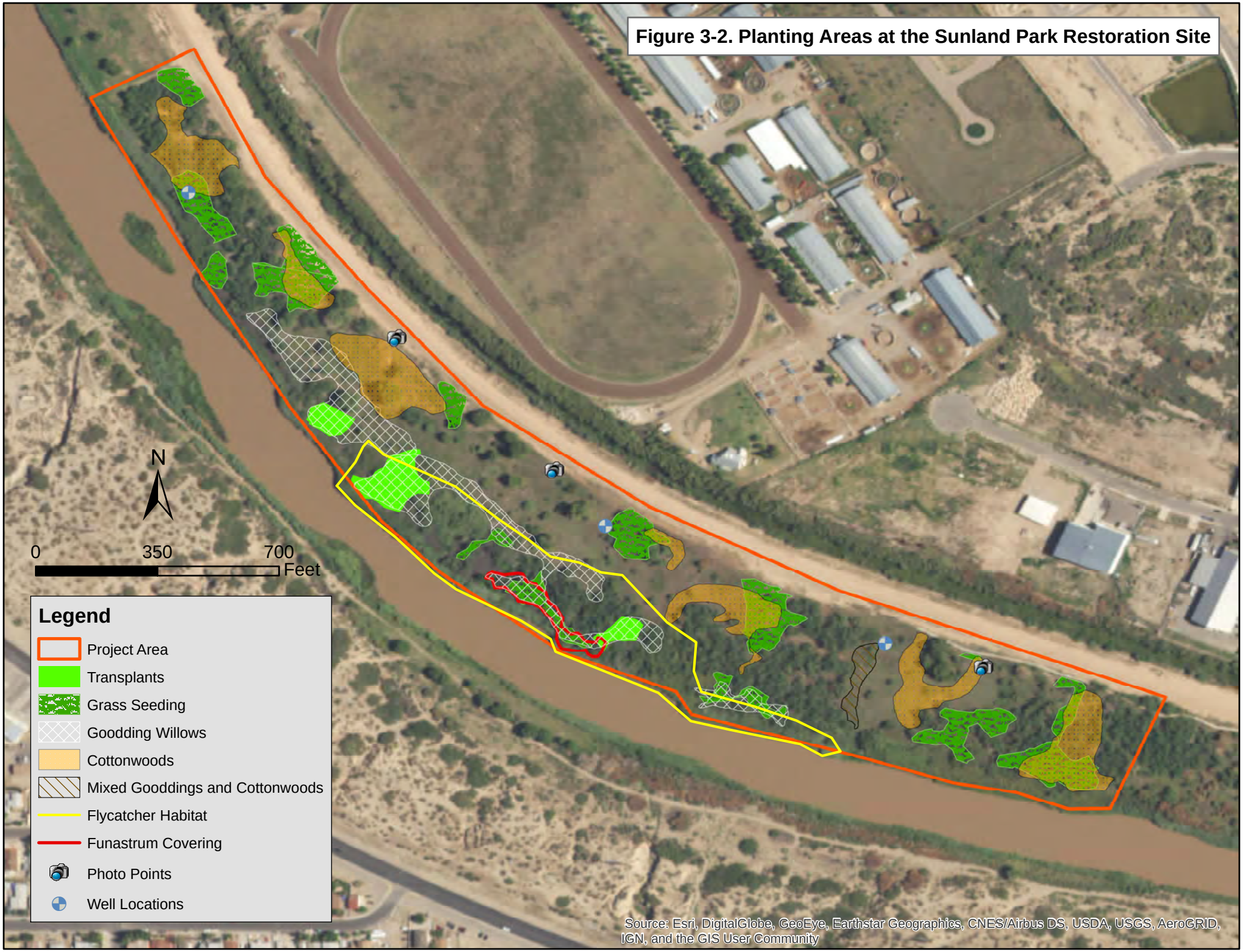
Figure 3-2. Planting Areas at the Sunland Park Restoration Site
N
0
350
700
Feet
Legend
Project Area
Transplants
Grass Seeding
Goodding Willows
Cottonwoods
Mixed Gooddings and Cottonwoods
Flycatcher Habitat
Funastrum Covering
Photo Points
Well Locations
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Gauge meters at all four bank cuts at Country Club East during October 2018 from south to north

Cottonwoods planted in the swales at Country Club East, 18 October 2018

Kochia found mixed with the transplanted coyote willows at Country Club East, 18 October 2018

During the August monitoring, silverleaf nightshade and Bermuda grass dominated the ground cover at the Sunland Park site (Table 3-2). Vegetative cover at the site was composed of 20 percent tree species and 80 percent ground cover. Very few sporadic saltcedar were observed at the site. Screwbean mesquite

and coyote willows dominated the canopy layer. The willows planted for the flycatcher habitat were developing well during the August 2018 monitoring (Appendix B). In October, the non-native species Bermuda grass dominated the site, although several other forb species were present during the site monitoring (Appendix A). During the October monitoring, IDEALS-AGEISS biologists noted that funastrum (*Funastrum cynanchoides*), a twining milkweed species, established within the transplanted coyote willows and Goodding's willows area; the area recently exposed for the salt-cedar removal. At times, only individual trees were entwined by the vine, but in some areas the vine developed into a large mat which overgrew the naturally occurring coyote willows on the bank and engulfed the planted willows.

Funastrum mat that has covered the coyote and Goodding's willows along the banks at Sunland Park, 17 October 2018

Example of a Goodding's willow covered with funastrum at Sunland Park, 17 October 2018

3.2.3 Anapra Bridge

The Anapra Bridge site is part of the hike and bike trail and should have been mowed, per the lease agreement with Sunland Park; however, the City of Sunland Park has not mowed in several years. This 11-acre narrow site has a thin strip of mixed native vegetation comprised of coyote willow, seep willow (*Baccharis salicifolia*), and screwbean mesquite, that runs along the bank of the river. Salinity on this site varies with one area containing surface salt noted during the pre-implementation phase of the project. Approximately 1,144 coyote willows were transplanted along the bank at the site (330 willows were recommended; Figure 3-3) and 55 Goodding's willows and 110 cottonwoods. Limited seeding (0.27 acres) occurred at the Anapra site and included the area north of the bridge where the coyote willows were removed (mowed).

In March 2018, the USIBWC maintenance crew mowed the transplanted coyote willows at the Sunland Park Bridge at the Anapra site. Approximately 385 trees were mowed. USIBWC is revising the No Mow Zones accordingly to include the east bank of the Sunland Park Bridge as a No Mow Zone. USIBWC's River Management Plan notes that 300 feet upstream and downstream of bridges are mowed; however, USIBWC has noted the Sunland Park Bridge east bank as an exception and will be mowed only 100 feet upstream and downstream of the bridge at the Anapra site. In October 2018, the north side of the bridge appeared to have been mowed again and at the south side of the bridge some willows were re-sprouting. Heavy salt patches were documented in several areas on the site during the October monitoring.

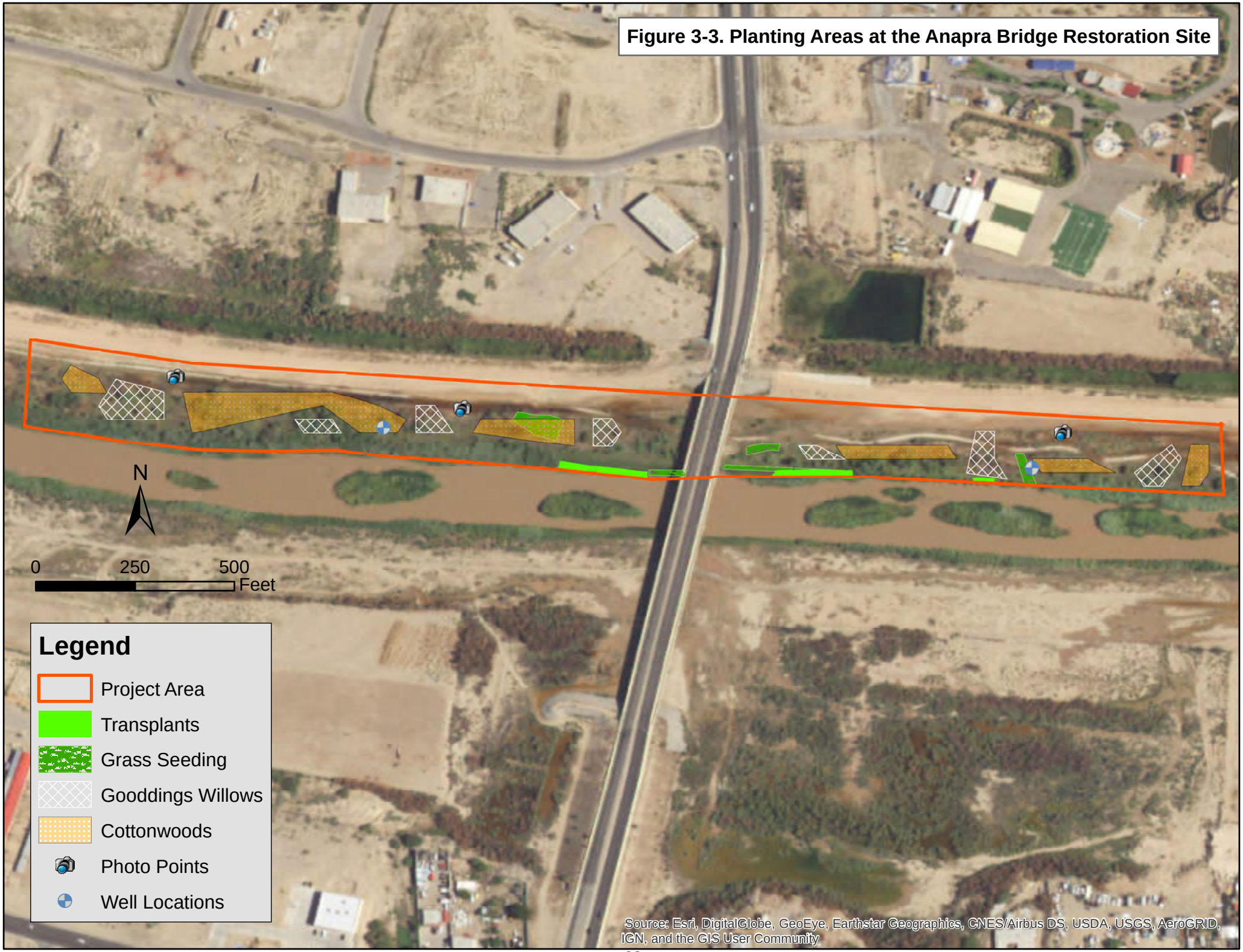
Figure 3-3. Planting Areas at the Anapra Bridge Restoration Site
N
0
250
500
Feet
Legend
Project Area
Transplants
Grass Seeding
Gooddings Willows
Cottonwoods
Photo Points
Well Locations
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coyote willows mowed at the Sunland Bridge on the Anapra restoration site, 14 March 2018

No recent evidence of herbivory was observed at any of the sites, although a dead (shot) beaver (*Castor canadensis*) was located at the Sunland Park site in November 2018. The IDEALS-AGEISS team biologists did observe other instances which had an impact, or the potential to impact, restoration efforts. Pocket gopher activity was pronounced at the Sunland Park and evident at the Anapra Bridge site. This species has the potential to undermine root structure of planted poles. Plantings at both Anapra Bridge and the Country Club East restoration sites incurred damage from maintenance crews and other recreationists. Approximately 20 cottonwood poles on the north end of Country Club East restoration site were destroyed by USIBWC maintenance crews mowing the floodplain on 29 August 2018. Additional damaged trees were noted at the Country Club East site during the October 2018 monitoring (see Section 3.3.

Wildlife species observed at the three restorations sites varied throughout the year (Appendix A) and were predominately avian. A diversity of avian species was noted during the October 2018 monitoring effort (Table 3-3).

Table 3-3. Wildlife Species Observed at all Restoration Sites in October 2018

Scientific Name	Common Name	Observed at Restoration Site
Accipiter striatus	Sharp-shinned hawk	Anapra
Agelaius phoeniceus	Red-winged blackbird	Anapra, Sunland Park
Ammodramus savannarum	Grasshopper sparrow	Anapra
Auriparus flaviceps	Verdin	Country Club
Ardea alba	Great egret	Country Club
Ardea herodias	Great blue heron	Country Club
Buteo jamaicensis	Red-tailed hawk	Country Club

Scientific Name	Common Name	Observed at Restoration Site
Buteogallus anthracinus	Black hawk	Sunland Park, Country Club
Cathartes aura	Turkey vulture	Sunland Park
Circus hudsonius	Northern harrier	Sunland Park
Colaptes auratus	Red-shafted flicker	Sunland Park
Columba livia	Rock pigeon	Sunland Park
Geomys spp. or Cratogeomys spp.	Pocket gopher	Anapra, Sunland Park, Country Club
Haemorhous mexicanus	House finch	Anapra, Sunland Park, Country Club
Hirundo rustica	Barn swallow	Anapra, Country Club
Melospiza lincolnii	Lincoln sparrow	Sunland Park, Country Club
Pandion haliaetus	Osprey	Sunland Park
Passer domesticus	House sparrow	Anapra
Peucaea cassinii	Cassin's sparrow	Sunland Park
Phainopepla nitens	Phainopepla	Sunland Park
Plegadis chihi	White-faced ibis	Anapra
Procyon lotor	Raccoon	Country Club
Sayornis nigricans	Black phoebe	Sunland Park
Sylvilagus audubonii	Audubon's cottontail	Sunland Park
Tringa melanoleuca	Greater yellowlegs	Anapra
Zenaida asiatica	White-winged dove	Sunland Park, Country Club
Zenaida macroura	Mourning dove	Country Club
Zonotrichia albicollis	White-throated sparrow	Sunland Park
Zonotrichia leucophrys	White-crowned sparrow	Country Club

3.3 Native Planting Survivorship

During each monitoring event, IDEALS-AGEISS Team biologists inspected the transplanted willows and the pole plantings to document survival and evaluate their overall health status. With the number of trees to be planted, IDEALS-AGEISS recommended survivorship plots be established on each site to provide a sample of the site until the October 2018 monitoring when all planted species were accounted for. Dead trees were flagged during the May and August 2018 monitoring periods when noted, although flagging unfortunately did not last through the summer. In October 2018, the IDEALS-AGEISS Team biologists walked transects through the sites to identify all the plantings. Poles that appeared to be dormant or dead were examined for regrowth at the base of the pole and a "snap test" was applied to the outer branches when no regrowth was

Example of cottonwood damage at Country Club East, August 2018

noted. Poles that showed no signs of regrowth and easily cracked or broke during snap tests were recorded as mortalities. Survivorship documented during the October 2018 monitoring period is noted in Table 3-4.

It was noted especially at the Anapra Bridge and Sunland Park restoration sites that some cottonwood poles rotted at the base of the pole. When the snap test was applied to these trees, the pole broke at ground level and the stem and the root system appeared to be rotted. These sites were not inundated with water to create prolonged exposure of submerged poles.

Example of cottonwood that rotted at the base at Anapra Bridge, 17 October 2018

Base of rotted cottonwood at Anapra Bridge, 17 October 2018

Table 3-4. Plant Survivorship per Monitoring Event

	Anapra Bridge			Sunland Park			Country Club East		
	Coyote Willow	Cottonwood	Goodding's Willow	Coyote Willow	Cottonwood	Goodding's Willow	Coyote Willow	Cottonwood	Goodding's Willow
May 2018[1]									
Alive	67	2	7	886	0	139	248	56	12
Stressed	1	13	6	2	13	136	0	87	12
Dead	0	0	0	0	0	5	1	1	0
Survival	100%	100%	100%	100%	100%	98%	99%	99%	100%
August 2018[1]									
Alive	69	0	7	833	0	107	667	25	13
Stressed	0	43	13	169	32	206	0	96	21
Dead	0	2	2	178	1	14	1	7	1
Survival	100%	96%	91%	85%	97%	96%	99.9%	94%	97%
October 2018									
Alive	805	0	21	4,997	2	725	2,077	276	140
Stressed	0	92	33	599	210	584	0	949	275
Dead	0	43	1	66	114	273	0	78 (57)[2]	9 (16)[2]
Unaccounted for	-	0	0	-	74	473[3]	-	260	0
Survival	100%	68%	98%	99%	53%	67%	100%	78%	98%

[1] Trees counts determined in May and August using random and fixed plots.
[2] Numbers in parenthesis were destroyed by motor vehicles/maintenance crews and were not used in survivorship calculations
[3] Approximately 68-100 Goodding's willows are likely underneath the funastrum layer based on the planting maps and known plantings and were inaccessible to count. These willows were not considered in the mortality calculations.

Per the request of the USFWS and stipulations in the 2017 BO, coyote willows were transplanted from islands being removed for channel maintenance. Willows were transplanted to all the restoration sites to fill in gaps along the banks where saltcedar extraction occurred. These clumps of willows were difficult to count in every bucket load, so USIBWC and IDEALS-AGEISS determined that an average of 20 willows was contained in each bucket load. Willow transplantation was extremely successful given that mature willows and root balls were transplanted at each site. At the Country Club East site approximately 4,000 willows were planted and nearly all plants counted in October were thriving with a few dead willows noted. Kochia was very prominent during the October monitoring periods and was found growing on the edge of the willow transplants towards the restoration site in very thick and impenetrable clumps making access to all the transplanted willows difficult. In addition, the transplanted willows have started to blend into the native vegetation and making them difficult to distinguish. The biologists counted as many willows as they could access and then surveyed those areas they could not for any stressed or dead willows. At the Sunland Park site, a few dead (66) coyote willows were noted among the transplants usually occurring away from the river bank. Coyote willows from the transplants were thriving at this site as well with a 99-percent survivorship. At the Anapra site approximately 1,144 willows were transplanted (based on bucket load estimates). Those coyote willows remaining at the site (those not mowed) were all thriving (Table 3-4).

Goodding's willow survival was high at two of the sites and all the trees were accounted for: Country Club East and Anapra (Table 3-5). A large majority of the trees did show signs of stress although passed the snap test. At the Sunland Park restoration site, 473 of the Goodding's willows could not be located despite having a crew of four field personnel walking transects through the site. Some of the missing trees can be attributed to the heavy infestation of the funastrum which is estimated to have covered approximately 68-100 planted trees (Figure 3-4). In addition, Goodding's willows in the flycatcher area were intermixed with the densely packed transplanted coyote willows and were difficult to find.

Cottonwood survivorship was not as successful as the willows at any of the sites (Table 3-6). At the Sunland Park site, 74 trees were unaccounted for and given the root-rot issue it is likely that these trees died during the summer. Several areas near the levee toe road appeared void of plantings even though the areas were planted. In addition, while conducting the longstem plantings it was noted that in some areas, cottonwood sprouts 4-6 inches high were located in tree planting areas where no stems were evident. The small sprouts could have been easily missed in the tall grass as no other evidence of the planted cottonwoods existed. This site has incurred damage from several sources as evident by the trees that are recovered and the tire tracks through the site and may have been the cause of the missing trees.

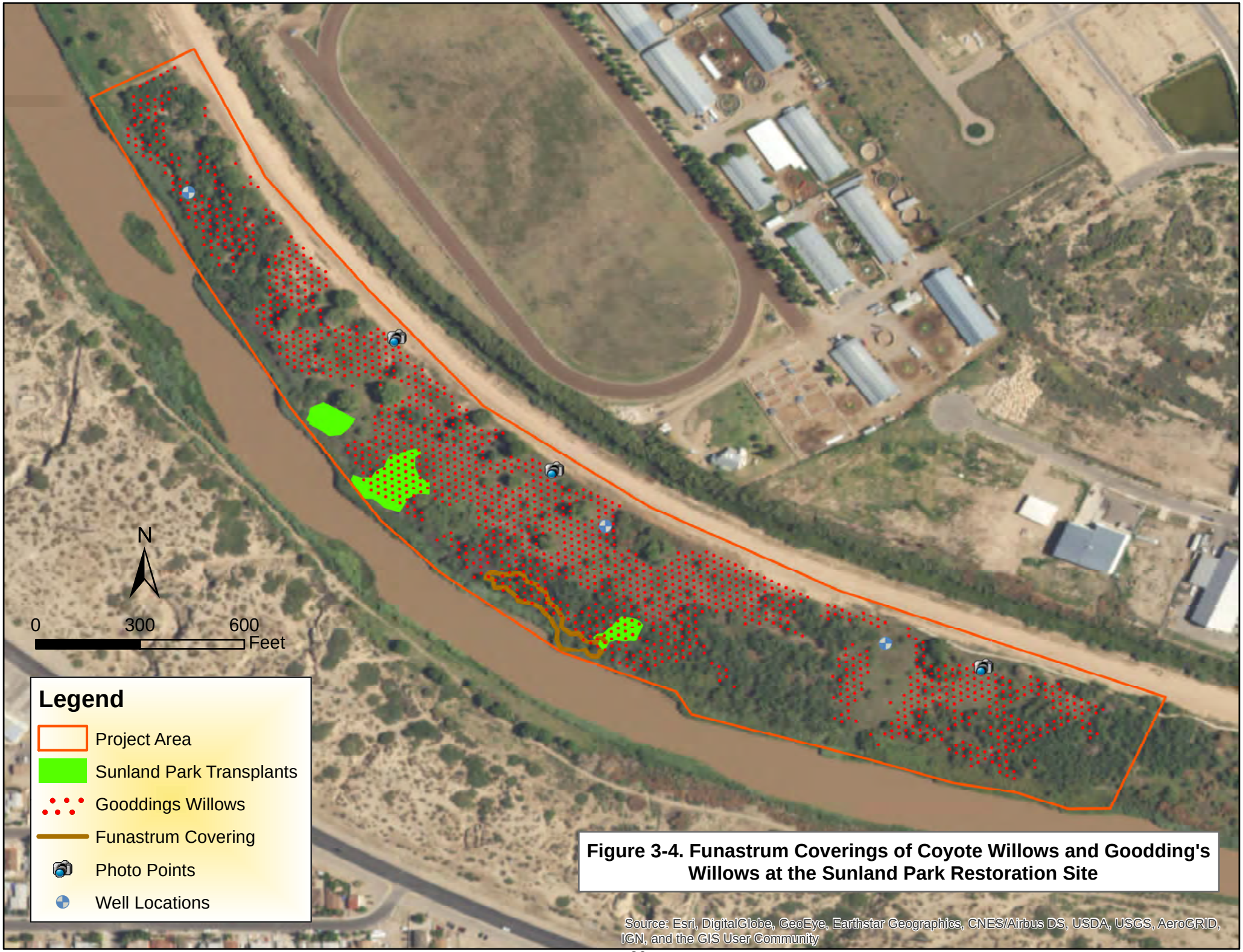

Figure 3-4. Funastrum Coverings of Coyote Willows and Goodding's Willows at the Sunland Park Restoration Site

Table 3-5. Goodding's Willow Survival at Each Restoration Site – October 2018

	Country Club East	Sunland Park	Anapra Bridge
Scope of Work Requirement	440	2,350	55
Planted	440	2,055	55
Poles Located	440	1,582	55
Destroyed	16[1]	0	0
2018 Mortality	9	273 + 473 (not located)[2]	1
Total Survived	374	1,309	54
Percent Survival	98%	64%[3]	98%

[1] Poles damaged or destroyed by recreationists (Poles were broken off and tire tracks were evident) and maintenance crews were not counted in the survivorship calculations.
[2] Over 100 Goodding's willows are underneath the funastrum layer based on the planting maps and known plantings and were inaccessible to count. It is unknown the impact that the vine may have on the willows but indications in November showed the coyote willows still thriving.
[3] Includes both mortality and missing poles.

Table 3-6. Cottonwood Survival at Each Restoration Site – October 2018

	Country Club East	Sunland Park	Anapra Bridge
Scope of Work Requirement	1,620	400	110
Planted	1,620	400	110
Poles Located	1,360	326	110
Destroyed	57[1]	0	0
2018 Mortality	78 + 260 (not located)	114 + 74 (not located)	43
Total Survived	1,225	212	67
Percent Survival	76%[2]	53%[2]	61%

[1] Poles damaged or destroyed by recreationists and maintenance crews were not counted in the survivorship calculations.
[2] Includes both mortality and missing poles.

The USIBWC established a 15-percent mortality (85-percent survival) threshold for acceptable survival of planted poles and shrubs. The October 2018 monitoring session provided the baseline for the number of replacement plants. Although not all the transplanted coyote willows were counted at the Country Club East site, there was no obvious sign of die back, transplants blended in with the already present willows, and the thick kochia hampered the ability to access the willows. IDEALS-AGEISS believes that these willows, as at the other restoration sites, are all thriving and does not recommend any compensation at this site. Coyote willow survivorship at the Anapra Bridge and Sunland Park site exceed the USIBWC survival rate.

Goodding's willow survival at Country Club East and Anapra was above the mortality threshold level. In addition to the 273 dead Goodding's willows at the Sunland Park site, 473 trees were unaccounted for. Some areas north of the SP-3 well along the levee toe road were devoid of Goodding's willow plantings. It is unknown if this is from trees dying or potential incursions into the site that may have damaged the trees. In addition, a large area containing Goodding's willows was inundated with funastrum and the densely populated flycatcher areas made locating trees difficult. An estimated 68-100 trees were potentially affected by this twining vine. At the Sunland Park site, IDEALS-AGEISS overplanted the coyote willows by 145 plants while 295 Goodding's willows still remain to be planted. IDEALS-AGEISS recommends that the 273 documented dead Goodding's willows be replaced in the flycatcher habitat. Of

the missing 473 Goodding's willows, IDEALS-AGEISS recommends replacing 80 additional Goodding's willows based on documented October mortality rate of 17 percent (17 percent of 473). We believe that the willows under the funastrum are likely still viable, and that trees were missed in the flycatcher area because they were tucked away in existing vegetation and blended in with the transplants. The 145 additional coyote willows are a supplement to the flycatcher habitat and the potential loss of the Goodding's willows. IDEALS-AGEISS recommends the Sunland Park replacement of the 188 cottonwoods be composed of half cottonwoods (94) and half Goodding's willows (94) to further augment the flycatcher habitat.

The Country Club site incurs heavy recreational use. IDEALS-AGEISS field crews noticed that once the water in the river stopped flowing, that motor cross and four-wheeler activity significantly increased. Like the Sunland Park area, the grass was extremely high and dense during the monitoring and some cottonwood re-sprouting may have gone unnoticed. It was noted in November during longstem shrub planting that some re-sprouting was occurring from the ground with no pole evident in the areas. The re-spouts were approximately 6 inches high and would not have been very visible during the October monitoring due to the height and density of the grass. We have no way of determining if the missing trees were damaged (they were mostly missing along the edges of the site) or if they were actual mortalities. IDEALS-AGEISS recorded 78 dead and 57 destroyed cottonwoods at this site. We were unable to locate 260 trees but assume based on our findings and the known activity in the area that a portion of these trees are likely destroyed and gone. IDEALS-AGEISS recommends replacing the known 78 dead cottonwoods and an additional 151 cottonwoods based on the known ratio of dead versus damaged (58 percent of the documented dead/destroyed cottonwoods were known dead during the October monitoring event). Cottonwoods replanted at the Country Club site should be concentrated in the swale areas or further away from the levee toe road.

To improve survivorship of the cottonwoods at Anapra Bridge, 43 cottonwoods would need to be replanted (Table 3-7). IDEALS-AGEISS recommends considering other species, such as four-winged saltbush or mesquite, to replace the cottonwoods (see Section 4.3).

Table 3-7. Proposed Replanting at Each Site

	Country Club East	Sunland Park	Anapra Bridge
Goodding's willows	0	447[1]	0
Cottonwoods	229	94[1]	43[2]

[1] Recommend replacing half of the 188 dead cottonwoods with cottonwoods and the other half with Goodding's willows.
[2] Recommend not replacing missing cottonwoods but instead use four-winged saltbush or mesquite to add diversity.

Longstem shrubs such as wolfberry (*Lycium andersonii*), four-wing saltbush (*Atriplex canescens*), chamisa (*Ericameria nauseosa*), and three-leafed sumac (*Rhus trilobata*) and 20 desert willows were planted at all the restoration sites at the end of October while the October 2018 monitoring was being conducted. Since these species were just planted, they were not considered in October 2018 survivorship counts.

4.0 CONCLUSIONS AND DISCUSSION

By the October 2018 monitoring period, all the willows and cottonwoods were planted, with the exception of 295 Goodding's willows at Sunland Park, and the longstem shrub planting was scheduled for and had begun in late fall 2018 at these three sites. Preliminary findings suggest that coyote willow transplants establish well and quickly along the river banks. Survivorship was nearly 100 percent for the areas transplanted although the invasive species kochia tended to establish in the transplant areas. IDEALS-AGEISS recommends for future monitoring of survival for the transplanted coyote willows that biologists visually estimate survival based on the linear estimates of plants transplanted since counting individual transplanted plants once they have established is difficult. Many of the cottonwood poles remaining at the sites showed signs of stress although some also showed re-sprouting at the base of the pole. Goodding's willows also showed signs of stress. Irrigation peak releases occurred in Mid-March and June-July 2018 and an unusually late and minimal monsoon season did not provide much moisture. Monitoring in the spring will help determine if these cottonwood poles did in fact survive the summer.

4.1 Country Club East

Cottonwood vigor varied across the site where cottonwoods within the swales and areas towards the river contained healthier trees than those cottonwoods closer to the levee toe road that were often impacted by recreationists. Shafroth, Auble, and Scott (1995) noted that cottonwood establishment success drops off if groundwater levels drop below 1 meter (3.3 feet) in the first year. The swales constructed through the site, with the fine sandy loam that poorly drains, provided sources of water retention for the cottonwoods and promoted increase survival. The transplanted coyote willows at the river bank are becoming indistinguishable from the already present native vegetation and will continue to develop into thick riparian habitat adjacent to the closed canopy habitat developed under the planting regime. Habitat will continue to improve along this site for flycatchers as the coyote willows fill in and the densely planted cottonwoods create the closed canopy habitat. IDEALS-AGEISS recommends that any cottonwoods that are planted to increase survival should be planted in the swales and towards the river edge and not at the ends of the site at the levee toe road. Strategically placing the cottonwoods in these areas may reduce the impacts from recreational and maintenance damage.

4.2 Sunland Park

Although the coyote willow transplants are thriving at this site, the Goodding's and cottonwood trees are not doing as well. When considering the Gooding's willows that we were able to locate during the October 2018 monitoring effort, survivorship was 83 percent. Some of the Gooding's willows are underneath the funastrum although based on the planting maps this is approximately 68-100 trees. That leaves 405 trees that were unaccounted for even using four field-personal to survey the site. Some may have been overlooked in the densely packed flycatcher habitat. Thicker ground cover at the site may have precluded field personnel from locating damaged and decaying stems or noticing ground-level re-sprouting. In addition, there is a potential that some of the missing trees could have been disturbed or damaged by recreationists. Water tables are high at this site during the non-irrigation season and the high clay content in the soil tends to have low water-holding capabilities (TRC 2010) which could potentially impact plant establishment. Replanting at this site should first focus in the 5-acre flycatcher habitat area,

which appears to be doing well. Other Goodding's willows could be grouped away from the levee toe road, maybe at least 50 feet, to prevent future damage.

4.3 Anapra Bridge

Flycatcher habitat area at Sunland Park in August 2018

The Anapra Bridge site is characterized by areas with high salinity, shallow groundwater levels, and disturbance. Cottonwood survival was low at this site even with the shallow water table. Although the Agua wet soil variant is composed of fine sandy loam, high clay concentrations in the soil (TRC 2010) which do not provide high aeration potential, in conjunction with the high salt concentration could affect plant survivorship. Cottonwoods were suggested at the Anapra Bridge site to provide shade along the trail as well as to develop the open woodland. Goodding's willow and Rio Grande cottonwood have low salinity tolerance while understory species such as fourwing saltbush, pale wolfberry, and screwbean mesquite can tolerate appreciably higher soil salinity levels (Dreesen et al. 2001). Fourwing saltbush and wolfberry are currently being planted as part of the longstem shrub requirement. Given the high salt content at Anapra Bridge and the root-rot that occurred in the cottonwoods, IDEALS-AGEISS recommends that the USIBWC consider not replanting the lost cottonwoods, or only replanting a portion of them, but instead focus on other species such as four-wing saltbush or mesquite to provide the species diversity at the site.

5.0 MANAGEMENT RECOMMENDATIONS

Although the sites are only 1-year post-restoration and not all the plantings have been conducted (e.g., longstem shrubs), preliminary observations may provide some insight for future restoration efforts.

- For those restoration sites near or that about a No Mow Zone, place extra delineators just outside the restoration site that are highly visible to USIBWC maintenance crews.
- Continue to conduct willow transplants when possible. Transplantation of mature coyote willows with their established root balls provides high survivorship at the sites. In addition, the habitat is well on its way to establishment using these mature trees.
- Continue the use of swales at sites to promote water retention and increase vigor and survival of cottonwoods.
- Increase public access enforcement.
- For new Goodding's willows and cottonwood pole plantings, create a shallow well around the tree to catch rain water and provide positive flow towards the root systems.

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APPENDIX A

Monitoring Datasheets

Pre-Implementation Monitoring Datasheets

Pre-Implementation Qualitative Monitoring Field Sheet

Site: Country Club East Date: 16-Oct-2017

Participants: Margaret, Andrew, Ryan, Beau, Charles Target habitat:

Document conditions at restoration site prior to restoration work implementation:

Identifiable Native Species	Abundance (Sporadic individuals, Low, Moderate, High)	Comments
Coyote Willow	Moderate	
Screwbean Mesquite	Moderate	
Amaranthus	High	
Sporobolus wrightii	High	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Comments**
Saltcedar	Moderate	thicker w. sand
Russian Thistle	Moderate	
Siberian elm	sporadic	

General Site Conditions: Thin coyote willow along bank. More mesquite on southern end. One Goodding's Willow. Some cottonwoods but not many (mistletoe - 6, 4, 0)

Observed Wildlife: House Finch, House Sparrow, Woodhouse's Scrub jay, American Kestrel, White-crowned Sparrow, Lucifer Hummingbird

Photos Taken:

max height of native vegetation 20'-35'

max height of non-native vegetation 15'-20'

Country Club East Photopoints

Photopoint 1	NAD83 Zone 13 R	Easting	348007	Northing	3523023
Target 1	198°				
Target 2	262°				
Target 3	310°				
Photopoint 2	NAD83 Zone 13 R	Easting	348022	Northing	3522824
Target 1	196°				
Target 2	234°				
Target 3	284°				
Photopoint 3	NAD83 Zone 13 R	Easting	348154	Northing	3522498
Target 1	178°				
Target 2	228°				
Target 3	276°				

Pre-Implementation Qualitative Monitoring Field Sheet

Site Sunland Park Date 16-October-2017

Participants Margaret, Andrew Ryan, Brian, Charles Target habitat Southwest Willow Flycatcher habitat

Document conditions at restoration site prior to restoration work implementation:

Identifiable Native Species	Abundance (Sporadic individuals, Low, Moderate, High)	Comments
Coyote Willow	Moderate	~~Big~~ This strip along bank
Cottonwood	Moderate	More concentrated on north end
Screwbean Mesquite	Moderate	Mixed with saltcedar
Festuca spp	Moderate	in open areas
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Comments**
Saltcedar	Moderate	
Russian olive	Sporadic	along bank
Siberian elm	Sporadic	along bank
Russian thistle	Moderate	in open areas

General Site Conditions: Cottonwoods heavy infested w/ mistletoe. Cwoods dense on north end & transitions to Screwbean Mesquite/Saltcedar to the south. Best potential willow flycatcher habitat. See back for mistletoe

Observed Wildlife: Yellow-rumped Warbler, Say's Phoebe, White-crowned Sparrow, Northern Mockingbird, Lesser Goldfinch, Northern Flicker, Lincoln's Sparrow, ~~Black-chinned~~ Dark-eyed Junco, Pygmy Nuthatch, Green-tailed Towhee, Vesper Sparrow, Queen butterfly, Cassin's Vireo

Photos Taken:

max height of native vegetation ~45'

max height of non-native vegetation ~~~~ 20'

Sunland Park Photopoints

Photopoint 1	NAD83 Zone 13 R	Easting	350406	Northing	3519904
Target 1	170°				
Target 2	230°				
Target 3	260°				
Photopoint 2	NAD83 Zone 13 R	Easting	350522	Northing	3519787
Target 1	164°				
Target 2	190°				
Target 3	268°				
Photopoint 3	NAD83 Zone 13 R	Easting	350840	Northing	3519610
Target 1	170°				
Target 2	188°				
Target 3	240°				

Pre-Implementation Qualitative Monitoring Field Sheet

Site Anapra Bridge Date 16-Oct-2017

Participants Margaret, Ryan, Brian, Andrew, Chad Target habitat Open riparian woodland

Document conditions at restoration site prior to restoration work implementation:

Identifiable Native Species	Abundance (Sporadic individuals, Low, Moderate, High)	Comments
Coyote willow	Moderate	on edge
Seep willow (Baccharis)	Low	on edge
Rio Grande Cottonwood	Sporadic	only one
Screwbean Mesquite	Moderate	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Comments**
Saltcedar	Moderate	easy to access
Russian olive	Sporadic	along bank
Siberian elm	Sporadic	along bank
Russian thistle	Moderate	away from bank

General Site Conditions: Good potential structure, salty topsoil, translocation of island coyote willow after saltcedar removal may improve riparian habitat. Slight stress from Diorhabda beetle. Open areas with some high nutsedge

Observed Wildlife: Killdeer, Mallard, Yellow-rumped Warbler, Northern Flicker, Vireo, Yellow-headed Blackbird, White-winged Dove, Red-winged Blackbird, Curve-billed Thrasher, House finch, House Sparrow, Black Phoebe, Say's Phoebe, Cliff Swallow, Marsh Wren, Orange-crowned Warbler, White-crowned Sparrow, Cooper's Hawk, Rock Pigeon, Monarch butterfly, Queen butterfly, Northern Mockingbird

Photos Taken:

max height of native vegetation ~15'

max height of non-native vegetation ~15'

Anapra Bridge Photopoints

Photopoint 1	NAD83 Zone 13 R	Easting	352217	Northing	3519296
Target 1	115°				
Target 2	178°				
Target 3	238°				
Photopoint 2	NAD83 Zone 13 R	Easting	351825	Northing	3519320
Target 1	106°				
Target 2	170°				
Target 3	238°				
Photopoint 3	NAD83 Zone 13 R	Easting	351638	Northing	3519347
Target 1	110°				
Target 2	168°				
Target 3	254°				

Groundwater Levels Monitoring Field Sheet

Participants ANDREW GUERRA Date 12/8/17

Site	Well ID	TOC Elevation	Ground Surface Elevation	Casing Height	Date	Time	Water Level Reading TOC	Water Depth (Reading TOC - Casing Height)	Comments/Observations
Country Club East	CCE-MW-1	3746.76	3743.48	3.28	12/7/17	1:30PM	9.83	6.55	NONE
	CCE-MW-2	3748.67	3745.48	3.19	11/10/17	12:50PM	7.58	4.39	NONE
	CCE-MW-3	3747.23	3743.96	3.27	11/10/17	12:30PM	2.58	(-0.69)	DRY SOIL SURFACE MEASURES AN ELEVATION HIGHER THAN GROUND SURFACE
Sunland Park	SP-MW-1	3741.37	3737.91	3.46	11/10/17	11:50AM	—	—	WELL DESTROYED
	SP-MW-2	3740.51	3737.08	3.43	11/10/17	11:20AM	8.75	5.32	NONE
	SP-MW-3	3740.35	3736.85	3.50	11/10/17	11:45AM	6.58	3.08	NONE
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41	11/10/17	10:30AM	7.5	4.09	NONE
	AB-MW-2	3738.49	3735.14	3.35	11/10/17	10:50AM	8.5	5.15	NONE

Pre-restoration Monitoring Datasheets

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Anapra Date 02/05/18

Participants Bryan Zvolanek Pedro Nevarez Target Habitat Riparian (East bank)

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Coyote Willow	Moderate (instripaling river)	5% of whole site	along river in about 1 foot strip
Buchanas	low	1-2%	along river
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Sporadic	< 1%	Most All removed

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	along river				A	A	A		just planted
					D	D	D		
Goodding's Willow					A	A	A		
					D	D	D		
Cottonwood					A	A	A		
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Restoration along river in small strip about 3 feet wide. Plants removed from Islands in river channel & translocated. Jan 15-16

Observed Wildlife: WWDO, MODO, AMKE

Photos Taken: See photo point photos 3 photos each at 3 photo points

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 02/05/18

Participants BZ PH Target Habitat Riparian

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cottonwood	Low	5+/o	Lots of Cottonwoods, some in groves, all mature
Coyote Willow	Moderate along bank	5o/o	10ft strip along banks
Baccharis	Sporadic	1o/o	
Grasses	High	60o/o	Open areas
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Moderate	30o/o	Just starting to be removed,

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow					A	A	A		
					D	D	D		
Goodding's Willow					A	A	A		
					D	D	D		
Cottonwood					A	A	A		
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Very little Salt Cedar removal, Just starting. Still very similar to last visit. Cottonwood & Salt Cedar groves throughout site.

Observed Wildlife: GAQU, WCSP, MODO, WWDO

Photos Taken: 3 each at 3 different photo points

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Country Club East Date 02/05/18

Participants BZ PH Target Habitat East bank of River

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Coyote Willow	Moderate in just stretch along river	5%	only along immediate riverbank
~~Bad~~ Baccharis	low along bank of river	1%	
Cottonwood	Sporadic	1%	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	None	0%	almost all removed.

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow					A	A	A		
					D	D	D		
Goodding's Willow					A	A	A		
					D	D	D		
Cottonwood					A	A	A		
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Site looks good. All salt cedar removed. Very Open.

Observed Wildlife: AMKE, PHAIN, WESJ, MODO, RTHA

Photos Taken: at photo points. 3 photos at Each.

Participants BRYAN ZVOLANEK, PERRIANNE HOUGHTON Date 02/05/18

Groundwater Levels Monitoring Field Sheet

Site	Well ID	TOC Elevation	Ground Surface Elevation	Casing Height	Date	Time	Water Level Reading TOC	Water Depth (Reading TOC - Casing Height)	Comments/Observations
Country Club East	CCE-MW-1	3746.76	3743.48	3.28	2/5/18	15:36	119"	77S	
	CCE-MW-2	3748.67	3745.48	3.19		15:11	87"	DRY	
	CCE-MW-3	3747.23	3743.96	3.27		15:06	36"	DRY	Well is shallower than casing depth
Sunland Park	SP-MW-1	3741.37	3737.91	3.46	→	→	→	→	Well down
	SP-MW-2	3740.51	3737.08	3.43		14:08	76"	41"	
	SP-MW-3	3740.35	3736.85	3.50		14:27	81"	33"	
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41		13:40	92"	46"	
	AB-MW-2	3738.49	3735.14	3.35	↓	13:50	106"	26"	

Post-restoration Monitoring Datasheets

May 2018

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Anapra Date 14 May 2018

Participants B. Zvolanek, W. Arp Target Habitat open riparian woodland

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Screwbean Mesquite	Sporadic	< 5%	
baccaris	sporadic	< 1%	
Coyote willow	low along bank	5-10%	along river
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	sporadic individuals	< 5%	

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 25-30% tree 40% ground cover

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate - see other sheet (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	transplant	thrive		4-10'	A	A	A	100%	none are dead yet
					D	D	D		
Goodding's Willow		stressed		6-8'	A	A	A	100%	none are dead yet
					D	D	D		
Cottonwood		stressed		6-8'	A	A	A	100%	none ~~need~~ are dead
					D	D	D		
Long Stem Shrub (specify in	—				A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: cleared - / field creasants, western pygmy blue violet-green

Observed Wildlife: ~~northern rough-wing swallow~~, red-winged black bird, killdeer, western kingbird, cave swallow, rock pidgeon, Says phoebe, cave swallow, black phoebe, white wing dove, MS kite

Photos Taken: all photo points taken

Site: Anapra

Date: 14 May 2018

Permanent Plot #1 352033E 3519 290N

transplant

Species	Alive	Stressed	Dead
Coyote willow	12	1	—
Goodding's willow	2	2	—
Cottonwood			

Notes: small salt cedar regrowth; baccaris in plot <5%

Random Plot #1 352237 E 3519285 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	1	5	
SB resprute	3		

Notes: Small salt cedars - regrowth

Permanent Plot #2 351939 E 3519293 N

transplant

Species	Alive	Stressed	Dead
Coyote willow	~~5~~ 4	—	—
Goodding's willow			
Cottonwood	—	2	—

Notes: 1 salt cedar; Russian olive milkweed <5%; lycium <5%; 2 coyote willows are natural in plot

Random Plot #2 351848 E 3519339 N

Species	Alive	Stressed	Dead
Coyote willow	1		
Goodding's willow			
Cottonwood		3 +1	
SB resprute	9		

Notes: 1 cottonwood is large natural

Permanent Plot #3 351641 E 3519313 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	3	1	
Cottonwood		1	

Notes:

Random Plot #3 351570 E 3519312 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	2	3	
Cottonwood	1	1	

Notes:

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			

Notes:

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 5/14 - 5/15/18

Participants B. Zvolanek, W. Arjo Target Habitat riparian woodland + dense riparian

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
coyote willow	Mod	10-15%	along river
screw bean mesquite	low	<5%	
cottonwood	sporadic individuals	<5%	
grass	high	~50%	open areas
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	sporadic individuals	1%	new growth

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 70-80% tree layer no understory but some ground cover <50%

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate see other sheet (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	transplant	thrive		4-9'	A	A	A	100%	
					D	D	D		
Goodding's Willow		normal some stressed		~6-7'	A	A	A	~~266~~ 275/279	average w/ a few dead
					D	D	D		
Cottonwood		stressed		4-7'	A	A	A	10/13	plants not dead just stressed
					D	D	D		
Long Stem Shrub (specify in					A	A	A		not planted until spring
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: nice mesquite forest in areas

Observed Wildlife: TV, Gambels quail, roadrunner, mockingbird, house finch, doves, white wing dove, phoebe, Verdin, Black chinned hummingbird, Queen butterfly, checkered white, 8-eye junco, black phoebe, ladderback, Bewicks wren, thrasher (curved billed), Yellow breasted chat, Bells vireo, brown-headed cowbird, Western tanager, Chipping sparrow

Photos Taken: all photo points

Site: Sunland Park

Date: 14-15 May 2018

Permanent Plot #1 350894 E 3519523 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood		10	

Notes: Some small salt cedar regrowth, tall screwbean Mesquite

Permanent Plot #2 350563 E 3519651 N

Species	Alive	Stressed	Dead
Coyote willow	633	2	—
Goodding's willow	60	20	—
Cottonwood	—	—	—

transplant

Notes: transplants thriving

Permanent Plot #3 350427 E 3519773 N

Species	Alive	Stressed	Dead
Coyote willow	253		
Goodding's willow	75	9	1
Cottonwood	2		

transplant

Notes:

Permanent Plot #4 350401 E 3519916 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	39	63	3
Cottonwood			

Notes:

Random Plot #1 350825 E 3519604 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	—	9	—
Cottonwood			

Notes: open area with ag cover of nightshade and pea species

Random Plot #2 350516 E 3519706 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	11	23	1
Cottonwood			

Notes: some scattered mesquite

Random Plot #3 350335 E 3519999 N

Species	Alive	Stressed	Dead
Coyote willow	—	—	—
Goodding's willow	8	12	
Cottonwood	—	3	—

Notes:

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Country Club East Date: 5/15/18

Participants: B. Zvolanek, W. Arp Target Habitat: riparian forest and woodland

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
cottonwood	Sporadic	1%	
screwbean Mes.	sporadic	5%	
coyote willow	along bank - mod	< 5%	along river bank
baccharis	Sporadic	1%	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Sporadic	< 1%	new growth

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 1% tree
>90% ground cover

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	some transplant	thrive		6-10'	A	A	A	249/249	
					D	D	D		
Goodding's Willow		part stressed		~6'	A	A	A	24/24	
					D	D	D		
Cottonwood		part stressed		4-8'	A	A	A	143/144	
					D	D	D		
Long Stem Shrub (specify in					A	A	A		not planted
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: very clear of salt cedar; a lot of grass/ground cover in places

Observed Wildlife: mule deer; No Hacking; white wing dove; house finch; red bellied woodpecker TV; black swallowtail; Grackles; barn swallow; black chinned hummer western kingbird; great tailed grackle; house sparrow; black phoebe

Photos Taken: photopoints; western pygmy blue; Queen; western tiger swallowtail; Orange sulfur; common mallard; Bells vireo; Verdin

Northern cloudy wing; buckeye

Site: Country Club East

Date: 15 May 2018

Permanent Plot #1 ~~348~~ 348250 E 3522267 N

transplant

Species	Alive	Stressed	Dead
Coyote willow	147	—	1
Goodding's willow	11	11	—
Cottonwood	9	16	—

Notes: Some mesquite and chenopod

Permanent Plot #2 348083 E 3522571 N

Species	Alive	Stressed	Dead
Coyote willow	—	—	—
Goodding's willow	—	—	—
Cottonwood	12	26	—

Notes:

Permanent Plot #3 347911 E 3522821 N

transplant

Species	Alive	Stressed	Dead
Coyote willow	101		
Goodding's willow	1	1	
Cottonwood	2	3	1

Notes:

Permanent Plot #4 347907 E 3523022 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	—	7	—

Notes:

Random Plot #1 348151 E 3522497 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	2	32	

Notes:

Random Plot #2 348028 E 3522697 N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	6	6	—

Notes:

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	25	7	
38 mesquite	1		

Notes: 1 small mesquite

Groundwater Levels Monitoring Field Sheet

Participants B. Zvolanek, W. Argo Date 14-15 May 2018

Site	Well ID	TOC Elevation	Ground Surface Elevation	Casing Height	Date	Time	Water Level Reading TOC	Water Depth (Reading TOC - Casing Height)	Comments/Observations
Country Club East	CCE-MW-1	3746.76	3743.48	3.28	5/15/18	1000	8.5	5.22	
	CCE-MW-2	3748.67	3745.48	3.4 ~~3.19~~	5/15/18	1125	6.08	2.68	
	CCE-MW-3	3747.23	3743.96	2.7 ~~3.27~~	5/15/18	0945	6.78	4.08	
Sunland Park	SP-MW-1	3741.37	3737.91	2.9 ~~3.46~~	5/15/18	0913 ~~0945~~ WA	5 58	2.68	
	SP-MW-2	3740.51	3737.08	3.43	5/14/18	1616	8.3	4.87	
	SP-MW-3	3740.35	3736.85	3.50	5/14/18	1630	8.08	4.58	
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41	5/14/18	1430	4.93	1.52	
	AB-MW-2	3738.49	3735.14	3.35	5/14/18	1525	8.25	4.5	

Post-restoration Monitoring Datasheets

August 2018

L81975

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

7:45 AM
9:40 AM

Site Country Club Date 08/29/18

Participants Bryan Zvolanek Perrianne Houghton Target Habitat Rio Grande Riverine Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cottonwood	Sporadic	1%	mature trees
Sawtooth	Sporadic	5%	mature
Coyote Willow	Sporadic	<5%	along bank
Baccharis	Sporadic	1%	along banks
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Sporadic-low	1%	~~only~~ mostly resprouts
Cynodon	High	40%	dominant cover
Kochia	low	5%	

squirreltail 1%
sloanum 15%
milkweed 15%
cane 1%
crotalaria 1%
bulrush 1%
Alkali sacaton 5%
saltgrass

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	transplant	Thrive			A	A	A	100%	doing very well
					D	D	D		
Goodding's Willow	~~stressed~~ poles	stressed			A	A	A	100%	about 1/4 to 1/8 alive. many v. stressed
					D	D	D		
Cottonwood	poles	Stressed			A	A	A	100%	about 1/8 alive & well
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

Gauge Readings: 1 4'8"
2 4' 11"
3 4' 5.5"
4 4' 8"

General Site Conditions: lots of siphon activity. Much better cottonwood survival, mostly in wet areas. Pools down in drainages. Lots of H_2O, flooded w/in berms. PP3 post was in wrong location on map. Best Survival

Observed Wildlife: Greater roadrunner, Am. Kestrel, Lincoln's Sparrow, Savannah Sparrow, Vesper Sparrow, Bell's Vireo, Yellow-breasted Chat, Black-chinned Hummer, Barn/Bank swallows, White-wing dove

Photos Taken: gauge readings

Mourning dove, Gophers, osprey, Northern Mockingbird, Eurasian Collared Dove

Very stressed or dead between plots: Cottonwood: 12vs, 7 dead Goodings: 5vs, 1 dead.

Site: County Club

Date: 08/29/18

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	147		1
Goodding's willow	11	8	
Cottonwood	5	10	

Notes: 5 cottonwoods alive
Coyote willow behind large Kochia Row
Coyote willow thriving

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	10	28	

Notes: 1/3 cottonwoods healthy & leaved

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	102		
Goodding's willow		2	
Cottonwood		5	

Notes: Could not find T post.
Coyotes thriving. ~~Both~~ Goodings & Cotton V. stressed

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	2	10	

Notes: More than last time?
10 Very stressed

Random Plot #1

348243
3522347

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	0	26	

Notes: all cottonwoods stressed w/ no leaves

Random Plot #2

348015
3522652

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	3	4	
Cottonwood	8	5	

Notes: Berm Area Good Cottonwood Survival

Random Plot #3

347895
3523101

Species	Alive	Stressed	Dead
Coyote willow	420		
Goodding's willow		3	
Cottonwood			
Old Cottonwood	1		

Notes: Willow's thriving (transplant)

Very Stressed or Dead
Between plots (orange flags)

	Very stressed	Dead
Cotton	12	7 } ungroomed
Goodings	5	1 }

28197S

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 08/28/18 13:25 - 17:30

Participants Bryan Zvolanek, Perrin Houghton Target Habitat Rio Grande Riverine Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cottonwood	Sporadic	1%	mature w/ mistletoe
Screwbean Mesquite	Sporadic / low	5%	tall understory
Coyote Willow		<5%	along bank
Solanum		8%	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Very Sporadic	<1%	very few, mostly low saplings; between flow s.
Cynodon	High	40%	dominant grass

guara 5%
fogfruit 1%
milkweed 5%
tamastrum 1%
Chloracantha 1%
Sunflower 1%

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 20% tree 80% ground cover

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	Some transplants	most thriving		6-10'	A	A	A	100%	mostly thriving, some small areas stressed or dead, esp. transplant away from H2O
					D	D	D		
Goodding's Willow	poles	stressed			A	A	A	100%	about 1/3 alive or stressed.
					D	D	D		
Cottonwood	poles	very stressed			A	A	A	0%	none w/ leaves.
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Moist from recent rains. Very low cottonwood survival, none w/ leaves.

Observed Wildlife: about 1/3rd of Goodings alive or stressed, others very stressed, moderate gopher activity. Yellow-billed Cuckoo, Western Kingbird, House finch, American Kestrel, American Goldfinch, Great Blue Heron, Gophers, Great Blue Heron

Photos Taken:

Very Stressed / Dead: Cotton 16 none w/ leaves on whole site.
out of plot Goodings 12 (green flags)

Site: Sunland Park

Date: August 28 2018

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood		9	1

Notes: Very stressed Cottonwoods lots of saltcedar

Random Plot #1 350832 3519538

Species	Alive	Stressed	Dead
Coyote willow	60	15	97
Goodding's willow			
Cottonwood	2		

Notes: grove of transplanted Coyote Willow, some mowed down, some weed-eaten by Equestrian vines, Transplant is far from H_2O & not typical river bank transplant

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	557	30	76
Goodding's willow		26	
Cottonwood			

Notes: Goodings Very stressed, Coyote mostly thriving, some yellowing. Some tamarisk coming up in rows.

Random Plot #2 350775 3519591

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood		7	

Notes: 7 very stressed cottonwoods solanum, cyprelon, grass, fugfruit, low tamarisk

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	129	124	5
Goodding's willow	57	18	11
Cottonwood			

Notes: Overall thriving, some yellowing of coyote willow. Lots of sunflower.

Random Plot #3 350416 3519817

Species	Alive	Stressed	Dead
Coyote willow	87		
Goodding's willow	27	17	
Cottonwood			

Notes: Mostly Goodings w/ a strip of coyote.

Permanent Plot #4 350314 3519426

CORRECT COORDINATES

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	23	133	3
Cottonwood			

Notes: lots of Gooding to the ~~NE~~ SE are very stressed or dead.

# of VS or Dead between plots
Cotton 16 Very stressed
GW: 12 Very Stressed.
green-fass

281975

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Anapra Date 08/28/2018 8:50AM - 11:50AM

Participants Bryan Zwolinski, Perrianne Houghton Target Habitat Rio Grande Riverine Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Screwbean Mesquite	Sporadic	<5%	primary tree throughout
Coyote Willow	low along bank	5-10%	along river
~~Cynodon~~	~~major Grass High~~	~~40%~~	
Iodinebush	Sporadic	<1%	lower bush
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Sporadic, needs treatment		beetles present
Cynodon		40%	major grass

Baccharis <1%
Croton <1%
Alkali Sacaton <3%
Chloracantha spinosa
Saltgrass <5%
Chenopodium sp <5%
purple aster sp. <1%

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 10% tree 40% ground cover

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	transplant	thrive		4-10'	A	A	A	100%	looks good no fatalities
					D	D	D		
Goodding's Willow	poles	stressed			A	A	A	100%	some poles ok 80% stressed to very stressed
					D	D	D		
Cottonwood	poles	very stressed			A	A	A	100%	all cottonwoods look very stressed. Lose of leaves.
					D	D	D		
Long Stem Shrub (specify in	none planted	X			A	A	A	X	X
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: heaviest tamarisk resprouts of all sites, beetles present but needs retreatment. mostly small to medium individuals. All cottonwoods very stressed. flagged some

Observed Wildlife: Verdin, Common yellowthroat, ladder-backed woodpecker

Photos Taken: pics of beetles & tamarisks

Very Stressed to dead = Cottonwoods: 33, Goodings Willow: 10 } counted off plots while walking (green flags)

Site: Anapra

Date: 08/28/18

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	15		
Goodding's willow	3	1	1
Cottonwood			

Notes: Willows thriving

Random Plot #1

352188 3519291

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	1	1	
Cottonwood		3	

Notes: Cottonwood Very Stressed

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	54		
Goodding's willow			
Cottonwood		2	

Notes: Willows in good shape (thriving)
Cottonwoods Very stressed

Random Plot #2

351681 3519331

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood		4	1

Notes: Very stressed

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	3	1	1
Cottonwood			1

Notes:

Random Plot #3

352075E
3519278N

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	2	1	

Notes: Very stressed

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			

Notes:

Participants BRYAN ZVOLANEK, PERRIANNE HOUGHTON Date 28-~~29~~ August 2018

Groundwater Levels Monitoring Field Sheet

Site	Well ID	TOC Elevation	Ground Surface Elevation	Casing Height	Date	Time	Water Level Reading TOC	Water Depth (Reading TOC - Casing Height)	Comments/Observations
Country Club East	CCE-MW-1	3746.76	3743.48	3.28	08/24/18	07:49	220cm	198cm	6.49 feet
	CCE-MW-2	3748.67	3745.48	3.19	08/24/18	09:02	181cm	85cm	2.79 feet
	CCE-MW-3	3747.23	3743.96	3.27	08/24/18	08:25	199cm	120cm	3.94 feet
Sunland Park	SP-MW-1	3741.37	3737.91	3.46	08/28/18	14:10		121cm	3.97 feet
	SP-MW-2	3740.51	3737.08	3.43	08/28/18	13:07	226	111cm	3.64 feet
	SP-MW-3	3740.35	3736.85	3.50	08/28/18	13:38	252	216cm	7.09 feet
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41	08/28/18	11:32	190	74cm	2.43 feet
	AB-MW-2	3738.49	3735.14	3.35	08/28/18	12:07	182	66cm	2.17 feet

Post-restoration Monitoring Datasheets

October 2018

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Anapra Date: 10/17/18

Participants: BZ, PM, WA Target Habitat: Riverine Restoration

Solanum elaeagnifolium

Sporobolus airoides

Portulaca pilosa

Portulaca oleracea

Astragalus lentiginosus

Ambrosia sp.

Chenopodium leptophyllum

Kochia Scoparia

Cyperus sp.

Schoenoplectus sp.

Amaranthus sp.

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cynodon Dactylon	High	30%	
Distichus Spicata	High	30%	
screwbean mesquite	Low	5%	
coyote willow	Low	5%	on banks
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	low	3%	mostly resprouts, but quite a few compared to other sites

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	banks	thriving			A	A	A		A = 805 area near bridge mowed some returning
					D	D	D		
Goodding's Willow		~50% alive			A	A	A		A 21 S 33 D 1
					D	D	D		
Cottonwood		Stressed v. Stressed			A	A	A		A 0 S 92 D 43
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: lots of salt stains, some sacked cross. Need another tamarisk round, beetle damage on some tamarisk, some pocket gopher.

Observed Wildlife: Yellow-faced pocket gopher, Barn swallow, Sharp-shinned hawk, Red-winged Blackbird House Finch, House Sparrow, White-faced Ibis, Greater Yellow legs, Grasshopper sparrow

Photos Taken:

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 10/17/18

Participants BZ, WA, PH, LA Target Habitat Riverine Rest

Portulaca pilosa
Chloracantha spinosa
Malvella leprosa
Sphaeralcea angustifolia
Sphaerophysa salsula
Astragalus lentiginosus
Russian thistle
Kochia scoparia
Melilotus albus
Ambrosia sp.
Fall aster
Amaranth sp.
Cyperus sp.
Sporobolus wrightii
Sporobolus airoides
Sorghum halepense
Distichlis spicata
Coyote willow
Helianthus sp.
Fumastrum sp.
Yucca Saltbush

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cottonwood	Low	5%	large specimens
Screwbean Mesquite	Moderate	5%	large thickets
Cynodon dactylon	High	40%	most prevalent groundcover
Solanum elaeagnifolium	High		lots, most prevalent herbaceous
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Low	~3%	Some resprouts + smaller individuals

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) _____

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	along banks	thriving			A	A	A		A = 4,997 S - 599 D - 66
					D	D	D		
Goodding's Willow	towards river	~50% alive			A	A	A		A - 725 S - 584 D - 273 } 1582
					D	D	D		
Cottonwood	scattered throughout	most stressed or dead			A	A	A		A - 2 S - 210 D - 114 } 326
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

2 to 3 seedlings poles in many holes.

General Site Conditions: basal rot on many dead poles, woods another tamarisk removal lots of pocket gopher activity. funnastrum vines smothering many poles.

Observed Wildlife: Red-winged blackbird, Audubon's Cottontail, yellow-faced pocket gopher, Rock pigeon Northern Harrier, White-winged Dove, Black phoebe, Red-shafted flicker, Cassin's Sparrow, Osprey, Turkey Vulture, phainopepla, Lincoln's Sparrow, White-throated Sparrow, Domestic Cat, House Finch

Photos Taken:

Asclepias subverticalla
Solanum elaeagnifolium
Kochia scoparia
Guara sp.
Ambrosia sp.
Chenopodium sp.
Portacula sp.
Purple fall aster
Honey Mesquite
Astragalus
Baccharis salicifolia
Elymus canadensis
Distichlis spicata
Achnatherum hymenoides
Carex sp.
Anemopsis californica
Chloracantha spinosa
Alkali saccaton
Lespidiza
Melilotus alba

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: COUNTRY CLUB Date: 10/18/18

Participants: BZ, WA, PH Target Habitat: RESTORATION RIVERINE

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
COYOTE WILLOW	High	5%	High on River banks
SCREWBEAN MES.	Low	2%	scattered groves
CYNODON DACTYLON	High	40%	primary ground cover
Cottonwood	Sporadic	<1%	Some large specimens
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Low	1%	Some smaller individuals need to be removed
Kochia scoparia	Moderate	5%	Especially in disturbed soil
Sphaerophysa salsula	Low	3%	Scattered throughout

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 99%

Success of plantings:

Species	General Planting Area (s)	Vigor (stressed, normal, thriving)	Density (stems /acre)	Height Range	Survival Rate (average of 3 subplot counts) A = Alive, D = Dead, Average = Sum A/ (Sum D + Sum A)				Comments
					Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	A=100% K=3.6%	Thriving			A	A	A		2,077 Alive
					D	D	D		
Goodding's Willow	A=31% S=62.5% D=2%				A	A	A		A-140 S-275 D-9 K-16 T-440
					D	D	D		
Cottonwood	A=20% S=69.6% D=5.7% K=4.2%				A	A	A		A-376 S-949 D-78 K-57 T-1,355
					D	D	D		
Long Stem Shrub (specify in					A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

A=Alive
S=stressed
D=Dead
K=killed knocked down
T=Total

General Site Conditions: Some trees killed by being knocked down, Kochia in disturbed areas, esp in front of coyote transplants, overall best survival of all sites.

Observed Wildlife: pair of black hawks (also at sunland), Yellow-faced pocket-gopher, raccoon, house finch, Great Blue Heron, Great Egret, Verdin, Red-tailed Hawk, White-winged Dove, Barn swallow, Lincoln's Sparrow, White-crowned Sparrow, Mourning Dove

Photos Taken:

Participants BZ, PH

Date

Groundwater Levels Monitoring Field Sheet

Site	Well ID	TOC Elevation	Ground Surface Elevation	Casing Height	Date	Time	Water Level Reading TOC	Water Depth (Reading TOC - Casing Height)	Comments/Observations
Valley Creek	VC-MW-1	3755.64	3752.26	3.38	10/17/18	1554	121.2"	81.9"	208cm 81.9 inches 6.8ft
	VC-MW-2	3754.72	3751.16	3.56	10/17/18	1520	111.3"	72"	183cm 72 inches 6ft
Vinton A	VA-MW-1	3780.70	3777.44	3.46	10/19/18	0818	90.5"	47.2"	120cm 47.2 inches 3.9ft
	VA-MW-2	3780.41	3776.76	3.43	10/19/18	0836	90.5"	41.7"	106cm 41.7 inches 3.5ft
Vinton B	VB-MW-1	3777.12	3774.04	3.08	10/19/18	0901	90.6"	48"	122cm 48 inches 4ft
	VB-MW-2	3777.31	3773.60	3.71	10/19/18	0914			Could not open lock

39.3"
39.3"
43.3"
48.8"
42.6"

Planting Field Sheets

Planting Field Sheet

Site Country Club Date Planted See Below

Participants IDEALS Auger Depth 9 FT Auger / 9 FT Trench w/mini excavator

Species	# Planted	Stock/Origin	Comments
Coyote Willow	3050	Transplants from Islands @ Sunland Park	1/31/18 - 2/7/18
Goodding's Willow	440	HYDRA Aquatic Inc.	4/5/18 - 4/16/18
Cottonwood	1620	Santa Ana Native Plants	3/28/18 - 4/16/18 / 4/18/18
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted Coyote Along River Bank Others Throughout entire site Area (acres) ~29ac

Provide GPS coordinates of planting locations or a sketch of the site:

31.833641 X -106.607292, 245 LF x 2.5 willow/LF = 615 willow

31.831364 X -106.607376, 486 LF x 2.5 willow/LF = 1215 willow

31.829351 X -106.606232, 208 LF x 2.5 willow/LF = 520 willow

31.825987 X -106.603424, 174 LF x 2.5 willow/LF = 435 willow

31.826651 X -106.604111, 106 LF x 2.5 willow/LF = 265 willow

Planting Field Sheet

Site Sunland Park Date Planted See Below

Participants IDEALS Auger Depth 9FT Auger, 9FT Trench w/mini excavator

Species	# Planted	Stock/Origin	Comments
Coyote Willow	3585	TransPlant from Islands @Sunland Park	2/19/18 - 2/28/18
Goodding's Willow	2055 *	Hydro Aquatic Inc.	4/18/18 - 4/24/18 **
Cottonwood	400	Santa Ana Native Plants	3/21/18 - 3/26/18
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted Willows in/near Flycatcher habitat area Throughout entire site Area (acres) ~29 ac

Provide GPS coordinates of planting locations or a sketch of the site:

31.80274 X -106.57842, 355 LF x $\frac{2.5 \text{ will}}{\text{LF}}$ = 888 coyote willow

31.80388 X -106.58025, 835 LF x $\frac{2.5 \text{ will}}{\text{LF}}$ = 2088 coyote willow

31.80433 X -106.58052, 244 LF x $\frac{2.5 \text{ will}}{\text{LF}}$ = 610 coyote willow

* less than plan QTY, remainder to be planted in Fall

** Majority planted in/near coyote willow transplant sites.

Planting Field Sheet

Site Anapra Date Planted See Below

Participants IDEALS Auger Depth 9FT, 9FT Trench for Transplants

Species	# Planted	Stock/Origin	Comments
* Coyote Willow	155	Transplants from Islands @ Sunland Park	1/15/18 - 1/16/18
Goodding's Willow	55	Hydro Aquatic Inc.	3/26/18 - 3/28/18
Cottonwood	110	Santa Ana Native Plants	3/26/18 - 3/28/18
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted Coyote willows along bank Others Throughout Site Area (acres) ~1/ac

Provide GPS coordinates of planting locations or a sketch of the site: 31°47'58.25"X106°33'50.97", 250LF x $\frac{2.5 \text{ willow}}{\text{LF}}$ = 625 willow
31°47'58.06"X106°33'47.51", 159LF x $\frac{2.5 \text{ willow}}{\text{LF}}$ = 397 willow
31°47'57.74"X106°33'42.00", 53LF x $\frac{2.5 \text{ willow}}{\text{LF}}$ = 133 willow

*153LF (385 willow) Mowed By IBWC Crews, adjacent to Bridge

APPENDIX B

Repeat Photos

Country Club East

Photo Point 1 Target 1

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 1 Target 2

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 1 Target 3

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 2 Target 1

10 November 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 2 Target 2

10 November 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 2 Target 3

10 November 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 3 Target 1

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 3 Target 2

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Country Club East

Photo Point 3 Target 3

16 October 2017

5 February 2018

15 May 2018

29 August 2018

18 October 2018

Sunland Park

Photo Point 1 Target 1

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 1 Target 2

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 1 Target 3

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 2 Target 1

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 2 Target 2

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 2 Target 3

16 October 2017

5 February 2018

15 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 3 Target 1

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 3 Target 2

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Sunland Park

Photo Point 3 Target 3

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 1 Target 1

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 1 Target 2

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 1 Target 3

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 2 Target 1

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 2 Target 2

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Photo Point 2 Target 3

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 3 Target 1

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Anapra Bridge

Photo Point 3 Target 2

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

Photo Point 3 Target 3

16 October 2017

5 February 2018

14 May 2018

28 August 2018

17 October 2018

APPENDIX C

Planting Maps

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

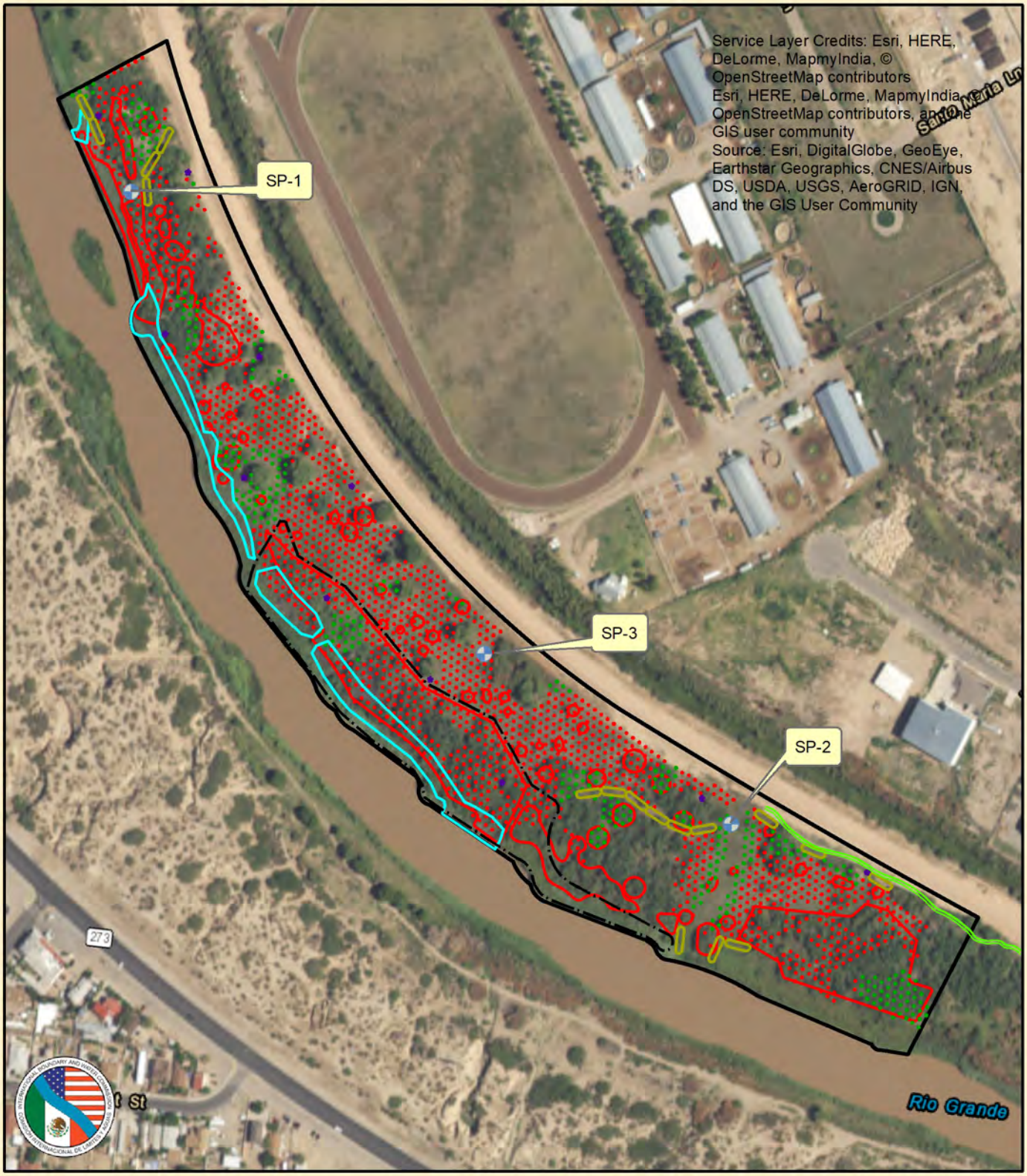
N

1:6,250

Feet
0 190 380 760

Meters
0 50 100 200

IDEALS-AGEISS, LLC



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

N

1:4,250

Feet: 0 125 250 500

Meters: 0 35 70 140

IDEALS-AGEISS, LLC

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

N

1:4,500

Feet
0 137.5 275 550

Meters
0 37.5 75 150

IDEALS-AGEISS, LLC