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

Title:

Final Restoration Report

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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
SOW	Scope of Work
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 as the culmination of the *Final Environmental Impact Statement (EIS): River Management Alternatives for the Rio Grande Canalization Project*. 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. The 2009 USIBWC ROD (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 USIBWC used the Conceptual Restoration Plan and Site Implementation Plans as 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 provided 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 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 was issued a new 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 2012 and 2017 BOs. 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 the 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 summarizes the work planned and implemented at each of the three restoration sites. This final report describes the current conditions, the restoration activities, and the monitoring results from October 2017 to January 2020 at the Anapra Bridge, Sunland Park, and Country Club East restoration sites.

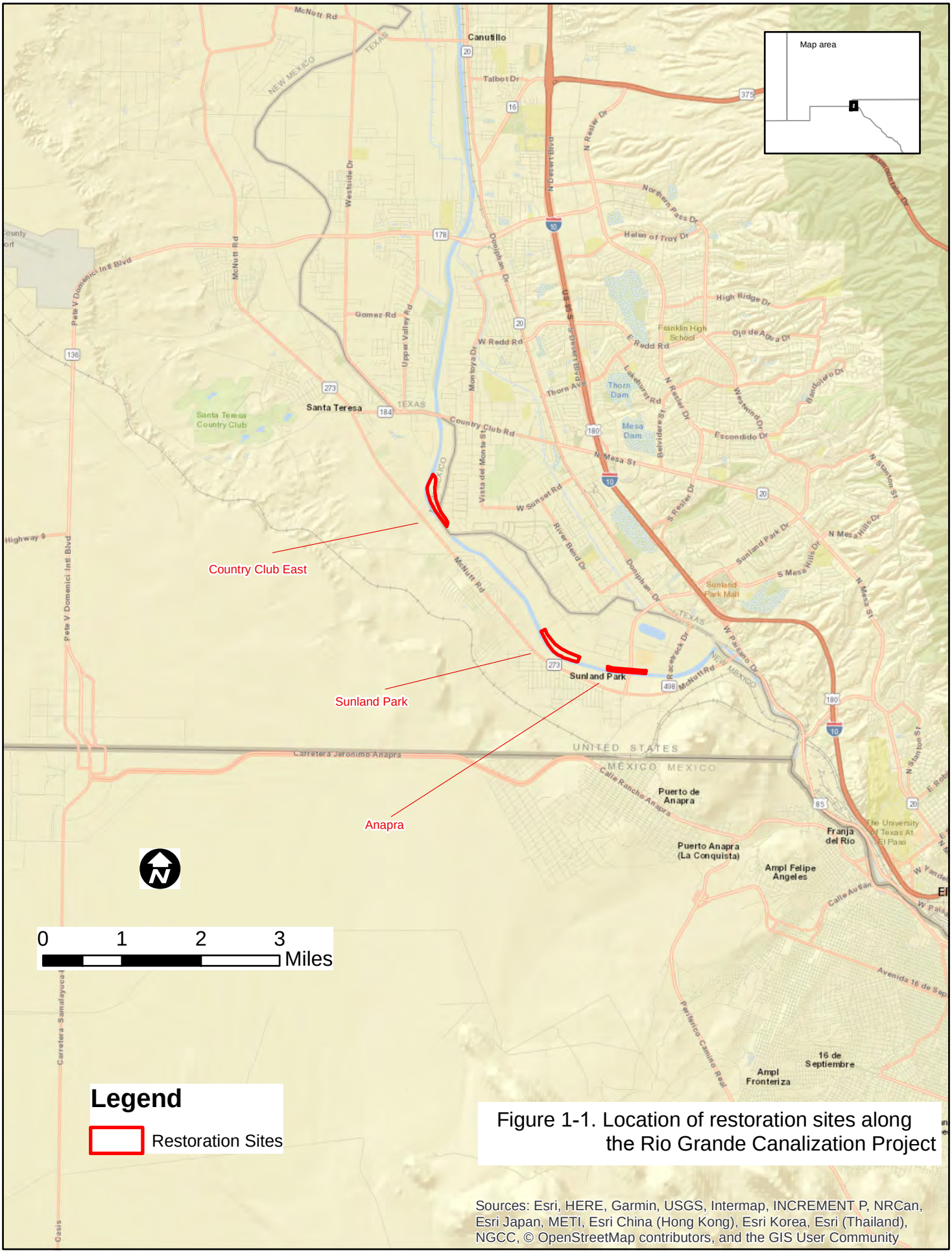

Figure 1-1. Location of restoration sites along the Rio Grande Canalization Project

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	Before Restoration Conditions-October 2017/ Planned Restoration Work	Restoration Work Implemented 2017-2019
Country Club East	29	Riparian forest (15 acres) and woodland (14 acres)	Targeted habitat included 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. Long stem shrubs were placed along the swales and connections to the swales. Replanting occurred for the long stem shrubs during December 2019 and December 2019-January 2020 for the cottonwoods and Goodding's willows.
Sunland Park	28.8	Open riparian woodland and dense riparian shrub habitat	Targeted habitat for this site included 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. Coyote willows were transplanted from nearby islands to augment the willows at the river banks where saltcedars were removed. 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. Long stem shrubs were planted throughout the site. Mistletoe mitigation occurred on several mature cottonwood trees. Replanting occurred for the long stem shrubs during December 2019 and December 2019-January 2020 for the cottonwoods and Goodding's willows.

Site	Acres	Targeted Habitat	Before Restoration Conditions-October 2017/ Planned Restoration Work	Restoration Work Implemented 2017-2019
Anapra Bridge	11	Open riparian woodland	Planned restoration efforts included: ▪ Creation of open riparian woodland habitat, with cottonwoods spaced throughout this linear site ▪ Spacing cottonwoods along the trail to provide shade ▪ Long stem shrubs 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. A small number of long stem shrubs were planted along the trail. Replanting of poles occurred in January 2020.

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 was 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 azimuth was noted and an identification number was assigned to each photo and camera point. The points had 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 eight periods of the project: pre-implementation monitoring, pre-restoration monitoring, and six 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 C.
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 and large Russian olive trees (*Elaeagnus angustifolia*) were cut near the base of the plant with a chainsaw and the 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,
14 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 inaccessible to mechanical methods or where mechanical methods were 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 of the migratory bird nesting season (March 1 to August 31).

2.2 Native Planting

IDEALS-AGEISS developed a restoration plan (IDEALS-AGEISS 2018; Appendix A) 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 B). 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, long stem 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 the islands (approximately 4 acres) 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 would 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 at all three sites 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 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).

Based on other restoration sites, fall planting for the long stem shrubs seems to promote better survivorship; therefore; planting of these species was moved to late fall 2018. Shrub planting began in October 2018. Shrub planting was conducted using an approximate 3-foot auger hole. A 4-inch well around the shrubs was then created to retain additional moisture (Appendix B).

Site specific planting maps (Appendix B) based on the required 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

Shrubs for planting at the restoration sites, 25 October 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
Long stem riparian shrubs	2,320	1,152	330
Arizona ash and/or desert willow	10	10	10
Grass and forb seeding	5.15 acres	3.5 acres	0.27 acre

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 was 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.

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.

Six post-restoration assessments were conducted in May, August, and October of 2018, and April, August, and October of 2019. 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 and the October 2019 monitoring session, all planted species were counted to determine survivorship. Percent cover and species composition were recorded on each site's field monitoring sheet. 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 higher at the Anapra Bridge site compared to the other two sites except during irrigation release periods when they are similar (Appendix C). 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 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	Aug 2019	Oct 2019
Anapra	AB-MW-1	4.09	3.83	4.5	2.43	7.40	2.64	2.6	3.54
	AB-MW-2	5.15	2.17	1.52	2.17	8.90	2.1	2.5	3.61
Sunland Park	SP-MW-1	Destroyed	Destroyed	2.68	3.97	8.76	2.58	3.7	1.44
	SP-MW-2	5.42	3.42	4.87	3.64	11.8	2.53	1.5	5.12
	SP-MW-3	3.08	2.75	4.58	7.09	9.00	2.36	4.4	4.5
Country Club East	CCE-MW-1 (TX)	6.55	6.46	5.22	6.49	7.60	2.39	4.2	4.5
	CCE-MW-2	4.38	Obstructed	2.68	2.79	7.90	1.47	2.8	3.61
	CCE-MW-3	Obstructed well	Obstructed at 4.06	4.08	3.94	5.80	1.72	4.2	4.66

3.2 Pre-Restoration Site Conditions

Pre-restoration site conditions described below are based on a 2016 survey (IDEALS-AGEISS 2016) as well as surveys conducted during October 2017 (Appendix C and D). Abundance of floral species observed on each site was documented (Table 3-2).

Table 3-2. Vegetative Species Observed Prior to Restoration Efforts and the Three Sites.

Common Name	Scientific Name	Abundance		
		Country Club East	Sunland Park	Anapra Bridge
Coyote willow	*Salix exigua*	Moderate	Moderate	Moderate
Cottonwood	*Populus deltoides*	-	Moderate	Sporadic
Screwbean mesquite	*Prosopis pubescens*	Moderate	Moderate	Moderate
Saltcedar	*Tamarix chinensis*	Moderate	Moderate	Moderate
Russian thistle	*Salsola kali*	Moderate	Moderate	Moderate
Willow baccharis	*Baccharis salicina*	-	-	Low
Smooth pigweed	*Amaranthus hybridus*	High	-	-
Siberian elm	*Ulmus pumila*	Sporadic	Sporadic	Sporadic

Common Name	Scientific Name	Abundance		
		Country Club East	Sunland Park	Anapra Bridge
Fescue grass	*Festuca sp.*	-	Moderate	-
Russian olive	*Elaeagnus angustifolia*		Sporadic	Sporadic
Alkali sacaton	*Sporobolus airoides*	High	-	-

3.2.1 Country Club East

The southern end of this site has moderate patches of screwbean mesquite (*Prosopis pubescens*) with a thin coyote willow (*Salix exigua*) 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 (*Tamarix ramosissima*). Within the channel, there are some narrow islands in this stretch dominated by coyote willow and common reed (*Phragmites spp.*). 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 restoration efforts. Mowing has been discontinued at Country Club East since 2011. Pre-restoration site conditions and saltcedar distribution are noted in Figure 3-1. Country Club East had minor infestation of mistletoe (4 to 6 clumps) in two trees.

The soils on the Country Club East site are Agua variant soils which are fine sandy loam which is deep and somewhat poorly drained and moderately wet. Clay comprises approximately 4 to 20 percent of the soils type, although some higher clay concentrations (31 percent) were documented in some of the sample horizons (TRC 2010). The 2017 site visit documented salty topsoil towards the southern end of the site. Permeability in this soil type is rapid and the soils tend to have a low-holding capacity. The groundwater levels are dependent on the amount of water released during irrigation season as well as rainfall. Groundwater levels vary considerably at the site, historically ranging from 3.4 to 8.5 feet below the surface.

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, willows, and mature saltcedar. This site contained a thin row of coyote willow (in moderate abundance) along the river bank with patchy, diverse mixed vegetation away from the river. The diverse mixed vegetation habitat contains large screwbean mesquite and saltcedar with larger cottonwood growing amongst them towards the southern end of the site. The cottonwoods become more concentrated in an open gallery toward the north end of the site; many of which are heavily infested with mistletoe. Of the 39 cottonwoods surveyed, mistletoe infestation ranged from 0-120 clumps with a mean per tree of 33. Ground cover was primarily fescue grass and silverleaf nightshade (*Solanum elaeagnifolium*). Russian olives (*Eleagnus angustifolia*) are sporadic through the site along the river bank along with Siberian elm. Russian thistle (*Salsola tragus*) occurs in moderate abundance in the open areas. Saltcedar in this section was suffering from *Diorhabda*. This site has good potential for flycatcher habitat. Figure 3-2 shows the pre-restoration distribution of native species (mixed and protected areas) and saltcedar on the site.

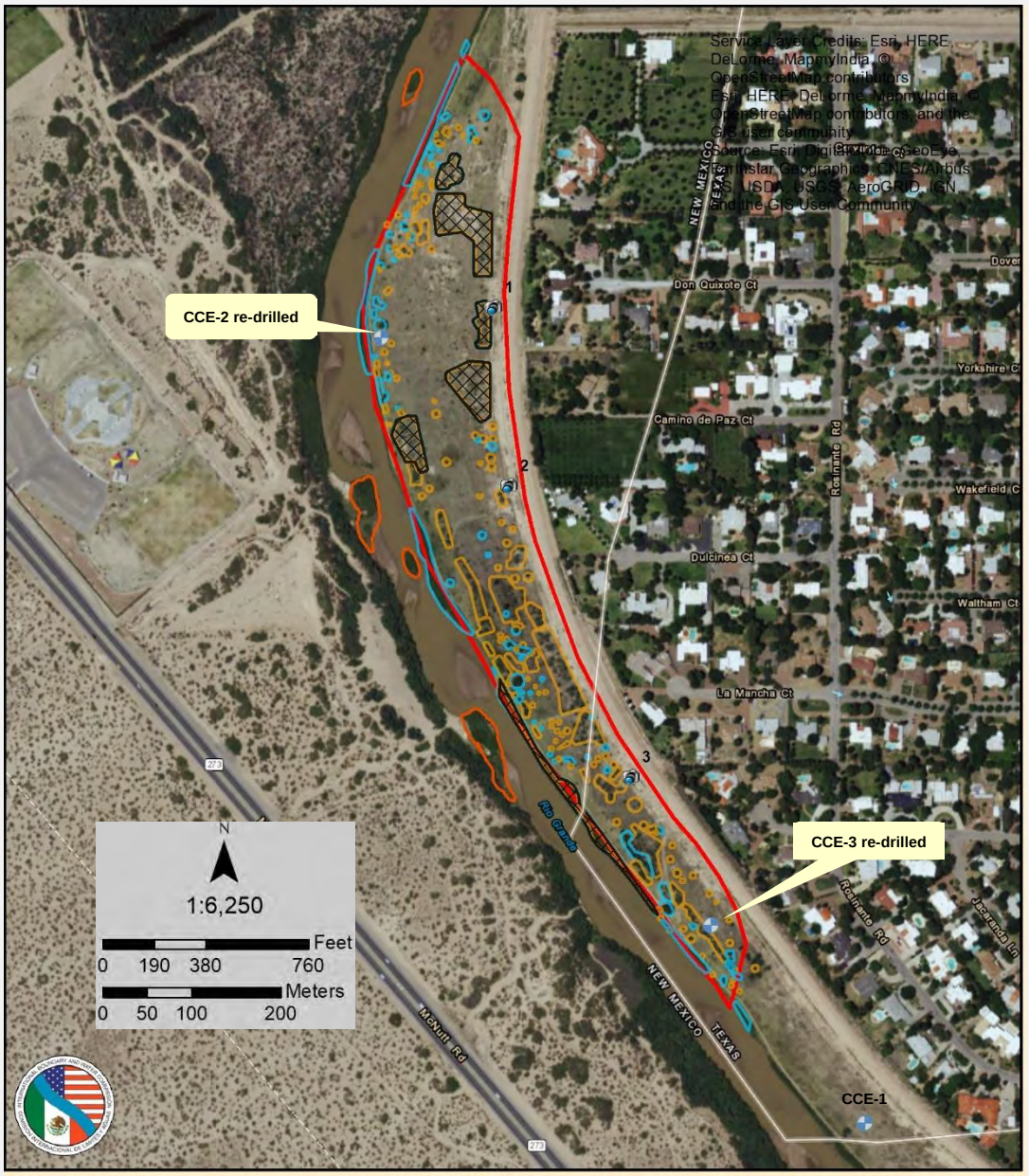

Figure 3-1. Pre-restoration Conditions at the Country Club East Restoration Site

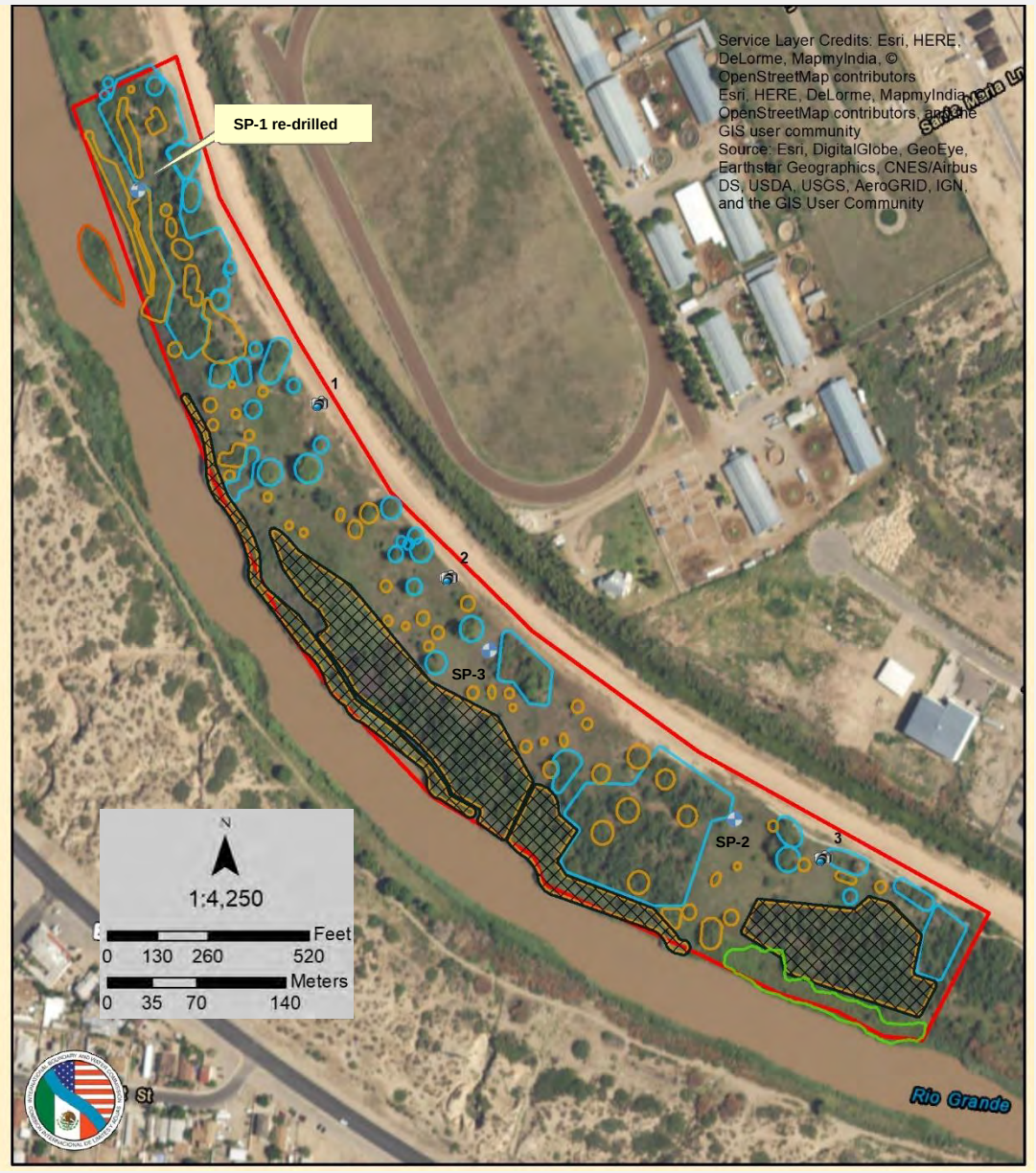

Figure 3-2. Pre-restoration Conditions at the Sunland Park Restoration Site

The soils on the Sunland Park site are Agua wet variant which are fine sandy loam which is deep and somewhat poorly drained and moderately wet. Clay comprises approximately 4 to 24 percent of the soils type, although some higher clay concentrations (42 percent) were documented in some of the sample horizons (TRC 2010). Permeability in this soil type is rapid and the soils tend to have a low-holding capacity. Salinity on this site is low (TRC 2010). Groundwater levels vary considerably at this site, ranging from 1.9 to 11.1 feet below the surface.

Sunland Park pre-restoration effort, 14 November 2017.

Sunland Park pre-restoration effort with example of mistletoe infected cottonwood, 14 November 2017.

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 prior to the pre-restoration survey, had not mowed in several years. The site has good potential structure. A thin strip of mixed vegetation comprised of coyote willow, seep willow, screwbean mesquite, and saltcedar runs along the bank of the river with a few Siberian elm and Russian olive. Further away from the river a young stand of saltcedar and screwbean mesquite was growing in what appears to be a depression. Saltcedar in this area showed slight stress from *Diorhabda* and is easily accessible for removal. A moderate abundance of Russian thistle occurred away from the site and native grass (*Distichlis spp.*) was found in the open areas (Figure 3-3).

The soils at the Anapra site are also Agua wet variant. Clay concentration in the soil is higher at this site than the other restoration sites varying between 3 to 35 percent (TRC 2010). Salinity on this site varies with one area containing surface salt which may potentially affect plant survivorship. The water table is high at this site with groundwater levels ranging from 1.1 to 5.1 feet below the surface.

3.3 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 C). Dominant vegetation at the three sites varied (Table 3-3). 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 occurrence 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 were removed: Country Club East 5.17 acres, Sunland Park 7.18 acres, and Anapra Bridge 3.55 acres. From September 19-21, 2018, a licensed applicator treated saltcedar re-sprouts with Garlon® 4 herbicide at the restoration sites.

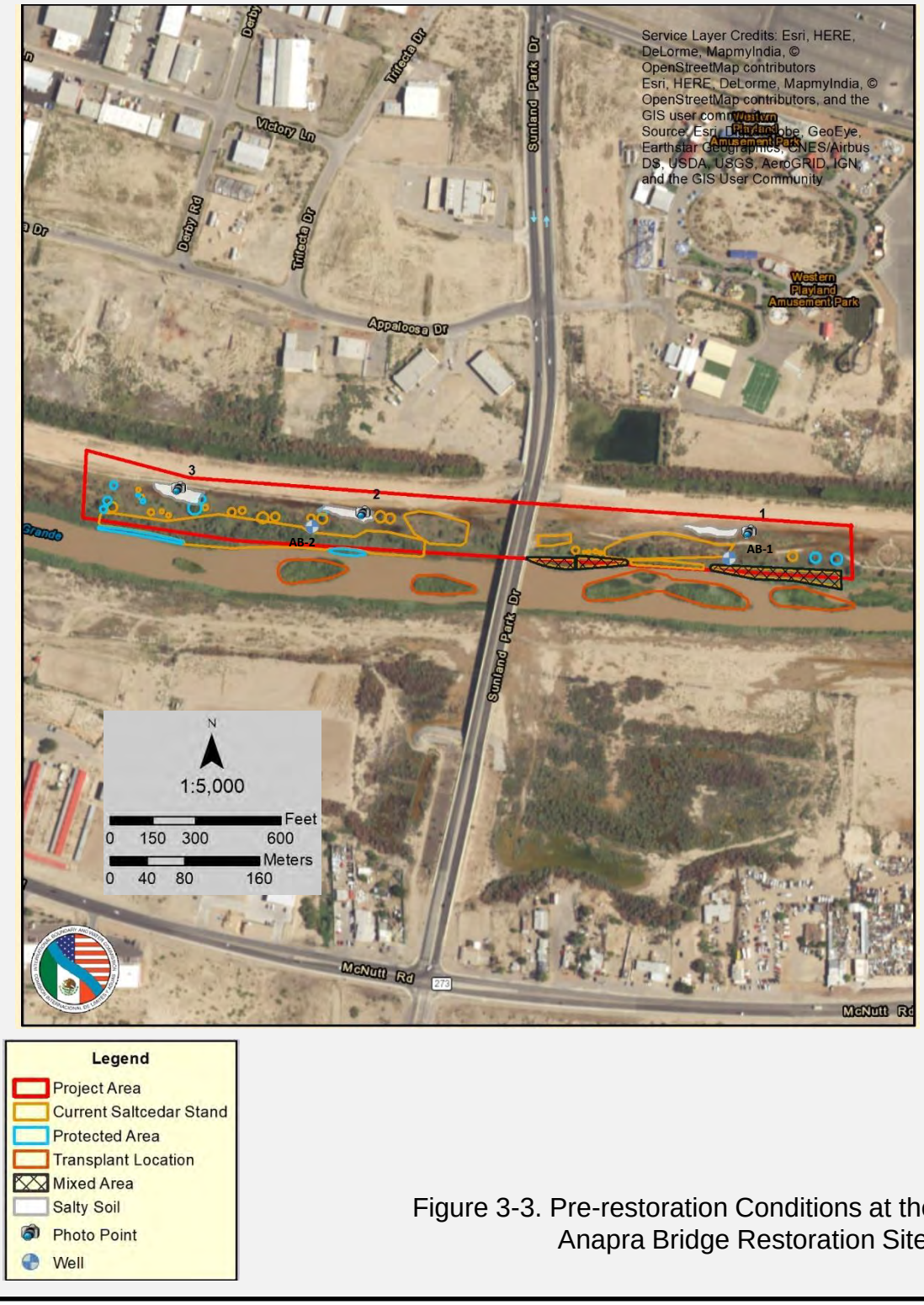

Figure 3-3. Pre-restoration Conditions at the Anapra Bridge Restoration Site

Table 3-3. Dominant Vegetation Cover Observed at the Three Restoration Sites, August 2019

Scientific Name	Common Name	Estimated Percent Cover		
		Anapra	Sunland Park	Country Club
Native Species				
Apocynum cannabinum	Dogbane	10	-	-
Asclepias spp.	Milkweed	10	-	-
Atriplex canescens	Four-wing saltbush	3	10	5
Baccharis salicifolia	Seep willow	20	20	-
Baccharis salicina	Willow baccharis	-	20	-
Cressa truxillensis	Spreading alkaliweed	85	-	6
Distichlis spicata	Salt grass	80	-	50
Ephedra	Ephedra	-	70	-
Ericameria nauseosa	Chamisa	3	-	2
Funastrum cynanchoides	Funastrum	-	2	-
Guara spp.	Guara	-	2	2
Helianthus spp.	Sunflower	-	1	-
Heliotropium	Heliotrope	-	12	-
Lactuca serriola	Prickly lettuce	-	-	9
Lycium torreyi	Wolfberry	3	6	4
Machaeranthera tanacetifolia	Tansyleaf tansyaster	-	2	-
Malva spp	Mallow	-	7	-
Melilotus officinalis	Yellow sweet clover	30	8	-
Panicum spp.	Grass	1	-	4
Polygonum	Knotweed	-	3	-
Populus deltoides	Cottonwood	-	5	15
Prosopis glandulosa	Honey mesquite	3	2	-
Prosopis pubescens	Screwbean mesquite	10	8	15
Ratibida columnifera	Prairie coneflower	-	-	4
Salix exigua	Coyote willow	20	75	75
Salix gooddingii	Goodding's willow	2	11	5
Schoenoplectus	Bulrush/tule	-	-	3
Sesuvium verrucosum	Western sea-purslane	40	4	-
Solanum elaeagnifolium	Silverleaf nightshade	5	15	13
Sphaeralcea spp.	Globe mallow	1	3	-
Sphaerophysa salsula	Bladder vetch	-	-	2
Sporobolus airoides	Alkali sacaton	2	-	8
Suaeda nigra	Bush seepweed	30	10	35
Typha spp.	Bulrush	-	-	20
Non-Native Species				
Cynodon dactylon	Bermuda grass	6	15	80
Kochia scoparia	Kochia	5	12	2
Phragmites	Reed	-	10	-
Salsola kali	Russian thistle (tumble weed)	-	5	-

Scientific Name	Common Name	Estimated Percent Cover		
		Anapra	Sunland Park	Country Club
Tamarix chinensis	Saltcedar	3	15	3

3.3.1 Country Club East

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.

Creating the drainage swales created at Country Club East, 21 March 2018.

Planting locations are shown in Figure 3-4. 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 during January-February 2018. 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 during the rainy season. A mixture of four-wing saltbush (*Atriplex canescens*, 1,312), Anderson wolfberry (*Lycium andersonii*, 54), New Mexico olive (*Forestiera neomexicana*, 122) and Arizona ash (*Fraxinus velutina*, 10) shrubs were planted from October- November 2018.

As of August 2019, minimal saltcedar (3 percent) remained at the site and consisted of small re-growth sporadic individuals. August monitoring documented screwbean mesquite, cottonwood, and coyote willows dominated the canopy layer while salt grass, bush seepweed (*Suaeda nigra*), silverleaf nightshade (*Solanum elaeagnifolium*) and Bermuda grass dominated the forb/grass layer. These dominant species were similar to species observed during the 2018 monitoring effort. Several other forb species make up the grass and forb vegetation cover on the site (Table 3-3). Saltcedar regrowth was mainly concentrated along the river bank intermixed with the coyote willows. In October 2019, native species such as salt grass and bush seepweed dominated the cover (Appendix C). Photos throughout the two years are contained in Appendix D.

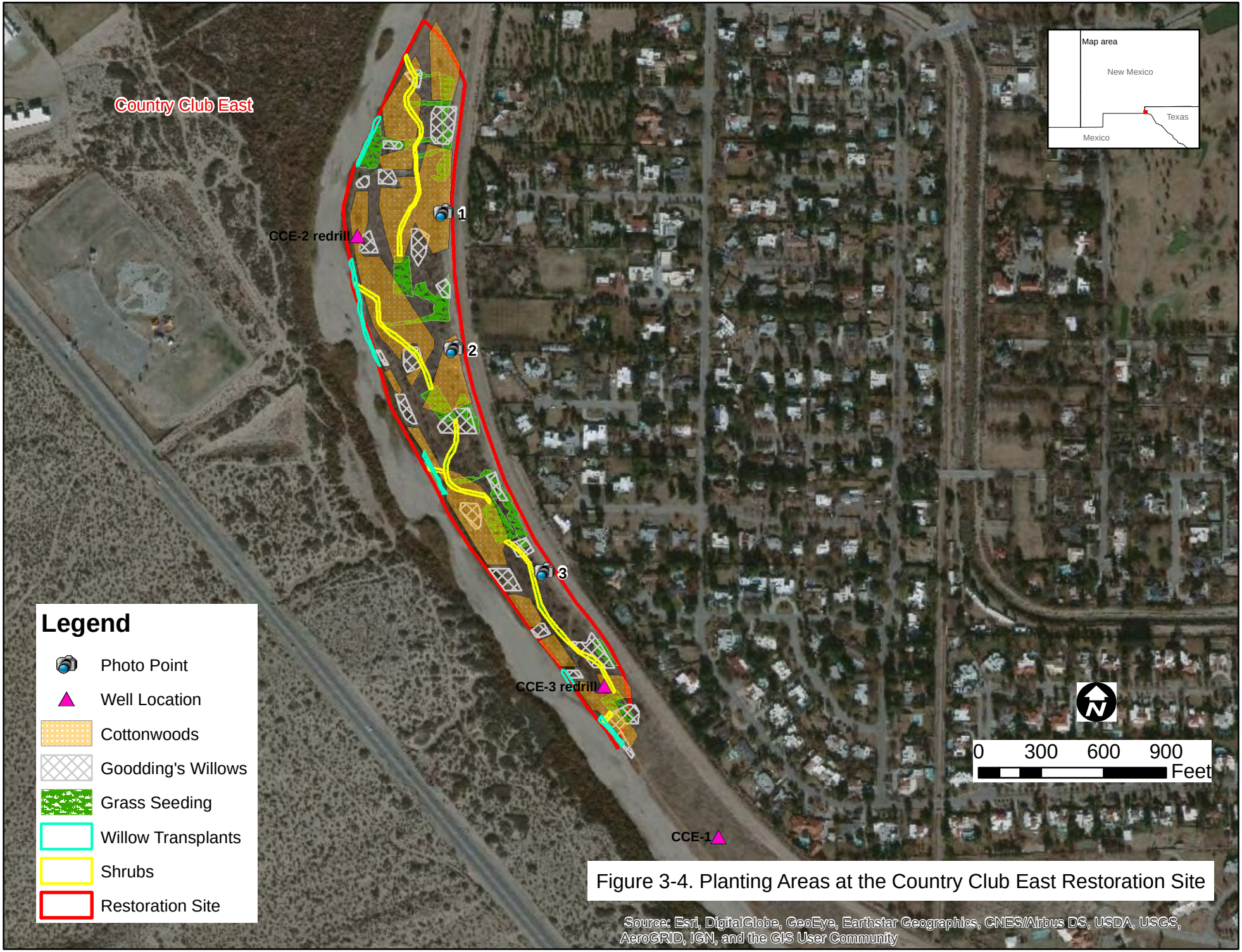

Figure 3-4. Planting Areas at the Country Club East Restoration Site

Gauges were installed at the cuts for the Country Club East restoration site to monitor water levels. Water levels at each gauge were similar during the irrigation release period at each bank cut (Table 3-4).

Table 3-4. Water Levels at the Country Club East Site During Post-Restoration Monitoring

Gauge No.	Height of Water (feet)					
	May 2018[a]	Aug 2018	Oct 2018	April 2019	Aug 2019	Oct 2019
1	-	4.67	0	0	4.7	4.9
2	-	4.9	0	0	missing	missing
3	-	4.46	0	0	5.4	3.8
4	-	4.67	0	0	5.4	4.3

a Gauges were not installed prior to this monitoring session.

Gauge meters at all four bank cuts at Country Club East during October 2019 from south (Gauge #1) to north (Gauge #4).

3.3.2 Sunland Park

At the Sunland Park site, 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 3-5). In addition, Goodding's willows (2,055 Goodding's willows of the required 2,350) were planted throughout the site by spring 2018 primarily concentrated in the flycatcher habitat area. The remainder of the Goodding's willows was planted in February 2019. All 400 cottonwoods were planted at the site per the planting plan in winter 2017-2018 (Appendix B). 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 3-5). A diversity of shrub species was planted in October 2018 at the site including three-leaf sumac (*Rhus trilobata*, 178), chamisa (*Ericameria nauseosa*, 440), four-wing salt bush (233), Anderson wolfberry (179), New Mexico olive (122), and Arizona ash (10).

As noted, mature cottonwood trees were present on the Sunland Park site prior to restoration efforts. The cottonwoods become more concentrated in an open gallery toward the north end of the site; many of which were heavily infested with mistletoe. Thirty-nine cottonwoods were surveyed at Sunland Park and 82 percent of these trees were infested. Mistletoe tends to spread faster in multi-storied and monoculture stands (USDA 2010). Seeds may also fall from mistletoe in the upper parts of the trees creating new infestations on lower branches. Birds feed off of the berries, digest the pulp, and excrete the seeds, which can then adhere to the branches of living trees. When the seed germinates, it grows into tree tissues. It may take up to 2 years for the plant to bloom and produce viable seed. Based on discussions with arborists and New Mexico State University Extension, there is a good chance that mistletoe, once established on a host tree that is dominant to the area, tends to remain attracted to that specific tree species. However, mistletoe provides important components for wildlife habitat and some recommend that removing the infestation should be avoided unless other defects in the tree are significant (Halloin 2003).

Planting in flycatcher habitat, 3 April 2018.

The most effective way to control mistletoe and prevent its spread is to prune infected branches, if possible, as soon as the parasite appears. Thinning-type pruning cuts to remove infected branches at their point of origin or back to large lateral branches was used. Infected branches were cut at least 1-foot below the point of mistletoe attachment in order to completely remove embedded haustoria. Mistletoe mitigation occurred in February 2019 for those trees with less than 25 clumps per individual (n = 24 trees).

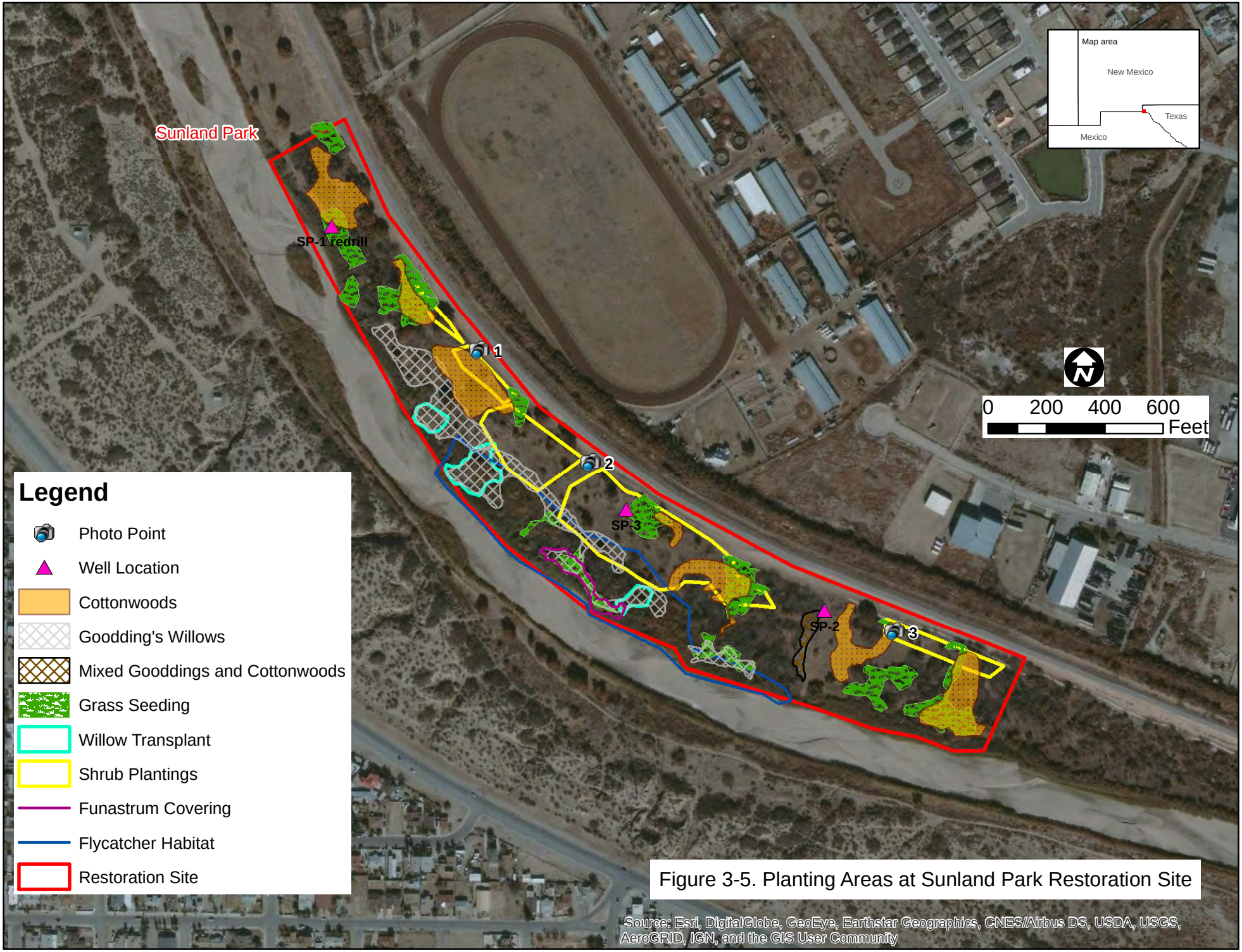

Figure 3-5. Planting Areas at Sunland Park Restoration Site

During the August 2019 monitoring, silverleaf nightshade dominated the ground cover and *Ephedra* the shrub layer at the Sunland Park site. Vegetative cover at the site was composed of a wide diversity of both native and non-native species (Table 3-3). Saltcedar was beginning to come back along the river intermixed with the coyote willows in some areas. Coyote willows and Goodding's willows dominated the canopy layer. The willows planted for the flycatcher habitat were developing well during the 2019 monitoring. The non-native species, Bermuda grass, was not as prevalent during the October 2019 monitoring session as it was in 2018 (Appendix C).

Flycatcher habitat at Sunland Park, 28 August 2018.

Planting in the flycatcher habitat at Sunland Park, 16 October 2019.

Transplanted coyote willows along the river bank in the flycatcher habitat at Sunland Park, 16 October 2019.

During the October 2018 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 saltcedar 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. However, by October 2019 the vine was not as prevalent although some of the trees in the area had been damaged/killed by the vine.

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

3.3.3 Anapra Bridge

Approximately 1,144 coyote willows were transplanted along the bank at the site (330 willows were recommended; Figure 3-6) and 55 Goodding's willows and 110 cottonwoods by late winter 2018. Limited seeding (0.27 acre) occurred at the Anapra site and included the area north of the bridge where the coyote willows were removed (mowed). Long stem shrubs, 110 of each species, were planted in October 2018 and included: chamisa, four-wing salt bush, and Anderson wolfberry. In addition, 10 Arizona ash were also planted at the site.

Figure 3-6. Planting Areas at the Anapra Bridge Restoration Site

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 revised 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. Additionally, heavy salt patches were documented in several areas on the site during the 2018 and 2019 October monitoring.

Vegetative ground cover at the Anapra Bridge site was high with spreading alkaliweed (*Cressa truxillensis*) and salt grass dominating (Table 3-3) as noted during the August 2019 monitoring session. Of all three sites, the Anapra Bridge restoration site had the lowest occurrence of invasive species, although native species diversity was similar across all three sites.

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

Wildlife species observed at the three restorations sites varied throughout the year (Appendix C) and were predominately avian. A diversity of avian species was noted during the October 2019 monitoring effort (Table 3-5).

Table 3-5. Wildlife Species Observed at all Restoration Sites in October 2019

Scientific Name	Common Name	Restoration Site		
		Anapra	Sunland Park	Country Club East
Accipiter cooperii	Cooper's hawk		X	
Agelaius phoeniceus	Red-winged blackbird		X	
Anas platyrhynchos	Mallard	X	X	
Anthus rebescens	American pipit	X		
Aphelocoma woodhouseii	Woodhouse's scrub jay			X
Auriparus flaviceps	Verdin	X	X	
Buteo jamaicensis	Red-tailed hawk		X	X
Buteo swainsoni	Swainson's hawk	X	X	
Carduelis psaltria	Lesser Goldfinch	X	X	X
Cathartes aura	Turkey vulture			X
Charadrius vociferus	Killdeer		X	X
Circus hudsonius	Northern harrier		X	
Colaptes auratus	Northern flicker	X	X	
Columba livia	Rock pigeon	X	X	
Contopus sordidulus	Western wood pewee		X	
Dryobates scalaris	Ladder-backed woodpecker		X	
Euphagus cyanocephalus	Brewer's blackbird		X	
Falco peregrinus	Peregrine falcon		X	
Falco sparverius	American kestrel			X
Geothlypis trichas	Common Yellowthroat			X
Haemorhous mexicanus	House finch		X	X
Junco hyemalis	Dark-eyed Junco		X	X
Melospiza melodia	Song sparrow			X
Mimus polyglottos	Northern mockingbird		X	
Quiscalus mexicanus	Great-tailed Grackle		X	
Plegadis chihi	White-faced ibis	X		
Pooecetes gramineus	Vesper sparrow			X
Regulus calendula	Ruby-crowned kinglet			X
Sayornis nigricans	Black phoebe	X		
Sayornis saya	Say's phoebe	X		
Setophaga coronata	Yellow-rumped warbler		X	
Spinus tristis	American goldfinch		X	
Spizella passerina	Chipping sparrow		X	X
Streptopelia decaocto	Eurasian collared-dove		X	
Sylvilagus audubonii	Audubon's cottontail/desert cottontail		X	
Thryomanes bewickii	Bewick's wren		X	

Scientific Name	Common Name	Restoration Site		
		Anapra	Sunland Park	Country Club East
Toxostoma crissale	Crissal thrasher		X	
Zenaida asiatica	White-winged dove		X	
Zenaida macroura	Mourning dove		X	X
Zonotrichia leucophrys	White-crowned sparrow		X	X

3.4 Native Planting Survivorship

Species planted at each site were dependent upon the desired habitat for the restoration site. The species of long stem shrubs varied between sites, but the total quantity of each species planted followed with the recommendations from the RGCP Conceptual Restoration Plan (USACE 2009) and RGCP Site Implementation Plan (TRC 2011) and outlined in the 2018 restoration plan (IDEALS-AGEISS 2018). Species and quantities planted at each site are documented in Table 3-6.

Example of cottonwood damage at Country Club East, August 2018

During each monitoring event, IDEALS-AGEISS Team biologists inspected the transplanted willows, shrubs, 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 and October 2019 monitoring when all planted species were accounted for. Dead trees were flagged during the May and August monitoring periods when noted, although flagging unfortunately did not last through the summer. In October 2018 and 2019, 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 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 and 2019 monitoring period is noted in Table 3-6. If poles or shrubs could not be accounted for then they were assumed dead in the mortality calculations; therefore, the actually known dead added to the known alive do not always add up to the total number of plants planted.

Table 3-6. Plant Survivorship at Each Restoration Site

Planting	Survivorship Year	Parameter	Country Club	Sunland Park	Anapra Bridge	Total
Coyote willows	**2018**	**SOW**	3,480	3,440	330	7,250
		Planted	4,000	3,585	1,155	8,740
		2018 Mortality	0	66	0[a]	66
		Total Survived	4,000	4,997[b]	805	8,324
		% Survival	100%	99%	100%	100%
	2019	**2019 Mortality**	0	500	0	500
		Total Survived	4,000	4,497	805	9,302
		% Survival	100%	90%	100%	100%[b]
Goodding's willows	**2018**	**SOW**	440	2,350	55	2,845
		Planted	440	2,055[c]	55	2,550
		2018 Mortality	9 (16)[d]	273 (473)[e]	1	688
		Total Survived	415	1,309	54	1,778
		% Survival	98%	67%	98%	70%[c,d]
	2019	**Plants present**	415	1,604	54	2,073
		2019 Mortality	77	236	12	325
		Total Survived	278	897	49	1,224
		% Survival	66%	38%	89%	43%
Cottonwoods	**2018**	**SOW**	1,620	400	110	2,130
		Planted	1,620	400	110	2,130
		2018 Mortality	78 (57)[d]	114	43	569
		Total Survived	1,225	212	67	1,504
		% Survival	78%	53%	68%	73%[d]
	2019	**Plants present**	1,225	212	67	1,504
		2019 Mortality	803	86	54	943
		Total Survived	344	129	16	489
		% Survival	22%	32%	15%	23%

Planting	Survivorship Year	Parameter	Country Club	Sunland Park	Anapra Bridge	Total
Native Shrubs	**2019**	**SOW**	2,330[f]	1,162[f]	340[f]	3,832
		Planted	2,330	1,162	340	3,832
		2019 Mortality	937[g]	207	56	1,200
		Total Survived	1,393	955	307	2,655
		% Survival	60%	82%	90%	69%

a Mortality does not include willows that were mowed.
[b] Re-sprouting had occurred and the transplants were becoming indistinguishable with the natural occurring plants
c Not all Goodding's willows were planted in 2018. Approximately 295 were planted late in 2019.
d Numbers in parenthesis were destroyed by motor vehicles/maintenance crews and were not used in survivorship calculations.
e 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 (n = 68 additional willows).
f Includes 10 Arizona ash
[g] Not all plants could be accounted for so they were considered mortalities.
SOW scope of work

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

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 the potential to impact restoration efforts. Pocket gopher activity was observed at the Sunland Park site and was evident at the Anapra Bridge site during the 2018 season. This species has the potential to undermine root structure of planted poles. However, during the 2019 season the species was not documented on the sites as the ground cover increased. 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 and shrubs were noted at the Country Club East site during the October 2018 monitoring from recreationists.

Evidence of recreational damage to the Country Club East shrub plantings, December 28, 2018.

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 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, dead coyote willows were documented among the transplants usually occurring away from the river bank, although coyote willows from the transplants were thriving at the river bank. More willows were counted in this section owing to the fact that re-sprouting had occurred and the transplants were becoming indistinguishable with the natural occurring plants. At the Anapra Bridge 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 3-6). Overall coyote willow survival for the three sites was very high. Natural recruitment and re-sprouting was observed.

3.4.1 Country Club East

Goodding's willow survival was high at the Country Club East site during the October 2018 monitoring and all the trees were accounted for (Table 3-6). A large majority of the trees did show signs of stress although passed the snap test. A greater mortality of poles occurred after the second growing season with only a 66 percent survivorship by October 2019.

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

During the first growing season, cottonwood survival at the site was roughly 78 percent. However, 56 percent of the cottonwoods showed some form of stress. Cottonwood survival throughout the site dropped dramatically the second year to only 22 percent. The majority of the surviving cottonwoods occurred in the swale areas. 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.

Native long stem shrub survival was highly variable between species at the Country Club site (Table 3-7). Overall survivorship was the lowest at Country Club East for the three sites (60 percent). Approximately 119 dead long stem shrubs could not be identified to species during the October 2019 monitoring session.

Table 3-7. Survivorship of Long Stem Shrubs Planted by Species for Country Club East

Common Name	Scientific Name	Planted	Survived	% Survival
Three leaf sumac	*Rhus trilobata*	342	25	7%
Four-wing saltbush	*Atriplex canescens*	1,312	1,070	82%
Anderson wolfberry	*Lycium andersonii*	544	296	54%
New Mexico olive	*Forestiera neomexicana*	122	2	2%
Arizona ash	*Fraxinus velutina*	10	0	0%

3.4.2 Sunland Park

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 during the 2018 survey. 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. In addition, Goodding's willows in the flycatcher area were intermixed with the densely packed transplanted coyote willows and were difficult to find. Survival was 67 percent. Despite the addition of 295 Goodding's willows in early 2019 to complete the required plantings, willow survival continued to drop (38 percent) and many poles were not located. Some of this can be attributed to the funastrum, but in addition, any poles that potentially rotted and fell over into the understory may not have been found. The impact of the funastrum and delayed 2019 irrigation release likely contributed to the mortality.

Cottonwood survivorship was not as successful at this site during either October monitoring sessions (53 percent in 2018 and 32 percent in 2019). Several areas near the levee toe road appeared void of plantings even though the areas were planted. In addition, while conducting the long stem plantings it was noted that in some areas, cottonwood sprouts 4- to 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.

Overview of riparian habitat at Sunland Park, 15 November 2018.

Overall long stem shrub survivorship was good at the site (82 percent) and like the Country Club site, varied by species (Table 3-8). The unknown shrubs were counted (the stems could not be identified to species) and therefore could not be used in the species-specific mortality calculations.

Table 3-8. Survivorship of Long Stem Shrubs Planted by Species for Sunland Park

Common Name	Scientific Name	Planted	Survived	% Survival
Three leaf sumac	*Rhus trilobata*	178	76	43%
Chamisa	*Ericameria nauseosa*	440	411	93%
Four-wing saltbush	*Atriplex canescens*	233	222	96%
Anderson wolfberry	*Lycium andersonii*	179	151	84%
New Mexico olive	*Forestiera neomexicana*	122	87	71%
Arizona ash	*Fraxinus velutina*	10	8	80%

3.4.3 Anapra Bridge

The Anapra Bridge site had good survivorship for the Goodding's willows in both 2018 (98 percent) and 2019 (89 percent). Cottonwood poles survivorship however, was poor at this site. During the 2018 monitoring, 25 more cottonwood poles were counted than according to the planting sheets. Survivorship was 68 percent. In 2019, survivorship dropped to 15 percent with the surviving poles occurring on the south end of the site. Shrub survival on the site was high at 90 percent. The biologists counted 23 more

shrubs (all four-wing salt bush) than planted; however, overall survival estimates per species (Table 3-9) was based on the numbers planted and known mortality of 56 total shrubs. Only one four-wing salt bush was documented. Good recruitment of native shrubs, mostly baccahris and four-wing salt bush, occurred on site.

Table 3-9. Survivorship of Long Stem Shrubs Planted by Species for Anapra Bridge

Common Name	Scientific Name	Planted	Survived	% Survival
Chamisa	*Ericameria nauseosa*	110	96	87%
Four-wing saltbush	*Atriplex canescens*	110	128[a]	100%
Anderson wolfberry	*Lycium andersonii*	110	95	87%
Arizona ash	*Fraxinus velutina*	10	8	80%

[a]Assumed that native shrubs were counted in the calculations as all flagging had disintegrated.

3.5 Re-Planting

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 (Table 3-10). 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. Coyote willow survivorship at the Anapra Bridge and Sunland Park site exceeded the USIBWC survival rate. The second year saw a little more mortality at the Sunland Park site for the willows transplanted further away from the river bank. Irrigation release was late in 2019 (31 May) which could have contributed to this increase in mortality. Goodding's willow survival at Country Club East and Anapra Bridge was above the mortality threshold level.

Table 3-10. Replanting Conducted at Each Site in 2019-2020

Common Name	Country Club East	Sunland Park	Anapra Bridge
Goodding's willows	0	447	0
Cottonwoods	229	94	43
Long stem shrubs	583	291	0

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. The grass was extremely high and dense during the monitoring and some cottonwood re-sprouting may have gone unnoticed. It was noted in November 2018 during long stem 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. There is no way to determine 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 during the 2018 monitoring. 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 is likely destroyed and gone. IDEALS-AGEISS recommended 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). Figure 3-7 shows the re-planting areas at the Country Club East site.

Country Club East replanting of cottonwoods, 13 January 2020.

Country Club East pole replanting, 13 January 2020.

Figure 3-7. Re-planting areas at Country Club East Restoration Site

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 to 100 trees were potentially affected by this twining vine. At the Sunland Park site, IDEALS-AGEISS overplanted the coyote willows by 145 plants. IDEALS-AGEISS recommended that the 273 documented dead Goodding's willows be replaced in the flycatcher habitat. Of the missing 473 Goodding's willows, IDEALS-AGEISS recommended replacing 80 additional Goodding's willows based on documented October mortality rate of 17 percent (17 percent of 473). It is likely that some of the willows under the funastrum are 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 recommended 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 (Table 3-10). Cottonwoods were replanted from 7-9 January 2020. Goodding's willows were re-planted on the site during 23-24 December 2019 and were concentrated in the middle to northern end of the site closer to the river than the levee road at Sunland Park (Figure 3-8).

Replanting efforts for Goodding's willow at the Sunland Park Restoration site, 7 January 2020.

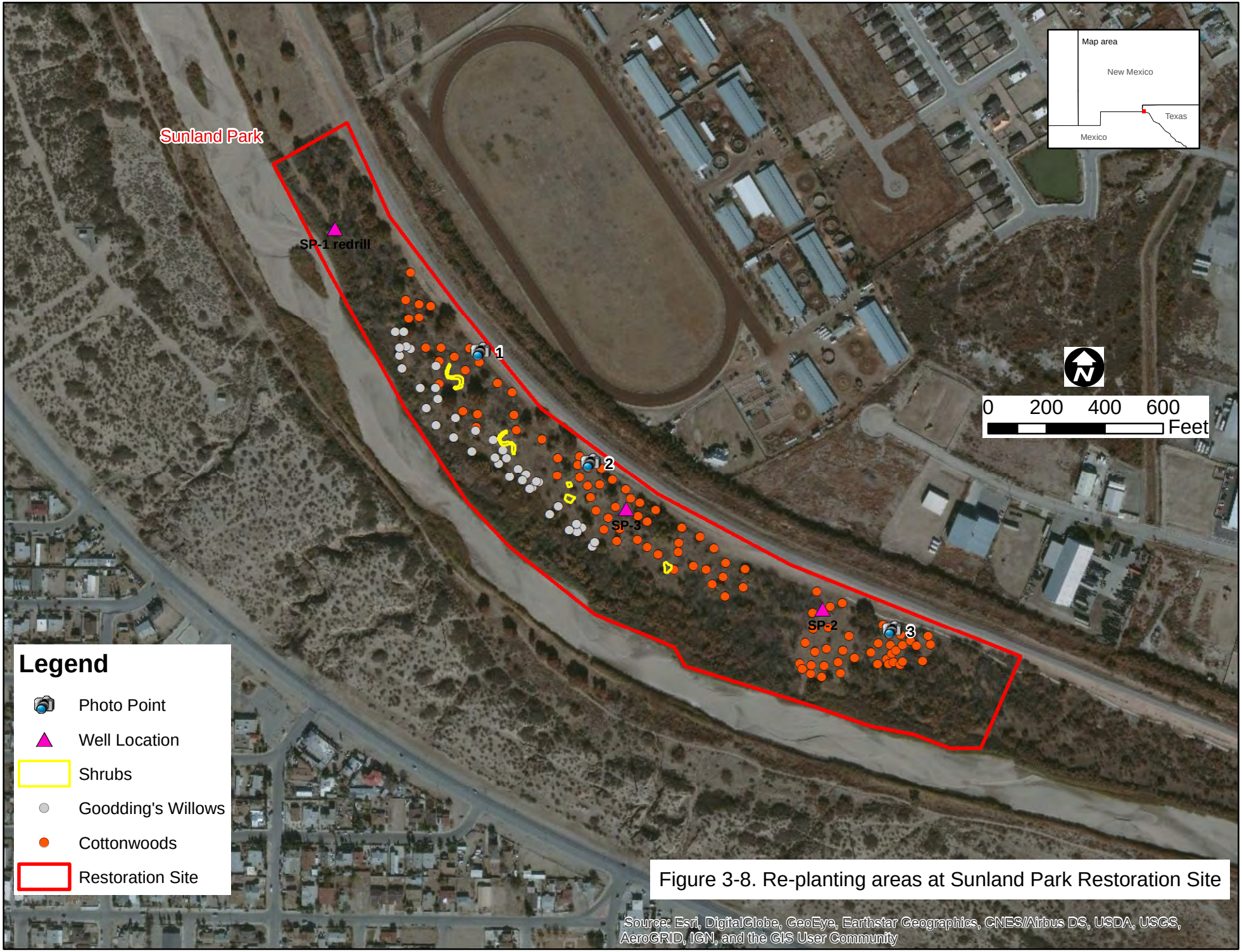

Figure 3-8. Re-planting areas at Sunland Park Restoration Site

Replanting efforts for Goodding's willow at the Sunland Park Restoration site, 7 January 2020.

To improve survivorship of the cottonwoods at Anapra Bridge, 43 cottonwoods were replanted (Table 3-10) at the site on 7 January 2020 (Figure 3-9). Shrub survivorship from the October 2019 monitoring effort was used to determine re-planting efforts for all sites.

Replanting for the long stem shrubs occurred from mid-December 2019 to early January 2020. Species diversity was increased during this planting effort. IDEALS-AGEISS recommended adding seep willow (*Baccharis salicifolia*) to the planted species. For the Country Club East and the Sunland Park sites a diversity of long stem shrubs were replanted (Table 3-11).

Table 3-11. Long Stem Shrub Replanting

Common Name	Scientific Name	Country Club East	Sunland Park
Three-lead sumac	*Rhus trilobata*	72	6
New Mexico olive	*Forestiera neomexicana*	150	9
Seep willow	*Baccharis salicifolia*	169	9
False indigo bush	*Amorpha fruticose*	160	9
Desert Willow	*Chilopsis linearis*	28	0
Arizona Ash	*Fraxinus velutina*	9	0

During the replanting efforts, soil amendments were added to each planting and poles and shrubs were watered immediately after planting. Additional cutting of saltcedar and herbicide treatment were conducted the week of 20 January 2020 for all sites.

Figure 3-9. Re-planting areas at Anapra Bridge Restoration Site

Ash tree replanting at Country Club East, 17 January 2020.

Shrub replanting at the Country Club East Restoration site, 12 December 2019.

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. Long stem shrub planting took place in late fall 2018 at all three sites. 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. Goodding's willow survival was highly variable not only throughout a site but between the three sites. Cottonwood survival was very low at all three sites. Irrigation peak releases occurred in Mid-March and June-July 2018 and an unusually late and minimal monsoon season did not provide much moisture during the fall period. Irrigation release for the 2019 season was even later, 31 May 2019, and likely contributed to additional stress on the pole plantings.

4.1 Country Club East

Targeted habitat for the 29-acre Country Club East restoration site includes creating alternating zones of closed canopy habitat and open woodland: 15 acres of riparian forest and 14 acres of 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. The denser forest would be adjacent to the river bank and the more open woodland areas would be closer to the levees. Except for discharges from uncontrolled tributaries, the flow regime of the Rio Grande is entirely regulated, and irrigation and flood control operations have reduced the magnitude of discharges within the floodway limiting the extent of overbank flooding (USACE 2009). The concept behind the excavation of the banks was that this change was expected to enable the water to flow through the site under some conditions (USACE 2009). In addition the creation of swales would allow water to remain on the site for longer periods. While the water at high flow during the study was at the river bank top, conditions were never present to allow water to flow into the restoration sites from the cut banks. The swales did act for rain water retention; however, salt also tended to be concentrated in the swales.

Cottonwoods planted in the Country Club East excavated swales (15 October 2018).

The revised planting plan allowed for a more continuous habitat with denser habitat along the river and a more open canopy away from the river. The density of cottonwoods recommended for the site was 30-80 per acre depending on the closed or open habitat. 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 to promote increase survival.

Survivorship of the Goodding's willows planted nearer to the levee toe was lower than those planted closer to the river. Shrub survival varied across species at the sites with four-wing salt bush having the greatest survival; however, overall shrub survival was the lowest at the Country Club East site compared the other two sites. Groundwater monitoring at the site noted very consistent depths to ground water throughout the year. The water, at least at the wells, never dropped below 8 feet. While the shrub species were planted on this site along the excavated swales that retained water, this area may have increased the distance to groundwater for these plants during the drier periods allowing the most drought tolerant species to survive the best. Plant species like the New Mexico olive and false indigo do better nearer to the hydric zone intermixed in the riparian zone where it is easier to reach the capillary fringe then further out in mesic conditions (USDA 2007). Replanting of the shrubs occurred from the river edge towards the middle of the site to provide for structure diversity.

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. The greatest impact to restoration efforts at this site is non-authorized recreational use. While the swales are retaining water as designed, these depressions are great attractants to ATV users at the expense of the cottonwoods planted there. Increased signage may benefit this site and the site, should be monitored for damage.

Swale at Country Club East with some salt accumulation, 16 October 2019.

4.2 Sunland Park

Although the coyote willow transplants are thriving at this site, the Goodding's willows and cottonwood trees did not survive as well. As with the Country Club East site, the poles planted closer to the river had better survival and rigor than those in the open areas closed to the levee toe. 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. Although originally recommended after the first year of monitoring (October 2018) that the Goodding's willows be replanted in the flycatcher area, after the October 2019 monitoring effort, it was determined that this area was developing well. Goodding's willows were re-planted along the northern edge of the flycatcher habitat and then further north towards the mesquite grove (Figure 3-8) to provide a more continuous riparian area from the river bank. Shrub survival at this site was good and was pretty high for all species expect three-leaf sumac. As this site matures the riparian woodland will develop with additional structure. No further plantings are recommended; however, the flycatcher habitat area should be monitored for any invasive species encroachment.

Flycatcher habitat area at Sunland Park in October 2019.

4.3 Anapra Bridge

Coyote willow re-sprouts at Anapra Bridge, 15 October 2019.

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. Stem rot was noted on cottonwoods which may be attributed to the constant exposure to water. 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 four-wing saltbush, pale wolfberry, and screwbean mesquite can tolerate appreciably higher soil salinity levels (Dreesen et al. 2001). Shrub survival for the three species was very high as these species are drought tolerant in addition to four-wing salt bush being salt tolerant.

Given the high salt content at Anapra Bridge and the root-rot that occurred in the cottonwoods, IDEALS-AGEISS recommends that in the future the USIBWC consider focusing on species such as four-wing saltbush, bachharis, or mesquite to provide the species diversity at the site if additional plantings are implemented.

5.0 MANAGEMENT RECOMMENDATIONS

Currently, the extent of riparian and wetland plant communities in the historic floodplain of the RGCP has been reduced; however, little information is available to accurately quantify the reduction. In addition to direct replacement by agricultural and urban development throughout the reach, the ground water elevation in the valley was lowered by the construction of drains in the 1920s (USACE 2009). Successful establishment of restoration sites requires availability of water especially during the first few growing seasons. IDEALS-AGEISS recommends the following management actions to ensure success of future restoration projects:

- For those restoration sites near or that abut 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.
- Continue to plant long stem shrubs in the fall to promote survivorship.
- 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.
- Although all the sites had monitoring wells, they do not necessarily capture the variability of groundwater depth across the sites. Others have suggested the use of several sets of nested piezometers located at different areas across the floodplain to help capture this variability before and during restoration to allow plantings in areas with good groundwater connection (GSRC 2018). IDEALS-AGEISS recommends at a minimum conducting several test drillings across the site to look at variability prior to planting.
- Consider planting cottonwoods at a lower density to reduce competition. Long-term survival of cottonwoods is generally associated with high flows during the periods of establishment. Young plants are especially susceptible to drought when the water table drops below their rooting zone (OSU 2002). Competition between new plantings created by dense plantings can decrease the survivorship of cottonwoods.
- Continue monitoring of invasive species at least annually and conduct treatments as needed. USIBWC may consider for future restoration contracts increasing the watering requirement especially if the irrigation release continues to be later in the year.
- For any further development or restoration efforts at the Anapra Bridge site, focus on salt tolerant species. Soils with high salinity are not viable areas for the restoration of cottonwood and willows (USACE 2009).

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APPENDIX A

Restoration Plan

Habitat Restoration Plan for Country Club East, Sunland Park, and Anapra Bridge Restoration Sites

Title:

Version: **FINAL**

Date: **January 2018**

Prepared for:

United States Section
International Boundary and Water Commission
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Contract Number: IBM15D0006

Task Order Number: IBM17T0012

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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
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

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 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.

The purpose of this restoration plan is to describe the current conditions and the restoration activities planned to improve a total of 68.8 acres of riparian habitat at three restoration sites along the RGCP in compliance with the 2009 USIBWC Record of Decision (ROD) on long-term management of the RGCP as well as the 2011 and 2017 biological assessments (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). The goal of the restoration activities is to reduce exotic vegetation, enhance river-floodplain hydrologic connectivity, restore endangered species habitat, and reestablish riparian habitat. Specifically habitat restoration efforts will be aimed at establishing riparian woodland and riparian forest at all three sites, as well as improving dense riparian shrub habitat for the endangered southwestern willow flycatcher (*Empidonax traillii extimus*; flycatcher) at Sunland Park.

2.0 THE RIO GRANDE CANALIZATION PROJECT RECORD OF DECISION BACKGROUND

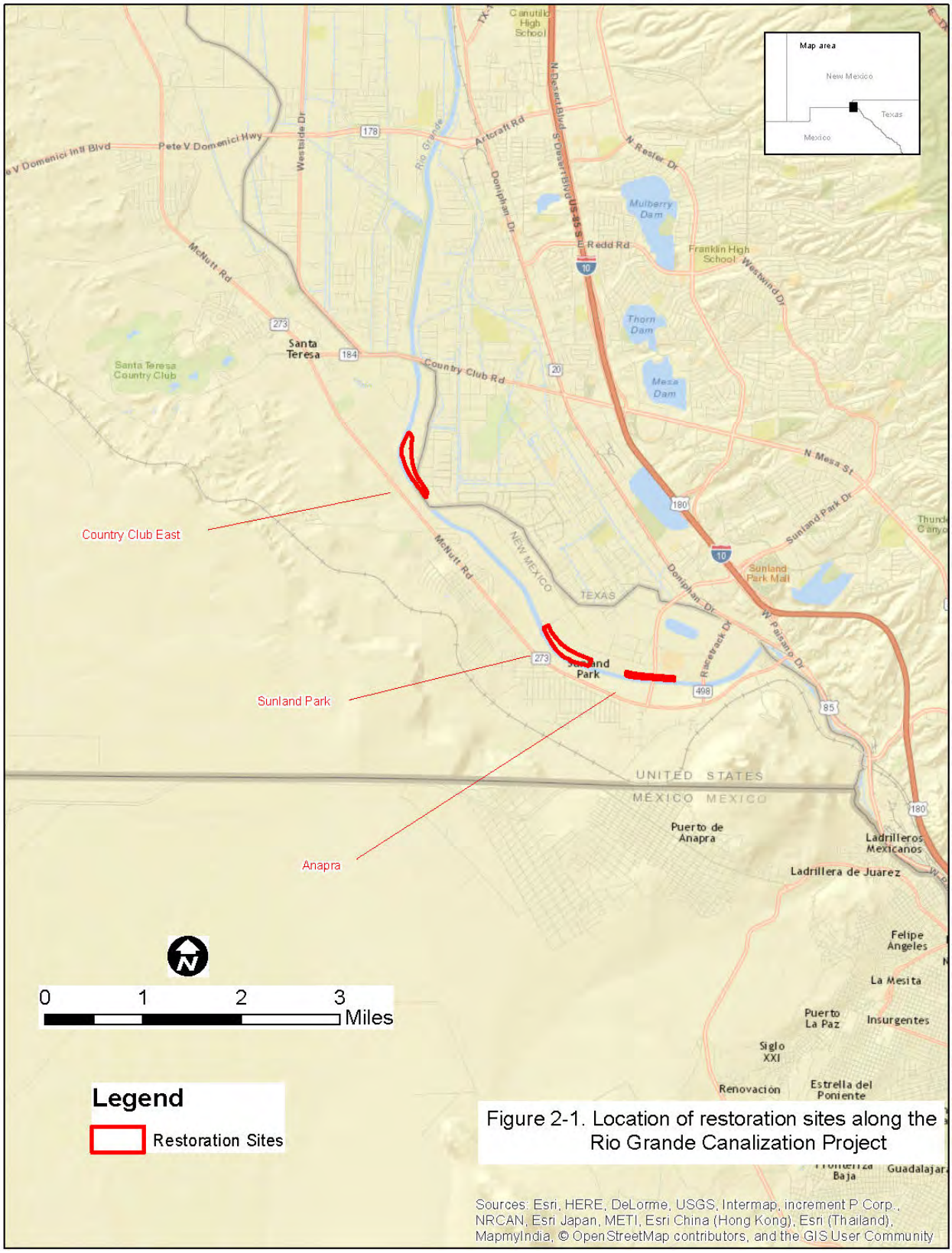
Riparian and wetland habitats support a variety of floral and faunal species and are important habitats found along the floodplains of the Rio Grande river system. These habitats support threatened and endangered species including the flycatcher. Changes and reductions to riparian systems including the 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 RGCP was constructed to facilitate water deliveries to the Rincon and Mesilla Valleys in New Mexico, El Paso Valley in Texas, and Juárez Valley in Mexico, and to provide flood control.

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. In 2004, the USIBWC completed the *Final Environmental Impact Statement (EIS) River Management Alternatives for the USIBWC Rio Grande Canalization Project* (Final EIS) for long-term management alternatives of the RGCP (USIBWC 2004). Alternatives addressed practices such as flood control, channel maintenance and erosion reduction, as well as environmental measures intended to enhance river floodplain hydrologic connectivity, and support restoration of native riparian and aquatic habitats along the RGCP. The USIBWC issued a ROD on June 4, 2009 for the Integrated Land Management Alternative (USIBWC 2009). The ROD committed the USIBWC to continuing the flood control and water delivery mission while implementing environmental enhancements. An important element of the ROD consisted of riparian habitat restoration at 30 sites along the RGCP, three of which are the subject of this restoration plan (Figure 2-1).

The RGCP Conceptual Restoration Plan (2009), which was developed in coordination with the U.S. Army Corps of Engineers (USACE 2009), was incorporated into the ROD. 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 EIS, the ROD 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 were documented in the 2011 *RGCP River Restoration Site Implementation Plans* (TRC 2011). The Conceptual Plan and Site Implementation Plans are guides for restoration site implementation, including the site improvement for flycatcher breeding habitat.

The 2011 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 will 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, and the new BO was issued August 2017.

Figure 2-1. Location of Restoration Sites along the Rio Grande Canalization Project



3.0 EXISTING CONDITIONS

Existing site conditions described below are based on a 2016 survey (IDEALS-AGEISS 2016) as well as surveys conducted during October 2017 (Appendix A).

3.1 Country Club East

The southern end of this site has moderate patches of screwbean mesquite (*Prosopis pubescens*) with a thin coyote willow (*Salix exigua*) component along the river bank and a few cottonwoods (*Populus deltoides*; Figures 3-1 and 3-2). 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 (*Tamarix ramosissima*; Table 3-1). Within the channel, there are some narrow islands in this stretch dominated by coyote willow and common reed (*Phragmites*). Faunal species observed during the 2017 site visit are listed in Table 3-2. Ground cover vegetation is 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 restoration efforts. Mowing has been discontinued at Country Club East since 2011. Current site conditions and saltcedar distribution are noted in Figure 3-3. Country Club East has minor infestation of mistletoe (4 to 6 clumps) in two trees.

The soils on the Country Club East site are Agua variant soils which are fine sandy loam which is deep and somewhat poorly drained and moderately wet. Clay comprises approximately 4 to 20 percent of the soils type, although some higher clay concentrations (31 percent) were documented in some of the sample horizons (TRC 2010). The 2017 site visit documented salty topsoil towards the southern end of the site. Permeability in this soil type is rapid and the soils tend to have a low-holding capacity. The groundwater levels are dependent on the amount of water released during irrigation season as well as rainfall. Groundwater levels vary considerably at the site, ranging from 3.4 foot to 8.5 feet below the surface.

Figure 3-1. Pre-implementation Photo of Country Club East from Photo Point 1

Figure 3-2. Pre-implementation Photo of Country Club East from Photo Point 3

Figure 3-3. Existing Conditions at the Country Club East Restoration Site

Table 3-1. Plants Observed at Country Club East Restoration Site

Scientific Name	Common Name	Native/Non-native Species
Amaranthus spp.	pigweed	native
Distichlis spicata	saltgrass	native
Kochia scoparia	kochia	non-native
Populus deltoids	cottonwood	native
Phragmites australis	common reed	may be either
Prosopis pubescens	screwbean mesquite	native
Salix exigua	coyote willow	native
Salsola tragus	Russian thistle	non-native
Sporobolus airoides	alkali sacaton	native
Tamarix ramosissima	saltcedar	non-native
Ulmus pumila	Siberian elm	non-native

Table 3-2. Wildlife Species Observed at Country Club East Restoration Site, October 2017

Scientific Name	Common Name
Aphelocoma woodhouseii	Woodhouse's Scrub Jay
Falco sparverius	American Kestrel
Haemorhous mexicanus	House Finch
Passer domesticus	House Sparrow
Selasphorus rufus	Rufus Hummingbird
Zonotrichia leucophrys	White-crowned Sparrow

3.2 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, willows, and mature saltcedar. This site has a thin row of coyote willow (in moderate abundance) along the river bank with patchy, diverse mixed vegetation away from the river. The diverse mixed vegetation habitat contains large screwbean mesquite and saltcedar with larger cottonwood growing amongst them towards the southern end of the site (Figure 3-4). The cottonwood becomes more concentrated in an open gallery toward the north end of the site; many of which are heavily infested with mistletoe. Of the 39 cottonwoods surveyed, mistletoe infestation ranged from 0-120 clumps with a mean per tree of 33. Ground cover is primarily fescue grass and silverleaf nightshade (*Solanum elaeagnifolium*). Russian olives (*Eleagnus angustifolia*) are sporadic through the site along the river bank along with Siberian elm (Figure 3-5). Russian thistle (*Salsola tragus*) occurs in moderate abundance in the open areas. Saltcedar in this section is currently suffering from *Diorhabda*. This site currently has good potential for flycatcher habitat. Figure 3-6 shows the distribution of native species (mixed and protected areas) and saltcedar on the site. Vegetation and fauna detected during the habitat assessment are provided in Tables 3-3 and 3-4.

Figure 3-4. Pre-implementation Photo of Sunland Park at Photo Point 2

Figure 3-5. Pre-implementation Photo of Sunland Park at Photo Point 3

Figure 3-6. Existing Conditions at the Sunland Park Restoration Site

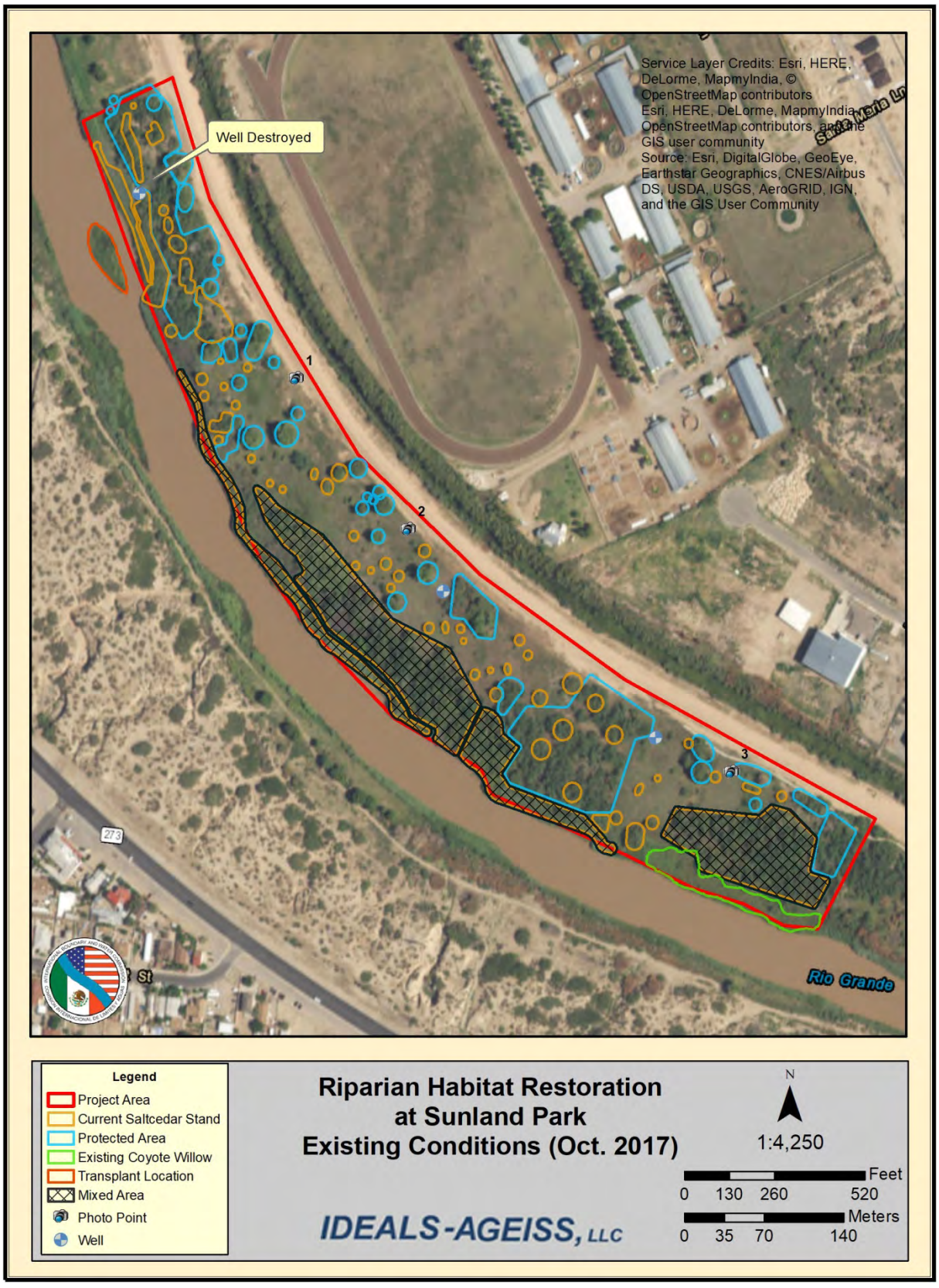


Table 3-3. Plants Observed at Sunland Park Restoration Site

Scientific Name	Common Name	Native/Non-native Species
Amaranthus hybridus	smooth pigweed	native
Atriplex canascens	four-wing saltbush	native
Distichlis spicata	saltgrass	native
Eleagnus angustifolia	Russian olive	non-native
Festuca	fescue grass	may be either
Kochia scoparia	kochia	non-native
Populus deltoides	cottonwood	native
Phragmites australis	common reed	may be either
Prosopis pubescens	screwbean mesquite	native
Salix exigua	coyote willow	native
Salsola tragus	Russian thistle	non-native
Solanum elaeagnifolium	Silverleaf nightshade	native
Tamarix ramosissima	saltcedar	non-native
Ulmus pumila	Siberian elm	non-native

Table 3-4. Wildlife Species Observed at Sunland Park Restoration Site, October 2017

Scientific Name	Common Name
Colaptes auratus	Northern Flicker
Danaus gilippus	Queen butterfly
Junco hyemalis	Dark-eyed Junco
Melospiza lincolnii	Lincoln Sparrow
Mimus polyglottos	Northern Mockingbird
Pipilo chlorurus	Green-tailed Towhee
Pooecetes gramineus	Vesper Sparrow
Sayornis saya	Say's Phoebe
Setophaga coronata	Yellow-rumped Warbler
Sitta pygmaea	Pygmy Nuthatch
Spinus psaltria	Lesser Goldfinch
Vireo cassinii	Cassin's Vireo
Zonotrichia leucophrys	White-crowned Sparrow

The soils on the Sunland Park site are Agua wet variant which are fine sandy loam which is deep and somewhat poorly drained and moderately wet. Clay comprises approximately 4 to 24 percent of the soils type, although some higher clay concentrations (42 percent) were documented in some of the sample horizons (TRC 2010). Permeability in this soil type is rapid and the soils tend to have a low-holding capacity. Salinity on this site is low (TRC 2010). Groundwater levels vary considerably at this site, ranging from 1.9 to 11.1 feet below the surface at Sunland Park.

3.3 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. The site has good potential structure. A thin strip of mixed vegetation comprised of coyote willow, seep willow, screwbean mesquite, and saltcedar, runs along the bank of the river with a few Siberian elm and Russian olive (Figure 3-7). Further away from the river a young stand of saltcedar and screwbean mesquite is growing in what appears to be a depression. Saltcedar in this area is showing slight stress from *Diorhabda* and is easily accessible for removal.

A moderate abundance of Russian thistle occurs away from the site and native grass (*Distichlis spp.*) is found in the open areas (Figure 3-8). This site has the potential to be a good candidate for the transplant of willows from island removal (see Section 5.0) once the saltcedars are removed (Figure 3-9). Vegetation and fauna detected at this site are listed in Tables 3-5 and 3-6.

The soils at the Anapra site are also Agua wet variant. Clay concentration in the soil is higher at this site than the other restoration sites varying between 3 to 35 percent (TRC 2010). Salinity on this site varies with one area containing surface salt which may potentially affect plant survivorship. The water table is high at this site with groundwater levels ranging from 1.1 to 5.1 feet below the surface.

Figure 3-7. Pre-implementation Photo of Anapra Bridge Site at Photo Point 1

Figure 3-8. Pre-implementation Photo of Anapra Bridge Site at Photo Point 3

Figure 3-9. Existing Conditions at the Anapra Bridge Restoration Site

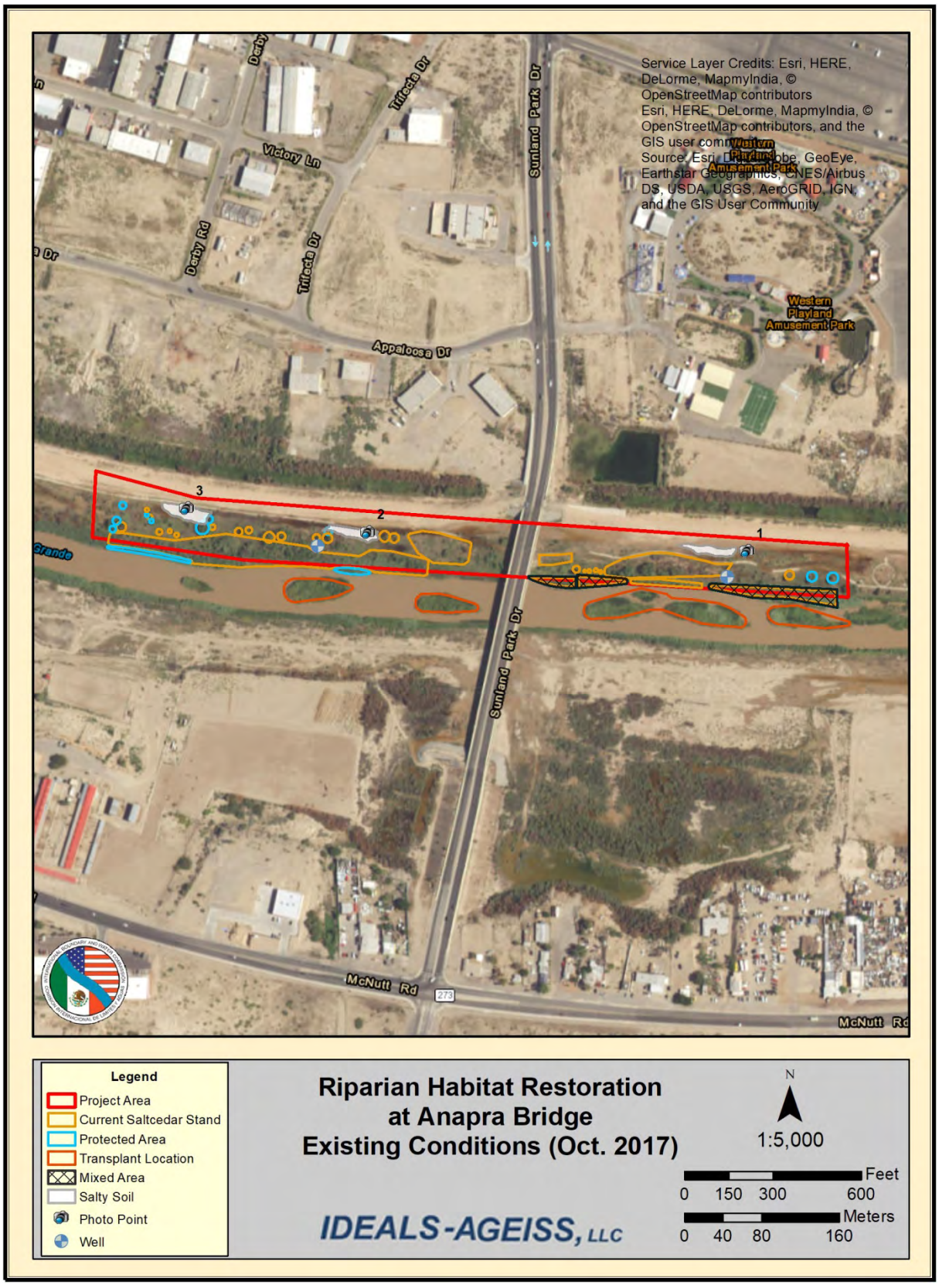


Table 3-5. Plants Observed at Anapra Bridge Restoration Site

Scientific Name	Common Name	Native/Non-native Species
Allenrolfea occidentalis	iodine bush	native
Amaranthus hybridus	smooth pigweed	native
Atriplex canascens	four-wing saltbush	native
Distichlis spicata and other *spp.*	saltgrass	native
Eleagnus angustifolia	Russian olive	non-native
Kochia scoparia	kochia	non-native
Populus deltoides	cottonwood	native
Phragmites australis	common reed	may be either
Prosopis pubescens	screwbean mesquite	native
Salix exigua	coyote willow	native
Salsola tragus	Russian thistle	non-native
Suaeda nigra	pickleweed	native
Tamarix ramosissima	saltcedar	non-native
Ulmus pumila	Siberian elm	non-native

Table 3-6. Wildlife Species Observed at Anapra Bridge Restoration Site, October 2017

Scientific Name	Common Name
Accipiter cooperii	Cooper's Hawk
Agelaius phoeniceus	Red-winged Blackbird
Anas platyrhynchos	Mallard Duck
Auriparus flaviceps	Verdin
Charadrius vociferus	Killdeer
Cistothorus palustris	Marsh Wren
Colaptes auratus	Northern Flicker
Columba livia	Rock Pigeon
Danaus gilippus	Queen butterfly
Danaus plexippus	Monarch butterfly
Haemorhous mexicanus	House Finch
Mimus polyglottos	Northern Mockingbird
Passer domesticus	House Sparrow
Petrochelidon pyrrhonota	Cliff Swallow
Sayornis nigricans	Black Phoebe
Sayornis saya	Say's Phoebe
Tyrannus verticalis	Western Kingbird
Toxostoma curvirostre	Curved-billed Thrasher
Vermivora celata	Orange-crowned Warbler
Setophaga coronata	Yellow-rumped Warbler
Xanthocephalus xanthocephalus	Yellow-headed Blackbird
Zenaida asiatica	White-winged Dove
Zonotrichia leucophrys	White-crowned Sparrow

4.0 DESIGN AND IMPLEMENTATION ACTIVITIES

The design plans for each site are based the on 2009 Conceptual Plans developed by the USACE and the 2011 Site Implementation Plans, in addition to the changes requested by USIBWC in the Statement of Work. The restoration sites focus on the creation of different habitats: open riparian woodland, dense riparian shrub, and riparian woodland or forest. Specific tree and shrub plantings are identified in Table 4.1. The conceptual layout of the plantings is further defined for each site in the sections below.

Table 4-1. Planting Regime for the Riparian Woodland Sites

Planting	Country Club East	Sunland Park	Anapra
Grass and forb seeding (acres)	14	0	0
Coyote willow poles[1]	3,480 (4,628)	3,440 (4,575)	330 (439)
Goodding's willow poles[1]	440 (585)	2,350 (3,125)	55 (73)
Cottonwood poles[1]	1,620 (2,154)	400 (532)	110 (146)
Longstem riparian shrubs	2,320	1,152	330
Desert willow and/or Arizona ash	10	10	10

[1] The plant numbers include an increase in count (number in parenthesis) to account for planting two poles in at least 1/3 of the augured holes.

4.1 Site Preparation and Planting Methodology

4.1.1 Site Preparation

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

To protect native vegetation identified at the site, vegetation will be flagged prior to site preparation. Exotic species will then be removed in order to increase the current native habitat. Using a backhoe or excavator with a bucket and grappler (clasping thumb) attachment to extract large root masses below the crown, individual saltcedars along the existing stream bank and throughout the identified restoration site within the floodplain will be extracted. Other mechanical equipment such as skid steers or other hand held mechanical devices may also be used if certain field conditions or site constraints are discovered in the field. Figures 3-1 to 3-3 show where these saltcedars are located currently within the restoration sites. Other low growing weeds (e.g., Russian thistle) will be grubbed using a compact skid steer with brush hog attachment.

New invasive species growth identified during the monitoring phase and outside of the 30-foot buffer of the river channel or seasonal pond will be treated with chemical application of herbicides. Identified species will be treated in areas where mechanical methods are inaccessible or not appropriate. A Commercial Applicator, licensed by the New Mexico Department of Agriculture, will determine the application concentrations and rates of the herbicide. Garlon® 4 is the anticipated herbicide for the permanent removal of invasive species, such as saltcedar. Application of the herbicide will depend on the proximity of native species to the non-native species. Localized basal placement of the herbicide (versus foliar) can be used to prevent drift and protect surrounding native plants. Habitat® may also be used if

needed in the buffer area. Herbicides will not be used on the levees. Vegetation will be treated outside the migratory bird nesting season (March 1 to August 31).

4.1.2 Planting Methodology

For all sites, cottonwood nursey stock and Gooddings willows for planting will be purchased locally that are 12 to 16 feet long and approximately 2 to 3 inches in diameter. An auger will be used to plant cuttings after the cuttings have soaked for 2 weeks. Planting will be conducted in late winter/early spring months (February through March). Coyote willow whips are typically cut 5 to 8 feet long but will need to be cut longer to reach the water table; they can be cut close to the ground. The ideal diameter of a cut whip is less than 1 inch. Poles and cuttings will be soaked in large tubs with water brought from offsite prior to planting. Live stakes will be cut at an angle along the bottom with bud ends facing upwards when planted (see Appendix B). In addition to poles, some coyote willow stock will come from nearby islands, as discussed in Section 5.

Longstem riparian plants purchased will include: three leaf sumac (*Rhus trilobata*), New Mexico olive (*Forestiera neomexicana*), false indigo bush (*Amorpha fruticosa*), limited four-wing saltbush (*Atriplex canescens*), and wolfberry (*Lycium spp.*). Proper installation will be to place them into the capillary fringe at the time of planting for root expansion. The planting holes will be dug 2.0 times wider than the container size of the plants. The hole will be dug 1.5 times the depth of the root ball to ensure the root collar is level with the ground and not covered by soil. If planted too high, the exposed root collar will dry out the specimen; if too low, the vegetative structure of the specimen will be compromised (see Appendix B). The depth to the capillary fringe will vary; however, data from groundwater wells will provide an estimate of placement into this capillary fringe. Placing mulch around each longstem shrub will also reduce soil moisture loss.

A site-specific planting field sheet will be developed and will include date and location of plant groups, overall health of plant groups, as well as field notes with regard to the specific site and weather conditions. Between mid-March and mid-April, a water tender will be used to apply required amounts of water (5 gallons per tree and 2 gallons per bush) to the plantings within each of the restoration sites. Longstem plantings will be watered two times between April and July 15. Additional watering periods may occur should the need arise as determined during the site monitoring. In order to establish sufficient growth over the first growing season at the open riparian woodland sites, watering tubes for shrub plantings will be used. A typical watering tube is 1- to 3-inch diameter PVC pipe with perforation to ensure the displacement of moisture at root ball depth in order to promote growth and root expansion. The water tube typically protrudes about 6 inches above the soil surface when placed with the bottom end at depth near the root ball to ensure water getting directly to the root ball. For especially the longstem shrubs, landscape grade mulch (or mulch made from the vegetation previously removed) will be incorporated in/around the planting holes to increase water retention and provide supportive nutrients to the transplants to increase survival. To test for survivability based on planting time, a portion of the longstem shrubs will be planted in the spring and a portion in the fall of 2018. Live stakes will be provided along area that experiencing any heavy erosion along the slope of the embankment. Existing coyote willow whips not used during transplanting procedures will be used as staking the embankment in areas seeing extensive erosion. The staking procedure may be provided in areas where ground cover is sparse.

Ground water conditions throughout Country Club East, Sunland Park, and Anapra restoration sites range from 3 feet to 6.5 feet below ground surface as of early November 2017. Ground water depths are expected to increase as the season progresses through the winter months into early spring. Table 4-2 presents information tabulating current ground water levels at the Anapra, Sunland Park and Country Club East restoration sites.

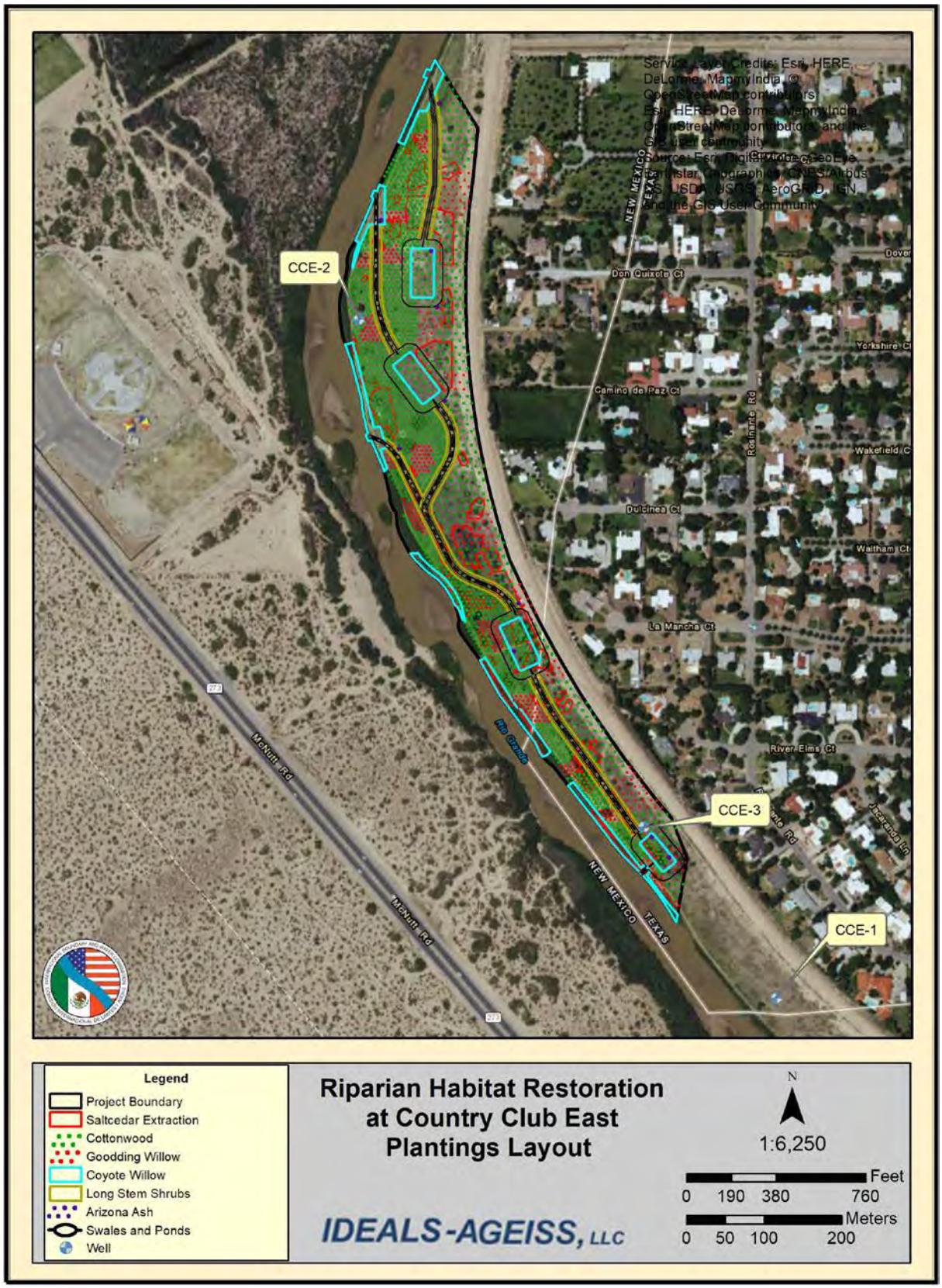
Table 4-2. Pre-implementation Groundwater Monitoring

Restoration Site	Well No.	Date/ Time of Monitoring	Depth to Water from Surface (feet)
Anapra	AB-MW-1	11/10/17 10:30	4.09
	AB-MW-2	11/10/17 10:50	5.15
Sunland Park	SP-MW-1	11/10/17 11:50	Destroyed
	SP-MW-2	11/10/17 11:20	5.42
	SP-MW-3	11/10/17 11:45	3.08
Country Club East	CCE-MW-1 (TX)	12/07/17 13:30	6.55
	CCE-MW-2	11/10/17 12:50	4.38
	CCE-MW-3	11/10/17 12:30	Obstructed well

4.2 Country Club East

Targeted habitat for the 29-acre Country Club East restoration site includes creating alternating zones of closed canopy habitat and open woodland: 15 acres of riparian forest and 14 acres of woodland. Planting densities at this site will vary based on the desired habitat. 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. The denser forest will be adjacent to the river bank and the more open woodland areas will be closer to the levees. For the closed canopy forest, coyote willow whips will be planted at approximately 120 per acre, Goodding's willow whips at 20 per acre, longstem shrubs at 80 per acre, and cottonwood poles at 80 per acre. For the open woodland areas, coyote willow whips will be planted at approximately 120 per acre, Goodding's willow whips at 10 per acre, longstem shrubs at 80 per acre, and cottonwood poles at 30 per acre. Grass seeding will occur on 14 acres in the open woodland habitat. Native grass seed using a combination of alkali sacaton (*Sporobolus airoides*), sand dropseed (*S. cryptandrus*), and inland saltgrass (*Distichlis spicata var. spicata*) will be spread on the 14 acres of open woodland habitat. Per the Natural Resources Conservation Service guidelines for restoration grasses in southern New Mexico, successful grass seeding in the arid southwest requires at least three to four consecutive rainstorms separated by 4 to 7 days (NRCS 2007). This cycle is typical of the monsoon that begins in July. It is recommended that seeding of the open woodland habitat occur during the monsoon season. Grasses will be hand broadcasted and a wood-fiber hydro mulch or native grass hay (free of weed seeds) placed over the seeded area to assist in water retention (NRCS undated). The planting layout for the site is shown in Figure 4-1.

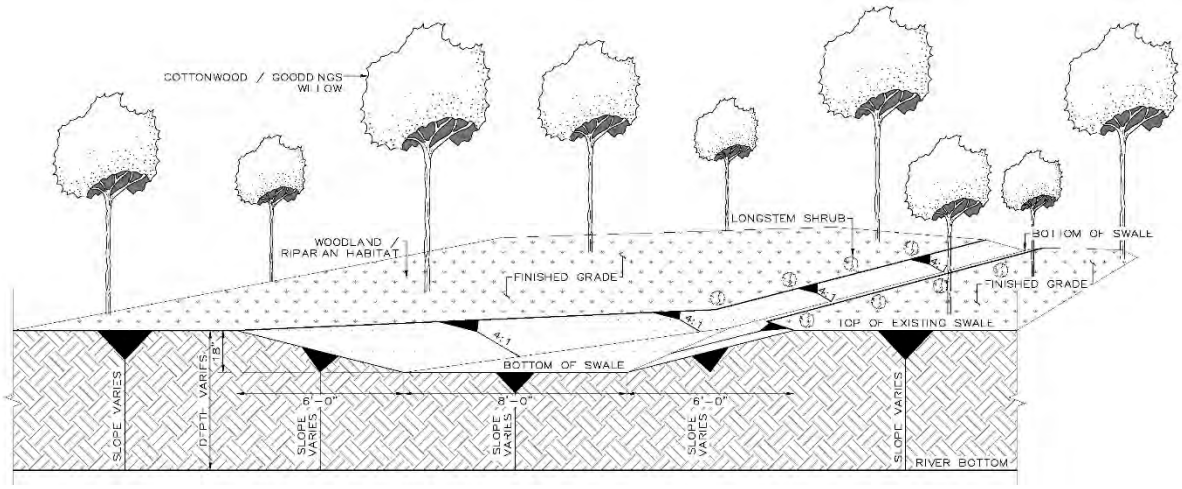
Figure 4-1. Country Club East Planting Layout



4.2.1 Excavation Work

Country Club East will have two types of excavation work: channel cuts and floodplain excavation of swales. The 2009 Conceptual Restoration Plan and the 2011 Site Implementation Plans recommended that the bank at Country Club East have two channel cuts to enable water to flow through the site under high flows for floodplain re-connection. This plan proposes that the bank will be lowered in four places; two additional cuts are recommended from the previously requested two cuts, as they would prove beneficial due to the alignment of river, location of the existing islands and nearby river bank vegetation. These conditions appear to influence the direction of flow as the river migrates in a more southern direction (see Appendix B). The bank cuts will be 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 immediate approach to the swale will transition from a trapezoidal section with a defined bottom width of 8 feet at the river bank to a V-Shape configuration within 10 feet of traveled distance. Refer to Figure 4-2 for a representation of the inlet bank cuts located at Country Club East.

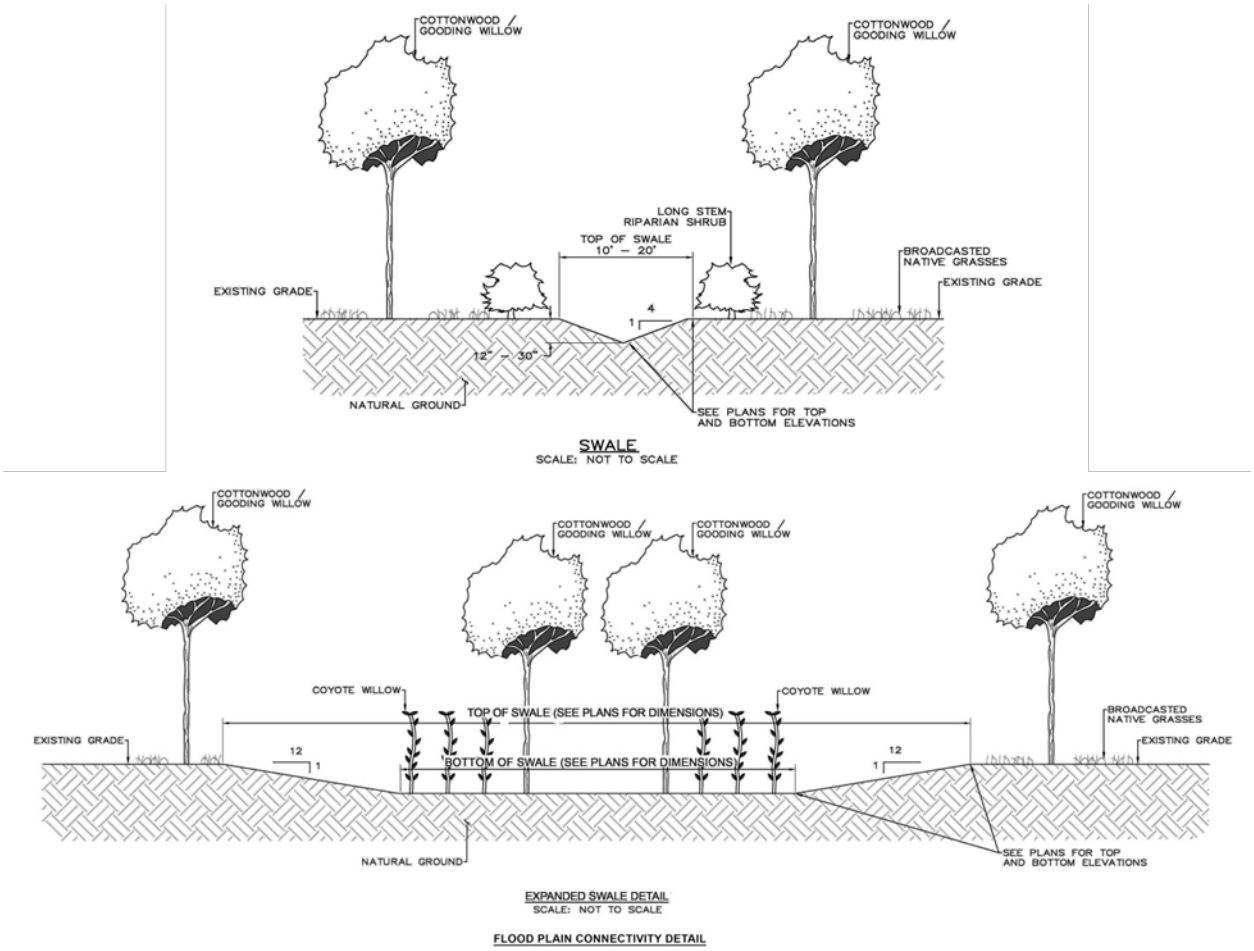
Figure 4-2. Representation of the Inlet Bank Cuts



The three upstream bank cuts located along the embankment of the river, as shown in Appendix B, 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 will transition to a V-shape swale that will meander throughout the restoration site providing additional moisture and improving plant growth. Located at the south end of Country Club East restoration site will be an additional bank cut that is intended to release low flow runoff conditions back to the stream channel of the river. Based on the current cross sections of the river at County Club East the bottom of the stream channel varies from 150-250 feet, respectively. Flows that reach 3,000 cfs will vary in depth from 2.7 to 3.7 feet at a reestablished design depth of 4 feet. This is expected, considering ongoing dredging activities of the stream channel. With a stream channel depth of approximately 4 feet, the bank cut of 18 inches will allow flows to encroach as the stream channel depth reaches 2 feet 6 inches or higher. Bank cuts at Country Club East were reviewed by the USACE in 2012; USACE concurred with USIBWC's determination that the work is excavation-only and does not require USACE authorization (SPA-2012-00529-LCO).

The drainage swales at Country Club East will be approximately 18 inches deep at the embankment of the Rio Grande and reach depths up to 2 feet at the water retention storage areas. The swales will be constructed in a V-shape configuration utilizing 4H:1V side slopes which tie back to existing grade (Figure 4-3). The top width of the swales is expected to range from 12 feet to 20 feet. The drainage swales will be revegetated with native salt grass in order to prevent water erosion (additional erosion control measures are discussed in Section 7.0) and riling of the embankment.

Figure 4-3. Typical Swale and Expanded Swale Cross Section



The expanded swale areas will be constructed to various depths not to exceed 2 feet in order to prevent the long-term exposure of ground water during the shallow ground water periods. Slopes of the retention areas will be constructed at 12:1 resulting in slopes reaching existing grade in approximately 20 to 30 feet. These areas will also be revegetated with native salt grass, Goodding's willow poles, cottonwood poles, and longstem riparian shrubs (three leaf sumac, New Mexico olive, false indigo bush). Coyote willows will be planted along gaps immediately adjacent to the river bank. Coyote willows will also be located where water retention occurs, and where bank lowering occurs to allow water to enter or leave the drainage swales. These are opportunistic areas to create larger patches of coyote willow. The intent of the water retention storage areas is to primarily accelerate growth of the new material along the embankment edge to provide maturity as quickly as possible. The volume of soil expected to be displaced as part of the

Country Club East restoration site is 4,000 cubic yards for the drainage swales and 9,000 cubic yards for the water retentions storage areas yielding a composite volume of 13,000 cubic yards.

4.3 Sunland Park

The 28.8-acre Sunland Park restoration site will be targeted for open riparian woodland and approximately 5 acres of dense riparian shrub habitat for flycatchers. Goodding's willow whips at 10 per acre, longstem shrubs at 80 per acre, and cottonwood poles at 40 per acre will be planted throughout most of the site for the riparian woodland habitat. The planting layout for this restoration site is shown in Figure 4-3. The southern end of the site, which already contains some riparian habitat, will be further augmented with coyote and Goodding's willows to provide for the dense riparian habitat preferred by flycatchers (Figure 4-4). Coyote willow whips will be planted at a higher density in this confined area. The site will be expanded slightly from the river with both willow species. Longstem shrubs will be planted within willow and cottonwood areas to provide structural diversity. Cottonwoods will be planted in clusters while avoiding the native vegetation and along portions of the trail to provide shade. Planting designs will take into account a 10-foot buffer between the vegetation and the trail to reduce encroachment of vegetation on the trail.

4.3.1 Mistletoe Assessment and Remediation

Cottonwoods at all sites were assessed for mistletoe infestation during the pre-implementation monitoring period and the number of clumps for each individual tree noted. Figure 4-5 shows the number of mistletoe clumps per cottonwood at the Sunland Park restoration site where the heaviest infestation was noted. Thirty-nine cottonwoods were surveyed at Sunland Park and 82 percent of these trees were infested. Mistletoe tends to spread faster in multi-storied and monoculture stands (USDA 2010). Seeds may also fall from mistletoe in the upper parts of the trees creating new infestations on lower branches. Birds feed off of the berries, digest the pulp, and excrete the seeds, which can then adhere to the branches of living trees. When the seed germinates, it grows into tree tissues. It may take up to 2 years for the plant to bloom and produce viable seed. Based on discussions with arborists and New Mexico State University Extension, there is a good chance that mistletoe, once established on a host tree that is dominant to the area, tends to remain attracted to that specific tree species. With Sunland Park receiving a large number of new Goodding's willow (as opposed to cottonwood) there may be some control by utilizing a larger number of Goodding's willows and providing a buffer as field conditions dictate. New cottonwoods should be planted a minimum of 100 feet away from infested cottonwoods.

Figure 4-4. Sunland Park Planting Layout

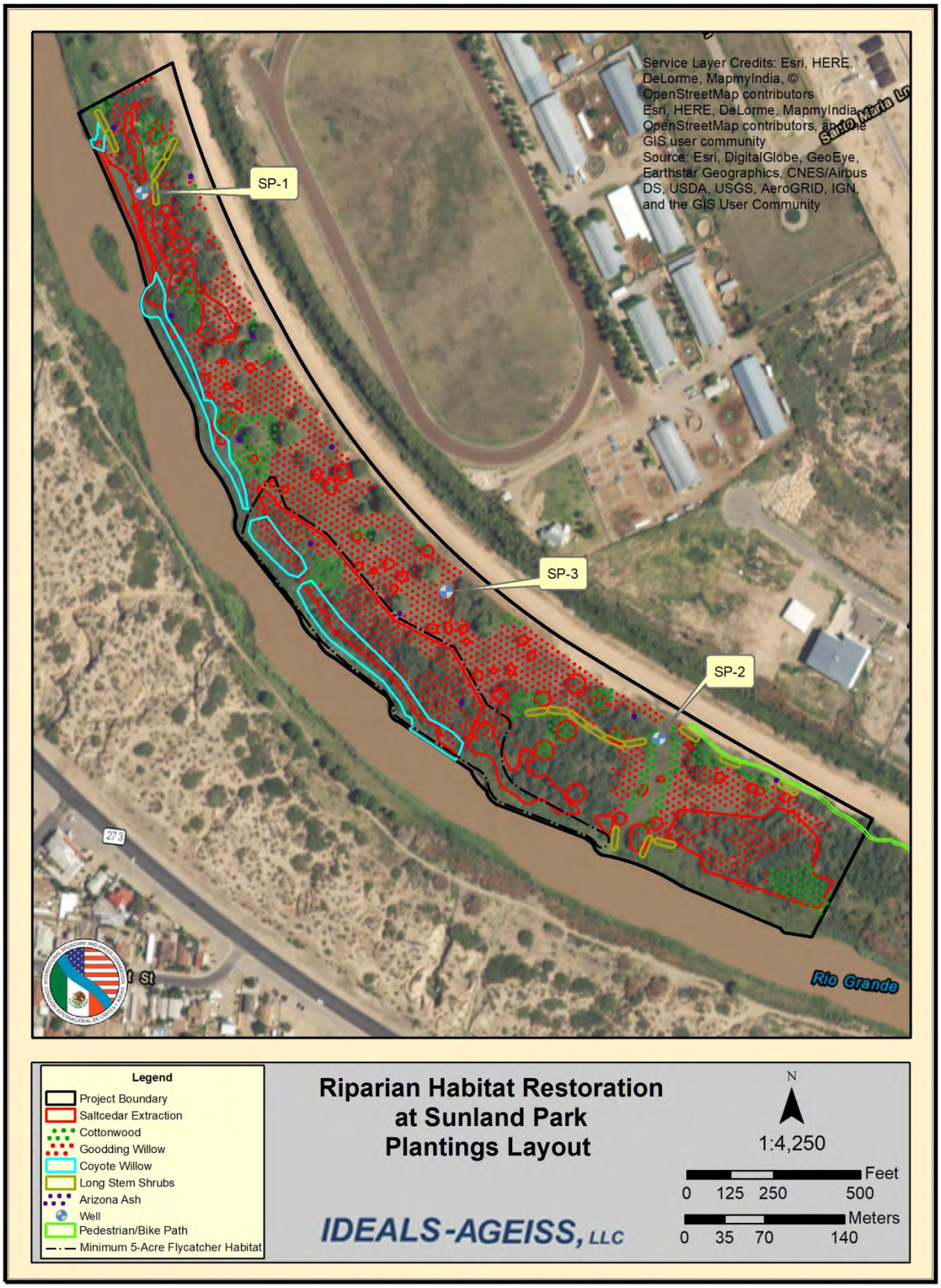
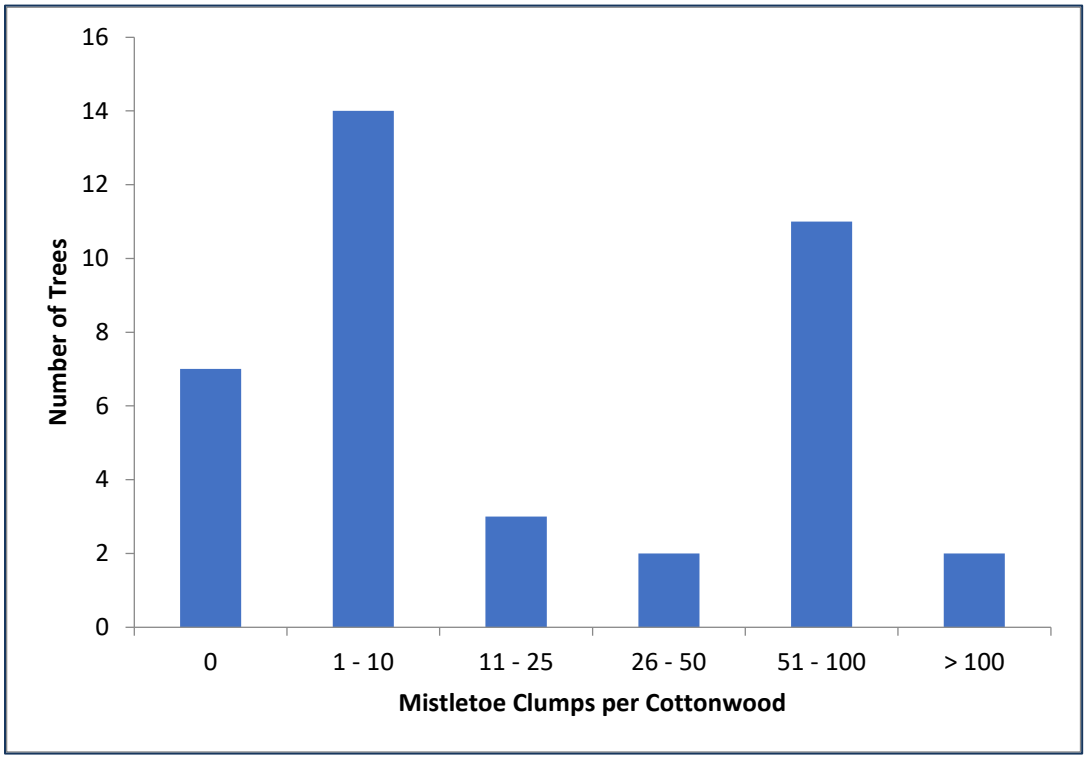


Figure 4-5. Histogram of Mistletoe Clumps per Cottonwood at the Sunland Park Restoration Site

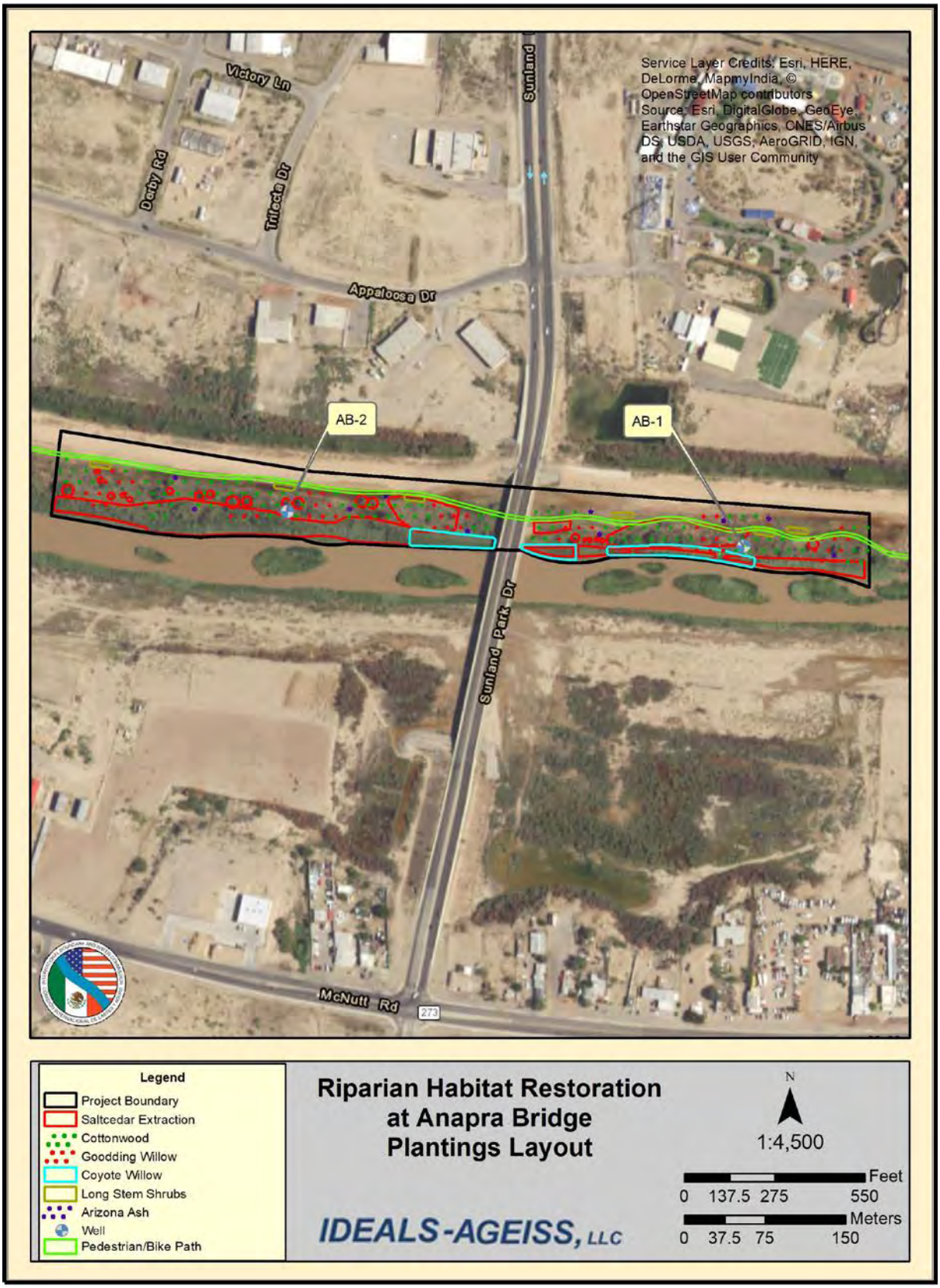


Mistletoe provides important components for wildlife habitat and some recommend that removing the infestation should be avoided unless other defects in the tree are significant (Halloin 2003). The most effective way to control mistletoe and prevent its spread is to prune infected branches, if possible, as soon as the parasite appears. Thinning-type pruning cuts to remove infected branches at their point of origin or back to large lateral branches will be used. Infected branches will be cut at least 1 foot below the point of mistletoe attachment in order to completely remove embedded haustoria. Cuttings will occur in the winter when seeds are not being produced. Done properly, limb removal for mistletoe control can maintain or even improve tree structure. The field crew will avoid severe heading (topping) if possible; such pruning weakens a tree's structure, and destroys its natural form. Pruning to control the mistletoe is recommended for the trees with less than 25 clumps per individual. Removing infestations greater than that at this point may not be beneficial and removal of the severely infested trees would greatly alter the site characteristics. Further monitoring and evaluation of the tree structure should be performed yearly in order to confirm adverse effects and or disease resulting from other parasites, bacteria, or migrating insects. Mistletoes infecting a major branch or the trunk where it cannot be pruned may be controlled by cutting off the mistletoe flush with the limb or trunk. To increase effectiveness of the pruning, the area can be wrapped with a few layers of wide, black polyethylene to exclude light (Perry and Elmore 2006).

4.4 Anapra Bridge

Target habitat for the 11-acre Anapra site will consist of open riparian woodland. For this site, coyote willow whips will be planted at approximately 30 per acre, Goodding's willow whips at 5 per acre, longstem shrubs at 30 per acre, and cottonwood poles at 10 per acre. Figure 4-6 shows the proposed planting layout for the Anapra site. Cottonwoods would be spaced throughout this linear site to create the open woodland. In addition, cottonwoods will be spaced along the trail to provide shade. Coyote willows will be clumped near the river bank for riparian habitat establishment and cottonwoods will be spaced throughout the site in patches. Coyote willow clumps obtained from the island removal area will replace the excavated saltcedar cavities located along the river bank. These transplanted coyote willow clumps will be intermixed with remaining native vegetation and open woodland habitat. Longstem shrubs will be placed in six areas along the trail section with a 10-foot buffer between the trail and the vegetation.

Figure 4-6. Anapra Bridge Planting Layout



5.0 ISLAND REMOVAL AND HABITAT SALVAGE EFFORTS

Habitat salvage efforts include relocating coyote willows found within the river bed at all three sites. At the Anapra restoration site, there is approximately 1.85 acres of remote island habitat which contributes to the growth of healthy coyote willows. As part of island removal, coyote willows found and extracted from this location will be relocated along the embankment and recreational area of the Anapra site until the minimum number of coyote willows has been planted and the expected species habitat has been achieved. Willow salvaging from other islands located throughout Sunland Park and Country Club East restoration sites that are slated for removal will be used to supplement those restoration sites. Due to the overall density of coyote willows, a front-end loader will be used to excavate and extract large sections of coyote willows that will be transplanted in areas where saltcedar has been removed. This approach is considered most feasible in that large quantities can be moved at one time and the survival rate is expected to remain high as opposed to transplanting one pole or few at a time. Any excess coyote willows extracted as part of the island removal process at Anapra will be transported to Sunland Park and Country Club East sites for transplanting. Due to the location of remote islands and coyote willows situated within 300 feet of the restoration sites at Anapra Bridge, Sunland Park and Country Club East, transplanting activities among each of these locations is beneficial and ideal in meeting the need of riparian habitat immediately adjacent to the river.

6.0 DEBRIS MANAGEMENT AND SOIL SPOILS MANAGEMENT

A chipper/grinder will be used to process and masticate extracted vegetation to a size ranging from 1 to 2 inches across. Processed vegetation will be disposed of onsite and dried. A sufficient drying time will be implemented to prevent any root stock fragments from re-sprouting before applying the mulch. Mulch will be applied to vegetation within the floodplain to provide organic material and a base for seed germination, to assist in moisture retention, and aide in erosion control. Additional mulch will be placed over compacted roads within the restoration site. No mulch will be placed on the levee toe road. Excess vegetation at the Country Club East, Sunland Park, and Anapra sites will be hauled and disposed of at a permitted landfill or local recycle center. Subsequent monitoring of the sites will assess the need to spray any mulched areas for resprouting.

The creation of swales and large trenches or holes created for planting will generate excess soil material that will need to be hauled and deposited in an upland location outside of USIBWC levees. Potential locations would include a permitted landfill facility, site and infrastructure developments requiring the material, or other off-site authorized disposal areas. No spoils will be deposited within the active river channel. At the discretion of USIBWC officials, the spoils may be spread where large saltcedar cavities are created from extraction.

7.0 SEDIMENT AND EROSION CONTROL MEASURES

Sediment and erosion control measures will be implemented throughout the life of the project in order to minimize sediment-laden runoff and unwanted soil degradation. Every phase of a construction project has the potential of contributing significant quantities of sediment load due to soil breakdown as a result of construction activities. Temporary erosion control measures will be implemented early in construction in order to mitigate dust and runoff pollution, if any, generated by restoration activities. The removal of vegetation is considered one of the primary reasons for dust and sediment accumulation. As a result, water will be provided on a regular basis to ensure soil materials are adequately saturated in order to minimize airborne soil particles and limit dust accrual to nearby residences, pedestrians, and traffic. Best Management Practices, such as silt fences and straw bales, will be used on an as-needed basis; however, due to the existing topography, sediment transport as a result of rainfall runoff will not have a significant impact on the site compared to potential dust accumulation. Silt fencing will be installed across slopes on contour lines as needed to control any excess soils or debris that result from dense saltcedar extractions (see Appendix B). Due to the earthwork proposed, National Pollution Discharge Elimination System (NPDES) requirements will be adhered to during the progression of the project. A notice of intent will be filed along with a low erosivity waiver.

8.0 MONITORING

Prior to conducting any work, the field crew established a minimum of three camera points for each restoration site (Table 8-1). Each camera point has a Global Positioning System (GPS) location and is permanently marked for future reference. Two to 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 will give an adequate view of the site to document the anticipated growth of revegetated areas (a meter stick placed in the view area will allow documentation of plant height and growth progression), and to monitor the stability of in-stream work. Photo point information will be collected during eight periods of the project: pre-implementation monitoring, pre-restoration monitoring, and six times during post-monitoring events. Additional photos will be taken of any significant changes and points of interest. Photos will be documented in accordance with Federal and National Archives and Records Administration regulations. Each photo will meet the USIBWC requirements for pixel array and will be uniquely numbered and labeled for identification.

During each monitoring period and assessment, groundwater levels will be 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.

Table 8-1. Established Photo Points for Each Restoration Site[1]

Restoration Site	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.

8.1 Pre-implementation Assessment

A pre-implementation monitoring assessment was conducted on 16 October 2017 prior to any work at the sites in support of the restoration plan. The distribution of invasive species for removal, as well as riparian habitat (specifically the willow species of interest) to be protected during restoration efforts, was identified and mapped. Wildlife species and floral species observed on the site were documented (Appendix A) and ground water levels measured. Pre-implementation photos for all photo points are contained in Appendix A.

8.2 Pre-restoration Assessment

Once the noxious vegetation has been removed, and the site prepped for planting, a pre-restoration assessment of the three sites will be conducted. This assessment will document the remainder of the native vegetation on each site and the baseline habitat prior to site implementation. Photo assessments and groundwater measurements will occur during the monitoring session as described above.

8.3 Post-restoration Assessment

Six post-restoration assessments will be conducted in April, June, and October of 2018; and February, April, and June of 2019. During post-monitoring efforts, vegetation species and percent cover of created and restored areas before and after will be compared; and a comparison to reference riparian areas within the project vicinity will be provided. The comparison of these areas will guide potential corrective actions and maintenance needs during the course of the monitoring period. Both random and fixed plot approaches (1/10th-acre plots) will be used to approximate the type and percent of ground, brush, and canopy cover. Immediately after planting, three to four fixed plots will be established within each restoration site. In addition, during each monitoring session, three additional random plots will be chosen and monitored. Percent cover and species composition will be recorded on data sheets imported into a field tablet and each on its own field monitoring sheet. Percentage mortality rate for species will be calculated based on the representative plots. In addition, any changes in vegetation condition will be noted on the field monitoring sheet, as well as stream bank conditions and any wildlife sightings. Dead trees will be flagged during each assessment. During the post-implementation assessments, any sprouts of saltcedar or other exotic species encountered will be re-treated and their locations will be recorded by GPS for future survey efforts.

During the post-restoration effort, potential issues that may occur from wildlife damage (e.g., beaver) will be noted. Tree protection measures may be recommended (e.g., tree protectors, sand paint) to protect vegetation from wildlife damage and increase the efficacy of plantings if damage is extensive. Field personnel will observe the site to determine if any potential issues may occur from wildlife damage and act accordingly.

All monitoring site assessments will be coordinated with USIBWC. These post-monitoring events will allow assessment of the mortality of the new plantings. If the mortality exceeds 15 percent, then equivalent stock will be replanted during the 2018 season.

9.0 REFERENCES

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APPENDIX A

Pre-implementation Monitoring Forms and Photos

Pre-Implementation Qualitative Monitoring Field Sheet

Site: County 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 in south
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, Rufous 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°				

10162017_1_Country Club East Photopoint 1 Target 1

10162017_2_Country Club East Photopoint 1 Target 2

10162017_3_Country Club East Photopoint 1 Target 3

10162017_4_Country Club East Photopoint 2 Target 1

10162017_5_Country Club East Photopoint 2 Target 2

10162017_6_Country Club East Photopoint 2 Target 3

10162017_7_Country Club East Photopoint 3 Target 1

10162017_8_Country Club East Photopoint 3 Target 2

10162017_9_Country Club East Photopoint 3 Target 3

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	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°				

10162017_1_Sunland Park Photopoint 1 Target 1

10162017_2_Sunland Park Photopoint 1 Target 2

10162017_3_Sunland Park Photopoint 1 Target 3

10162017_4_Sunland Park Photopoint 2 Target 1

10162017_5_Sunland Park Photopoint 2 Target 2

10162017_6_Sunland Park Photopoint 2 Target 3

10162017_7_Sunland Park Photopoint 3 Target 1

10162017_8_Sunland Park Photopoint 3 Target 2

10162017_9_Sunland Park Photopoint 3 Target 3

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
Seepwillow (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 multiple native grasses

Observed Wildlife: Killdeer, Mallard, Yellow-rumped Warbler, Northern Flicker, Verdin, 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°				

10162017_1_Anapra Bridge Photopoint 1 Target 1

10162017_2_Anapra Bridge Photopoint 1 Target 2

10162017_3_Anapra Bridge Photopoint 1 Target 3

10162017_4_Anapra Bridge Photopoint 2 Target 1

10162017_5_Anapra Bridge Photopoint 2 Target 2

10162017_6_Anapra Bridge Photopoint 2 Target 3

10162017_7_Anapra Bridge Photopoint 3 Target 1

10162017_8_Anapra Bridge Photopoint 3 Target 2

10162017_9_Anapra Bridge Photopoint 3 Target 3

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

APPENDIX B

Restoration Design Plans

INTERNATIONAL BOUNDARY AND WATER COMMISSION
HABITAT RESTORATION PROJECT
COUNTRY CLUB EAST,
SUNLAND PARK AND ANAPRA BRIDGE

DONA ANA COUNTY, NEW MEXICO
EL PASO COUNTY, TEXAS
JANUARY 23, 2018

VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

PLANS PREPARED FOR:

INTERNATIONAL BOUNDARY AND WATER COMMISSION
U.S. SECTION
4171 NORTH MESA, SUITE C-310
EL PASO, TX 79902-1441

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE: www.ideals-inc.com
PHONE :575-532-9652 FAX :575-532-5045

Rio Grande Restoration Project
141039-022/G.C.
Final Set
January 23, 2018

ALL SITE NOTES

REMOVAL:

MOST SITES REQUIRE BRUSH REMOVAL, MAINLY THE VEGETATION OF SALT CEDAR. CLEARING METHODS FOR REMOVAL OF SALT CEDAR INCLUDE:

- CUTTING TO GROUND LEVEL AND TREATING THE STUMPS WITH HERBICIDE, SUCH AS GARLON (TRICLOPYR) APPLIED FROM A BACKPACK SPRAYER TO THE EXPOSED CUT. THESE TECHNIQUES MUST BE PERFORMED DURING LATE DECEMBER AND JANUARY SO THAT HERBICIDE IS DRAWN INTO THE ROOD SYSTEM OF THE PLANTS. IT IS ESSENTIAL TO REMOVE OR KILL THE SUBSURFACE ROOT CROWN OF SALT CEDAR TO PREVENT RE-SPROUTING.
- FUTURE SPOT TREATMENTS FOR RE-VEGETATION OF NON-DESIRABLE PLANTS CAN ALSO BE DONE USING HERBICIDE.
- SELECTIVE EXTRACTION, SUCH AS WITH A BACKHOE, USE OF A HYDRAULIC THUMB ATTACHMENT TO THE BACKHOE ARM IS EFFICIENT IN REMOVING SELECTED TREES AND ROOT CROWNS WITH LESS SOIL DISTURBANCE.
- STRANDS OF LARGE, DENSE SALT CEDAR CAN BE CLEARED WITH A SCRAPER OR BULLDOZER, FOLLOWED BY ROOT PLOWING TO REMOVE THE ROOT CROWN.

PLANTING GENERAL NOTES:

1. PROVIDE A MINIMUM DISTANCE OF 35-FT FROM THE TOE OF LEVEE TO THE EDGE OF PROPOSED PLANT LINE.
2. MINIMUM DISTANCE OF 10-FT AROUND WELLS FOR PLANTINGS AND OTHER DISTURBANCE.
3. DRAWING LEGEND TO BE USED FOR ALL SITES.

NOTE:

BIRD SPECIES IN THE PROJECT AREA THAT ARE PROTECTED UNDER THE MIGRATORY BIRD TREATY ACT (MBTA) MAY NEST IN AREAS CONTAINING TREES, GRASSES, OR OTHER SUITABLE HABITAT. VEGETATION CLEARING ACTIVITIES SHOULD BE SCHEDULED TO OCCUR OUTSIDE THE MARCH THROUGH AUGUST MIGRATORY BIRD NESTING SEASON. WHEN POSSIBLE, IF VEGETATION CLEARING ACTIVITIES MUST OCCUR DURING THE NESTING SEASON OF BIRDS PROTECTED UNDER THE MBTA, THAN THE AREAS PROPOSED FOR DISTURBANCES MUST BE SURVEYED FOR NESTING BIRDS PRIOR TO CONSTRUCTION TO AVOID INADVERTENT DESTRUCTION OF NESTS AND EGGS.

SUNLAND PARK ONLY

NOTE:

BIRD SPECIES IN THE PROJECT AREA THAT ARE PROTECTED UNDER THE MIGRATORY BIRD TREATY ACT (MBTA) MAY NEST IN AREAS CONTAINING TREES, GRASSES, OR OTHER SUITABLE HABITAT. VEGETATION CLEARING ACTIVITIES SHOULD BE SCHEDULED TO OCCUR OUTSIDE THE MARCH THROUGH AUGUST MIGRATORY BIRD NESTING SEASON. WHEN POSSIBLE, IF VEGETATION CLEARING ACTIVITIES MUST OCCUR DURING THE NESTING SEASON OF BIRDS PROTECTED UNDER THE MBTA, THAN THE AREAS PROPOSED FOR DISTURBANCES MUST BE SURVEYED FOR NESTING BIRDS PRIOR TO CONSTRUCTION TO AVOID INADVERTENT DESTRUCTION OF NESTS AND EGGS.

THIS SITE IS KNOWN HABITAT FOR THE SOUTHWESTERN WILLOW FLY CATCHER (WFL), AN ENDANGERED SPECIES. VEGETATION REMOVAL WILL CONFORM WITH U.S. FISH AND WILDLIFE SERVICE REQUIREMENTS AND RESTRICTIONS. NO CONSTRUCTION ACTIVITIES WILL OCCUR WITHIN 1/4 MILE OF ANY IDENTIFIED WFL NESTS.

THIS SITE IS KNOWN HABITAT FOR THE YELLOW-BILLED CUCKOO. NO WORK MAY BE DONE AT THIS SITE DURING THE BREEDING SEASON (MARCH – AUGUST).

NOTE:

CONTRACTOR SHALL ONLY USE EXISTING LEVEE RAMPS WHEN TRAVELING UP AND DOWN THE LEVEES.

NEW MEXICO STATE PLANE, CENTRAL ZONE (FIPS 3002), U.S. FEET WITH HORIZONTAL DATUM NAD 83 HARN AND VERTICAL DATUM NAVD 88.

SITE SPECIFICATIONS

MINIMUM NUMBER OF PLANTINGS AT EACH SITE

SITE	GRASS AND FORB SEEDING (ACRES)	COYOTE WILLOW WHIPS	GOODDINGS WILLOW POLES	COTTONWOOD POLES	LONGSTEM RIPARIAN SHRUBS	DESERT WILLOW / ARIZONA ASH	SALTCEDAR EXTRACTION (ACRES)
COUNTRY CLUB EAST	14	3,480	440	1,620	2,320	0/10	±5.17
SUNLAND PARK	0	3,440	2,350	400	1,152	0/10	±7.18
ANAPRA	0	330	55	110	330	0/10	±3.55
TOTAL:	14	7,250	2,845	2,130	3,802	0/30	±15.90

SITE LEGEND

PROJECT LEGEND

PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL
3915 FINISHED MAJOR CONTOUR
3914 FINISHED MINOR CONTOUR
3915 EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
@14.55TOP TOP OF POND
@14.55BTM BOTTOM OF POND
@14.55TOS TOP OF SWALE
@14.55FL FLOWLINE
4H:1V HORIZONTAL/VERTICAL SLOPE

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS-T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS-R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS-P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

NEW PLANTS SPECIES (NPS)

1. GRASSES AND FORB SEEDING
2. COYOTE WILLOW WHIPS
3. GOODDINGS WILLOW POLES
4. COTTONWOOD POLES
5. LONG-STEM RIPARIAN SHRUBS
6. DESERT WILLOW
7. ARIZONA ASH

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New Mexico One Call, Inc. Call 2 days before you dig! Dial 811 or 1-800-321-2537 NMOC Professional Resources for Damage Prevention

Disclaimer

Upon acceptance of these plans for construction, the contractor agrees to familiarize himself with the project and verify the location and correctness of any and all appurtenances, right-of-way, property lines, elevations, obstructions, hazards, or conflicts that may exist upon examination of actual field conditions. design of these plans was based on available information and interpretation of available data. any discrepancies discovered, shall be immediately brought to the attention of the engineer for evaluation, the contractor shall accept all liability and risks for construction proceeding prior to engineers evaluation.

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE NOTES AND LEGENDS ~

Plan Revisions

Date : 2018/01/23
T.O. # 14.009-023.005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by: A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
2
OF 20

Date: Jan 25, 2018 - 4:30pm User:Gabriel
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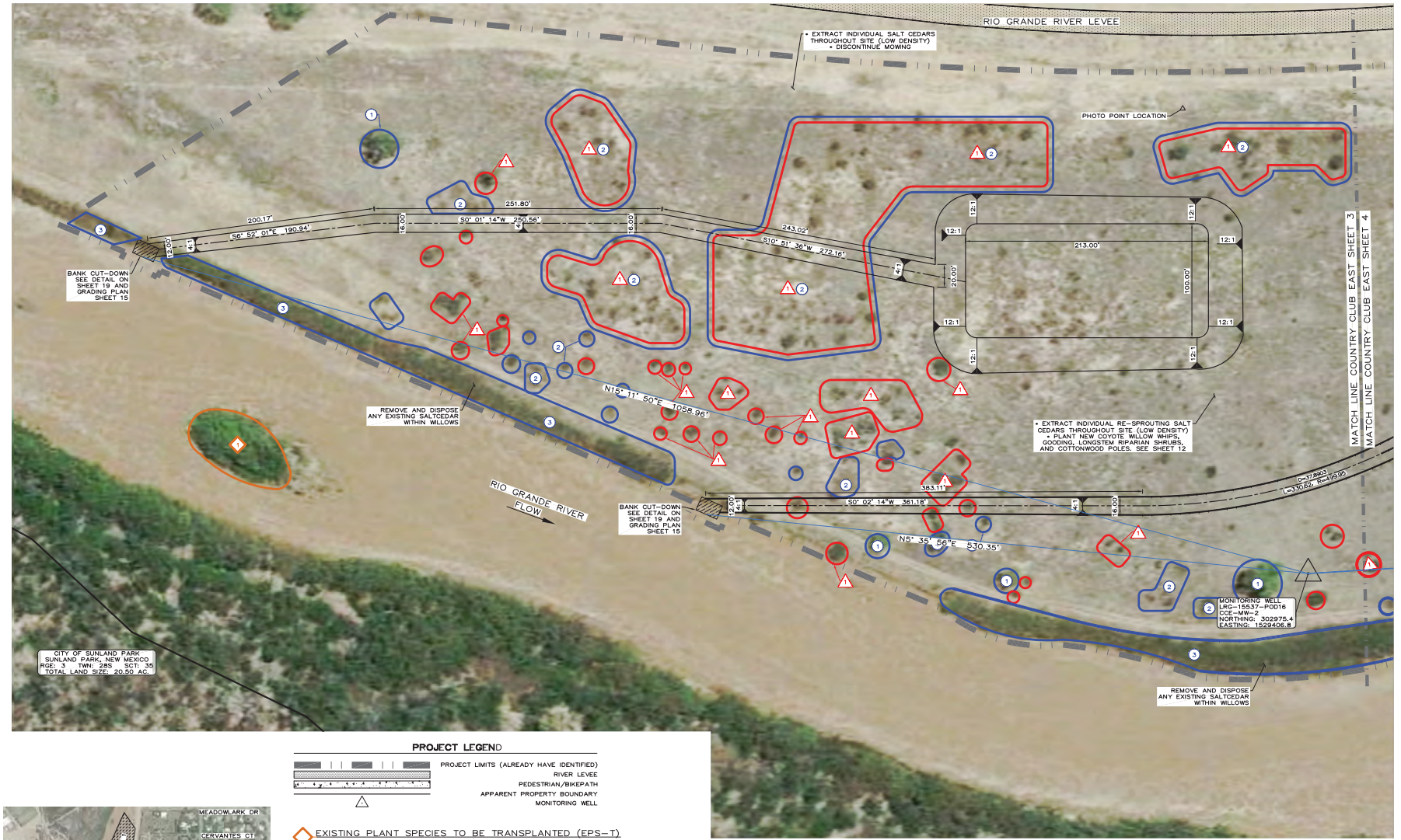
Layout Name: G2



SITE 28 - COUNTRY CLUB EAST SITE PLAN

SCALE: 1" = 40'

SCALE: 1"=40'

SITE 28 – COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

- PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
- RIVER LEVEE
- PEDESTRIAN/BIKEPATH
- APPARENT PROPERTY BOUNDARY
- MONITORING WELL

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS-T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS-R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS-P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST ~

Plan Revisions

Date : 2018/01/23
T.O. # 14009-023.005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by: A. Guerra

Engineer's Stamp

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Sheet Number

3

OF 20

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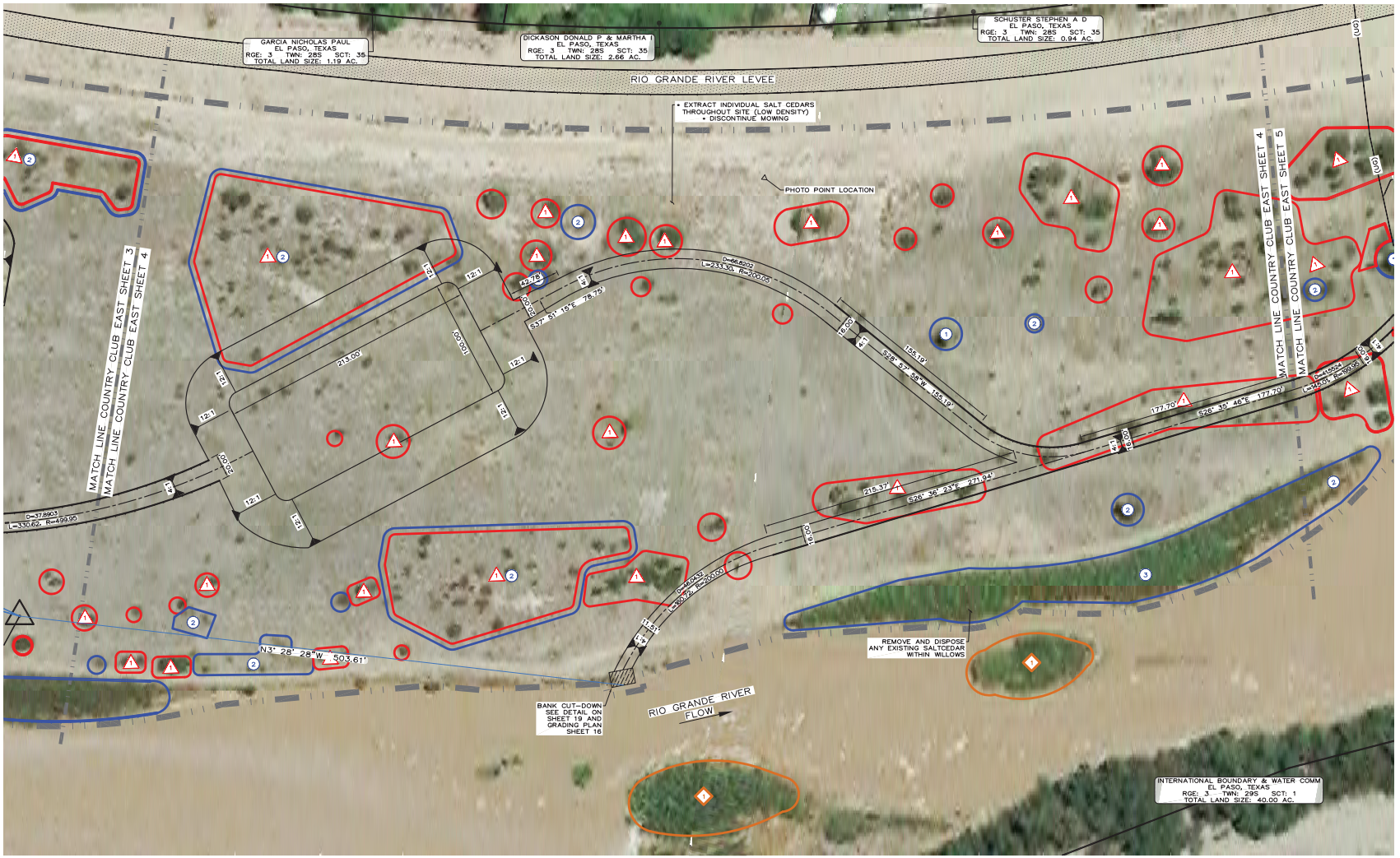

SITE 28 – COUNTRY CLUB EAST SHEET MAP
NOT TO SCALE

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS–T)
1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS–R)
1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS–P)
1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND
PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL

SITE 28 - COUNTRY CLUB EAST SITE PLAN
SCALE: 1"=40'
SCALE: 1"=40'

Texas 811 Know what's below. Call before you dig.

New Mexico One Call, Inc Call 2 days before you dig! Dial 811 or 1-800-321-2537

Disclaimer

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N

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST ~

Plan Revisions

Date : 2018/01/23
T.O. # 14009-023-005
Engineer : M.Dublin
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Sheet Number
4
OF 20

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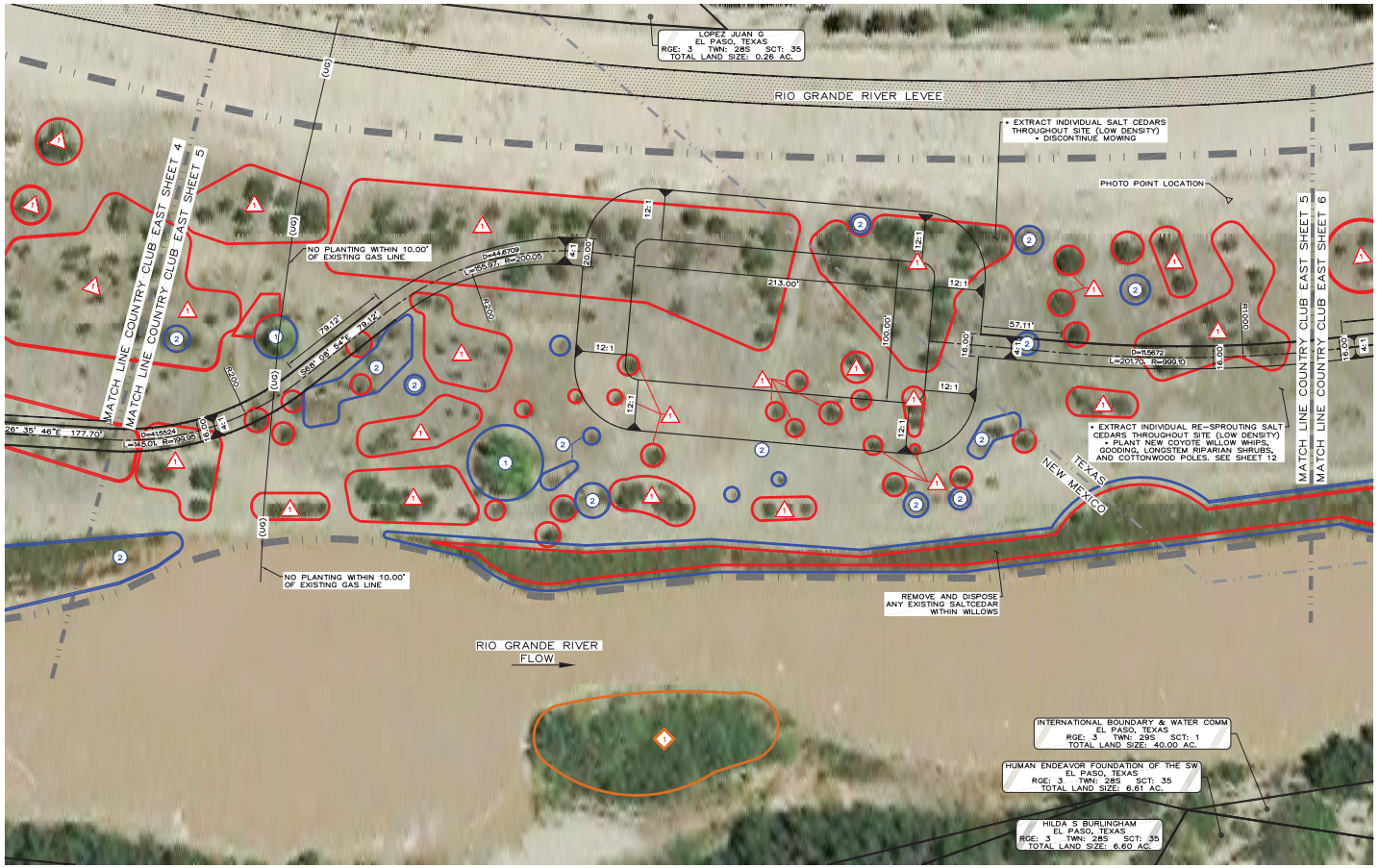


SITE 28 - COUNTRY CLUB EAST SITE PLAN

SCALE: 1"=40'

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS-T)
1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS-R)
1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS-P)
1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND

PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL

SITE 28 – COUNTRY CLUB EAST SHEET MAP
NOT TO SCALE

Disclaimer

Upon acceptance of these plans for construction, the contractor agrees to familiarize himself with the project and verify the location and correctness of any and all appurtenances, right-of-way, property lines, elevations, obstructions, hazards, or conflicts that may exist upon examination of actual field conditions. design of these plans was based on available information and interpretation of available data. any discrepancies discovered, shall be immediately brought to the attention of the engineer for evaluation, the contractor shall accept all liability and risks for construction proceeding prior to engineers evaluation.

Texas 811 Know what's below. Call before you dig.

New Mexico One Call, Inc. Call 2 days before you dig! Dial 811 or 1-800-321-2537

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST ~

Plan Revisions

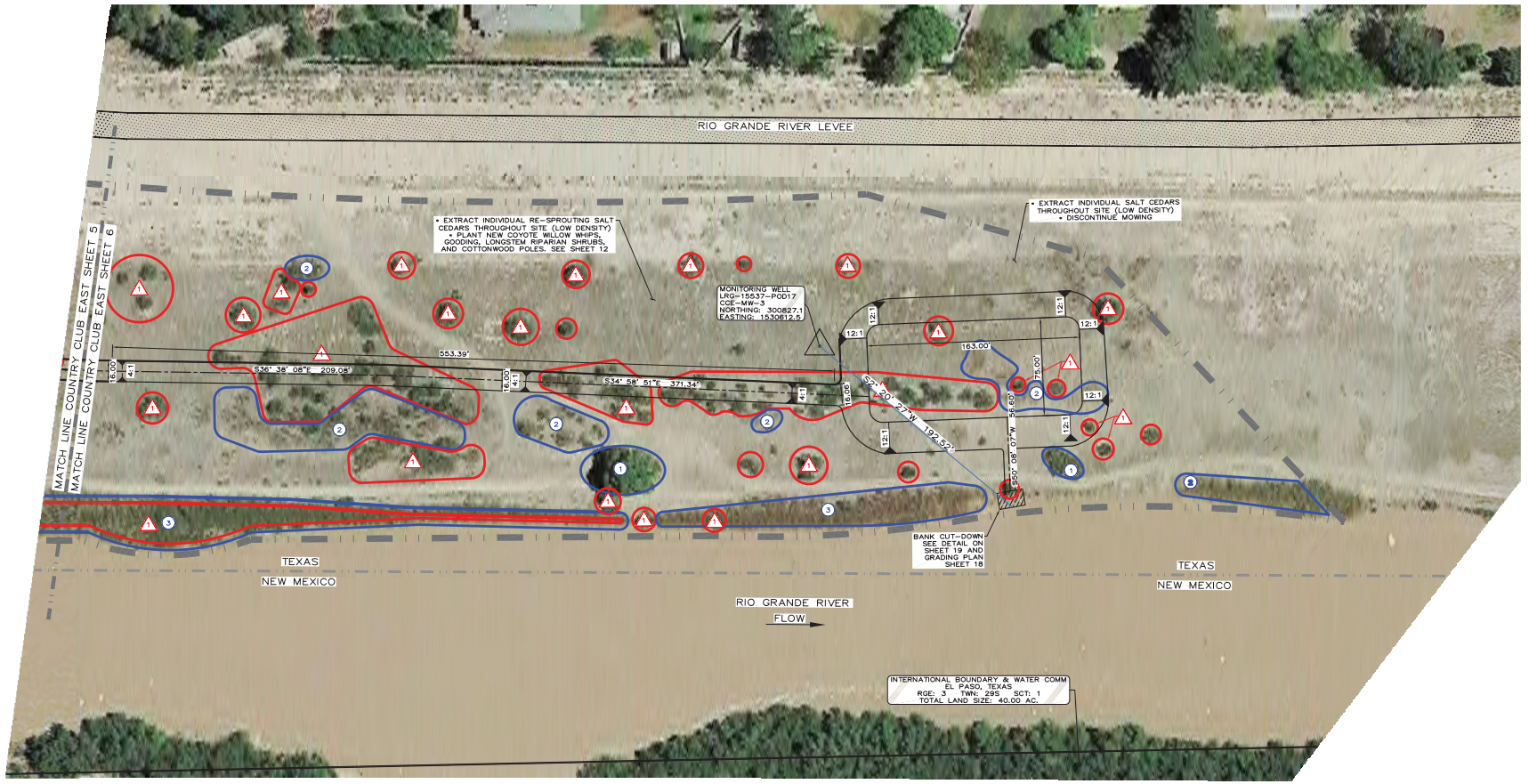
Date : 2018/01/23
T.O. # 14109-023-005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by: A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
5
OF 20

Date: Jan 25, 2018 - 4:58pm User:Gabriel
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: CC-5



SITE 28 - COUNTRY CLUB EAST SITE PLAN

SCALE: 1" = 40'

SCALE: 1"=40'

SITE 28 – COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

- PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
- RIVER LEVEE
- PEDESTRIAN/BIKEPATH
- APPARENT PROPERTY BOUNDARY
- MONITORING WELL

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS–T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS–R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS–P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST ~

Plan Revisions

Date : 2018/01/23
T.O. # 141059-023-005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by: A. Guerra

Engineer's Stamp

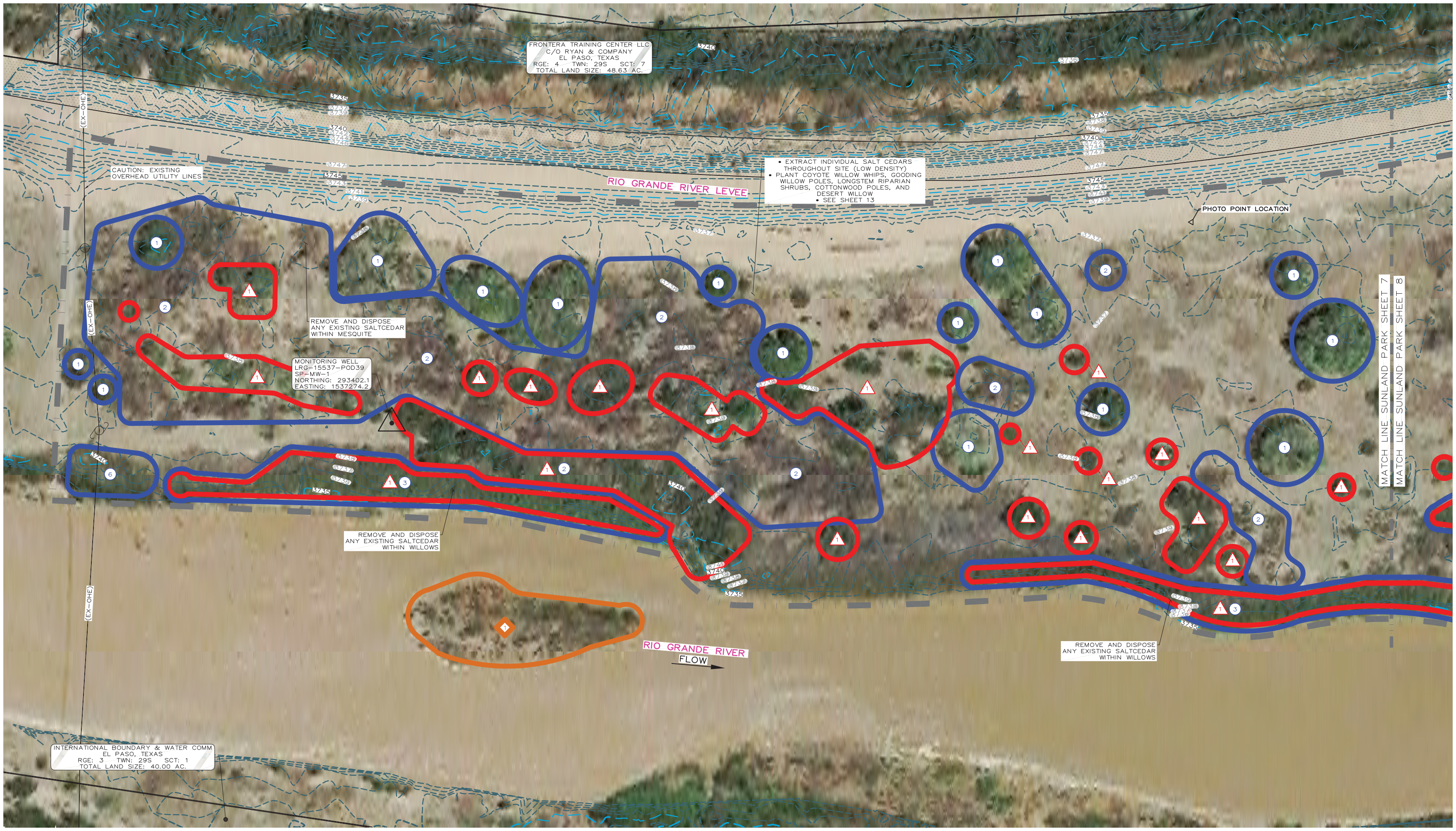
IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number

6

OF 20

Date: Jan 25, 2018 - 5:43pm User:Gabriel
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: CC-6



SITE 29 – SUNLAND PARK SHEET MAP

NOT TO SCALE

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS–T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS–R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS–P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND

	PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
	RIVER LEVEE
	PEDESTRIAN/BIKEPATH
	APPARENT PROPERTY BOUNDARY
	MONITORING WELL
3915	EXISTING MAJOR
3914	EXISTING MINOR

SITE 29 - SUNLAND PARK SITE PLAN

SCALE: 1" = 40'

40 0 20 40 60 80

SCALE: 1"=40'

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 29 - SUNLAND PARK ~

Plan Revisions

Date : 2018/01/23
T.O. # 14029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
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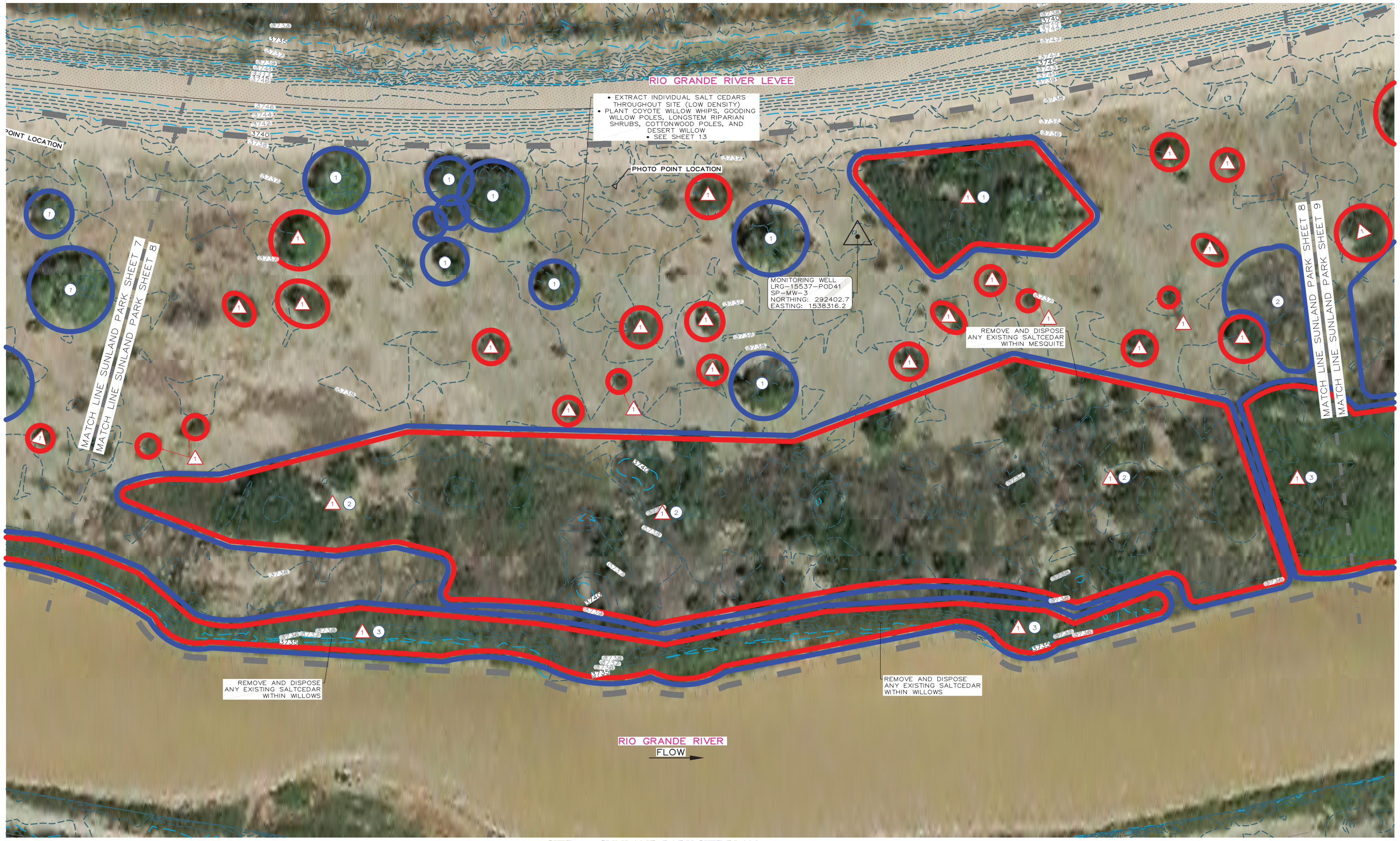
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
7
OF 20

Date: Jan 25, 2018 - 8:43am User:Nathan
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: SP-7



SITE 29 - SUNLAND PARK SITE PLAN

SCALE: 1"= 40'

40 0 20 40 60 80

SCALE: 1"=40'

SITE 29 – SUNLAND PARK SHEET MAP

NOT TO SCALE

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS–T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS–R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS–P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND

PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL
3915 EXISTING MAJOR
3914 EXISTING MINOR

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 29 - SUNLAND PARK ~

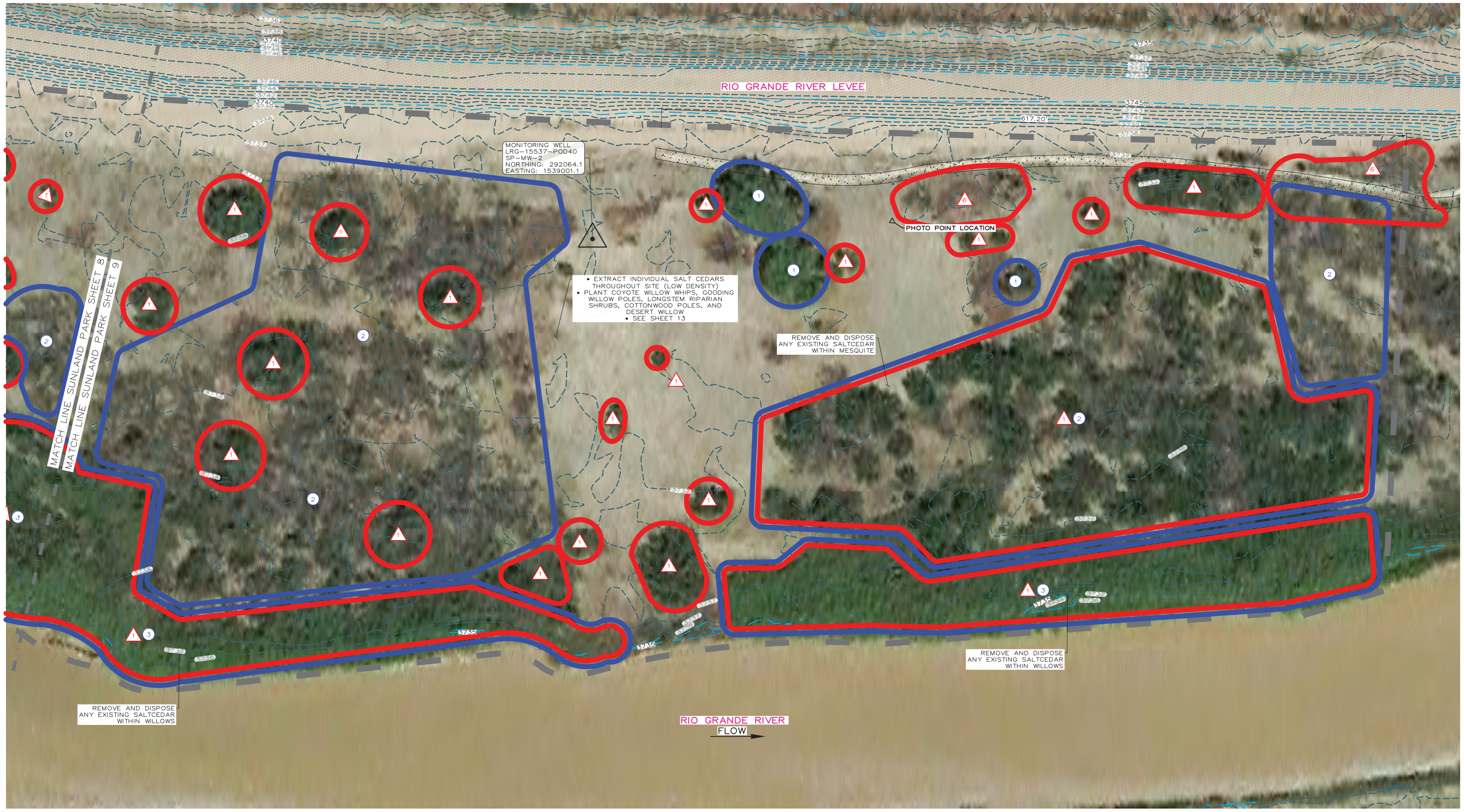
Plan Revisions

Date : 2018/01/23
T.O. # 141029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Date: Jan 25, 2018 - 8:46am User:Nathan
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: SP-8



SITE 29 - SUNLAND PARK SITE PLAN

SCALE: 1" = 40'

40 0 40 80

20 60

SCALE: 1"=40'

SITE 29 – SUNLAND PARK SHEET MAP

NOT TO SCALE

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS–T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS–R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS–P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND

PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL
3915 EXISTING MAJOR
3914 EXISTING MINOR

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N

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 29 - SUNLAND PARK ~

Plan Revisions

Date : 2018/01/23
T.O. # 141029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
9
OF 20

Date: Jan 25, 2018 - 8:49am User:Nathan
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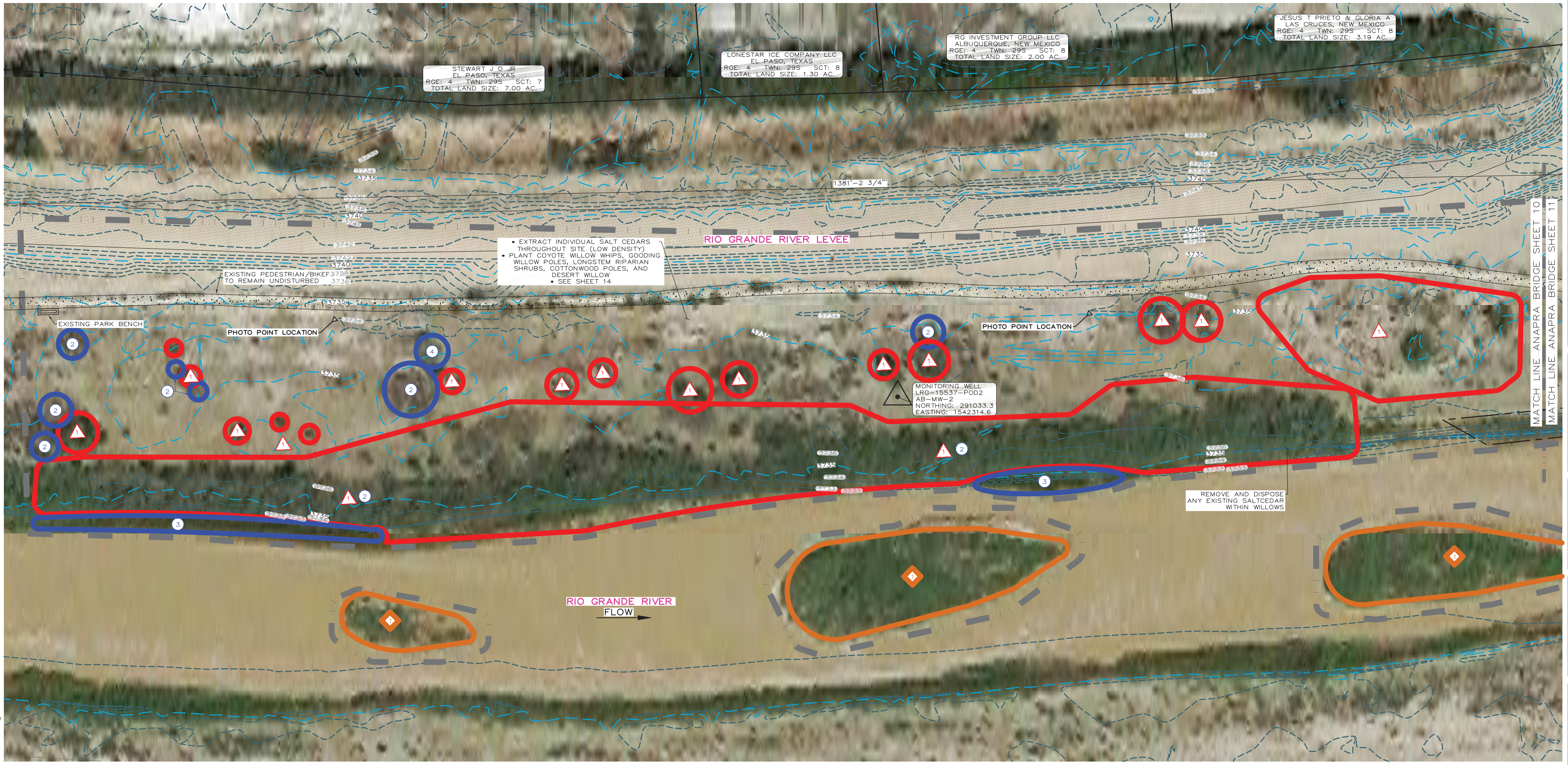
Layout Name: SP-9



SITE 30 - ANAPRA BRIDGE SITE PLAN

SCALE: 1" = 40'

40 0 40 80

20 60

SCALE: 1"=40'

PROJECT LEGEND

PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
RIVER LEVEE
PEDESTRIAN/BIKEPATH
APPARENT PROPERTY BOUNDARY
MONITORING WELL
3915 EXISTING MAJOR
3914 EXISTING MINOR

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS-T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS-R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS-P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

SITE 30 – ANAPRA BRIDGE SHEET MAP

NOT TO SCALE

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New Mexico One Call, Inc. Call 2 days before you dig! Dial 811 or 1-800-321-2537 NM1C Professional Resources for Damage Prevention

Disclaimer

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N

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 30 - ANAPRA BRIDGE ~

Plan Revisions

Date : 2018/01/23
T.O. # 14029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

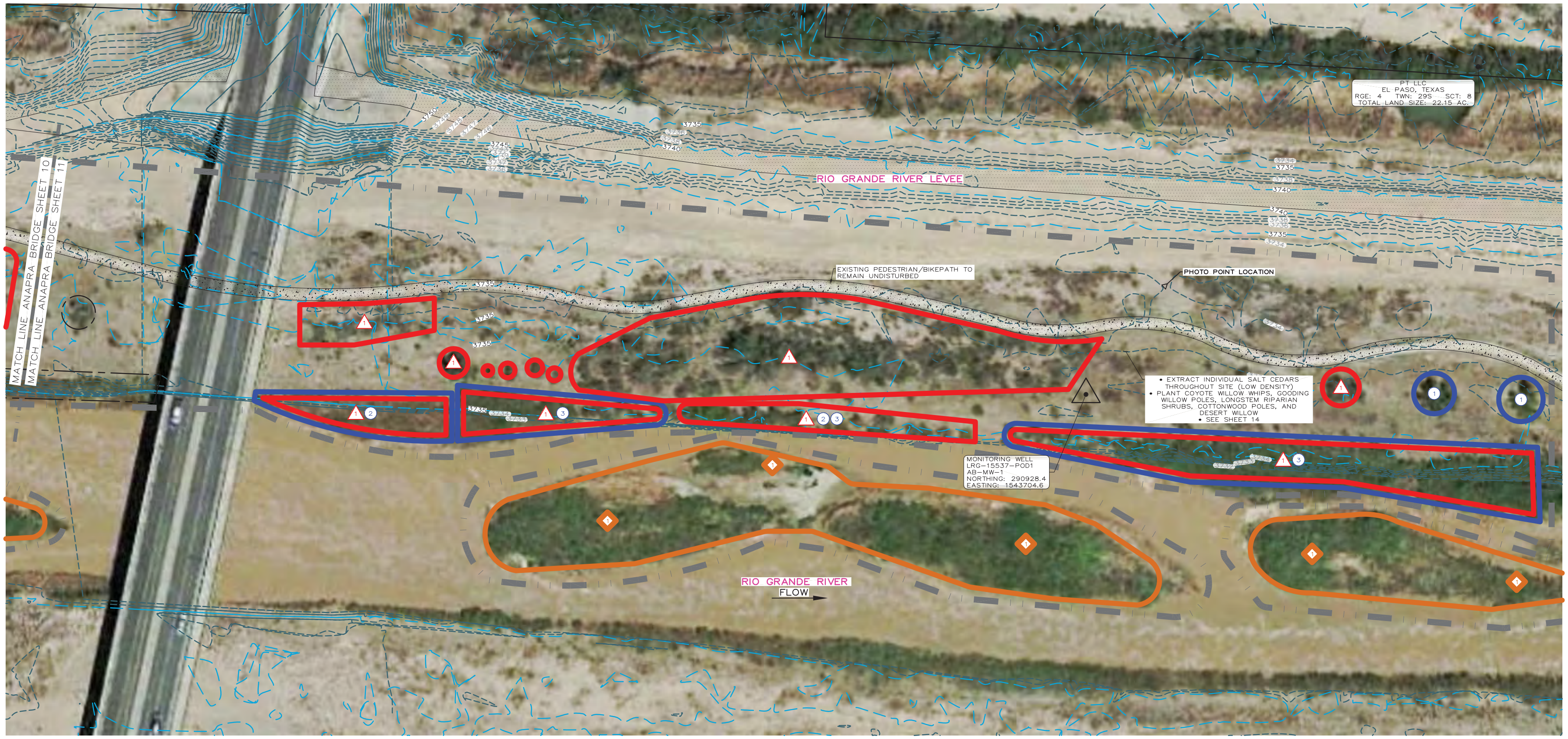
IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number

10

OF 20

Date: Jan 25, 2018 - 8:56am User:Nathan
Drawing File: Y:\000000-000 IEI\RC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: A-10



SITE 30 - ANAPRA BRIDGE SITE PLAN

SCALE: 1" = 40'

40 0 40 80

20 60

SCALE: 1"=40'

EXISTING PLANT SPECIES TO BE TRANSPLANTED (EPS-T)

1. COYOTE WILLOW
2. PYRUS

EXISTING PLANT SPECIES TO BE REMOVED (EPS-R)

1. SALTCEDAR
2. RUSSIAN OLIVE
3. KOCHIA
4. GIANT CANE
5. EXOTIC PHRAGMITES
6. MESQUITE

EXISTING PLANT SPECIES TO BE PROTECTED (EPS-P)

1. COTTONWOOD
2. MESQUITE
3. COYOTE WILLOW
4. ACACIA
5. BACCHARIS
6. CAT TAIL

PROJECT LEGEND

- PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
- RIVER LEVEE
- PEDESTRIAN/BIKEPATH
- APPARENT PROPERTY BOUNDARY
- MONITORING WELL
- 3915 EXISTING MAJOR
- 3914 EXISTING MINOR

SITE 30 — ANAPRA BRIDGE

NOT TO SCALE

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N

~RIO GRANDE~

~RESTORATION PROJECT~

~ SITE 30 - ANAPRA BRIDGE ~

Plan Revisions

Date : 2018/01/23

T.O. # 14029-022.005

Engineer : M.Dubbin

Drawn by : G. Chavez

Checked by : A. Guerra

Engineer's Stamp

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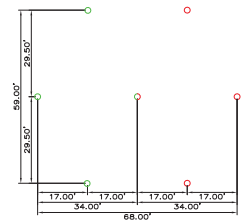
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

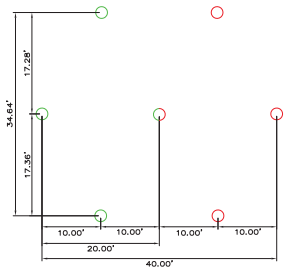
Sheet Number

11

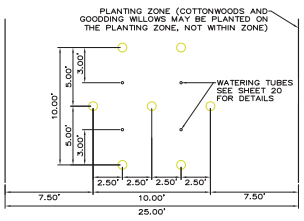
OF 20



SUGGESTD WOODLAND COTTONWOODS & GOODDING WILLOW PLANT PATTERNS
NOT TO SCALE



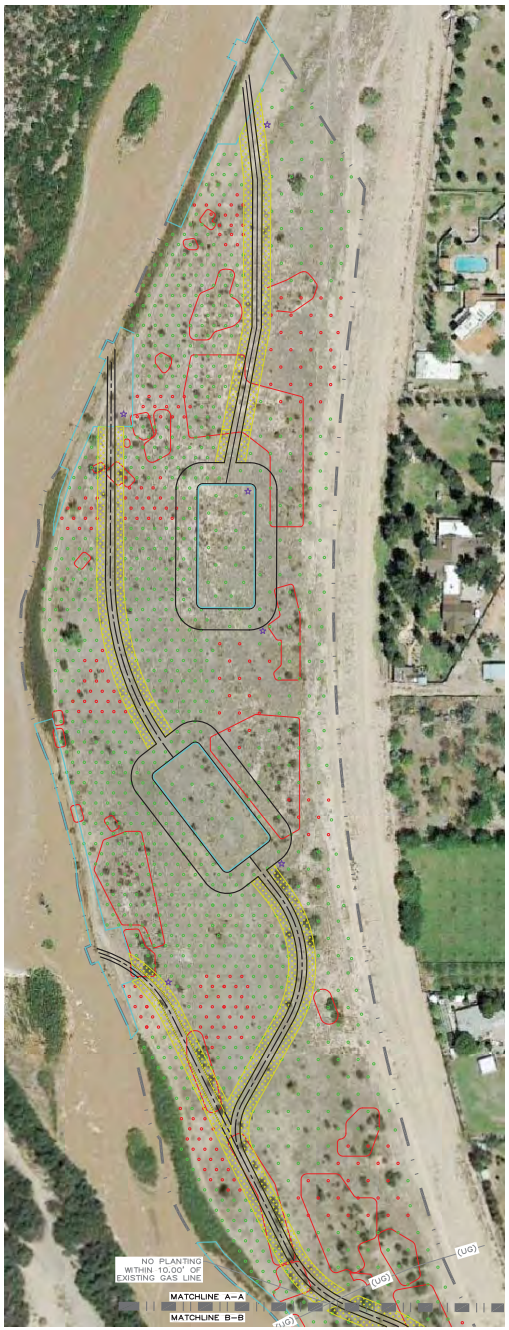
SUGGESTED RIPARIAN COTTONWOODS & GOODDING WILLOW PLANT PATTERNS
NOT TO SCALE



NOTE:
LONGSTEM SHRUBS PLACED PARALLEL TO PEDESTRIAN/BIKE PATH SHALL MAINTAIN 10.00' MINIMUM SEPARATION FROM CONCRETE EDGE.

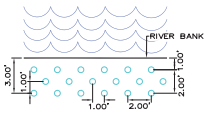
SUGGESTED LONGSTEM SHRUBS PLANT PATTERNS
NOT TO SCALE

SITE 28 – COUNTRY CLUB EAST SHEET MAP
NOT TO SCALE



SITE 28– COUNTRY CLUB EAST PLANTING PLAN

NOTE:
1. PROVIDE A MINIMUM DISTANCE OF 35–FT FROM THE TOE OF LEVEE TO THE EDGE OF PROPOSED PLANT LINE.
2. MINIMUM DISTANCE OF 10–FT AROUND WELLS FOR PLANTINGS AND OTHER DISTURBANCE.
3. PLANTING PATTERN SHOWS APPROXIMATE SPACING FOR PLANTING TO ACHIEVE NUMBER OF PLANTS. CONTRACTOR MAY CLUSTER OR SPACE AS NEEDED TO ACHIEVE NUMBER OF PLANTS DESIRED, AS LONG AS PLANTING DOES NOT ENCROACH INTO WARNINGS LISTED ON THIS SHEET.



NOTE:
COYOTE WILLOW POLES TO BE PLANTED TO DEPTH OF 10.00' OR EXISTING GROUNDWATER USING 1" DIAMETER DRILL BIT, POWER AUGER, OR PUNCH BAR.

SUGGESTED COYOTE WILLOW POLES PLANT PATTERNS
NOT TO SCALE

MINIMUM NUMBER OF PLANTINGS AT EACH SITE							
SITE	GRASS AND FORB SEEDING (ACRES)	COYOTE WILLOW WHIPS	GOODING WILLOW POLES	COTTONWOOD POLES	LONGSTEM RIPARIAN SHRUBS	DESERT WILLOW / ARIZONA ASH	SALT CEDAR EXTRACTION (ACRES)
COUNTRY CLUB EAST	14	3,480	440	1,620	2,320	0/10	±5.17

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Disclaimer

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST ~
~ PLANTING ~

Plan Revisions

Date : 2017/12/15
T.O. # 141039-023.005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by: A. Guerra

Engineer's Stamp

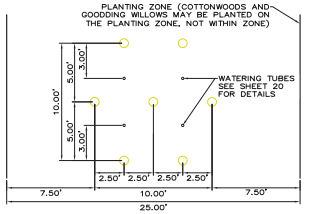
IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
12
OF 20

Date: Jan 25, 2018 – 4:18pm User:Cabriel
Drawing File: Y:\000000-000 RWC River Restoration Project\Dwg\North and South Planting Plans.dwg
Layout Name: CC PLANT– 12

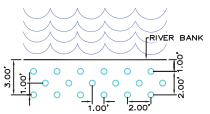
SITE 29 – SUNLAND PARK SHEET MAP
NOT TO SCALE

SUGGESTED COTTONWOODS & GOODDING WILLOW PLANT PATTERNS
NOT TO SCALE



NOTE:
LONGSTEM SHRUBS PLACED PARALLEL TO PEDESTRIAN/BIKE PATH SHALL MAINTAIN 10.00' MINIMUM SEPARATION FROM CONCRETE EDGE.

SUGGESTED LONGSTEM SHRUBS PLANT PATTERNS
NOT TO SCALE



NOTE:
COYOTE WILLOW POLES TO BE PLANTED TO DEPTH OF 10.00' OR EXISTING GROUNDWATER USING 1" DIAMETER DRILL BIT, POWER AUGER, OR PUNCH BAR.

SUGGESTED COYOTE WILLOW POLES PLANT PATTERNS
NOT TO SCALE

MINIMUM NUMBER OF PLANTINGS AT EACH SITE

SITE	GRASS AND FORB SEEDING (ACRES)	COYOTE WILLOW WHIPS	GOODING WILLOW POLES	COTTONWOOD POLES	LONGSTEM RIPARIAN SHRUBS	DESERT WILLOW / ARIZONA ASH	SALT CEDAR EXTRACTION (ACRES)
SUNLAND PARK	0	3,440	2,350	400	1,152	0/10	±7.18

NOTE:

1. PROVIDE A MINIMUM DISTANCE OF 35–FT FROM THE TOE OF LEVEE TO THE EDGE OF PROPOSED PLANT LINE.
2. MINIMUM DISTANCE OF 10–FT AROUND WELLS FOR PLANTINGS AND OTHER DISTURBANCE.
3. PLANTING PATTERN SHOWS APPROXIMATE SPACING FOR PLANTING TO ACHIEVE NUMBER OF PLANTS. CONTRACTOR MAY CLUSTER OR SPACE AS NEEDED TO ACHIEVE NUMBER OF PLANTS DESIRED, AS LONG AS PLANTING DOES NOT ENCROACH INTO WARNINGS LISTED ON THIS SHEET.

SITE 29- SUNLAND PARK PLANTING PLAN
SCALE: 1" = 100'

SCALE: 1" = 100'

Disclaimer

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Date: Jan 25, 2018 – 4:20pm User: Gabriel
Drawing File: Y:\000000-000 RWC River Restoration Project\Dwg\North and South Planting Plans.dwg
Layout Name: SUNP PLANT– 13

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 29 - SUNLAND PARK ~
~ PLANTING ~

Plan Revisions

Date : 2017/12/15
T.O. # 141039-023.005
Engineer : M Dublin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

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848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
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Sheet Number
13
OF 20

SITE 29- ANAPRA BRIDGE PLANTING PLAN

SCALE: 1" = 100'

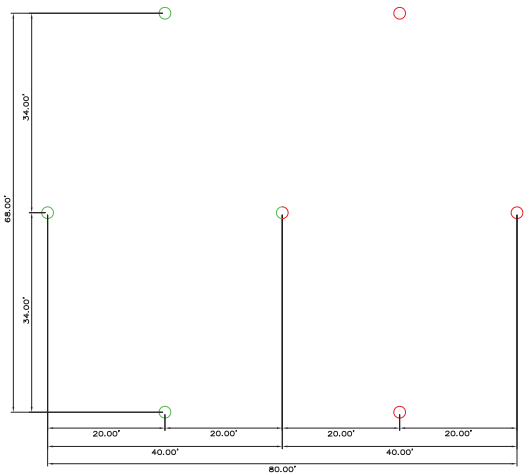
100 0 100 200

50 150

SCALE: 1" = 100'

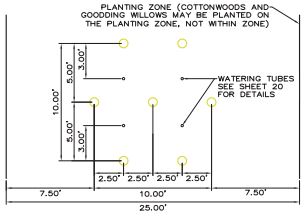
SITE 30 – ANAPRA BRIDGE SHEET MAP

NOT TO SCALE



SUGGESTED MCOTTONWOODS & GOODDING WILLOW PLANT PATTERNS

NOT TO SCALE



NOTE:

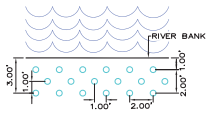
LONGSTEM SHRUBS PLACED PARALLEL TO PEDESTRIAN/BIKE PATH SHALL MAINTAIN 10.00' MINIMUM SEPARATION FROM CONCRETE EDGE.

SUGGESTED LONGSTEM SHRUBS PLANT PATTERNS

NOT TO SCALE

NOTE:

1. PROVIDE A MINIMUM DISTANCE OF 35-FT FROM THE TOE OF LEVEE TO THE EDGE OF PROPOSED PLANT LINE.
2. MINIMUM DISTANCE OF 10-FT AROUND WELLS FOR PLANTINGS AND OTHER DISTURBANCE.
3. PLANTING PATTERN SHOWS APPROXIMATE SPACING FOR PLANTING TO ACHIEVE NUMBER OF PLANTS. CONTRACTOR MAY CLUSTER OR SPACE AS NEEDED TO ACHIEVE NUMBER OF PLANTS DESIRED, AS LONG AS PLANTING DOES NOT ENCROACH INTO WARNINGS LISTED ON THIS SHEET.



NOTE:

COYOTE WILLOW POLES TO BE PLANTED TO DEPTH OF 10.00' OR EXISTING GROUNDWATER USING 1" DIAMETER DRILL BIT, POWER AUGER, OR PUNCH BAR.

SUGGESTED COYOTE WILLOW POLES PLANT PATTERNS

NOT TO SCALE

MINIMUM NUMBER OF PLANTINGS AT EACH SITE							
SITE	GRASS AND FORB SEEDING (ACRES)	COYOTE WILLOW WHIPS	GOODING WILLOW POLES	COTTONWOOD POLES	LONGSTEM RIPARIAN SHRUBS	DESERT WILLOW / ARIZONA ASH	SALT CEDAR EXTRACTION (ACRES)
ANAPRA	0	330	55	110	330	0/10	±3.55

Disclaimer

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N

~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 30 - ANAPRA BRIDGE ~
~ PLANTING ~

Plan Revisions

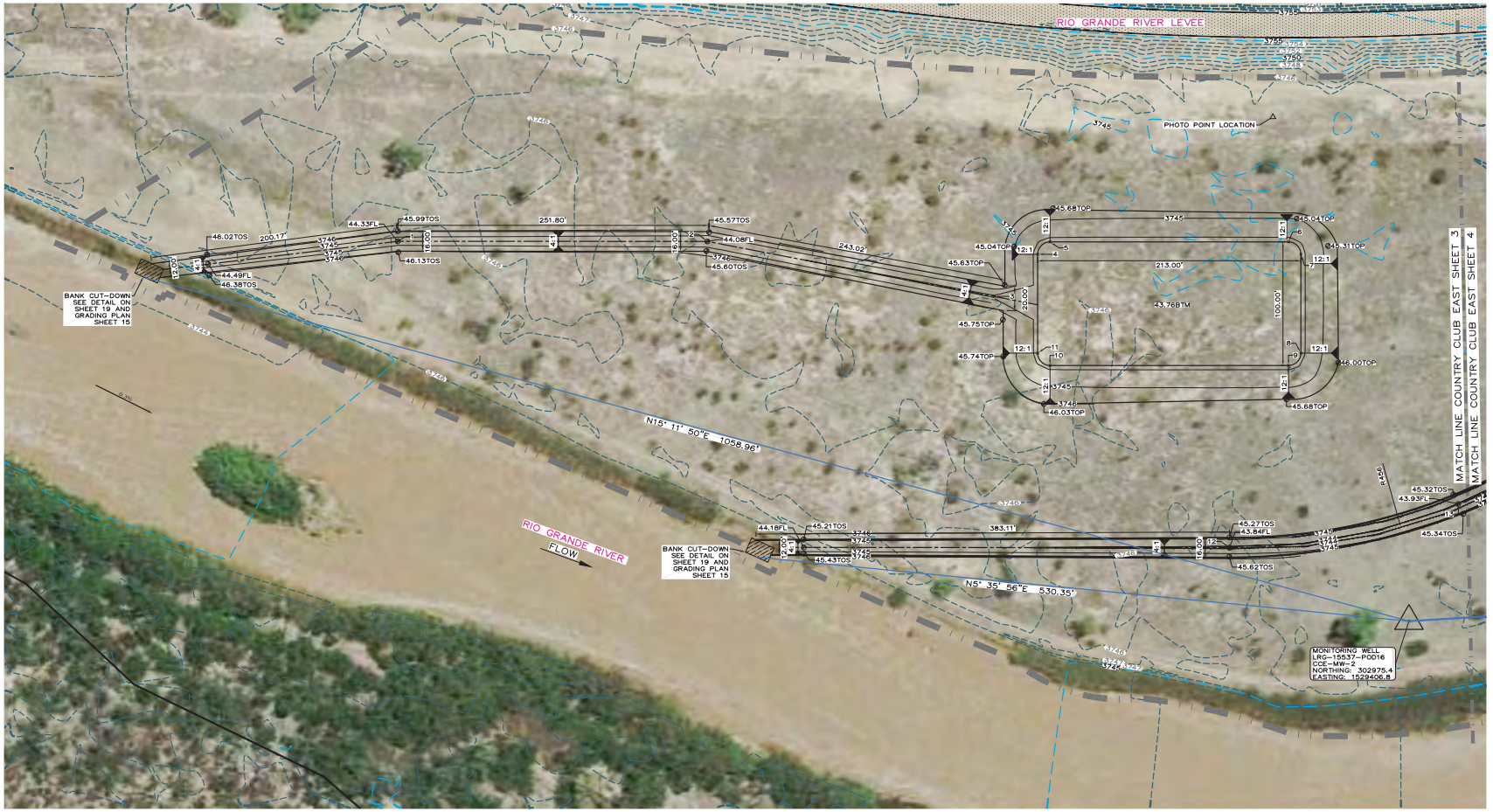
Date : 2017/12/15
T.O. # 141039-022.005
Engineer : M Dublin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
14
OF 20

Date: Jan 25, 2018 - 4:32pm User:Gabriel
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\North and South Planting Plans.dwg
Layout Name: ANAP PLANTING - 14



SITE 28 - COUNTRY CLUB EAST GRADING PLAN

SCALE: 1" = 40'

SITE 28 – COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

	PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
	RIVER LEVEE
	PEDESTRIAN/BIKEPATH
	APPARENT PROPERTY BOUNDARY
△	MONITORING WELL
3915	FINISHED MAJOR CONTOUR
3914	FINISHED MINOR CONTOUR
3915	EXISTING MAJOR CONTOUR
3914	EXISTING MINOR CONTOUR
@14.55TOP	TOP OF POND
@14.55BTM	BOTTOM OF POND
@14.55TOS	TOP OF SWALE
@14.55FL	FLOWLINE
4H:1V	HORIZONTAL/VERTICAL SLOPE

POINT TABLE		
POINT#	LATITUDE	LONGITUDE
1	N31° 50' 04.97"	W106° 36' 23.34"
2	N31° 50' 02.49"	W106° 36' 23.33"
3	N31° 50' 00.20"	W106° 36' 23.84"
4	N31° 49' 59.85"	W106° 36' 23.44"
5	N31° 49' 59.75"	W106° 36' 23.32"
6	N31° 49' 57.84"	W106° 36' 23.32"
7	N31° 49' 57.74"	W106° 36' 23.43"
8	N31° 49' 57.74"	W106° 36' 24.36"
9	N31° 49' 57.84"	W106° 36' 24.48"
10	N31° 49' 59.75"	W106° 36' 24.48"
11	N31° 49' 59.85"	W106° 36' 24.37"
12	N31° 49' 58.30"	W106° 36' 26.19"
13	N31° 49' 56.47"	W106° 36' 25.77"

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Disclaimer

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST GRADING ~

Plan Revisions

Date : 2018/01/23
T.O. # 14202-022-005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number

15

OF 20

Date: Jan 25, 2018 - 9:06am User:Nathan
Drawing: P:\14202-022-005\14202-005 BWC Reach Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drawi.dwg
Layout Name: CC-15

POINT TABLE		
POINT#	LATITUDE	LONGITUDE
14	N31° 49' 56.16"	W106° 36' 25.61"
15	N31° 49' 55.51"	W106° 36' 25.16"
16	N31° 49' 55.46"	W106° 36' 24.55"
17	N31° 49' 55.45"	W106° 36' 24.39"
18	N31° 49' 53.94"	W106° 36' 23.01"
19	N31° 49' 53.80"	W106° 36' 23.03"
20	N31° 49' 53.31"	W106° 36' 23.76"
21	N31° 49' 53.33"	W106° 36' 23.92"
22	N31° 49' 54.84"	W106° 36' 25.30"
23	N31° 49' 54.98"	W106° 36' 25.28"
24	N31° 49' 52.95"	W106° 36' 22.83"
24	N31° 49' 52.95"	W106° 36' 22.83"
25	N31° 49' 50.77"	W106° 36' 22.62"
25	N31° 49' 50.77"	W106° 36' 22.62"
26	N31° 49' 49.43"	W106° 36' 23.49"
26	N31° 49' 49.43"	W106° 36' 23.49"
27	N31° 49' 50.91"	W106° 36' 24.93"
27	N31° 49' 50.91"	W106° 36' 24.93"
28	N31° 49' 48.95"	W106° 36' 23.77"
28	N31° 49' 48.95"	W106° 36' 23.77"

SITE 28 - COUNTRY CLUB EAST GRADING PLAN

SCALE: 1" = 40'

SCALE: 1"=40'

SITE 28 — COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

- PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
- RIVER LEVEE
- PEDESTRIAN/BIKEPATH
- APPARENT PROPERTY BOUNDARY
- MONITORING WELL
- 3915 FINISHED MAJOR CONTOUR
- 3914 FINISHED MINOR CONTOUR
- 3915 EXISTING MAJOR CONTOUR
- 3914 EXISTING MINOR CONTOUR
- 14.55TOP TOP OF POND
- 14.55BTM BOTTOM OF POND
- 14.55TOS TOP OF SWALE
- 14.55FL FLOWLINE
- 4H:1V HORIZONTAL/VERTICAL SLOPE

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NM1C Professional Resources for Damage Prevention

Disclaimer

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST GRADING PLAN ~

Plan Revisions

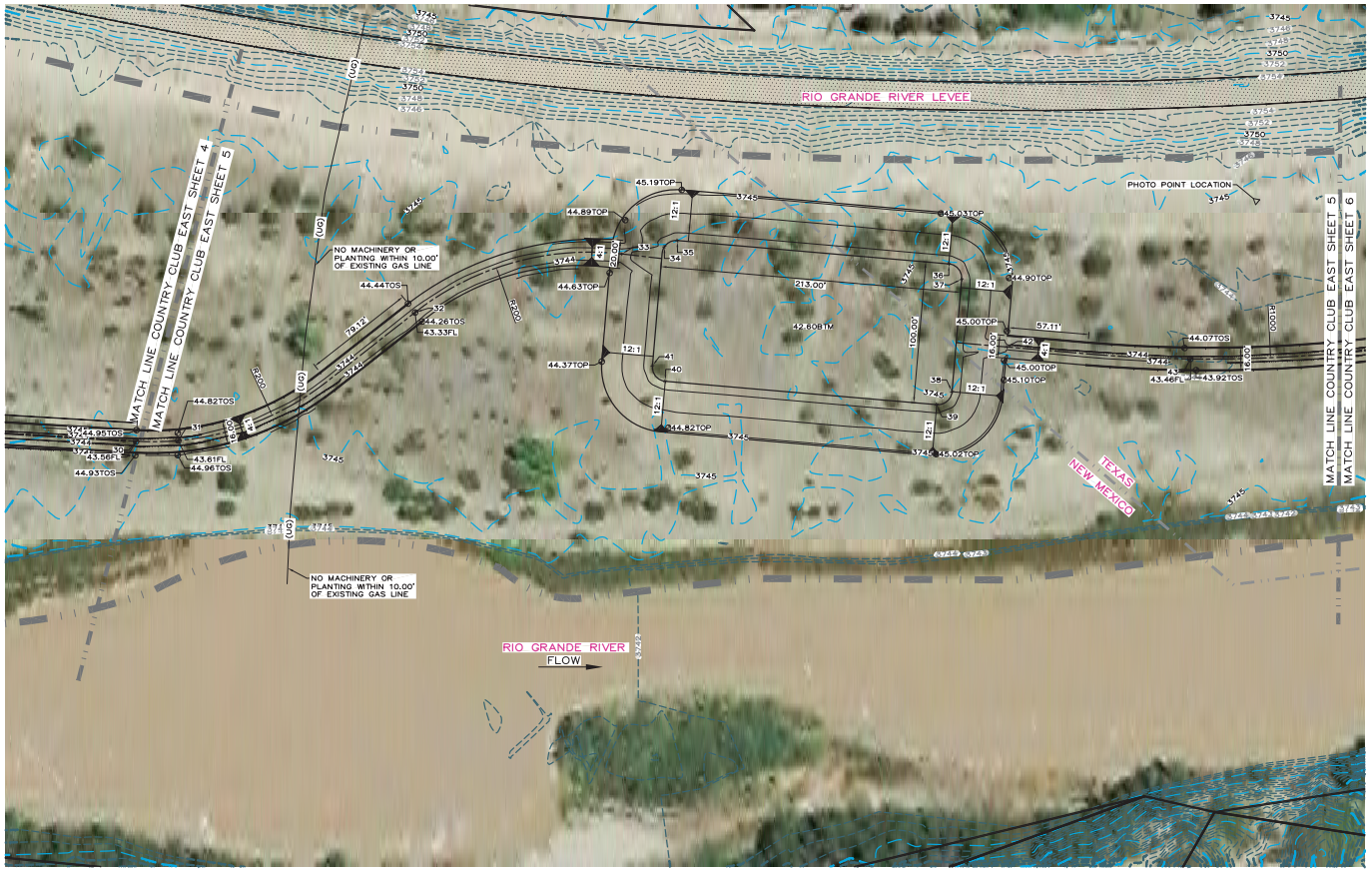
Date : 2018/01/23
T.O. # 14029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
16
OF 20

Date: Jan 25, 2018 - 9:09am User:Nathan
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: CC-16



SITE 28 - COUNTRY CLUB EAST GRADING MAP

SCALE: 1" = 40'

SCALE: 1"=40'

SITE 28 – COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

	PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
	RIVER LEVEE
	PEDESTRIAN/BIKEPATH
	APPARENT PROPERTY BOUNDARY
△	MONITORING WELL
3915	FINISHED MAJOR CONTOUR
3914	FINISHED MINOR CONTOUR
3915	EXISTING MAJOR CONTOUR
3914	EXISTING MINOR CONTOUR
@14.55TOP	TOP OF POND
@14.55BTM	BOTTOM OF POND
@14.55TOS	TOP OF SWALE
@14.55FL	FLOWLINE
4H:1V	HORIZONTAL/VERTICAL SLOPE

POINT TABLE		
POINT#	LATITUDE	LONGITUDE
31	N31° 49' 46.68"	W106° 36' 22.40"
32	N31° 49' 45.70"	W106° 36' 20.51"
33	N31° 49' 44.65"	W106° 36' 19.25"
34	N31° 49' 44.42"	W106° 36' 19.02"
35	N31° 49' 44.36"	W106° 36' 18.92"
36	N31° 49' 42.64"	W106° 36' 17.97"
37	N31° 49' 42.50"	W106° 36' 18.02"
38	N31° 49' 42.17"	W106° 36' 18.86"
39	N31° 49' 42.21"	W106° 36' 19.01"
40	N31° 49' 43.94"	W106° 36' 19.97"
41	N31° 49' 44.07"	W106° 36' 19.91"
42	N31° 49' 41.99"	W106° 36' 18.32"
43	N31° 49' 40.84"	W106° 36' 17.64"

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST GRADING PLAN ~

Plan Revisions

Date : 2018/01/23
T.O. # 14102P022.005
Engineer : M.Dublin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

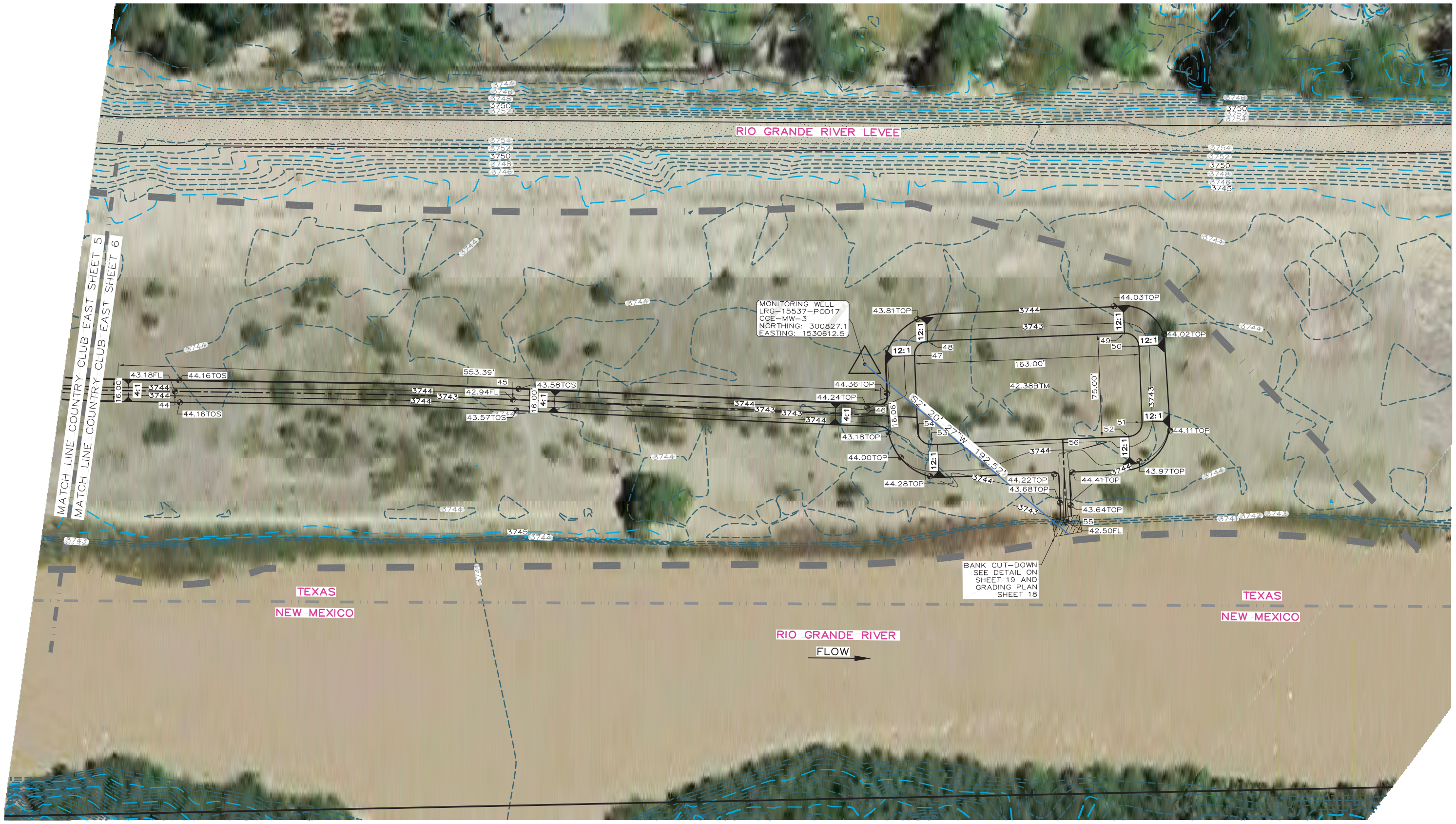
IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number

17

OF 20

Date: Jan 25, 2018 - 9:12am User:Nathan
Drawing: P:\14102P022.005\Dwg\Rio Grande Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Detail.dwg
Layout Name: CC-17



SITE 28 - COUNTRY CLUB EAST GRADING PLAN

SCALE: 1"=40'

SITE 28 – COUNTRY CLUB EAST SHEET MAP

NOT TO SCALE

PROJECT LEGEND

- PROJECT LIMITS (ALREADY HAVE IDENTIFIED)
- RIVER LEVEE
- PEDESTRIAN/BIKEPATH
- APPARENT PROPERTY BOUNDARY
- MONITORING WELL
- 3915 FINISHED MAJOR CONTOUR
- 3914 FINISHED MINOR CONTOUR
- 3915 EXISTING MAJOR CONTOUR
- 3914 EXISTING MINOR CONTOUR
- 14.55TOP TOP OF POND
- 14.55BTM BOTTOM OF POND
- 14.55TOS TOP OF SWALE
- 14.55FL FLOWLINE
- 4H:1V HORIZONTAL/VERTICAL SLOPE

POINT TABLE		
POINT#	LATITUDE	LONGITUDE
44	N31° 49' 39.44"	W106° 36' 16.54"
45	N31° 49' 37.49"	W106° 36' 14.86"
46	N31° 49' 35.41"	W106° 36' 13.14"
47	N31° 49' 35.40"	W106° 36' 12.50"
48	N31° 49' 35.39"	W106° 36' 12.34"
49	N31° 49' 34.30"	W106° 36' 11.27"
50	N31° 49' 34.16"	W106° 36' 11.28"
51	N31° 49' 33.81"	W106° 36' 11.77"
52	N31° 49' 33.82"	W106° 36' 11.94"
53	N31° 49' 34.91"	W106° 36' 13.00"
54	N31° 49' 35.02"	W106° 36' 13.01"
55	N31° 49' 33.81"	W106° 36' 12.82"
56	N31° 49' 34.12"	W106° 36' 12.39"

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~RIO GRANDE~
~RESTORATION PROJECT~
~ SITE 28 - COUNTRY CLUB EAST GRADING PLAN ~

Plan Revisions

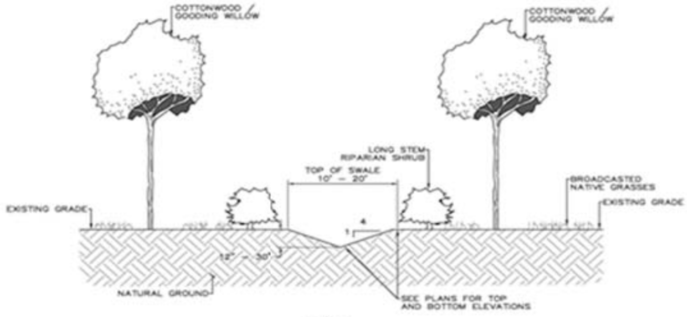
Date : 2018/01/23
T.O. # 14029-022.005
Engineer : M.Dubbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

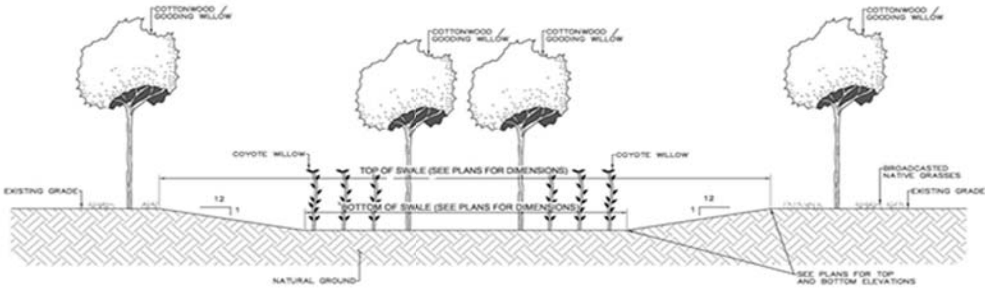
IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
18
OF 20

Date: Jan 25, 2018 - 9:14am User:Nathan
Drawing File: Y:\000000-000 IBWC River Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Drew.dwg
Layout Name: CC-18

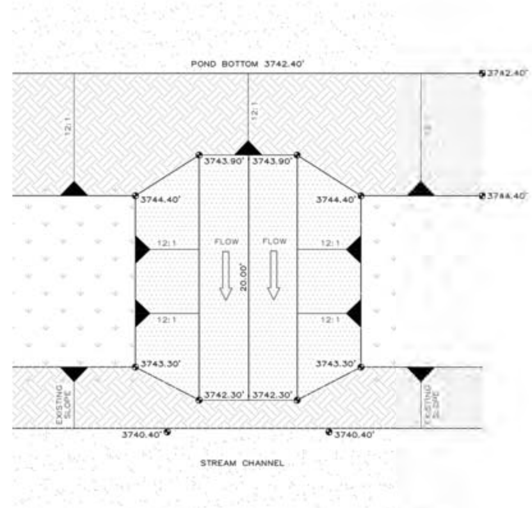


SWALE
SCALE: NOT TO SCALE

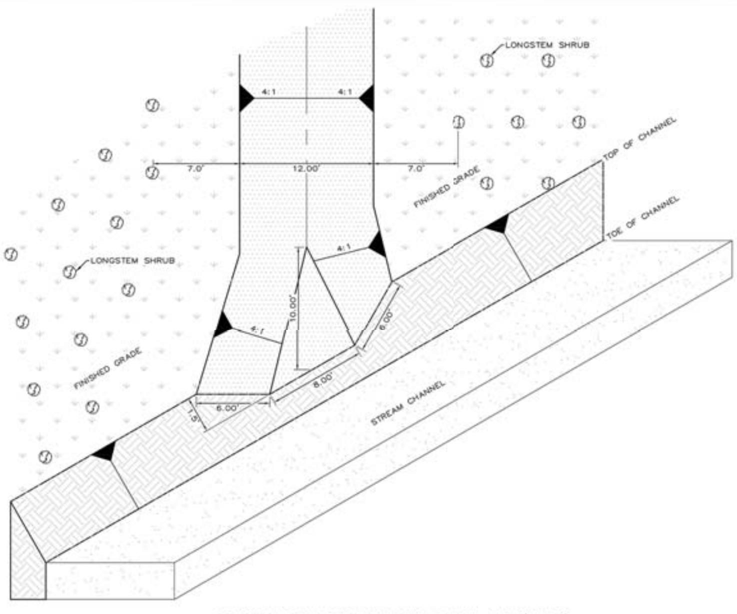


EXPANDED SWALE DETAIL
SCALE: NOT TO SCALE

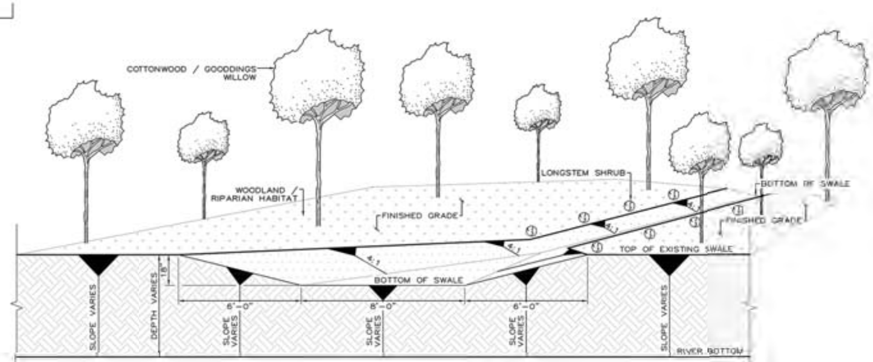
FLOOD PLAIN CONNECTIVITY DETAIL



COUNTRY CLUB EAST CHANNEL BANK CUT (OUTLET)
SCALE: NOT TO SCALE



COUNTRY CLUB EAST CHANNEL BANK CUT (INLET)
SCALE: NOT TO SCALE



COUNTRY CLUB BANK CUT
SCALE: NOT TO SCALE

Texas 811 Know what's below. Call before you dig.

New Mexico One Call, inc. NMOC Call 2 days before you dig! Dial 811 or 1-800-321-2537

Disclaimer

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~RIO GRANDE~
~RESTORATION PROJECT~
~ GENERAL DETAILS ~

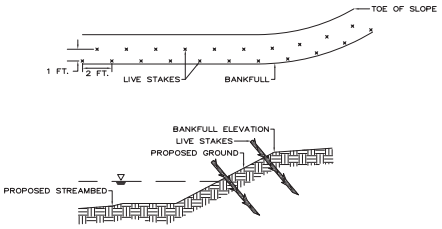
Plan Revisions

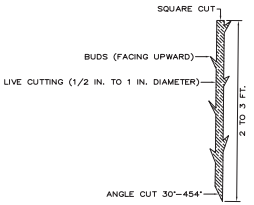
Date: 2018/01/23
T.O. # 141029-022.005
Engineer: M.Dubbin
Drawn by: G. Chavez
Checked by: A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
19
OF 20



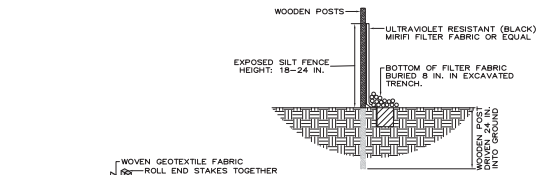


LIVE STAKE
SCALE: NOT TO SCALE

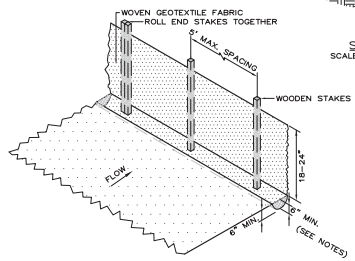
NOTES:

1. LIVE STAKES SHALL BE SPACED APPROXIMATELY 2' ON CENTER, WITH RANDOM SPACING, BETWEEN THE BANKFULL AND EXISTING STREAM BED.
2. LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY 3/4 OF LIVE STAKE IS WITHIN GROUND.
3. A STARTER HOLE MAY BE REQUIRED IF STAKING THROUGH MATTING, ROCK OR COMPACTED SOILS.
4. IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET.
5. ALL MATERIALS ARE TO BE APPROVED BY ENGINEER OR ENGINEER'S ONSITE CONSTRUCTION MANAGER.

DETAIL–LIVE STAKING (OPTIONAL)
SCALE: NOT TO SCALE



SIDE VIEW
SCALE: NOT TO SCALE

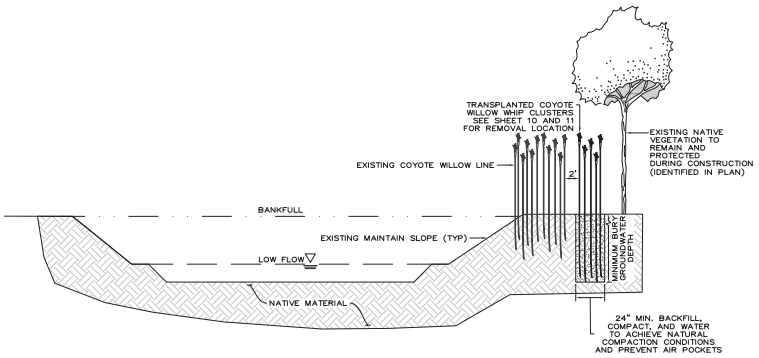


ISOMETRIC VIEW
SCALE: NOT TO SCALE

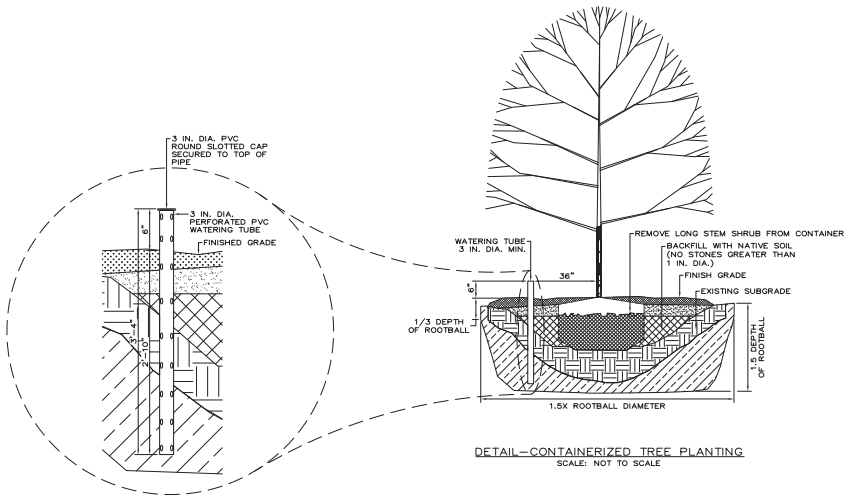
NOTES:

1. SILT FENCE SHALL BE INSTALLED ACROSS SLOPES ON THE CONTOUR LINE.
2. ATTACH FILTER FABRIC TO WOODEN STAKES WITH STAPLES, HOGRINGS OR OTHER MATERIALS APPROVED BY THE ENGINEER.
3. WOODEN STAKES SHALL BE INSTALLED ON THE DOWNHILL SIDE OF FILTER FABRIC.
4. BURY THE BOTTOM 12 INCHES OF FILTER FABRIC IN A 6"X6" TRENCH (TO PREVENT SEDIMENT FROM ESCAPING UNDER THE FENCE) AND BACK FILL WITH SOIL.
5. JOIN SILT FENCE SECTIONS BY ROLLING END STAKES TOGETHER TO CREATE AN UNBROKEN SEDIMENT BARRIER.
6. MULCH BERMS MAY BE APPROVED BY THE ENGINEER ON A CASE–BY–CASE BASIS.
7. SILT FENCE SHALL BE PLACE AROUND THE STAGING AND STOCKPILING AREA.
8. THE SILT FENCING PERIMETER SHALL BE CHECKED AFTER ALL RAIN EVENTS.

DETAIL–SILT FENCE
SCALE: NOT TO SCALE



TRANSPLANTING COYOTE WILLOWS
SCALE: NOT TO SCALE



DETAIL–CONTAINERIZED TREE PLANTING
SCALE: NOT TO SCALE

~RIO GRANDE~
~RESTORATION PROJECT~
~ PLANTING DETAILS ~

Plan Revisions

Date : 2008/01/23
T.O. # 141039-023.005
Engineer : M.Dabbin
Drawn by : G. Chavez
Checked by : A. Guerra

Engineer's Stamp

IDEALS, inc
848 W. HADLEY AVENUE
LAS CRUCES, NM 88005
WEBSITE:www.ideals-inc.com
PHONE:575-532-9652 FAX:575-532-5045

Sheet Number
20
OF 20

Disclaimer

Upon acceptance of these plans for construction, the contractor agrees to familiarize himself with the project and verify the location and correctness of any and all appurtenances, right-of-way, property lines, elevations, obstructions, hazards, or conflicts that may exist upon examination of actual field conditions, design of these plans was based on available information and interpretation of available data. any discrepancies discovered, shall be immediately brought to the attention of the engineer for evaluation, the contractor shall accept all liability and risks for construction proceeding prior to engineers evaluation.

Date: Jan 23, 2008 - 12:10pm User:Gilbert
Drawing File: C:\Documents and Settings\Gilbert\Desktop\Rio Grande Restoration Project\Dwg\Rio Grande Restoration Project - South Sites - Dtrail.dwg
Layout Name: D-20

APPENDIX B

Planting Maps and Planting Sheets

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

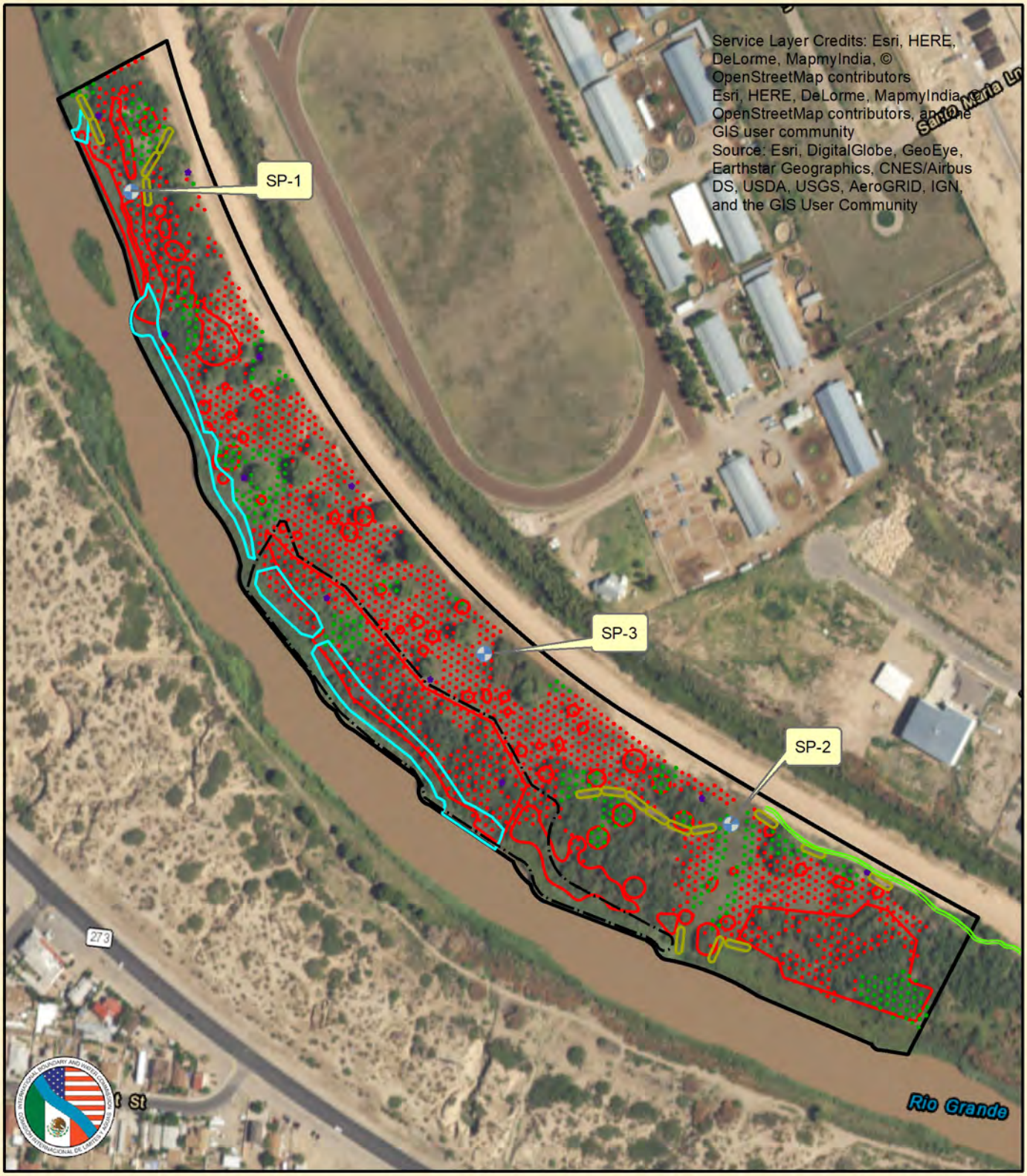
N

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

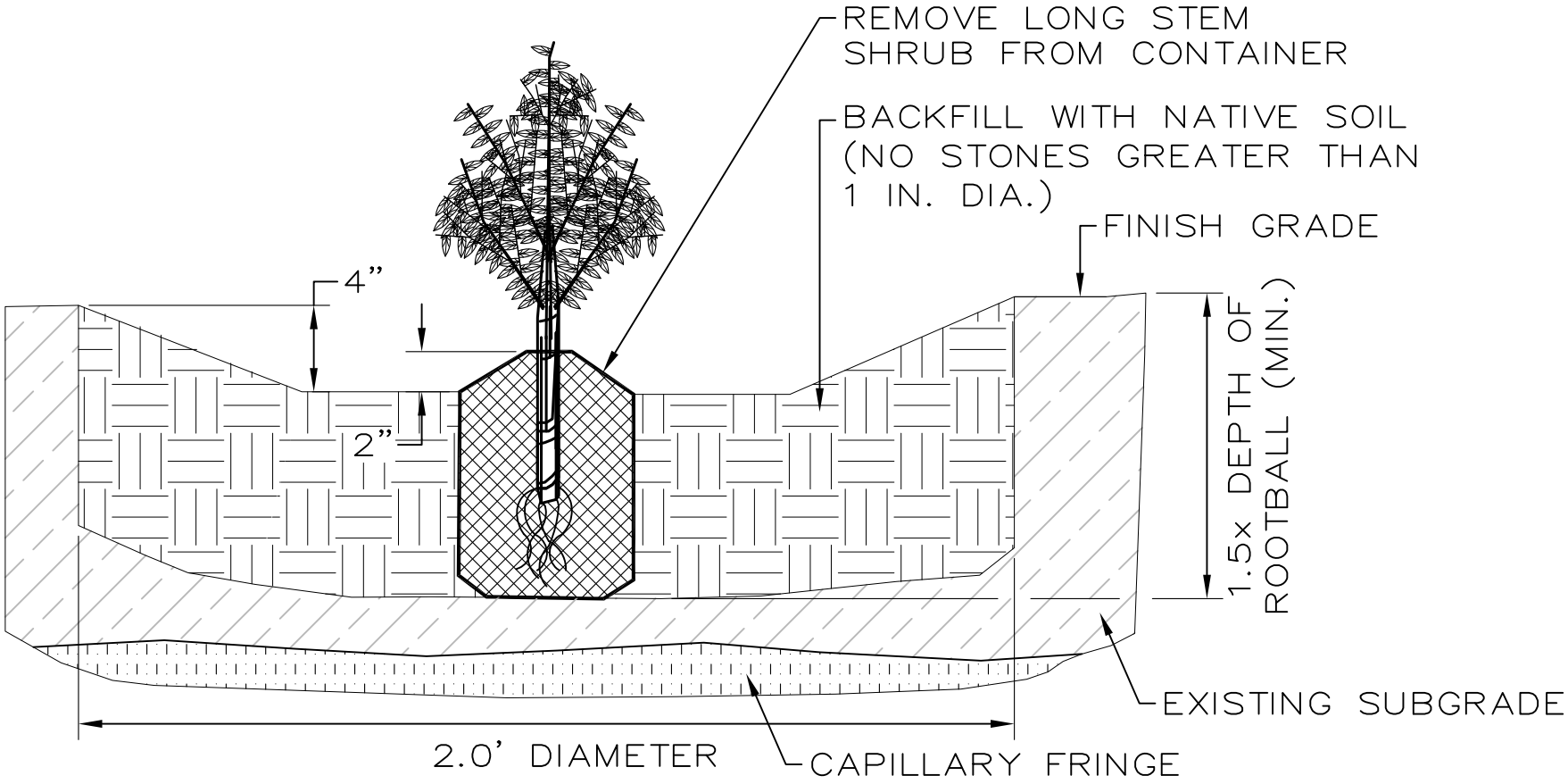
N

1:4,500

Feet
0 137.5 275 550

Meters
0 37.5 75 150

IDEALS-AGEISS, LLC



SHRUB PLANTING (TYP.)

SCALE: NOT TO SCALE

Planting Field Sheet

Site Country Club Date Planted See Below

Participants IDEALS Auger Depth 9FT Auger / 9FT 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, 245LF x 2.5 willow/LF = 615 willow

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

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

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

31.826651 X -106.604111, 106LF 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 *	Hydra 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			

Willows in/near Flycatcher habitat area

General Location of trees planted Others Throughout entire Site Area (acres) ~29ac

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

31.80274 X -106.57842, 355LF x 2.5 will/LF = 888 coyote willow

31.80388 X -106.58025, 835 LF x 2.5 will/LF = 2088 coyote willow

31.80433 x -106.58052, 244LF x 2.5 will/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" x 106°33'50.97", 250LF x $\frac{2.5 \text{ willow}}{LF}$ = 625 willow
31°47'58.06" x 106°33'47.51", 159LF x $\frac{2.5 \text{ willow}}{LF}$ = 397 willow
31°47'57.74" x 106°33'42.00", 53LF x $\frac{2.5 \text{ willow}}{LF}$ = 133 willow
*153LF (385 willow) Mowed By IBWC Crews, adjacent to Bridge

Planting Field Sheet

Site _____ Date Planted _____

Participants _____ Auger Depth _____

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted _____ Area (acres) _____

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

Planting Field Sheet

Site: Country Club East Date Planted: 2/7/18 - 2/8/18

Participants: IDEALS Auger Depth: ~9' deep trench

Species	# Planted	Stock/Origin	Comments
Coyote Willow	950	transplants	
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: along river bank Area (acres): _____

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

---

Planting Field Sheet

Site: Sunland Park Date Planted: 2/26/19 - 2/28/19

Participants: G. Biel Auger Depth: ~9'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	295	Hydra	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: near flycatcher area Area (acres): ~

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

Planting Field Sheet

Site: Country Club East Date Planted: 10/16 - 11/7/18

Participants: G. Biel, L. Ross Auger Depth: ~3-4'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	2320	High Desert Native Plants	three-leaf sumac (342) four-wing saltbush (1312)
Other Arizona ash	10	High Desert	Andersen wolfberry (544) NM Olive (122)

General Location of trees planted: along channels from swales Area (acres): ~1.2

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

---

Planting Field Sheet

Site: Sunland Park Date Planted: 10/1 - 10/15/18

Participants: G. Biel, L. Ross Auger Depth: ~3-4'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			NM Olive (122)
Long Stem Shrub (specify in comments)	1152	High Desert Native Plants	three-leaf sumac (178) Chamiza (446)
Other Arizona ash	10	High Desert	four-wing saltbush (233) Andersen wolfberry (179)

General Location of trees planted: throughout site Area (acres): 5.35

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

Planting Field Sheet

Site Anapra Bridge Date Planted 10/1 - 10/15/18

Participants G. Biel, L. Ross Auger Depth ~3-4'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	330	High Desert Native Plants	110 of ea Chamiza, four-wing salt bush, Anderson wolfberry
Other Arizona ash	10	High Desert	

General Location of trees planted near path Area (acres) 1.1

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

---

Planting Field Sheet

Site _____ Date Planted _____

Participants _____ Auger Depth _____

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted _____ Area (acres) _____

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

Planting Field Sheet

Site Country Club East Date Planted 12-11-19

Participants Gil Martinez, Jimmy Martinez Auger Depth 3 1/2'
~~Todd Hurlig, Alfred Cordero~~

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	225	Hydra Nursery	Desert willow, Seep willow, NM Olive Three Leaf sumac, False Indigo
Other			

General Location of trees planted Northern 1/3 Area (acres) _____

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

Planting Field Sheet

Site _____ Date Planted _____

Participants _____ Auger Depth _____

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted _____ Area (acres) _____

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

Planting Field Sheet

Site: Country Club East Date Planted: 12-12-19

Participants: Gil M., Todd H., Alfred C., Jimmy M., Marcos C. Auger Depth: 3.5'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	225	Hydra Nursery	Baccharis, NM olive, False Indigo Three Leaf Sumac
Other			

General Location of trees planted: Southern 1/3 Area (acres): _____

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

Planting Field Sheet

Site: Country Club East Date Planted: 12-13-19

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 3.5'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	129	Hydra Nursery	Baccharis, NM olive, False Indigo, Three Leaf Sumac
Other			

General Location of trees planted: Middle 1/3 Area (acres): _____

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

Planting Field Sheet

Site Sunland Park Date Planted 12-13-19

Participants Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth 3.5'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)	33	Hydra Nursery	Baccharis, NM olive, Three Leaf Sumac, False Indigo
Other			

General Location of trees planted 4 sections from North Boundary heading South Area (acres) _____

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

Planting Field Sheet

Site _____ Date Planted _____

Participants _____ Auger Depth _____

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted _____ Area (acres) _____

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

Planting Field Sheet

Site Sunland Park Date Planted 12-17-19

Participants Gil M., Alfred C., Jimmy M., Marcos C., Todd H. Auger Depth 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	30	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted Northern 1/3 Sunland site Area (acres) _____

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

Planting Field Sheet

Site Sunland Park Date Planted 12-18-19

Participants Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	80	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted Northern 1/3 Sunland site cont. Area (acres) _____

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

Planting Field Sheet

Site: Sunland Park Date Planted: 12-19-19

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	106	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Finished Northern 1/3 moved to Middle 1/3 of Sunland site. Area (acres): _____

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

Planting Field Sheet

Site: Sunland Park Date Planted: 12-20-19

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	100	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Middle 1/3 Sunland Area (acres): _____

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

Planting Field Sheet

Site: Sunland Park Date Planted: 12-23-19

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	101	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Middle 1/3 continued moving to Southern 1/3 of Sunland. Area (acres):

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

Planting Field Sheet

Site: Sunland Park Date Planted: 12-24-19

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow	30	Hydra Nursery	
Cottonwood			
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Southern 1/3 Sunland Area (acres):

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

Planting Field Sheet

Site: Anapra — Date Planted: 1/7/20

Participants: Gil M., Alfred C., Jimmy M., Marcos C. — Auger Depth: 4' - 6'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood	43	Hydra Nursery	Depth of water was observed between 4'-6' feet.
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Anapra site both sides of the bridge. — Area (acres):

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

Planting Field Sheet

Site: Sunland Park — Date Planted: 1/8/20

Participants: Gil M., Alfred C., Jimmy M., Marcos C. — Auger Depth: 8' - 10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood	96	Hydra Nursery	
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Cottonwoods spread out and planted on entire site. — Area (acres):

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

Planting Field Sheet

Site: Country Club East Date Planted: 1/9/20

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8'-10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood	120	Hydra Nursery	
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Southern section to middle section of site planted. Area (acres): _____

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

Planting Field Sheet

Site: Country Club East Date Planted: 1/10/20

Participants: Gil M., Alfred C., Jimmy M., Marcos C. Auger Depth: 8'-10'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood	109	Hydra Nursery	
Long Stem Shrub (specify in comments)			
Other			

General Location of trees planted: Finished middle section and Completed planting to boundary of northern section. Area (acres): _____

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

Planting Field Sheet

Site Country Club East Date Planted 1/14/20

Participants Ben, Alfred C. Auger Depth 1'-2'

Species	# Planted	Stock/Origin	Comments
Coyote Willow			
Goodding's Willow			
Cottonwood			
Long Stem Shrub (specify in comments)			
Other	9	Hydra Nursery	Ash trees planted

General Location of trees planted 3 groups of 3. North 1/3, middle 1/3, and South 1/3 Area (acres) _____

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

APPENDIX C

Monitoring Data Sheets

Pre-Implementation Monitoring Datasheets

Pre-Implementation Qualitative Monitoring Field Sheet

Site: County 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 in south
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, Rufous 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	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: Langevin, 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 multiple native grasses

Observed Wildlife: Killdeer, Mallard, Yellow-rumped Warbler, Northern Flicker, Verdin, 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, Perrin LaVine Houghton   Target Habitat: Riparian (East bank)

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Coyote Willow	Moderate (in strip along river)	5% of whole site	along river in about 10 foot strip
Bacharris	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	60%	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, PHAI, 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. Argo 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 crescents, 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 352033 E 3519 290 N

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 (average of 3 subplot counts) A = Alive, D = Dead Average = Sum A/ (Sum D + Sum A) see other sheet				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	~~255~~ 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

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

Permanent Plot #2 350563 E 3519651 N

transplant

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

Notes: transplants thriving

Random Plot #2 350516 E 3519706 N

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

Notes: some scattered mesquite

Permanent Plot #3 350427 E 3519773 N

transplant

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

Notes:

Random Plot #3 350335 E 3519959 N

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

Notes:

Permanent Plot #4 350401 E 3519916 N

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

Notes:

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

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

Participants: B. Zvolanek, W. Arft 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-tailed jackrabbit; Gambel's; 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

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~~ Gooding & 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 }

281975

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, cyperus, grass, fig fruit, 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 sunflowers.

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 Goodings to the ~~NE~~ SE are very stressed or dead.

# of VS or Dead between plots

Cotton 16 Very stressed

GW: 12 Very Stressed.

green-fuss

28197S

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

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

Participants BRYAN ZWILLNER, 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	08/29/18	07:49	220cm	198cm	6.49 feet
	CCE-MW-2	3748.67	3745.48	3.19	08/29/18	09:02	181cm	85cm	2.79 feet
	CCE-MW-3	3747.23	3743.96	3.27	08/29/18	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%	
Distichlis 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. Needs 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 vining 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%				A	A	A		A-376 S-949 D-78 K-57 T-1,355
					D	D	D		
Long Stem Shrub (specify in	K=4.2%				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, Merlin, 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 (39.3")
	VC-MW-2	3754.72	3751.16	3.56	10/17/18	1520	111.3"	72"	183cm 72 inches 6ft (39.3")
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 (43.3")
	VA-MW-2	3780.41	3776.76	3.43	10/19/18	0836	90.5"	41.7"	106cm 41.7 inches 3.5ft (48.8")
Vinton B	VB-MW-1	3777.12	3774.04	3.08	10/19/18	0901	90.6"	48"	122cm 48 inches 4ft (42.6")
	VB-MW-2	3777.31	3773.60	3.71	10/19/18	0914			Could not open lock

Post-restoration Monitoring Datasheets

April 2019

Cressa truxillensis 1%-2%
Sesuvium verrucosum 2%
Apocynum cannabinum ~~1%~~ < 1%
Astragalus lentiginosus 1%
Sporobolus airoides 5%
Phragmites australis
Prosopsis glandulosa
Suaeda moquinii
Cyclolomia atriplicifolium
Solanum elaeagnifolium
Dieteria canescens
Senecio flaccidus
Lepidium fasciculatum
Descurainia pinnata
Sysimbrium altissimum

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Anapra Date: 04/18/19

Participants: BRYAN ZVOLANEK, PERRIANNE HOUGHTON Target Habitat: RIPARIAN RESTORATION

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Screwbean Mesquite	Moderate	15%	healthy, scattered groves + individuals
Coyote Willow	High on banks	10%	banks only
Baccharis Salicifolia	low-moderate		
Goodding's Willow	Sporadic	1%	Native individuals
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	Moderate	5%	lots of reshoots
Cynodon dactylon	high	30%	most prevalent ground cover
Kochia scoparia	low	2%	where disturbed ground

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 70%

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		thriving			A	A	A	94-A	doing well
					D	D	D		
Goodding's Willow		stressed			A	A	A	3-A	many stressed or dead/missing
					D	D	D	3-S 1-D	
Cottonwood		stressed			A	A	A	14-S 2-D	many stressed or dead/missing survived
					D	D	D		
Long Stem Shrub (specify in		normal			A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Seems to be missing some trees/plantings. Shrubs look good. Tamarisk coming back despite beetle predation. Heaviest Tamarisk of all sites.

Observed Wildlife: white-winged dove, Snowy Egret, Red tailed Hawk, Northern Mockingbird, Western Kingbird, belted kingfisher, Cliff swallow, Mourning dove, ladder-backed woodpecker, Black phoebe house Sparrow, Gambel's quail, Common yellowthroat, Verdin, Greater roadrunner, yellow-faced pocket-gopher, Mexican mallard

Photos Taken:

Site: Anapra

Date: 04/18/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	20		
Goodding's willow	2		
Cottonwood			
Screwbean	1		
Buchanis	1		
tamarisk	1		

Notes: _____

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	59		
Goodding's willow			
Cottonwood			

Notes: _____

Permanent Plot #3

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

Notes: Missing trees?

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			

Notes: _____

352129
3519290

Random Plot #1

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	1	1	
Cottonwood		1	
Screwbean	24		
tamarisk	15		
honey mesquite	1		

Notes: _____

351688
3519331

Random Plot #2

Species	Alive	Stressed	Dead
Coyote willow	15		
Goodding's willow			
Cottonwood		6	
Screwbean	1	4	

Notes: Coyote Willows not transplants, previously existing

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow		2	
Cottonwood		7	

Notes: _____

351849
3519343

351603
3519343

Prosopis glandulosa · 1·
Baccharis salicifolia 1·1·
Funastrum sp. 1·1·
Gaura mollis 1·1·
Machaeranthera tanacetifolia 1·1·
Lycium berlandieri torreyi
Heliotropum curassavicum
Ratibida columnifera
Phragmites australis
Sporobolus airoides
Sporobolus wrightii
Elaeagnus angustifolia
Dimorphocarpa wislizeni
Eressia tmandlus
Schoenoplectus pungens
Phoradendron macrophyllum
Solanum elaeagnifolium
Sphaeralcea angustifolia
Pescusania pinnata
Sisymbrium altissimum

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Sunland park
Date: 04/18/19
Participants: Bryan Zwolanek, Perrianne Houghton
Target Habitat: Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Screwbean Mesquite	Sporadic	5·1·	Scattered Groves
Cottonwood	Sporadic	2·1·	Mature trees
Coyote Willow	High (banks only)	10·1·	high on banks
Honey Mesquite	low	1·1·	
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar		1·1·	coming back in spots towards river
Kochia scoparia	moderate - low	2·1·	not too bad
Cynodon dactylon	Moderate-high	10·1·	

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 85·1·

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		thriving			A	A	A	735-A 46-S 161-D	98·1· survival
					D	D	D		
Goodding's Willow		stressed			A	A	A	65-A 9-S 41-D	80·1· survival
					D	D	D		
Cottonwood		stressed			A	A	A	7-A 22-S 4-D	75-80·1· survival
					D	D	D		
Long Stem Shrub (specify in		normal			A	A	A		100·1· survival
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Some tamarisk coming back, esp. towards river. Cottonwoods + Goodding poles stressed (5·1·-10·1· survival). Transplanted Coyotes doing well. Funastrum strangled trees.

Observed Wildlife: Verdin, Western kingbird, black-chinned hummingbird, Gambel's Quail, House finch, Bell's Vireo Northern mockingbird, yellow-rumped warbler, phainopepla, crissal thrasher, mourning dove Chipping Sparrow, white-throated sparrow, ladder-backed woodpecker, desert cottontail yellow-faced pocket gopher. Butterflies: Queen, Checkered white, field crescent pipevine swallowtail, great purple hairstreak. Claying eggs on mistletoe!)

Photos Taken:

funastrum has strangled some trees. Overall plantings better near river, very poor away
4 brush piles.

Site: Sunland Park

Date: 04/18/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood		3	4
tamarisk	43		
Screwbean	4		

Notes: _____

Random Plot #1

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

350835
3519588

Notes: _____

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	520		160
Goodding's willow	1		eleven
Cottonwood			

Notes: _____

Random Plot #2

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	(1)7	19	
Screwbean	3		

350587
3519703

Notes: paranthetical cottonwood on pre-existing tree

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	215	91	
Goodding's willow	36	12	8
Cottonwood			
tamarisk	1		
baccharis	1		

Notes: Goodding's doing well overall at this plot.

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	3	6	4
Cottonwood			

~~350457~~
3519751
350483
3519751

Notes: Some Goodding's sprouting from base.

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	25	38	13
Cottonwood			

Notes: Funnstrum may have destroyed many. Hard to accurately count

Prosopsis glandulosa
Oenothera (Gaura) suffulta
Machaerathera tanacetifolia
Baccharis salicifolia
Schoenoplectis pungens
Ratibida columnifera
Gelolonia atriplicifolium
Asclepias fascicularis
Elymus sp.
Phragmites australis
Solanum elaeagnifolium
Sphaerophysa salsula
Cressa truxinellus
Sporobolus airoides
Suaeda . . . nuguinii
Dimorphocarpa wislizeni
Lepidium lasiocarpum
Descurainia pinnata
Si symbrium altissimum
Lycium torreyi
Apocynum cannabinum
Anemopsis californica
Pseudognaphalium stramineum
Verbena sp.
Cattail sp

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Country Club Date: 04/19/19

Participants: Bryan Zvolanek, Perrianne Houghten Target Habitat: RIPARIAN Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Screwbean Mesquite	Sporadic low	5%	scattered small groves
Coyote Willow	Moderate-High	10%	high along banks
Goodding Willow	Sporadic	<1%	Some mature individuals
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar	low	<1%	Very low, some resprouts
Cynodon dactylon	High	60%	most common grass
Kochia scoparia	low	2%	pretty low, mostly disturbed areas

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 85%

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		thriving			A	A	A	100-A	transplants close to 100% survival
					D	D	D		
Goodding's Willow		stressed			A	A	A	11-A 18-S 15-D	~60% survival
					D	D	D		
Cottonwood		stressed			A	A	A	18-A 22-A 19-D	~60% survival
					D	D	D		
Long Stem Shrub (specify in		normal			A	A	A		
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Best survival at this site, w/ watering definitely helping. There are still lots of knocked down trees in area. Kochia & tamarisk low. Shrubs doing well

Observed Wildlife: Northern mockingbird, mourning dove, white-winged dove, black-chinned hummingbird, greater roadrunner, chipping sparrow, lark sparrow, white-throated sparrow, yellow-rumped warbler, Wilson's warbler, common yellowthroat, killdeer, black-necked stilt, House finch, Gambel's Quail, Barn swallow, red-winged blackbird, Cliff swallow, Mexican mallard, Bell's Vireo, ladder-backed woodpecker, yellow-faced pocket-gopher

Photos Taken:

Butterflies: Orange sulphur, Clouded sulphur, Checkered white, Cabbage white, field crescent, Reakirt's blue, marine blue, western pygmy blue, Acmon blue

Site: Country Club

Date: 04/19/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	5	4	5
Cottonwood	2	4	1

Notes: _____

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	5	2	6

Notes: _____

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	100		
Goodding's willow		1	1
Cottonwood		3	

Notes: post missing? went to best area, closest to prior GPS coord.

Permanent Plot #4

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

Notes: _____

Random Plot #1

348210
3522389

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow		7	4
Cottonwood		1	

Notes: in new shrub plot

Random Plot #2

348077
3522572

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood	eaten	3	10

Notes: _____

Random Plot #3

347934
3523135

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	10	6	5
Cottonwood		2	1

Notes: far North end

Participants P. Houghton Date 4/18/19

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	Ca→TOC 3.28 44"	4/18/19	1415	139"	95"	WB→TOC = 234" - 96 = 139 - 44 = 95
	CCE-MW-2	3748.67	3745.48	3.19 38"	4/18/19	1525	114"	76"	WB→TOC = 222" - 108 = 114 - 38 = 76
	CCE-MW-3	3747.23	3743.96	~~3.27 39"~~	4/18/19	1436	128"	93"	WB→TOC = 224" - 86 = 128 - 35 = 93
Sunland Park	SP-MW-1	3741.37	3737.91	3.46 29"	4/18/19	1254	120"	91"	WB→TOC = 212" - 92 = 120 - 29 = 91
	SP-MW-2	3740.51	3737.08	3.43 47"	4/18/19	1216	132"	85"	WB→TOC = 181" - 49 = 132 - 47 = 85
	SP-MW-3	3740.35	3736.85	3.50 46"	4/18/19	1140	132"	86"	WB→TOC = 181" - 49 = 132 - 46 = 86
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41 46"	4/18/19	1118	99"	53"	WB→TOC = 144" - 45 = 99 - 46 = 53
	AB-MW-2	3738.49	3735.14	3.35 46"	4/18/19	1107	108"	62"	WB→TOC = 183" - 75 = 108 - 46 = 62

Post-restoration Monitoring Datasheets

August 2019

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Anapra Date 8/21/19

Participants K. Hucks / D. Houghton Target Habitat Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar			
See attached			

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 60%

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		Thriving			A	A	A		Plantings survivors, mowed growing back
					D	D	D		
Goodding's Willow		Stressed			A	A	A		Stressed or dead
					D	D	D		
Cottonwood		Stressed			A	A	A		Stressed or dead
					D	D	D		
Long Stem Shrub (specify in		Stressed			A	A	A		many Stressed or dead
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Coyote willows Thriving & mowed plants coming back

Observed Wildlife: See attached

Photos Taken:

Site: Anapra

Date: 3/21/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	85	1	3
Goodding's willow	2		2
Cottonwood			

Notes: new sprouts where mowed

Random Plot #1

Species	Alive	Stressed	Dead
Coyote willow	52	2	2
Goodding's willow			
Cottonwood			4
ericameria ERNA	13		1
Lycium LYPA	11		1
Atriplex ATCA	12		

Notes: GPS taken

tamarix at site 37 ft

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	52		
Goodding's willow			2
Cottonwood			
ERNA			1
LYPA			
ATCA			1

Notes: new sprouts

Random Plot #2

Species	Alive	Stressed	Dead
Coyote willow	230		
Goodding's willow			4
Cottonwood			1

Notes:

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	39		
Goodding's willow			4
Cottonwood			2

Notes:

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow			1
Goodding's willow			7
Cottonwood			2
ERNA			3
LYPA	5		3
ATCA	2		2

Notes:

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			

Notes:

Site Anapra
Date 8/21/19

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
coyote willow Salix exigua	moderate	20%	
cuttings willow	sporadic	2%	
honey mesquite	sporadic	3%	
screwbean mesquite	low	10%	
Baccharis salicifolia	moderate	20%	
Apocynum cannabinum dogbane	low	10%	
nightshade Solanum	low	5%	
Erigeria	low	3%	plantings
four winged saltbush Atriplex	low	3%	"
Lycium wolfberry	low	3%	"
Suaeda nigra	moderate	30%	
Sporobolus airoides	sporadic	2%	
globe mallow	sporadic	1%	trace
Cressa truxillensis	high	85%	
Distichlis spicata	High	80%	
Panicum sp	sporadic	1%	
melolotus officianalis	moderate	30%	
Sesuvium verrocosum	moderate	40%	
Asclepias sp. poison milkweed	low	10%	
cynodon dactylon	low	6%	

Site Anapra
Date 8/21/19

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Tamarix	low	3%	
Kochia	low	5%	

Site Anapra
Date 8/21/19

Type of wildlife	Code	Name
mammal	DECO	desert cottontail
bird	ROPI	Rock Pigeon
bird	EUCD	Eurasian Collared-Dove
bird	MODO	Mourning Dove
bird	VGSW	Violet-green swallow
bird	WEKI	Western Kingbird
bird	LEGO	Lesser Goldfinch
bird	VERD	Verdin
bird	KILL	Killdeer
bird	TUVU	Turkey Vulture
bird	BCHU	Black-chinned Hummingbird
bird	GRRO	Roadrunner (Gr)
bird	MALL	Mallard
bird	CAEG	Cattle Egret
bird	NECO	Neotropic Cormorant
bird	NOMO	Northern Mockingbird
bird	BLGR	Blue Grosbeak
bird	BEVI	Bell's Vireo
bird	LBWO	Ladder-backed Woodpecker
bird	SWHA	Swainson's Hawk

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 8/21-22/19

Participants K. Hucks / P. Houghton Target Habitat Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar			
see attached			

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 80%

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		thriving			A	A	A		~15% survival due to tamarisk
					D	D	D		
Goodding's Willow		normal			A	A	A		thriving where plantings took
					D	D	D		
Cottonwood		stressed			A	A	A		several stressed/ dead trees/planting
					D	D	D		
Long Stem Shrub (specify in		normal/ stressed			A	A	A		several dead & live plantings
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: relatively high tamarisk. Intense heat at site, causing survey to be two days

Observed Wildlife: See attached

Photos Taken:

Site: Sunland Park

Date: 8/21-22/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	14		
Goodding's willow			
Cottonwood			

Notes: mostly tamarisk, some willows

Random Plot #1

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

Notes:

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	390		130
Goodding's willow			
Cottonwood			

Notes: lots of tamarisk, mod 95 bad 95 PRI

Random Plot #2

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	8		1
Cottonwood			
elaeagnus	31	2	1
Lycium		1	6
Atriplex	11		1

Notes:

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	202		2
Goodding's willow	58		9
Cottonwood			

Notes: lots of CW comparatively doing well

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow	129		12
Goodding's willow			
Cottonwood	11		

Notes:

Permanent Plot #4

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			

Notes: very near road - no [illegible]

Site Sunland Park
Date 8/21/19

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Nightshade Solanum elaeagnifolium	low/mod	15%	
heliotropium	low/mod	12%	
screwbean mesquite	low	8%	
coyote willow	high	75%	
twine vine Funastrum sp.	sporadic	2%	
unk - similar to ephedra	high	70%	
Melilotus sp	low	8%	
Sesuvium verrocosum	low	4%	
Baccharis salicifolia	moderate	20%	
polygonum sp	low	3%	
suaeda nigra	low	10%	
tansy aster machaeranthera	sporadic	2%	
Lycium torreyi	low	6%	
Cottonwood	low	5%	
tree of heaven? walnut?	sporadic	1%	One tree - unknown
globe mallow sp.	low	3%	
Nama mollis	sporadic	2%	
cynodon dactylon	low	15%	
honey mesquite	sporadic	2%	
Salt bush Atriplex	low	10%	
sunflower Helianthus sp	sporadic	1%	
mallow sp.	low	7%	
Goodings willow	moderate	11%	

Site Sunland Park
Date 8/21/19

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
tamarisk	Moderate	15%	
tumbleweed	low	5%	
Kochia	Moderate	12%	
Phragmites	low	10%	

Site Sunland Park
Date 8/21/19

Type of wildlife	Code	Name
bird	WEKI	Western Kingbird
bird	BUOR	Bullock's Oriole
bird	WIWA	Wilsons Warbler
bird	LBWO	Ladder-backed Woodpecker
bird	TUVU	Turkey Vulture
bird	GRRO	Greater Roadrunner
bird	ROPI	Rock Pigeon
bird	VERD	Verdin
bird	GAQU	Gambel's Quail
bird	BLGR	Blue Grosbeak
bird	ATFL	Ash-throated Flycatcher
bird	KILL	Killdeer
bird	VEFL	Vermilion Flycatcher
bird	BCHU	Black-chinned Hummingbird
bird	WEWP	Western Wood-Pewee

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: Country Club East Date: 8/22/19

Participants: K Hucks/P Houghton Target Habitat: Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar			
See attached			

OVERALL PERCENT COVER OF VEGETATION AT SITE (planted and naturally recruited) 65%

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		thriving			A	A	A		thriving
					D	D	D		
Goodding's Willow		thriving			A	A	A		35% survival
					D	D	D		
Cottonwood		stressed			A	A	A		40% survival
					D	D	D		
Long Stem Shrub (specify in		normal			A	A	A		60% survival mostly
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Most plantings looking good. Coyote willows doing well & recruiting

Observed Wildlife:

Photos Taken: See attached

Site: Country Club East

Date: 8/22/19

Permanent Plot #1

Species	Alive	Stressed	Dead
Coyote willow	350		4
Goodding's willow	5		8
Cottonwood	2		5

Notes: _____

Random Plot #1

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow			
Cottonwood			1
Ericameria			3
Lycium	14	2	4
Atriplex	18	3	3

Notes: _____

Permanent Plot #2

Species	Alive	Stressed	Dead
Coyote willow	9		
Goodding's willow			1
Cottonwood	4		2

Notes: _____

Random Plot #2

Species	Alive	Stressed	Dead
Coyote willow			
Goodding's willow	1		3
Cottonwood	7		2

Notes: Cottonwoods thriving

Permanent Plot #3

Species	Alive	Stressed	Dead
Coyote willow	305		2
Goodding's willow			1
Cottonwood			2

Notes: pole missing - used GPS point on road - truck

Random Plot #3

Species	Alive	Stressed	Dead
Coyote willow	107		25
Goodding's willow			
Cottonwood	5		

Notes: several dead coyote willows

Permanent Plot #4

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

Notes: _____

Site Country Club
Date 8/22/19

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
screwbean mesquite	low/mod	15%	
cynodon dactylon	high	80%	
distichlis spicata	moderate	50%	
coyote willow salix exigua	moderate/hi	75%	
goodding's willow salix goodding.	low	5%	
suaeda nigra	moderate	35%	
cottonwood	moderate	15%	
night shade solanum elaegnifolium	moderate	13%	
cressa truxillensis	sporadic	3%	
Lycium torreyi	low	4%	
fricameria	sporadic	2%	
Atriplex canescens saltbush	low	5%	
Lactuca serriola	low	9%	
Cressa truxillensis	low	6%	
Guara mollis	sporadic	2%	
Panicum spp	low	4%	
Sporobolus airoides	low	8%	
bladder-wrack Sphaerophysa salsula	sporadic	2%	
Ratibida columnifera	low	4%	
Typha spp.	moderate	20%	
Schoenoplectus spp.	low	3%	

Site Country Club East
Date 8/22/19

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
tamarisk	low	3%	
Kochia	low	2%	

Site Country Club East
Date 3/22/19

Type of wildlife	Code	Name
bird	WEWP	Western Wood-Pewee
bird	HOFI	House Finch
bird	BCHU	Black-chinned Hummingbird
bird	LEGO	Lesser Goldfinch
bird	YBCH	Yellow-breasted Chat
bird	LASP	Lark Sparrow
bird	WIWA	Wilsons Warbler
bird	LBWO	Ladder-backed Woodpecker
bird	VERD	Verdin
bird	NOMO	Northern Mocking bird
bird	BLGR	Blue Grosbeak
bird	SUTA	Summer Tanager
bird	CHSP	Chipping Sparrow
bird	AMRO	American Robin
bird	HOSP	House Sparrow
bird	GRHE	Green Heron
bird	GBHE	Great Blue Heron
bird	SWHA	Swainson's Hawk
bird	MODO	Mourning Dove
bird	EUCD	Eurasian Collared-Dove
bird	WWDO	White-winged Dove
mammal	BTJA	black-tailed jackrabbit
bird	WEKI	Western Kingbird
bird	BARS	Barn Swallow
bird	VGSW	Violet-green Swallow
mammal	RACC	raccoon

Participants K. Hucks/P Houghton Date 8/21/19

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 1.12m	8/22/19	0917	240 cm 94.5"	128 cm 50.4"	581 - 341 = 240 - 112 = 128 B to TOC = 5.81m, H_2O = 3.41m
	CCE-MW-2	3748.67	3745.48	3.19 96cm	8/22/19	1122	182 cm 71.7"	86 cm 33.9"	576 - 394 = 182 - 96 = 86 B to TOC = 5.76m, H_2O = 3.94m
	CCE-MW-3	3747.23	3743.96	3.27 8.0m	8/22/19	0947	209 cm 82.3"	129 cm 50.8"	527 - 318 = 209 - 80 = 129 B to TOC = 5.27, H_2O = 3.18m
Sunland Park	SP-MW-1	3741.37	3737.91	3.46 74cm	8/22/19	0838	187 cm 73.6"	113 cm 44.5"	557 - 370 = 187 - 74 = 113 B to TOC = 5.57, H_2O = 3.70m
	SP-MW-2	3740.51	3737.08	3.43 m 1.14	8/21/19	1856	146 cm 57.5"	32 cm 12.6"	358 - 212 = 146 - 114 = 32 B to CH = 3.58m, H_2O = 2.12m
	SP-MW-3	3740.35	3736.85	3.50 m 1.19	8/21	18:06	253 cm 99.6"	134 cm 52.8"	476 - 223 = 253 - 119 = 134 B to CH = 4.76m, H_2O = 2.23m
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41 m 1.16	8/21/19	10:14	196 cm 77.2"	80 cm 31.5"	382 - 186 = 196 - 116 = 80 B to CH = 3.82m, H_2O = 1.86m
	AB-MW-2	3738.49	3735.14	3.35 m 1.17	8/21/19	12:26	193 cm 76.0"	76 cm 30.0"	478 - 285 = 193 - 117 = 76 B to CH = 4.78m, H_2O = 2.85m

H_2O Gages

#1 - Southern Most = 4.7'

#3 - Near PP#3 = 5.4' Not

#4 5.1 ft

#2 missing

Post-restoration Monitoring Datasheets

October 2019

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Anapra Date 15 October 2019

Participants K. Hucks, W. Arjo, C. Britt, S. Allen Target Habitat Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			
Identifiable Exotic (Non-Native) Species	**Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)**	**Percent Cover (Estimate)**	**Comments**
Saltcedar			
See attached			

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
	found	planted			Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	A=805	805			A	A	A	✓	100% survival
					D	D	D		
Goodding's Willow	S=21 D=12 A=28	55			A	A	A	49/55	89% survival
					D	D	D		
Cottonwood	S=15 D=54 A=1	110			A	A	A	16/110	15% survival
					D	D	D		
Long Stem Shrub (specify in all)	S=70 D=56 A=237	340			A	A	A	307/340	90% survival
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Good survival of all plantings except cottonwoods

Observed Wildlife: See attached

Photos Taken:

Site Anapra
Date 15 Oct 2019

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
screwbean mesquite	low	10%	
coyote willow	moderate	25%	
Goodding's willow	low	2%	
sporobolus airoides	low	2%	
Solanum elaegnifolium	low	10%	
Baccharis salicifolia	moderate	20%	
Atriplex canescens	low	5%	
Ericameria	low	5%	
Lycium	low	7%	
Sueda nigra	moderate	35%	
Panicum sp.	Sporadic	2%	
globe mallow	sporadic	1%	
Guara mollis	low	5%	
Sesuvium verrocosum	moderate	40%	
Arizona Ash Fraxinus	sporadic	1%	
Cressa truxillensis	high	85%	
Asclepias sp.	low	8%	
Apocynum (dogbane) cannabinum	low	10%	
Melolotus officianalis	moderate	32%	
honey mesquite	sporadic	2%	
Distichlis spicata	high	80%	

Site Anapra
Date 15 Oct 2019

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Tamarix	low	3%	
tumbleweed	low	2%	
Kochia	low	7%	
Cynodon dactylon	moderate	10%	

Site Anapra
Date 19 Oct 2019

Type of wildlife	Code	Name
bird	SWHA	Swainson's Hawk
bird	SAPH	Says Phoebe
bird	WFIB	White-faced Ibis
bird	MALL	Mallard
bird	ROPI	Rock Pigeon
bird	VERD	Verdin
bird	LEGO	Lesser Goldfinch
bird	NOFL	Northern Flicker
bird	AMPI	American Pipit
bird	BLPH	Black Phoebe

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site Sunland Park Date 16 October 2019

Participants K. Hucks, N. Arjo, C. Britt, S. Allen Target Habitat Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)	Percent Cover (Estimate)	Comments
Saltcedar			
See attached			

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
	found	planted			Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	D: 500 A: 4497	4997			A	A	A	4497/4997	90% survival
					D	D	D		
Goodding's Willow	S: 102 D: 236 A: 795	2350			A	A	A	897/2350	38% survival
					D	D	D		
Cottonwood	S: 114 D: 86 A: 15	400			A	A	A	129/400	32% survival
					D	D	D		
Long Stem Shrub (specify in all)	S: 163 D: 207 A: 792	1162			A	A	A	955/1162	82% survival
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Good survival of coyote willow & shrubs, poor survival of Gooddings willow & cottonwoods.

Observed Wildlife: See attached

Photos Taken:

Site Sunland Park
Date 15 oct 2019

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Cottonwood	low	8%	
Coyote Willow	high	75%	
Screwbean	low	10%	
Gooddings Willow	moderate	12%	
Solanum	moderate	15%	
Mistletoe	low	5%	
Honey mesquite	sporadic	2%	
Guara mollis	low	4%	
Ephedra / unk	high	70%	
Baccharis salicifolia	moderate	20%	
Sunflower Helianthus sp.	sporadic	1%	
purple tansy aster Machaeranthera	sporadic	2%	
Polygonium sp.	low	3%	
Dogbane Apocynum cannabinum	low	3%	
Suada nigra	low	10%	
Lycium	low	6%	
NM Olive	low	4%	
Atriplex Canescens	low	7%	
Sesuvium verrocosum	low	4%	
Melolotus	low	8%	
Rhus trilobata	low	5%	
Ericamera	moderate	10%	
Melolotus	low	8%	
heliotropium	moderat	12%	
Arizona ash	sporadic	1%	

Site Sunland Park
Date 11e Oct 19

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Phragmites australis	low	10%	
tumbleweed	low	5%	
goathead	low	3%	
Tamarix	moderate	15%	
Funastrum	low	5%	
Kochia Bassia Scoparia	moderate	20%	
cynodon dactylon	moderate	35%	

Site Sunland Park
Date 15 Oct 2019

Type of wildlife	Code	Name
bird	NOHA	Northern Harrier
bird	RTHA	Red-tailed Hawk
bird	WEWP	Western Wood-Pewee
bird	YRWA	Yellow-rumped Warbler
bird	MODO	Mourning Dove
bird	HOFI	House Finch
bird	LEGO	Lesser Goldfinch
bird	KILL	Killdeer
bird	MALL	Mallard
bird	SWHA	Swainson's Hawk
bird	WCSP	White-crowned sparrow
bird	NOMO	Northern Mockingbird
bird	ROPI	Rock Pigeon
bird	WWDO	White-winged Dove
bird	EUCD	Eurasian-Collared-Dove
bird	RWBL	Red-winged Blackbird
bird	AMGO	American Goldfinch
bird	NOFL	Northern Flicker
bird	GTGR	Great-tailed Grackle
bird	DEJU	Dark-eyed Junco
bird	PEFA	Peregrine Falcon
bird	COHA	Cooper's Hawk

Site Sunland Park
Date 16 Oct 2019

Type of wildlife	Code	Name
bird	CHSP	Chipping Sparrow
bird	BRBL	Brewer's Blackbird
bird	LBWO	Ladder-backed Woodpecker
bird	CRTH	Crissal Thrasher
bird	VERD	Verdin
bird	BEWR	Bewicks Wren
mammal	DECO	Desert Cottontail

Restoration Work Effectiveness - Qualitative Monitoring Field Sheet

Site: County Club East Date: 16 October 2019

Participants: K. Hucks, W. Argo, C. Britt, S. Allen Target Habitat: Riparian Restoration

Identifiable Native Species	Abundance (None, Sporadic individuals, Low, Moderate, High)	Percent Cover (Estimate)	Comments
See attached			

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic individuals, Low, Moderate, High, Monotypic)	Percent Cover (Estimate)	Comments
Saltcedar			
See attached			

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
	found	planted			Plot 1	Plot 2	Plot 3	Average	
Coyote Willow	A = 4000	4000			A	A	A	✓	100% survival
					D	D	D		
Goodding's Willow	S = 33 D = 77 A = 245	440			A	A	A	278/440	63% survival
					D	D	D		
Cottonwood	S = 64 D = 803 A = 280	1620			A	A	A	349/1620	21% survival
					D	D	D		
Long Stem Shrub (specify in all	Sc 47 D: 299 A = 1346	2330			A	A	A	1393/2330	60.9% survival
					D	D	D		
Other					A	A	A		
					D	D	D		

General Site Conditions: Good coyote willow survival, decent Goodding's willow & shrub survival. Poor cottonwood survival

Observed Wildlife: see attached

Photos Taken:

Site Country Club
Date 17th Oct 2019

Identifiable Native Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
coyote willow	high	78%	
cottonwood	moderate	20%	
Goodding's willow	low	10%	
Solanum	moderate	13%	
Sueda nigra	moderate	35%	
Sesuvium verrocosum	low	3%	
Typha	moderate	20%	
screwbean	moderate	15%	
Panicum sp.	low	3%	
Sporobolus aeroides	moderate	10%	
Schoenoplectus	low	2%	
Distichlis spicata	moderate	55%	
Lycium	low	6%	
Cressa truxillensis	low	8%	
Guara mollis	sporadic	2%	
Sphaerophysa salsula	sporadic	2%	
Ratibida columnifera	low	4%	
Atriplex canescens	moderate	11%	
Lactuca serriola	low	8%	
Rhus trilobata	sporadic	2%	
NM Olive	low	6%	

Site Country Club
Date 16 Dec 2019

Identifiable Exotic (Non-Native) Species	Abundance (None, Sporadic, Low, Moderate, High)	Percent Cover (Estimate)	Comments
Tamarix	low	4%	
Kochia	low	3%	

Site Country Club
Date 11e Oct 2019

Type of wildlife	Code	Name
bird	CHSP	Chipping Sparrow
bird	WCSP	White-crowned Sparrow
bird	KILL	Killdeer
bird	MODO	Mourning Dove
bird	HOFI	House Finch
bird	RTHA	Red-tailed Hawk
bird	TUVU	Turkey Vulture
bird	COYE	Common Yellowthroat
bird	LEGO	Lesser Goldfinch
bird	AMKE	American Kestrel
bird	SOSP	Song Sparrow
bird	VESP	Vesper Sparrow
bird	DEJU	Dark-eyed Junco
bird	WOSJ	Woodhouse's Scrub-Jay
bird	RCKI	Ruby-crowned Kinglet

Groundwater Levels Monitoring Field Sheet

Participants K. Hucks Date 15 Oct 2019 - 16 Oct 2019

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 1.22	10/16	1102	259 cm 102"	137 cm 54"	577 - 318 = 259 - 122 = 137 B → TOC = 577 H_2O = 318
	CCE-MW-2	3748.67	3745.48	3.19 1.10	10/16	1237	220 cm 86.6"	110 cm 43.3"	575 - 355 = 220 - 110 = 110 B → TOC = 575 H_2O = 355
	CCE-MW-3	3747.23	3743.96	3.27 0.93	10/16	1119	235 cm 92.5"	142 cm 55.9"	526 - 291 = 235 - 93 = 142 B → TOC = 526 H_2O = 291
Sunland Park	SP-MW-1	3741.37	3737.91	3.46 0.80	10/16	0848	124 cm 48.8"	44 cm 17.3"	560 - 436 = 124 - 80 = 44 cm B → TOC = 560 H_2O = 436
	SP-MW-2	3740.51	3737.08	3.43 1.19	10/16	0758	275 cm 108.3"	156 cm 61.4"	472 - 197 = 275 - 119 = 156 B → TOC = 472 H_2O = 197
	SP-MW-3	3740.35	3736.85	3.50 1.22	10/16	0814	259 cm 102"	137 cm 54"	478 - 219 = 259 - 122 = 137 B → TOC = 478 H_2O = 219
Anapra Bridge	AB-MW-1	3737.62	3734.21	3.41 1.13	10/15	1600	225 cm 88.6"	108 cm 42.5"	374 - 149 = 225 - 117 = 108 B → TOC = 374 H_2O = 149
	AB-MW-2	3738.49	3735.14	3.35 1.20	10/15	1623	230 cm 90.6"	110 cm 43.3"	482 - 252 = 230 - 120 = 110 B → TOC = 482 H_2O = 252

Gauge 1: 4.9 (in mud)

Gauge 2: gauge missing, but tire tracks out to mudflat on river; Typha surrounding

Gauge 3: 3.8 (in mud)

Gauge 4: 4.3 (in mud)

APPENDIX D

Repeat Photos

Country Club East

Photo Point 1 Target 1

16 October 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 1 Target 2

 16 October 2017	 5 February 2018
 15 May 2018	 29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 1 Target 3

16 October 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 2 Target 1

 10 November 2017	 5 February 2018
 15 May 2018	 29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 2 Target 2

10 November 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 2 Target 3

10 November 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 3 Target 1

16 October 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 3 Target 2

16 October 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Country Club East

Photo Point 3 Target 3

16 October 2017

5 February 2018

15 May 2018

29 August 2018

Country Club East

18 October 2018

18 April 2019

22 August 2019

16 October 2019

Sunland Park

Photo Point 1 Target 1

16 October 2017

5 February 2018

15 May 2018

28 August 2018

Sunland Park

17 October 2018

18 April 2019

21 August 2019

16 October 2019

Sunland Park

Photo Point 1 Target 2

 16 October 2017	 5 February 2018
 15 May 2018	 28 August 2018

Sunland Park

17 October 2018

18 April 2019

21 August 2019

16 October 2019

Sunland Park

Photo Point 1 Target 3

16 October 2017

5 February 2018

15 May 2018

28 August 2018

Sunland Park

17 October 2018

18 April 2019

21 August 2019

16 October 2019

Sunland Park

Photo Point 2 Target 1

16 October 2017

5 February 2018

15 May 2018

28 August 2018

Sunland Park

17 October 2018

18 April 2019

21 August 2019

16 October 2019

Sunland Park

Photo Point 2 Target 2

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 15 May 2018	 28 August 2018

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Photo Point 2 Target 3

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Sunland Park

Photo Point 3 Target 1

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28 August 2018

Sunland Park

17 October 2018

18 April 2019

21 August 2019

16 October 2019

Anapra Bridge

Photo Point 1 Target 1

16 October 2017

5 February 2018

14 May 2018

28 August 2018

Anapra Bridge

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21 August 2019

15 October 2019

Anapra Bridge

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15 October 2019

Anapra Bridge

Photo Point 3 Target 3

16 October 2017

5 February 2018

14 May 2018

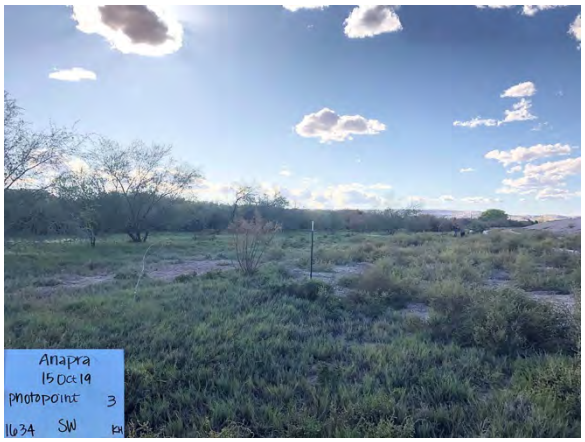
28 August 2018

Anapra Bridge

17 October 2018

18 April 2019

21 August 2019



15 October 2019