# APPENDIX B

# TECHNICAL REPORTS – 2019




# *Rio Grande Canalization Project Aquatic Habitat Restoration Site Alternatives and Conceptual Designs*

*Prepared for:*
*United States Section International Boundary & Water Commission and Gulf South Research Corporation*

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# *Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs*

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## 1.0 INTRODUCTION AND BACKGROUND

Numerous modifications to optimize the Rio Grande in southern New Mexico (NM) and west Texas (TX) for irrigation delivery and to protect human life and property from catastrophic flooding have eroded the ecological integrity in the watershed. Elephant Butte Dam was completed in 1916. Then in the 1940's, the United States Section of the International Boundary and Water Commission (USIBWC) built the 105-mile-long Rio Grande Canalization Project (RGCP) from Percha Diversion Dam, Sierra County, NM through Dona Ana County, NM to American Dam in El Paso, El Paso County, TX. The RGCP facilitated "compliance with equitable allocation of water between the U.S. and Mexico under the U.S.-Mexico Convention of 1906 (Act of June 4, 1936, 49 Stat. 1463)" (USIBWC 2016).

The RGCP protects against a 100-year flood and assures water delivery to Mexico and U.S. users from Elephant Butte and Caballo Reservoirs upstream in NM. USIBWC was granted authority to construct, operate, and maintain the RGCP which straightened and entrenched the Rio Grande active channel, armored riverbanks, built flood-protection levees, removed floodplain vegetation, and has led to widespread river dewatering. These actions have ensured more consistent and predictable water delivery to Mexico and irrigators in the US, protected infrastructure from catastrophic flooding, and supported creation of a vast, diverse agricultural economy in southern NM and west TX; however, RGCP activities caused environmental and ecological damage.

Since construction, the RGCP has greatly reduced the distribution, frequency, and extent of valuable aquatic, riparian and wetland habitat, as well as, to federally-listed species including the Southwestern willow flycatcher (*Empidonax traillii extimus*), the yellow-billed cuckoo (*Coccyzus americanus*), and numerous aquatic species. A recent study estimates that one-half to two-thirds of native fish species diversity has been lost, virtually all the pre-dam aquatic habitat diversity destroyed, and native riparian forests are almost eliminated (Propst and Bixby 2018).

Historically, twenty-four fish species were potential inhabitants of this reach of the Rio Grande. Some were year-round residents while others occurred seasonally or when migrating up- or downstream. Based on surveys since the mid-1980s, 11 native species still occur there (Propst and Bixby 2018). Persistence of fishes in this reach is challenging because most of the river channel is seasonally dry. Those species that still occur do so because individuals find refuge by moving upstream to perennial river segments. Because of these extreme swings in habitat availability, quantity, and quality, the pool of potential colonizers of restored habitats is limited numerically and taxonomically. Potential colonizers are typically habitat "generalists" with broad environmental tolerances.

Environmental impacts were assessed in a 2009 USIBWC (2009) Environmental Impact Statement (EIS). The RGCP EIS evaluated four long-term Rio Grande management alternatives including: a) No Action, b) Flood Control Improvement, c) Integrated Land Management, and d) Targeted River Restoration. The EIS process strove to maintain flood control, water delivery, and operation and maintenance activities in a manner that could also benefit the river ecosystem. Following an 8-year EIS evaluation and stakeholder consultation process, USIBWC ultimately selected the Integrated Land Management Alternative and the Record of Decision (ROD) committed USIBWC to implement the selected alternative during the next 10 years (ending in 2019). The ROD also required that

USIBWC implement 30 conceptual restoration projects (which total about 550 acres) identified by the U.S. Army Corp of Engineers (USACE 2009) during this same 10-year time period (USIBWC 2016).

The ROD specifically authorized:

- Conversion of 1,983 acres to managed native grasslands;
- 553 acres of native riparian vegetation enhancement.
- Establishment of a minimum of 53 acres targeted for flycatcher habitat (dense riparian shrub habitat) by 2017 and up to 119 acres by 2019.

The first ROD implementation phase (2009 to 2014) included reach evaluations, pilot projects, and creation of an environmental water rights transaction framework. The second phase (2014 to 2019 focused on habitat restoration project design and construction (USIBWC 2016).

The Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande—Caballo Dam to American Dam, New Mexico and Texas ("Conceptual Plan") published by USACE (2009) via technical support contracts with Mussetter Engineering and Riada Engineering, identifies 30 potential habitat restoration project sites, recommends specific restoration techniques, and estimate project construction costs. Thus far, USIBWC has enhanced native riparian vegetation at a total of 22 sites spanning approximately 506 acres (E. Verdecchia, USIBWC, personal communication). Three aquatic habitat restoration sites (Angostura Arroyo, Yeso Arroyo, and Placitas Arroyo) are proposed in the Conceptual Plan but aquatic habitat restoration projects have not been constructed yet. Each of the three proposed aquatic habitat restoration sites is situated on the opposite side of the Rio Grande active channel from a major arroyo confluence and the conceptual design involves destabilizing the river banks to encourage river migration into the abandoned floodplain terrace. However, USIBWC and project stakeholders are concerned that (if constructed) these projects may adversely impact RGCP levees and increase flood risk for neighboring communities. Due to these concerns, USIBWC is currently evaluating the aquatic habitat restoration sites recommended in the Conceptual Plan against other potential aquatic restoration locations.

## 1.1 Scope of this Report

Under this project, GeoSystems Analysis, Inc. (GSA) was contracted as part of a Gulf South Research Corporation (GSRC)-led team to identify up to six aquatic habitat restoration project sites, develop conceptual designs, and provide key information that will enable GSRC to evaluate restoration site alternatives in an Environmental Assessment (EA). This report precedes the EA, which also evaluates a no action alternative. Of the six restoration sites identified through this process, USIBWC intends to select two projects for formal engineering design and construction during a later phase in this project.

The principle objectives for USIBWC-led habitat restoration projects in the canalization reach as stated in USIBWC 2016 and USACE 2009 include:

1) Reduce exotic vegetation,
2) enhance river-floodplain hydraulic connectivity,
3) enhance aquatic diversity,
4) restore riparian function and enhance natural riverine processes,
5) improve terrestrial wildlife habitat,

6) restore endangered species habitat, and
7) reestablish riparian habitat.

Per the project scope of work, USIBWC recommended the following restoration project site alternatives:

1) Las Cruces Effluent Site: wetland creation, fish passage structure, constructed channel and/or oxbow
2) Mesilla Valley Bosque State Park: deepen previously constructed oxbow pond (resaca) habitats, Picacho Drain modification, other excavated habitat features such as side channels
3) Broad Canyon Arroyo: enhancement of arroyo mouth
4) Conceptual Restoration Plan (USACE 2009) Arroyo Sites: bank destabilization at Yeso, Angostura, Placitas Arroyos
5) Plus, two additional sites to be determined by contractor.

A map showing the location of these project sites is presented in Figure 1.


*Figure 1. Project area map showing locations of project sites under consideration.*

* Red stars indicate sites removed during the conceptual design phase but evaluated in the field, green stars indicate sites with designs/alternatives still in consideration, blue stars mark sites discussed but not evaluated.

## 2.0 METHODS

Following a November 2018 site reconnaissance with USIBWC staff and stakeholders, and a November 9, 2018 scoping meeting with USIBWC, key stakeholders, other interested parties, and project consultants; GSA scientists completed site assessments at ten sites between January 6 and January 10, 2019. The specific sites assessed during this effort are presented in Table 1. Detailed descriptions of the assessment methodologies and results are described in the following subsections.

Table 1. Sites assessed in the field by GSA staff during January 2019.

| Site | Location | Soils | Vegetation |
|---|---|---|---|
| Yeso Arroyo (Conceptual Plan Site) | Hatch, NM (32.737614, -107.28354) | | X |
| Angostura Arroyo (Conceptual Plan Site) | Hatch, NM (32.65736, -107.095225) | | X |
| Broad Canyon Arroyo | Radium Springs, NM (32.53325, -106.98412) | X | X |
| Selden Point Bar | Radium Springs, NM (32.518509, -106.968552) | X | X |
| Las Cruces Effluent Site | Las Cruces, NM (32.293155, -106.82351) | X | X |
| Mesilla Valley Bosque State Park | Mesilla, NM (32.24301, -106.81606) | X | X |
| NeMexas Siphon | Santa Teresa, NM (31.837603, -106.606335) | X | X |
| Montoya Intercepting Drain/EP Electric | El Paso, TX (31.803177, -106.549088) | X | X |
| Montoya Intercepting Drain | El Paso, TX (31.79963, -106.55679) | | X |
| Downstream of Courchesne Gage | El Paso, TX (31.80262, -106.54139) | X | X |

## 2.1 Vegetation Mapping

During fieldwork, GSA scientists divided potential habitat restoration sites into discreet "map units" and assigned representative vegetation types to each using a modified Hink and Ohmart (H&O) classification system (H & O 1984). H & O vegetation types are named based on dominant woody plant species in different canopy layers (i.e., "overstory" canopy exceeds 20 ft; "understory" canopy is less than 20 ft). When total canopy cover exceeds 25 percent in a canopy layer, the most dominant species (one or more) comprising that layer are used to name the vegetation type. Plant species names are abbreviated using letter codes, and the letter codes for dominant overstory and understory species are combined with a numerical code associated with the canopy structure (Figure 2).

The modified Hink and Ohmart classification system also provides suffix categories for describing non-woody vegetation types. For example, open water habitats, marsh habitats, and wet meadows are labeled as "OW", "MH", and "WM", respectively. Open, barren areas that are sparsely vegetated by woody plants, lack an abundance of perennial grasses, and lack wetland herbaceous species are described as type "OP", while grasslands are labeled as "G".

**Vegetation Community Naming Convention**

*OVERSTORY LAYER SPECIES* / *UNDERSTORY LAYER SPECIES* STRUCTURE TYPE

SPECIES(>=25%) - SPECIES(>=25%) / SPECIES(>=25%) - SPECIES(>=25%) 1-6

**Species in each layer listed in descending order of dominance

**Plant Species Codes**

| Code | Common Name |
|---|---|
| ATX | Fourwing saltbush |
| AW | Arrowweed |
| B | Baccharis |
| BB | Burrobrush |
| C | Rio Grande cottonwood |
| CW | Coyote willow |
| EP | Ephedra/jointfir |
| HM | Honey mesquite |
| JW | Jimmyweed |
| SBM | Screwbean mesquite |
| SC | Saltcedar |
| WB | Wolfberry |

**Structure Types**

**Woody**

| Structure Type | Overstory Cover | Overstory Height | Understory Cover | Understory Height | Description |
|---|---|---|---|---|---|
| 1 | **>25%** | >40 feet | **>25%** | 6-20 feet | Tall trees with dense understory |
| 2 | **>25%** | >40 feet | *<25%* | NA | Tall trees with sparse understory |
| 3 | **>25%** | 20-40 feet | **>25%** | 6-20 feet | Intermediate-sized trees with dense understory |
| 4 | **>25%** | 20-40 feet | *<25%* | NA | Intermediate-sized trees with sparse understory |
| 5 | *<25%* | NA | **>25%** | 6-20 feet | Dense shrubs |
| 6 | *<25%* | NA | **>25%** | <6 feet | Sparse shrubs |

**Non-Woody**

| | |
|---|---|
| G | Grassland |
| WM | Wet Meadow |
| MH | Marsh |
| OP | Open Area (often weedy) |

*Figure 2. Hink and Ohmart vegetation naming conventions applied to this project.*

For the purpose of presenting data in this report, H&O vegetation communities were simplified into more general vegetation types, but electronic Geographic Information System (GIS) data delivered during this project, indicate the actual H&O type assigned at each map unit. In addition to ascribing a H&O vegetation type, the project botanist listed dominant herbaceous species as well as noxious weeds observed in each map unit. A list of all species observed during our site assessments is provided in Appendix C. In some instances where the conceptual design was expected to target very specific field locations (like the resaca ponds at Mesilla Valley State Park, barren patches at Selden Point Bar, and the mouth of Broad Canyon arroyo) due to degradation or another unique circumstance, sub-meter GPS was utilized to delineate a location with high accuracy.

## 2.2 Soil Assessment

Soil texture data were collected during January 2019 from numerous sampling locations strategically targeted within potential aquatic habitat restoration sites. The goal was to assess soil texture similarities and differences across a range of vegetation and other site conditions to aid future site restoration and revegetation planning efforts. The number of samples varied by site depending on vegetation diversity, design concept under consideration, and other factors including field efficiency. At each sampling location, representative photographs were recorded and then a hand auger was used to bore a hole to the alluvial groundwater table (except where buried rock prevented the auger from reaching the water table). Soil cores were extracted from the auger hole in 1-foot increments and placed on a tarp. Each 1-foot increment was subdivided on the tarp based upon differences in textural characteristics. Soil textures were assessed using the “hand-feel” method described in Brady (2008). Soil textures were recorded for each discreet soil layer using the following USDA soil texture classes (Brady 2008):

- Sand (Sa)
- Loamy sand (LS)
- Sandy loam (SaL)
- Silt loam (SiL)
- Loam (L)
- Sandy clay loam (SaCL)
- Silty clay loam (SiCL)
- Clay loam (CL)
- Sandy clay (SaC)
- Silty clay (SiC)
- Clay (C)

Additional information recorded at each bore hole included notes regarding notable changes with depth in soil moisture, presence of visible salt concentrations, iron reduction-oxidation observations (“mottling”), and gleying. Bore hole observations are presented in the Results section of this report.

## 2.3 Hydraulic Modeling and River Flow Assessment

GSA obtained and ran simulation results produced by calibrated and validated hydraulic models (HEC-RAS) developed in support of a 2014 RGCP channel seepage and water budget study (Tetra Tech 2014). The steady state HEC-RAS model had been calibrated by Tetra Tech to align with 2011 Light Detection and Ranging (LiDAR) topographic data and adjusted in channel segments that were underwater when the LiDAR topography data were originally captured. Modeled discharges range from 10 to 6,000 cfs, 100-year discharge, plus ineffective flow areas (see Tetra Tech 2014 for more specific information regarding the hydraulic model). HEC-RAS simulation results were extrapolated to predict water surface elevations (WSE) from a variety of discharges contained in the steady state iteration of the 2014 model and used to determine excavation targets for conceptual designs and earthwork quantities published in this report.

Streamflow information was obtained at the Rio Grande below Leasburg Dam, Rio Grande at Hayner’s Bridge, and Rio Grande at Mesilla Dam sites from USIBWC published datasets which include provisional data (https://waterdata.ibwc.gov/). These three gages were selected due to their proximity to the study sites. Published streamflow data from the USIBWC website date back to 2003 at Hayner’s Bridge and 2011 at Leasburg Dam and Mesilla Dam while historical data are also available for many of the gages. As requested during the project scoping meeting, we compared flow duration for two periods (2003 to 2009 and 2010 to 2018) at the Hayner’s Bridge site to ensure conceptual designs account for drought conditions over the past decade (Figure 3). A flow duration curve (Figure 4) was also developed for the entire period of record available at the Leasburg Dam and Mesilla Dam sites (2011 to 2018) via data downloaded from the USIBWC streamflow website.

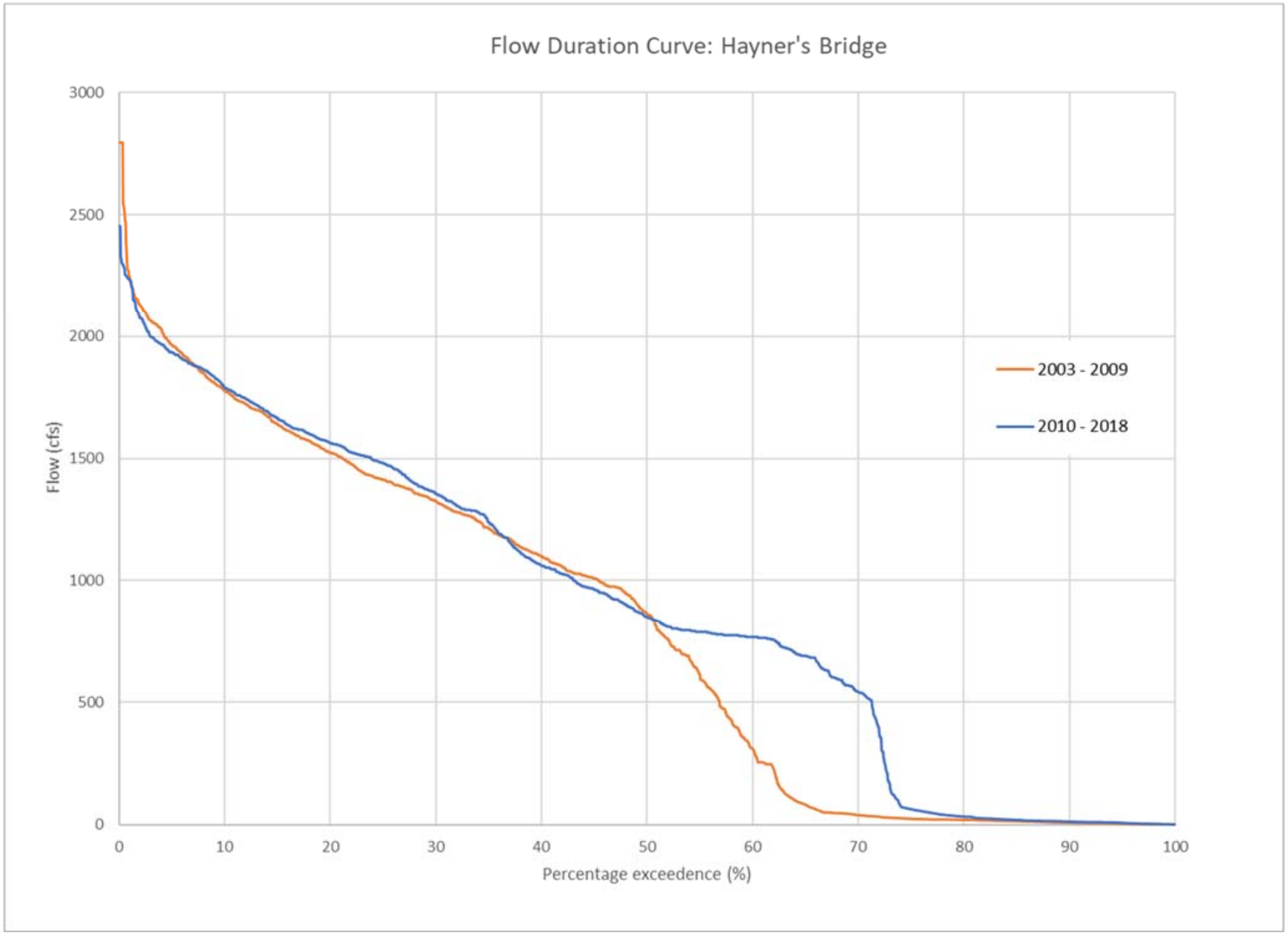



*Figure 3. Flow duration curves at Hayner's Bridge Gage for two periods: 2003 to 2009 and 2010 to 2018.*

Analysis at Hayner's Bridge (about 10 miles south of Hatch, NM) revealed that streamflow was very similar for 50% of the year during the past decade compared to the decade prior (Figure 3). However, at 60% exceedance, discharge increased by 150% during 2010-2018 compared to 2003-2009 (Table 2). Flows continued to be substantially higher at 75% and 90% exceedance since 2010. Comparably, between 2011-2018, the 50% exceedance discharge was 618 cubic feet per second (cfs) at Leasburg Dam (near Radium Springs, NM) while 60% exceedance was 320 cfs (Figure 4). Downstream at the Mesilla Dam gage, which lies below the Las Cruces sites, 50% exceedance discharge was 388 cfs while 60% exceedance was 196 cfs (Figure 5).

Table 2. Comparison of the discharge (cfs) relative to percent exceedance at the Hayner's Bridge Gage for two periods: 2003 to 2009 and 2010 to 2018.

| | **Percent Exceedance** | | | | |
|---|---|---|---|---|---|
| | **25%** | **50%** | **60%** | **75%** | **90%** |
| **Period** | **Discharge (cfs)** | | | | |
| 2003 to 2009 | 1,413 | 862 | 307 | 24 | 8 |
| 2010 to 2018 | 1,480 | 848 | 766 | 63 | 12 |
| Percent Difference | 5% | -2% | 150% | 163% | 55% |

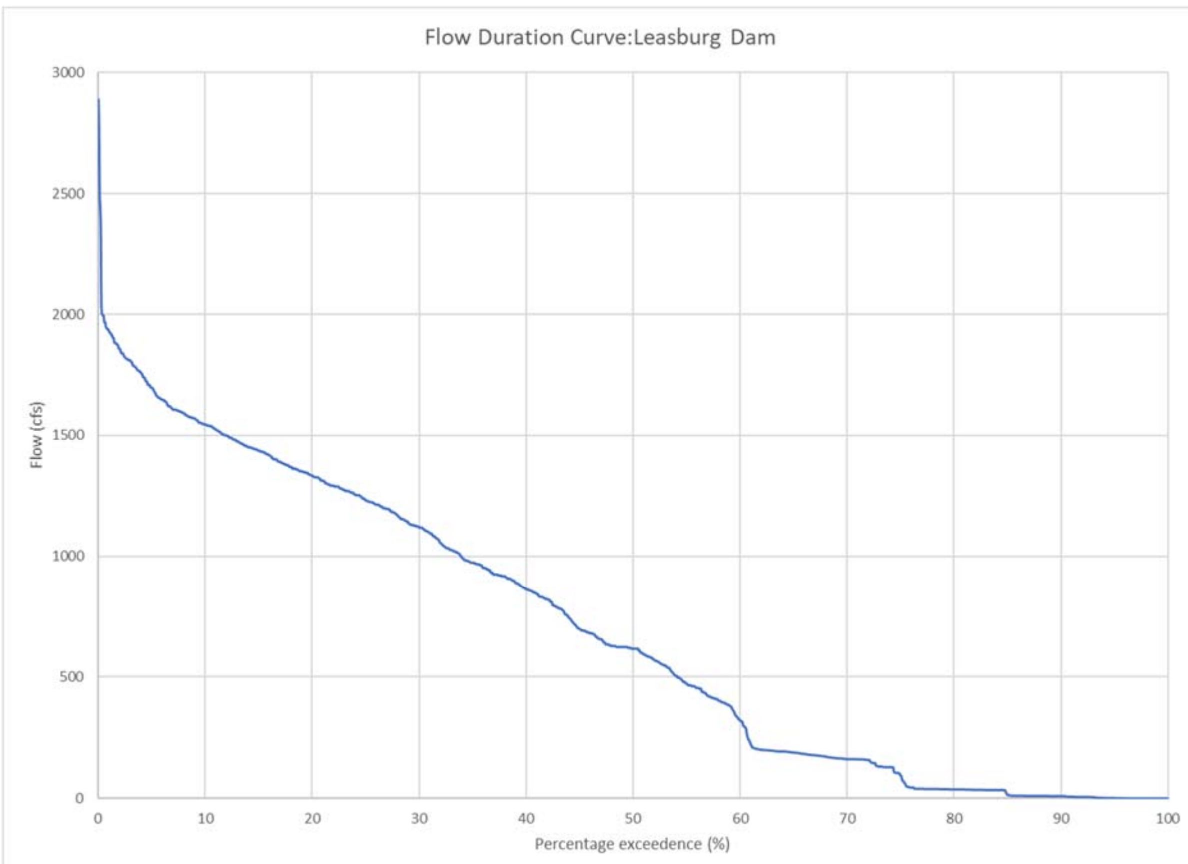



*Figure 4. Flow duration curve at the Leasburg Dam Gage from 2011 to 2018.*

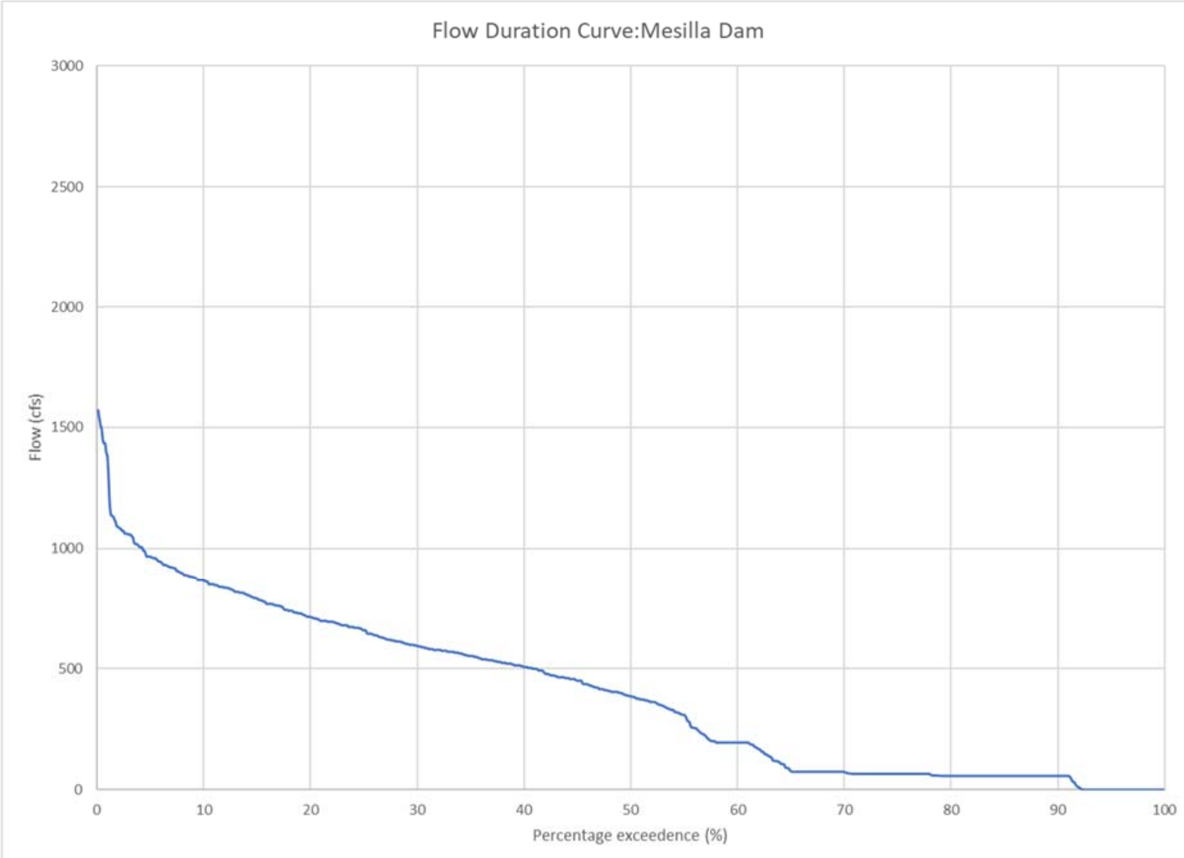



*Figure 5. Flow duration curve at the Mesilla Dam gage from 2011 to 2018.*

## 2.4 LiDAR Processing

GSA staff mosaicked individual 2011 LiDAR tiles (provided by USIBWC) into a single grid using Blue Marble Geographics Global Mapper software. The mosaicked 2011 LiDAR grid was then used as a basis for characterizing floodplain topography. Fluctuations in floodplain terrain were calculated by differencing the ground elevation in the floodplain from what appeared to be dry segments of the channel bed with a combination of analysis techniques that include virtual cross section draping, interpolation, and raster algebra. The resulting topographic grid predicts the height above or below the adjacent riverbed (in perpendicular cross section) for each grid cell in the floodplain. This process is particularly useful for extracting relatively low versus high spots in the floodplain from a LiDAR dataset that can otherwise be difficult to display or interpret (Appendix B). The results were also used to stage various restoration features recommended in this report and predict project excavation quantities.

## 2.5 Evapotranspiration Evaluation

Evapotranspiration (ET) is a process that accounts for movement of water from the land surface to the air via evaporation off standing water and soil plus transpiration by plants. GSA determined the net change in annual water depletion at each restoration site alternative following a similar method as the Conceptual Plan (USACE 2009). Estimates of consumptive use for various vegetation communities published in USACE (2009) were supplemented with ET rates contained in other regional riparian/wetland planning documents (e.g. Multi-Species Conservation Plan [MSCP] 2004) when current or predicted future plant communities were not published in the Conceptual Plan.

ET rates used during this process include (adapted from USACE 2009 and MSCP 2004):

- Dense shrubs: 4.9 ft/yr
- Riparian forest: 4.8 ft/yr
- Riparian woodland: 3.4 ft/yr
- Grassland (including saltgrass meadows): 2.4 ft/yr
- Marsh: 5.8 ft/yr

We differenced existing ET rate for pre-restoration plant communities (per current vegetation mapping unless saltcedar removal previously occurred) and predicted optimal restored habitat type to calculate the predicted change in consumptive use attributed to habitat restoration activities. Net depletion volume for each site was then calculated in GIS software by multiplying ft/yr by the total acreage of each map unit. Several sites contained dense saltcedar prior to implementing previous exotic species management projects. At these locations (Broad Canyon, Selden Canyon, Mesilla Valley, and Downstream of Courchesne), a dense saltcedar shrubland was used as the baseline (pre-restoration) condition and we assume that dense saltcedar recolonization will be prevented during ongoing maintenance. Results are included in Table 11.

## 3.0 SITE CHARACTERIZATION AND CONCEPTUAL DESIGNS

The vegetation, soils, topography and hydrology evaluations described above were combined with restoration recommendations developed by others (USACE 2009, Propst and Bixby 2018, etc.) to develop conceptual restoration designs. The following subsections discuss results and recommendations using these combined sources.

### 3.1 Yeso Arroyo

The Yeso Arroyo project site is located near river mile (RM) 94 and is the northernmost site alternative addressed in this report. The Yeso Arroyo site is characterized by an elevated floodplain terrace located immediately across the arroyo confluence with the Rio Grande (Figure 6). Yeso arroyo is free flowing and contains no sediment control dams or lesser retention structures. The bankline across from the confluence is very steep, and USIBWC had historically placed large rip-rap along the toe of the bankline to minimize potential for channel migration towards a non-engineered levee on the northeast side of the river. USIBWC has also historically dredged the river channel in this location to maintain channel conveyance capacity and gradient. Rio Grande flows appear persistent, possibly perennial in this reach.

This site was one of three aquatic restoration sites (along with Angostura Arroyo and Placitas Arroyo) proposed in the Conceptual Plan (USACE 2009). The design in that report proposed destabilizing the bankline across from the arroyo mouth by removing the riprap and vegetation from the bankline toe so that channel forming discharge in the Rio Grande could gradually erode the bank, increase channel sinuosity and improve habitat complexity for native fish. The riprap removed from the bankline would be used to reinforce the levee along the edge of the elevated floodplain terrace.

**Site Assessment**
Three vegetation map units were documented at the site (Figure 6). Non-native saltcedar (*Tamarix chinensis*) dominates the length of the bankline slope throughout the site. Honey mesquite (*Prosopis glandulosa*) is a co-dominant with saltcedar along the bankline in southern (downstream) segment of the site, while coyote willow (*Salix exigua*) is a co-dominant with saltcedar in the upstream segment. Additional woody plant species growing along the bankline slope includes willow baccharis (*Baccharis salicina*), fourwing saltbush (*Atriplex canescens*), Rio Grande cottonwood (*Populus deltoides*), wolfberry (*Lycium torreyi*), whitethorn acacia (*Acacia constricta*), prickly pear (*Opuntia phaeacantha*), arrowweed (*Pluchea serecia*), and feather plume (*Dalea formosa*). Scratchgrass (*Muhlenbergia asperifolia*) was the most common grass species observed on the bankline. Other grasses observed included Canada wildrye (*Elymus canadensis*), spike dropseed (*Sporobolus contractus*), sideoats grama (*Bouteloua curtipendula*), Bermuda grass (*Cynodon dactylon*), and bromes (*Bromus* sp.). Dominant forbs along the bankline slope included Russian thistle (*Salsola tragus*), velvetweed (*Oenothera curtiflora*), *Mentzelia* sp., globemallow (*Sphaeralcea* sp.), and fringed twinevine (*Funastrum cynachoides*). Two giant cane (*Arundo donax*) tussocks, a Class C noxious weed in NM (NMDA 2016), colonized the sloped bankline.

The elevated floodplain terrace above the bankline slope is currently dominated by Jimmyweed (*Isocoma pluriflora*), a native shrub (Figure 7). Other woody species documented on the floodplain terrace include saltcedar, honey mesquite, arrowweed, prickly pear, fourwing saltbush, whitethorn acacia, indigobush (*Psorothanmus scoparius*), and longleaf jointfir (*Ephedra trifurca*). The herbaceous layer is dominated by spike dropseed with interstices filled by winter annuals including redstem filaree (Erodium cicutarium), tansymustard (*Descuriania pinnata*), and annual Townsend daisy (*Townsendia annua*). Desert marigold (*Baileya multiradiata*), tansyaster (*Machaeranthera tanacetifolia*) globemallow, spectacle pod (*Dimorphocarpa wislizeni*), (*Schismus* sp.), silverleaf nightshade (*Solanum elaeagnifolium*), Lehmann lovegrass (*Eragrostis lehmanniana*) Russian thistle, bush muhly (*Muhlenbergia porteri*), twinpod (*Physaria* sp), needle grama (*Bouteloua aristidoides*) and woollygrass (*Dasyochloa pulchella*).

Field observations from the January 2019 site assessment found the riverbed contains a large quantity of 3- to 6-inch rock deposited immediately downstream of the Yeso Arroyo confluence, with some rocks as large as 12 to 18 inches. Yeso Arroyo was approximately 50 feet wide near the mouth and was also dominated by coarse substrate. Hydraulic modeling indicates that flows on the order of 6,000 cubic feet per second (cfs) would be required to crest surface of the elevated floodplain terrace. Under current conditions, therefore, river flows would only wet the floodplain terrace at the 100-year peak discharge (Figure 8). LiDAR data indicate that most of the floodplain terrace at the site is elevated 8 to 11 feet higher than the adjacent riverbed. Accordingly, no soil augering was performed during the recent site assessment.

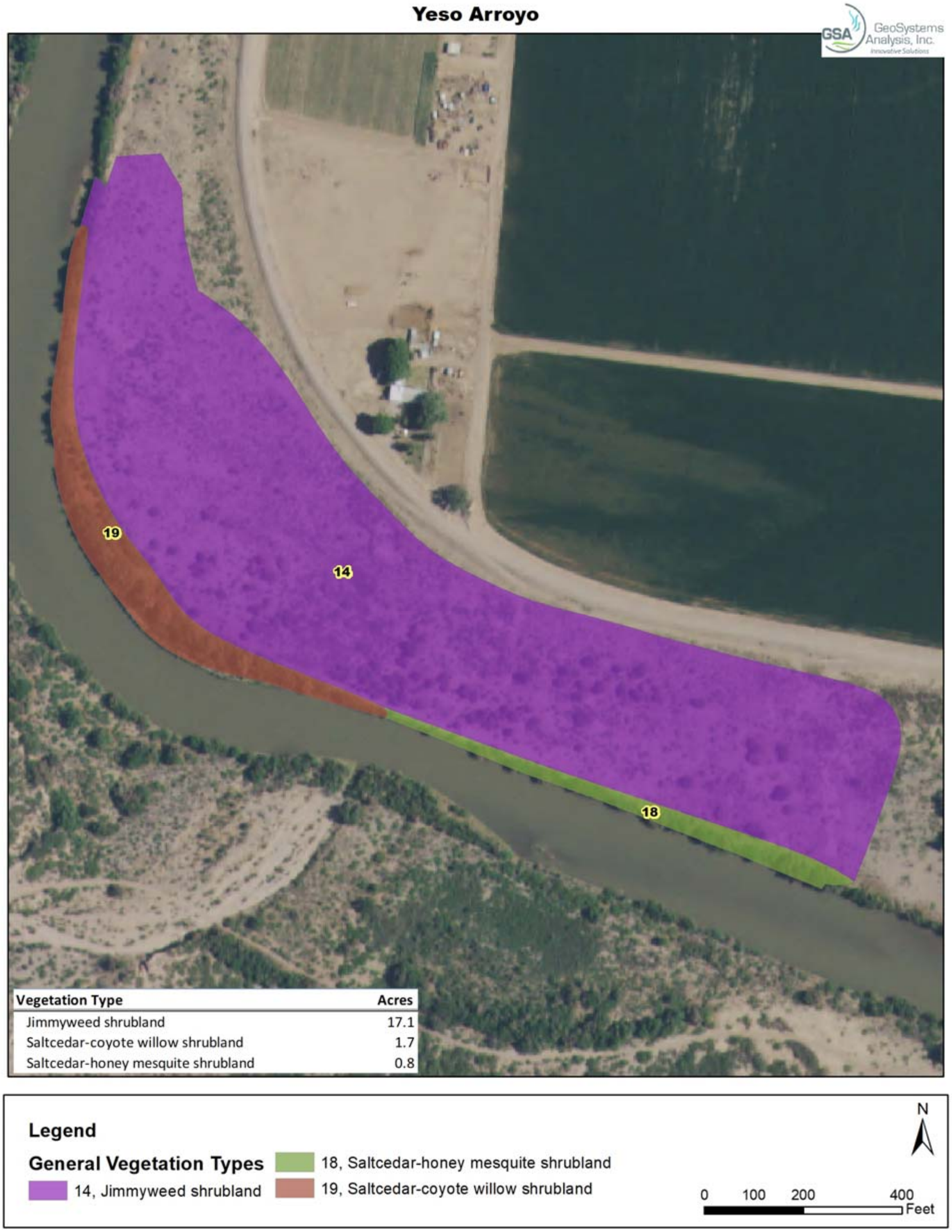



*Figure 6. Yeso Arroyo vegetation map*

*Figure 7. Representative photos of the Yeso Arroyo site. Top photo: typical vegetation conditions on the elevated floodplain terrace. Bottom left: riprap on toe of bank. Bottom right: bed conditions in the Rio Grande near the site.*

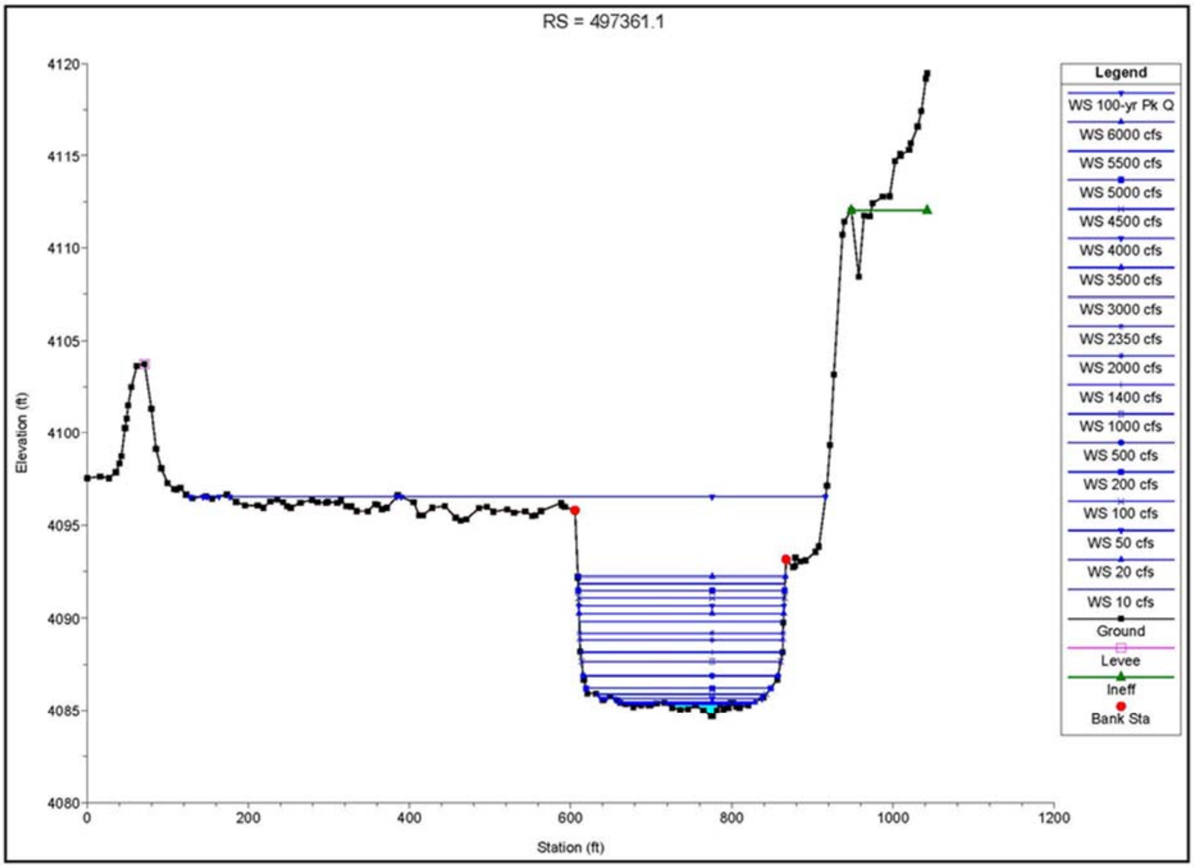



*Figure 8. Representative channel cross-section of Rio Grande at Yeso Arroyo site showing predicted surface-water elevations under a range of discharges.*

**Conceptual Design**

The conceptual design in this report for the Yeso Arroyo site (Figure 9 & Figure 11) includes modifying the slope of the existing steep bankline terrace by creating a series of terraced benches capable of experiencing overbank flood inundation at a range of low to moderate discharge levels (e.g., 800-2,500 cfs). The terrace benches would be planted with native riparian vegetation that could provide nesting, roosting and feeding substrate for bird species and, when inundated, habitat for native fishes. Lower bench surfaces should be actively revegetated with a diverse assemblage of wetland herbs while upper terrace surfaces should be targeted for revegetation with native woody plant species.

Bankline terracing will provide wetted, variable and sometimes low-velocity habitat when local Rio Grande discharge exceeds 800 cfs. The most likely users of such a habitat are red shiner (*Cyprinella lutrensis*) and fathead minnow (*Pimephales promelas*). Their primary use would be feeding on small aquatic macroinvertebrates. If water velocities were slow to moderate, western mosquitofish

(*Gambusia affinis*) might also feed and potentially spawn. Channel catfish (*Ictalurus punctatus*) might move through it in search of macroinvertebrate and fish prey. Pulsing flows over the lowered terrace would transport organic debris into the river channel thereby increasing its nutrient base.

The conceptual design elements include:

- Removing saltcedar and other non-native vegetation,
- Removing riprap from the bankline toe and placing along the base of the levee,
- Reduce the bankline slope gradient by creating three- to four- nested terrace benches stabilized by planting native riparian vegetation on the upper bench,
- Install herbaceous wetland vegetation on the lower bench surfaces and woody vegetation on the higher terraces,
- Discontinue channel dredging in this reach segment (as also recommended for the site in USACE 2009) to encourage channel mobility.

<u>Opportunities and Constraints</u>
Compared to the sandy, homogenous channel conditions through most of the RGCP, the rocky channel substrate found at the Yeso Arroyo site has potential to provide relatively heterogenous aquatic habitat structure, including riffles, runs, and pool habitats. These complex channel conditions, particularly in combination with the previously constructed (by USIBWC) Yeso West wetland restoration site immediately downstream, form a potentially valuable and unique suite of aquatic habitat features in this segment of the Rio Grande. Furthermore, flows in this segment of the Rio Grande appears to be persistent (possibly perennial), even outside the irrigation delivery season, which further supports the potential for aquatic habitat enhancements through restoration.

This site has excellent potential to improve in-channel and off channel aquatic habitats with a nested geomorphic floodplain (e.g. terraced approach). Design would incorporate (at minimum) a low-flow bench inundated at approximately 800 cfs, a moderate-flow bench inundated at approximately 1,400 cfs, a high-flow bench inundated at approximately 2,500 cfs, with the remainder of the terrace remaining protected at the 100-year flood elevation. To ensure optimal functionality, design elevations recommended in Figure 10 should be thoroughly evaluated in the engineering design phase. Over time, this design alternative has potential to encourage natural recruitment of native vegetation. Cottonwood/willow planting on the higher terrace sections would provide benefits to southwestern willow flycatcher and yellow-billed cuckoo as the trees mature.

The property is owned by USIBWC. The primary constraint at this site is to provide assurances to protect levee integrity. Scour analysis is recommended during the engineering phase of this project. Additionally, lowering the floodplain terrace to desired discharges would require significant earthwork (and cost). Ongoing maintenance will be required to periodically remove sediment (which often forms bankline berms in this design alternative) to ensure long-term functionality.

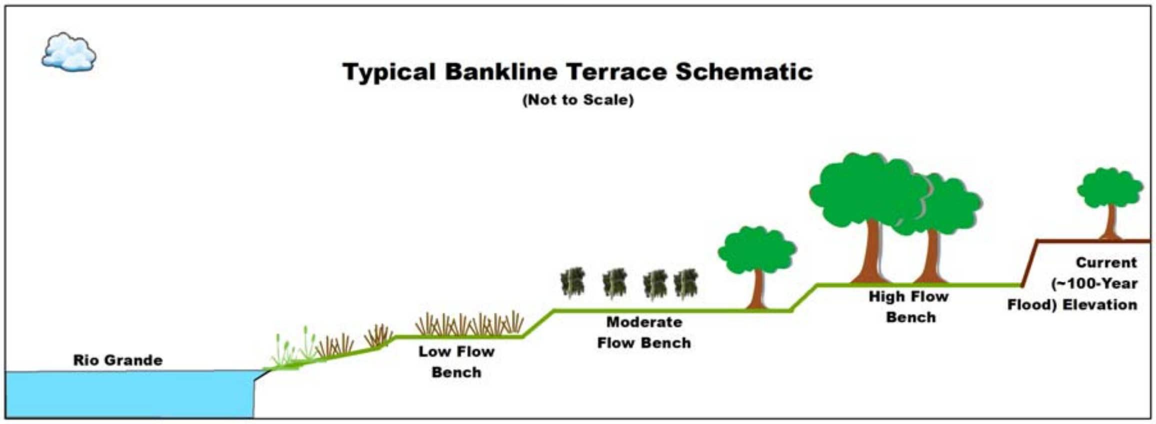



*Figure 9. Cross-section of terraced bankline conceptual design at the Yeso Arroyo site.*

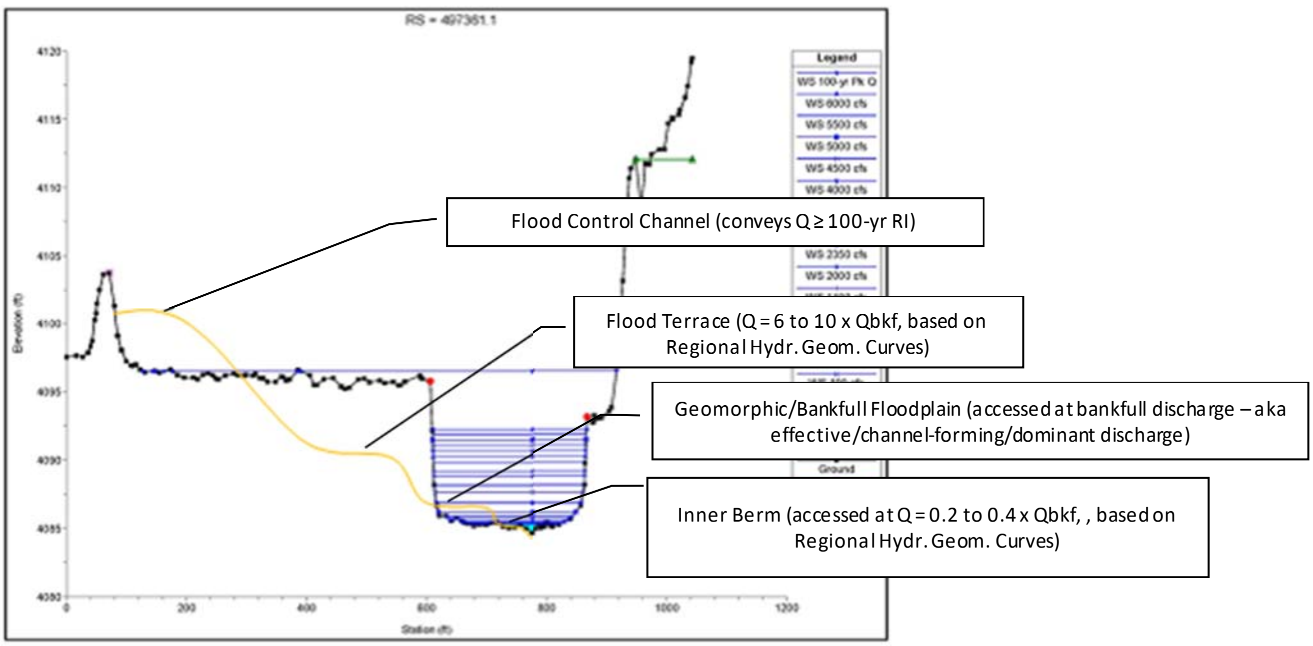



*Figure 10. Geomorphic surfaces targeted in the nested terrace design. Lower terrace and bank full elevations and their associated terraces are representative of the secondary and overbank (i.e. effective/channel forming/dominant) discharges.*

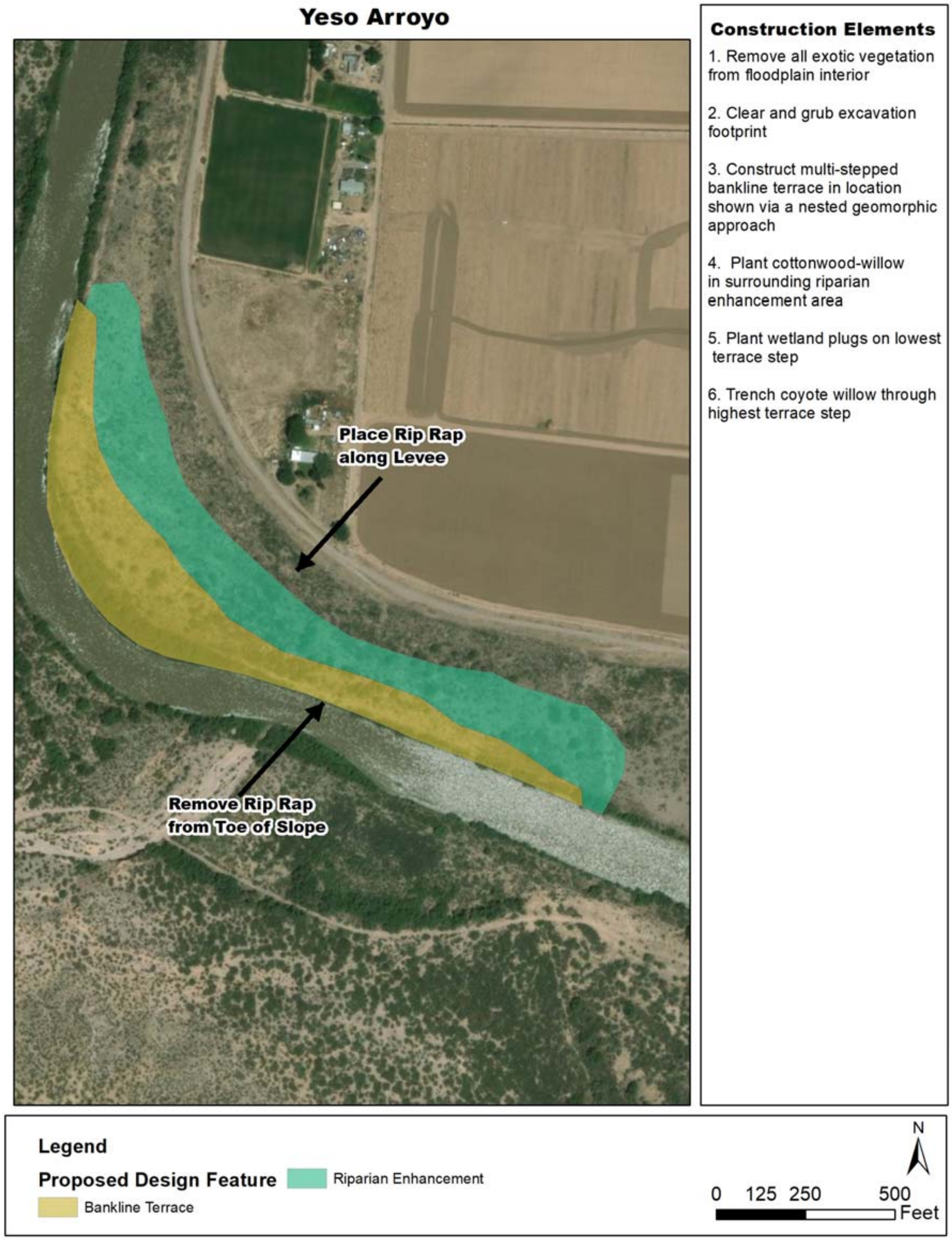



*Figure 11. Plan-view conceptual restoration design map for the Yeso Arroyo project site.*

## 3.2 Angostura Arroyo

Angostura Arroyo enters the Rio Grande from the south side of the river in a channel bend near RM 80. This site was included as an aquatic restoration site in the Conceptual Plan (USACE 2009). The design in that report is like Yeso Arroyo and includes saltcedar removal and bankline destabilization to facilitate river migration into the site. Both the arroyo mouth and the bankline are densely vegetated with willow. Arroyo discharge is funneled into a box culvert structure below highway 185 and another road just west of the confluence with the Rio Grande. Rocky, volcanic derived alluvium is more common above the box culverts and arroyo substrate becomes more sand dominated below the culverts. Large rock and gravel bars have formed in the Rio Grande channel near the arroyo mouth, increasing the diversity of substrate and flow conditions in the channel in and around the confluence. USIBWC has also historically dredged the river channel in this location to maintain channel conveyance capacity and gradient.

Flows in the Rio Grande appear to be persistent (possibly perennial) at this site, even outside the irrigation delivery season. LiDAR data indicates that much of the floodplain terrace is approximately 10 feet above the riverbed at this site (Appendix B) and hydraulic model results show that the site does not inundate until flows approach the 100-year discharge event (Figure 12). GSA scientists did not auger holes at this site, however, soils at the site are very coarse grained on the surface. The east bank of the river has large rock (likely riprap) along the toe.

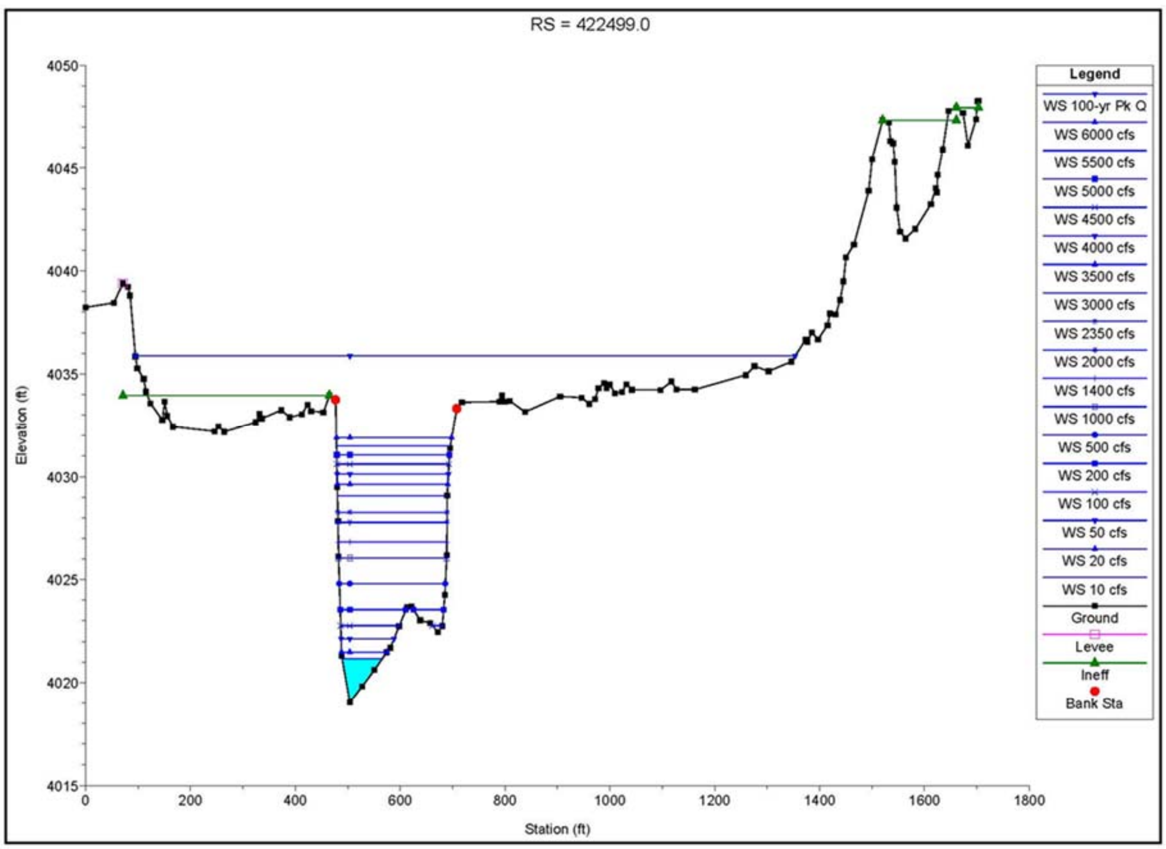



*Figure 12. Representative channel cross-section of Rio Grande at Angostura Arroyo site showing predicted surface-water elevations under a range of discharges.*

**Site Assessment**

Two vegetation types were identified at the proposed Angostura Arroyo restoration site (Figure 13). A saltcedar-coyote willow shrubland inhabits the bankline slope. Other woody species observed on the bankline include saltcedar, arrowweed, screwbean mesquite (*Prosopis pubescens*), Baccharis (*Baccharis salicifolia* and *salicina*), honey mesquite, fourwing saltbush, wolfberry, and skunkbush sumac (*Rhus trilobata*). Saltcedar is more prevalent on top of slope while coyote willow and *Baccharis* spp. are more common on lower portions of the slope. Spiny chloracantha (*Chloracantha spinosa*) bands inhabit the slope/terrace transition. A bench of cattail (*Typha domingensis*) and bulrush (*Schoenoplectus* sp.) occurs at the bottom of the bank. Bermudagrass, alkali sacaton (*Sporobolus airoides*), and bearded sprangletop (*Leptochloa fusca*) are the most abundant graminoids on the bankline slope.

The floodplain terrace is actively mowed by USIBWC so woody vegetation is mostly absent (Figure 14). The terrace is characterized as an open/barren area and Russian thistle is the most abundant species. Mowed saltcedar and arrowweed stems are patchy while Jimmyweed, spiny chloracantha, and fourwing saltbush stems are evenly distributed. Mowed whitethorn acacia, wolfberry, fourwing saltbush, and screwbean mesquite individuals are occasional. Alkali sacaton is the most abundant graminoid while bermudagrass, scratchgrass, needle grama, spike dropseed, Mediterranean (*Schismus* sp), feathertop (*Chloris virgata*), and mesa dropseed (*Sporobolus flexulosus*). Other annual weeds like kochia (*Bassia scoparia*) and amaranth (*Amaranthus* sp.) scorpionweed (*Phacelia* sp.), London rocket (*Sisimbrium irio*), and western tansymustard occur but at lower frequency than expected given the high degree of site disturbance.

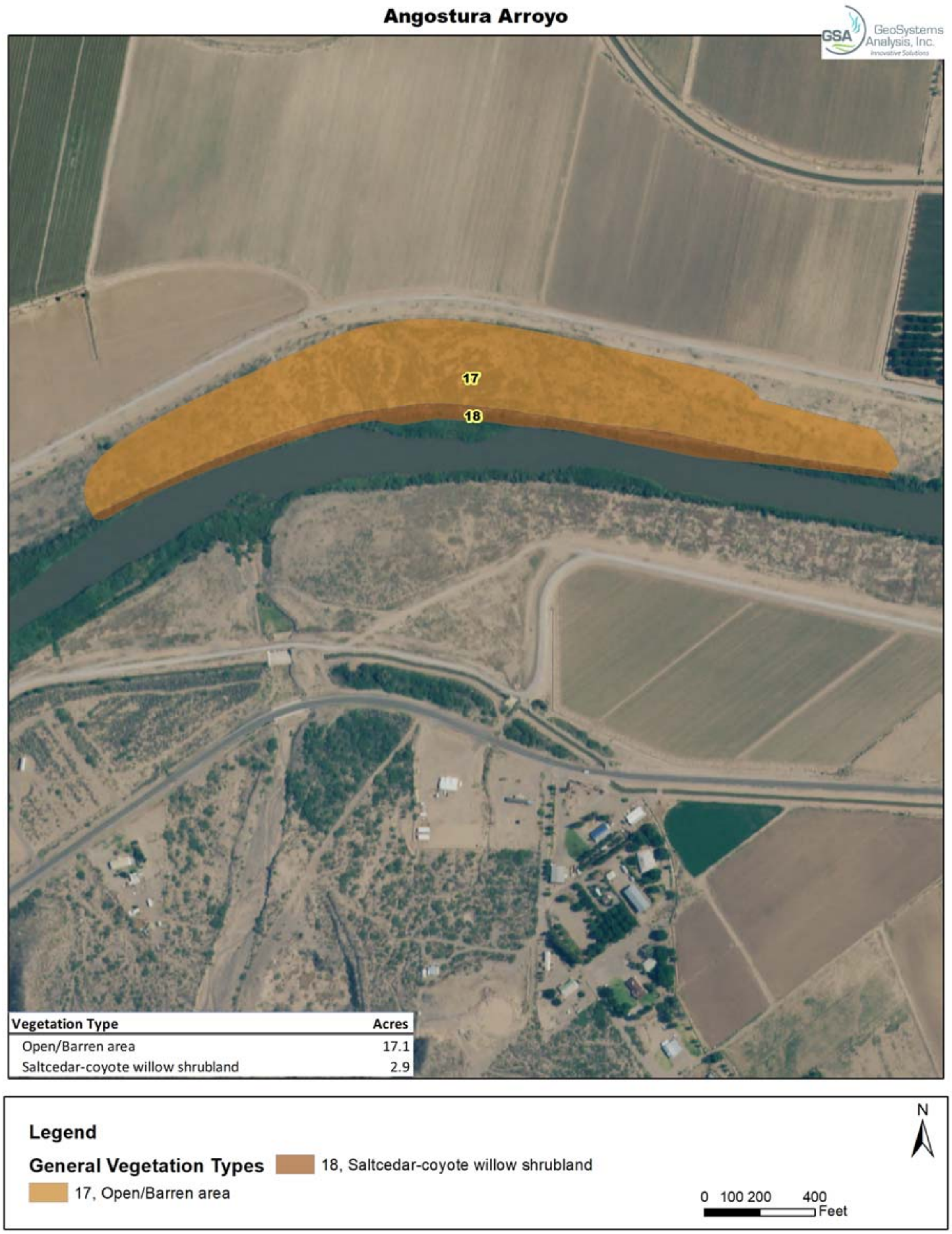



*Figure 13. Angostura Arroyo vegetation map*

*Figure 14. Representative photos from the Angostura Arroyo site. Top photo: typical conditions on the elevated floodplain terrace. Bottom left and right, Rio Grande channel adjacent to the site.*

***Conceptual Design***

The conceptual design at this site (Figure 17) is very similar to Yeso Arroyo in that it would involve modifying the steep bankline slope by creating a series of terraced benches (see Figure 9) capable of experiencing overbank flood inundation at a range of low to moderate discharge levels (e.g., 800-2,500 cfs). The terrace benches would be planted with native riparian vegetation that could provide nesting substrate for bird species and potential nursery habitat for native fishes. Lower terrace surfaces should be revegetated with a diverse mix of wetland herbs while woody vegetation (cottonwood-willow plus potted shrubs) planting is recommended on upper benches.

Restoration consists primarily of lowering banks to provide a wetted low-profile terrace when local discharge exceeds 800 cfs. When wetted sufficiently, several small-bodied, short-lived fish species may use the terrace. Of these, the most likely are red shiner, fathead minnow, and western mosquitofish. Fathead minnow and western mosquitofish favor low-velocity habitats with abundant aquatic vascular plants. Red shiner generally prefers moderate-velocity habitats, such as the inundated, upstream arroyo delta, but will use flooded areas such as the terrace for foraging. Female fathead minnows deposit their eggs on submerged organic matter and live-bearing western mosquitofish need zero or low-velocity habitats to avoid current entrainment of their young. Red shiner would spawn in the higher gradient portions of the upstream arroyo delta, but their young, upon emergence would use the low velocity habitats of the terrace. The wetted terrace would likely support a variety of aquatic insects that would be consumed by fishes. A fourth species, channel catfish, might forage for insects and fishes on the terrace. Pulsing flows over the lowered terrace would transport organic debris into the river channel thereby increasing its nutrient base.

The conceptual design elements include:

- Removing saltcedar and other non-native vegetation,
- Removing riprap from the bankline toe and placing along the base of the levee,
- Reduce the bankline slope gradient by creating three- to four-bankline terrace benches stabilized by planting native riparian vegetation on the upper bench,
- Install herbaceous wetland plant species on the lower benches and woody riparian species on the higher benches,
- Discontinue channel dredging in this reach segment (as recommended in USACE 2009) to encourage channel mobility.

Opportunities and Constraints

This site has potential to improve in-channel and off channel aquatic habitats with a nested geomorphic floodplain (e.g. terraced approach). Design discharges are intended to achieve a low-flow bench at approximately 800 cfs, moderate flow bench at approximately 1,400 cfs, a high flow bench at approximately 2,500 cfs, with the remainder of the terrace remaining protected at the 100-year flood elevation. Over time, this design alternative has potential to encourage natural recruitment of native vegetation recruitment. Cottonwood/willow planting on the higher terrace sections would provide benefits to southwestern willow flycatcher and yellow-billed cuckoo as the trees mature. Deposition of large bed material from the arroyo contributes to increased habitat heterogeneity in the vicinity of the restoration area.

The property is owned by USIBWC. The primary constraint at this site is to provide assurances to protect levee integrity. Supplemental flood scour evaluations are recommended during the engineering phase to ensure that project construction does not affect levee integrity. Additionally, lowering the floodplain terrace to desired discharges would require significant earthwork (and cost). Ongoing maintenance will be required to periodically remove sediment (which often forms bankline berms in this design alternative) to ensure long-term functionality.

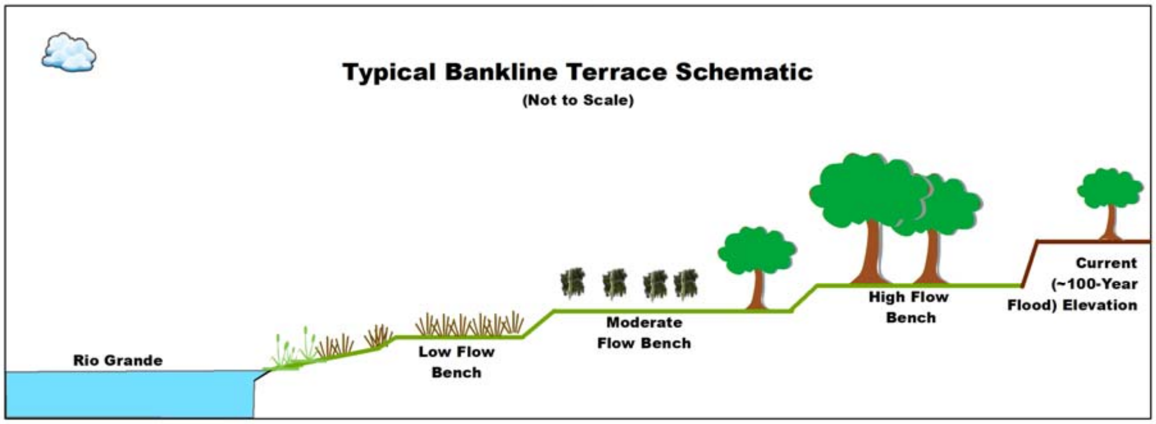



*Figure 15. Cross-section of terraced bankline conceptual design at Angostura Arroyo site.*

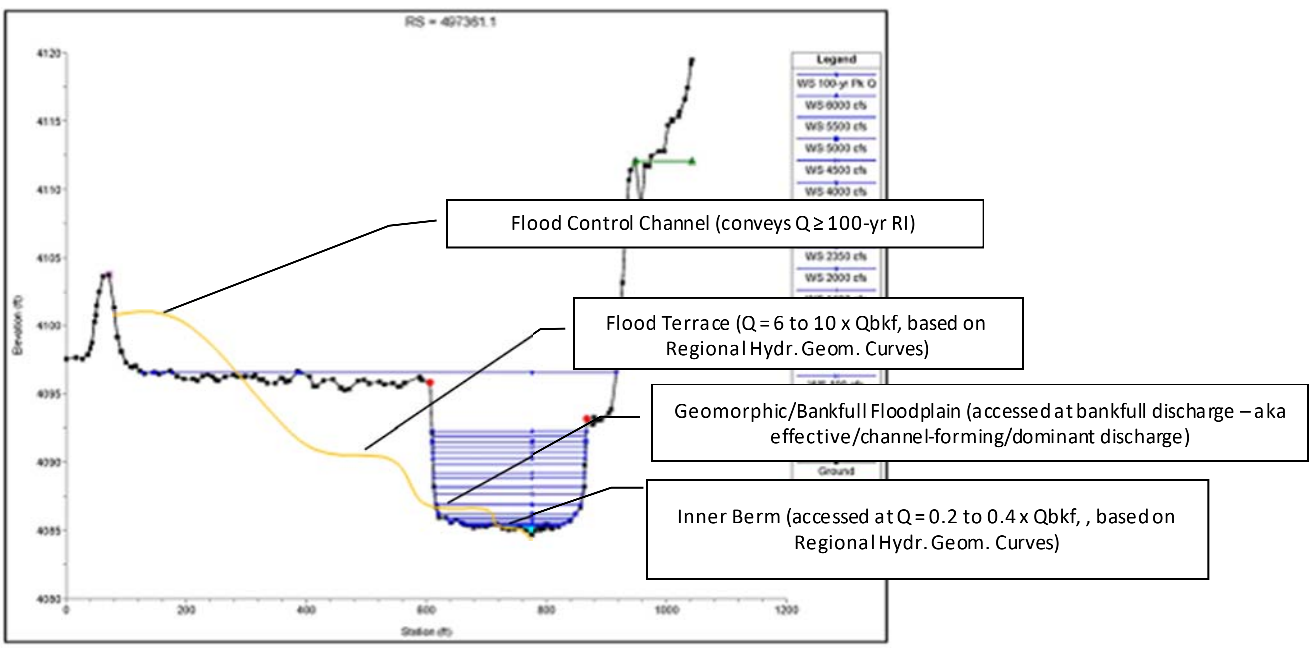



*Figure 16. Example geomorphic surfaces targeted in the nested terrace design. Lower terrace and bank full elevations and their associated terraces are representative of the secondary and overbank (i.e. effective/channel forming/dominant) discharges.*

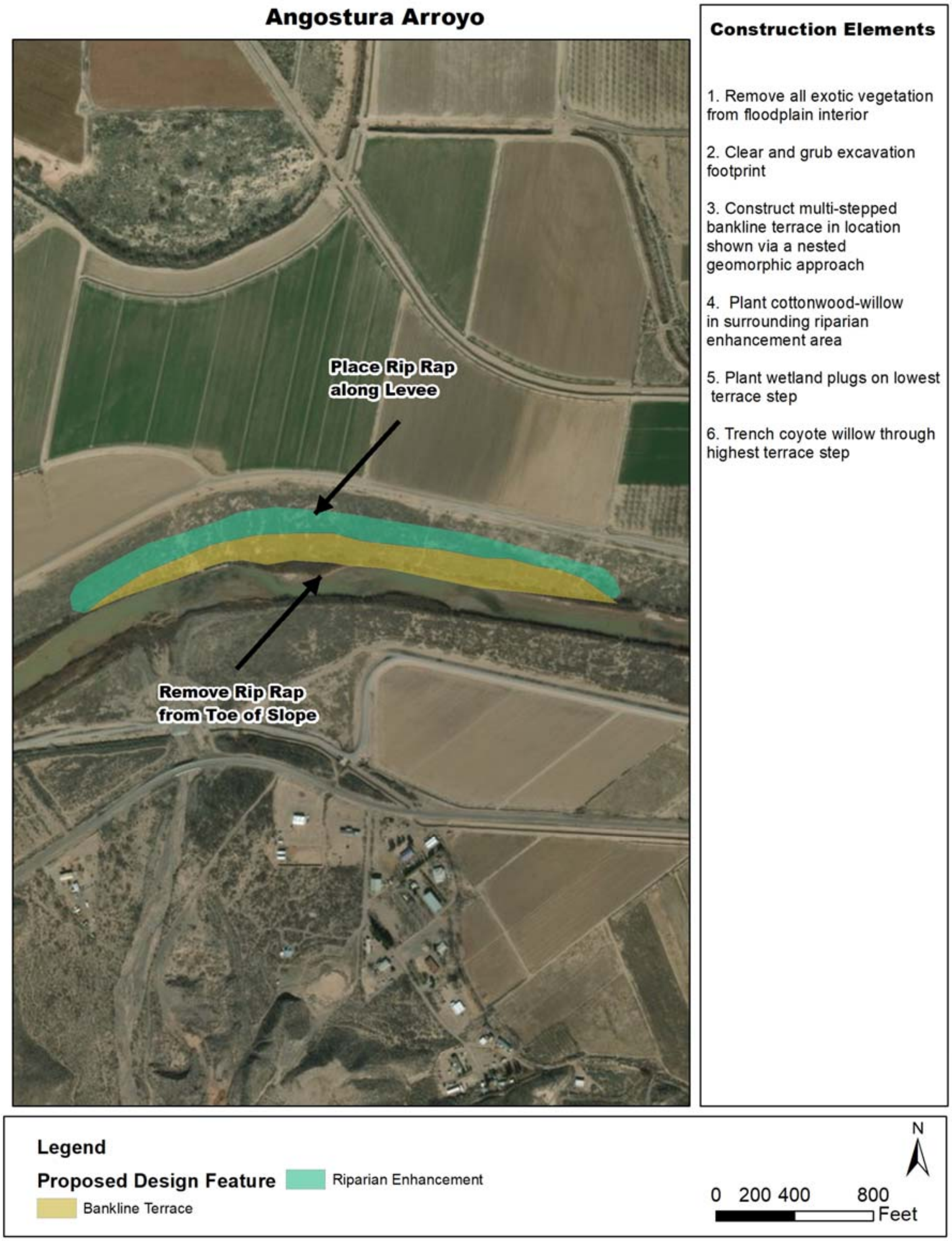



*Figure 17. Angostura Arroyo conceptual restoration design map*

## 3.3 Broad Canyon Arroyo

Broad Canyon Arroyo is a tributary to the Rio Grande that enters from the west side of the river near RM 68. The site has been the focus of previous riparian habitat enhancement by U.S. Fish & Wildlife Service (USFWS) for USIBWC. These projects have mostly emphasized planting riparian vegetation, although success has been mixed. Gooding's willow (*Salix gooddingii*), cottonwood and coyote willow pole plantings are flourishing near the mouth of Broad Canyon Arroyo and along the arroyo bottom. Conversely, coyote willow and cottonwood/willow tree plantings on higher terraces further from the arroyo mouth experienced high mortality. It's likely that soil salinity has negatively affected planting survival on the higher terraces. Propst and Bixby (2018) proposed multiple potential options for improving fish habitat at the site including 1) enhancing backwater habitat at the arroyo mouth and 2) establishing two alternative paths for carrying Rio Grande water via a new point of diversion to create a manmade spring in the arroyo

Buckle Bar Canyon joins the Rio Grande opposite (east) of Broad Canyon Arroyo. The substrate periodically delivered to the Rio Grande channel from both arroyos contributes to channel structural diversity and a substrate for benthic invertebrates. The Rio Grande channel contains short riffle, run and pool habitats, and the channel habitat complexity along the site is further enhanced by existing vegetated islands and point-bars. A backwater forms up Broad Canyon Arroyo during low to moderate flows. Hydraulic models indicate that a backwater begins to form when flows reach approximately 100 cfs (Figure 18) and inundation expands up the arroyo with increasing discharge. LiDAR data indicates that the arroyo bottom is approximately 2 feet above the riverbed at the confluence (Appendix B). Surface flow in the Rio Grande appears persistent, possibly perennial even outside the irrigation delivery season. This site lies in an USIBWC no-mow zone.

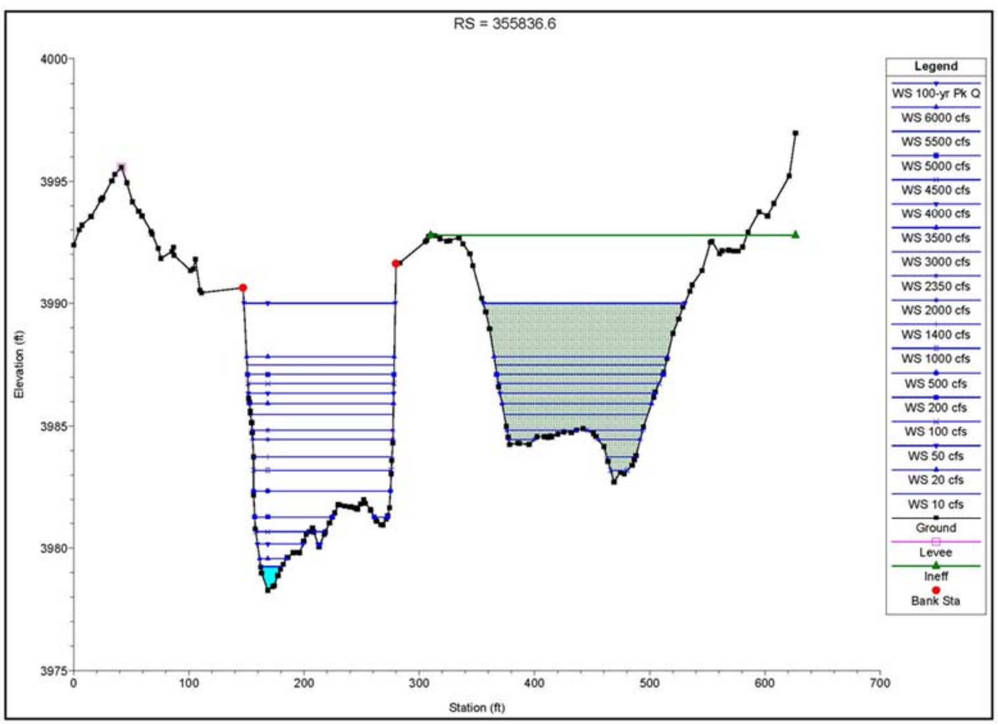



*Figure 18. Representative channel cross-section of Rio Grande at the Broad Canyon Arroyo site showing predicted surface-water elevations under a range of discharges. Green-highlighted area shows predicted surface water elevations at the mouth of Broad Canyon Arroyo.*

**Site Assessment**
Seven different vegetation types were described for the site as indicated in Figure 19. Most of the bankline is a coyote willow shrubland with occasional Baccharis, wolfberry, cottonwood, honey mesquite, arrowweed, and netleaf hackberry (*Celtis laevigata* var. *reticulata*). A short segment of bankline is mapped as an arrowweed shrubland near the north end of the assessment area. Alkali sacaton is the most abundant herbaceous plant along the bankline.

A long berm parallels the channel near the upstream-most edge, where it separates two distinct open/barren areas. The southern open/barren area is dominated with Russian thistle, with patches of saltcedar and honey mesquite, and numerous piles of discarded concrete and rubble. The open/barren area on the north side of the berm was cleared and planted with cottonwood, seep willow, Gooding's willow, wolfberry and possibly other species but survival appears low. That open/barren site is now dominated by Russian thistle and Mojave seablite (*Suaeda nigra*). The top of the berm is mostly bare and appears driven on occasionally (by railroad contractors and others). Honey mesquite shrublands with a mix of grasses, predominantly spike dropseed and woollygrass inhabit the berm edges. The riverside slope and the area between the berm and the willow bankline is weedy and diverse, with a portion that previously burned, possibly during prescriptive burning of debris piles. The riverside edge of the berm is predominantly Russian thistle, with scattered wolfberry and honey mesquite, and fringed twinevine growing throughout. The inland side of the berm is predominantly honey mesquite entangled with fringed twinevine and bristlegrass (*Setaria* sp.), amaranth, Russian thistle along with other weedy annuals dominating the herbaceous layer.

More upland portions of the site include honey mesquite shrublands, open/barren areas, burrobrush shrublands, and portions where jointfir (*Ephedra*) co-dominates with honey mesquite. Russian thistle, sand dropseed, sacred datura (*Datura wrightii*), wolfberry, fringed twinevine, broom snakeweed (*Gutierrezia sarothrae*), giant sacaton (*Sporobolus giganticus*) are the primary herbaceous constituents.

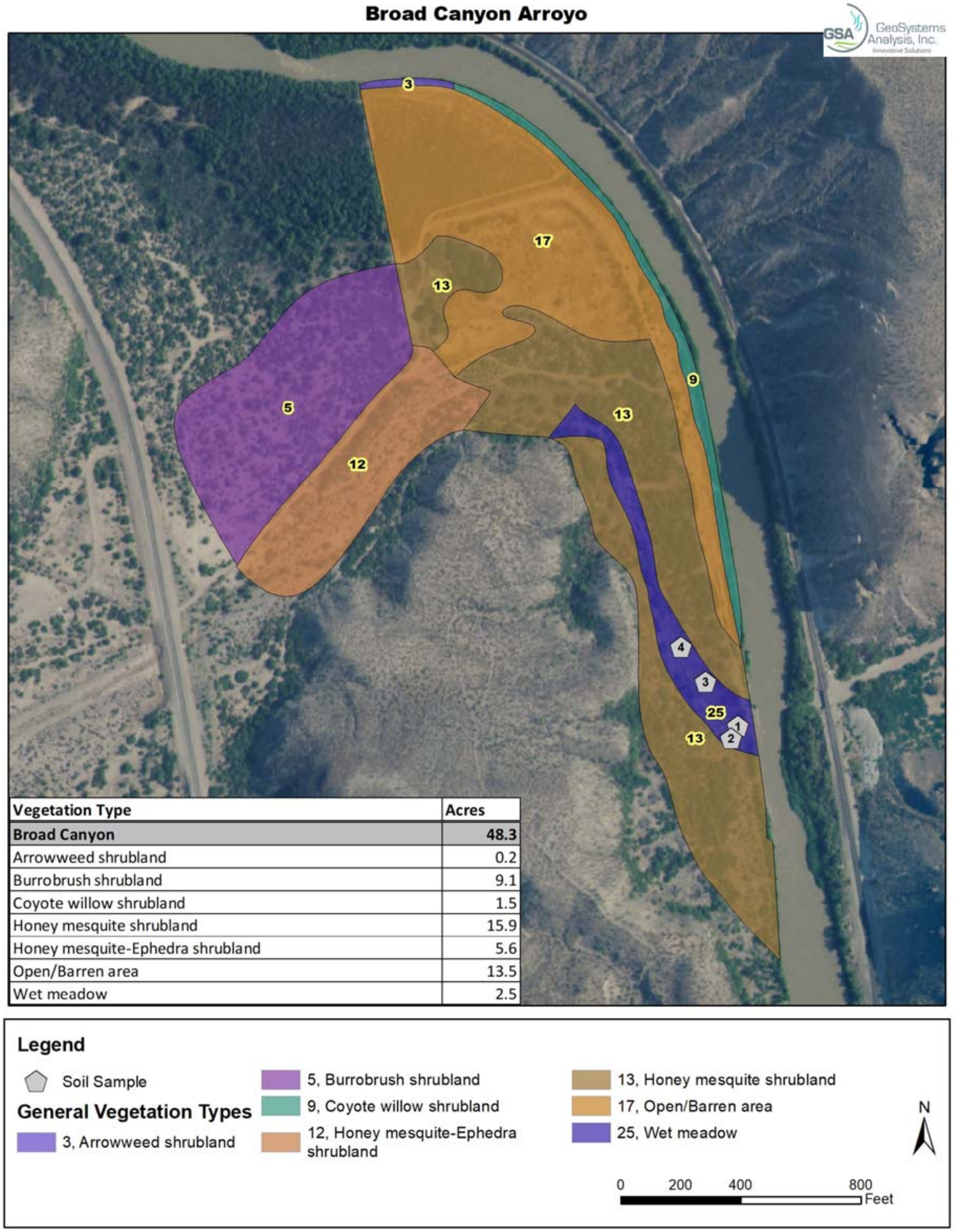
While the arroyo floodplain is mapped as a wet meadow at the scale shown in our report, the arroyo bottom is highly diverse with numerous small-scale wetland and aquatic features (Figure 20). The terrace above the active flow path is predominantly a bermudagrass meadow with small patches of saltgrass, common threesquare (*Schoenoplectus pungens*) and spike rush (*Eleocharis* sp.) dispersed throughout. Vigorous Gooding's willow and seep willow plantings are prominent near the confluence of the river, as well as a band of planted coyote willow, with high survival that will likely begin to spread via rhizome. Previous plantings near the confluence reportedly had high mortality, suspectedly due to salinity or prolonged inundation (USIBWC personal communication).

The arroyo flow path is bare from the river confluence to about 200 feet upstream, where a mosaic of cattail marsh areas, coyote willow patches, and small wet meadows begins. Beyond that point, extending about 900 feet upstream are smaller Gooding's willow and cottonwood plantings in the bermudagrass meadow intermixed with cattail marsh and coyote willow patches in and adjacent to the arroyo bottom. By about 1,100 feet above the confluence, rush patches diminish and the bermudagrass becomes mixed with kochia. Coyote and Gooding's willow patches discontinue near this location and the arroyo bank line has lower woody species cover - honey mesquite with an occasional planted cottonwood trench, and netleaf hackberry. Jungle rice (*Echinochloa colona*) and feather fingergrass become the dominant herbaceous species as the arroyo becomes drier, with occasional giant sacaton (*Sporobolus wrightii*), globe mallow and silverleaf nightshade. By approximately 2,000 feet above the confluence, arroyo vegetation becomes more arid and blends with upland types that inhabit the sides of the canyon which are dominated by honey mesquite and longleaf jointfir and spike dropseed with woollygrass being the dominant herbaceous species.

Soils were augered at four locations as shown in Figure 19 and Table 3. Unfortunately, buried rock and gravel prevented penetration to groundwater at three of the bore holes augered on benches immediately above the primary flow path of Broad Canyon Arroyo. One bore hole in the primary flow path revealed clay soils down to 38 inches. After leaving the hole open for a few minutes, upwelling groundwater filled to 22 inches. Bore hole 3 was augered in a location with high coyote willow planting mortality. Salt crystals were abundant in the clay loam found in the top 13 inches. Salts were less apparent in the other auger locations, some of which included higher planting success.

Table 3. Soil texture and depth to groundwater observed at Broad Canyon Arroyo soil bore hole locations.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 4 | C | Dry | Dry clay plates. Hole in unvegetated segment of arroyo, near mouth. |
| | 4 to 11 | C | Wet | |
| | 11 to 38 | C | Very Moist | |
| | 22 | GW | | After sitting open, hole filled with water at 22". |
| 2 | 0 to 8 | CL | Slightly moist | Bermuda grass, Gooding's willow bench. |
| | 0 to 30 | C | Slightly moist | Hit a rock, groundwater likely ~5 feet. |
| 3 | 0 to 13 | CL | | Visible salts concentrated in top layer. Hole in center of dead coyote willow plantings. |
| | 13 to 24 + | | | Could not penetrate with auger. Gravelly coarse sand |
| 4 | 0 to 10 | CL | Moist | |
| | 10+ | Sa | Moist | Gravelly coarse sand. Could not penetrate. Less salt visible than hole 3. Salt crystals only apparent at transition point between clay and sand. Hole in Bermuda grass with live plantings. |




| Vegetation Type | Acres |
|---|---|
| **Broad Canyon** | **48.3** |
| Arrowweed shrubland | 0.2 |
| Burrobrush shrubland | 9.1 |
| Coyote willow shrubland | 1.5 |
| Honey mesquite shrubland | 15.9 |
| Honey mesquite-Ephedra shrubland | 5.6 |
| Open/Barren area | 13.5 |
| Wet meadow | 2.5 |

*Figure 19. Broad Canyon Arroyo vegetation map and soil sampling locations.*

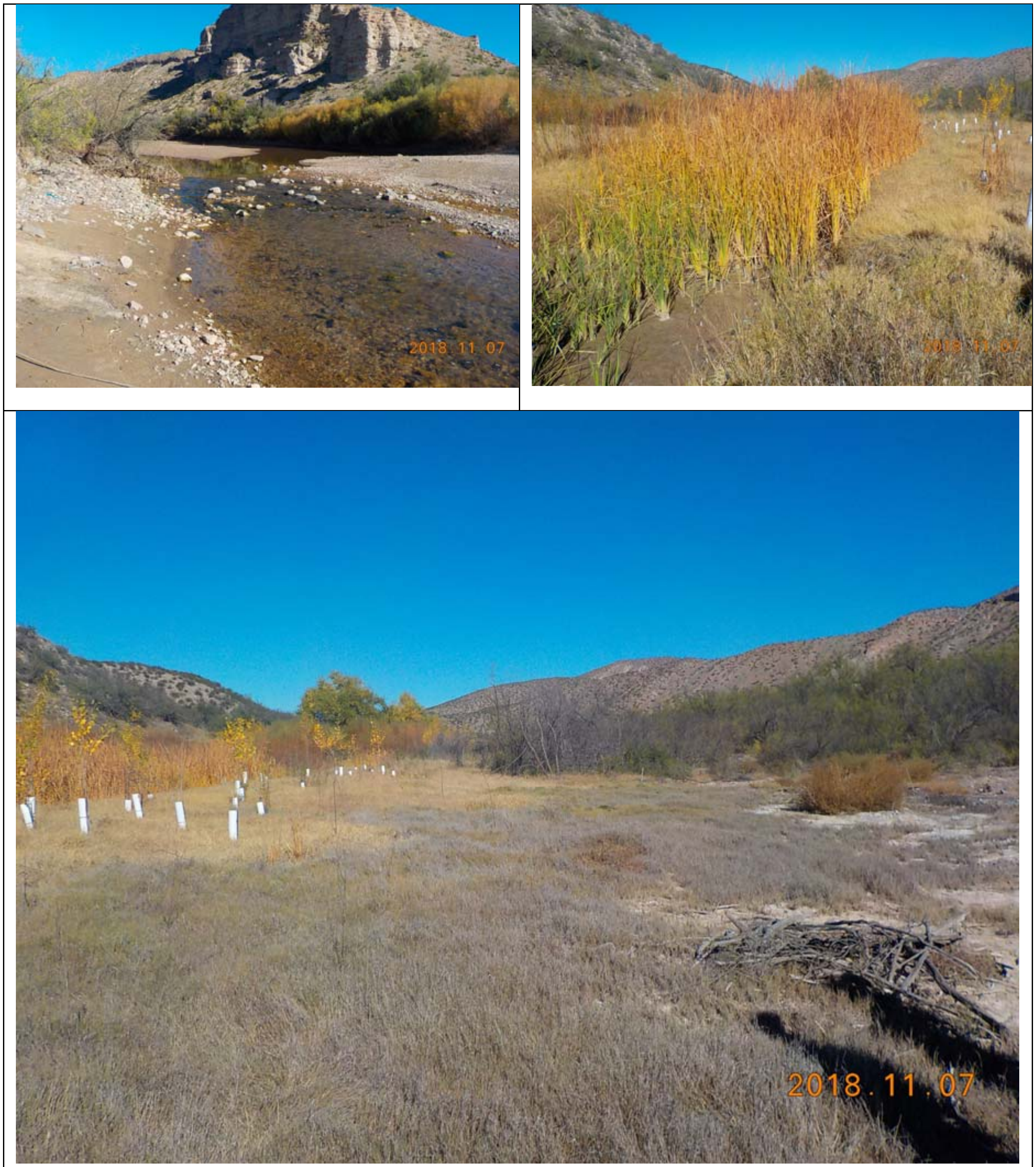



*Figure 20. Representative photos of the Broad Canyon Arroyo site. Top left: Rio Grande near the arroyo confluence. Top right: marsh habitat in the arroyo bottom. Bottom photo: typical bench targeted for embayment excavation with nearby plantings.*

**Conceptual Design**

The conceptual restoration design recommendation for the Broad Canyon Arroyo site emphasizes enhancing the backwater function and habitat diversity by creating a series of embayments supplemented with diverse riparian-wetland revegetation (Figure 21 & Figure 22). Excavated embayments provide an opportunity to diversify off channel aquatic habitat plus enhance existing restoration projects already located at the site. The embayments are designed with a target elevation approximately 1 foot higher than the primary arroyo flow path and predicted to begin inundating when localized discharge in the Rio Grande reaches approximately 400 cfs. Embayments nearest the Rio Grande would inundate first. By approximately 1,500 cfs (in the Rio Grande), backwater conditions are predicted to back far enough up the arroyo that each of the embayments would be entirely underwater. Manipulating topography in the arroyo mouth is expected to diversify emergent wetland vegetation and provide backwater aquatic habitat for fish and other aquatic species.

Addition of embayments to the Broad Canyon backwater will provide deep water, structurally diverse habitats that are not otherwise available in the existing channel. In addition to providing habitat for fathead minnow and western mosquitofish, the constructed deep-water features would potentially provide habitat for several large-bodied fish species. Of these, channel catfish and bluegill (*Lepomis macrochirus*) are the most likely beneficiaries. While channel catfish would be more likely to inhabit the Rio Grande when flowing, it would also forage in the backwater for macroinvertebrates and fish. Bluegill, however, would be more likely to inhabit the backwater, especially with addition of deep pool habitats. It is more common in deeper zero- and low-velocity structurally diverse habitats with vascular aquatic plants where it feeds on macroinvertebrates and small fishes. Gizzard shad (*Dorosoma sp*.) might forage for zooplankton in the still water habitat of the backwater. Less likely, but still potential users of the improved backwater are red shiner, river carpsucker, and flathead catfish (*Pylodictis olivaris*). Red shiner generally does not occur in zero-velocity habitats. Both large-bodied river carpsucker and flathead catfish might occasionally feed in the backwater; carpsucker on organic-rich sediments and flathead catfish on fishes and macroinvertebrates.

The conceptual design elements for this project site includes:

- Excavating strategically placed (to avoid live plantings and target Bermuda grass dominated locations) embayments adjacent to the primary flow path in Broad Canyon Arroyo,
- Revegetation with native riparian-wetland species, with emphasis on native herbaceous species.

<u>Opportunities and Constraints</u>

This project will require coordination with multiple agencies because there are multiple owners. USIBWC owns the north bank while USFWS and State of NM own portions of the south bank. Bureau of Land Management also owns a small portion of land near the site. Continuous sedimentation will need to be monitored and sediment will likely need to be periodically removed from the arroyo mouth to maintain the hydraulic connection with the Rio Grande.

In addition to enhancements within the arroyo bottom, as described in our conceptual design, Probst and Bixby (2018) also considers construction of temporary, artificial spring with two alternative piping routes. That idea is complicated due to clear creation of a new point of diversion and effects on Rio Grande Compact deliveries. Regardless, the team reviewed existing hydraulic models along with the LiDAR data to assess the feasibility of constructing an artificial spring as described in that report (Propst and Bixby 2018). The team located the approximate field location and marked a Global Positioning System (GPS) location during the site visit. LiDAR data indicate that the ground elevation at that location is approximately 3,993 feet. A HEC-RAS cross section located near the proposed point of diversion shows that the water surface elevation does not rise to 3993 feet until river discharge nears 10,000 cfs. Hydraulic models indicate that by that discharge, a well-formed backwater migrates up the arroyo without support from an artificial spring. Thus, pumping would be required. Because the physical conditions do not readily support creation of an artificial spring, in addition to the predictably intensive maintenance associated with cleaning the polyvinyl chloride (PVC) pipe, removing debris from screens, servicing pumps, and permitting a new point of diversion, our design does not recommend creation of an artificial spring.

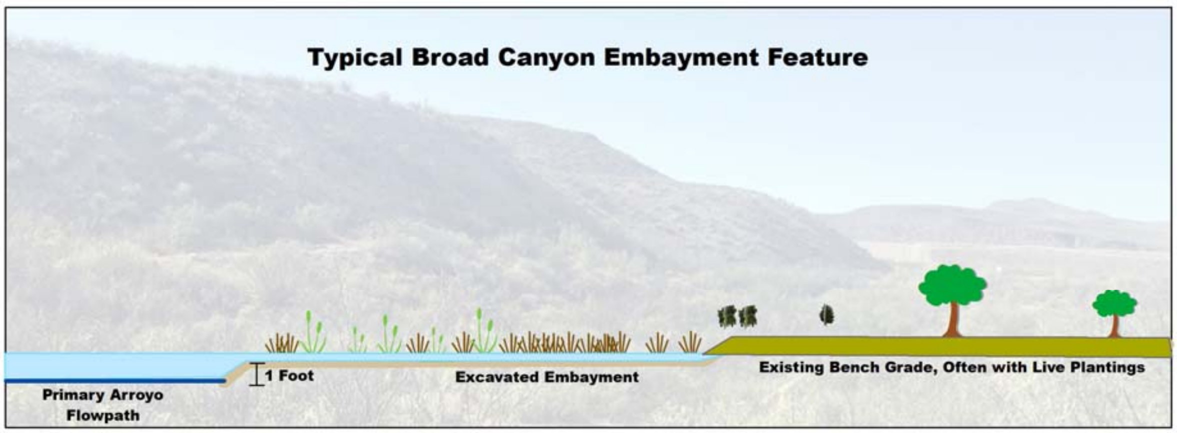



*Figure 21. Cross-section of embayment design concept within the Broad Canyon Arroyo immediately upstream from its confluence with the Rio Grande.*

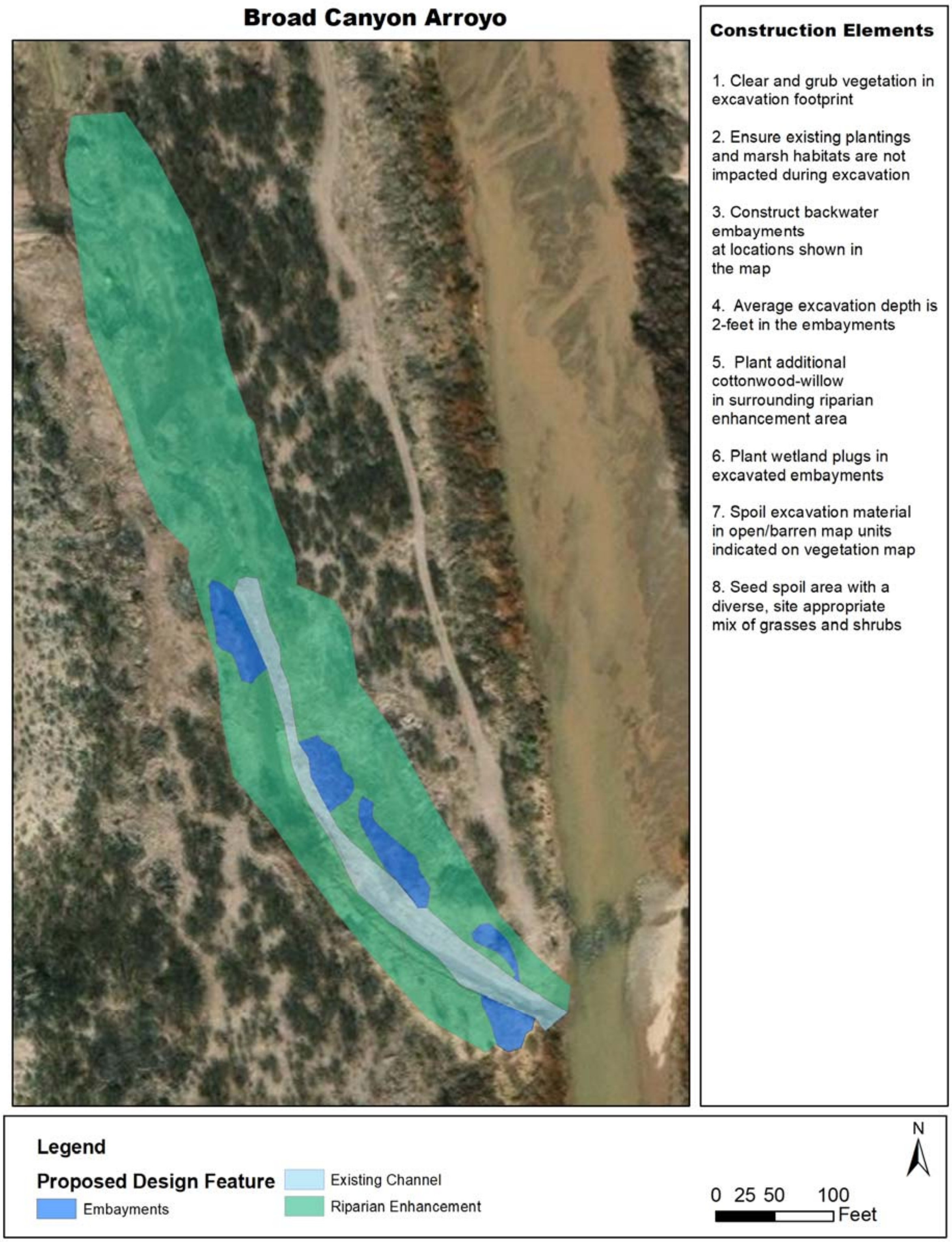



*Figure 22. Broad Canyon Arroyo conceptual restoration design map.*

### 3.4 Selden Canyon Point Bar

Selden Canyon Point Bar is a vegetated, bank-attached (point) bar located on the east side of the Rio Grande near RM 66. Selden Canyon arroyo enters the Rio Grande just downstream of the site. A 2008 report (Parametrix 2008) indicates that this location (referred to as the "Martinez Property" in that report but the property was acquired by USIBWC in 2011) contained dense saltcedar. Saltcedar was removed from the site in recent years and the native herbaceous community has colonized portions of the site. Cottonwood/willow poles appear to have been planted near the southern end of the site with mixed success and along the bank (many are dead, likely due to high soil salinity).

Flows at this location may be perennial in most years, but discharge was visibly lower in this river segment compared to near Broad Canyon during our site visit. Deposition of rock into the Rio Grande channel from the arroyo contributes to channel habitat heterogeneity in the vicinity of the restoration area but there is visibly less coarse substrate in the channel compared to the sites upstream.

According to LiDAR topography, the Seldon Canyon Point Bar site is primarily 3 to 5 feet above the riverbed (Appendix B), with marsh dominated areas only 1-2 feet above the riverbed. Hydraulic models indicate that the significant portions of the point bar have potential to inundate at 3,000-3,500 cfs if bankline berms were lowered (Figure 23).

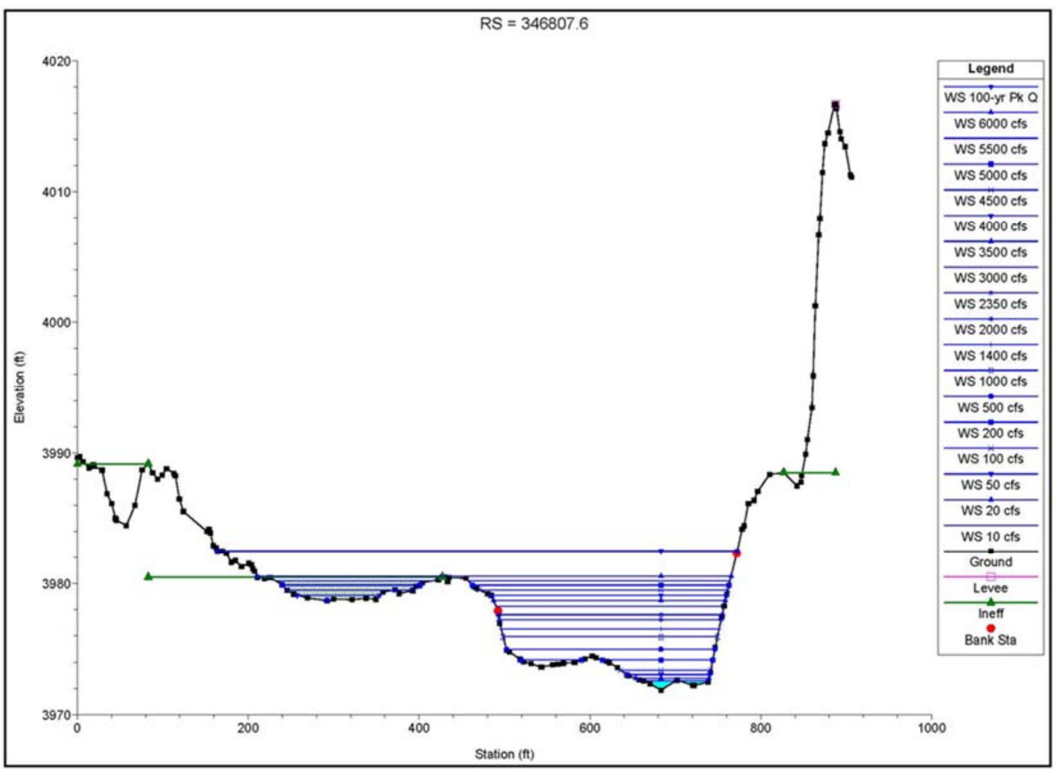



*Figure 23. Representative channel cross-section of Rio Grande at the Seldon Canyon Point Bar site showing predicted surface-water elevations under a range of discharges.*

**Site Assessment**

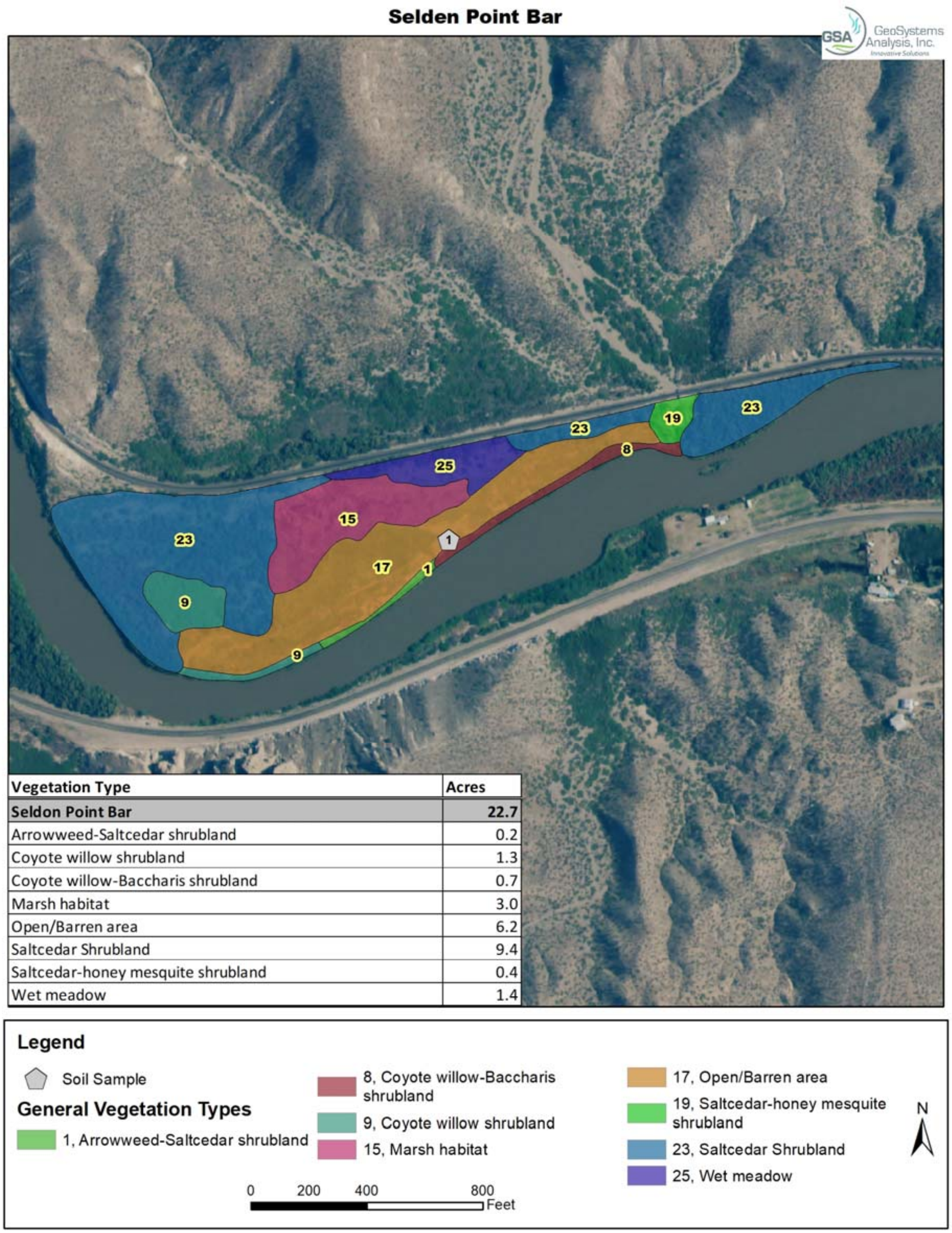
Vegetation types at this site (Figure 24) are largely a mosaic of desirable and uncommon (in the RGCP reach) native herbaceous communities including scratchgrass/saltgrass meadows (Figure 25) with some common threesquare and dense patches of arrowweed. A large cattail marsh is situated in what appears to be a former borrow pit adjacent to the railroad track, with occasional saltcedar between the tracks and marsh. An alkali sacaton (*Sporobolus airoides*) meadow with intermixed honey mesquite, seep willow, saltcedar and wolfberry is located just downstream from the cattail marsh. Open/barren areas indicated behind bankline vegetation are often void of vegetation but become dominated by annual weeds (kochia and Russian thistle) plus alkaliweed (*Cressa truxillensis*) on the downstream end. The open/barren areas also include entirely unvegetated areas with visible salt accumulation (Figure 25). It appears that saltcedar piles were burned in this zone during previous treatment activities. Former revegetation efforts appear concentrated near the downstream most end but had mixed success (numerous dead cottonwood/willow poles were observed).

Untreated saltcedar monocultures dominate the eastern and western edges, occasionally with skunkbush sumac or wolfberry along the saltcedar margins and fringed twinevine climbing throughout. The upstream saltcedar patch transitions into a large coyote willow shrubland. Banklines of tall coyote willow with occasional seep willow and cattail are abundant, but transition into drier areas with less woody cover dominated by arrowweed and saltcedar near the center of the site. Drier bankline segments contain bermudagrass, scratchgrass and knotgrass dominated herbaceous layers.

GSA staff augered one bore hole at this site, however, Parametrix (2008) includes a highly detailed Order 2 soil survey for this location. A sample from within a proposed aquatic habitat feature revealed that visible salts were concentrated in a clay loam found on the top 2-feet and especially abundant on the soil surface (Table 4). Soils were moist throughout the profile, blackening was found in the top 8 inches possibly due to residual organics from burning saltcedar piles, and groundwater was reached at 46 inches. Gleying was evident by approximately 30 inches.

Table 4. Soil texture and depth to groundwater observation from Selden Canyon Point Bar.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 25 | CL | Moist | In potential excavation. Salts evident through 8". Salt crystals concentrated in this layer |
| | 25 to 34 | L | Moist | Gleying, blackened |
| | 34 to 46 | Sa | Very Moist | |
| | 46 | GW | | Auger in weedy barren area, Saltcedar re-sprouts |




| Vegetation Type | Acres |
|---|---|
| **Seldon Point Bar** | **22.7** |
| Arrowweed-Saltcedar shrubland | 0.2 |
| Coyote willow shrubland | 1.3 |
| Coyote willow-Baccharis shrubland | 0.7 |
| Marsh habitat | 3.0 |
| Open/Barren area | 6.2 |
| Saltcedar Shrubland | 9.4 |
| Saltcedar-honey mesquite shrubland | 0.4 |
| Wet meadow | 1.4 |

*Figure 24. Selden Canyon Point Bar vegetation map.*

*Figure 25. Representative field photos from the Selden Point Bar site. Top photo: Abundant surface salt accumulations are generally void of vegetation. Bottom left and right: Saltgrass meadow typical of the herbaceous communities at the site.*

**Conceptual Design**

A conceptual restoration design for this site would involve creating a high-flow channel and a backwater channel supplemented by revegetation with native riparian-wetland plant species. As illustrated in Figure 28, a constructed side channel would be built on the upstream end of the point-bar while two backwaters would be constructed on the downstream end. The channel is designed to begin inundating at 500 cfs and flow through by 1,000 cfs (Figure 27). The backwater features are designed to begin inundating at 500 cfs and will fill with water by 800 cfs (Figure 26). Within the vicinity of this site, riverine habitat is near monotonous and when wetted consists almost entirely of a channel wide, sand-bottomed run except for rock immediately near the arroyo mouth. Construction of a flowing side channel, at least during irrigation season, provides additional habitat diversity. The backwaters add another structural element. Red shiner would be the most likely small-bodied user of the side channel, both for foraging (it is an insectivore) and potentially spawning (eggs deposited amongst pea gravel in flowing water). Depending on its depth, large-bodied channel catfish, flathead catfish and river carpsucker might also use it for feeding. The backwater portions of this site would most likely be used by fathead minnow and western mosquitofish. If sufficiently deep, gizzard shad might feed in the backwaters.

The principal conceptual design elements at this site include:

- Re-treating saltcedar throughout the site
- Excavating a strategically placed (to target barren areas with high concentrations of visible surface salts) flow through channel
- Excavating two strategically placed (to avoid live plantings and target weedy areas) backwaters
- Revegetation

<u>Opportunities and Constraints</u>

In addition to potential benefits for fish species, riparian plantings adjacent to the excavations will diversify the vegetation complexity at the site and improve habitat quality for the southwestern willow flycatcher and yellow-billed cuckoo. During moderate to high flows (e.g. 2,500+ cfs) it's also likely that the proposed aquatic features will promote (groundwater and surface water) inundation beyond the excavated footprints, likely flushing salts from the site.

Perhaps the greatest constructability challenge is access. Heavy equipment will need to be walked onto the site across the active channel and it may be necessary to construct a temporary ramp from the opposite side of the river. Regular sedimentation monitoring will be necessary to validate that the sites continue to function as designed and/or mature on a desirable trajectory. Sediment cleanout is highly likely on a periodic basis.

The northern portion of the site is privately owned and USIBWC acquired remaining portions of the site from a private landowner in 2011 (USIBWC personal communication).

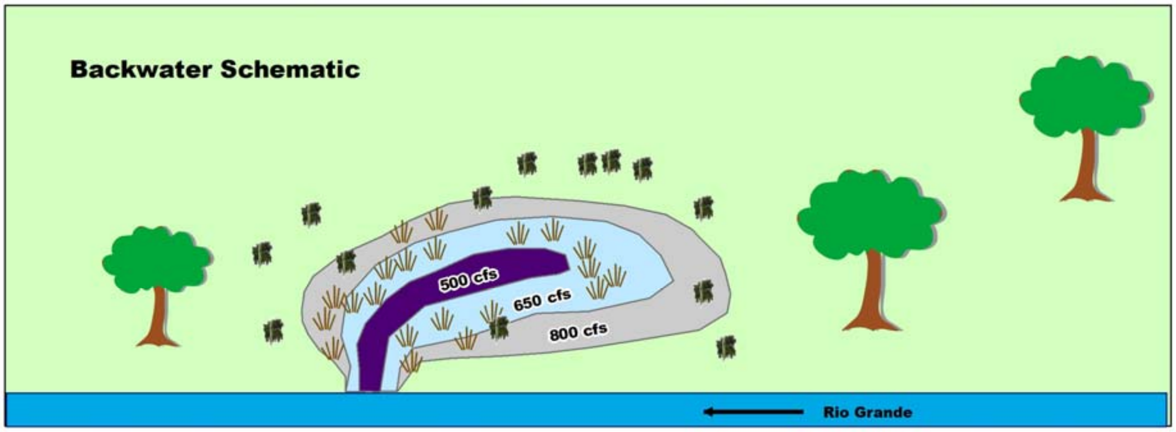



*Figure 26. Illustration of a backwater with flow targets that could be used at Selden Canyon.*

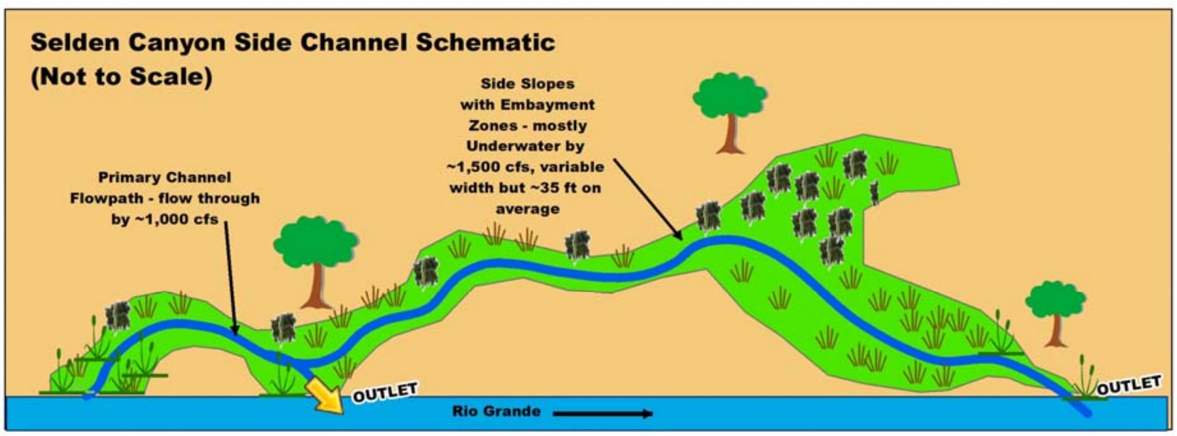



*Figure 27. Illustration of a side channel design concept for Selden Canyon.*

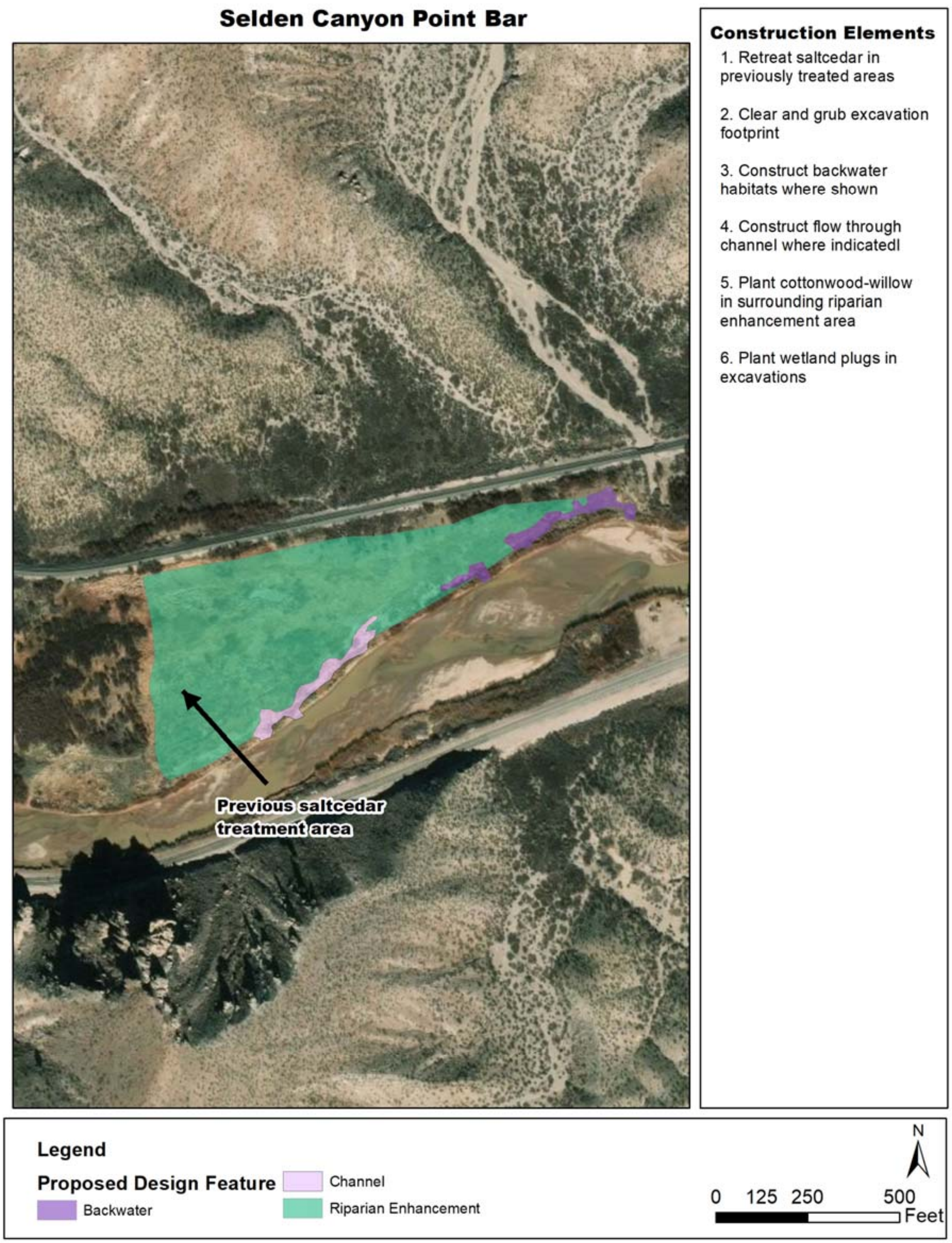



*Figure 28. Selden Canyon Point Bar conceptual restoration design map.*

## 3.5 Las Cruces Effluent Site

The Las Cruces Effluent site lies on the east side of the Rio Grande near RM 44. Interstate 10 crosses the Rio Grande near the site and the Las Cruces wastewater treatment plant is east of the project area. The wastewater facility discharges about 8 million gallons of water per day (constant discharge of approximately 5 cfs) and effluent passes directly to the river via a concrete lined channel (**Error! Reference source not found.**). Effluent creates perennial flow in this segment in the Rio Grande that often extends for 2 to 3 river miles through Mesilla Valley State Park before completely seeping into the riverbed. The site is near La Llorona Park and paved walking trails support regular recreation. Propst and Bixby (2018) provide multiple habitat restoration design alternatives that include using effluent discharge to create a new channel or oxbow lake in the east-side floodplain.

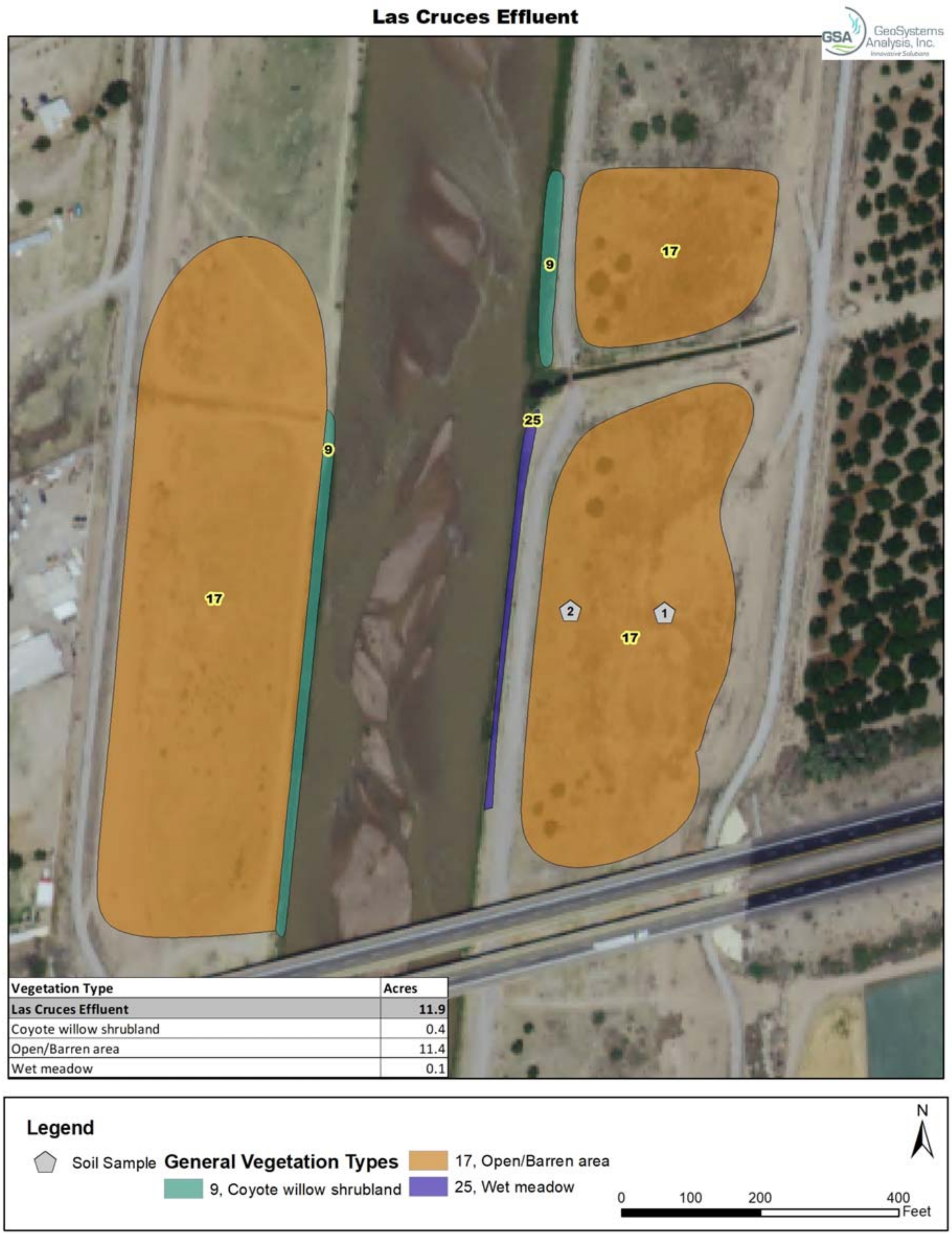
The NM State Engineer considers treated wastewater effluent discharge to the river channel as an offset for groundwater pumping by the treatment facility, and under the current permit, discharge volume must reach the river. Habitat restoration, therefore, must minimize evapotranspiration losses at the site and any proposed design would need to off-set any water depletions (the primary habitat restoration constraint). A gage for measuring inflow and outflow would be recommended to quantify water usage in any habitat restoration feature (if that occurs).

**Site Assessment**

Three vegetation types are described for this site (**Error! Reference source not found.**). The east side is dominated by a bermudagrass meadow (described as open/barren on the map) with occasional planted cottonwoods situated between the levee and the recreational trail adjacent to the bankline. A small portion of this area is mostly barren (**Error! Reference source not found.**) but supports patches of kochia and sand dropseed. Other occasional herbaceous species include blue grama (*Bouteloua gracilis*), feather fingergrass, silverleaf nightshade, hoary tansyaster (*Dieteria canescens*), and verrucose seapurslane (*Sesuvium verrucosum*). The bankline upstream from the effluent channel is a narrow coyote willow shrubland with some scratchgrass in the herbaceous layer. Downstream of the effluent discharge channel, the bankline is a mix of coyote willow interspersed with cattail, Johnsongrass (*Sorghum halapense*), an occasional saltcedar, spiny chlorocantha, and bermudagrass extending to the river from an adjacent meadow.

The westside floodplain (across the river from the discharge channel) is also dominated by a bermudagrass meadow (open/barren on the map), but with more alkali sacaton than the east side. Occasional saltcedar, Lehman's lovegrass, and kochia also occur. From north to south, a bermudagrass and spiny chlorocantha bankline becomes a healthy coyote willow shrubland with bermudagrass along the ground.

Two soil bore holes were augered at the site as indicated on Table 5. Soils in the top 20 inches appear unnaturally sorted near the river possibly due to previous spreading of soil along the surface, discing, etc. Groundwater was approximately 6 to 6.5 feet below the surface and ribbons of clay to clay loam were encountered 2.5 to 3.5 feet below the ground surface at both locations. Mottles became evident approximately 3.5 feet belowground. Bore Hole 1 was augered in a location that contained a variety of grass species while Bore Hole 2 was exclusively bermudagrass.




| Vegetation Type | Acres |
|---|---|
| **Las Cruces Effluent** | **11.9** |
| Coyote willow shrubland | 0.4 |
| Open/Barren area | 11.4 |
| Wet meadow | 0.1 |

*Figure 29. Las Cruces Effluent vegetation map and soil sampling locations.*

*Figure 30. Representative field photos from the Las Cruces Effluent site. Top: Effluent channel with adjacent terrace where constructed channel is proposed. Bottom left: Rio Grande downstream of the effluent channel. Bottom right: effluent discharge channel.*

Table 5. Texture and depth to groundwater observed at the Las Cruces effluent site soil sample locations.

| Bore Hole | Depth | Texture | SM | Notes |
|---|---|---|---|---|
| 1 | 0 to 4 | SaL | Slightly moist | |
| | 4 to 6 | CL | Moist | |
| | 6 to 18 | LS | Very Slightly Moist | |
| | 18 to 40 | SaL | Slightly Moist | |
| | 40 to 42 | CL | Moist | mottles distinct |
| | 42 to 70 | LS | Moist | mottles prominent |
| | 70 to 77 | SaL | Very Moist | mottles prominent |
| | 77 | GW | | |
| 2 | 0 to 12 | L | Moist | Unnaturally sorted, previously mixed? |
| | 12 to 20 | SaL | Moist | Disturbance still evident |
| | 20 to 28 | SaL | Moist | No evidence of disturbance/mixing |
| | 28 to 31 | C | Moist | |
| | 31 to 57 | Sand | Slightly moist | mottles distinct |
| | 57 to 72 | LS | Moist to very moist | mottles prominent |
| | 72 | GW | | |

**Conceptual Design**

The habitat creation concept for this site is to install a check structure off the concrete lined channel currently used to convey treated wastewater to the Rio Grande and reroute flows through a relatively long, meandering channel with diverse aquatic habitat features (Figure 31). These aquatic habitats would be enhanced by planting aquatic vegetation within backwaters, and riparian vegetation along the channel margins.

The channel habitat would emphasize variable conditions to support a diversity of native fish species. Springhead habitat at the channel source could provide habitat for the regionally extirpated Mexican tetra (*Astyanax mexicanus*). Large, deep, and structurally complex pools would potentially support large-bodied species such as gizzard shad, bluegill, and largemouth bass (*Micropterus salmoides*). Both bluegills and largemouth bass construct shallow-depression nests in clean substrates near shore in moderately deep water. The primary small-bodied species occupying pool habitats would be fathead minnow and western mosquitofish. With moderate velocity water in close proximity to root mass pools, it might be possible to establish a small population of another regionally extirpated species, Rio Grande chub (*Gila pandora*). Small-bodied fishes and aquatic macroinvertebrates would provide forage for large-bodied occupants of pools. Riffles and runs would provide habitat for red shiner and longnose dace (*Rhinichthys cataractae*). Although recently documented in the region, longnose dace is extremely rare. Channel catfish would mainly inhabit moderate velocity runs but would move into riffles and pools to feed. Rio Grande chub need rapid velocity riffles with gravel substrates for spawning. Insectivorous longnose dace would occur mainly in riffles but occasionally move into slower-velocity runs.

The principal conceptual design elements for this project site includes:

- Creating a meandering side channel with variable substrate and flow characteristics,
- Installing a check structure to control inflows into the constructed side channel,
- Instrumenting the side channel inlet and outlet with flow volume monitoring equipment that can be used to quantify water loss,
- Installing a pedestrian bridge over the channel,
- Revegetation

Opportunities and Constraints

Because of the proposed complexity, this design feature has the potential to provide habitat for a comparatively large diversity of fish species. It also has the advantage of excluding nonnative fishes by controlling access of fishes from the river. Among the sites, it is the one where restoration of regionally extirpated species has greatest potential. If the mix of habitats includes a spring head and pool-run-riffle sequences with substrates ranging from sand through gravel and cobble, as many as eight locally extant species and two locally extirpated species might inhabit the constructed channel. Cottonwood/willow plantings and cessation of mowing at this site would benefit the southwestern willow flycatcher and yellow-billed cuckoo.

The major constraint at this site is the use of effluent water since it is not USIBWC water and the City of Las Cruces' groundwater permit uses the surface water discharge as offset; water rights would need to be obtained. Per comments at the project scoping meeting, the Las Cruces mayor supports the idea of using effluent to create a meandering channel and has offered water rights to offset potential ET losses in the channel (EBID and USIBWC, personal communication during the scoping meeting). There is also potential to negotiate groundwater for beneficial use with NM State Engineers Office. A local citizens group has proposed a wetland at this site in honor of the late author Charles Bowden. There are no ownership constraints at this site. USIBWC owns the floodplain in the proposed project area and the NM Department of Transportation has a license from USIBWC for the Interstate 10 bridge.


*Figure 31. Las Cruces Effluent Site conceptual restoration plan map.*

## 3.6 Mesilla Valley Bosque State Park

Mesilla Valley Bosque State Park (MVBSP), near RM 41, was established in 2005 (Blue Earth 2008). The Park is located on the west side of the Rio Grande near the Town of Mesilla, NM and has been the focal point for other restoration efforts over the past two decades. For example, the Picacho Wetland project was constructed by the Southwest Environmental Center (SWEC), the City of Las Cruces, EBID, and other partners between 2002 and 2005 on a 55-acre tract of land within the Park managed by the New Mexico Department of Game and Fish (NMDGF) (Blue Earth 2008). That project involved excavating two ponds to create aquatic/wetland habitat along the Picacho Drain. A deep 3-acre pond was excavated to a depth of 8 feet with hopes that it would contain perennial surface water to provide year-round aquatic habitat for a variety of species. The deeper pond contains two trenches that connect with the Picacho Drain which allow water to flow between the ponds, the drain, and the Rio Grande. A shallower, adjoining 2-acre shallow pond connects with the deep pond via a culvert and fills when flows in the river are high, thus functioning as a seasonally-flooded meadow. Due to a combination of lower groundwater conditions and sedimentation, the “perennial" pond no longer holds water during droughts and both ponds are being invaded by cattail (Figure 32).

MVBSP provides opportunities for wildlife viewing, recreation, community gatherings, and education. Since the Picacho Wetland Project, numerous other efforts have been completed to revegetate MVBSP with native plant species, enhance wetlands via a mitigation project, and remove saltcedar. Several entities own property within and immediately adjacent to this site, including USIBWC, USFWS, Elephant Butte Irrigation District (EBID), NMSP, NMDGF, and private owners. There is also a current ownership dispute between NMDGF and NMSP. Picacho Drain is located near the entrance by the visitor center and EBID owns the land on either side of the drain. The EBID right of way includes a 50-foot buffer in each direction from the center of the drain (EBID and USIBWC personal communication). USIBWC owns most of the land between Picacho Drain and the Rio Grande except for isolated private land inholdings. NMSP and NMDGF own the land from Picacho Drain to the upland transition (away from the river).

EBID rarely maintains Picacho Drain. It is currently overgrown with cattail and beaver dams frequently interrupt its conveyance efficiency. There is a potential for aquatic/riparian/wetland habitat creation, however; it is crucial that the drain continues to convey irrigation return flows and stormwater back to the river. River flows are perennial through most of the state park due to effluent released from the Las Cruces wastewater treatment facility. Even when the Rio Grande dries, groundwater often surfaces in the drain.

Multiple restoration options for this site were proposed by Propst and Bixby (2018), as well as in an older Resource Management Plan (RMP, Blue Earth 2008). Potential alternatives presented in those reports include deepening existing resaca pool habitats, side channel creation, backwater excavation, and modifications to Picacho Drain. Additional design concepts were shared by EBID and USIBWC during a February 2019 site visit and the recommendations voiced during that meeting are the design concepts largely included in this report.

*Figure 32. Representative field photos from the Mesilla Valley Bosque State Park site. Top left: Picacho Drain. Top right: lower (wetter) Resaca pond nearly entirely dry. Bottom: site conditions near proposed channel.*

**Site Assessment**

Twelve different vegetation types are described for the site as indicated in Figure 33. Two large grasslands/wet meadows (described as open/barren areas on the map) occur north of the visitor's center. The grassland on the east side is dominated by alkali sacaton, with over 80% grass cover and low (5-10%) woody species cover, mostly Jimmyweed and wolfberry. A berm divides the alkali sacaton grassland from a saltgrass meadow adjacent to Picacho Drain. The berm includes a narrow Mojave Seablite and kochia dominated strip, with some wolfberry and saltgrass. The saltgrass meadow is 80-90% saltgrass with occasional alkali sacaton, globebmallow, yerba mansa (*Anemopsis californica*); planted honey mesquite, screwbean mesquite, saltbush and wolfberry, with an occasional saltcedar. A band of saltcedar with occasional seep willow line the Picacho Drain west of the saltgrass meadow.

South of the visitor center is a diverse mosaic of different vegetation types. A nearly contiguous narrow band of vigorous coyote willow shrubland occur on the bank line and occasionally also includes saltcedar. A previous wetland mitigation area has matured into a flourishing wet meadow dominated by scratchgrass mixed with common threesquare, arctic rush (*Juncus arcticus*), occasional cattail and yerba mansa. Previously excavated Resaca ponds are shown as open water on the map. The ponds contained large pools of open water during the November 2018 site visit that had dried by our January 2019 site visit. The large triangular area adjacent to the river alternates between a saltgrass meadow, and weedy kochia areas (described as open/barren areas), improving in saltgrass cover in the northern portions, where it is planted with cottonwood and Gooding's willow east of the wetland mitigation area.

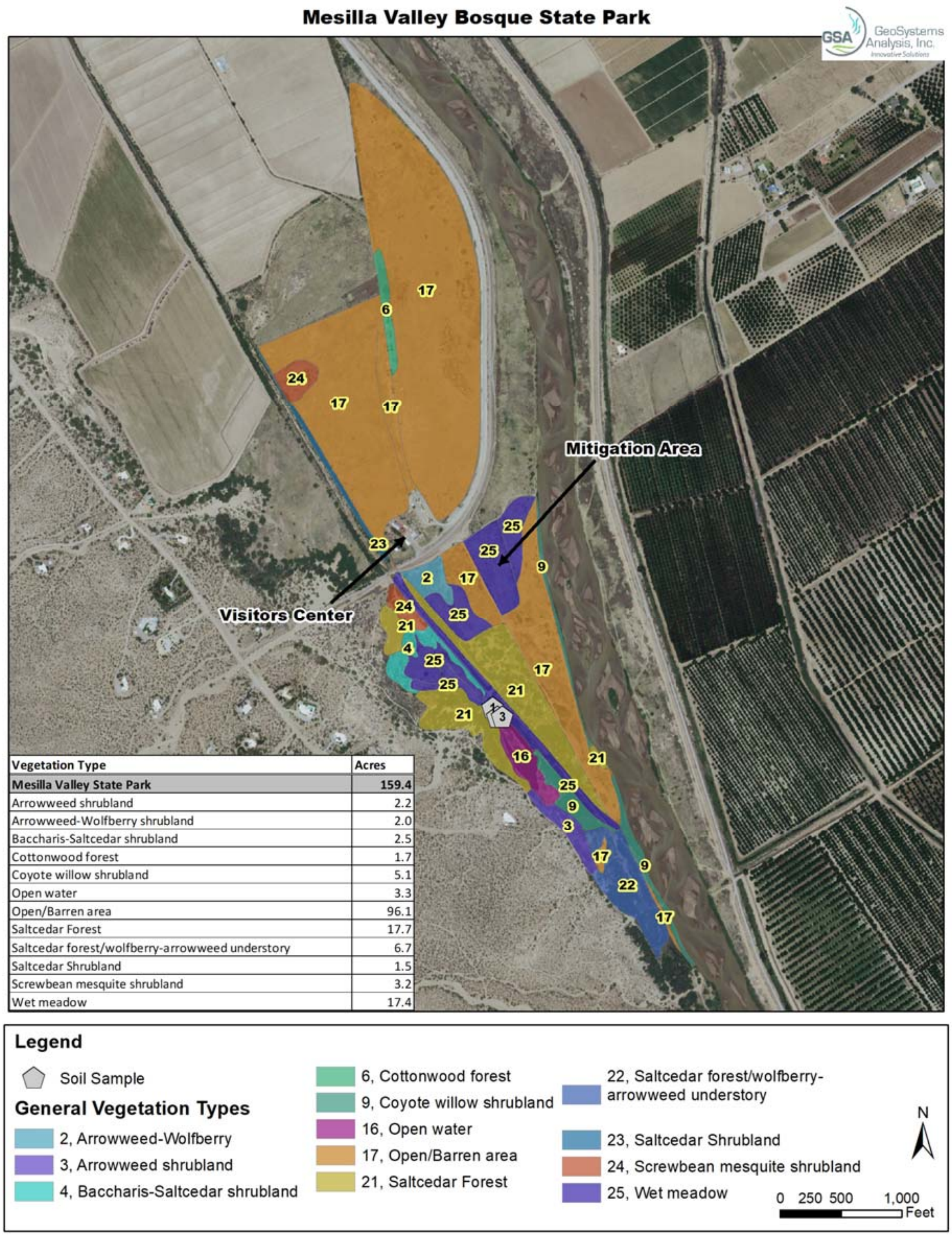
The Bosque Ecosystem Monitoring Program (BEMP) has established a monitoring site between the wetland mitigation area and the Picacho Drain. The BEMP area includes a mix of a saltgrass meadow, patches of arrowweed and wolfberry, and a weedy area dominated by Kochia. An untreated saltcedar forest (which remains on a private land inholding) lies south of the BEMP site. The Picacho Drain interior is dense cattail, with occasional seep willow and arrowweed on the drain slopes. The west side of Picacho Drain (between the drain and the upland) is a large treated saltcedar area recolonizing as a large saltgrass meadow with milkweed, sedge, milkweed and a few scattered planted cottonwood and Gooding's willows. The edges of that zone have a mix of seep willow, wolfberry, arrowweed and saltcedar with kochia and saltgrass in the herbaceous layer. South of the wetland meadow are the previously excavated resaca ponds, primarily dry during the January site visit (see Figure 34 for a detailed map of the resaca ponds). Vegetated portions of the ponds have filled with cattail and occasional common threesquare and sedge on the pond margins. A single pampas grass (*Cortaderia sellonana*), listed by the NM Department of Agriculture (NMDA) as a watch list species, was observed on the berm above the Picacho Drain adjacent to the open water portion of the resaca pond.

Untreated saltcedar remains between the resaca ponds and the upland includes arrowweed and transitions into wolfberry, honey mesquite and skunkbush sumac as elevation increases. Herbaceous species include mountain pepperweed, fringed twinevine, sacred thorn-apple (*Datura wrightii*), tansymustard and London rocket. South of the resaca ponds is a large coyote willow stand, followed by a mix of saltcedar, wolfberry, arrowweed with some Gooding's willow, honey mesquite and screwbean mesquite south of where Picacho Drain confluences with the river. Herbaceous species in this area include spike dropseed, kochia, silverleaf nightshade.

A total of four soil bore holes were augered in the constructed resaca ponds, three in the south pond and one in the north pond as indicated in Figure 33 and Table 6. Soil sampling locations in the south pond were intentionally placed in locations with little to no vegetation growth that appeared to be inundated during much of the year. Depth to groundwater ranged from 13 to 20 inches on the day of the site assessment; however, groundwater remained at the surface in a portion of the pond while other portions of the pond the groundwater would have been deeper than 20 inches. Fine sediment has accumulated on the soil surface in the upper 7 to 11 inches at all sites, possibly a result of fines suspended from water entering the ponds via Picacho Drain or overflow from nearby arroyos during storm events.

Table 6. Soil texture and depth to groundwater observed at Mesilla Valley State Park site.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 11 | SiCL | Moist | South pond |
| | 11 to 20 | Sand | Very moist | |
| | 20 | GW | | |
| 2 | 0 to 8 | SiCL | Moist | South pond |
| | 8 to 19 | Sand | Very moist | |
| | 19 | GW | | |
| 3 | 0 to 10 | CL | Very moist | South pond |
| | 10 to 13 | Sand | Very moist | |
| | 13 | GW | | |
| 4 | 0 to 7 | SiCL | Slightly moist | North pond |
| | 7 to 47 | LS | Slightly moist to saturated | |
| | 47 | GW | | |




| Vegetation Type | Acres |
|---|---|
| **Mesilla Valley State Park** | **159.4** |
| Arrowweed shrubland | 2.2 |
| Arrowweed-Wolfberry shrubland | 2.0 |
| Baccharis-Saltcedar shrubland | 2.5 |
| Cottonwood forest | 1.7 |
| Coyote willow shrubland | 5.1 |
| Open water | 3.3 |
| Open/Barren area | 96.1 |
| Saltcedar Forest | 17.7 |
| Saltcedar forest/wolfberry-arrowweed understory | 6.7 |
| Saltcedar Shrubland | 1.5 |
| Screwbean mesquite shrubland | 3.2 |
| Wet meadow | 17.4 |

*Figure 33. Mesilla Valley Bosque State Park vegetation map.*


*Figure 34. Map showing the condition of the resaca ponds during our January site visit.*

**Conceptual Design**

The conceptual design for this project site includes a diversity of habitat features. The first proposed feature is an excavated channel between the Rio Grande and the Picacho Drain to enhance both riparian and aquatic habitat (Figure 35). Several shallow depressions (swales) would be excavated along the length of this channel and densely planted with coyote willow, cottonwood and Gooding's willow. The channel would be intentionally situated to provide water to new and existing riparian plantings plus inundate an existing wetland mitigation site Figure 36). Aquatic habitat in Picacho Drain would be enhanced by controlling cattails that currently dominate the drain and constructed a series of stepped terraces along the eastern edge of the drain that would be inundated under a range of discharges (Figure 37). The water in the Picacho Drain would be from two principal sources, high-flows from the Rio Grande and storm water during summer monsoon flows.

The restoration designs emphasize habitat features for a wide-variety of native fish species. The channel will begin to inundate at relatively low flows (e.g. 200 cfs). Among large-bodied fishes, longnose gar (*Lepisosteus osseus*; regionally extirpated), river carpsucker, and channel catfish could potentially persist in constructed channel/enhanced drain habitats. In addition, bluegill and largemouth bass currently occupy the Resaca and would benefit from habitat improvements. Longnose gar inhabits low-velocity rivers and oxbow lakes and prey on co-occurring fishes while river carpsucker is generally more common in water of somewhat greater velocity where it moves about feeding on bottom organic matter. Western mosquitofish and fathead minnow would occur in both drain and constructed channel habitats. Red shiner would mainly occur in the constructed channel when it had water.

The principal conceptual design elements at this site includes:

- Creation of a side channel from the Rio Grande to Picacho Drain,
- Excavation and planting of willow swales that integrate with the channel,
- Widening and terracing the side slopes of Picacho Drain,
- Excavate cattail in Picacho Drain and the resaca ponds,
- Install new irrigation check structure in Picacho Drain,
- installation of pedestrian bridge over the channel,
- revegetation

<u>Opportunities and Constraints</u>

Like the Las Cruces Effluent site, this proposed project will provide a diverse mix of habitats and consequently would be able to support a comparatively diverse fish assemblage. Groundwater seepage maintains near permanent surface water in portions of the drain.

This conceptual design option has the potential to create interior floodplain and side channel habitats that are rare to nonexistent in the RGCP. We expect these features could become refuge habitats for numerous species. Proposed elements also integrate with previous restoration actions at the Park plus assist with controlling sediment deposition from tributary arroyos in the Park to prevent sedimentation of aquatic and wetland habitats while maintaining delivery of precipitation runoff to the Park and the Rio Grande. Habitat for native wetland- and riparian-dependent wildlife, including southwestern willow flycatcher and yellow-billed cuckoo will be improved.

This site is potentially complicated by a proposed land transfer of the MVBSP from NMSP to NMDGF. Picacho Drain must be maintained for agricultural return flow and floodwater protection; thus, proposed designs must ensure the facility is accessible for periodic maintenance and comply with EBID policy.

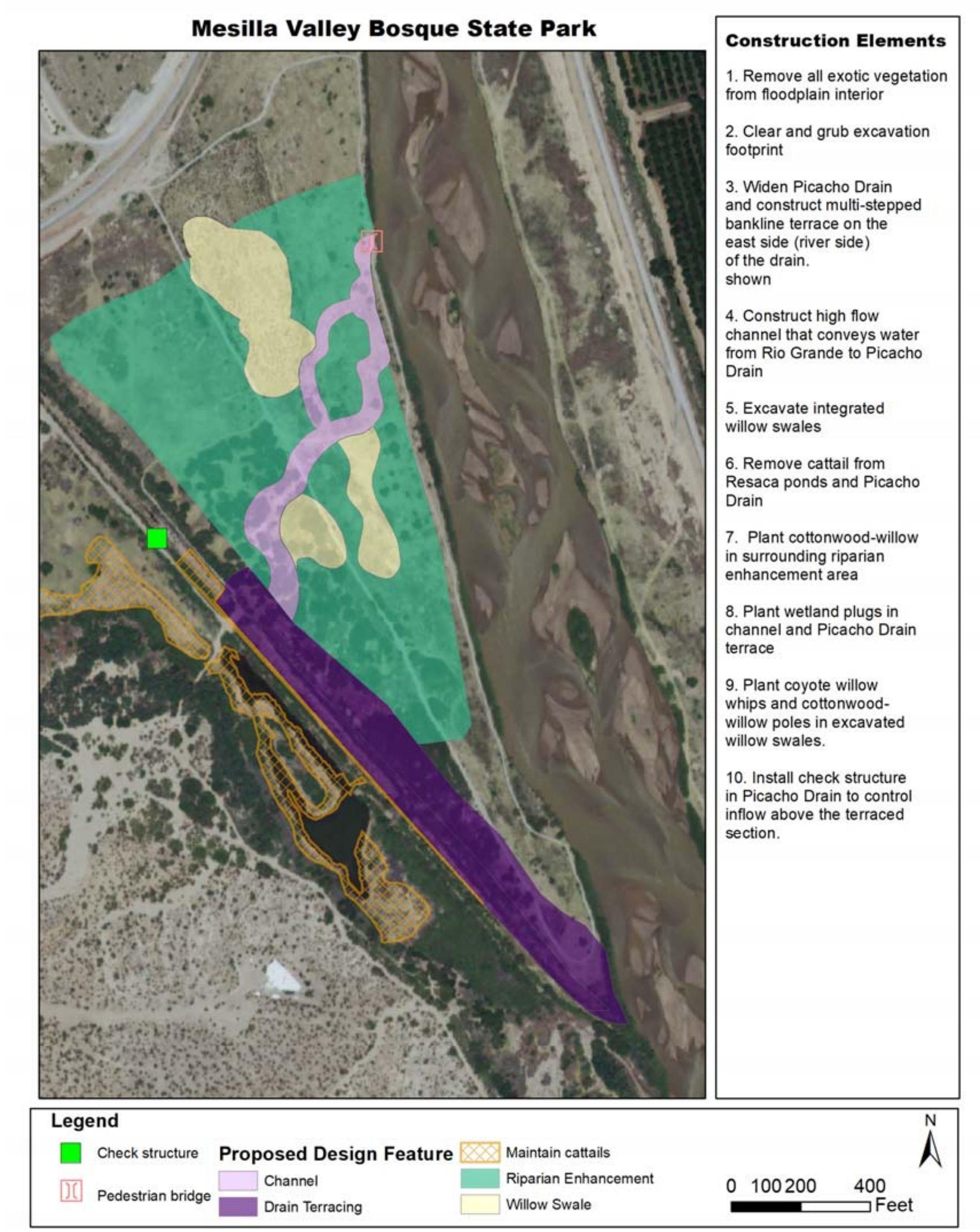



*Figure 35. Mesilla Valley State Park conceptual restoration design map.*

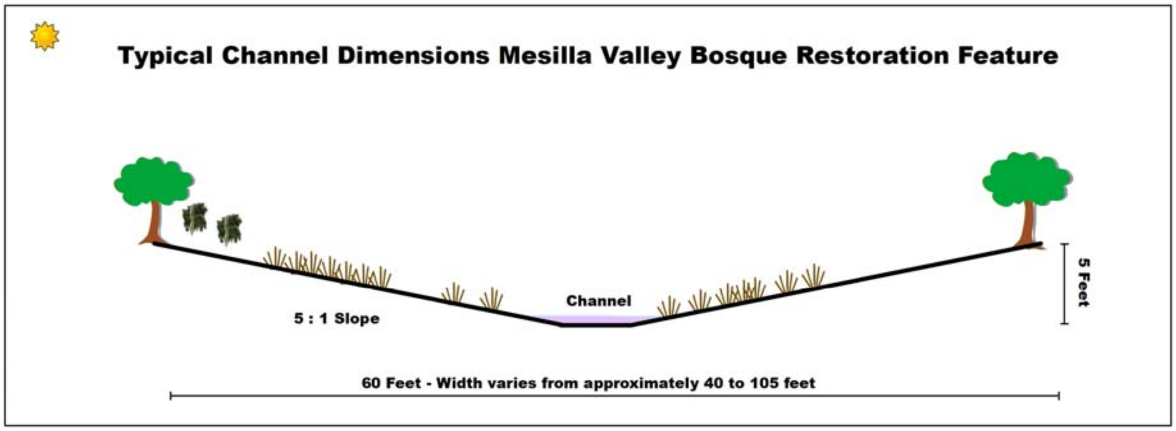



*Figure 36. Cross-section of conceptual restoration design for the constructed channel at Mesilla Valley Bosque State Park.*

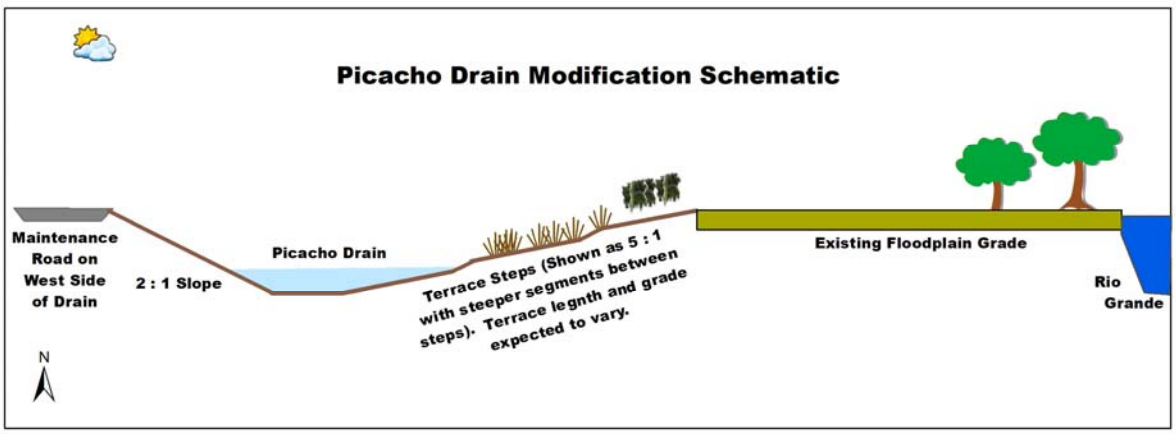



*Figure 37. Cross-section showing conceptual design for habitat enhancements along the Picacho Drain.*

### 3.7 Downstream of Courchesne Gage

The Downstream of Courchesne Gage site is near RM 1 in El Paso, TX. The Texas Department of Transportation (TXDOT) recently reconstructed highway 85 near this location; USIBWC's original design included a flood wall or levee along the highway but that flood control feature may no longer be required. Stormwater runoff enters the site below the highway via two 8 ft by 8 ft box culverts, and outlets do not effectively convey water across the site. At the current invert elevation, culverts from below the highway provide supplemental water and promote wetland expansion. A trench was excavated between January and March 2019 site visits to improve stormwater drainage through the site and more effectively return water to the Rio Grande. National wetlands inventory data indicates that the site supported jurisdictional wetland conditions prior to recent modifications of the highway.

The site currently supports a native herbaceous wetland complex with saltcedar largely confined to bankline portions (Figure 39). Groundwater is shallow and the Rio Grande in this reach is perennial due to discharge from Sunland Park Wastewater Treatment Plant. El Paso Irrigation District will not currently allow planting woody vegetation at this site and is encouraging more aggressive mowing at this location. Based on the LiDAR data, much of the site is situated 2 to 4 feet above the riverbed. Hydraulic models indicate inundation has the potential to begin when flows reach approximately 1,400 cfs, particularly with relatively minor bankline excavation (Figure 38).

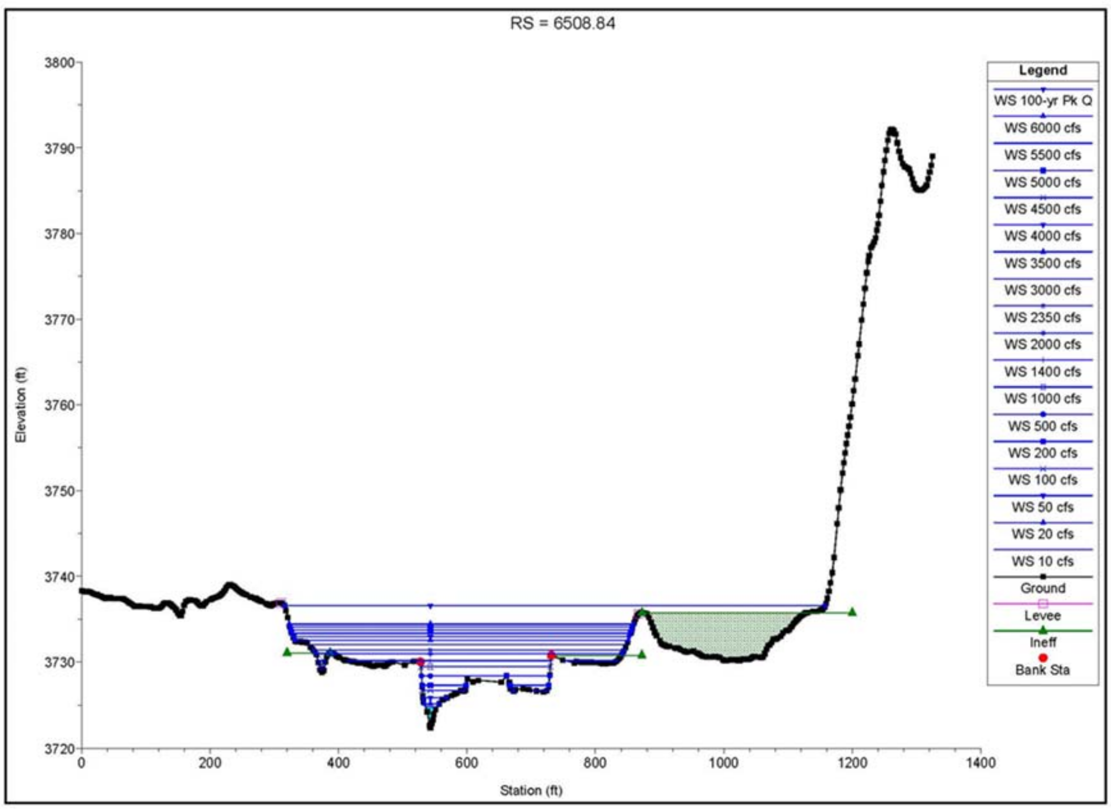



*Figure 38. Representative channel cross-section of Rio Grande at the Downstream of Courchesne Gage site showing predicted surface-water elevations under a range of discharges.*

**Site Assessment**

Five vegetation types were identified at the Downstream of Courchesne site, but nearly the entire site is a derivative of a saltgrass/scratchgrass wetland meadow, with varying degrees of overstory cover (Figure 39 & Figure 40). Open/barren areas dominated by kochia and Mojave seablite are found adjacent to the road in locations that appear to have been used for staging equipment during recent construction on the adjacent highway. Two trenches have been excavated to drain water from below the highway towards the river. The upstream trench contained water while the downstream trench was dry during the November and January site visits.

Marsh habitats dominated by a mix of cattail and hardstem bulrush occur immediately downstream of the northern drainage trench and numerous pools of open water were observed during the January site visit. Some common reed (*Phragmites australis*) can also be found in the marshy areas, as well as some perennial pepperweed (*Lepidium latifolium*) listed as a Class B noxious weed in NM (but not in TX). Herbaceous communities become drier moving away from the upstream drainage trench, but the diversity of herbaceous vegetation also increases. Marsh habitats disappear and transition into sedge (*Carex* sp.) communities, wild licorice (*Glycyrrhiza lepidota*), Indianhemp (*Apocynum cannabinum*), Canada wild rye (*Elymus canadensis*), dock (*Rumex* sp.).

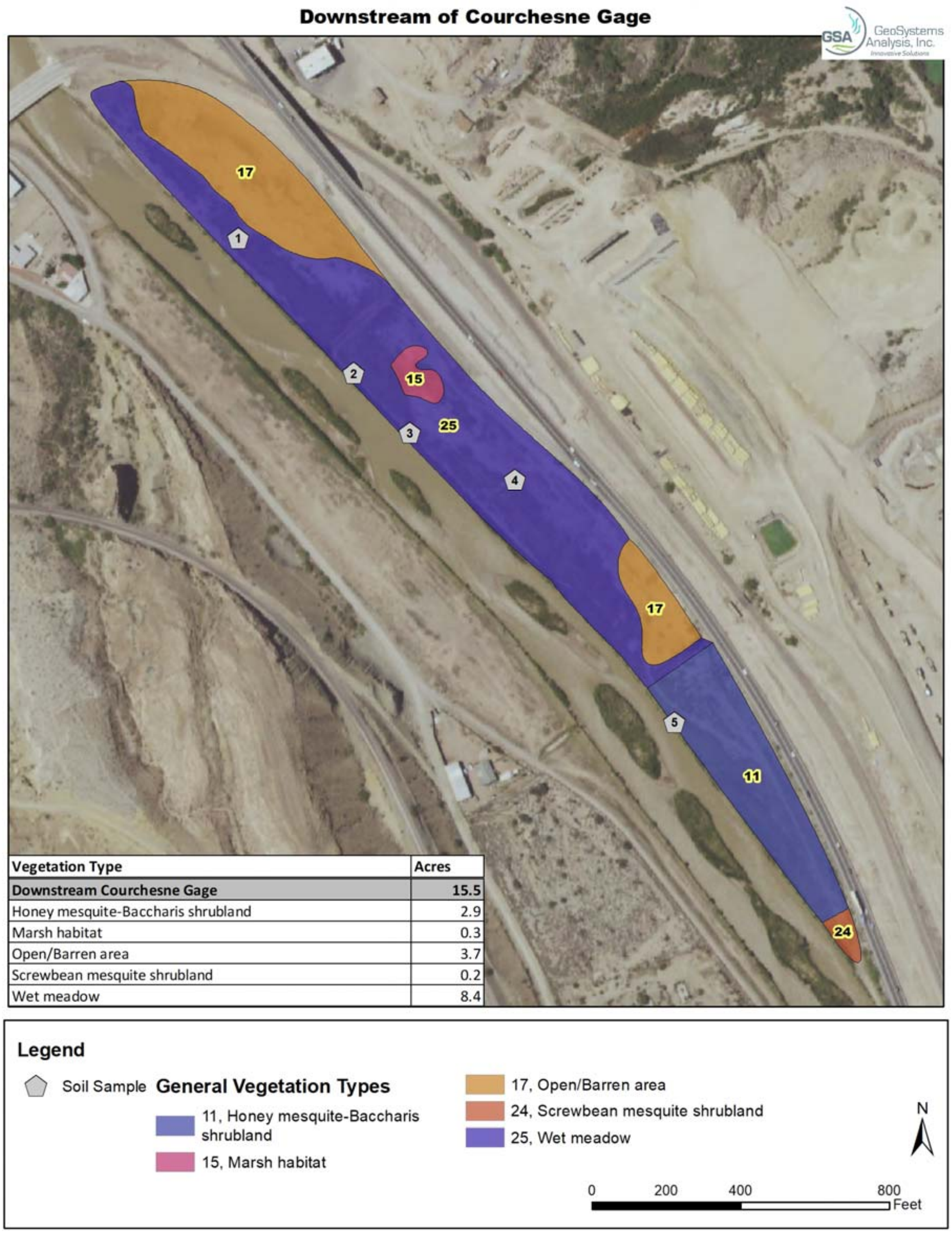
Bankline, slightly drier, portions of the wetland meadow include a more diverse mix of species and more woody vegetation. Saltcedar is the most abundant woody species, followed by seep willow. Cattail and spiny chlorachantha were observed on the active channel margin.

The downstream drainage trench is lined with seep willow. South of the channel, the site becomes significantly drier and becomes a honey mesquite-Baccharis shrubland. Saltcedar nearly disappears in this zone while saltgrass/scratchgrass remain dominant in the herbaceous layer. Other herbaceous species south of the lower drainage channel include bristlegrass, milkweed (*Asclepias* sp.), giant sacaton, and silver beard grass (*Bothriochloa laguroides*). In the downstream-most end, screwbean mesquite becomes more dominant, but with a diverse mix of other woody species like seep willow, honey mesquite, Jimmyweed, and Jerusalem thorn (*Parkinsonia aculeata*). The southernmost end of the site described as a screwbean mesquite shrubland continues to become dryer. There is more saltcedar in this map unit compared to the bordering honey mesquite-Baccharis shrubland.

Soil bore holes were augered at five locations (Figure 39 and Table 7). Groundwater was reached in three holes while gravels blocked auger penetration at the other two locations. Pools of water occur in portions of the site and groundwater was detected within 6-inches of the surface throughout that area. Groundwater occurred within 5-feet at bore holes 1 and 3. Favorable soil moisture was found throughout the profile in every hole and mottling was evident by 2 to 2.5 feet at every auger location. Fine textured soils, with variable thickness and depth, were encountered at each sample. As would be expected given the abundance of salt tolerant plant species, surface salts were observed at several locations and most concentrated in drier zones near the bankline.

Table 7. Texture and depth to groundwater observed at soil auger locations within downstream of Courchesne Gage site.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 4 | LS | Slightly moist | |
| | 4 to 11 | SaL | Moist | |
| | 11 to 22 | Sand | Slightly moist | |
| | 22 to 25 | SiC | Very Moist | |
| | 25 to 30 | SaL | Moist | Mottles many, distinct |
| | 30 to 58 | Sand | On moisture gradient | Gleying towards bottom, strong mottling throughout this section, increase with depth |
| | 58 | GW | | |
| 2 | 0 to 8 | CL | Moist | Salts evident, saltgrass, scratchgrass |
| | 8 to 10 | GrSa | Moist | Gravels 0.5 inch |
| | 10 to 16 | SaC | Very Moist | |
| | 16 to 19 | C | Moist | Very heavy soil |
| | 19 to 22 | GrSa | Moist | Could not penetrate, groundwater not determined |
| 3 | 0 to 2 | Sand | Moist | Barren with heavy surface salt, many salt crystals through top 2 inches |
| | 2 to 10 | SiL | Moist | Salts |
| | 10 to 13 | C | Moist | |
| | 13 to 29 | GrLS | Moist | Surprised was able to penetrate |
| | 29 to 37 | SaC | Moist | Mottles many, prominent |
| | 37 to 41 | C | Moist | Mottles many, prominent |
| | 41 to 56 | Sand | On moisture gradient | Prominent mottling throughout more abundant with depth, gleying towards bottom, |
| | 56 | GW | | |
| 4 | 0 to 3 | SiCL | Near saturated | |
| | 3 to 6 | C | Saturated | Filled with water on tarp |
| | 6 | GW | | Near pools of standing water, thick saltgrass |
| 5 | 0 to 5 | CL | Dry | |
| | 5 to 14 | CL | Moist | Lots of roots |
| | 14 to 17 | GrSa | Slightly moist | Hit rock and couldn't penetrate |




| Vegetation Type | Acres |
|---|---|
| **Downstream Courchesne Gage** | **15.5** |
| Honey mesquite-Baccharis shrubland | 2.9 |
| Marsh habitat | 0.3 |
| Open/Barren area | 3.7 |
| Screwbean mesquite shrubland | 0.2 |
| Wet meadow | 8.4 |

*Figure 39. Downstream of Courchesne Gage vegetation map.*

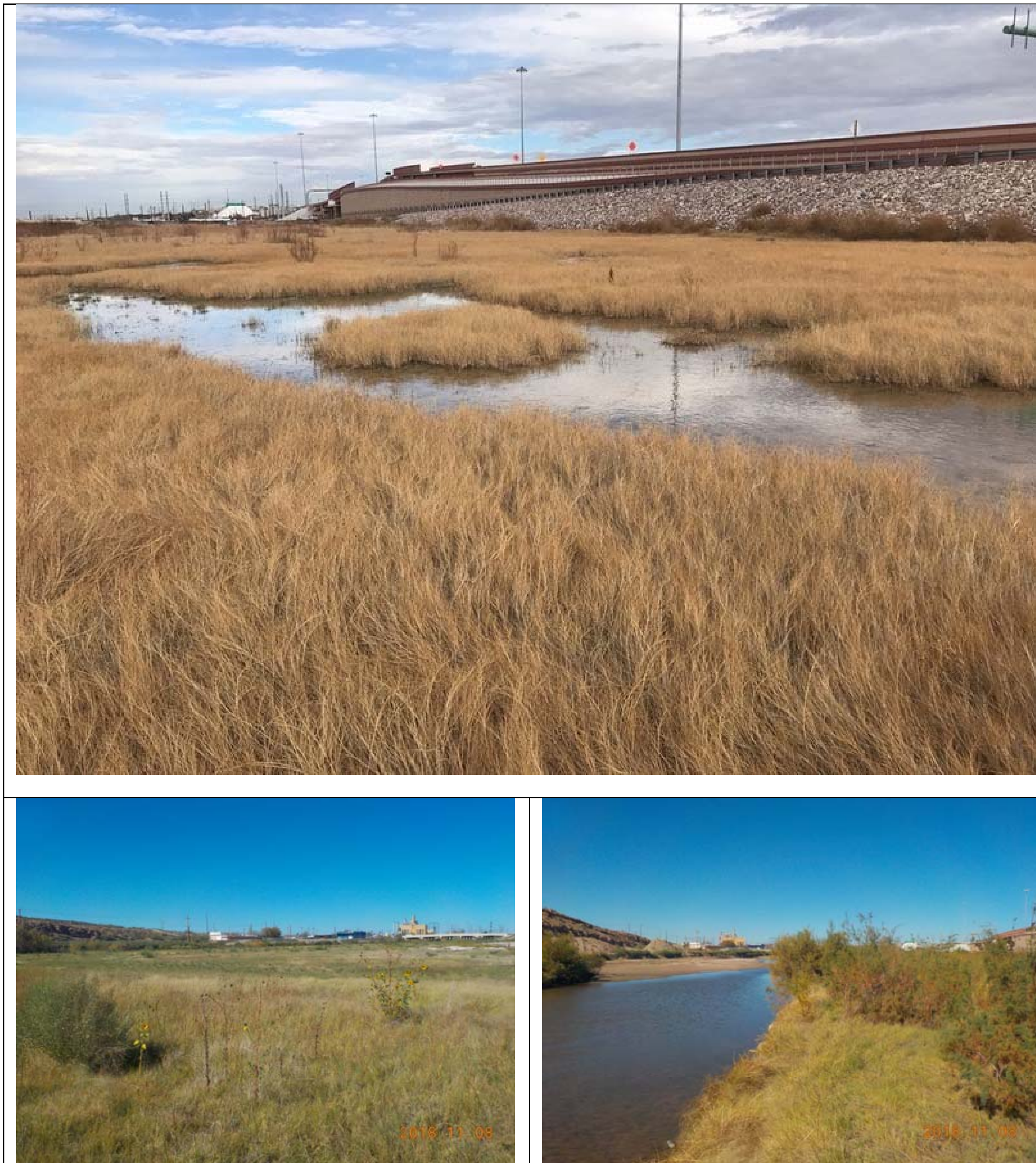


*Figure 40. Representative field photos from the downstream of Courchesne Gage site. Top: standing water in an herbaceous wetland. Bottom left, typical wet meadow vegetation conditions. Bottom right: saltcedar along bankline.*

**Conceptual Design**

The conceptual design at this site focuses primarily on creating a meandering channel that routes stormwater from below the highway, through the site, and into the Rio Grande. Design elements would include benches, embayments, and pools within the channel and along the margins (Figure 41 & Figure 42). Supplemental herbaceous wetland plug plantings and low density, overhanging woody vegetation will increase native wetland species diversity and aquatic habitat complexity at the site.

The channel habitat emphasizes variable conditions to support a diversity of native fish species. Large, deep, pools can potentially support large-bodied species such as gizzard shad, bluegill, and largemouth bass. The primary small-bodied species occupying pool habitats would be fathead minnow and western mosquitofish. With moderate velocity water in close proximity to root mass pools, it might be possible to establish a small population of another regionally extirpated species, Rio Grande chub (Gila pandora). Small-bodied fishes and aquatic macroinvertebrates would provide forage for large-bodied occupants of pools. During periods of elevated flow when wetland and terrestrial vegetation is flooded, fish species that occur in the adjacent river would also move onto the wetted terraces. The most likely river occupants that would move onto the wetted terraces would be western mosquitofish and red shiner. If the terrace was wetted for a sufficient time both species might spawn on it. Primary conceptual design elements include:

- Excavating floodplain terraces along the active Rio Grande channel
- Planting native riparian-wetland plant species
- Treating saltcedar and perennial pepperweed
- Conserving unique, herbaceous wetlands that currently inhabit the site

<u>Benefits and Constraints</u>

This area certainly has potential for multiple sites and expansion of restoration activities in the future, including wetland mitigation sites, or even creation of a wetland mitigation bank. While future mitigation requirements still need to be determined, USIBWC is considering using a portion of the site for mitigation for levee floodwall construction. The property is owned by USIBWC.

Challenges at this site include buried utilities, future floodwall or levee construction, and uncertainty surrounding how TXDOT may respond to drainage challenges below the highway. Future restoration activities will need to be coordinated with TXDOT, as there is potential to integrate storm water outfall improvements with habitat restoration. Recent trenching of new drainages through the site could potentially impact existing wetlands, thus conserving the high-quality wetlands that currently inhabit the site should be considered high importance.

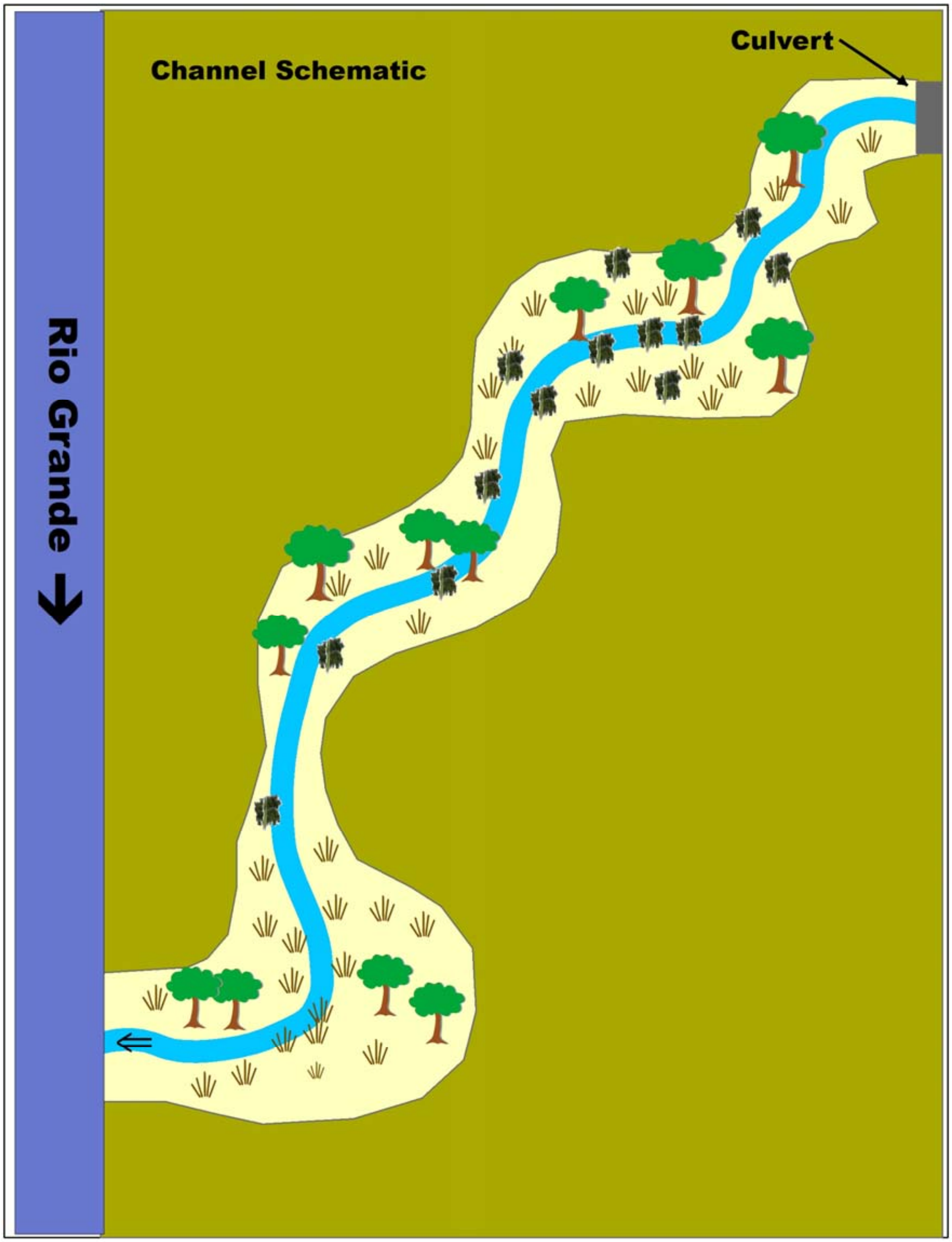



*Figure 41. Conceptual meandering channel at Downstream of Courchesne.*

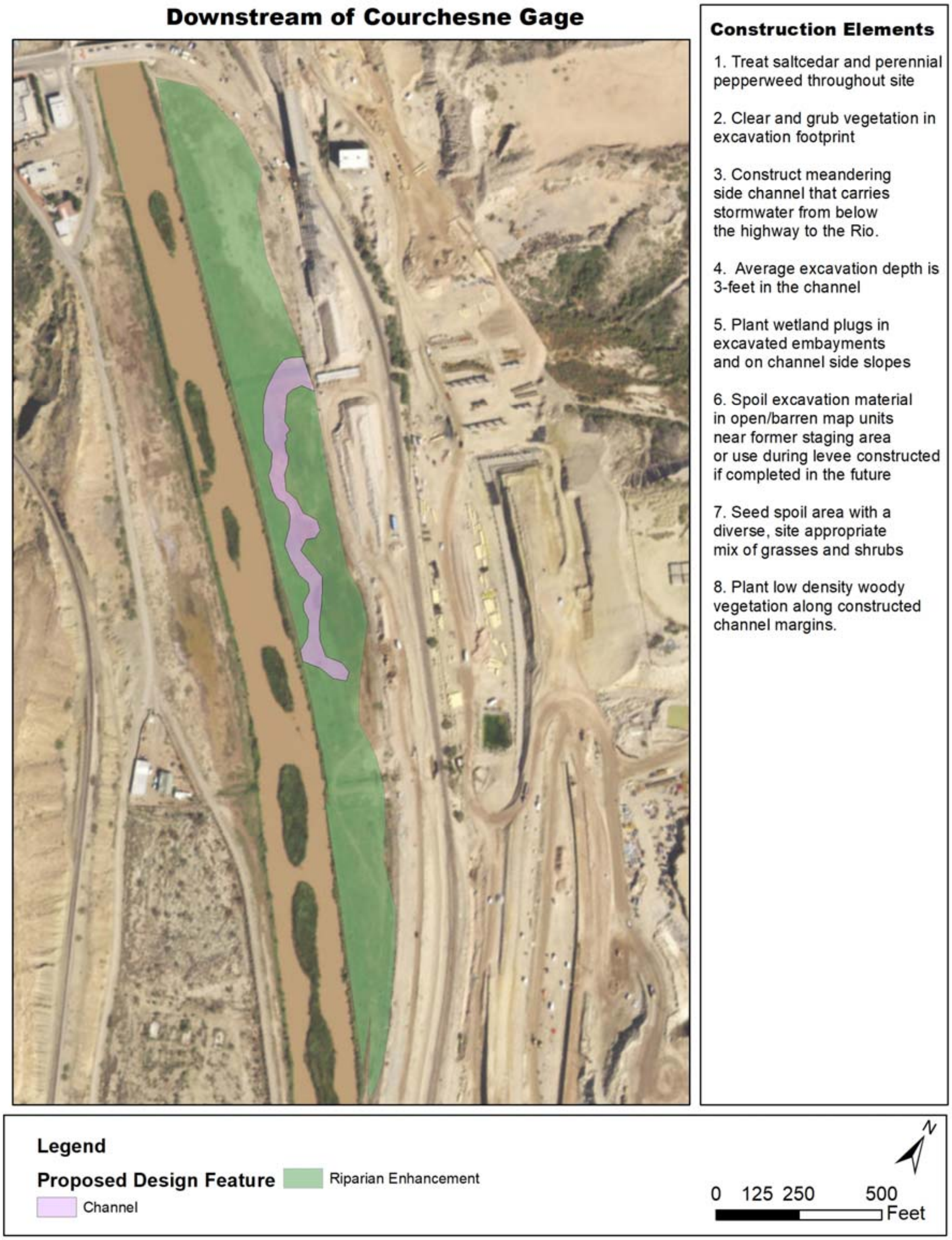



*Figure 42. Downstream of Courchesne Gage conceptual restoration map.*

## 3.8 Additional Sites and Concepts

Several additional sites were assessed during this process but eliminated from further evaluation due to various uncertainties often related to land ownership, future proposed projects, etc. that will predictably delay construction or prevent the project from moving forward altogether. However, several of these locations do have high potential for future restoration projects, most notably the NeMexas Siphon and El Paso Electric/Montoya Drain project sites. Observations from the November 2018 and January 2019 site visits along with general descriptions of these sites are included in the following subsections.

### *3.8.1 NeMexas Siphon*

NeMexas Siphon site is near RM 7. A spur dyke parallels the Rio Grande and a large cattail marsh has formed behind the dyke in a previously excavated wetland (part of the EBID Dias Lagos project). Managing agencies are currently considering whether levee reconstruction is required, and if that happens, it would cause expansion of the levee footprint into adjacent riparian habitats. A siphon under the levee carries stormwater into the river. While this location has potential for integrating storm water retention, wetland construction, and habitat restoration; numerous potential obstacles exist related to land ownership and possible levee reconstruction. The property is currently in an ownership dispute between Sunland Park, NM and the Boy Scouts of America and litigation may be required. Due to these uncertainties, this site was removed from the restoration alternatives considered and no conceptual restoration design was developed. However, prior to eliminating this alternative, GSA staff completed a site assessment and those observations are included below.

Riverside portions contain dense saltcedar and wetlands that have formed in excavated borrow pits within the riparian vegetation. A portion of the site has recently burned. Soil and groundwater conditions appear to support a restoration approach that includes Goodding's willow forests, herbaceous wetlands, aquatic habitats, and excavated backwaters, that in combination, would be highly beneficial for the southwestern willow flycatcher and yellow-billed cuckoo. The Rio Grande riverbed was entirely dry at this location during the November 2018 and January 2019 site visits.

**Site Assessment**
Eight vegetation types are described for the assessment area at NeMexas Siphon (Figure 43). The site was previously vegetated with dense saltcedar, coyote willow, and cottonwood; however, the site burned approximately five years ago (Figure 44). Remaining stands of dense, mature saltcedar still occur in unburned areas, such as the upstream and western segments of the site. Saltcedar (forest or shrubland) map units are nearly saltcedar monocultures in the interior, but mix with wolfberry, fourwing saltbush, Mojave seablite and seep willow on the outer edges, and herbaceous species such as mountain pepperweed (*Lepidium montanum*), Russian thistle, Canadian horseweed (*Conyza canadensis*) and kochia also occur on the outside edge of the near closed saltcedar canopy. Open water wetlands have formed in borrow pits excavated within the saltcedar shrublands.

Marsh habitats and a tiered slope to the west were constructed as part of the EBID Dias Largos project. The marshes are cattail dominated with occasional common threesquare on the outer fringe at the toe of the slope. Adjacent to the cattail marsh are remnants of alternating patches of planted cottonwood and coyote willow swales (shown as an open/barren area on our map), but plantings have low survival and vigor. Multiple furrows tier upslope with planted desert willow

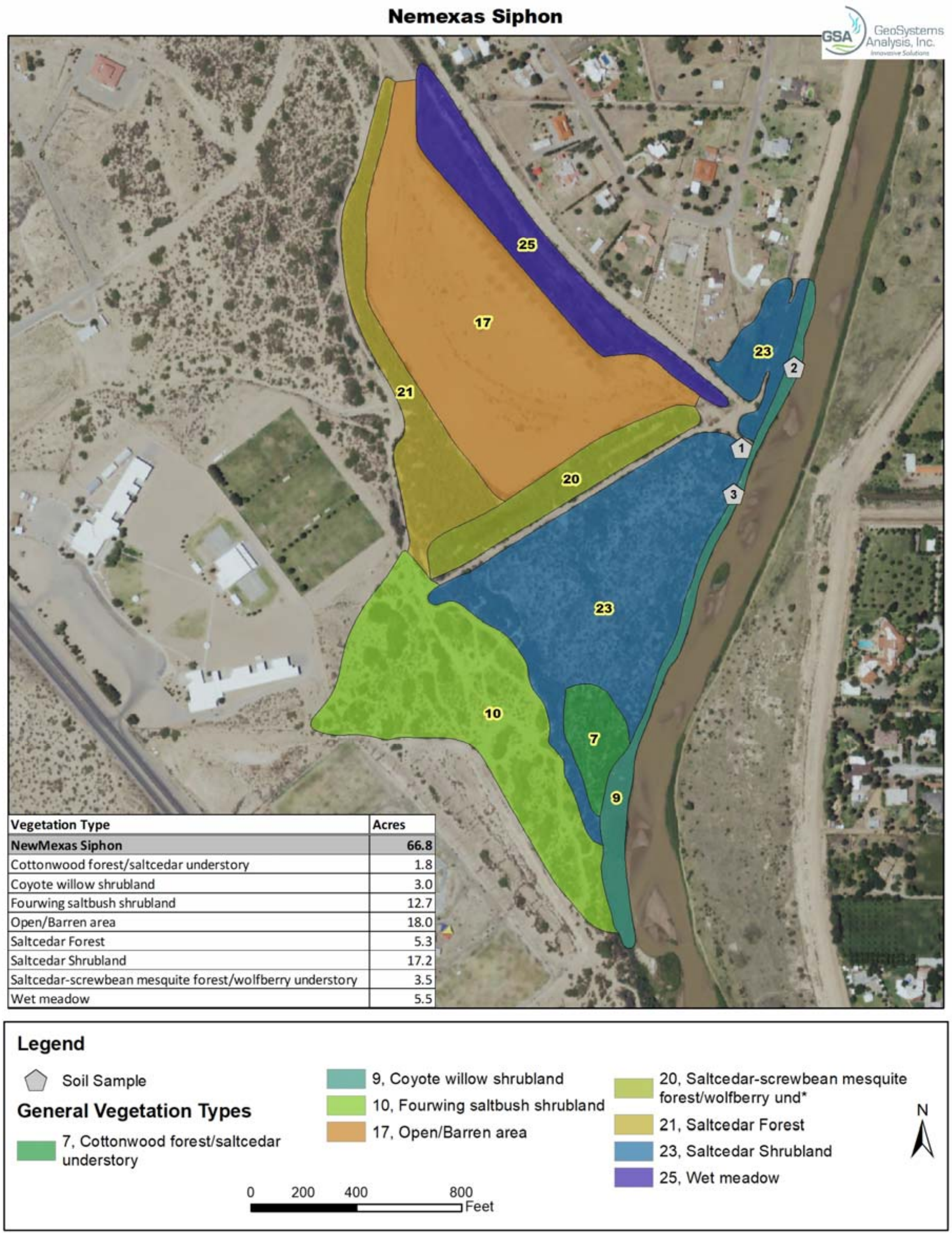
(*Chilopsis linearis*), wolfberry, fourwing saltbush, honey mesquite and screwbean mesquite. Planting survival appears highly variable throughout this revegetation site. Saltcedar is recolonizing the tiers, and the herbaceous layer is mostly barren and weedy.

Other portions of the site's interior are primarily dominated by saltcedar and wolfberry with occasional seep willow and screwbean mesquite, plus honey mesquite. While the bankline is a narrow band of healthy coyote willow, widening at the southern end to form nice southwestern willow flycatcher habitat. A few large cottonwoods remain in the burn along with occasional screwbean mesquite and coyote willow. Surface salts are visible in much of the burned area.

Three holes were augered at the site (Figure 43 and Table 8). Depth to groundwater ranged from about 5 to 7.5 feet though mottles were evident by about 2 feet at each sampling location. Soil texture was highly variable by site and with depth.

Table 8. Texture and depth to groundwater observed at soil sampling locations within the NeMexas Siphon site.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 8 | LS | Slightly moist | Cottonwood and Baccharis on fan |
| | 8 to 10 | SaL | Moist | |
| | 10 to 14 | C | Moist | |
| | 14 to 20 | SaL | Moist | Mottles distinct |
| | 20 to 30 | LS | Moist | very fine loamy sand |
| | 30 to 33 | SaL | Moist | Mottles distinct |
| | 33 to 35 | C | Moist | |
| | 35 to 45 | L | Moist | Mottles prominent |
| | 45 to 66 | LS | Moist | Mottles prominent |
| | 66 to 68 | C | Moist | |
| | 68 to 87 | Sand | Very Moist | On moisture gradient, gleying at 82 |
| | 87 | GW | | |
| 2 | 0 to 27 | CL | Moist | No evidence of salt. Coyote willow and saltcedar |
| | 27 to 33 | SaL | Moist | Fine, Mottles distinct |
| | 33 to 44 | Sa | Moist | Mottles distinct |
| | 44 to 47 | L | Moist | Mottles prominent |
| | 47-79 | Sa | Moist | Mottles prominent |
| | 79 | GW | | |
| 3 | 0 to 17 | SaL | Moist | In willow bankline, Mottles |
| | 17 to 20 | Sa | Moist | Mottles prominent |
| | 20 to 28 | SaL | Moist | |
| | 28 to 30 | Sa | Moist | |
| | 30 to 36 | L | Moist | |
| | 36 to 65 | SaCL | Moist | Mottles distinct |
| | 65 | GW | | |




| Vegetation Type | Acres |
|---|---|
| **NewMexas Siphon** | **66.8** |
| Cottonwood forest/saltcedar understory | 1.8 |
| Coyote willow shrubland | 3.0 |
| Fourwing saltbush shrubland | 12.7 |
| Open/Barren area | 18.0 |
| Saltcedar Forest | 5.3 |
| Saltcedar Shrubland | 17.2 |
| Saltcedar-screwbean mesquite forest/wolfberry understory | 3.5 |
| Wet meadow | 5.5 |

*Figure 43. NeMexas Siphon vegetation map.*

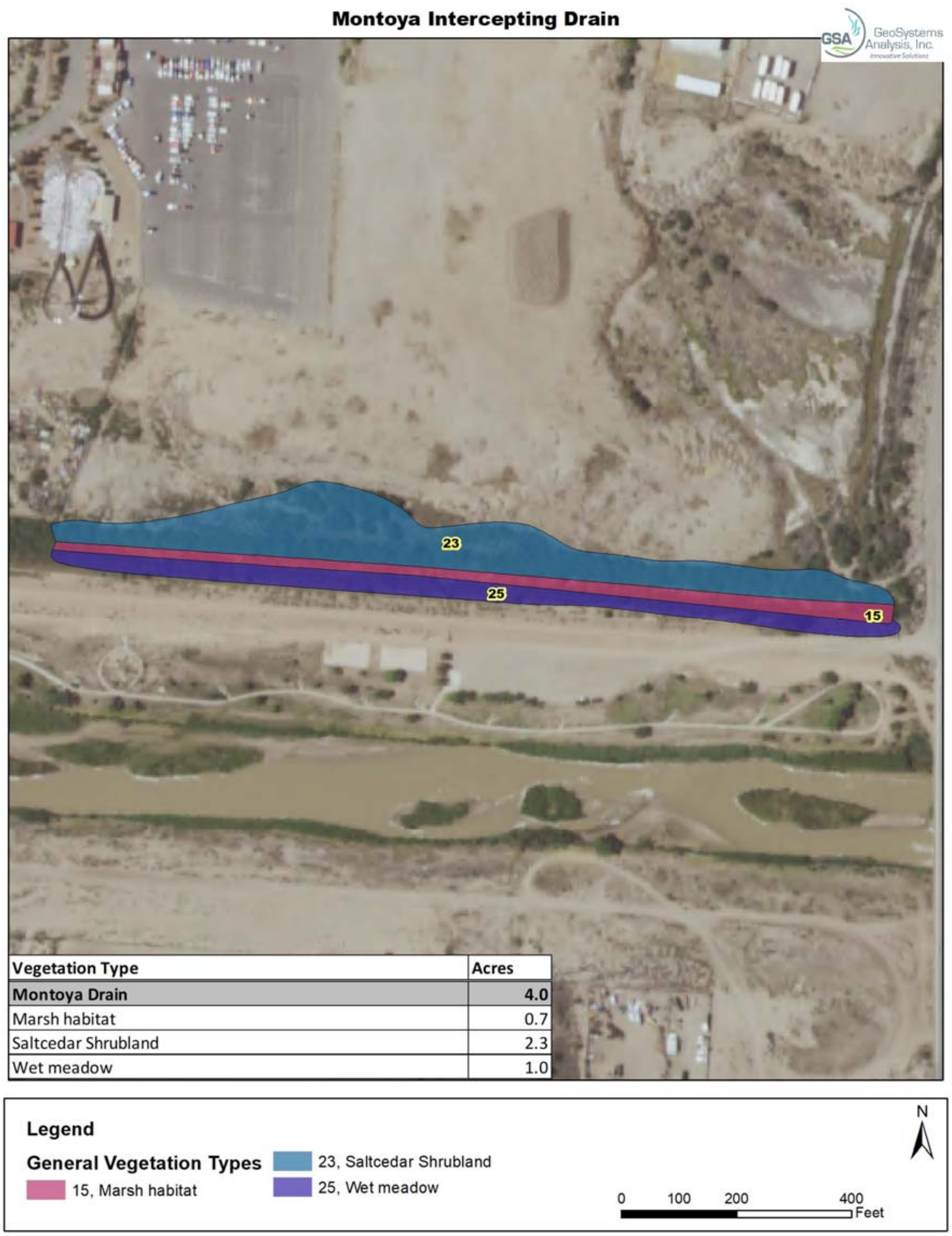
*Figure 44. Field photos from NeMexas Siphon site. Top: burn area. Bottom left: mature cottonwood tree outside the burn. Bottom right: constructed wetland at previous EBID site.*

### 3.8.2 Montoya Intercepting Drain

The Montoya Intercepting Drain site is an EBID owned irrigation facility near RM 3. The drain does not appear to be actively maintained and is currently overgrown with cattail (Figure 45). Depending on EBID's long term vision for this facility, the site has potential for aquatic habitat creation in the drain, possibly integrated with water conveyance requirements. Groundwater is shallow in the vicinity and standing water was observed in the facility during our November 2018 and January 2019 site visits. This site was removed from the restoration alternatives considered because better potential sites are available, the site is owned by multiple jurisdictions, and USIBWC does not have any ROW at this site. No formal conceptual restoration design was developed for this site. However, a site visit was conducted at this location during January 2019 and the results of that assessment are presented here.

*Figure 45. Representative field photo from Montoya Drain Site*

Three vegetation types are present at Montoya Drain (Figure 46). Cattail dominated marsh habitats are prominent in the drain interior, with some hardstem bulrush on the toe of the slope. The riverside of the drain, described as a wet meadow because most of the cover is saltgrass, does have consistent seep willow and occasional saltcedar, screwbean mesquite, Mojave seablite and wolfberry. Levee slopes are dominated by kochia. The upland side of the drain is a monoculture saltcedar shrubland.




| Vegetation Type | Acres |
|---|---|
| **Montoya Drain** | **4.0** |
| Marsh habitat | 0.7 |
| Saltcedar Shrubland | 2.3 |
| Wet meadow | 1.0 |

*Figure 46. Montoya Drain site vegetation map. Note: this site has the potential to go all the way downstream to Montoya Drain, and further upstream as well. The benefits of this site would be*

*maximized if it went all the way down to the Montoya Drain at the EP Electric and was integrated with that project*

### *3.8.3 El Paso Electric/Montoya Drain*

The El Paso Electric/Montoya Drain site, near RM 2, is located near an electricity generation station Figure 47). Numerous potential restoration approaches have been voiced by USIBWC, project partners, and other parties including excavation of wetland features along the river near the Montoya Drain outlet, integrating stormwater runoff with new wetland creation, and modifying the drain outlet to improve aquatic habitat quality. El Paso Water and El Paso Electric are considering new storm water catchments in a large open area on the northwest side of Montoya Drain. Due to land ownership complexities, multiple jurisdictions, limited USIBWC ROW, future levee improvements, and uncertain plans for future projects, this site was removed from consideration for this project. During the scoping meeting it was agreed that El Paso Electric and El Paso Water Utilities could collaborate with a third-party proponent (e.g. SWEC or another non-profit), in the future, possibly with USIBWC as a partner. Prior to eliminating this alternative, a rapid site assessment was conducted in January 2019 and observations are included below.

*Figure 47. Field photo from EP Electric/Montoya Drain site confluence with the Rio Grande from the USIBWC floodplain.*

**Site Assessment**

Only three vegetation types are present at the site (Figure 48). The fenced property owned by El Paso Electric was not traversed but from the perimeter, it appears to be dominated by saltcedar, iodinebush (*Allenrolfea occidentalis*), Mojave seablite and wolfberry. Other woody species observed include indigobush, Jimmyweed, and screwbean mesquite. Dominant herbaceous species include blazing star, scorpionweed, mountain pepperweed and needle grama.

Along Montoya drain, the upland side is a near monotypic saltcedar shrubland. The bottom of the drain is cattail dominated with a small amount of common reed and with hardstem bulrush on the upper fringe of the channel. The riverside of the drain is bermudagrass dominated with occasional silverleaf nightshade, saltgrass, hoary tansyaster and Australian saltbush (*Atriplex semibaccata*). Additional woody species include saltcedar, seep willow, screwbean mesquite and Mojave seablite.

By the river, the floodplain is mostly barren with occasional Mojave seablite, saltcedar, honey mesquite, and wolfberry plus kochia, Russian thistle, and Australian saltbush in the herbaceous layer. The bankline is composed of saltcedar with occasional coyote willow upstream from the outfall plus seep willow, honey mesquite, and screwbean mesquite. Herbaceous species along the bankline include scratchgrass, alkali sacaton, bermudagrass, foxtail barley (*Hordeum jubatum*), common reed and Indianhemp.  Perennial pepperweed, a Class B Noxious Weed in New Mexico was found along the river immediately downstream from the outfall.

Two holes were augured in barren areas directly adjacent to the active channel (Figure 48; Table 9). While the land topography appears nearly identical, groundwater was substantially deeper downstream of the outfall than upstream, likely due to a thick restrictive layer of clays/silty clays located from 4 to 6 feet below the surface.  Groundwater was detected at 76 inches, once sand was reached below the restrictive layer.  Except for a 3-inch-thick layer of clay, soils were coarser above the outfall and groundwater was reached at 55 inches.

Table 9. Texture and depth to groundwater observed at soil sample locations from the EP Electric/Montoya Drain site.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 10 | SaL | Dry | Salts |
| | 10 to 12 | C | Dry | Salts |
| | 12 to 20 | SaL | Very Slightly Moist | |
| | 20 to 23 | C | Slightly moist | Salts |
| | 23 to 25 | C | Moist | |
| | 25 to 50 | LS | Moist | Mottles distinct |
| | 50 to 76 | SiC | Moist | Near black, restrictive layer, subsurface fines appear nice for herbaceous wetland |
| | 76 | GW | | Sand, groundwater evident as soon as sand was reached |
| 2 | 0 to 10 | SaCL | Dry | |
| | 10 to 13 | C | Moist | Gleying, mottles |
| | 13 to 30 | SaL | Moist | Mottles prominent |
| | 30 to 55 | LS | Moist | Nears saturation at 50, mottles |
| | 55 | GW | | |


| Vegetation Type | Acres |
|---|---|
| **EP Electric/Montoya Drain** | **33.4** |
| Open/Barren area | 31.6 |
| Saltcedar Shrubland | 1.2 |
| Saltcedar-coyote willow shrubland | 0.3 |
| Wet meadow | 0.3 |

*Figure 48. EP Electric/Montoya Drain site vegetation map.*

### 3.8.4 Placitas Arroyo

Placitas Arroyo is an aquatic habitat restoration site recommended in the Conceptual Plan (USACE 2009). The proposed design in that report includes removal of the existing riprap toe protection plus bankline destabilization across from the arroyo confluence and cessation of future dredging (USACE 2009). The Conceptual Plan (USACE 2009) suggests that the proposed design will facilitate natural channel migration, contribute to reduced channel conveyance capacity, and more frequent overbank flooding in locations immediately upstream of the arroyo mouth. During the project scoping meeting, it was revealed that there are currently plans to create a sediment retention facility in Placitas Arroyo above the confluence with the Rio Grande. Since a sediment dam will reduce flow velocity and sediment-laden tributary flows, this site was removed from further alternatives analysis and no conceptual restoration design was developed.

### 3.8.5 Trujillo

Trujillo canyon enters the Rio Grande from the west side of the river just below Percha Dam. EBID expressed interest in exploring habitat restoration potential at this site in the future. The site was not evaluated in this report because EBID's interest in this location was not formally indicated until after the draft report with conceptual designs was completed.

### 3.8.6 Las Cruces Effluent Subterranean Pipe

EBID expressed interest in piping effluent discharged from the Las Cruces wastewater treatment plant below the Rio Grande and into Picacho Drain on the opposite side of the river. This action may benefit the habitat improvements recommended at MVBSP, however, designing this type of structure is beyond the scope of this report. Additionally, project engineers tasked with designing later phases of this project do not recommend this type of active hydraulic control or mechanism in river restoration.

## 4.0 ESTIMATED CONSTRUCTION QUANTITIES, CONSUMPTIVE WATER USE, AND COSTS

Implementation costs were determined for each project via assessing unit costs for various restoration activities from similar sized projects in the Rio Grande watershed. The basic method for determining construction quantities for major restoration activities is described in Table 10. Consumptive water use was quantified for each restoration project with an identical method as USACE 2009 (See Section 4.1 Evapotranspiration Evaluation) and summary results are shown in Table 11.

Table 10. Basic process used to determine quantities for various restoration activities. Note that sediment cleanout and ongoing feature operation and maintenance costs are not summarized in this report.

| **Activity** | **Notes** |
|---|---|
| ***All costs only include predicted initial construction costs. Operational and maintenance costs are not included in this table or otherwise in this report.*** | |

| **Activity** | **Notes** |
|---|---|
| Earthwork (cu yds) | Quantities based on analysis that combines HEC-RAS derived water surface elevations at target discharges, target discharges discussed in this report, and 2011 LiDAR based elevation. Supporting GIS shapefiles include the average estimated excavation depth and estimated quantity for each feature. Off-site hauling may be necessary but costs for hauling were not evaluated because determining off-site spoil locations was outside the scope of this project. |
| Contingencies | Contingency costs included to cover potential project uncertainties that may be encountered in subsequent project phases. Formal engineering design plans will help to alleviate uncertainties and increase cost estimation accuracy. |
| Grass Seeding | Assumes spoil areas would be targeted for seeding. Acreage based on earthwork volume and size of predicted spoil areas. Note that many sites have weedy sections that could be targeted for spreading spoil, however, spoiling against levees (and possibly within the floodplain) is not allowable by USIBWC. |
| Flow monitoring | Cost based on estimate obtained during a phone conversation with Xylem (GWI - Flow System). Cost includes DC powered flow monitor (Model BI2000), cellular data loggers, water level sensors, solar panels, batteries, enclosure, web hosting, misc. model engineering fees. |
| Pedestrian Bridge | Cost based on previous bridges installed in habitat restoration projects in the Middle Rio Grande. Typical cost on those projects was approximately $200 per square foot. |
| Selective Fish Passage | Cost assumes structure like Propst and Bixby (2018) would be used at the Las Cruces Effluent site. Cost estimation accuracy will be improved if a formal design is developed during engineering design phase. |
| Exotic Species Control (ac) | Quantities conservatively assume that some level of exotic species treatment will be required at all sites. Note that woody exotic species density is highly variable and certain sites also have herbaceous noxious weeds that should be treated prior to excavation plus monitored and retreated thereafter. |

Table 11. Consumptive water use by site under existing condition, after restoration activities, and the predicted change. Note that Broad Canyon, Selden Canyon, Mesilla Valley Bosque, and Downstream of Courchesne sites were composed of dense saltcedar prior to previous vegetation management activities.

| Site | Pre-Restoration (ac-ft/yr) | Post-Restoration (ac-ft/yr) | Difference (ac-ft/yr) |
|---|---|---|---|
| Yeso Arroyo | 40.7 | 59.0 | 18.3 |
| Angostura Arroyo | 42.5 | 62.0 | 19.5 |
| Broad Canyon Arroyo | 9.1 | 8.1 | -0.9 |
| Selden Canyon Point Bar | 45.5 | 31.6 | -13.9 |
| Las Cruces Effluent | 10.7 | 17.2 | 6.5 |
| Mesilla Valley Bosque State Park | 154.5 | 135.3 | -19.2 |
| Downstream of Courchesne Gage | 59.9 | 35.4 | -24.5 |

Planting rates recommended in this report are intended to achieve specific cover goals by 10 years after revegetation. Electronic GIS data created in support of this report include the recommended tree, shrub, willow whip, and herbaceous wetland plug planting rate for each map feature. In summary, specific plant installation density classes (low, moderate, and high) were used to recommend plant quantities as shown in Table 12.

Table 12. Plant installation quantities, classes, and cover goals.

| | Tree Poles | | Potted Shrubs | | Willow Whips | | Herbaceous Wetland Plugs | |
|---|---|---|---|---|---|---|---|---|
| Density | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate |
| Low | 10% | 8 | 10% | 100 | 10% | 250 | 10% | 200 |
| Mod | 25% | 20 | 25% | 375 | 25% | 700 | 25% | 500 |
| High | 50% | 40 | 50% | 750 | 50% | 1400 | 50% | 1000 |

Since the extent to which ephemeral habitats will be used by and of value to riverine fish and other aquatic species, among many factors, will depend on duration of inundation; the designs in this report intend to provide prolonged wetting of the floodplain whenever possible. Among the sites considered, two (Las Cruces Effluent and Mesilla Valley Bosque State Park) will provide perennial habitats while all others will provide habitats mainly during irrigation season elevated flows. The stormwater channel at the Downstream of Courchesne site is likely to provide near perennial conditions during many years. As summarized in Table 13, the projects proposed in this report are predicted to benefit fish species in varying degrees. The projects also range significantly in cost, size, potential benefits to southwestern willow flycatcher and yellow-billed cuckoo, and numerous additional factors. A detailed description of our preliminary cost estimate for constructing the sites as indicated in the conceptual designs within this report is shown in Table 14.

The complexity with estimating cost at this stage of the project also varies by site, so contingencies were added to cover potential additional costs that might arise during subsequent project design and engineering phases.

Table 13. Site alternatives summary including acreage, site proximity, ownership, total estimated costs, benefits to important fish and wildlife including southwestern willow flycatcher (WiFL) and yellow-billed cuckoo (YBCU).

| Site Name | River Mile and Bank | Proximity | Total Acres | Aquatic Features (excludes riparian enhancement) | Acres of Newly Constructed Aquatic Features | ET difference (ac-ft/yr) | Ownership | Estimated Restoration Cost | Direct Benefits to WiFL/YBCU | Predicted Number of Beneficiary Fish Species |
|---|---|---|---|---|---|---|---|---|---|---|
| Yeso Arroyo | 94 E | Hatch, NM | 14.3 | Bankline terrace | 6.9 | 18.3 | USIBWC | $836,900.00 | Yes | 4 |
| Angostura Arroyo | 80 E | Hatch, NM | 14.9 | Bankline terrace | 7.5 | 19.5 | USIBWC | $690,800.00 | Yes | 4 |
| Broad Canyon Arroyo | 68 W | Radium Springs, NM | 2.1 | Embayments | 0.2 | -0.9 | USIBWC, USFWS, State of NM, BLM | $ 37,665.00 | Yes | 8 |
| Selden Point Bar | 66 E | Radium Springs, NM | 8.8 | Backwater, channel | 0.8 | -13.9 | USIBWC | $146,550.00 | Yes | 7 |
| Las Cruces Effluent | 44 E | Las Cruces, NM | 4.5 | Channel | 0.9 | 6.5 | USIBWC | $199,300.00 | Yes | 10 |
| Mesilla Valley Bosque State Park | 41 W | Mesilla, NM | 31.3 | Channel, willow swale, drain terracing, cattail control | 15.8 | -19.2 | USIBWC, EBID, NM State Parks, private | $657,700.00 | Yes | 8 |
| Downstream of Courchesne Gage | 1 E | El Paso, TX | 12.9 | Channel | 1.4 | -24.5 | USIBWC | $101,600.00 | Yes | 7 |

Table 14. Detailed cost table.

| | Yeso Arroyo | Angostura Arroyo | Broad Canyon Arroyo | Selden Point Bar | Las Cruces Effluent | Mesilla Valley Bosque State Park | Downstream of Courchesne Gage |
|---|---|---|---|---|---|---|---|
| **Earthwork (cu yds)** | | | | | | | |
| *Unit Cost* | *$ 9.00* | *$ 9.00* | *$ 9.00* | *$ 9.00* | *$ 9.00* | *$ 9.00* | *$ 9.00* |
| *Units (cu yd)* | 74,000 | 57,000 | 560 | 4,300 | 4,400 | 33,000 | 7,000 |
| *Total Cost* | *$ 666,000.00* | *$ 513,000.00* | *$ 5,040.00* | *$ 38,700.00* | *$ 39,600.00* | *$ 297,000.00* | *$ 63,000.00* |
| **Contingencies** | | | | | | | |
| *Unit Cost* | $ 40,000.00 | $ 40,000.00 | $ 5,000.00 | $ 5,000.00 | $ 25,000.00 | $ 40,000.00 | $ 5,000.00 |
| *Units (misc)* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Total Cost* | *$ 40,000.00* | *$ 40,000.00* | *$ 5,000.00* | *$ 5,000.00* | *$ 25,000.00* | *$ 40,000.00* | *$ 5,000.00* |
| **Cottonwood/Willow Trees** | | | | | | | |
| *Unit Cost* | *$ 50.00* | *$ 50.00* | *$ 50.00* | *$ 50.00* | *$ 50.00* | *$ 50.00* | *$ 50.00* |
| *Units (poles)* | 160 | 208 | 35 | 65 | 65 | 450 | 50 |
| *Total Cost* | *$ 8,000.00* | *$ 10,400.00* | *$ 1,750.00* | *$ 3,250.00* | *$ 3,250.00* | *$ 22,500.00* | *$ 2,500.00* |
| **Potted Riparian Shrubs** | | | | | | | |
| *Unit Cost* | *$ 20.00* | *$ 20.00* | *$ 20.00* | *$ 20.00* | *$ 20.00* | *$ 20.00* | *$ 20.00* |
| *Units (shrubs)* | 3,500 | 4,000 | 650 | 3,000 | 1,200 | 4,500 | 250 |
| *Total Cost* | *$ 70,000.00* | *$ 80,000.00* | *$ 13,000.00* | *$ 60,000.00* | *$ 24,000.00* | *$ 90,000.00* | *$ 5,000.00* |
| **Wetland Plugs** | | | | | | | |
| *Unit Cost* | *$ 2.00* | *$ 2.00* | *$ 2.00* | *$ 2.00* | *$ 2.00* | *$ 2.00* | *$ 2.00* |
| *Units (plugs)* | 1,800 | 1,750 | 175 | 600 | 2,000 | 7,000 | 2,000 |
| *Total Cost* | *$ 3,600.00* | *$ 3,500.00* | *$ 350.00* | *$ 1,200.00* | *$ 4,000.00* | *$ 14,000.00* | *$ 4,000.00* |
| **Willow Whips** | | | | | | | |
| *Unit Cost* | *$ 6.00* | *$ 6.00* | *$ 6.00* | *$ 6.00* | *$ 6.00* | *$ 6.00* | *$ 6.00* |
| *Units (whips)* | 4,500 | 3,500 | 1,200 | 5,500 | 775 | 15,000 | 1,000 |
| *Total Cost* | *$ 27,000.00* | *$ 21,000.00* | *$ 7,200.00* | *$ 33,000.00* | *$ 4,650.00* | *$ 90,000.00* | *$ 6,000.00* |
| **Grass Seeding** | | | | | | | |
| *Unit Cost* | *$ 1,600.00* | *$ 1,600.00* | *$ 1,600.00* | *$ 1,600.00* | *$ 1,600.00* | *$ 1,600.00* | *$ 1,600.00* |
| *Units (acres)* | 5 | 5 | 3 | 2 | 3 | 0 | 2 |
| *Total Cost* | *$ 8,000.00* | *$ 8,000.00* | *$ 4,800.00* | *$ 3,200.00* | *$ 4,800.00* | *$ -* | *$ 3,200.00* |
| **Flow Monitoring** | | | | | | | |
| *Unit Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 10,000.00* | *$ -* | *$ -* |
| *Units (station)* | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| *Total Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 20,000.00* | *$ -* | *$ -* |
| **Pedestrian Bridge** | | | | | | | |
| *Unit Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 1.00* | *$ 1.00* | *$ -* |
| *Units (bridge)* | *0* | *0* | *0* | *0* | *60,000* | *60,000* | *0* |
| *Total Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 60,000.00* | *$ 60,000.00* | *$ -* |
| **Check Structure** | | | | | | | |
| *Unit Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 1.00* | *$ -* | *$ -* |
| *Units (facility)* | *0* | *0* | *0* | *0* | *10,000* | *0* | *0* |
| *Total Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 10,000.00* | *$ -* | *$ -* |
| **Cattail Control (ac)** | | | | | | | |
| *Unit Cost* | *$ 1,500.00* | *$ 1,500.00* | *$ 1,500.00* | *$ 1,500.00* | *$ 1,500.00* | *$ 1,500.00* | *$ 1,500.00* |
| *Units (acres)* | *0* | *0* | *0* | *0* | *0* | *6* | *0* |
| *Total Cost* | *$ -* | *$ -* | *$ -* | *$ -* | *$ -* | *$ 8,700.00* | *$ -* |
| **Exotic Species Control (ac)** | | | | | | | |
| *Unit Cost* | $ 1,000.00 | $ 1,000.00 | $ 250.00 | $ 250.00 | $ 1,000.00 | $ 1,250.00 | $ 1,000.00 |
| *Units (acres)* | 14 | 15 | 2 | 9 | 4 | 28 | 13 |
| *Total Cost* | *$ 14,300.00* | *$ 14,900.00* | *$ 525.00* | *$ 2,200.00* | *$ 4,000.00* | *$ 35,500.00* | *$ 12,900.00* |
| **TOTAL** | **$ 836,900.00** | **$ 690,800.00** | **$ 37,665.00** | **$ 146,550.00** | **$ 199,300.00** | **$ 657,700.00** | **$ 101,600.00** |

## 5.0 CITED REFERENCES

Blue Earth Ecological Consultants. 2008. Mesilla Valley Bosque State Park Resource Management Plan. Prepared for New Mexico State Parks. March 2008.

Brady, C.N. and Weil, R.R. (2008) The nature and properties of soils. 14th Edition, Pearson Education, Inc.

Hink, V.C. and R.D. Ohmart. 1984. Middle Rio Grande Biological Survey. Final Report to the U.S. Army Corps of Engineers, Albuquerque, NM.

Lower Colorado River Multi-Species Conservation Program. 2004. Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan. (J&S 00450.00) Sacramento, CA.

Parametrix. 2008. Order 2 Soil Survey and Vegetation Mapping of Five Private Land Parcels Along the Rio Grande Floodplain, Radium Springs, NM. Prepared for World Wildlife Fund. August 2008.

Propst, D.L. and K. Bixby 2018. Conserving native Rio Grande fishes in southern New Mexico and west Texas: A conceptual approach. Funded by the Peso del Norte Watershed Council. September 2018.

Tetra Tech. 2014. Preliminary Analysis of Channel Seepage and Water Budget Components Along the Rio Grande. Prepared for USIBWC.

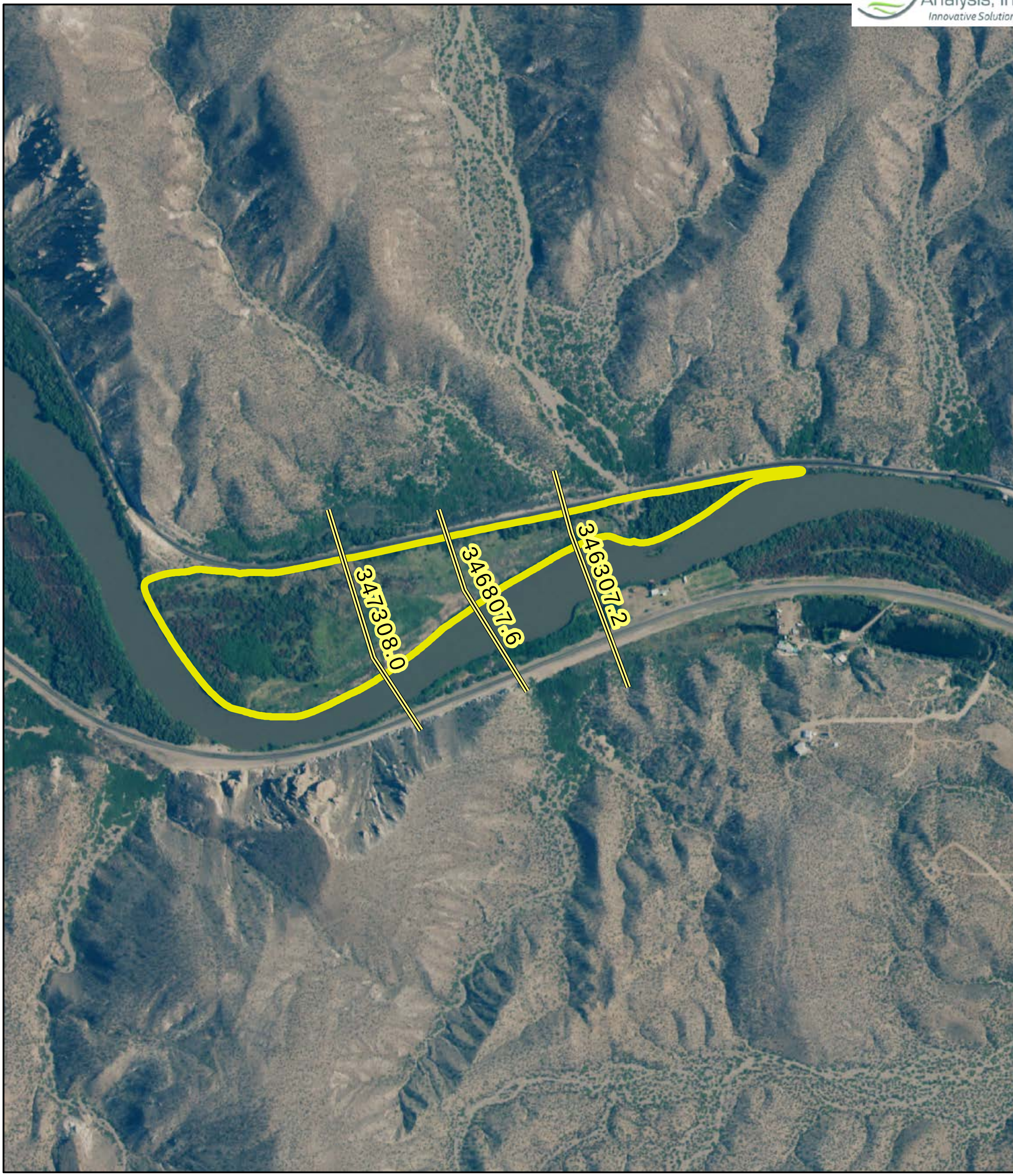
USIBWC 2016. USIBWC Rio Grande Canalization Project, River Management Plan. December 8, 2016.

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

United States Army Corps of Engineers (USACE). 2009. Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande – Caballo Dam to American Dam, New Mexico and Texas. Prepared by Mussetter Engineering, Inc. and Riada Engineering, Inc, under contract with USACE.

# Appendix A. HEC-RAS Model Outputs at Representative Cross-Sections for Restoration Sites in this Report

Yeso Arroyo




Legend

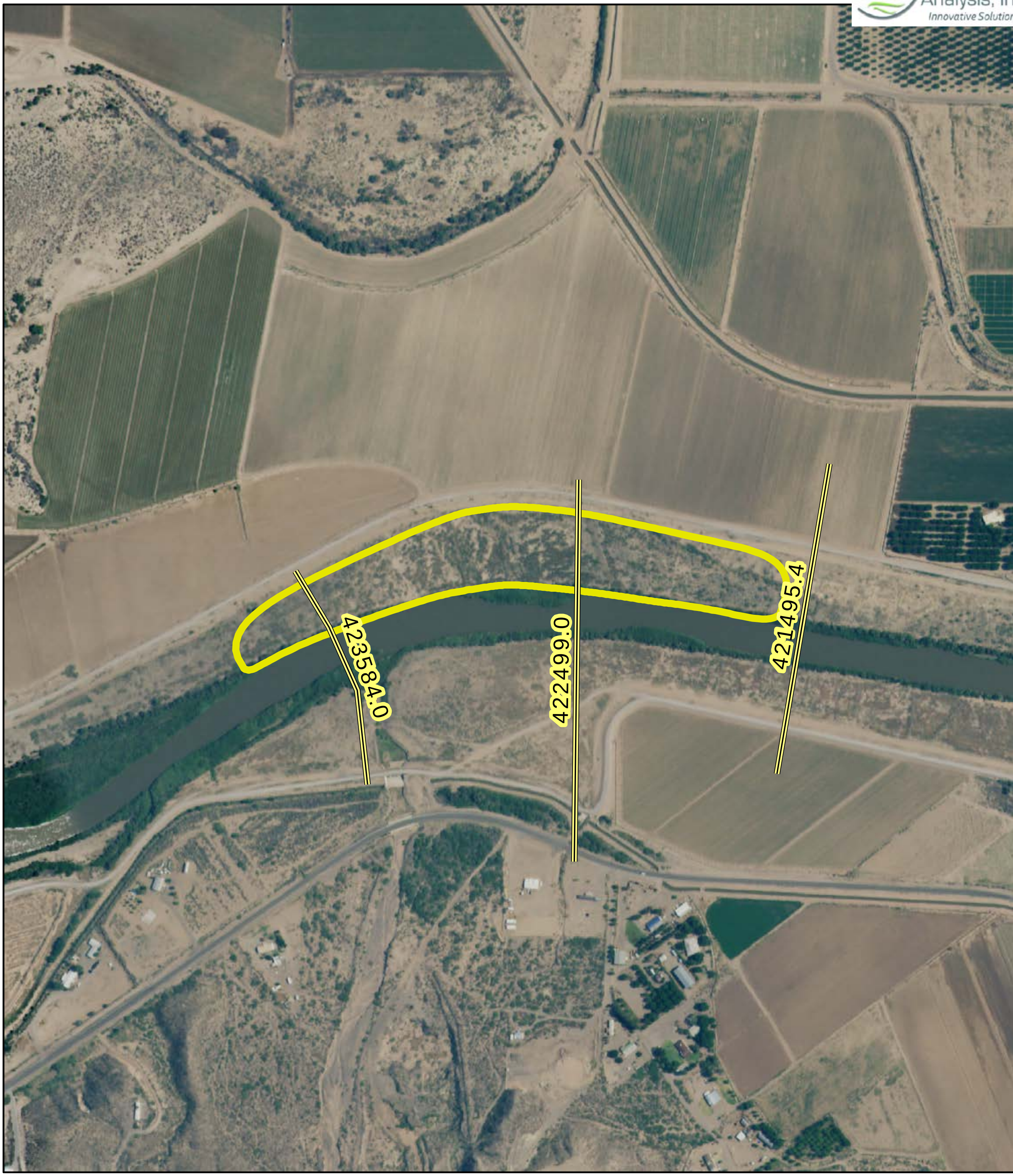
Selected Hec-RAS Cross-Sections

Site Assessment Boundary

0 200 400 800 Feet

N

# Angostura Arroyo




Legend

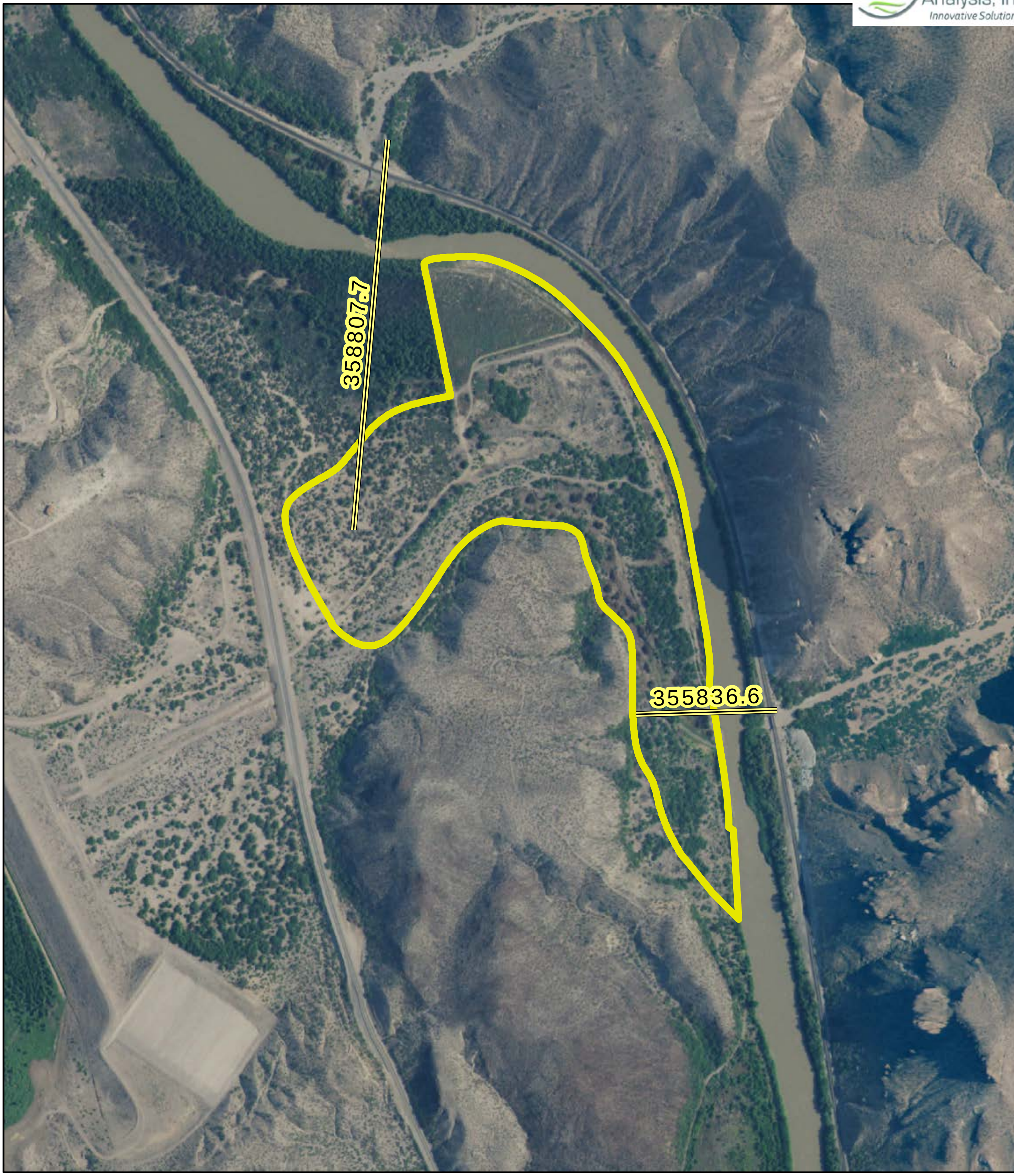
Feet
0 200 400 800

N

Selected Hec-RAS Cross-Sections
Site Assessment Boundary

# Broad Canyon Arroyo

GSA GeoSystems Analysis, Inc. Innovative Solutions



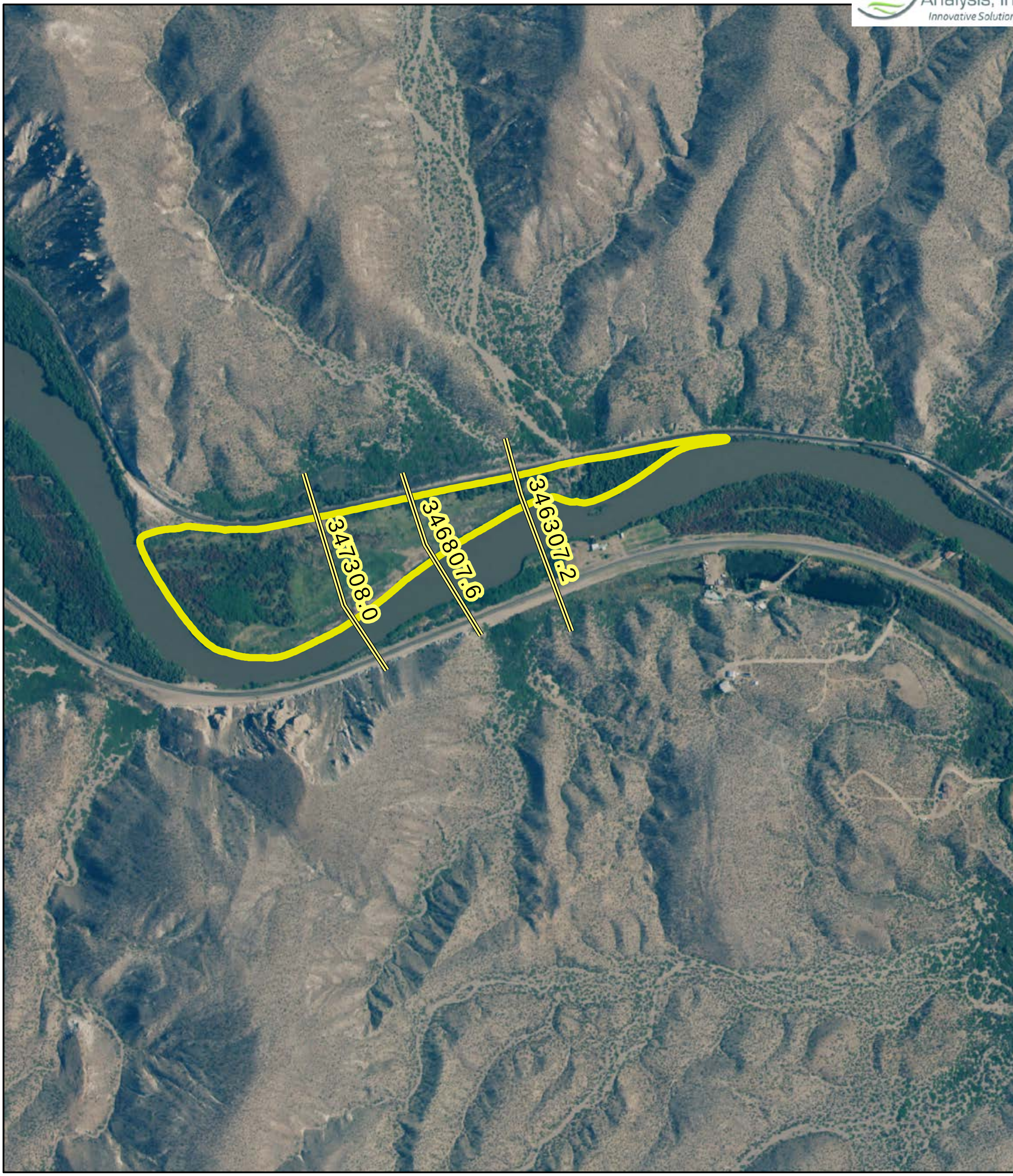

Legend

Selected Hec-RAS Cross-Sections
Site Assessment Boundary

0 200 400 800 Feet

N

# Selden Point Bar




Legend

Feet
0 500 1,000 2,000

N

Selected Hec-RAS Cross-Sections
Site Assessment Boundary

# Las Cruces Effluent


Legend

0 200 400 800 Feet

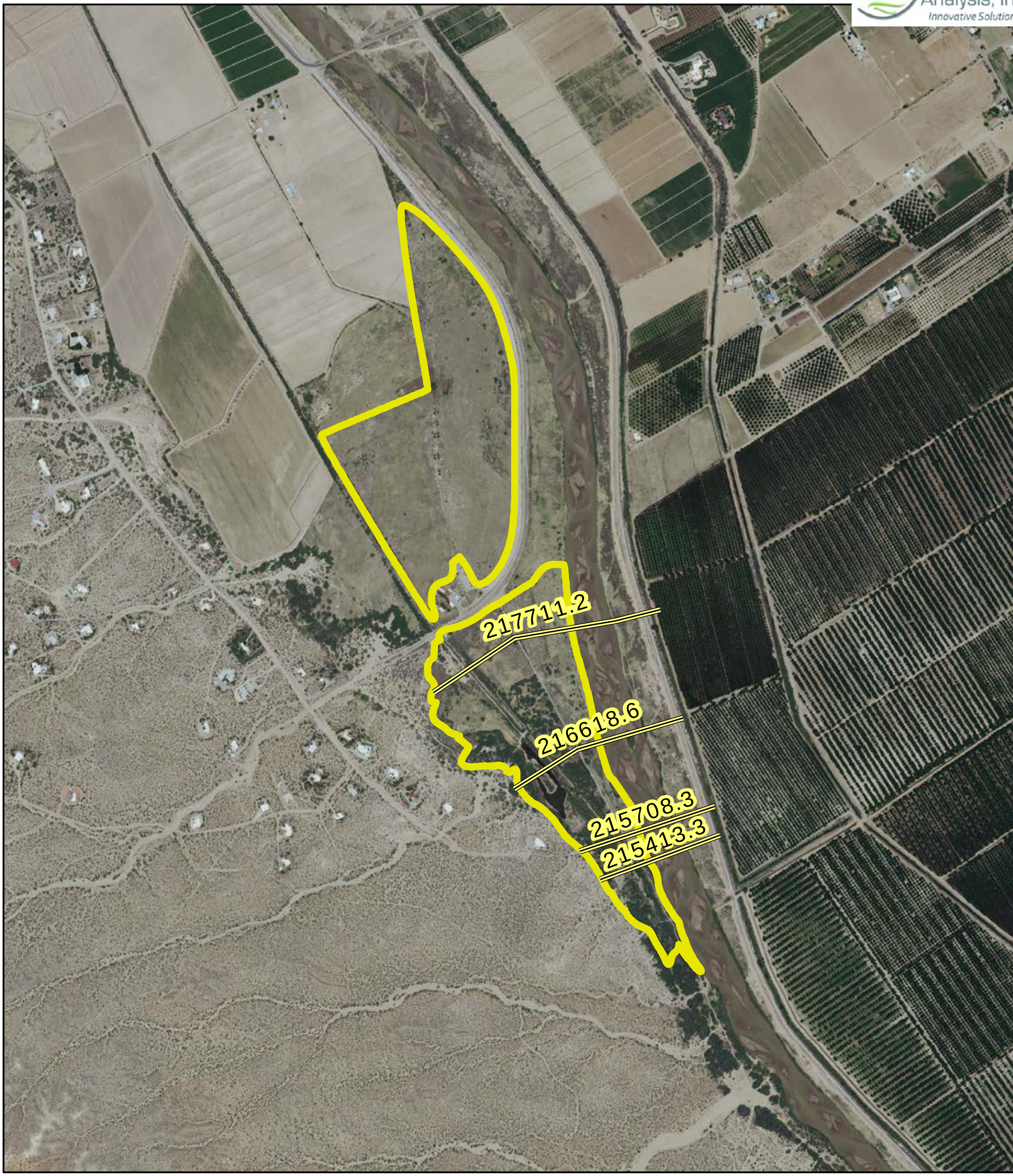
N

Selected Hec-RAS Cross-Sections

Site Assessment Boundary

# Mesilla Valley Bosque State Park

GeoSystems Analysis, Inc. Innovative Solutions




Feet

0 500 1,000 2,000

Legend

Selected Hec-RAS Cross-Sections

Site Assessment Boundary

N

## Downstream of Courchesne Gage


Legend

Selected Hec-RAS Cross-Sections

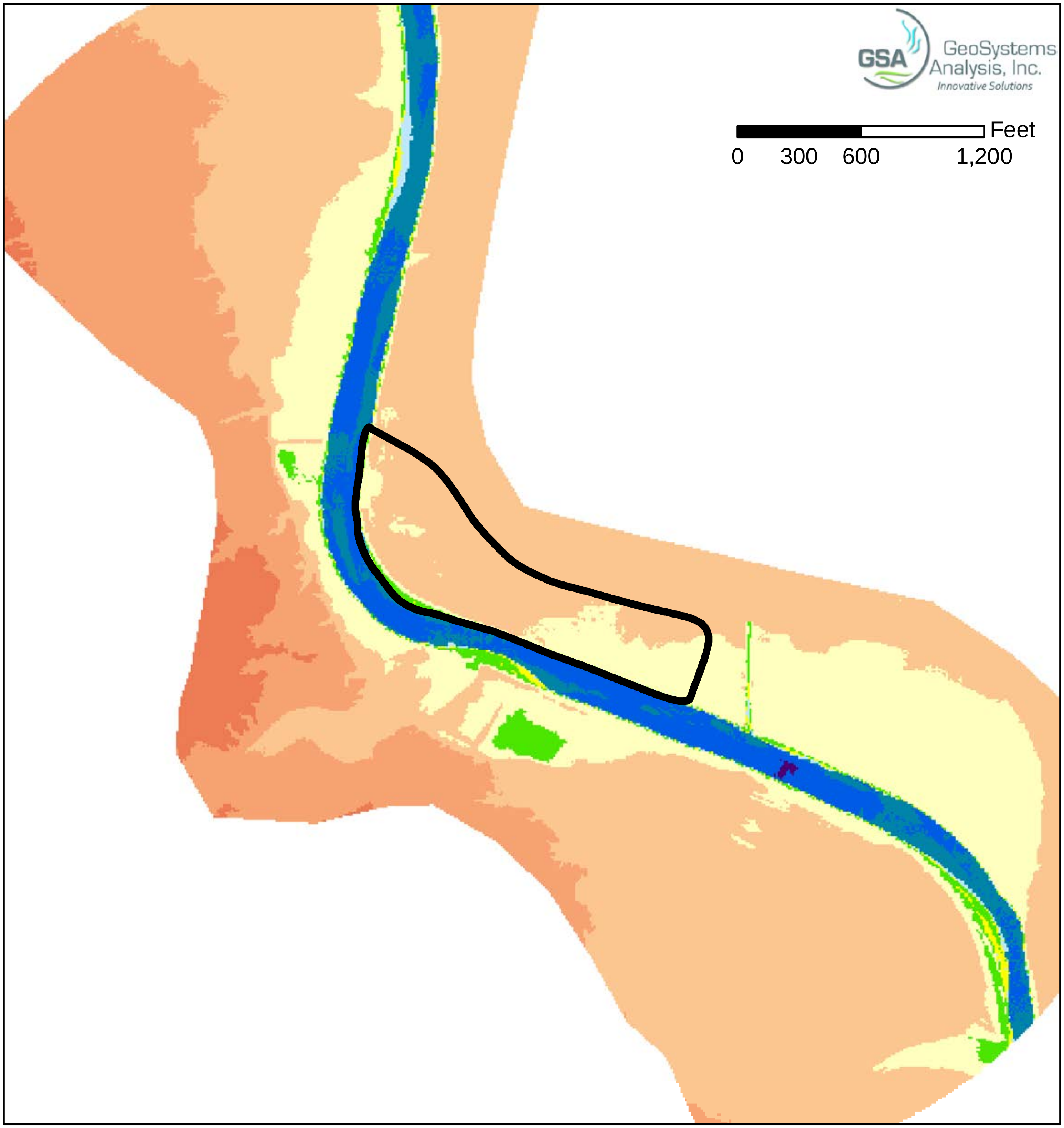
Site Assessment Boundary

0 200 400 800 Feet

N

# Appendix B. LiDAR Maps

Yeso Arroyo




Legend

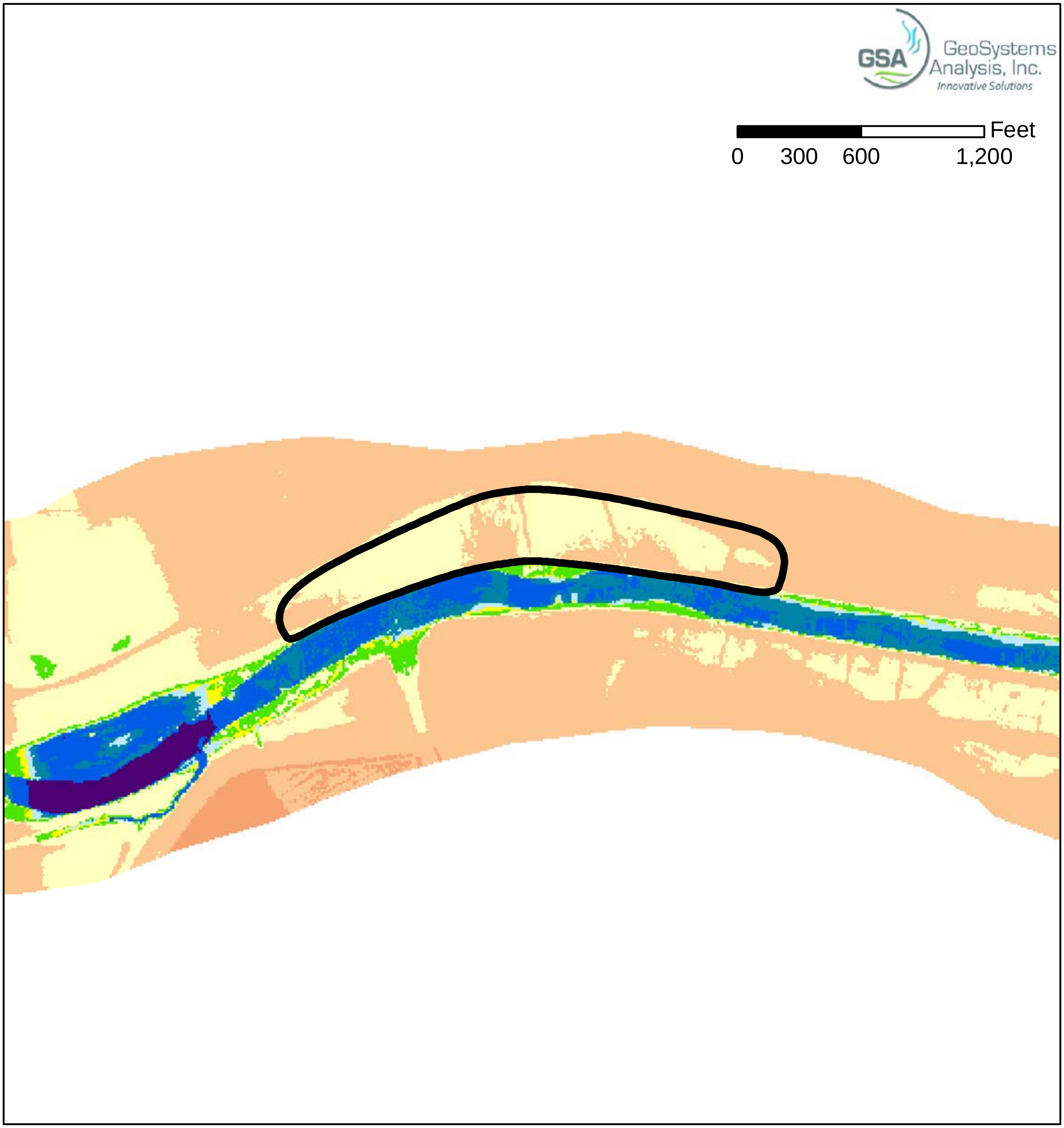
Site Assessment Boundary

**LiDAR Predicted Height Above the RiverBed (Feet)**

-6 to - 2 Feet
-2 to 0 Feet
0 to 1 Foot
1 to 2 Feet
2 to 3 Feet
3 to 5 Feet
5 to 10 Feet
10 to 25 Feet
25 to 50 Feet
50 to 100 Feet
100 to 250 Feet
>250 Feet

N

# Angostura Arroyo




## Legend

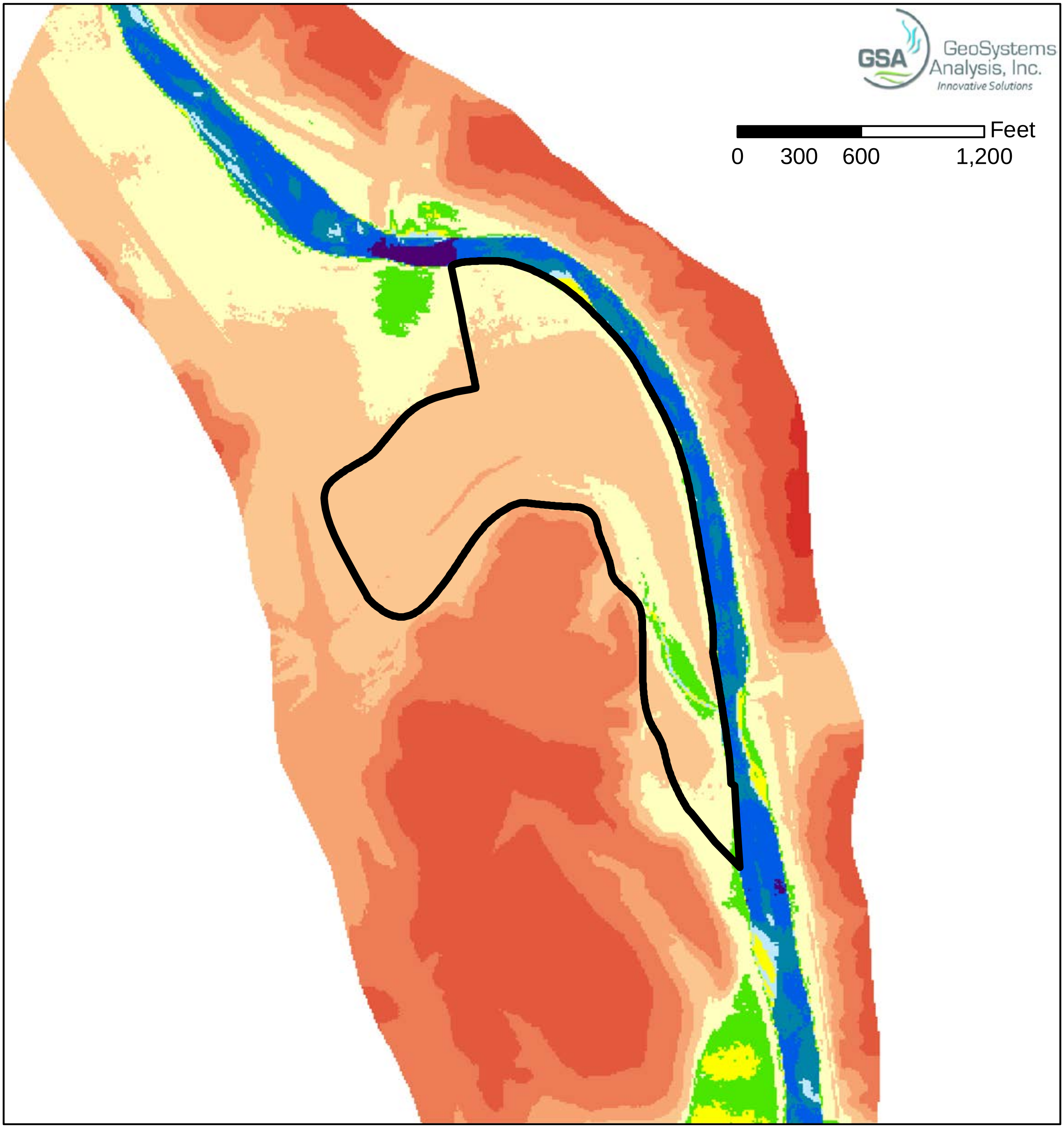
Site Assessment Boundary

**LiDAR Predicted Height Above the RiverBed (Feet)**

- -6 to - 2 Feet
- -2 to 0 Feet
- 0 to 1 Foot
- 1 to 2 Feet
- 2 to 3 Feet
- 3 to 5 Feet
- 5 to 10 Feet
- 10 to 25 Feet
- 25 to 50 Feet
- 50 to 100 Feet
- 100 to 250 Feet
- >250 Feet

N

## Broad Canyon Arroyo




### Legend

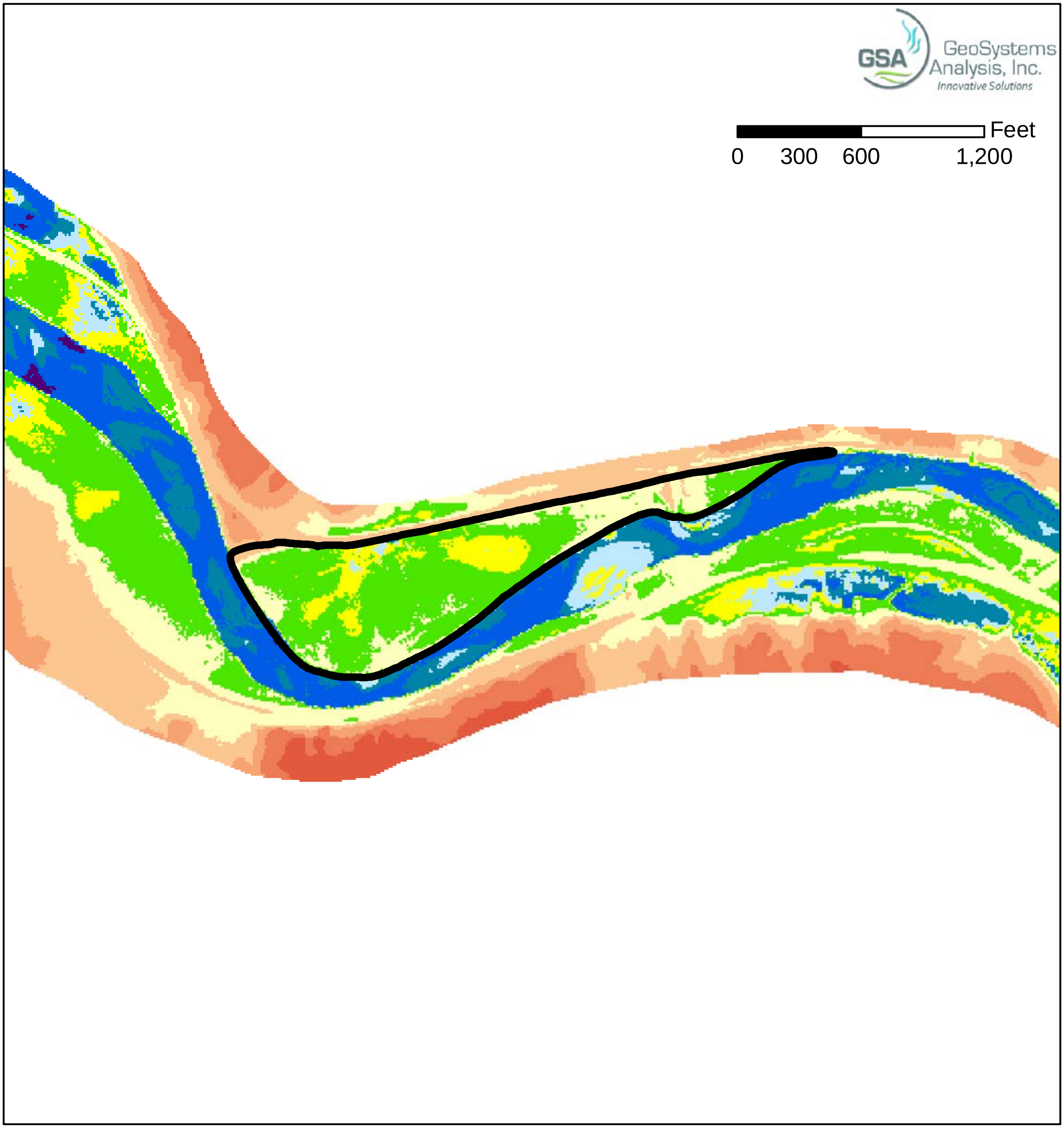
Site Assessment Boundary

**LiDAR Predicted Height Above the RiverBed (Feet)**

- -6 to - 2 Feet
- -2 to 0 Feet
- 0 to 1 Foot
- 1 to 2 Feet
- 2 to 3 Feet
- 3 to 5 Feet
- 5 to 10 Feet
- 10 to 25 Feet
- 25 to 50 Feet
- 50 to 100 Feet
- 100 to 250 Feet
- >250 Feet

N

# Selden Canyon Point Bar




## Legend

Site Assessment Boundary

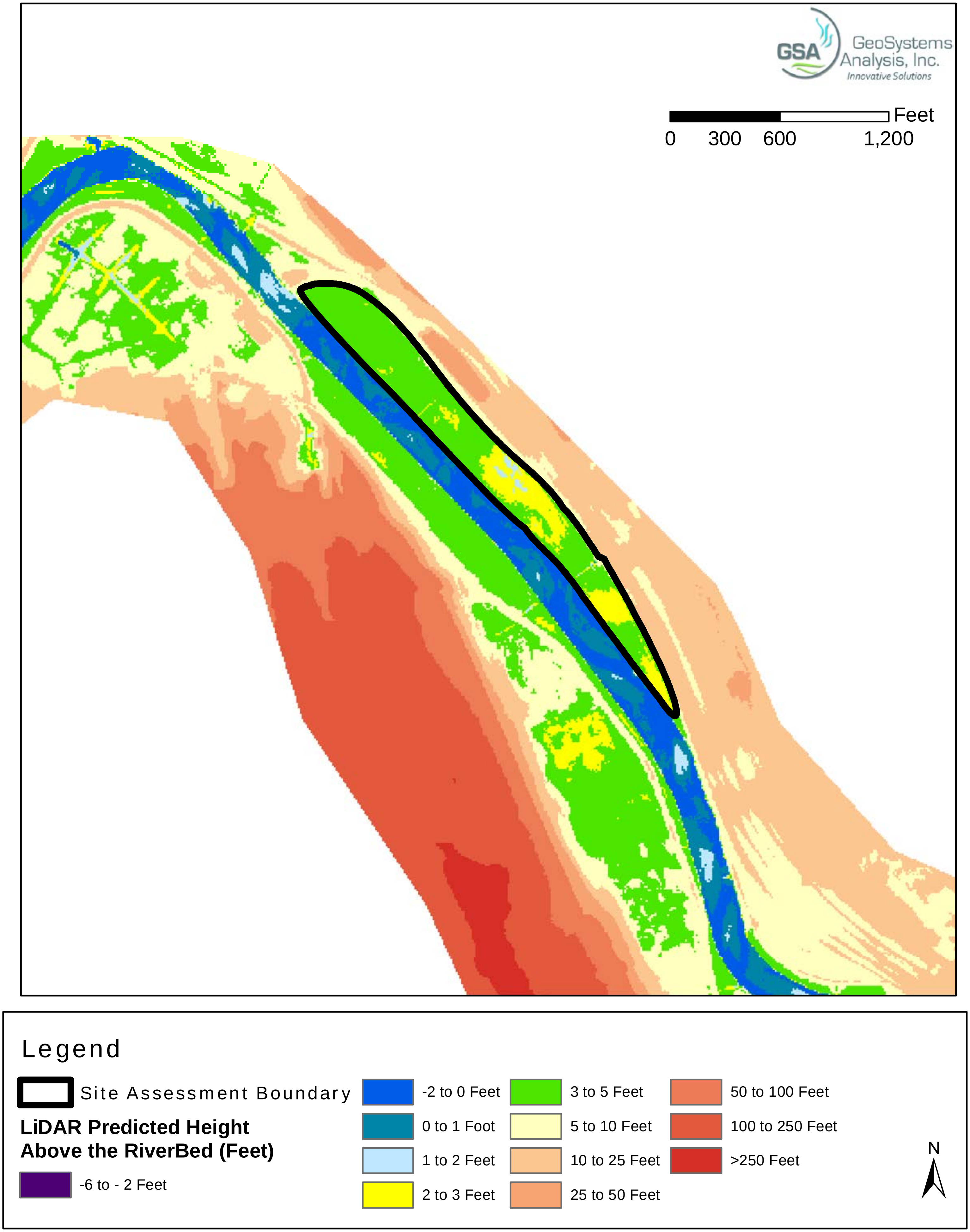
**LiDAR Predicted Height Above the RiverBed (Feet)**

- -6 to - 2 Feet
- -2 to 0 Feet
- 0 to 1 Foot
- 1 to 2 Feet
- 2 to 3 Feet
- 3 to 5 Feet
- 5 to 10 Feet
- 10 to 25 Feet
- 25 to 50 Feet
- 50 to 100 Feet
- 100 to 250 Feet
- >250 Feet

Las Cruces Effluent

Mesilla Valley Bosque State Park

# Downstream of Courchesne Gage



# Appendix C. List of Observed Plant Species and their Relative Prominence by Site

| | | Yeso Arroyo | Angostura Arroyo | Broad Canyon Arroyo | Selden Canyon Arroyo | Las Cruces Effluent | Mesilla Valley Bosque State Park | NeMexas Siphon | Montoya Drain | EP Electric/ Montoya Drain | Downstream Courchesne Gage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | | | | | |
| Whitethorn acacia | *Acacia constricta* | R | R | | | R | R | | | | |
| Netleaf hackberry | *Celtis laevigata* var. *reticulata* | | | R | | | | | | | |
| Desert willow | *Chilopsis linearis* | | | U | | | | R | | | |
| Russian olive | *Elaeagnus angustifolic* | | R | | | | | | | | |
| Jerusalem thorn | *Parkinsonia aculeata* | | | | | | | | | | R |
| Rio Grande cottonwood | *Populus deltoides* | R | | U | | R | C | U | | | |
| Honey mesquite | *Prosopis glandulosa* | C | U | A | U | U | C | C | | U | C |
| Screwbean mesquite | *Prosopis pubescens* | R | U | U | | R | C | U | U | U | U |
| Gooding's willow | *Salix goodingii* | | | U | | | U | | | | |
| Saltcedar | *Tamarix chinensis* | C | C | | C | U | C | A | A | A | C |
| Siberian elm | *Ulmus pumila* | | | | | | | | | R | R |
| | | | | | | | | | | | |
| **Shrub** | | | | | | | | | | | |
| Iodinebush | *Allenrolfea occidentalis* | | | | | | | | | A | |
| False indigo-bush | *Amorpha fruticosa* | | | | | R | | | | | |
| Fourwing saltbush | *Atriplex canescens* | U | U | U | U | | C | C | U | U | U |
| Seep willow | *Baccharis salicifolia* | R | U | U | U | R | U | C | | U | U |
| Seep willow | *Baccharis salicina* | C | C | U | C | | C | U | | U | C |
| Desertbroom | *Baccharis sarothroides* | | | | | | | | | R | R |
| Feather plume | *Dalea formosa* | R | | | | | | | | | |
| Longleaf jointfir | *Ephedra trifurca* | U | | U | R | | | R | | | |
| Apache plume | *Fallugia paradoxa* | | | U | | | | | | | |
| Broom snakeweed | *Gutierrezia sarothrae* | | | U | | R | | | | | |
| Singlewhorl burrobrush | *Hymenoclea monogyra* | R | | U | | | | | | | |
| Jimmyweed | *Isocoma pluriflora* | A | C | C | U | | C | U | | U | U |
| Creosote | *Larrea tridentata* | | | U | | | R | R | | | |
| Wolfberry | *Lycium torreyi* | U | U | C | C | | C | C | | C | U |
| Prickly pear | *Opuntia phaeacanthc* | U | U | U | | | | | | | |
| Arroweed | *Pluchea sericea* | C | U | | A | | C | | | R | |
| Indigobush | *Psorothamnus scoparius* | U | | R | | | | | | U | |
| Skunkbush sumac | *Rhus trilobata* | | R | | R | | U | | | R | |
| Coyote willow | *Salix exigua* | U | C | C | C | U | | U | | U | |
| Soaptree yucca | *Yucca elata* | | | | | | R | R | | | |
| Graythorn | *Ziziphus obtusifolia* | | | R | R | | | | | | |
| | | | | | | | | | | | |
| **Forb** | | | | | | | | | | | |
| Amaranth | *Amaranthus sp.* | | U | U | | | | | | | |
| Careless weed | *Amaranthus palmeri* | | | | | | | | | R | |
| flatspine bur ragweed | *Ambrosia acanthicarpa* | | | | | | | U | | U | |
| Yerba mansa | *Anemopsis californica* | | | | | | U | | | | |
| Indianhemp | *Apocynum cannabinum* | | | | | | | | | R | U |
| Milkweed | *Asclepias* sp. | | | U | U | U | U | | | | U |

| | | Yeso Arroyo | Angostura Arroyo | Broad Canyon Arroyo | Selden Canyon Arroyo | Las Cruces Effluent | Mesilla Valley Bosque State Park | NeMexas Siphon | Montoya Drain | EP Electric/ Montoya Drain | Downstream Courchesne Gage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Asparagus | *Asparagus officinalis* | | | | | | R | | | | |
| Austrailian saltbush | *Atriplex semibaccata* | | | | | | | | | C | |
| Desert marigold | *Baileya multiradiata* | R | | | | | | | | | |
| Kochia | *Bassia scoparia* | | U | C | C | C | C | U | U | U | C |
| Spiderling | *Boerhavia* sp. | | | U | | | | | | | |
| Field mustard | *Brassica rapa* | | | | | R | | | | | |
| Stinging serpent | *Cevallia sinuata* | | | R | | | | | | | |
| Goosefoot | *Chenopodium* sp. | | | R | | | | | | | |
| Spiny chloracantha | *Chloracantha spinosa* | | C | | | U | U | | | U | U |
| Canadian horseweed | *Conyza canadensis* | | | | | | | R | | | |
| Spreading alkaliweed | *Cressa truxillensis* | | | | U | | R | | U | U | |
| Winged-pigweed | *Cycloloma atriplicifolium* | | | | R | | | | | | |
| Sacred thorn-apple | *Datura wrightii* | | | R | | | R | | | | |
| Western tansymustard | *Descuriania pinnata* | U | U | R | | U | U | | | | |
| Hoary tansyaster | *Dieteria canescens* | | | U | | C | | U | | U | |
| Spectacle pod | *Dimorphocarpa wislizenii* | U | | | | | | | | | |
| Fetid goosefoot | *Dysphania graveolens* | | | R | | | | | | | |
| Buckwheat | *Eriogonum* sp. | | | R | | | | | | | |
| Redstem filaree | *Erodium cicutarium* | U | | | | | | | | | |
| Fringed twinevine | *Funastrum cynanchoides* | U | | A | C | | C | C | | | |
| Wild licorice | *Glycyrrhiza lepidota* | | | | | | | | | | U |
| Common sunflower | *Helianthus annuus* | R | | | | | | | | | R |
| Indian rushpea | *Hoffmannseggia glauca* | | | | | | U | | | | |
| Prickly lettuce | *Lactuca serriola* | | | | | R | | | | | |
| Perennial pepperweed | *Lepidium latifolium* | | | | | | | | | R | R |
| Mountain pepperweed | *Lepidium montanum* | | | | | | U | U | | C | |
| Tansyaster | *Machaeranthera tanacetifolia* | R | | | | | | | | | |
| Snapdragon vine | *Maurandya antirrhiniflora* | | | | | R | | | | | |
| Sweetclover | *Melilotus officinalis* | | | | | U | | | | | |
| Blazingstar | *Mentzelia* sp. | R | R | U | | | | | | | |
| Velvetweed | *Oenothera curtiflora* | R | | | | | | | | R | |
| Scorpionweed | *Phacelia* sp. | | U | | | R | | U | | A | |
| Twinpod | *Physaria* sp. | R | | | | | | | | | |
| Curlytop knotweed | *Polygonum lapathifolium* | | | | | R | | | | | |
| Cottonbatting plant | *Pseudognaphalium stramineum* | | | | | R | | | | | |
| Dock | *Rumex* sp. | | | | | R | | | | | R |
| Russian thistle | *Salsola tragus* | U | A | C | U | U | | C | | C | |
| Verrucose seapurslane | *Sesuvium verrucosum* | | | | | R | | | | | |
| London rocket | *Sisymbrium irio* | | U | | | U | U | U | | U | |
| Silverleaf nightshade | *Solanum elaeagnifolium* | C | | C | | U | U | | | U | U |
| Common sowthistle | *Sonchus oleraceus* | | | | | R | | | | | |
| Globemallow | *Sphaeralcea* sp. | C | | U | | C | U | | | | |
| Alkali swainsonpea | *Sphaerophysa salsula* | | | | | | R | | | | |

| | | Yeso Arroyo | Angostura Arroyo | Broad Canyon Arroyo | Selden Canyon Arroyo | Las Cruces Effluent | Mesilla Valley Bosque State Park | NeMexas Siphon | Montoya Drain | EP Electric/ Montoya Drain | Downstream Courchesne Gage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mojave seablite | *Suaeda nigra* | | | C | U | | C | C | C | C | C |
| Annual Townsend daisy | *Townsendia annua* | U | | | | | | | | | |
| Golden crownbeard | *Verbesina encelioides* | | R | R | R | | R | R | | | |
| Lacy sleepy daisy | *Xanthisma spinulosum* | | | | | R | | | | | |
| Rough cocklebur | *Xanthium strumarium* | | | | | R | | | | | R |
| | | | | | | | | | | | |
| **<u>Graminoid</u>** | | | | | | | | | | | |
| Sixweeks threeawn | *Aristida adscensionis* | | | | | U | U | | U | | |
| Giant cane | *Arundo donax* | R | | | | | | | | | |
| Silver beard grass | *Bothriochloa laguroides* | R | | | | | | | | | |
| Needle grama | *Bouteloua aristidoides* | U | U | | | | U | | | C | |
| Sixweeks grama | *Bouteloua barbata* | | | U | | | | | | | |
| Sideoats grama | *Bouteloua curtipendula* | R | | | | | | | | | |
| Blue grama | *Bouteloua gracilis* | | | | | U | | | | | |
| Brome | *Bromus* sp. | R | | | | R | | | | | |
| Sedge | *Carex* sp. | | | | | | U | | | | U |
| Feather fingergrass | *Chloris virgata* | | U | C | | U | | | | | |
| Pampas grass | *Cortaderia selloana* | | | | | | R | | | | |
| Bermuda grass | *Cynodon dactylon* | U | U | A | C | A | U | | | C | |
| Yellow nutsedge | *Cyperus esculentus* | | | | | R | | | | | |
| Woollygrass | *Dasyochloa pulchella* | U | | U | | | | | | | |
| Saltgrass | *Distichlis spicata* | | | | A | U | C | | C | U | A |
| Jungle rice | *Echinochloa colona* | | | C | | | | | | | |
| Spike rush | *Eleocharis* sp. | | | R | U | | | | | | |
| Canada wildrye | *Elymus canadensis* | R | | | | R | | | | | U |
| Stink grass | *Eragrostis cilianensis* | | | U | | | | | | | |
| Lehmann lovegrass | *Eragrostis lehmanniana* | R | | U | | U | | | | | |
| Vine mesquite | *Hopia obtusa* | | | R | | | | | | | |
| Foxtail barley | *Hordeum jubatum* | | | | | | | | | U | |
| Arctic rush | *Juncus arcticus* | | | | | | U | | | | |
| Bearded sprangletop | *Leptochloa fusca* | | U | | | | | | | | U |
| Scratchgrass | *Muhlenbergia asperifolia* | U | U | | A | U | | | | | A |
| Bush Muhly | *Muhlenbergia porteri* | U | | U | R | | | | | | |
| Witchgrass | *Panicum capillare* | | | U | | | | | | | |
| Knotgrass | *Paspalum distichum* | | | | U | | | | | | |
| Common reed | *Phragmites australis* | | | | | | | | | U | U |
| Annual rabbit's-foot grass | *Polypogon monspeliensis* | | | | | | | | | | R |
| Split grass | *Schismus* sp. | C | U | | | U | | | | | |
| Hardstem bulrush | *Schoenoplectus acutus* | | R | U | U | U | | | U | U | U |
| Common threesquare | *Schoenoplectus pungens* | | | | U | | U | U | | | U |
| Bristlegrass | *Setaria* sp. | U | | C | R | | | U | | | |
| Johnsongrass | *Sorghum halapense* | | | | | U | | | | | U |
| Alkali sacaton | *Sporobolus airoides* | | C | U | C | U | C | | | U | C |

| | | Yeso Arroyo | Angostura Arroyo | Broad Canyon Arroyo | Selden Canyon Arroyo | Las Cruces Effluent | Mesilla Valley Bosque State Park | NeMexas Siphon | Montoya Drain | EP Electric/ Montoya Drain | Downstream Courchesne Gage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spike dropseed | *Sporobolus contractus* | C | C | C | | | C | C | | U | |
| Sand dropseed | *Sporobolus cryptandrus* | | | C | U | U | | | | | |
| Mesa dropseed | *Sporobolus flexuosus* | | R | R | | | | | | | |
| Giant dropseed | *Sporobolus giganteus* | | | R | | | R | | | | |
| Big sacaton | *Sporobolus wrightii* | | | U | | | | R | | | R |
| Cattail | *Typha domingensis* | | R | U | C | U | C | C | | C | U |

# TECHNICAL MEMO

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*DRAFT: Wetland Delineation Results from Four Proposed Aquatic Habitat Restoration Sites*

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# 1.0 INTRODUCTION

In accordance with the Record of Decision (ROD) signed following the Environmental Impact Statement (EIS) for the Rio Grande Canalization Flood Control Project (RGCP) affecting 105 miles of the Rio Grande through southern New Mexico (NM) and west Texas (TX), the U.S. Section of the International Boundary and Water Commission (USIBWC) is planning to implement aquatic habitat improvement projects at two different sites within the RGCP reach. A team of consultants led by Gulf South Research Corporation (GSRC) is currently analyzing aquatic habitat restoration potential at six sites in the RGCP, and two sites will be selected for implementation during later project phases. GeoSystems Analysis, Inc. (GSA) developed a conceptual plan (in draft form at publication of this memo) for creating new aquatic habitat features at each of the six sites under consideration, *Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs*, a report written for the USIBWC under subcontract with GSRC (GSA 2019).

The most common basic types of habitat improvements published in that plan consist of riparian enhancement supplemental native vegetation plantings) and excavation of new aquatic habitat features, such as embayments, backwaters, high-flow channels, willow swales, and terraces. These constructed excavation features entail the removal of native soil in order to lower the topographic surface of the targeted site and improve river-floodplain connectivity which is expected to promote native riparian vegetation recruitment. Previous site assessments revealed that four sites appeared to have jurisdictional wetlands in or around proposed aquatic habitat creation features, and formal wetland delineations within proposed excavation features were conducted as part of this report. Specifically, sites evaluated for the presence of jurisdictional wetlands include Broad Canyon, Selden Canyon Point Bar, Mesilla Valley State Park and Downstream of Courchesne Gauge.

## 1.1 Sites

### *1.1.1 Broad Canyon*

The Broad Canyon site consists of Broad Canyon Arroyo, a tributary to the Rio Grande, which functions as a backwater during low to moderate river flows. The site is located in Doña Ana County, approximately 6 miles north of the village of Radium Springs, NM. Proposed habitat improvements consist of excavating embayments along the arroyo to diversify aquatic habitat, to be supplemented with diverse riparian-wetland vegetation.

### *1.1.2 Selden Canyon Point Bar*

Selden Canyon, located approximately two miles south of Broad Canyon, is a vegetated bank attached point bar on the east side of the Rio Grande near where Selden Canyon enters the river near Radium Springs, NM. Habitat improvement for this site includes creating a side channel plus excavation of a backwater channel near the bankline.

### *1.1.3 Mesilla Valley Bosque State Park*

This site is within the Mesilla Valley Bosque State Park (MVBSP) near the town of Mesilla, NM. The Picacho Drain runs through the site, and two shallow constructed wetland Resaca ponds are built on the inland side of the drain. Other existing habitat improvements include a mitigation area, riparian plantings, and a Bosque Ecosystem Monitoring Program (BEMP) monitoring site.

Proposed habitat improvements (GSA 2019) for this site include cattail maintenance in the Picacho Drain and the Resaca ponds, plus a series of stepped terraces along the eastern side of the drain to improve aquatic habitat, excavation of a new side channel that connects the Rio Grande and the Picacho Drain, and planting and lowering of multiple willow swales along the length of the channel.

### *1.1.4 Downstream of Courchesne Gauge*

This site is located within El Paso, TX limits, in the floodplain zone between the river and U.S. Route 85. Following recent highway construction, stormwater runoff plus possible seepage from the Portland Cement Reservoir enters the site from below the highway through two box culverts. During previous visits, water released from the upstream box culvert ponded throughout the site. On the most recent visit, a trench was dug to more effectively convey water from culverts to the river, and the site was no longer flooded. A palustrine emergent wetland was documented here prior to highway construction. Proposed aquatic habitat improvements include excavating terraced steps along the river bankline to improve river-floodplain connectivity at different river discharges.

## 1.2 Project Understanding

This wetland delineation was conducted to evaluate the presence of jurisdictional wetlands within proposed excavation features at each of these four sites. If it is determined that jurisdictional wetlands are present within these features, this report should provide the supporting documentation for the application of any permits required by any agency, such as the U.S. Army Corps of Engineers (USACE).

# 2.0 METHODS

The delineation was performed in accordance to the on-site methodology described in the *Corps of Engineers Wetlands Delineation Manual* (1987 Manual), and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008; Regional Supplement).

To qualify as a wetland, a site must meet the following three situations as defined in the 1987 Manual (USACE 1987):

- The prevalent vegetation must be hydrophytic as identified in *The National Wetland Plant List: 2013 Wetland Ratings*.
- Soils must have either been classified as hydric by the United States Department of Agriculture's Natural Resources Conservations Services (NRCS) and/or exhibit field

characteristics indicative of hydric soils, such as oxidation reduction (redox reactions); and,

- Exhibit hydrologic characteristics of areas that are periodically inundated or have saturated soils to the surface during portions of the growing season.

## 2.1 Off-Site Evaluation

Prior to field work, existing data were gathered from multiple sources to characterize environmental conditions at each site. Soil Survey Database (SSURGO) map unit locations and descriptions were assessed via data downloaded from the U.S. Department of Agriculture Natural Resources Conservation Service's Web Soil Survey website (NRCS 2019). Possible wetlands were identified at the sites using data obtained from the U.S. Fish and Wildlife Services National Wetlands Inventory website (USFWS-NWI).

## 2.2 Field Investigation and Delineation

A field botanist conducted the wetland delineations between March 5th and March 8th, 2019. Per our contract with USIBWC, the survey area was expected to be ten acres but a total of 21.5-acres were surveyed. Overall, weather conditions were favorable with partly cloudy skies and daytime high temperatures ranging from the high 60's to high 70's. March 8th had mostly cloudy skies and high afternoon winds.

A Bluetooth Global Positioning System (GPS) and tablet containing georeferenced maps of NRCS soil data, USFWS-NWI wetland data, and proposed excavation locations, was used to initially inspect locations for wetland indicators. When hydrophytic vegetation was present, a hole was shoveled, usually 16-18" deep, to determine the presence of hydrophytic soils. If hydrophytic soil features were observed, a full profile of the soil characteristics was recorded onto a datasheet, otherwise a visual inspection was completed. When hydrophytic soil characteristics were observed, hydrological sources and indicators were investigated and documented. "*Wetland Determination Data Form – Arid West Region*" datasheets were used to guide data collection as the field scientist evaluated vegetation, soil, and hydrology conditions at sample locations within the excavation footprints, in accordance with the Corps Manual (USACE 1987, USACE 2008). Sample locations were named with abbreviations corresponding to the site name, and/or an identifying feature and a sequential number. A list of sample locations is available in Appendix A. Completed field datasheets meeting all three criteria are included in Appendix C. Representative photos from sample locations were taken and included in Appendix D.

When field indicators (soils, vegetation, hydrology) positively confirmed the presence of potential jurisdictional wetlands, they were named by their associated abbreviation with the letters "WL" for "wetland" and a sequential number. The delineation boundary was logged as a line file with a (sub-meter accuracy rated) Juniper Systems Archer field computer equipped with a Hemisphere GPS. If wetlands were large and extended far beyond the excavation footprint, only the portion of the proposed excavation footprint containing a jurisdictional wetland was recorded. Resulting locations were used to delineate the wetlands shown in the Wetland delineation maps (Appendix B).

## 2.3 Rational for Determining Wetland Boundaries

Within each proposed excavation footprint, field data were recorded to assess an area's jurisdictional wetland potential. Wetlands are defined by the presence of a predominance of hydrophytic vegetation, hydric soils and hydrology indicators that demonstrate a site's partial inundation or saturation during a portion of the growing season.

### *2.3.1 Vegetation*

To meet the hydrophytic vegetation requirement to qualify as a jurisdictional wetland, the site must have 50% or more of it's dominant species rated as either an obligate (OBL), facultative wet (FACW) or facultative (FAC) species. The National Wetland Plant List (Lichvar 2016) was originally published as the *National List of Plant Species that Occur in Wetlands* by the USFWS in conjunction with USACE, the Environmental Protection Agency (EPA) and the NRCDS. The wetland plant species list was recently updated by the USACE and it now rates the indicator status of 3,519 plant species in the Arid West region. In order to qualify as a dominant species, aerial cover of that species must consist of more than 50% of the total vegetation cover within a single stratum (Tree, Sapling/shrub, Herbaceous or Vine) or at least 20% of the total vegetation over all stratums (USACE 2008). Additionally, the hydrophytic vegetation requirement could be met if the prevalence index is 3.0 or less. The prevalence index is calculated by using a weighted average, and adding the sum of species cover by rank multiplied by OBL (1), FACW (2), FAC (3), FACU (4) and UPL (5) and dividing by the total cover. For more specific information related to prevalence index calculations, see the Corps Manual (USACE 1988, 2008)

### *2.3.2 Soils*

In the Arid West Subregion, soils must exhibit at least 1 of 19 hydric soil indicators (USACE 2008). Five additional indicators are allowable if disturbed or problematic site conditions are present. The specific soil indicators evaluated include visible characteristics that signify prolonged inundation. Many of these indicators result from oxidation-reduction (redox) reactions that occur under anaerobic (oxygen-poor) atmospheric conditions. Commonly detected indicators are formed as soil microbes respire and oxidize manganese and iron. The water soluble, oxidized minerals are translocated through the soil matrix under saturated conditions. Other indicators include the desiccation process of organic matter that happens within the upper soil horizons when exposed to prolonged anaerobic conditions.

### *2.3.3 Hydrology*

Sites must also exhibit 1 of 18 hydrologic indicators plus hydrophytic vegetation and hydrophytic soils to qualify as jurisdictional wetlands. Additionally, nine secondary hydrologic indicators are evaluated when primary hydrological indicators are absent due to seasonality or drought. Hydrologic indicators are considered the most transitory wetland indicators because they are often temporary, seasonal, or intermittent; while hydrophytic vegetation and soil indicators exhibit more reliable and permanent characteristics in response to medium to long term exposure to seasonal inundation. There are three major groups of hydrologic indicators assessed: 1) presence of surface water or saturated soils near the surface 2) evidence of recent inundation 3) evidence of recent soil saturation near the surface.

# 3.0 RESULTS

## 3.1 Broad Canyon

### *3.1.1 Off-site Evaluation*

SSURGO soil map units within the proposed excavation footprints at Broad Canyon were almost entirely Cb-Canutio and Arizo gravelly sand loams, with a small section mapped as Riverwash, and neither are rated as a hydric soil (NRCS 2019). However, hydric soils were mapped within a quarter mile upstream and downstream of the proposed excavations.
NWI data indicates a riverine and Freshwater Forested/Shrub Wetland are present at the site.

### *3.1.2 Field Investigation and Delineation*

Two potential jurisdictional wetlands were identified at the Broad Canyon site during the field assessment. Both wetlands occur adjacent to but not within the proposed embayments. The first wetland, BC-WL1, is approximately 0.15 acres present as a shallow depression laying between the bermed arroyo bankline and the adjacent sandy hills. Obligate species, such as cattail (*Typha domingensis*) and common threesquare (*Schoenoplectus pungens*) were present in the lowest most point of the depression, with the FAC species, saltgrass (*Distichlis spicata*) covering most of the depression. Cracked soil and salt deposits were present in the depression. Outside of the depression, the surrounding land was mostly covered with the FACU species, Bermudagrass (*Cynodon dactylon*). Per GSA 2019, the arroyo confluence inundates during moderate river flows and forms a backwater. Redox reactions were observed at one location assessed on the upland bench adjacent to the arroyo, though it is expected that inundation events occur only often enough to support wetland vegetation within the smaller depressed area mapped as the wetland.

BC-WL2 is approximately 0.34 acres and consists of an emergent cattail wetland within the channel of the arroyo, with occasional coyote willow (*Salix exigua*) clumps adjacent. Saltgrass occasionally occurs at the top of the bankline, but otherwise the wetland transitions abruptly to the upland Bermudagrass meadow at top of the bankline. A dense, restrictive clay lens was present at 15”, preventing drainage and allowing soil saturation within 8”. Water inflow comes from both directions - down the arroyo drainage from the surrounding hills, and up the arroyo as back flow when the Rio Grande achieves moderate flows.

## 3.2 Selden Canyon Point Bar

### *3.2.1 Off-Site Evaluation*

SSURGO soil map units described within the proposed channel and backwater features at Selden Canyon Point Bar include AK-Agua variant and Belen variant soils, and RE-Riverwash, the former of which has minor components classified as hydric soils.

NWI data includes a wide Riverine wetland along the river bankline, with most of the floodplain between the railroad track and the bankline classified as a Freshwater-Forested/Shrub Wetland. Selden Canyon Arroyo is mapped as Riverine and the associated embankments as non-wetland.

### *3.2.2 Field Investigation and Delineation*

All excavation features at Selden Canyon Point Bar are within a wetland (SC-WL1). The wetland is extensive and extends well beyond the boundaries indicated on the map. Nearly the entire point bar likely qualifies as jurisdictional wetland with the exception of the berm and spoil pile adjacent to the arroyo confluence and occasional deeper sand deposits. The deep sand exclusions were not significant enough to map out.

The entire wetland site consists of a large saltgrass meadow, an emergent cattail meadow, a willow bankline, and intermittent stands of arrowweed (*Pluchea sericea*) and saltcedar (*Tamarix chinensis*), totaling approximately 14 acres. The proposed excavations fall within a comparatively barren zone situated between the coyote willow bankline and saltgrass meadow (it appears saltcedar was piled and burned in this location during previous activities). Dominant vegetation in this zone consists of a few incursions of coyote willow from the bankline and saltgrass creeping in from the adjacent meadow, an occasional saltcedar and wolf berry (*Lycium torreyi*), but mostly kochia (*Bassia scoparia*) and spreading alkali-weed (*Cressa truxillensis*). Soils were variable, with some sample locations only showing weak signs of redox reactions, and adjacent samples having heavy indicators of a depleted soil matrix, indicating that there may have been some soil disturbance during the saltcedar removal and burning. The low set floodplain elevation appears to be suitable for periodic flooding and shallow groundwater.

## 3.3 Mesilla Valley Bosque State Park

### *3.3.1 Off-Site Evaluation*

The proposed excavation activities (channel construction, willow swales, drain terracing, and cattail maintenance) fall within three SSURGO soil map units- BG-Belen Clay, BS-Brazito very fine sandy loam, thick surface and BR-Brazito loamy fine sand, 0 to 1 percent slopes; none of which are rated as hydric soils.

NWI data indicates that most of the MVSP site is either a Freshwater Emergent Wetland or a Freshwater Forested/Shrub Wetland. A small portion of proposed side channel and willow swales are not specified as a wetland in the NWI maps.

### *3.3.2 Field Investigation and Delineation*

Six potential jurisdictional wetlands were identified near or overlapping the excavation features at MVSP. Both constructed wetland Resaca ponds (MVSP-WL1), and the entirety of the Picacho Drain (MVSP-WL6), where cattail maintenance is proposed, were potentially jurisdictional. A large emergent wetland (MVSP-WL2) slightly overlaps portions of the proposed side channel. MVSP-WL2 is extensive and includes the mitigation site, plus potentially the BEMP site, as well. Note that formal delineation only focused on portions overlapping the proposed excavation features, beyond those boundaries, wetland presence is surmised from aerial photography and coarser-level field observations. A smaller emergent wetland was identified in-between sand deposits that appear to be excavated material from Picacho Drain. This wetland overlaps with proposed willow swale excavations and partially within a segment of the proposed channel (MVSP-WL3). A third emergent wetland was identified within a portion of the proposed drain terracing across the Picacho Drain from the southern Resaca pond (MVSP-WL4). An additional riverine wetland was identified in the willow bankline (MVSP-WL5) and mapped adjacent to the proposed channel inlet, though the footprint did not overlap. Two other wetlands that fell outside of the excavation footprints were documented, but not recorded (sample locations MVSP-S11 & MVSP-S19).

The Resaca ponds (MVSP-WL1), treated here as a single wetland separated by a narrow berm, span approximately 4.25 acres. The Picacho Drain (MVSP-WL6) consists of approximately 1 acre (within our assessment area). Both features consist almost entirely of emergent cattail, sometimes with common threesquare and coyote willow along the edges. Bare soil and standing water occur in the deeper portions of the southern Resaca pond. Muck and redox features were found in the soil samples. These wetlands are sustained by supplemental water in the Picacho Drain plus shallow groundwater.

MVSP-WL2 (16.5 acres) and MVSP-WL3 (0.25 acres) are wetland meadows under a stand of saltcedar, dominated mostly by scratchgrass (*Muhlenbergia asperifolia*), a FACW species, with yerba mansa (Anemopsis californica) and arctic rush (*Juncus arcticus*) in depressional pockets. These two wetlands appear unnaturally separated by sand spoiled from Picacho Drain maintenance. The wetland is bound by the berm along Picacho Drain on the west, sand deposits to the south, and a slight elevational gradient on the east, possibly a historic farming terrace. This is where the wetland transitions to an upland as the dominant vegetation changes from FACW scratchgrass to FACU Bermudagrass and hydrophytic soil indicators are no longer present and is where most of the proposed channel and willow swale. The north boundary was not delineated, as it was far from the proposed excavation features.

MVSP-WL4 (0.8 acres) is similar to the above wetlands, but with the addition of coyote willow. Additionally, a break in the berm hydrologically connects this portion to the Picacho Drain, providing an influx of surface water when the drain flows. Drainage patterns were observed within the wetland. This wetland is bound by sand deposits and the transition was noted with elevational gradients and an increase in saltcedar and coyote willow decadence.

MVSP-WL5 is a narrow willow bankline along the river, consisting of approximately 0.22 acres. It consists entirely of coyote willow, with some scratchgrass cover in the herbaceous layer. Hydrologic indicators were observed on the river side of the bankline but were not at the appropriate depths on the inland side, due to the slope of the bankline, limiting this wetland to the lower portions of the slope.

## 3.4 Downstream of Courchesne Gauge

### *3.4.1 Off-Site Evaluation*

Nearly the entire excavation area is contained within the MG-Made land, gila soil material SSURGO map unit. However, there are two small slivers that lie within other SSURGO map units near the bankline- RE-Riverwash at the downstream end of the proposed northern excavation area and HG-Harkey Loam at the upstream end of the proposed southern excavation area. None of the SSURGO map units are rated as hydric but the MG map unit does include minor hydric components that can be found in depressions which typically span 5% of the map unit (NRCS 2019).

NWI data indicates that most of the upstream excavation lies within a Freshwater Forested/Shrub Wetland while none of the downstream excavation is within a digitized NWI wetland.

### *3.4.2 Field Investigation and Delineation*

Previous site visits at this location suggested that much of this site would qualify as a jurisdictional wetland due to the presence of ponded water, near surface soil saturation in much of the site, and presence of a FAC-dominated wetland meadow with OBL species in lower depressional areas. Our March 2019 site assessment revealed that hydrologic indicators were largely absent in the soil, except for isolated depressional areas where indicators were weaker than expected. Outside the deepest depressions, redox signatures were weak and sporadic. Per recent aerial photography, it appears that much of the site was disturbed during recent highway construction. Its likely that hydrologic soils were in early development and promoted by due to the runoff from the box culverts installed during highway construction.

One depressional area that slightly overlapped with proposed bankline terracing exhibited hydrologic indicators and was delineated and mapped as DSC-WL1. Other depressional areas between the highway and the proposed excavations are likely to have hydrologic soils as well but they were not formally assessed because they fell outside the proposed excavation footprints. Due to the recent alteration of the box culvert, it is questionable whether the hydrology to sustain this wetland is still present, and whether DSC-WL1 qualifies as jurisdictional. Additionally, a small, low set surface near the bankline meets all wetland criteria indicators and was mapped as DSC-WL2. Another terrace (DSC-S1) was investigated but determined not to have enough vegetation cover to meet the hydrophytic vegetation requirements (≥5%).

DSC-WL1 is an approximately 0.33-acre emergent wetland dominated by common threesquare, with some saltgrass and scratchgrass intruding from the adjacent meadow area, and small patches of common reed (*Phragmites australis*) are present. The wetland lies in a depressional surface lower in elevation than the surrounding saltgrass meadow. The hydrologic conditions in this wetland are strongly correlated with water released from the box culvert, adjacent to where a new trench to the river was recently dug. Ponded water was present in this wetland during site visits conducted prior to recent drainage modifications.

DSC-WL2 is a narrow cattail-dominated bankline feature situated approximately 4-feet lower than the wetland meadow that dominates most of the site, and approximately 2-feet above the bed of the river channel. Some common threesquare was also present with a few other incidental species. This wetland is situated within the northern proposed bankline terrace. It consists of only 0.08 acres.

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

A total of 21.5 acres within 19 proposed excavations features spanning four sites were the focus of the wetland delineation work conducted under this project. A total of 37.5 acres of potential jurisdictional wetlands were identified across the four sites, however, only 8.16 acres were delineated within the proposed excavation features.

Broad Canyon had 0.01 acres of wetland within proposed excavation features with. very slight overlap into BC-WL2. The proposed excavation features were intentionally sited to avoid suspected wetlands during previous field visits.

Nearly the entire 0.75 acres of proposed excavations at Seldon Canyon Point Bar are potentially jurisdictional wetlands. Wetland SC-WL1 includes 14-acres of potential jurisdictional wetland.

7.4 acres of potential jurisdictional wetlands are within the approximately 16.5 acres of proposed excavation at MVBSP. Most (4.7-acres) of the proposed excavation features in potentially jurisdictional wetlands lie within the proposed cattail maintenance zones. MVSP-WL3 is entirely within the proposed channel and swale features. Only 1.6-acres of the 16.5-acre MVSP-WL2 wetland overlaps with proposed swale, channel and drain terracing features. Design alteration could avoid these two wetlands if that becomes necessary during later project stages. MVSP-WL4 mostly lies in the proposed drain terracing area, with slight overlap into the proposed cattail maintenance portion of Picacho Drain. These overlapping segments within the proposed excavation footprints total 0.81 acres. MVSP-WL5 only abuts to but does not overlap with the channel inlet.

At Downstream of Courchesne Gauge, only 0.02 acres of the 0.33-acre DSC-WL1 wetland falls within the proposed footprint of the northern bankline terrace feature. It is unlikely that current hydrology will sustain this wetland after recent drainage alteration. Wetland DSC-WL2 falls outside of the projected excavation footprint.

The nature of the proposed projects is to improve and expand wetland habitats at the proposed sites. Implementation of these projects is likely to improve conditions in existing wetlands that lie within or adjacent to the proposed aquatic features and increase total acreage of wetland habitat in the reach.

## 5.0 REFERENCES

GeoSystems Analysis (GSA), 2019. *DRAFT: Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs*. Prepared for Gulf South Research Corporation. Prepared by GeoSystems Analysis, Inc. Albuquerque, NM. February, 2019.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List*: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X

Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for Dona Ana County, New Mexico. Available online. Accessed March 1, 2019.U.S. Army Corps of Engineers. 1987. *Wetland Delineation Manual*. Technical Report Y-87.1, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers, 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0), ed. J.S. Wakely, R.W., Lichvar, and C.V. Noble. ERDC/ELTR-08-29. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

# APPENDIX A – SAMPLE LOCATIONS

Table 1. Sample table

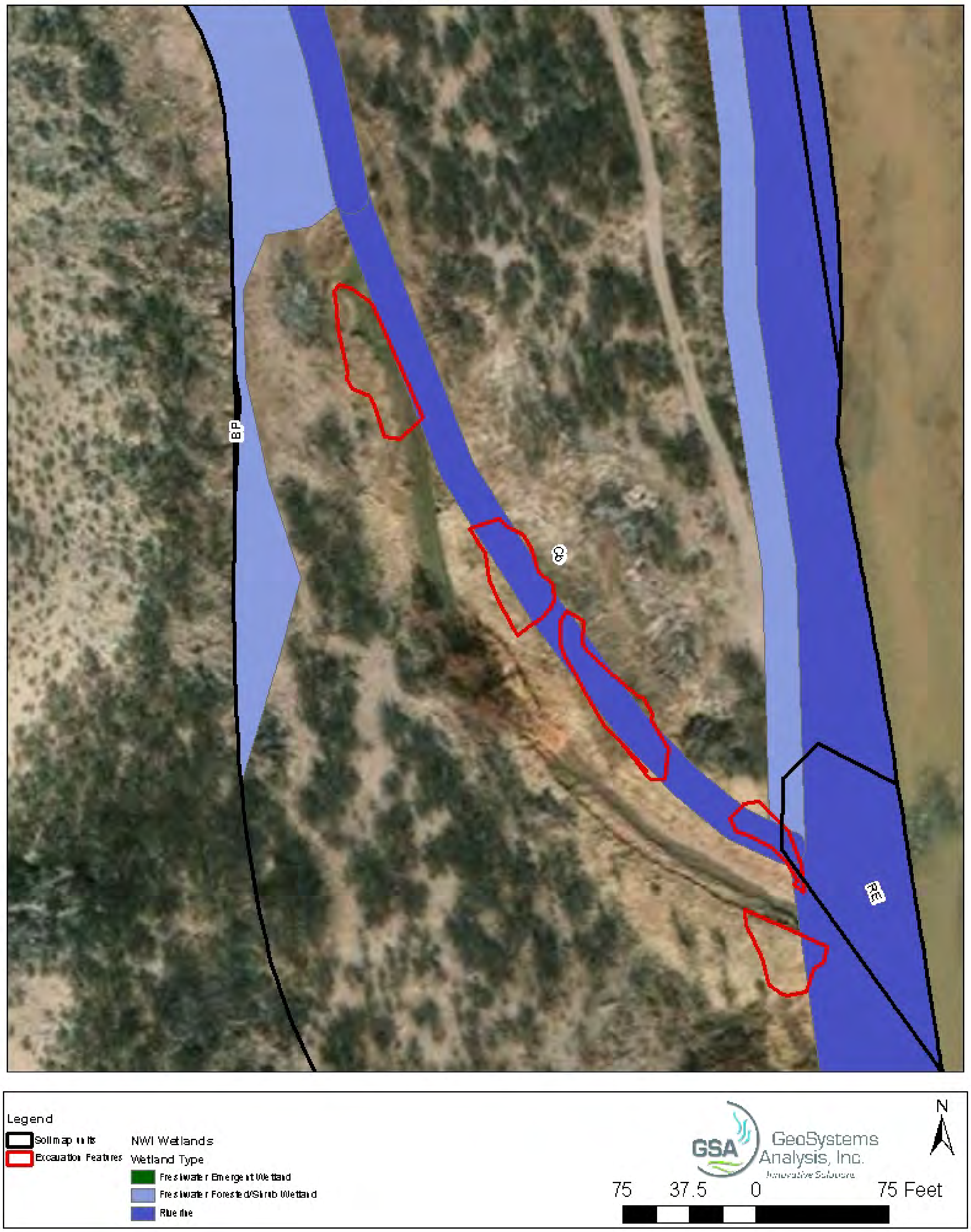
| Site Name | Sample Name | Conclusion | Feature | Methodology |
|---|---|---|---|---|
| Broad Canyon | BC-S1 | Non-Wetland | N/A | Data |
| | BC-WL1 | Wetland | BC-WL1 | Data |
| | BC-WL2 | Wetland | BC-WL2 | Data |
| Seldon Canyon Point Bar | SC-S1 | Wetland | SC-WL1 | Data |
| | SC-S2 | Inconclusive | SC-WL1 | Visual |
| | SC-S3 | Wetland | SC-WL1 | Visual |
| | SC-Swale1 | Wetland | SC-WL1 | Data |
| | SC-Swale2 | Wetland | SC-WL1 | Visual |
| | SC-BW-S1 | Wetland | SC-WL1 | Data |
| | SC-BW-S2 | Inconclusive | SC-WL1 | Data |
| | SC-BW-S3 | Wetland | SC-WL1 | Visual |
| Mesilla Valley Bosque State Park | MVSP-S1 | Wetland | MVSP-WL1 | Data |
| | MVSP-S2 | Wetland | MVSP-WL2 | Visual |
| | MVSP-S3 | Wetland | MVSP-WL2 | Data |
| | MVSP-S4 | Wetland | MVSP-WL2 | Visual |
| | MVSP-S5 | Wetland | MVSP-WL2 | Visual |
| | MVSP-S6 | Non-Wetland | N/A | Visual |
| | MVSP-S7 | Non-Wetland | N/A | Visual |
| | MVSP-S8 | Wetland | MVSP-WL2 | Visual |
| | MVSP-S9 | Non-Wetland | N/A | Visual |
| | MVSP-S10 | Non-Wetland | N/A | Visual |
| | MVSP-S11 | Wetland | N/A | Visual |
| | MVSP-WL3-S1 | Wetland | MVSP-WL3 | Data |
| | MVSP-WL3-S2 | Wetland | MVSP-WL3 | Visual |
| | MVSP-S12 | Non-Wetland | N/A | Visual |
| | MVSP-S13 | Non-Wetland | N/A | Visual |
| | MVSP-S14 | Non-Wetland | N/A | Visual |
| | MVSP-S15 | Non-Wetland | N/A | Visual |
| | MVSP-S16 | Non-Wetland | N/A | Visual |
| | MVSP-S17 | Non-Wetland | N/A | Visual |
| | MVSP-S18 | Non-Wetland | N/A | Visual |
| | MVSP-S19 | Wetland | N/A | Visual |
| | MVSP-WL4-S1 | Wetland | MVSP-WL4 | Data |
| | MVSP-C1 | Non-Wetland | N/A | Visual |
| | MVSP-C2 | Non-Wetland | N/A | Visual |
| | MVSP-C3 | Non-Wetland | N/A | Visual |
| | MVSP-C4 | Non-Wetland | N/A | Visual |
| | MVSP-C5 | Non-Wetland | N/A | Visual |
| | MVSP-C6 | Non-Wetland | N/A | Visual |
| | MVSP-C7 | Non-Wetland | N/A | Visual |

| | | | | |
|---|---|---|---|---|
| Mesilla Valley Bosque State Park | MVSP-C8 | Non-Wetland | N/A | Visual |
| | MVSP-C9 | Non-Wetland | N/A | Visual |
| | MVSP-C10 | Non-Wetland | N/A | Visual |
| | MVSP-C11 | Non-Wetland | N/A | Visual |
| | MVSP-WL5-S1 | Wetland | MVSP-WL5 | Data |
| | MVSP-WL6-S1 | Wetl and | MVSP-WL6 | Data |
| Downstream of Courchesne Gauge | DSC-S1 | Non-Wetland | N/A | Visual |
| | DSC-S2 | Non-Wetland | N/A | Data |
| | DSC-S3 | Non-Wetland | N/A | Visual |
| | DSC-S4 | Wetland | DSC-WL1 | Data |
| | DSC-S5 | Non-Wetland | N/A | Visual |
| | DSC-S6 | Non-Wetland | N/A | Data |
| | DSC-S7 | Non-Wetland | N/A | Visual |
| | DSC-S8 | Non-Wetland | N/A | Visual |
| | DSC-S9 | Non-Wetland | DSC-WL2 | Data |

# APPENDIX B – MAPS

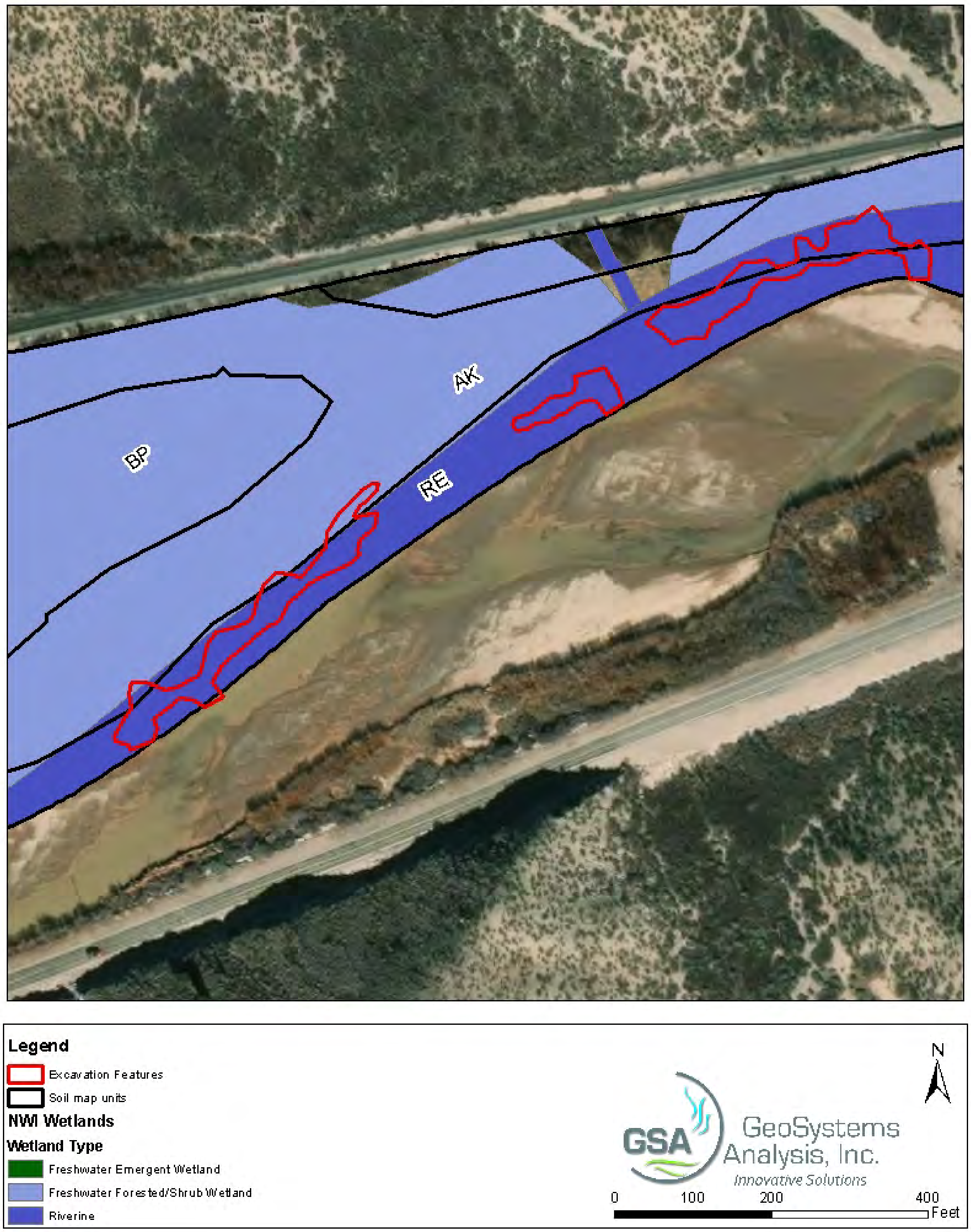

**GeoSystems *Analysis,* Inc.**

## Broad Canyon SSURGO and NWI Data

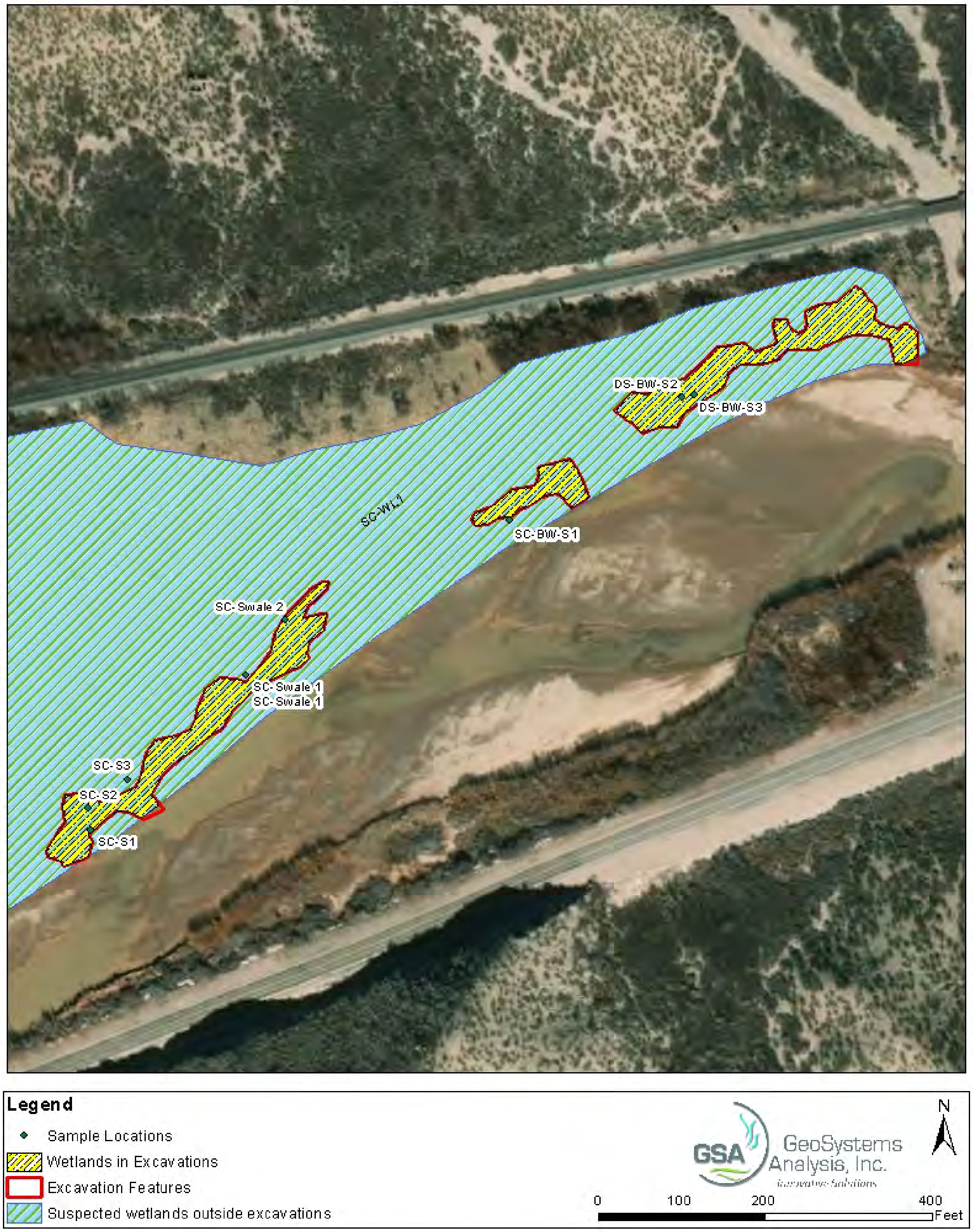


Wetland Findings at Broad Canyon

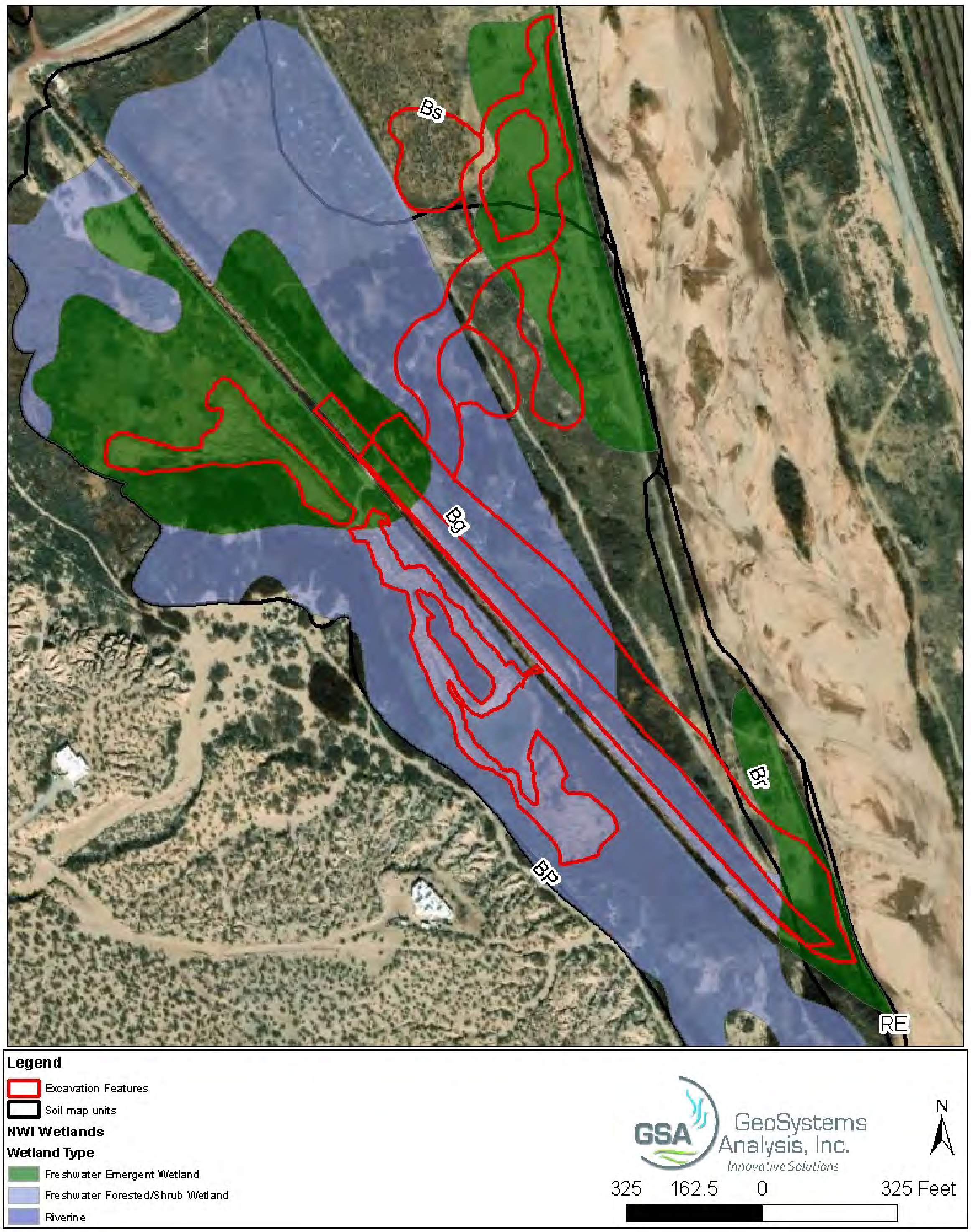
**Selden Canyon Point Bar SSURGO and NWI Data**



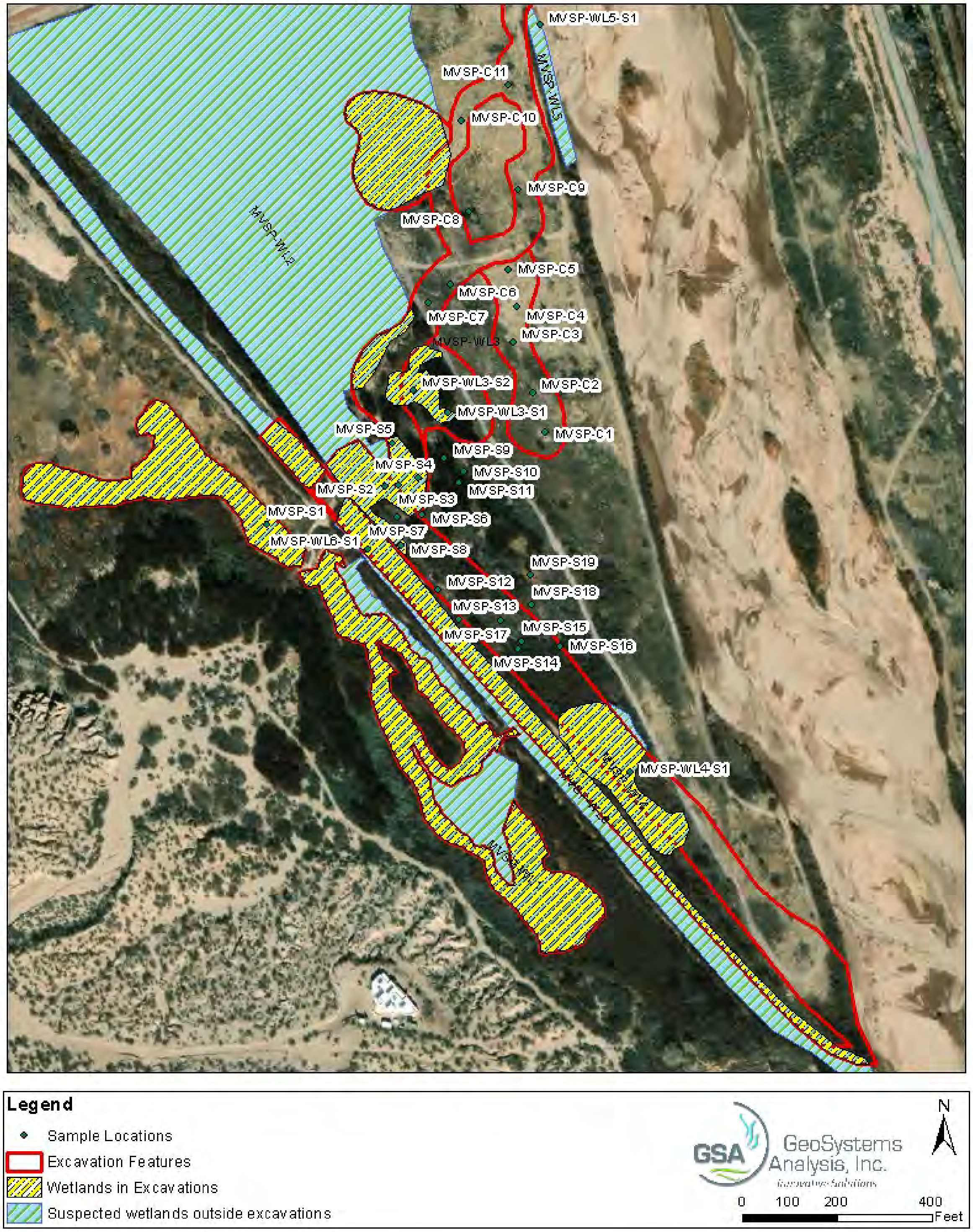
## Wetland Findings at Selden Canyon Point Bar



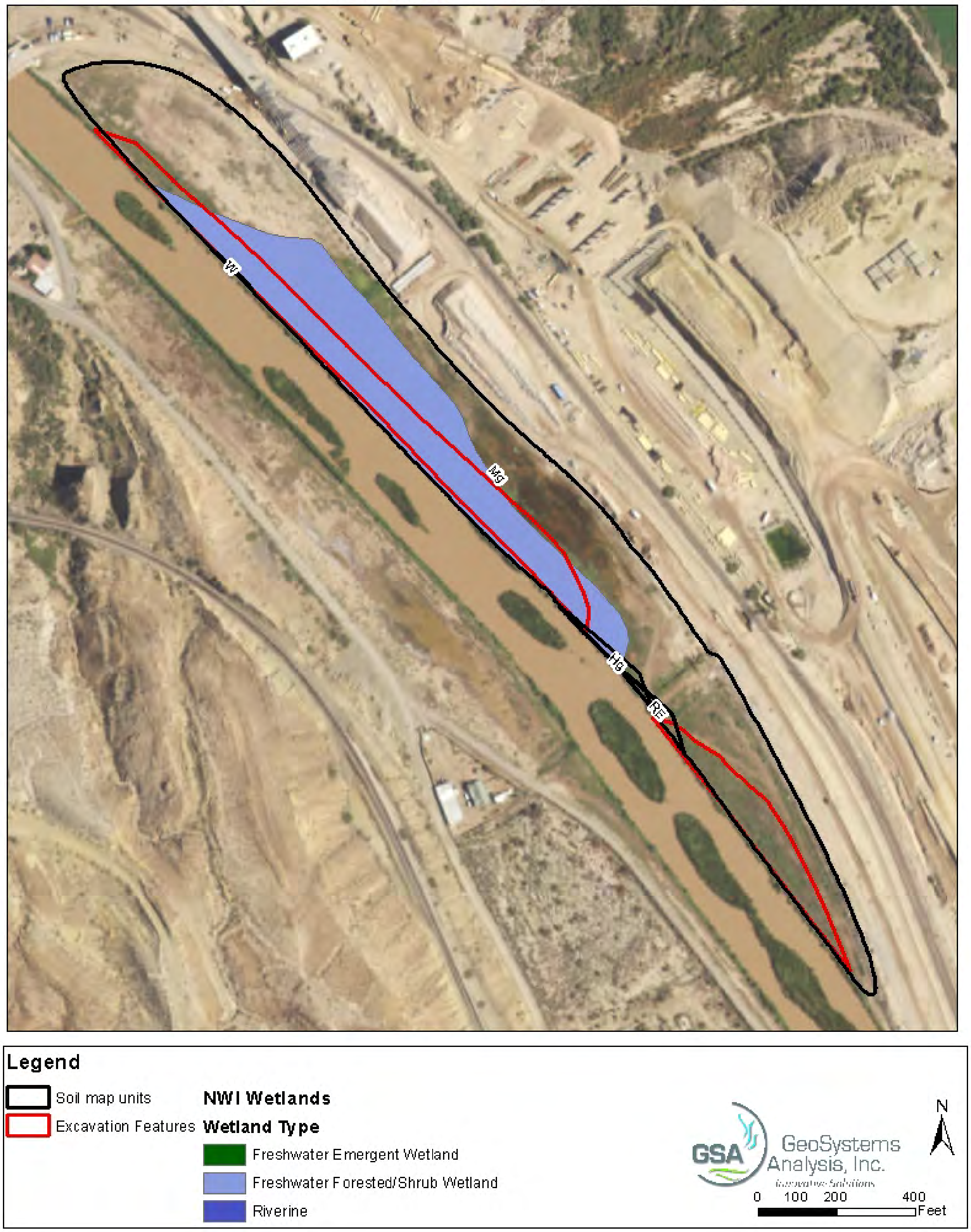
Mesilla Valley Bosque State Park SSURGO and NWI Data



## Wetland Findings at Mesilla Valley Bosque State Park



## Downstream of Courchesne Gauge SSURGO and NWI Data



# Wetland Findings at Downstream of Courchesne Gauge

# APPENDIX C –
# FIELD FORMS

# APPENDIX D - PHOTO PLATE

**BC-WL1**

*2*

BC-WL2

**SC1-WL1**

**MVSP-WL1**

**MVSP-WL2**


1 RULERS 2 3 4 5 6 7 8 9 10 11

**MVSP-WL3**

**MVSP-WL4**

**MVSP-WL5**

**MVSP-WL6**

**DSC-WL1**

DSC-WL2

# APPENDIX E – SOIL TABLE

| Site | Soil Map Unit | Components | Percentage of Map Unit | Hydric |
|---|---|---|---|---|
| Broad Canyon | Cb: Canutio and Arizo sandy loams | Canutio | 40 | No |
| | | Arizo | 30 | No |
| | | Riverwash | 1 | No |
| | | Yturbide | | No |
| | | Bluepoint | | No |
| | RE: Riverwash | Riverwash, Sandy | 95 | No |
| | | Riverwash | 1 | No |
| Selden Canyon | AK: Agua variant and Belen Variant | Agua variant | 45 | No |
| | | Belen variant | 45 | No |
| | | Belen variant | 1 | Yes |
| | | Agua variant | 1 | Yes |
| | RE: Riverwash | Riverwash, Sandy | 95 | No |
| | | Riverwash | 1 | No |
| Mesilla Valley Bosque State Park | BG: Belen Clay | Belen | 85 | No |
| | | Anapra | | No |
| | | Glendale | | No |
| | | Armijo | | No |
| | BS: Brazito very fine sandy loam, thick surface | Brazito | 80 | No |
| | | Anthony | | No |
| | | Agua variant | | No |
| | | Brazito | | No |
| | | Vinton | | No |
| | BR: Brazito loamy fine sand, 0 to 1 percent slopes | Brazito | 80 | No |
| | | Anthony | | No |
| | | Agua | | No |
| | | Vinton | | No |
| Downstream of Courchesne Gauge | MG: Made land, gila soil material | Gila | 90 | No |
| | | Unnamed, hydric | 5 | Yes |
| | | Unnamed | 5 | No |
| | HG: Harkey Loam | Harkey | 85 | No |
| | | Brazito | | No |
| | | Agua | | No |
| | | Harkey | | No |
| | | Glendale | | No |
| | | Anthony | | No |
| | | Vinton | | No |
| | RE: Riverwash | Riverwash, Sandy | 95 | No |
| | | Riverwash | 1 | No |

## APPENDIX C

## TECHNICAL REPORTS – 2020

# Rio Grande Canalization Project Aquatic Habitat Restoration Site Alternatives and Conceptual Designs: Addendum 1


*Prepared for:*
*United States Section International Boundary & Water Commission and Gulf South Research Corporation*

*Prepared by:*
*GeoSystems Analysis*
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*Albuquerque, NM 87110*
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## DOCUMENT CONTROL SUMMARY

| | | | |
|---|---|---|---|
| Title: | Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs: Addendum 1 | | |
| Client Company: | Gulf South Research Corporation (Prime Contractor) via contract with U.S. Section, International Boundary & Water Commission (USIBWC) | | |
| Client Contact: | Brian Bader, Elizabeth Verdecchia | | |
| Status: | Revised Final Draft | | |
| USIBWC Contract and Task Order # | IBM15D0005/191BWC18F0101, Modification #P00003 | | |
| GeoSystems Analysis Job #: | 2033 | | |
| Project Manager: | Chad McKenna | | |
| Author(s): | Chad McKenna, Todd Caplan | | |
| Revision Number: | 4 | | |
| Notes: | Includes new site assessments of Trujillo, Montoya Intercepting Drain, updates to Picacho Drain, Mesilla Valley State Park, recommendations for Keystone Heritage Park. Addresses B. Bader comments from initial draft dated July 16, 2020. Addresses E. Verdecchia comments dated July 31, 2020. Addresses additional USIBWC comments dated October 15, 2020. | | |
| Date: | January 11, 2021 | | |
| Checked By: | Brian Bader, GSRC; Crystal Young, SWCA; Liz Verdecchia and Andrea Glover, USIBWC | | |
| Distribution | Client | Other | GSA Library |
| (Number of Copies): | Electronic | | |

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# *Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs*

### *Citation*

*GeoSystems Analysis 2021. Rio Grande Canalization Reach Aquatic Habitat Restoration Site Alternatives and Conceptual Designs. Prepared for Gulf South Research Corporation: Addendum 1. Prepared by GeoSystems Analysis, Inc. Albuquerque, NM. September 2020*

| Name | Affiliation | Role |
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| William Widener | GeoSystems Analysis, Inc, | Botanist |
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| Crystal Young | SWCA | Review, Engineering Input |
| Elizabeth Verdecchia | United States International Boundary & Water Commission (USIBWC) | Review |

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## APPENDIX

## 1.0 INTRODUCTION AND BACKGROUND

This report is an addendum to a previous conceptual habitat restoration plan developed by GeoSystems Analysis, Inc. (GeoSystems [GSA] 2019). The previous report served as a precursor to an Environmental Assessment (Gulf South Research Corporation [GSRC] 2019) developed to support the United States Section of the International Boundary and Water Commission (USIBWC) with implementing aquatic habitat restoration obligations required by a 2009 Environmental Impact Statement (EIS) Record of Decision. The previous conceptual habitat restoration plan (GeoSystems 2019) and environmental assessment (EA) (GSRC 2019) were the primary "Phase 1" deliverables under a 2018-2019 contract with USIBWC. Two preferred alternative sites were selected during the 2019 EA process; Las Cruces Effluent (LCE) and Mesilla Valley Bosque State Park (MVBSP), and engineers from SWCA Environmental Consultants (SWCA) prepared 90% engineering drawings and cost estimates for these two sites in partnership with GSRC to satisfy "Phase 2" contractual obligations to USIBWC.

Significant design changes occurred between the Phase 1 conceptual designs and Phase 2 engineering plans. These design modifications were caused by numerous factors including changes in agency perspective for water rights offsets required at the sites, redesigns to optimize habitat performance, agency recommended revisions, etc. Accordingly, USIBWC decided to reopen the EA process and rerun the preferred site alternatives analysis with the redesigned projects at MVBSP and LCE; plus, consider three new alternative sites – Keystone Heritage Park (KHP), Montoya Intercepting Drain (MID), and Trujillo (**Figure 1**).

Under this current project, GSA was contracted as part of a GSRC-led team to 1) conduct site characterizations to support aquatic habitat restoration feature selection and design, 2) develop conceptual designs for three new sites (MID, Trujillo, and KHP); and 3) provide key information that will enable USIBWC to reevaluate restoration site alternatives in an amended EA that will also be delivered as part of this current project. The amended EA will evaluate a no-action alternative, the five restoration sites in this report, and four additional sites considered in the previous EA (Angostura Arroyo, Yeso Arroyo, Downstream of Courchesne, Selden Point Bar, and Broad Canyon). USIBWC intends to select at least two projects for formal engineering design and construction during a later phase in this project.

The principal objectives for USIBWC-led habitat restoration projects in the canalization reach as stated in USIBWC 2016 and USACE 2009 include:

1) Reduce exotic vegetation,
2) enhance river-floodplain hydraulic connectivity,
3) enhance aquatic diversity,
4) restore riparian function and enhance natural riverine processes,
5) improve terrestrial wildlife habitat,
6) restore endangered species habitat, and
7) reestablish riparian habitat.

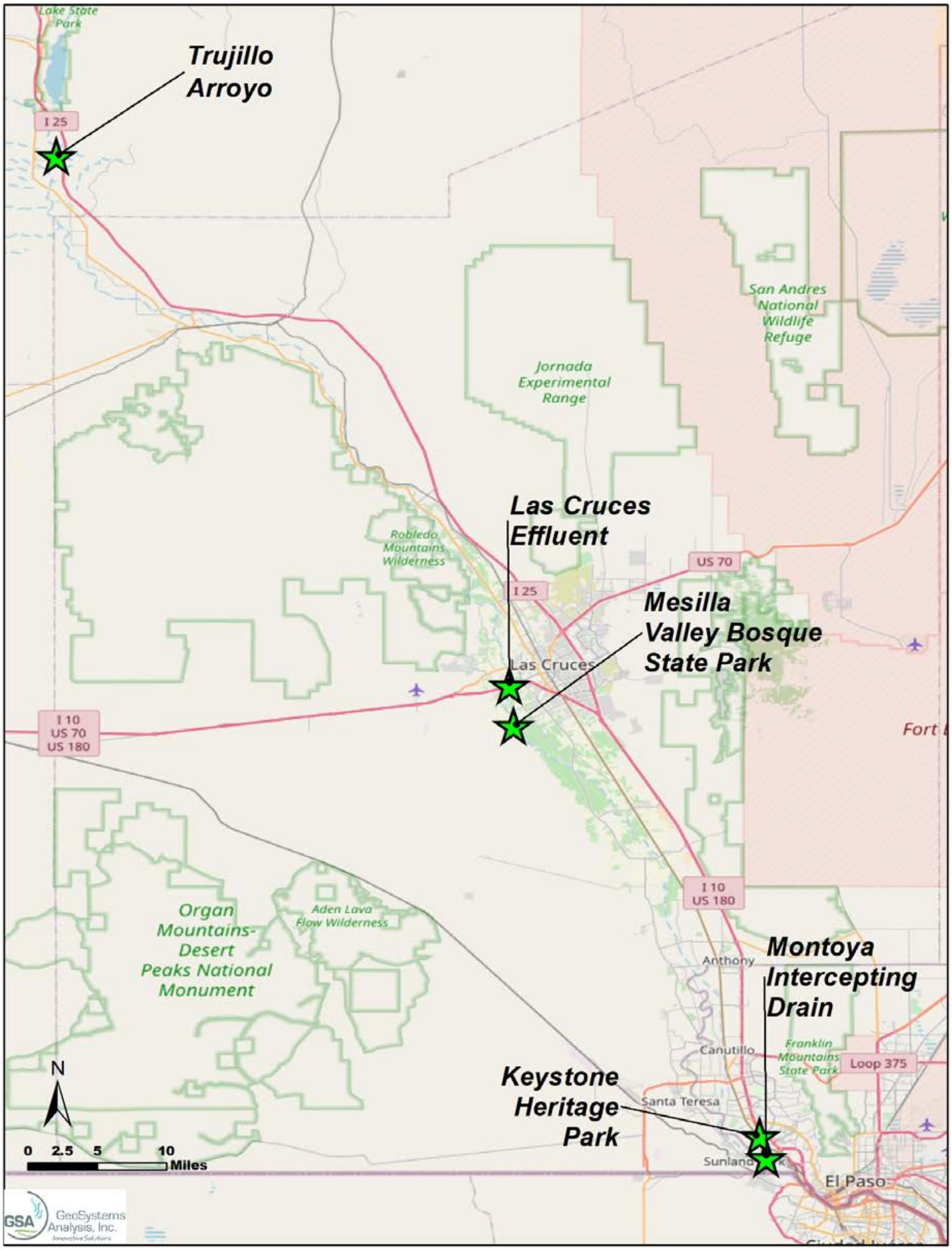


Figure 1. Project area map showing locations of project sites under consideration.

## 2.0 METHODS

Following a July 1, 2020 site reconnaissance with USIBWC staff and stakeholders, GSA scientists completed site assessments at Trujillo on July 7, 2020 and MID on July 8, 2020 (**Table 1**). Detailed descriptions of the assessment methodologies and results are described in the following subsections. In addition, this report retains the results of soil and vegetation investigations conducted by GSA staff at MVBSP and LCE during January 2019.

Table 1. GSA staff field assessment approach and dates.

| Site | Field Assessment Date | Location | Soils | Vegetation |
|---|---|---|---|---|
| Trujillo | July 7, 2020 | Arrey, NM (32.840799, -107.299097) | X | X |
| Las Cruces Effluent Site | January 2019 | Las Cruces, NM (32.293155, -106.82351) | X | X |
| Mesilla Valley Bosque State Park | January 2019 | Mesilla, NM (32.24301, -106.81606) | X | X |
| Montoya Intercepting Drain | July 8, 2020 | El Paso, TX (31.79963, -106.55679) | | X |

### 2.1 Vegetation Mapping

During fieldwork, GSA scientists divided potential habitat restoration sites into discreet "map units" and assigned representative vegetation types to each using a modified Hink and Ohmart (H&O) classification system (H & O 1984). H & O vegetation types are named based on dominant woody plant species in different canopy layers (i.e., "overstory" canopy exceeds 20 ft; "understory" canopy is less than 20 ft). When total canopy cover exceeds 25 percent in a canopy layer, the most dominant species (one or more) comprising that layer are used to name the vegetation type. Plant species names are abbreviated using letter codes, and the letter codes for dominant overstory and understory species are combined with a numerical code associated with the canopy structure (**Figure 2**).

The modified Hink and Ohmart classification system also provides suffix categories for describing non-woody vegetation types. For example, open water habitats, marsh habitats, and wet meadows are labeled as "OW", "MH", and "WM", respectively. Open, barren areas that are sparsely vegetated by woody plants, lack an abundance of perennial grasses, and lack wetland herbaceous species are described as type "OP", while grasslands are labeled as "G".

**Vegetation Community Naming Convention**

| *OVERSTORY LAYER SPECIES* | / | *UNDERSTORY LAYER SPECIES* | STRUCTURE TYPE |
|---|---|---|---|
| SPECIES(>=25%) - SPECIES(>=25%) | / | SPECIES(>=25%) - SPECIES(>=25%) | 1-6 |

**Species in each layer listed in descending order of dominance

**Plant Species Codes**

| Code | Common Name |
|---|---|
| ATX | Fourwing saltbush |
| AW | Arrowweed |
| B | Baccharis |
| BB | Burrobrush |
| C | Rio Grande cottonwood |
| CW | Coyote willow |
| EP | Ephedra/jointfir |
| HM | Honey mesquite |
| JW | Jimmyweed |
| SBM | Screwbean mesquite |
| SC | Saltcedar |
| WB | Wolfberry |

**Structure Types**

| Woody | | | | | |
|---|---|---|---|---|---|
| Structure Type | Overstory Cover | Overstory Height | Understory Cover | Understory Height | Description |
| 1 | **>25%** | >40 feet | **>25%** | 6-20 feet | Tall trees with dense understory |
| 2 | **>25%** | >40 feet | *<25%* | NA | Tall trees with sparse understory |
| 3 | **>25%** | 20-40 feet | **>25%** | 6-20 feet | Intermediate-sized trees with dense understory |
| 4 | **>25%** | 20-40 feet | *<25%* | NA | Intermediate-sized trees with sparse understory |
| 5 | *<25%* | NA | **>25%** | 6-20 feet | Dense shrubs |
| 6 | *<25%* | NA | **>25%** | <6 feet | Sparse shrubs |

| Non-Woody | |
|---|---|
| G | Grassland |
| WM | Wet Meadow |
| MH | Marsh |
| OP | Open Area (often weedy) |

Figure 2. Hink and Ohmart vegetation naming conventions applied to this project.

For the purpose of presenting data in this report, H&O vegetation communities were simplified into more general vegetation types, but electronic Geographic Information System (GIS) data delivered during this project, indicate the actual H&O type assigned at each map unit. In addition to ascribing a H&O vegetation type, the project botanist listed dominant herbaceous species as well as noxious weeds observed in each map unit. A list of all species observed during our site assessments is provided in **Appendix A**.

## 2.2 Soil Assessment

Soil texture data were collected from numerous sampling locations strategically targeted within potential aquatic habitat restoration sites. The goal was to assess soil texture similarities and differences across a range of vegetation and other site conditions to aid future site restoration and revegetation planning efforts. The number of samples varied by site depending on vegetation diversity, design concept under consideration, and other factors including field efficiency. At each sampling location, representative photographs were recorded and then a hand auger was used to bore a hole to the alluvial groundwater table (except where buried rock prevented the auger from reaching the water table). Soil cores were extracted from the auger hole in 1-foot increments and placed on a tarp. Each 1-

foot increment was subdivided on the tarp based upon differences in textural characteristics. Soil textures were assessed using the "hand-feel" method described in Brady (2008). Soil textures were recorded for each discreet soil layer using the following USDA soil texture classes (Brady 2008):

- Sand (Sa)
- Loamy sand (LS)
- Sandy loam (SaL)
- Silt loam (SiL)
- Loam (L)
- Sandy clay loam (SaCL)
- Silty clay loam (SiCL)
- Clay loam (CL)
- Sandy clay (SaC)
- Silty clay (SiC)
- Clay (C)

Additional information recorded at each bore hole included notes regarding notable changes with depth in soil moisture, presence of visible salt concentrations, iron reduction-oxidation observations ("mottling"), and gleying.

## 2.3 Hydraulic Modeling and River Flow Assessment

GSA obtained and ran simulation results produced by calibrated and validated hydraulic models (HEC-RAS) developed in support of a 2014 Rio Grande Canalization Project (RGCP) channel seepage and water budget study (Tetra Tech 2014). The steady state HEC-RAS model had been calibrated by Tetra Tech to align with 2011 Light Detection and Ranging (LiDAR) topographic data and adjusted in channel segments that were underwater when the LiDAR topography data were originally captured. Modeled discharges range from 10 to 6,000 cfs, 100-year discharge, plus ineffective flow areas (see Tetra Tech 2014 for more specific information regarding the hydraulic model). HEC-RAS simulation results were extrapolated to predict water surface elevations (WSE) from a variety of discharges contained in the steady state iteration of the 2014 model and used to determine excavation targets for conceptual designs and earthwork quantities published in this report.

Streamflow information was obtained at the Rio Grande below Leasburg Dam, Rio Grande at Hayner's Bridge, and Rio Grande at Mesilla Dam sites from USIBWC published datasets which include provisional data (https://waterdata.ibwc.gov/). These three gages were selected due to their proximity to the study sites. Published streamflow data from the USIBWC website date back to 2003 at Hayner's Bridge and 2011 at Leasburg Dam and Mesilla Dam while historical data are also available for many of the gages. As requested during the project scoping meeting, we compared flow duration for two periods (2003 to 2009 and 2010 to 2018) at the Hayner's Bridge site to ensure conceptual designs account for drought conditions over the past decade (**Figure 3**). A flow duration curve (**Figure 4**) was also developed for the entire period of record available at the Leasburg Dam and Mesilla Dam sites (2011 to 2018) via data downloaded from the USIBWC streamflow website.

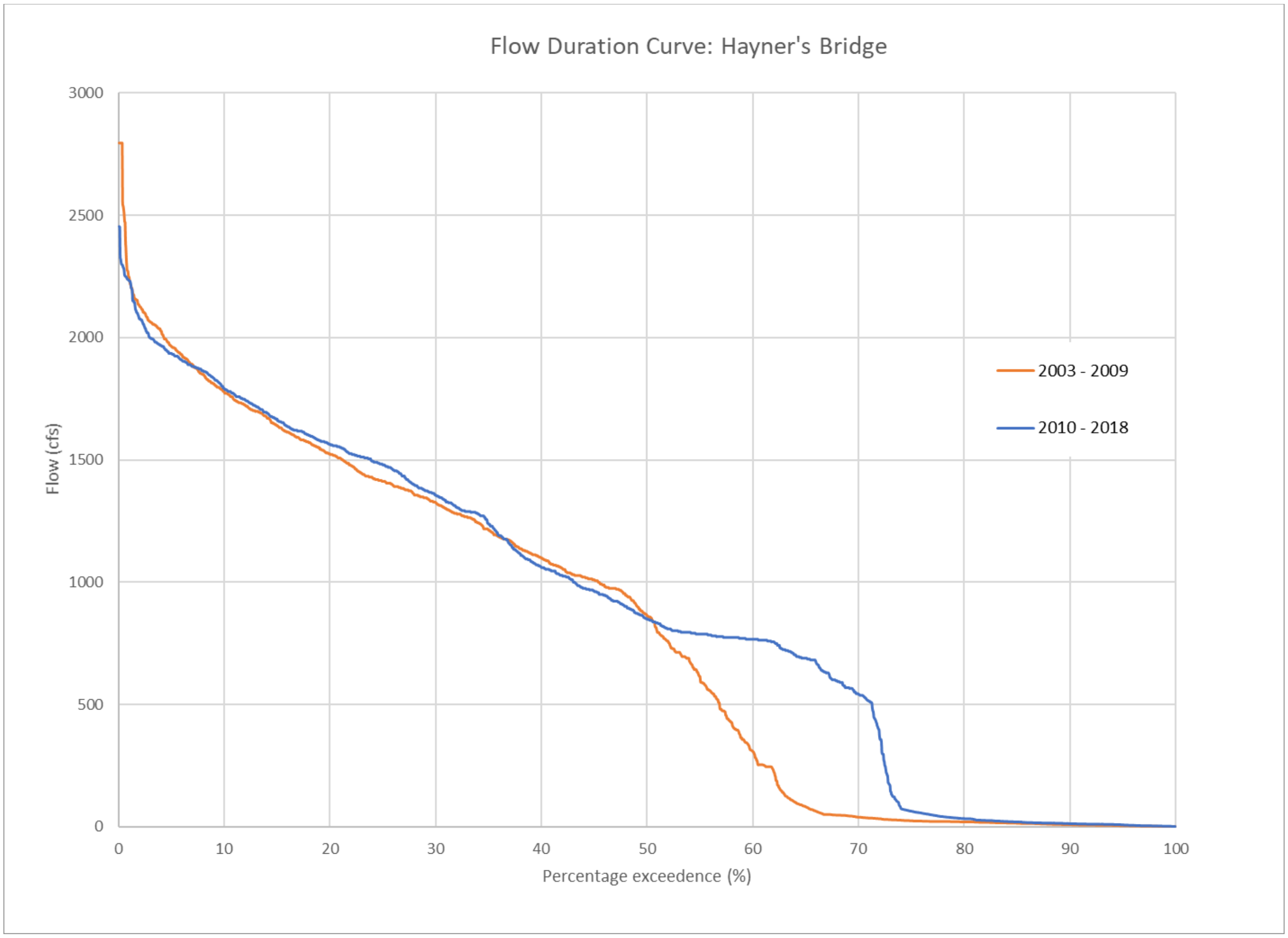


Figure 3. Flow duration curves at Hayner's Bridge Gage for two periods: 2003 to 2009 and 2010 to 2018.

A flow-duration curve (FDC) calculates the percent of time specified discharges are equaled or exceeded during a given period. Since aquatic habitats require regular surface water inundation, FDC's are useful metrics for deriving a target discharge during aquatic habitat restoration design, to ensure the site will inundate with sufficient frequency to regularly achieve "aquatic" conditions. FDC analysis at Hayner's Bridge (about 10 miles south of Hatch, NM) revealed that streamflow was very similar for 50% of the year during the past decade compared to the decade prior (**Figure 3**). However, at 60% exceedance, discharge increased by 150% during 2010-2018 compared to 2003-2009 (**Table 2**). Flows continued to be substantially higher at 75% and 90% exceedance since 2010. Comparably, between 2011-2018, the 50% exceedance discharge was 618 cubic feet per second (cfs) at Leasburg Dam (near Radium Springs, NM) while 60% exceedance was 320 cfs (**Figure 4**). Downstream at the Mesilla Dam gage, which lies below the Las Cruces sites, 50% exceedance discharge was 388 cfs while 60% exceedance was 196 cfs (**Figure 5**).

Table 2. Comparison of the discharge (cfs) relative to percent exceedance at the Hayner's Bridge Gage for two periods: 2003 to 2009 and 2010 to 2018.

| | **Percent Exceedance** | | | | |
|---|---|---|---|---|---|
| | **25%** | **50%** | **60%** | **75%** | **90%** |
| **Period** | **Discharge (cfs)** | | | | |
| 2003 to 2009 | 1,413 | 862 | 307 | 24 | 8 |
| 2010 to 2018 | 1,480 | 848 | 766 | 63 | 12 |
| Percent Difference | 5% | -2% | 150% | 163% | 55% |

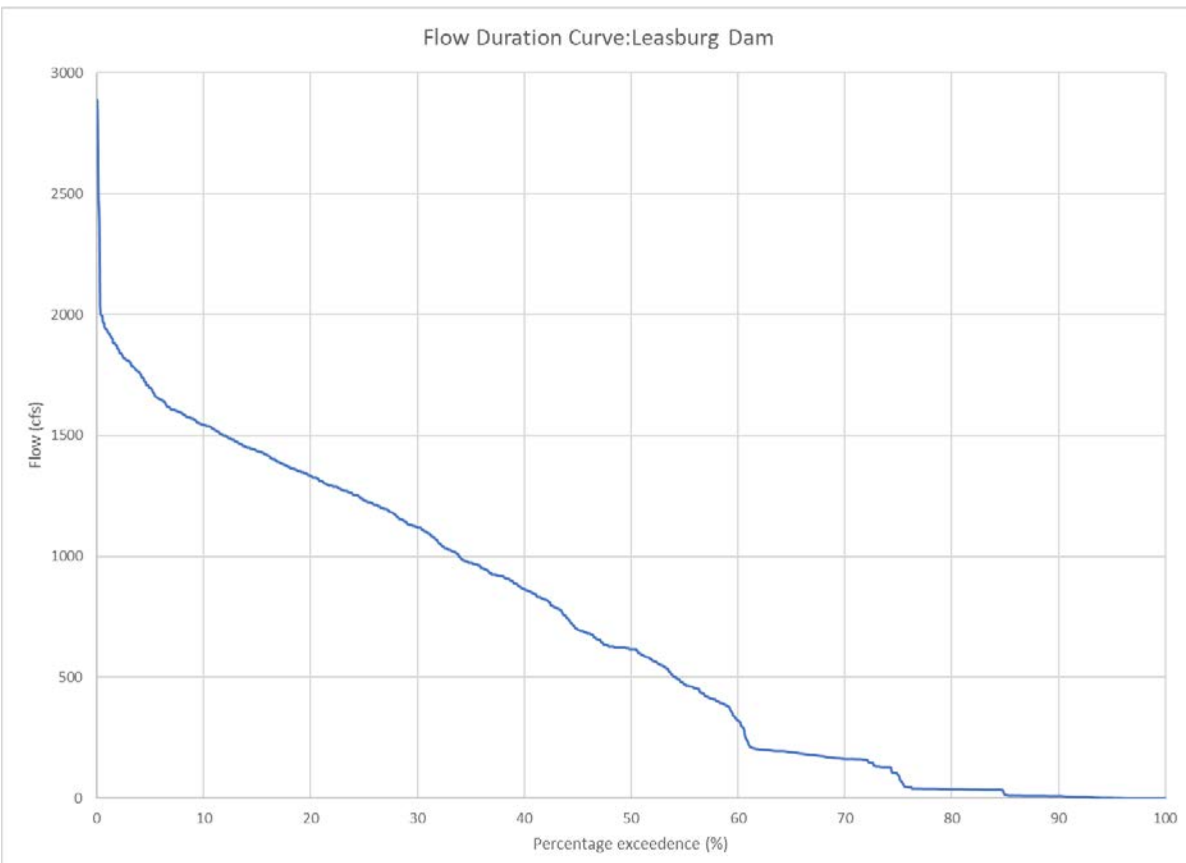


Figure 4. Flow duration curve at the Leasburg Dam Gage from 2011 to 2018.

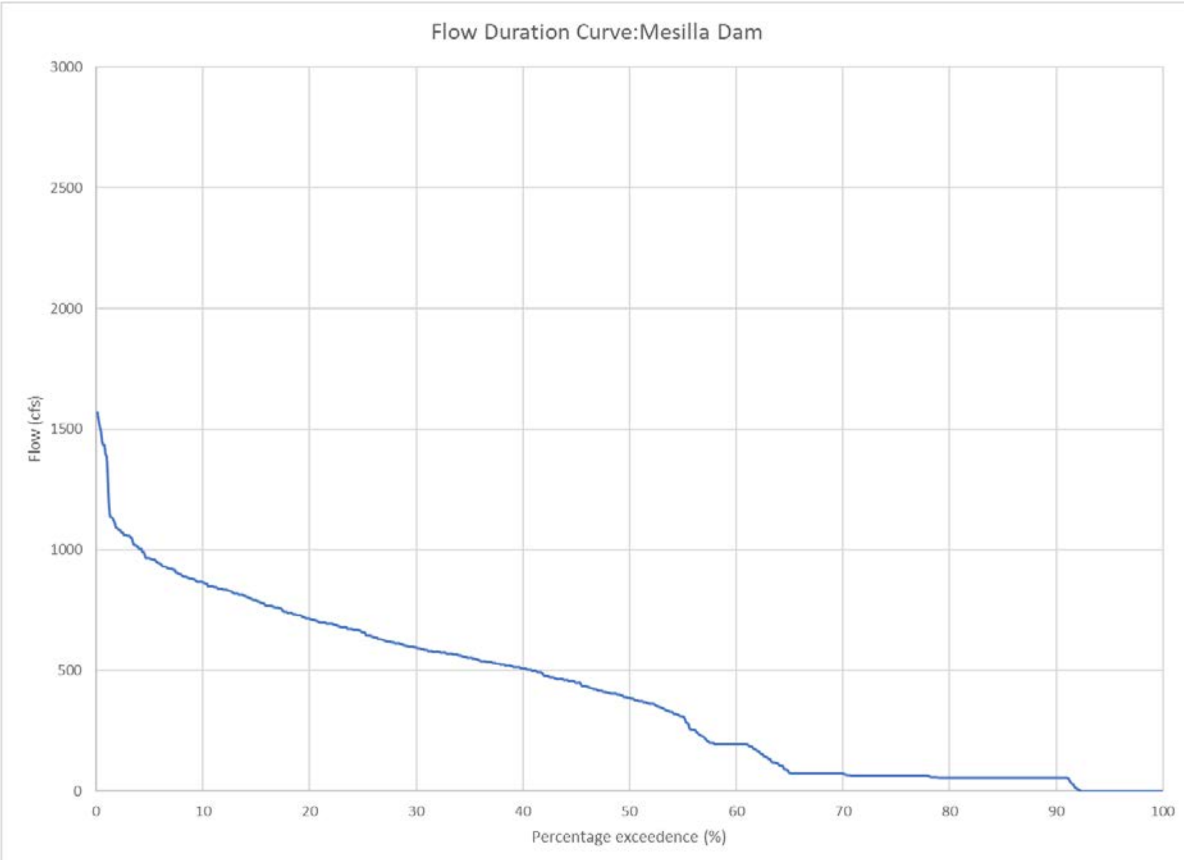


Figure 5. Flow duration curve at the Mesilla Dam Gage from 2011 to 2018.

## 2.4 Topographic Surveys

Real-time kinematic (RTK) survey equipment was used by GSA staff to measure the land surface elevation (as NAVD88) along eight cross sections established at MID. During this effort, a tape was stretched across the drain perpendicular to the flow direction and measurements were recorded at approximately 2-foot intervals. These data were imported into GIS software and MS Excel for additional processing and development of cross-section profiles for each of the eight section lines.

## 2.5 Evapotranspiration Evaluation

Evapotranspiration (ET) is a process that accounts for movement of water from the land surface to the air via evaporation off standing water and soil plus transpiration by plants. GSA determined the net change in annual water depletion at each restoration site alternative following a similar method as the Conceptual Plan (USACE 2009). Estimates of consumptive use for various vegetation communities published in USACE (2009) were supplemented with ET rates contained in other regional riparian/wetland planning documents (e.g., Multi-Species Conservation Plan [MSCP] 2004) when current or predicted future plant communities were not published in the Conceptual Plan.

ET rates used during this process include (adapted from USACE 2009 and MSCP 2004):

- Dense shrubs: 4.9 ft/yr
- Riparian forest: 4.8 ft/yr
- Riparian woodland: 3.4 ft/yr
- Grassland (including saltgrass meadows): 2.4 ft/yr
- Marsh: 5.8 ft/yr

We differenced the predicted ET rate for pre-restoration plant communities (per current, 2019/2020, vegetation mapping) and predicted optimal restored habitat type to calculate the predicted change in consumptive use attributed to habitat restoration activities. Net depletion volume for each site was then calculated in GIS software by multiplying ft/yr by the total acreage of each map unit. Results are included in **Table 6** (see page 53).

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## 3.0 SITE CHARACTERIZATION AND CONCEPTUAL DESIGNS

The vegetation, soils, topography and hydrology evaluations described above were combined with restoration recommendations developed by others (USACE 2009, Propst and Bixby 2018) to develop conceptual restoration designs. The following subsections discuss results and recommendations using these combined sources.

### 3.1 Trujillo Arroyo

The Trujillo Arroyo site (sometimes referred to as "Trujillo" in this report) is located near RM 103 approximately 4.5-miles downstream of Caballo Dam. The site, which was addressed in the Conceptual Plan (USACE 2009), is an 18.5-acre floodplain terrace on the west side of the river immediately downstream of the confluence with Trujillo Arroyo. The floodplain terrace is bisected by a north-south maintenance road that is used to access three groundwater monitoring wells established by USIBWC in 2015. The north end of the site contains a prominent (2-acre, approx. 36,000 yds$^3$) spoil pile of coarse alluvium placed by USIBWC maintenance staff immediately south of the Trujillo Arroyo confluence with the river. These spoils were excavated from the mouth of Trujillo Arroyo to maintain storm flow conveyance capacity. Trujillo Arroyo is highly channelized in the mile leading to the confluence with the Rio Grande. Representative photographs of the project site are provided in **Figure 6**.

The Trujillo floodplain has been the focus of recent riparian habitat rehabilitation efforts led by the USFWS under a cooperative agreement with USIBWC. The rehabilitation work has primarily involved controlling saltcedar and planting willow (both coyote and Gooding's) and cottonwood poles (USFWS 2020). Most of the revegetation occurred in the floodplain west of the maintenance road, although some plantings were also installed in linear trenches between the road and the river. The plantings west of the road are opportunistically irrigated with USIBWC surface water rights diverted from the Trujillo Lateral through a gated control structure. When the gate is lifted, irrigation water flows through a 36-inch subsurface culvert into a 450-foot long meandering canal excavated by USFWS through a portion of the planted area (see photos in **Figure 7**).

The floodplain zones planted by USFWS are immediately north of existing stands of native riparian habitat. Recent mapping performed by the Bureau of Reclamation (USBR 2017) delineated those riparian habitat patches as *suitable* breeding habitat for the federally endangered Southwestern willow flycatcher. No breeding flycatchers have been documented at the site to date, although migrant flycatchers have been documented at the site in the past several years.

**Site Assessment**

GSA performed a site assessment on July 7, 2020 focused on mapping vegetation community types, evaluating soil physical characteristics, and performing reconnaissance-level topographic surveys of the excavated irrigation canal. Existing data sets including groundwater depths, surface water hydrology (HEC-RAS 1D model) and various GIS layers were reviewed in the office to support the site assessment.

a. Willow and baccharis are widespread across the southern half of the project site

b. A mosaic of native and non-native grasses and woody plants comprise the northern half of the floodplain

c. View of Trujillo Arroyo looking towards the Rio Grande.

d. A large spoil pile of cobble and gravel occupies the northern end of the project site.

Figure 6. Representative photographs of the project site.

**Vegetation:** Vegetation mapping resulted in delineation of 33 map units ranging between less than 0.5-acres to nearly 4-acres in size. Coyote willow (*Salix exigua*) and baccharis (*Baccharis salicifolia*) were the most dominant native riparian species, covering nearly half of the 18.5-acre project site. These coyote willow-baccharis stands dominate most the central and southern portions of the project site (**Figure 8**), primarily south of the artificial canal created by USFWS. Except for a small (< 0.5-acre) saltcedar (*Tamarix chinensis*) patch, vegetation north of the artificial canal was indicative of relatively drier conditions, dominated mostly by patches of native grassland (big sacaton (*Sporobolus wrightii),* inland saltgrass (*Distichilis spicata*), and arrowweed (*Pluchea sericea*). Along both sides of the maintenance road the ground was sparsely vegetated or dominated by patches Jimmyweed (*Isocoma pluriflora*). Other dominant native species documented, albeit in small (< 0.5-acre) patches, included wolfberry (*Lycium sp*), four-wing saltbush (*Atriplex canescens*), and ash (*Fraxinus sp.*). Notable non-native herbaceous species observed included Bermudagrass (*Cynodon dactylon*), kochia (*Bassia scoparia*), and tumbleweed (*Salsola tragus*).

**Soils:** A detailed assessment of soil physical conditions across the Trujillo site was constrained by the presence of a pervasive cobble and gravel layer across the ground surface (**sidebar photo**). Only two of eight auger holes attempted were successful in penetrating to the water table. Success at these two locations (near USIBWC Well 1) is attributed to ground disturbance activities associated with the USFWS riparian rehabilitation project that scraped away the upper cobble-gravel layer. Physical examination of these areas indicates the cobble-gravel surface layer may be approximately 1-2 feet thick, overlying a relatively uniform sand layer of variable thickness between the cobble-gravel layer and the water table. Depth to groundwater at these two auger holes was within two feet of the ground surface.

**Groundwater**: Alluvial groundwater data from three wells installed at the site by USIBWC are plotted in **Figure 9**. These plots show that groundwater levels vary seasonally between approximately 1.5 feet and 7.0 feet below ground surface (bgs). The data indicate groundwater depths trend closer to the ground surface at Well 1 (downstream-most well) than the other two wells. However, the patterns of groundwater fluctuation between wells are inconsistent, indicating localized factors (e.g., artesian flow, irrigation?) may differentially influence groundwater levels at various wells.

**Supplemental Irrigation:** A reconnaissance-level assessment of the excavated canal was conducted to get a general sense of the canal dimensions. A survey rod and level were used to approximate relative elevation differences between the excavated canal bottom, banks, and adjacent floodplain surface. Measurements indicate an average canal width of 15 feet (bank to bank) and bank heights of approximately 3 feet (**Figure 7**). The floodplain surface ranges between approximately 0.3-ft and 0.7-feet higher than the canal bottom. The canal "dead-ends" where excavated floodplain sediments were left in place. These observations indicate irrigation water released into the canal overtop the berms once the canal is filled. The irrigation water then spreads across the floodplain as sheet-flow in a relatively non-uniform pattern and percolates into the alluvial aquifer.

**River/Surface-Water Hydrology:** The existing HEC-RAS 1-D hydrodynamic model developed by the Corps (USACE 2009) was used to evaluate predicted surface water elevations at different river discharges in relation to riverbank height at the project site. The model predicts that flows are bankfull at approximately 2,500 cfs to 3,500 cfs (**Figures 10-12)**. The model also indicates the bank elevation is approximately 1-2 feet above the adjacent floodplain at cross-section (XS) 543622.5 (**Figure 10**) and XS 542906.1 (**Figure 11)**. Data from XS 543406.4 (**Figure 12**) indicates the ground elevation at this location continuously increases between the bank and the floodplain.

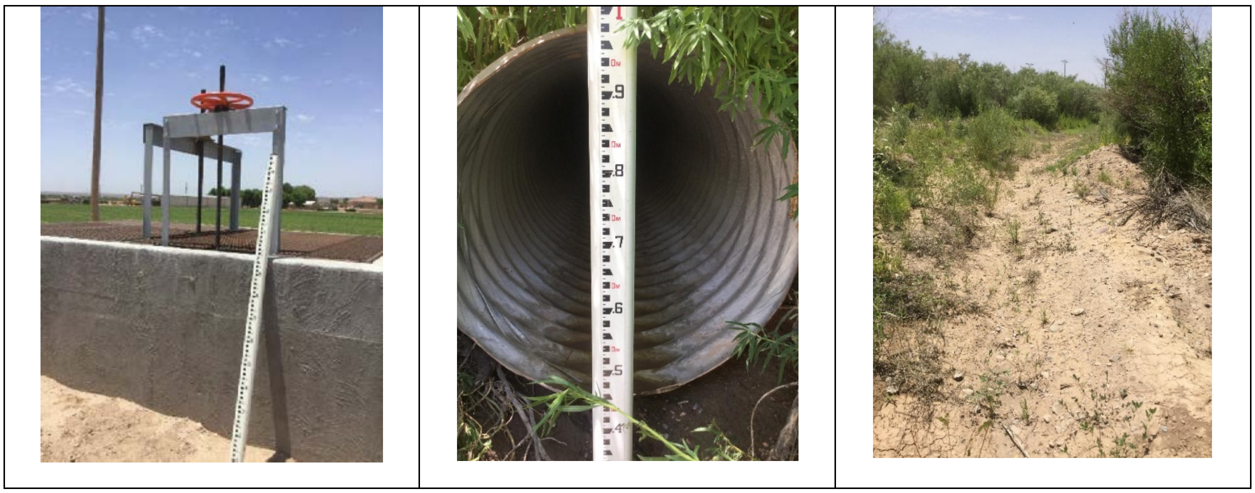


Figure 7. Photographs showing the irrigation turnout (left), 36" culvert (center), and excavated irrigation canal.

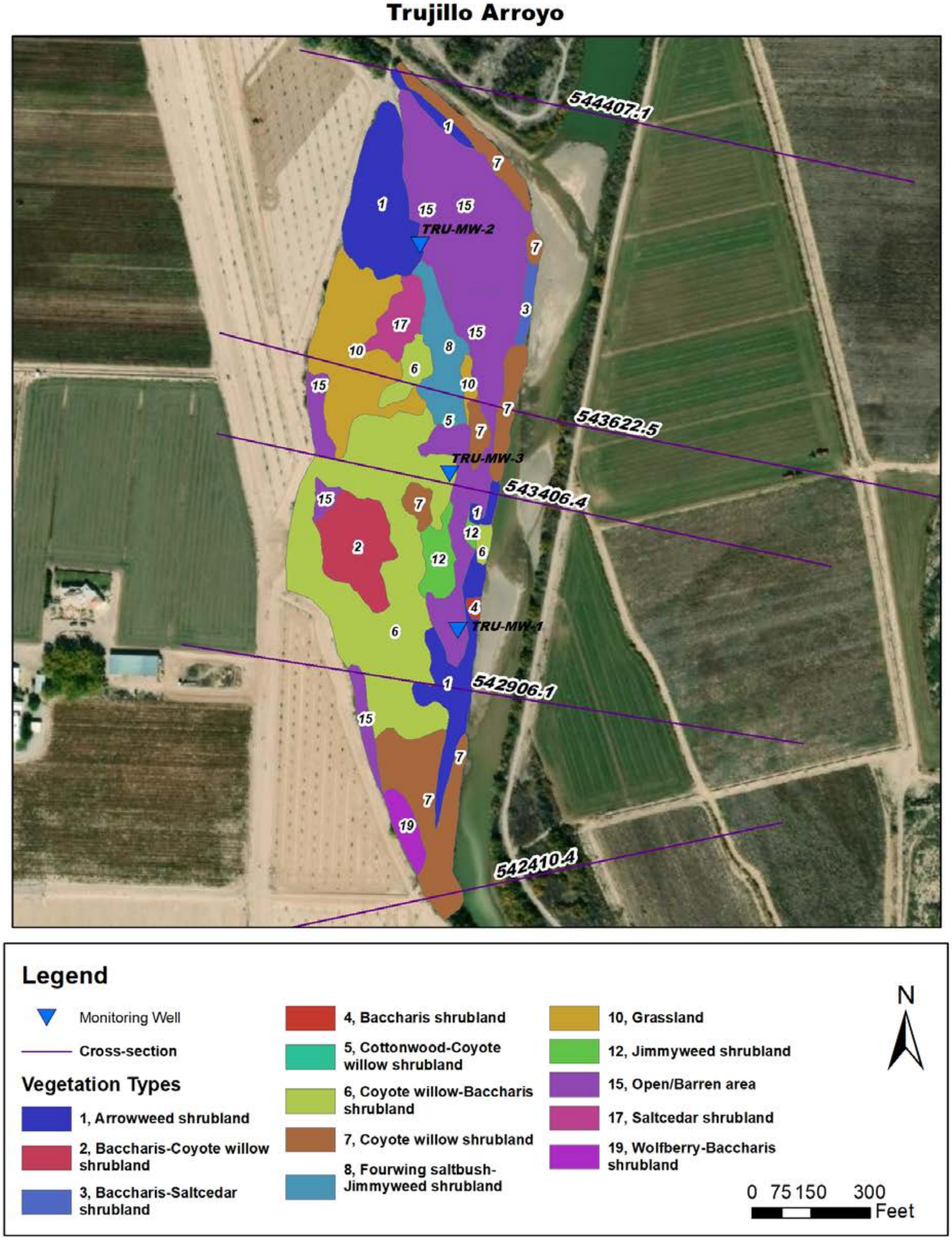



Figure 8. Vegetation types of the Trujillo project site.

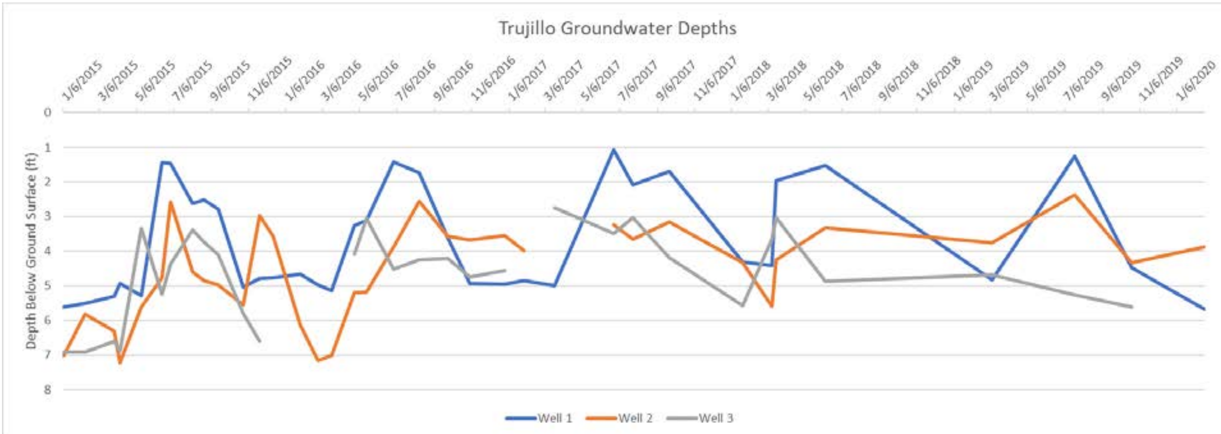



Figure 9. Groundwater levels measured from three shallow monitoring wells at the Trujillo project site.

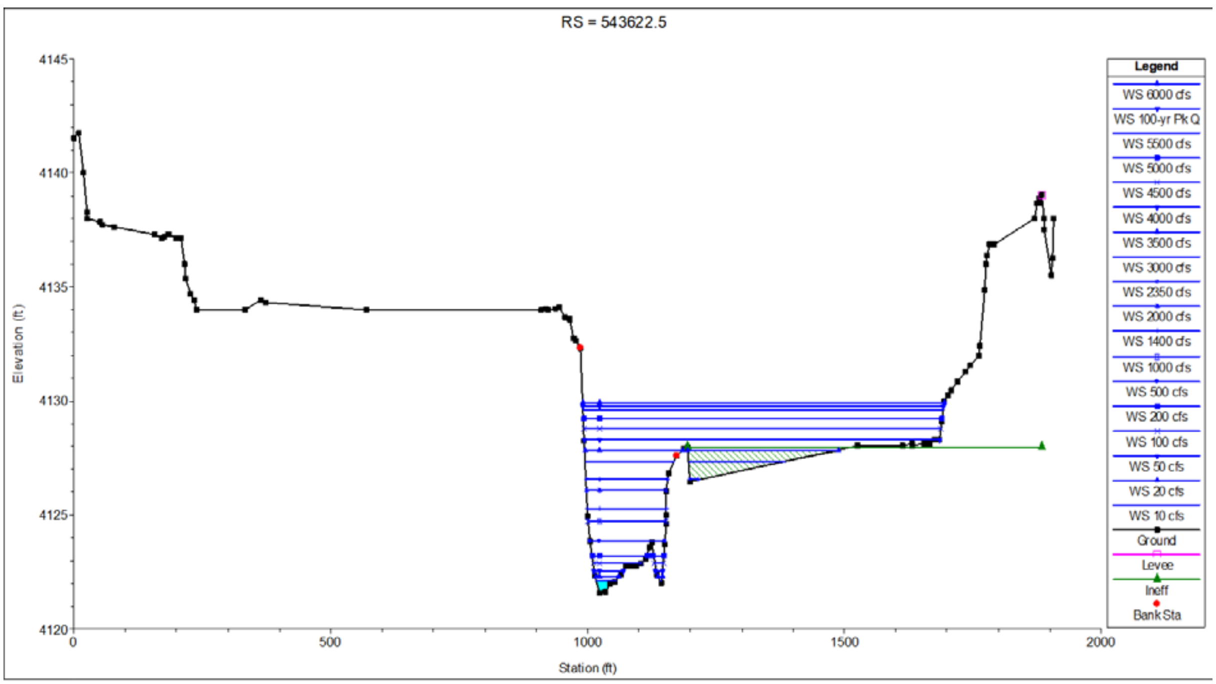



Figure 10. Cross-section generated from the USACE HECRAS Model showing predicted surface water elevations in relation to different Rio Grande discharge levels. This is the upstream most cross-section below Trujillo Arroyo and is oriented west-east (i.e., facing upstream).

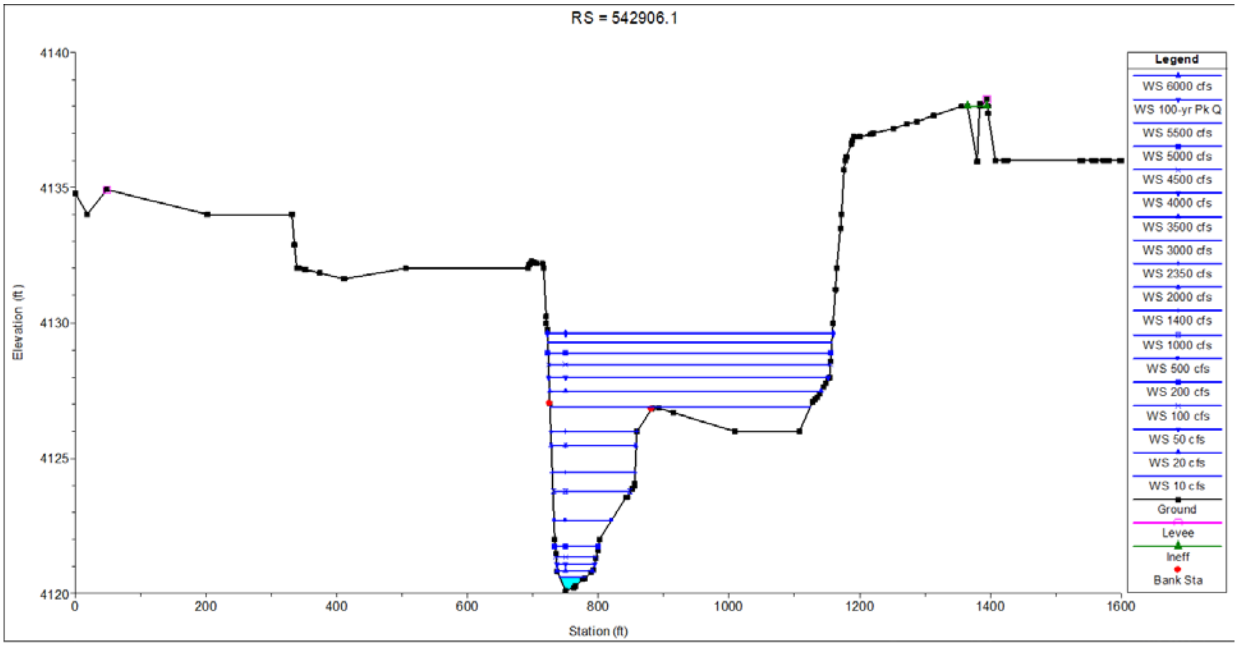



Figure 11. Cross-section generated from the USACE HECRAS Model showing predicted surface water elevations in relation to different Rio Grande discharge levels. This is the downstream most cross-section below Trujillo Arroyo and is oriented west-east (i.e., facing upstream).

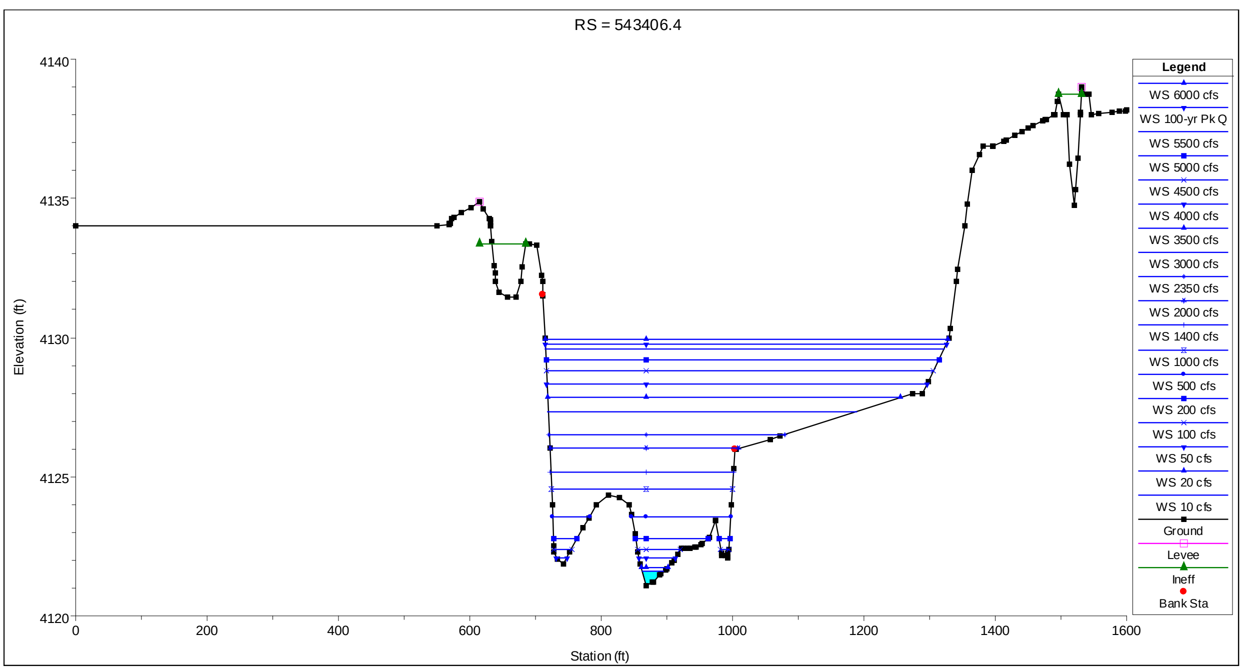



Figure 12. Cross-section generated from the USACE HECRAS Model showing predicted surface water elevations in relation to different Rio Grande discharge levels. This is the middle cross-section below Trujillo Arroyo and is oriented west-east (i.e., facing upstream).

**Conceptual Design**

The restoration design concepts for the Trujillo site focus on maximizing use of different surface water sources to expand aquatic habitat across the project area. Note that this design assumes that the existing spoil pile is moved to an offsite location prior to aquatic habitat creation. According to spoil pile dimensions and typical height, the spoil pile currently contains about 36,000 $yd^3$ of coarse alluvium. The principal concepts include three restoration features:

*Arroyo Mouth Widening*: This would involve widening the arroyo mouth to expand the size of the existing backwater habitat at the arroyo mouth **(Figure 13**) plus designate access for future periodic sediment removal. Prior to excavation, coyote willows that currently inhabit the southern bankline of the arroyo would be harvested and preserved as a source of revegetation material for this site. The floodplain would be lowered an average of four feet in the arroyo mouth widening zone. This wider area would naturally accrete fine sediment and potentially reduce the frequency for sediments removal in the Rio Grande. A wider mouth at the arroyo would result in larger cross-sectional areas and lower velocities which would allow for more sediment to settle out of the water column onto the arroyo terraces. The floodplain area immediate west/south-west of the widened arroyo mouth would be step terraced and planted with willow (including material harvested prior to arroyo widening), baccharis, and tree poles.

*Wetland Depression*: Convert the existing saltcedar stand to a seasonal wetland (see **Figure 8**, Vegetation Type #17). This would entail removing saltcedar and lowering the ground surface approximately two feet below grade to create a small depression **(Figure 13**). An impermeable pond liner (e.g., EPDM rubber or bentonite clay) would be placed along the bottom of the depression and the excavated soil material would be placed back on top and spread across the lined depression. The existing irrigation canal would then be extended to allow seasonal irrigation to the wetland depression (**Figure 13**), which would be planted with facultative wetland plants, including inland saltgrass, yerba mansa, and other desirable species.

*OPTIONAL: Backwater Channel & Swale*: A backwater channel would be excavated along the riverbank near cross-section 543406.4 (**Figure 13**) and would extend upstream into the floodplain area currently occupied by weedy vegetation (see **Figure 8** Vegetation Type #12). The riverbank and the floodplain surface in this location would be lowered an average of approximately 1.5 feet below grade to create <u>an unlined depression</u> (i.e., "swale") such that Rio Grande surface water would begin inundating the excavated swale at discharges of approximately 2,350 cfs (2%-5% return interval; see **Figure 3** and USACE 2007). The backwater inlet grade will be set to begin inundation at 2,300 cfs but the more interior portions of the backwater and swale should be set at a lower grade to encourage more prolonged inundation plus ensure that irrigation water is retained in the feature when it is applied. The swale would be planted with native cottonwood, willow and baccharis. Additionally, the existing irrigation canal would be extended to the swale to provide periodic supplemental irrigation water (**Figure 13**). A control gate and culvert would be installed to enable water management both to the swale and to the existing riparian habitats created by USFWS.

Opportunities and Constraints

The USIBWC and USFWS have already invested considerable effort and resources into improving the habitat value of the Trujillo project site, including expanding native riparian habitat and utilizing IBWC water rights to deliver irrigation water to the planted areas. The available site data indicates considerable opportunities to expand and diversify both riparian-wetland and seasonal aquatic habitats to the project site. The HEC-RAS model, for example, predicts relatively minor excavation (approximately 1-ft depth) along the river bankline could facilitate periodic surface-water inundation of the otherwise disconnected floodplain (USACE 2009). The existing irrigation canal could be expanded to strategically irrigate native wetland habitats created in areas currently occupied by weedy plants with low aquatic or terrestrial wildlife value. The mouth of Trujillo Arroyo is currently very narrow, and modeling performed by the USACE (2007) indicates the 100-year discharge is approximately 4,880 cfs. Widening the arroyo mouth at the confluence could reduce pressure against the Rio Grande east bank and levee (USACE 2007), could reduce the frequency of arroyo maintenance dredging, and could significantly increase the area of low-velocity habitat at the confluence for fish, amphibians, and aquatic invertebrates under a range of Rio Grande discharge levels. **Figure 13** provides a plan-view illustration of all restoration features currently proposed for consideration.

The principal constraint is that revegetation has already been completed within the location proposed (as an option) for backwater channel and swale creation. Like the willows growing on the south side of the arroyo mouth, the material previously planted could be salvaged, soaked, and replanted in the excavated backwater/swale. If the optional backwater channel and swale are constructed, the habitat features would provide more favorable soil moisture and seasonal aquatic habitat conditions than currently provided by the elevated terrace and willow trench plantings. The material quantity, unit price determinations, and detailed cost estimates are provided in **Table 7, Table 8**, and **Table 9**, on pages 53, 54, and 55, respectively.

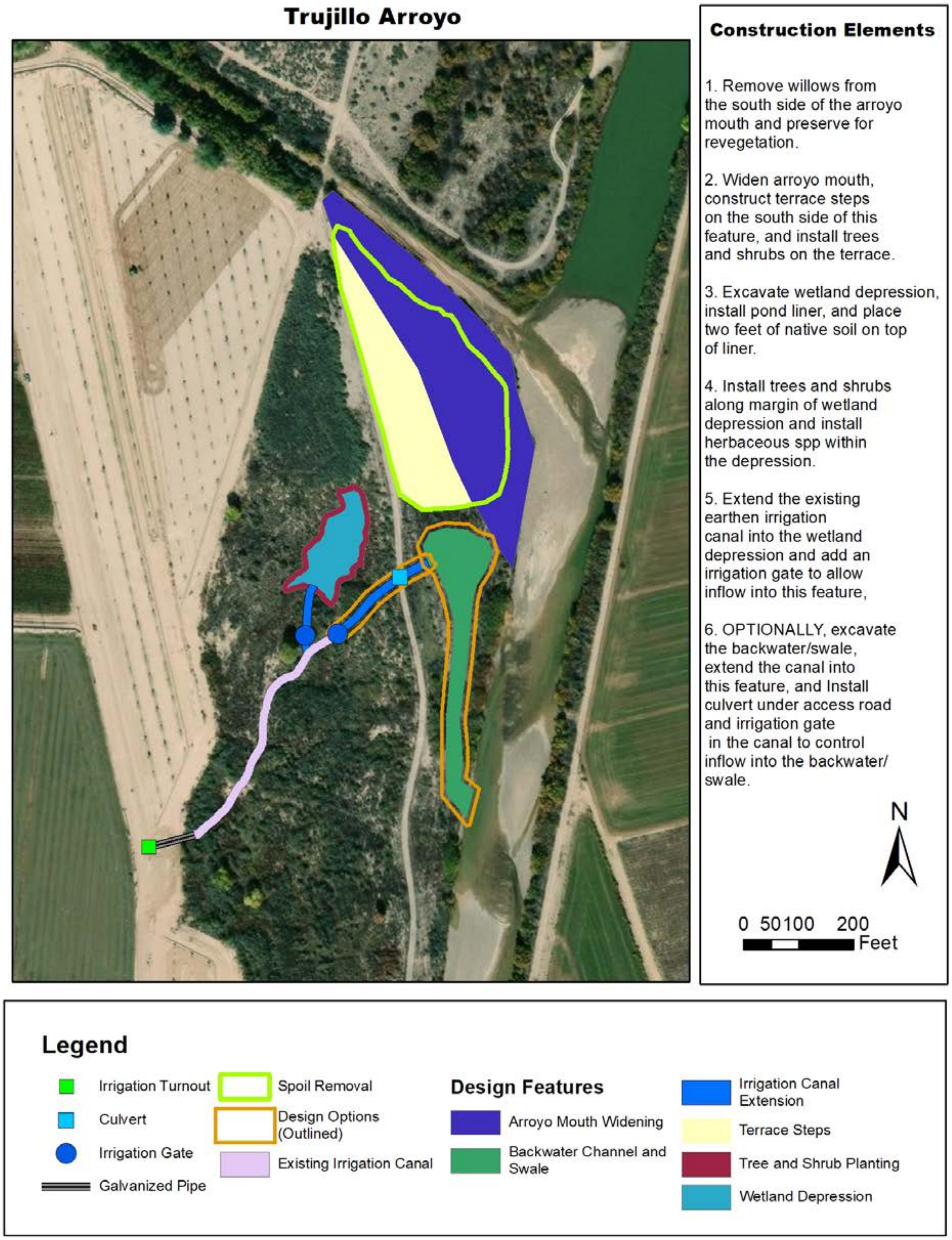



Figure 13. Schematic illustrating restoration design concepts at the Trujillo project site

## 3.2 Las Cruces Effluent Site

The Las Cruces Effluent site lies on the east side of the Rio Grande near RM 44. Interstate 10 crosses the Rio Grande near the site (**Figure 14** & **Figure 15**) and the Las Cruces wastewater treatment plant is east of the project area. The wastewater facility discharges about 8 million gallons of water per day (constant discharge of approximately 5 cfs) and effluent passes directly to the river via a concrete lined canal (**Figure 14**). Effluent creates perennial flow in this segment in the Rio Grande that often extends for 2 to 3 river miles through Mesilla Valley State Park before completely seeping into the riverbed. The site is near La Llorona Park and paved walking trails support regular recreation. Propst and Bixby (2018) provide multiple habitat restoration design alternatives that include using effluent discharge to create a new channel or oxbow lake in the east-side floodplain.

The NM State Engineer considers treated wastewater effluent discharge to the river channel as an offset for groundwater pumping by the treatment facility, and under the current groundwater permit, treated effluent derived from pumped groundwater must be returned to the river. Habitat restoration, therefore, must minimize evapotranspiration losses at the site and any proposed design would need to off-set any water depletions. A gage for measuring inflow and outflow would be recommended to quantify water usage in any habitat restoration feature (if that occurs).

**Site Assessment**

**Vegetation:** Three vegetation types were identified for this site (**Figure 15**). The east side is dominated by a bermudagrass meadow (described as open/barren on the map) with occasional planted cottonwoods situated between the levee and the recreational trail adjacent to the bankline. A small portion of this area is mostly barren (**Figure 15**) but supports patches of kochia and sand dropseed. Other occasional herbaceous species include blue grama (*Bouteloua gracilis*), feather fingergrass, silverleaf nightshade, hoary tansyaster (*Dieteria canescens*), and verrucose sea purslane (*Sesuvium verrucosum*). The bankline upstream from the effluent canal is a narrow coyote willow shrubland with some scratchgrass in the herbaceous layer. Downstream of the effluent discharge canal, the bankline is a mix of coyote willow interspersed with cattail, Johnsongrass (*Sorghum halapense*), an occasional saltcedar, spiny chlorocantha, and bermudagrass extending to the river from an adjacent meadow.

The westside floodplain (across the river from the discharge canal) is also dominated by a bermudagrass meadow (open/barren on the map), but with more alkali sacaton than the east side. Occasional saltcedar, Lehman's lovegrass, and kochia also occur. From north to south, a bermudagrass and spiny chlorocantha bankline becomes a healthy coyote willow shrubland with bermudagrass along the ground.

**Soils:** Two soil bore holes were augered at the site as indicated on **Figure 15** and **Table 3**. Soils in the top 20 inches appear unnaturally sorted near the river possibly due to previous spreading of soil along the surface, discing, etc. Groundwater was approximately 6 to 6.5 feet below the surface and ribbons of clay to clay loam were encountered 2.5 to 3.5 feet below the ground surface at both locations. Mottles became evident approximately 3.5 feet belowground. Bore Hole 1 was augered in a location that contained a variety of grass species while Bore Hole 2 was exclusively bermudagrass.

Figure 14. Representative field photos from the Las Cruces Effluent site. Top: Looking downstream across effluent discharge canal with adjacent eastside floodplain where constructed canal is proposed. Bottom left: Rio Grande downstream of the effluent canal. Bottom right: Effluent discharge canal flowing towards Rio Grande.

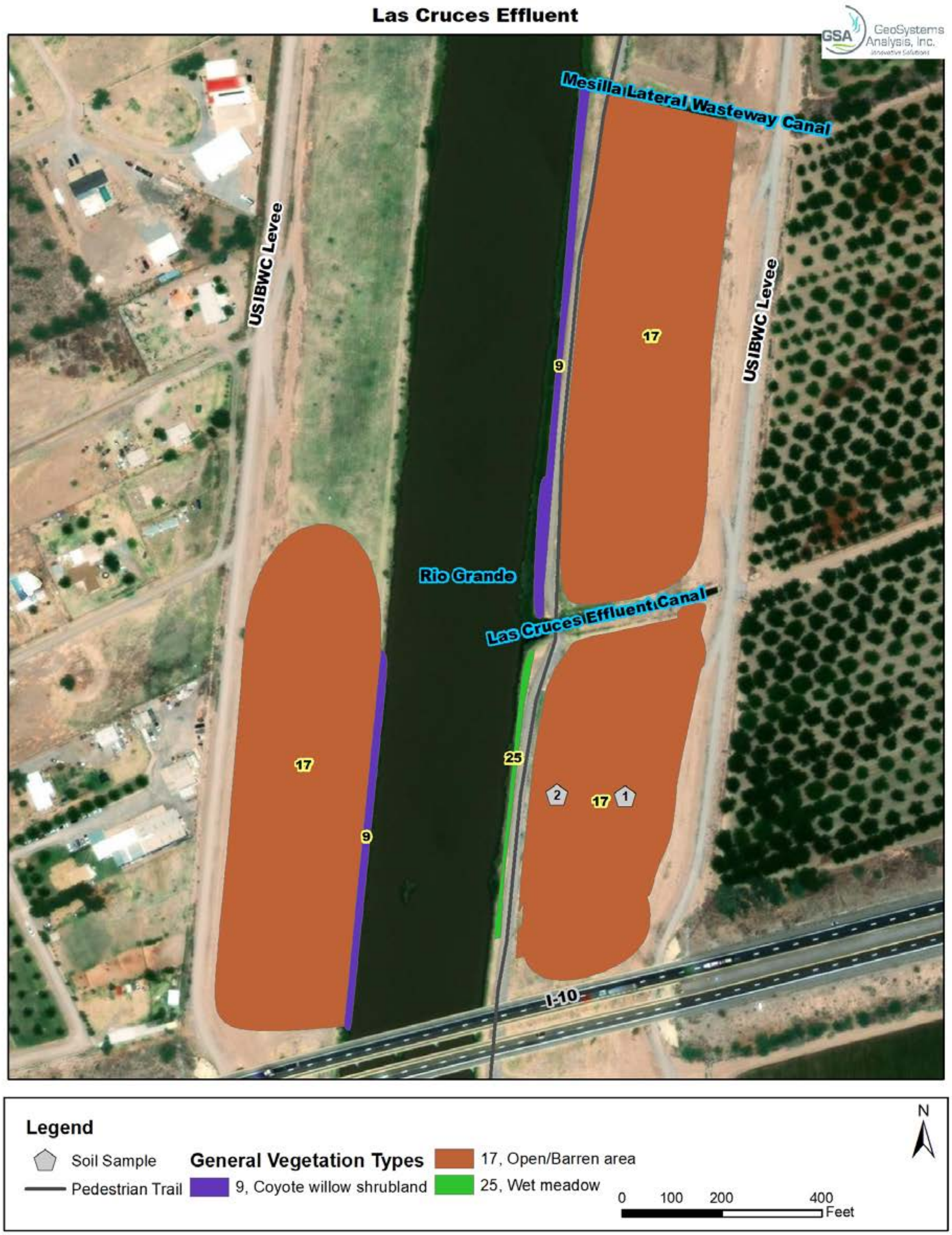



Figure 15. Las Cruces Effluent vegetation map and soil sampling locations.

Table 3. Texture and depth to groundwater observed at the Las Cruces effluent site soil sample locations.

| Bore Hole | Depth | Texture | SM | Notes |
|---|---|---|---|---|
| 1 | 0 to 4 | SaL | Slightly moist | |
| | 4 to 6 | CL | Moist | |
| | 6 to 18 | LS | Very Slightly Moist | |
| | 18 to 40 | SaL | Slightly Moist | |
| | 40 to 42 | CL | Moist | mottles distinct |
| | 42 to 70 | LS | Moist | mottles prominent |
| | 70 to 77 | SaL | Very Moist | mottles prominent |
| | 77 | GW | | |
| 2 | 0 to 12 | L | Moist | Unnaturally sorted, previously mixed? |
| | 12 to 20 | SaL | Moist | Disturbance still evident |
| | 20 to 28 | SaL | Moist | No evidence of disturbance/mixing |
| | 28 to 31 | C | Moist | |
| | 31 to 57 | Sand | Slightly moist | mottles distinct |
| | 57 to 72 | LS | Moist to very moist | mottles prominent |
| | 72 | GW | | |

**Conceptual Design**

The habitat creation concept for this site is to install a check structure off the concrete lined canal currently used to convey treated wastewater to the Rio Grande and reroute flows through a relatively long, meandering channel with diverse aquatic habitat features (**Figure 16**). These aquatic habitats would be enhanced by planting aquatic vegetation within backwaters, and riparian vegetation along the channel margins.

The channel habitat would emphasize variable conditions to support a diversity of native fish species. Springhead habitat at the channel source could provide habitat for the regionally extirpated Mexican tetra (*Astyanax mexicanus*). Large, deep, and structurally complex pools would potentially support large-bodied species such as gizzard shad, bluegill, and largemouth bass (*Micropterus salmoides*). Both bluegills and largemouth bass construct shallow-depression nests in clean substrates near shore in moderately deep water. The primary small-bodied species occupying pool habitats would be fathead minnow and western mosquitofish. With moderate velocity water in close proximity to root mass pools, it might be possible to establish a small population of another regionally extirpated species, Rio Grande chub (*Gila pandora*). Small-bodied fishes and aquatic macroinvertebrates would provide forage for large-bodied occupants of pools. Riffles and runs would provide habitat for red shiner and longnose dace (*Rhinichthys cataractae*). Although recently documented in the region, longnose dace is extremely rare. Channel catfish would mainly inhabit moderate velocity runs but would move into riffles and pools to feed. Rio Grande chub need rapid velocity riffles with gravel substrates for spawning. Insectivorous longnose dace would occur mainly in riffles but occasionally move into slower-velocity runs.

The principal conceptual design elements for this project site includes:

- Creating a meandering side channel with variable substrate and flow characteristics,
- Installing a check structure and gate within the Las Cruces Effluent Canal to control inflows into the constructed side channel,
- Instrumenting the side channel inlet and outlet with flow volume monitoring equipment that can be used to quantify water loss,
- Regrading an existing depression on the north end of the site to promote inflow and ensure water retention,
- Installing a check structure and gate in the Mesilla Lateral Wasteway canal to enable irrigation of the riparian plantings,
- Recreation improvements,
- Revegetation

Opportunities and Constraints

Because of the proposed complexity, this design feature has the potential to provide habitat for a comparatively large diversity of fish species. It also has the advantage of excluding nonnative fishes by controlling access of fishes from the river. Among the sites, it is the one where restoration of regionally extirpated species has greatest potential. If the mix of habitats includes a spring head and pool-run-riffle sequences with substrates ranging from sand through gravel and cobble, as many as eight locally extant species and two locally extirpated species might inhabit the constructed channel. Cottonwood/willow plantings and cessation of mowing at this site would benefit the southwestern willow flycatcher and yellow-billed cuckoo.

The major constraint at this site is the use of effluent water since it is not USIBWC water and the City of Las Cruces' groundwater permit uses the surface water discharge as offset; water rights would need to be obtained. Per comments at the project scoping meeting, the Las Cruces mayor pro tem supports the idea of using effluent to create a meandering channel and has offered water rights to offset potential ET losses in the channel (EBID and USIBWC, personal communication during the scoping meeting). A local citizens group has proposed a wetland at this site in honor of the late author Charles Bowden. There are no ownership constraints at this site. USIBWC owns the floodplain in the proposed project area and the NM Department of Transportation has a license from USIBWC for the Interstate 10 bridge. The City of Las Cruces has a license from USIBWC for the concrete outfall canal.

The material quantity, unit price determinations, and detailed cost estimates are provided in **Table 7, Table 8**, and **Table 9**, pages 53, 54, and 55, respectively.

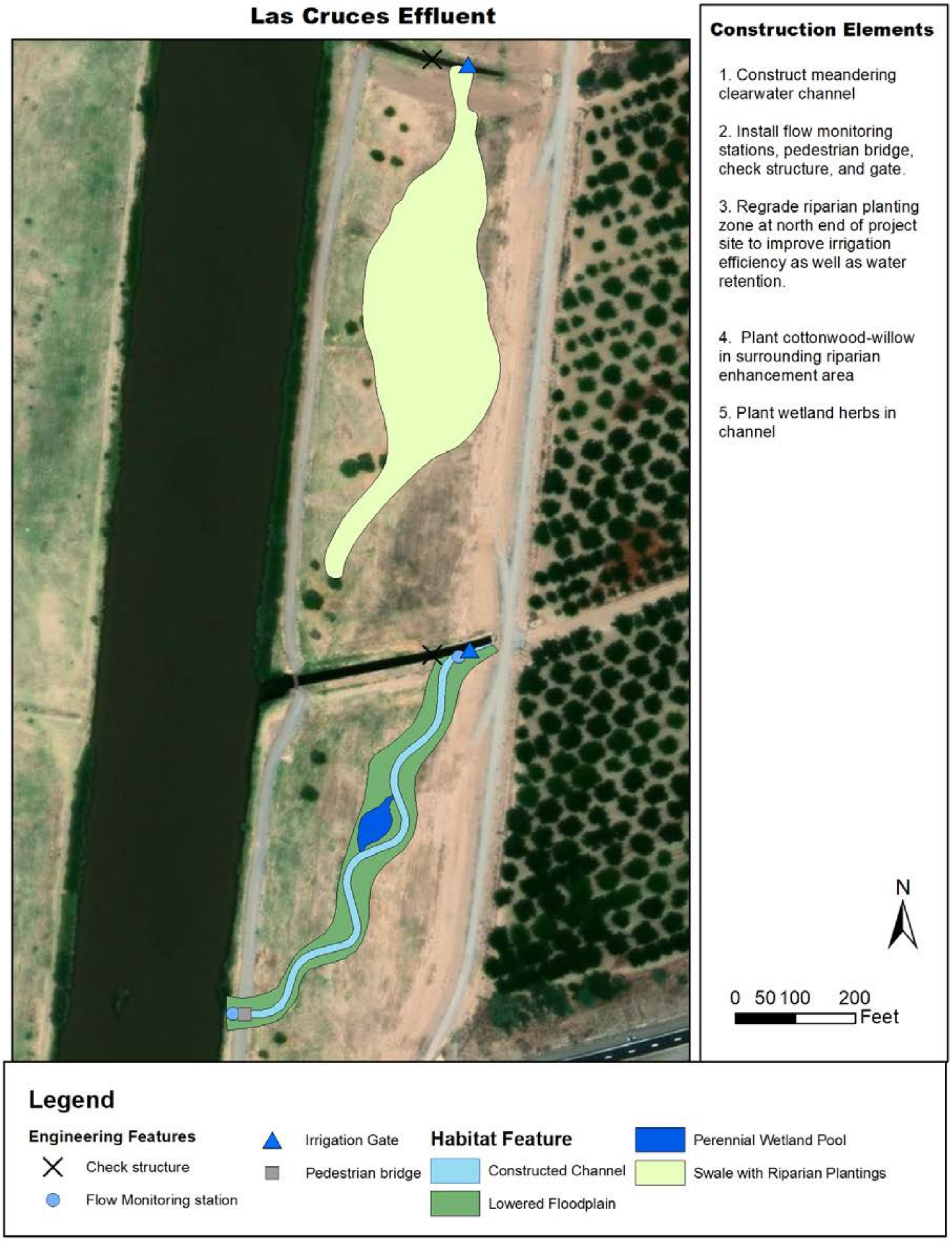



Figure 16. Las Cruces Effluent Site 90% engineering design.

## 3.3 Mesilla Valley Bosque State Park

Mesilla Valley Bosque State Park (MVBSP), near RM 41, was established in 2005 (Blue Earth 2008). The Park is located on the west side of the Rio Grande near the Town of Mesilla, NM and has been the focal point for other restoration efforts over the past two decades. For example, the Picacho Wetland project was constructed by the Southwest Environmental Center (SWEC), the City of Las Cruces, EBID, and other partners between 2002 and 2005 on a 55-acre tract of land within the Park managed by the New Mexico Department of Game and Fish (NMDGF) (Blue Earth 2008). That project involved excavating two ponds to create aquatic/wetland habitat along the Picacho Drain. A 3-acre pond was excavated to a depth of 8 feet with hopes that it would contain perennial surface water to provide year-round aquatic habitat for a variety of species. The deeper pond contains two trenches that connect with the Picacho Drain which allows water to flow between the ponds, the drain, and the Rio Grande. A shallower, adjoining 2-acre pond connects with the deep pond via a culvert and fills when flows in the river are high, thus functioning as a seasonally flooded meadow. Due to a combination of lower groundwater conditions and sedimentation, the “perennial" pond no longer holds water during droughts and both ponds are being invaded by cattail (**Figure 17**).

MVBSP provides opportunities for wildlife viewing, recreation, community gatherings, and education. Since the Picacho Wetland Project, numerous other efforts have been completed to revegetate MVBSP with native plant species, enhance wetlands via a mitigation project, and remove saltcedar. Several entities own property within and immediately adjacent to this site, including USIBWC, USFWS, Elephant Butte Irrigation District (EBID), New Mexico State Parks (NMSP), NMDGF, and private owners. There is also a current ownership dispute between NMDGF and NMSP. Picacho Drain is located near the entrance by the Visitor Center and EBID owns the land on either side of the drain. The EBID right of way includes a 50-foot buffer in each direction from the center of the drain (EBID and USIBWC personal communication). USIBWC owns most of the land between Picacho Drain and the Rio Grande except for isolated private land inholdings. NMSP and NMDGF own the land from Picacho Drain to the upland transition (away from the river).

EBID rarely maintains Picacho Drain. It is currently overgrown with cattail and beaver dams frequently interrupt its conveyance efficiency. There is a potential for aquatic/riparian/wetland habitat creation; however, it is crucial that the drain continues to convey irrigation return flows and stormwater back to the river. River flows are perennial through most of the state park due to effluent released from the Las Cruces wastewater treatment facility. Even when the Rio Grande dries, groundwater often surfaces in the drain.

Multiple restoration options for this site were proposed by Propst and Bixby (2018), as well as in an older Resource Management Plan (RMP, Blue Earth 2008). Potential alternatives presented in those reports include deepening existing resaca pool habitats, side channel creation, backwater excavation, and modifications to Picacho Drain. Additional design concepts were shared by EBID and USIBWC during a February 2019 site visit and the recommendations voiced during that meeting are the design concepts largely included in this report.

Figure 17. Representative field photos from the Mesilla Valley Bosque State Park site. Top left: Picacho Drain looking downstream from USIBWC levee. Top right: lower (wetter) resaca pond nearly entirely dry. Bottom: site conditions near proposed channel.

**Site Assessment**

**Vegetation:** Twelve different vegetation types are described for the site as indicated in **Figure 18**. Two large grasslands/wet meadows (described as open/barren areas on the map) occur north of the Visitor Center. The grassland on the east side is dominated by alkali sacaton, with over 80% grass cover and low (5-10%) woody species cover, mostly Jimmyweed and wolfberry. A berm divides the alkali sacaton grassland from a saltgrass meadow adjacent to Picacho Drain. The berm includes a narrow Mojave Seablite and kochia dominated strip, with some wolfberry and saltgrass. The saltgrass meadow is 80-90% saltgrass with occasional alkali sacaton, globemallow, yerba mansa (*Anemopsis californica*); planted honey mesquite, screwbean mesquite, saltbush and wolfberry, with an occasional saltcedar. A band of saltcedar with occasional seep willow line the Picacho Drain west of the saltgrass meadow.

South of the Visitor Center is a diverse mosaic of different vegetation types. A nearly contiguous narrow band of vigorous coyote willow shrubland occur on the bank line and occasionally also includes saltcedar. A previous wetland mitigation area has matured into a flourishing wet meadow dominated by scratchgrass mixed with common threesquare, arctic rush (*Juncus arcticus*), occasional cattail and yerba mansa. Previously excavated resaca ponds are shown as open water on the map in **Figure 19**. The ponds contained large pools of open water during the November 2018 site visit that had dried by our January 2019 site visit. The large triangular area adjacent to the river alternates between a saltgrass meadow, and weedy kochia areas (described as open/barren areas), improving in saltgrass cover in the northern portions, where it is planted with cottonwood and Gooding's willow east of the wetland mitigation area.

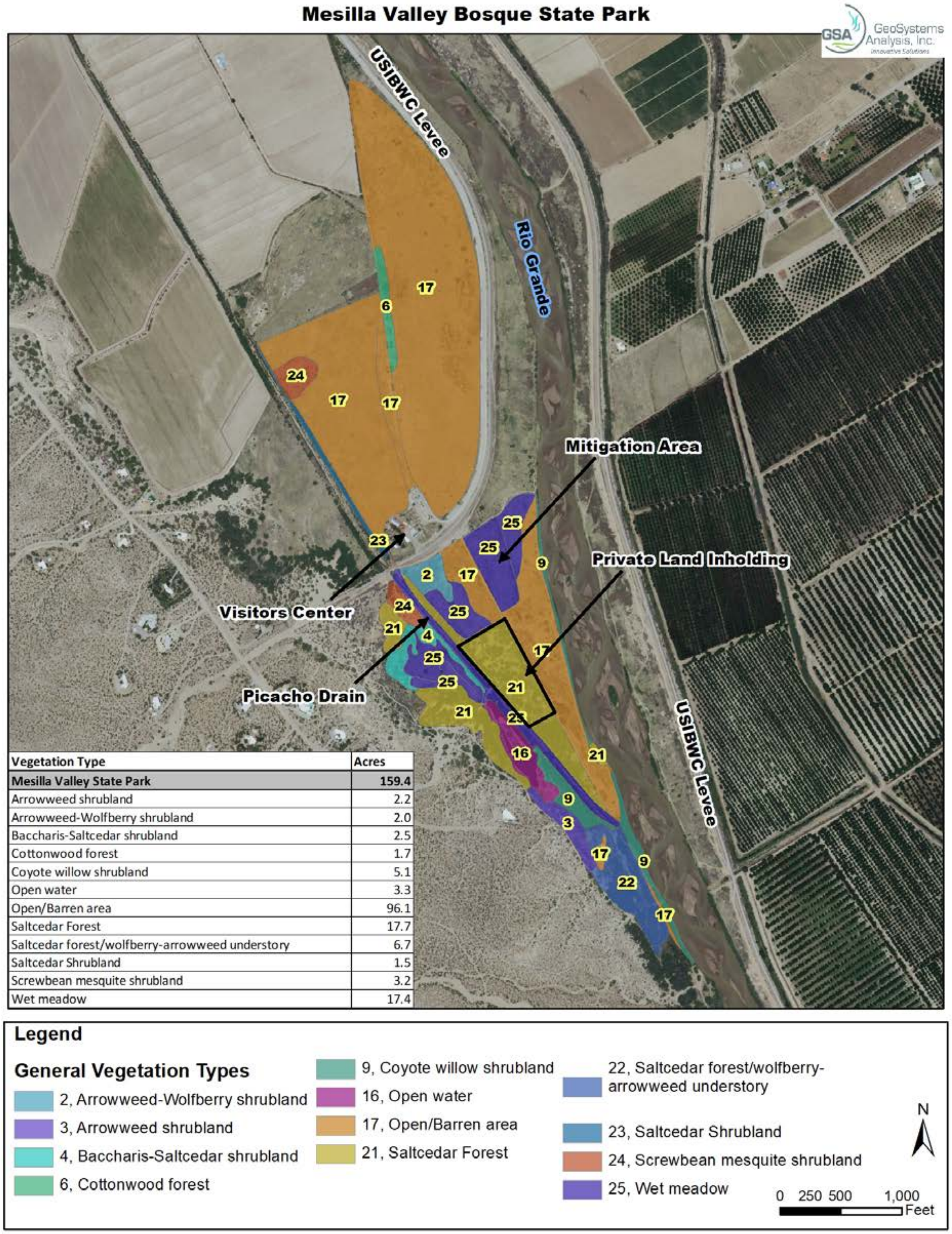
The Bosque Ecosystem Monitoring Program (BEMP) has established a monitoring site between the wetland mitigation area and the Picacho Drain. The BEMP area includes a mix of a saltgrass meadow, patches of arrowweed and wolfberry, and a weedy area dominated by Kochia. An untreated saltcedar forest (which remains on a private land inholding) lies south of the BEMP site. The Picacho Drain interior is dense cattail, with occasional seep willow and arrowweed on the drain slopes. The west side of Picacho Drain (between the drain and the upland) is a large treated saltcedar area recolonizing as a large saltgrass meadow with milkweed, sedge, milkweed and a few scattered planted cottonwood and Gooding's willows. The edges of that zone have a mix of seep willow, wolfberry, arrowweed and saltcedar with kochia and saltgrass in the herbaceous layer. South of the wetland meadow are the previously excavated resaca ponds, primarily dry during the January site visit (see **Figure 19** for a detailed map of the resaca ponds). Vegetated portions of the ponds have filled with cattail and occasional common threesquare and sedge on the pond margins. A single pampas grass (*Cortaderia sellonana*), listed by the NM Department of Agriculture (NMDA) as a watch list species, was observed on the berm above the Picacho Drain adjacent to the open water portion of the resaca pond.

Untreated saltcedar remains to the west of the resaca ponds and co-dominates this portion of the site with arrowweed. In this portion of the site, saltcedar and arrowweed transition into wolfberry, honey mesquite and skunkbush sumac as elevation increases. Herbaceous species include mountain pepperweed, fringed twinevine, sacred thorn-apple (*Datura wrightii*), tansymustard and London rocket. South of the resaca ponds is a large coyote willow stand, followed by a mix of saltcedar, wolfberry, arrowweed with some Gooding's willow, honey mesquite and screwbean mesquite south of where Picacho Drain confluences with the river. Herbaceous species in this area include spike dropseed, kochia, silverleaf nightshade.

**Soils:** A total of four soil bore holes were augered in the constructed resaca ponds, three in the south pond and one in the north pond as indicated in **Figure 19** and **Table 4**. Soil sampling locations in the south pond were intentionally placed in locations with little to no vegetation growth that appeared to be inundated during much of the year. Depth to groundwater ranged from 13 to 20 inches on the day of the site assessment; however, groundwater remained at the surface in a portion of the pond while other portions of the pond the groundwater would have been deeper than 20 inches. Fine sediment has accumulated on the soil surface in the upper 7 to 11 inches at all sites, possibly a result of fines suspended from water entering the ponds via Picacho Drain or overflow from nearby arroyos during storm events.

Table 4. Soil texture and depth to groundwater observed at Mesilla Valley State Park site.

| Bore Hole | Depth | Texture | Soil Moisture | Notes |
|---|---|---|---|---|
| 1 | 0 to 11 | SiCL | Moist | South pond |
| | 11 to 20 | Sand | Very moist | |
| | 20 | GW | | |
| 2 | 0 to 8 | SiCL | Moist | South pond |
| | 8 to 19 | Sand | Very moist | |
| | 19 | GW | | |
| 3 | 0 to 10 | CL | Very moist | South pond |
| | 10 to 13 | Sand | Very moist | |
| | 13 | GW | | |
| 4 | 0 to 7 | SiCL | Slightly moist | North pond |
| | 7 to 47 | LS | Slightly moist to saturated | |
| | 47 | GW | | |




| Vegetation Type | Acres |
|---|---|
| **Mesilla Valley State Park** | **159.4** |
| Arrowweed shrubland | 2.2 |
| Arrowweed-Wolfberry shrubland | 2.0 |
| Baccharis-Saltcedar shrubland | 2.5 |
| Cottonwood forest | 1.7 |
| Coyote willow shrubland | 5.1 |
| Open water | 3.3 |
| Open/Barren area | 96.1 |
| Saltcedar Forest | 17.7 |
| Saltcedar forest/wolfberry-arrowweed understory | 6.7 |
| Saltcedar Shrubland | 1.5 |
| Screwbean mesquite shrubland | 3.2 |
| Wet meadow | 17.4 |

Figure 18. Mesilla Valley Bosque State Park vegetation map.

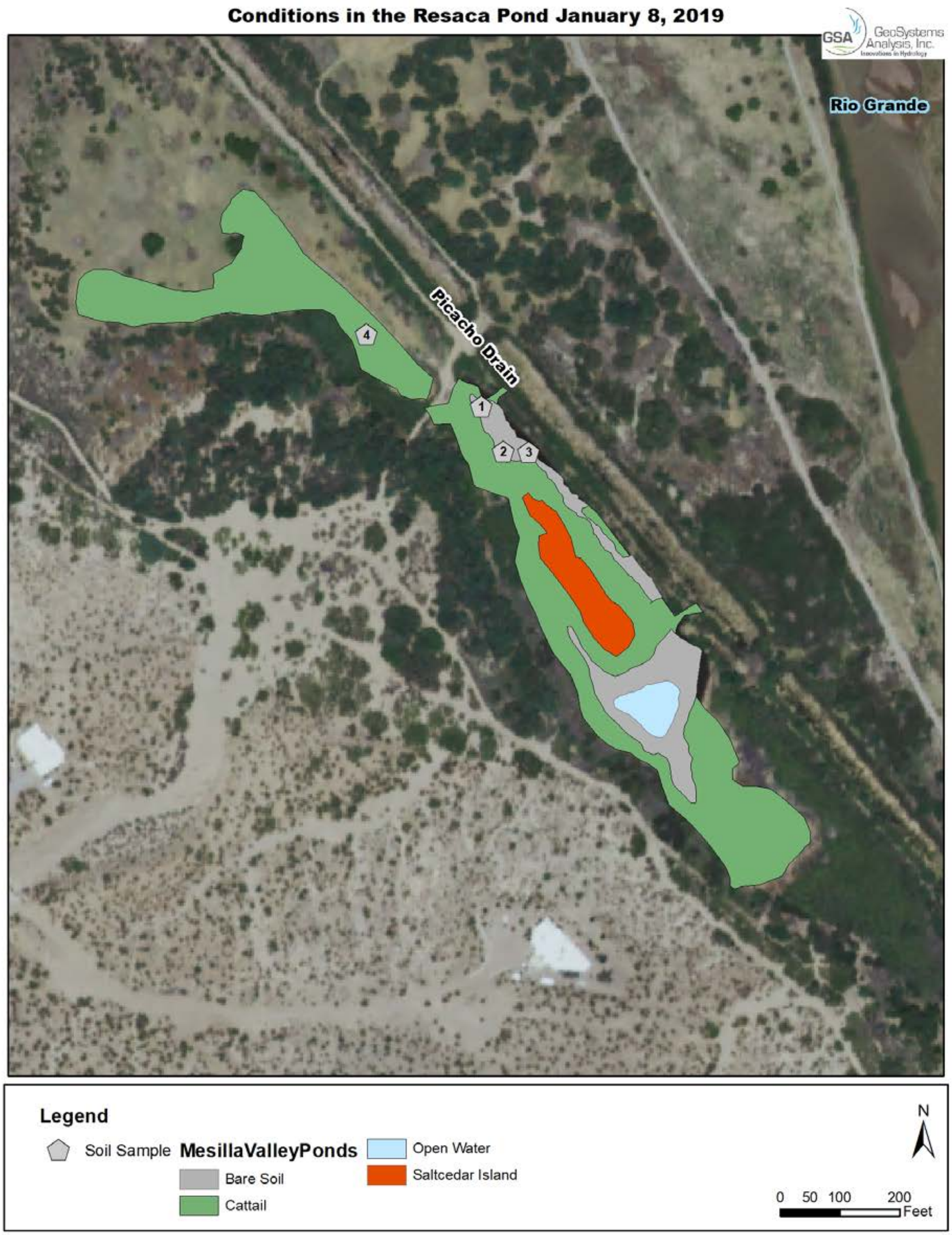



Figure 19. Map showing the condition of the resaca ponds during our January site visit.

**Conceptual Design**
The conceptual design for this project site includes a diversity of habitat features. The first proposed feature is an excavated side channel off of the Picacho Drain to enhance both riparian and aquatic habitat (**Figure 20**). Several shallow depressions (swales) would be excavated along the length of this channel and densely planted with coyote willow, cottonwood and Gooding's willow. The channel would be intentionally situated to provide water to new and existing riparian plantings plus improve hydrologic connection to existing wetland mitigation site (**Figure 20**). A constructed backwater channel will splice off this side channel to diversify the aquatic habitat, create variable flow conditions, and promote water temperature heterogeneity. Aquatic habitat in Picacho Drain would also be enhanced by controlling cattails that currently dominate the drain and constructing a series of stepped terraces along the eastern edge of the drain that would be inundated under a range of discharges (**Figure 20**). EBID has already completed the initial phase of the cattail removal and side slope terracing. The water in the Picacho Drain would be from two principal sources, high flows from the Rio Grande and storm water during summer monsoon flows.

The restoration designs emphasize habitat features for a wide variety of native fish species. The channel will begin to inundate as a backwater off the Rio Grande at relatively low flows (e.g., 200 cfs). Among large-bodied fishes, river carpsucker, and channel catfish could potentially persist in constructed channel/enhanced drain habitats. In addition, bluegill and largemouth bass currently occupy the resaca and would benefit from habitat improvements. Longnose gar inhabits low-velocity rivers and oxbow lakes and prey on co-occurring fishes while river carpsucker is generally more common in water of somewhat greater velocity where it moves about feeding on bottom organic matter. Western mosquitofish and fathead minnow would occur in both drain and constructed channel habitats. Red shiner would mainly occur in the constructed channel when it had water.

The principal conceptual design elements at this site includes:

- Widen and terrace the side slopes of Picacho Drain (already underway/completed),
- Create a side channel off Picacho Drain into the floodplain interior,
- Construct a backwater spur off the constructed side channel,
- Create a new wet meadow near the terminus of the side channel,
- Excavate cattail in Picacho Drain and the resaca ponds (already underway/completed),
- Install new irrigation check structure in Picacho Drain in order to route irrigation water to the restoration area and improve hydrologic connection to the wetland mitigation areas,
- Install a pedestrian bridge over the Picacho Drain,
- Improve trails, wildlife viewing, and recreation enhancements,
- Revegetate with a diverse suite of native, site-adapted plant species.

<u>Opportunities and Constraints</u>
This proposed project will provide a diverse mix of habitats and consequently would be able to support a comparatively diverse fish assemblage. Groundwater seepage maintains near permanent surface water in portions of the drain.

This conceptual design option has the potential to create interior floodplain and side channel habitats that are rare to nonexistent in the RGCP. We expect these features could become refuge habitats for numerous species. Proposed elements also integrate with previous restoration actions at the Park plus assist with controlling sediment deposition from tributary arroyos in the Park to prevent sedimentation of aquatic and wetland habitats while maintaining delivery of precipitation runoff to the Park and the Rio Grande. Habitat for native wetland- and riparian-dependent wildlife, including southwestern willow flycatcher and yellow-billed cuckoo will be improved.

A segment of private land between Picacho Drain and the Rio Grande complicates habitat restoration design and implementation and could hinder restoration efforts if landowner permission is not obtained. To mitigate potential property owner complexities, excavated habitat improvements are situated outside of the private land. Picacho Drain must be maintained for agricultural return flow and floodwater protection; thus, proposed designs must ensure the facility is accessible for periodic maintenance and comply with EBID policy.

The material quantity, unit price determinations, and detailed cost estimates are provided in **Table 7, Table 8**, and **Table 9**, on pages 53, 54, and 55, respectively.

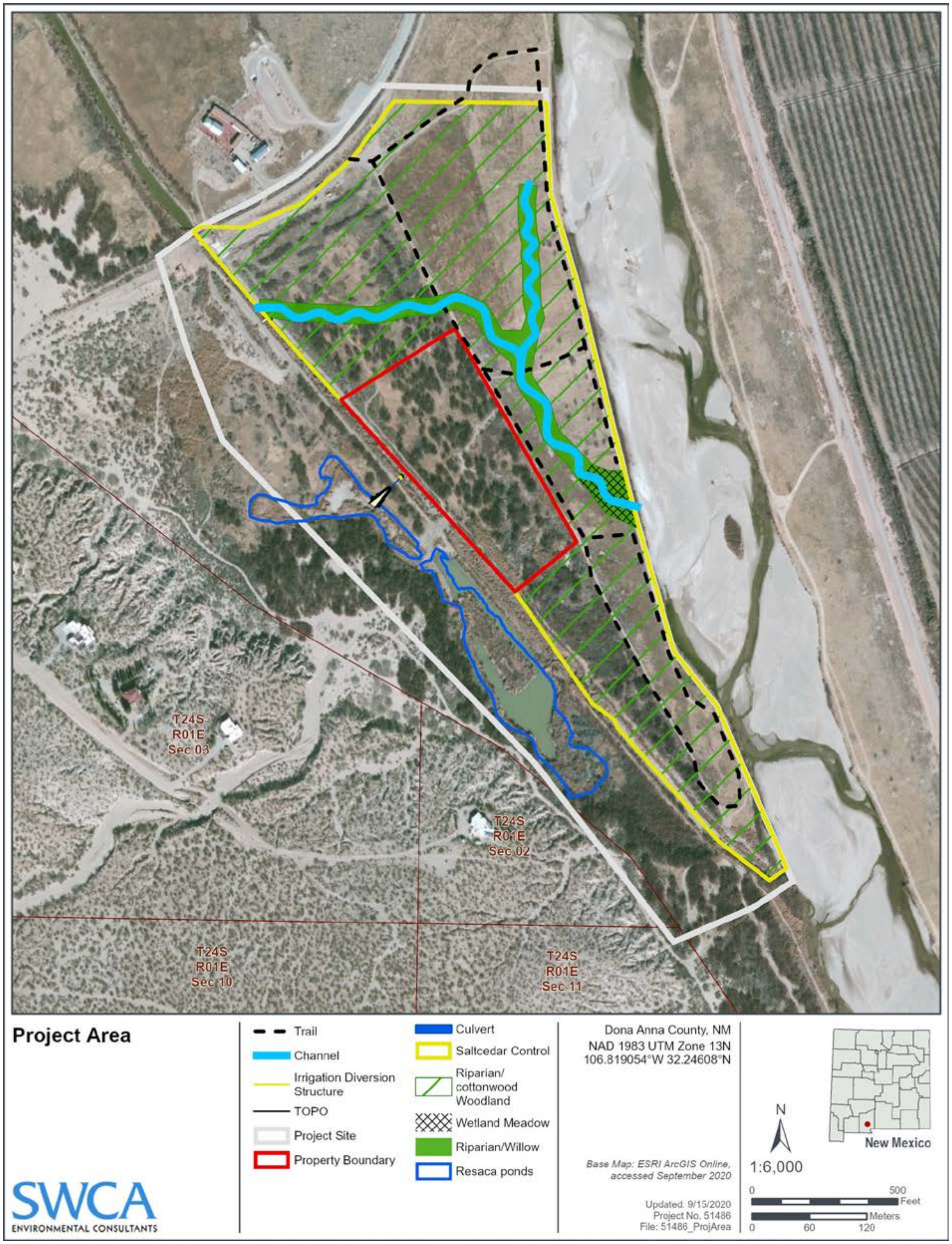



Figure 20. Mesilla Valley State Park conceptual design.

## 3.4 Montoya Intercepting Drain

The Montoya Intercepting Drain (MID) is a 3.4-mile long drainage canal that parallels the Rio Grande on the north-east side of the river in Sunland Park, NM. The MID was constructed by the USIBWC to drain waterlogged agricultural land (Andrea Glover, IBWC Engineer, personal communication July 13, 2020). EBID owns the upper 1.9-miles and the lower 1.5 miles is owned by USIBWC (USIBWC 1986). Despite the division of ownership, EBID is responsible for maintaining the entire 3.4-mile MID length, and they use the water captured by the drain to meet Rio Grande Project delivery obligations to the State of Texas (Z. Libbin, EBID, personal communication July 10, 2020).

The 1.5-mile MID segment owned by USIBWC extends from the MID intersection with the Montoya Lateral Branch C Wasteway 37 (Montoya C Wasteway) to the Montoya Drain adjacent to the El Paso Electric power plant. According to EBID, the MID is perennially wet and water depths are relatively constant, other than periodic discharge pulses from the Montoya C Wasteway (Z. Libbin, EBID, personal communication July 10, 2020). All three MID segments are choked with cattails, and these cattails along with a dysfunctional culvert at the terminus of Segment 3 hamper efficient drainage of MID water to the Montoya Drain.

**Site Assessment**

On July 8, 2020 GSA performed a site assessment of the MID between the Montoya C Wasteway and the Montoya Drain. The site assessment focused primarily on vegetation mapping and reconnaissance-level topographic assessments of the MID and associated infrastructure (i.e., culverts, weirs, etc.). The objective was to use these data to inform opportunities and constraints for aquatic habitat enhancements along the 1.5-mile section of MID owned by USIBWC. To aid discussion we divide this 1.5-mile section into three half-mile segments: Segment 1 extends from the Montoya C Wasteway to Sunland Park Road; Segment 2 extends from Sunland Park Road to Racetrack Road; Segment 3 extends from Racetrack Road to the Montoya Drain. Representative photographs of the site are provided in **Figure 21**.

**Vegetation:** Vegetation mapping followed the Hink & Ohmart (1984) community and structure-type nomenclature described previously. Mapping at the MID site resulted in delineation of 36 map units ranging between less than 0.5-acres to just over 3-acres in size. Marsh Habitat (MH) dominated by southern cattail (*Typha domingensis*) and hardstem bulrush (*Schoenoplectus acutus)* occupied the MID canal along all three MID segments (**Figure 22**). Dense stands of saltcedar (*T. chinensis*) dominated the north/east side of the MID along most of its length. Vegetation types along the south/west side of the MID were more variable, and included patches dominated by combinations of saltcedar, four-wing saltbush (*A. canescens*), Jimmyweed (*I. pluriflora*), baccharis (*B. salicifolia*), and native grasses (inland saltgrass and alkali sacaton). Other noteworthy native species observed included Mojave seabite (*Suaeda moquinii*), screwbean mesquite (*P. pubescens*), Arizona centaury (*Zeltnera calycosa*) and milkweed (*Asclepias subverticiata*). Notable non-native herbaceous species observed included kochia, Bermuda grass (*C. dactylon*), and prickly lettuce (*Lactuca serriola*).

a. Photo from approximate levee toe looking upstream

b. Dense saltcedar lines the entire north bankline of the MID

c. Looking north from the levee toe through the cattail to the saltcedar on the opposite MID bankline.

d. Small pockets of open water are found close to the culverts where water levels are relatively deep.

Figure 21. Representative photographs of the Montoya Intercepting Drain site

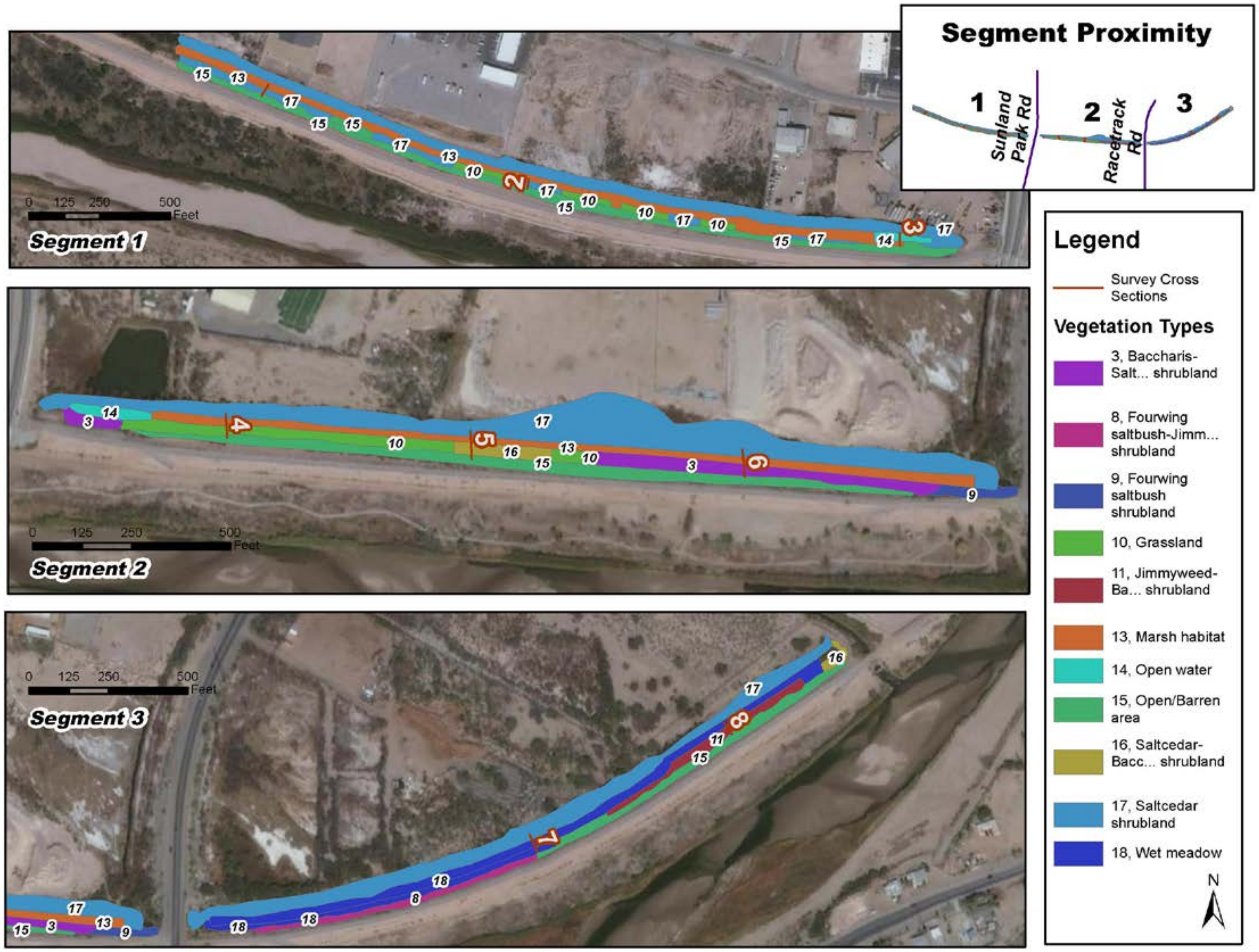



Figure 22. Vegetation community types growing along different segments of the Montoya Intercepting Drain

**MID Geometry**: Eight topographic cross-sections were established along the 1.5-mile length of the MID using a Real-Time Kinematic (RTK) global positioning system (GPS). The cross-section locations displayed in **Figures 23 thru 30**. A GPS point was recorded approximately every two feet along each cross-section line. Due to access constraints on the north side of the irrigation drain, the start of each cross-section (i.e., the 0-meter mark along the transect tape) was always on the south (levee) side of the drain. All three cross-sections in Segment 1 (**Figures 23-25**) span only to the approximate center of the MID due to poor satellite configuration, but the other five cross-sections (three in Segment 2 and two in Segment 3) span the entire MID width (**Figures 26-30**). The wetted width at the cross-sections in Segments 2 and 3 range from approximately 35-feet and 50-feet. Water depths during the July 8 site assessment averaged between approximately 2.5 and 3.5 feet in Segments 1 and 2 and between 1.0 and 2.0 feet in Segment 3. Dense saltcedar vegetation along the steep north/east bank restricted access to the north bankline terrace in all locations except at XS-7 in Segment 3 (**Figure 29**).

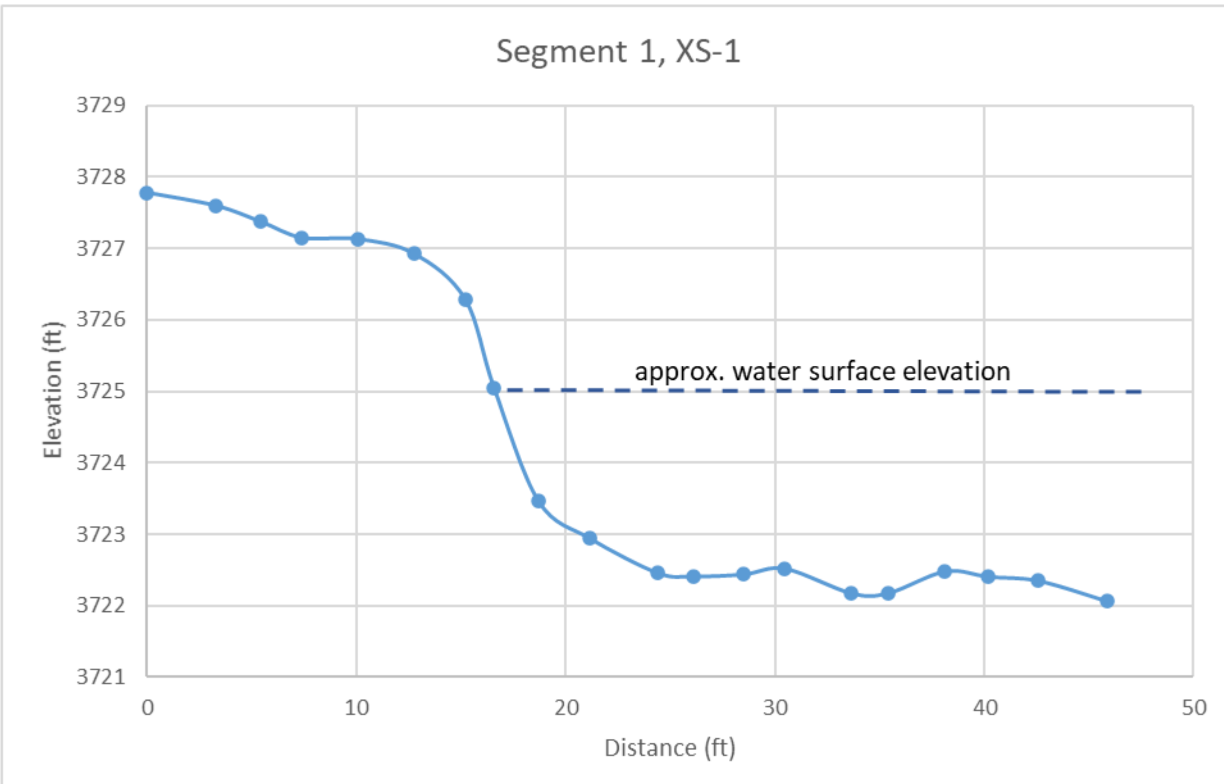



Figure 23. Elevation profile of XS-1, Segment 1. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream. Poor satellite coverage precluded extending this cross-section across the entire width of the MID.

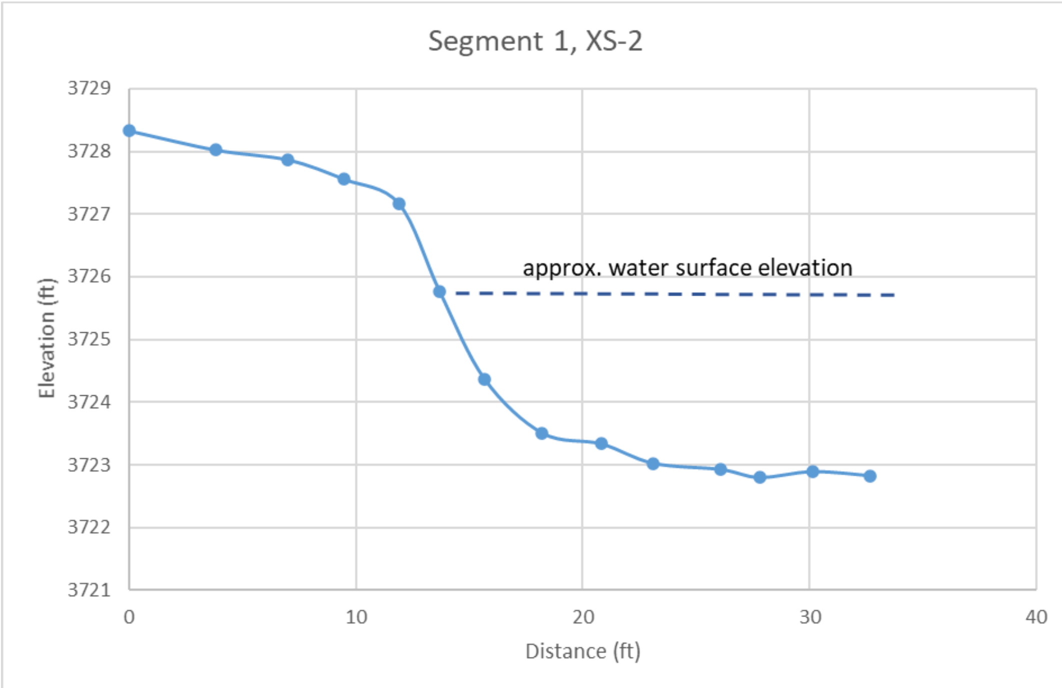



Figure 24. Elevation profile of XS-2, Segment 1. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream. Poor satellite coverage precluded extending this cross-section across the entire width of the MID.

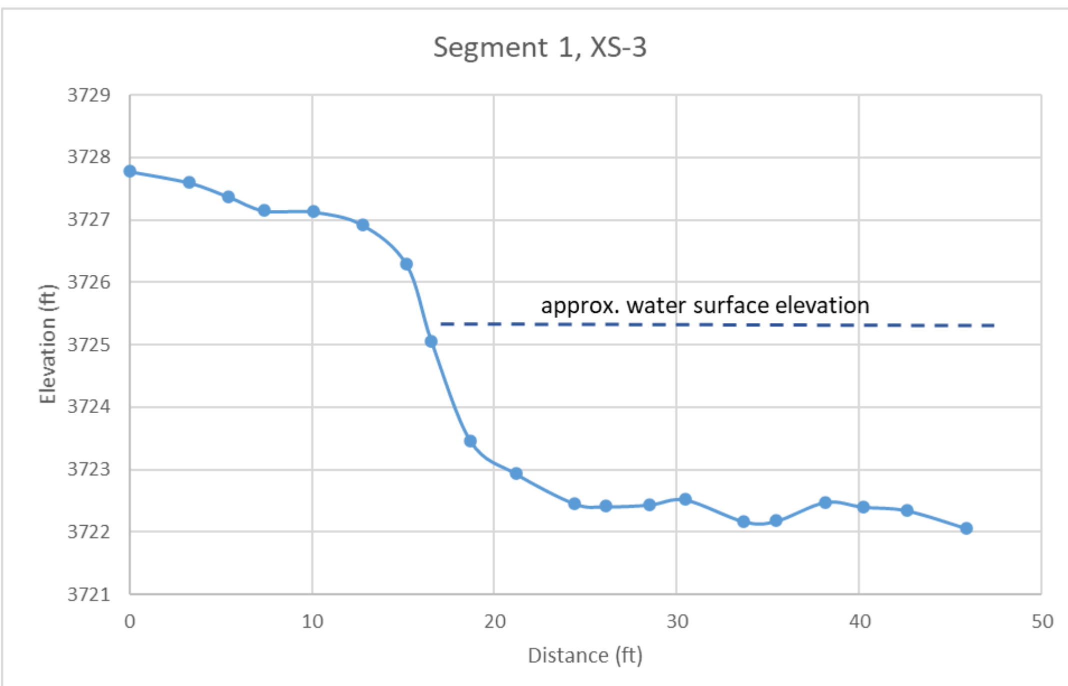



Figure 25. Elevation profile of XS-3, Segment 1. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream. Poor satellite coverage precluded extending this cross-section across the entire width of the MID.

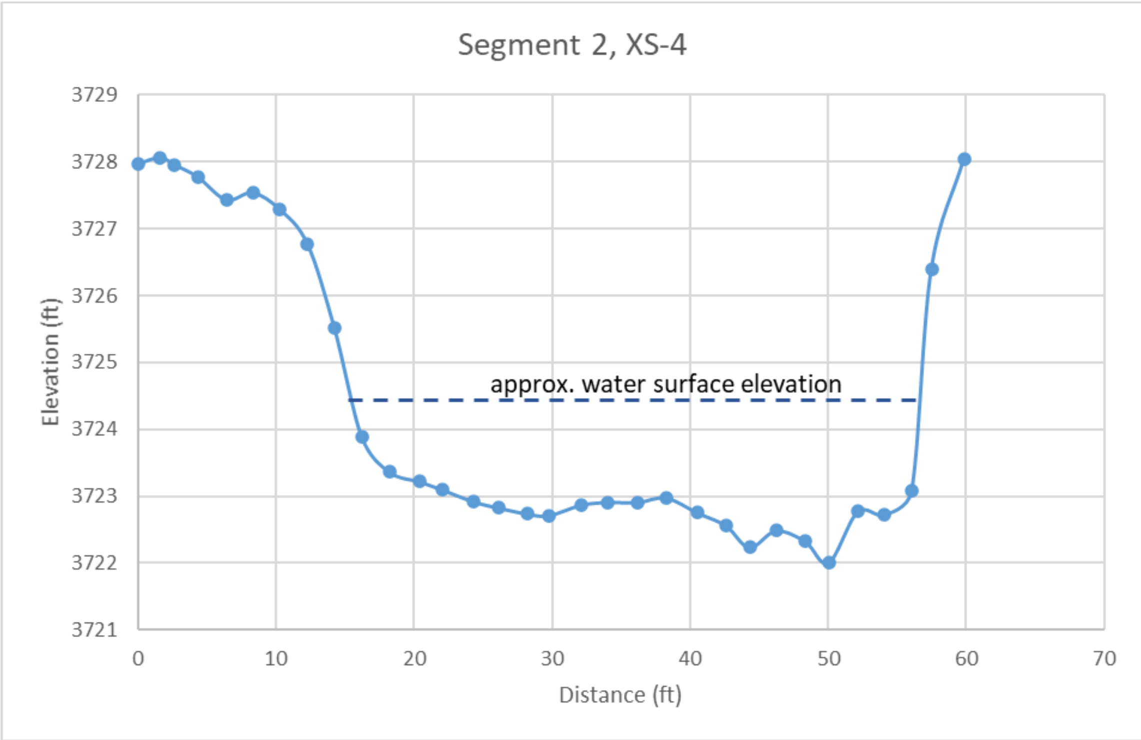



Figure 26. Elevation profile of XS-4, Segment 2. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream.

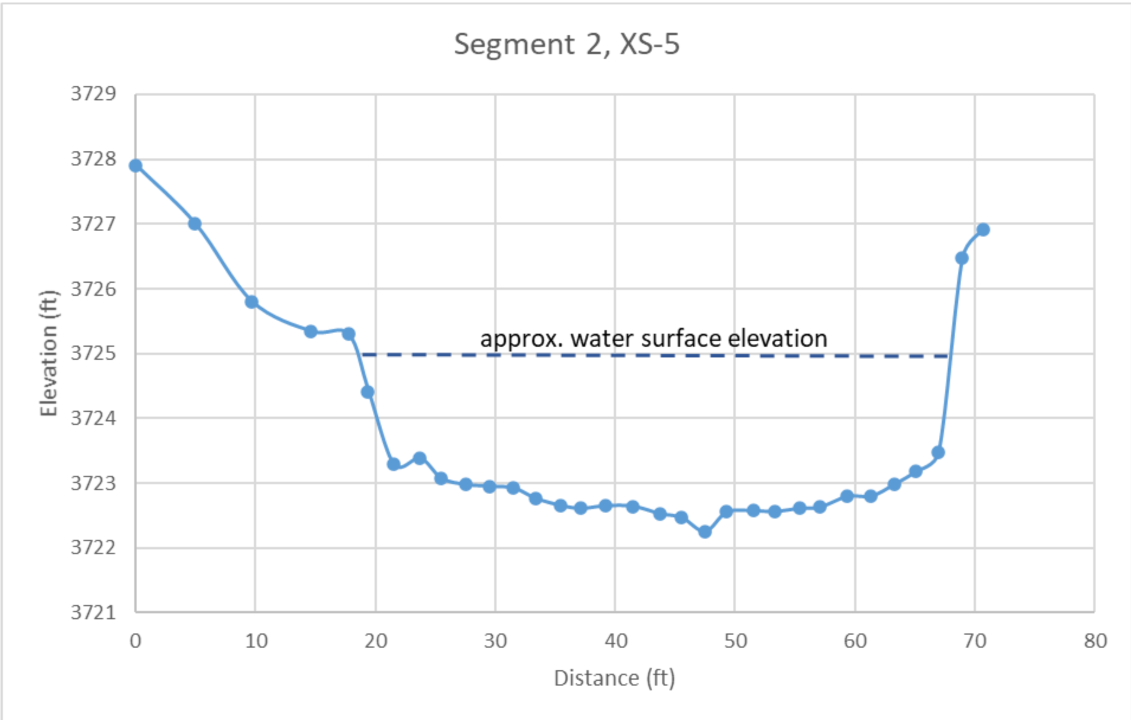



Figure 27. Elevation profile of XS-5, Segment 2. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream.

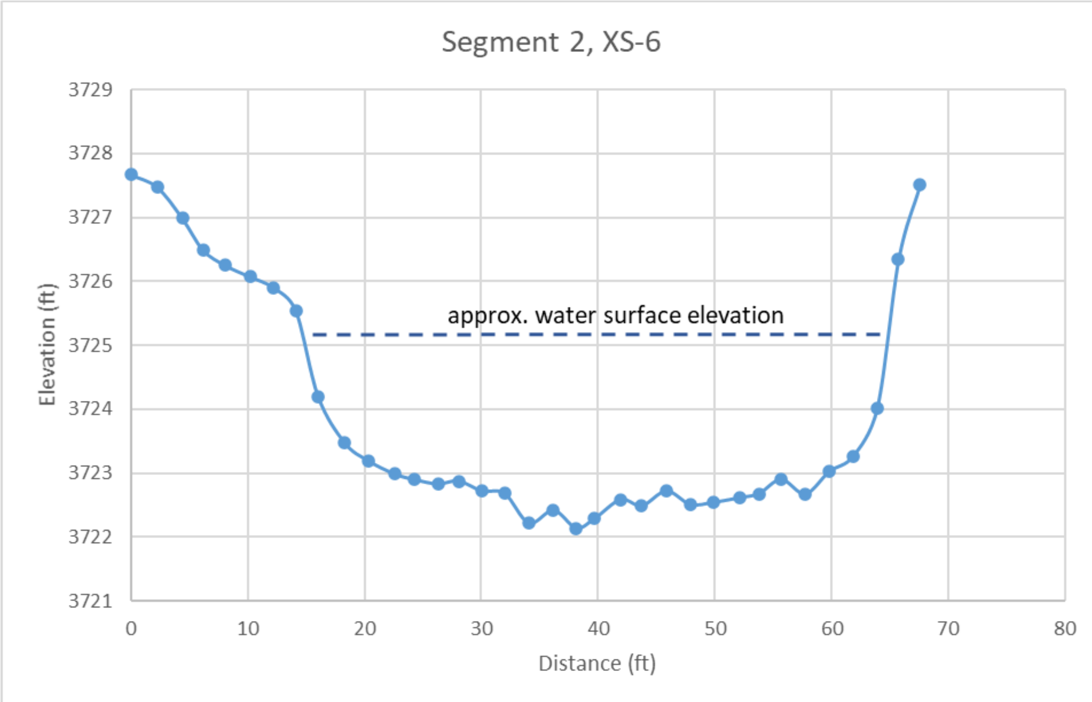



Figure 28. Elevation profile of XS-6, Segment 2. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream.

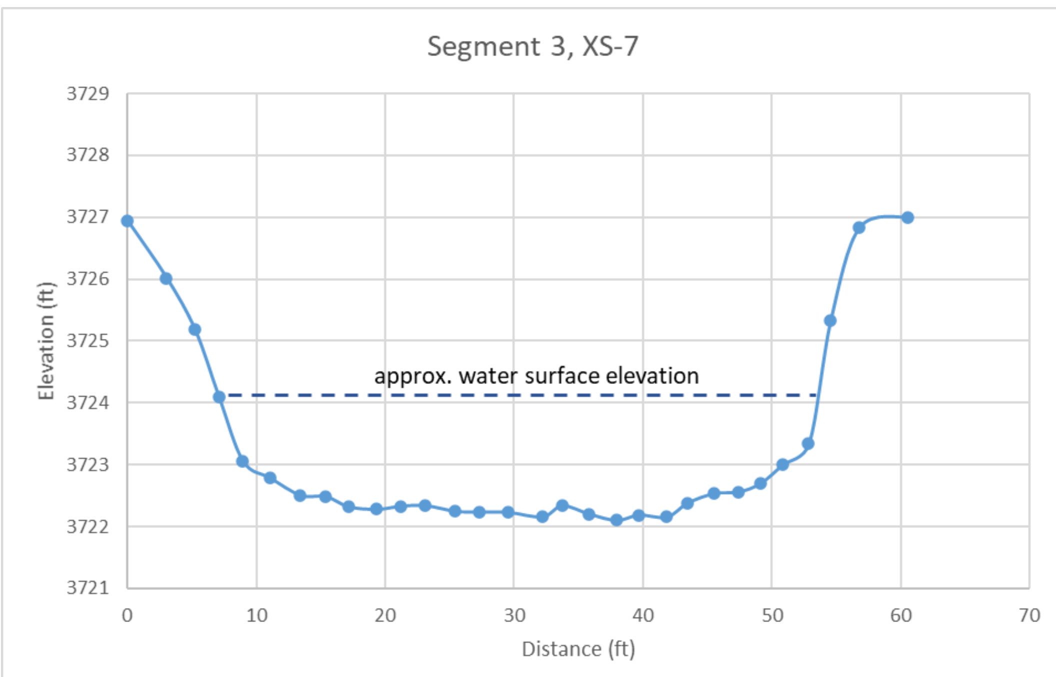



Figure 29. Elevation profile of XS-7, Segment 3. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream.

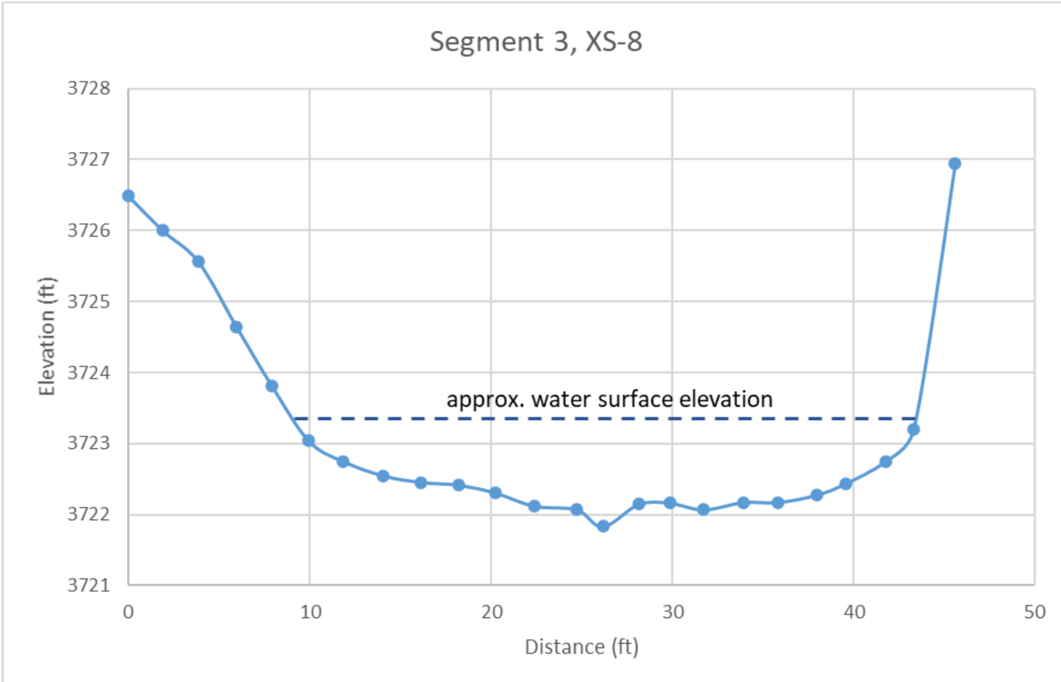



Figure 30. Elevation profile of XS-8, Segment 3 facing downstream. The distance stations displayed along the x-axis extend from left (station 0-ft) to right, facing upstream.

**Conceptual Design**

The restoration design concepts for the Montoya Intercepting Drain site focus on removing existing cattails, installing water control structures to manage new cattail infestations and improve drain water conveyance to the Montoya Drain, and implementing saltcedar removal and various levels of native revegetation along the MID north bankline (**Figure 31**).

*Cattail Management*: The conceptual design for all three segments of the MID is to remove cattail, dredge roots and dispose all plant waste material off-site. To reduce the potential for cattail re-establishment, gated water control structures would be added to the upstream end of culverts currently located under Sunland Park Road and Racetrack Road, and at the far downstream end where the MID intersects with the Montoya Drain. The gated structures would enable precise control over water levels in each segment to minimize future cattail establishment and growth. From their experience managing cattail marshes, the USFWS reports that maintaining 3-4 feet of water over the tops of new cattail shoots/leaves will effectively drown the plants (Sojda and Solberg 1993). The USFWS publication explains that seed germination and establishment of new cattail plants only occurs when the marsh substrate is dry. Given that the MID is perennially wet, the primary source of new cattail shoots would, therefore, likely originate from remnant root material in the drain bottom. Specific guidance on the duration that these 3-4 foot water levels would need to be maintained is not provided in the USFWS publication, so some level of monitoring and adaptive maintenance would be required to determine minimum duration, frequency and timing of water level management.

*Saltcedar Removal and Native Revegetation*: The MID is very narrow and is bordered on its southern flank by an engineered levee along its entire length. Vegetation density along the southern MID bankline is low, enabling easier access to implement cattail removal and periodic maintenance from the levee. On the northside of the MID, the USIBWC property boundary along Segments 1 and 2 aligns closely to the drain bankline edge (**Figure 31**). The proximity of this property boundary leaves little room to implement saltcedar removal or to physically manipulate bank heights through sloping or constructing terrace steps to support revegetation. Industrial development along the MID north bankline in Segment 1 appears to further constrain access to the north bankline. In Segment 1, therefore, no saltcedar removal or native revegetation is recommended. The only habitat rehabilitation measure would involve cattail removal and installing a water control gate at the Sunland Park Road culvert.

There is considerably less industrial infrastructure development in Segment 2 **(Figure 31**), so it may be possible to gain access permission from existing landowners along the north side of the MID in this location to perform saltcedar removal. However, the USIBWC property boundary in relation to the north MID bankline precludes lessening the bankline slope (**Figure 31**), so removing saltcedar in Segment 2 could result in failure of the steep bankline into the MID. To reduce this potential, saltcedar management techniques should involve only removing above-ground biomass and leaving existing root masses in place. Saltcedar removal can be implemented by using a long-reach excavator with a masticating head to cut saltcedar near ground level. The freshly cut stems should then be immediately treated by painting or spraying an aquatic approved herbicide formulation (e.g., Garlon 3A). Annual (i.e., once per year) herbicide treatment of saltcedar root-sprouts may be required for 2-3 consecutive years following the initial cut-stump treatment to ensure 100% mortality of the cut trees. Those treatments could be completed rapidly and efficiently in a day using a foliar imazapyr (e.g., Habitat™) herbicide treatment using backpack sprayers.

Once the above ground saltcedar biomass is removed, the narrow bankline should be planted with native vegetation capable of establishing dense root networks that can stabilize the steep bankline as the saltcedar root mass decays. *Baccharis* spp. can be planted by hand by opening a hole with a gas-powered hand auger and inserting the root material into moist soil. The plantings should be watered immediately after planting. One to two subsequent waterings are also recommended.

The greatest opportunity for native revegetation exists along the north bankline of Segment 3, where the USIBWC boundary is approximately 90-feet north of the north bankline (**Figure 31**). Once the saltcedar above-ground biomass is removed, we recommend reconstructing the north bankline to create three, 30:1 (H:V) terrace steps that would serve as revegetation zones. The lower step would be designed to rest approximately 3-feet above the surface water elevation in the drain. That lower step could be planted with coyote willow and wetland herbs. The middle step could be planted with Gooding's willow (*S. gooddingii*), baccharis and screwbean mesquite (*Prosopis pubescens*). The upper step could be planted with baccharis, palo verde (*Cercidium sp*) or other site adapted species.

<u>Opportunities and Constraints</u>: Removing existing dense cattail stands from the MID should greatly enhance potential for fish and other aquatic species to utilize the drain. Removing cattails and replacing the dysfunctional drain connection to the Montoya Drain should also vastly improve transport of MID water to the Montoya Drain. Cattails in modest quantities provide important habitat for redwing

blackbirds and waterfowl, but the existing cattail stands are so dense that they greatly limit the aquatic habitat quality of the MID. Installing gated structures in each segment should greatly assist with cattail management, while still allowing other native aquatic plant species (e.g., hardstem bulrush) to establish. Removing existing cattail biomass should increase dissolved oxygen levels for aquatic species and improve MID conveyance to the Montoya Drain. Beyond cattail removal and associated improvements to the aquatic habitat quality, the potential to diversify the riparian habitat along the MID drain banklines is constrained by the proximity of the levee to the south and the USIBWC property boundary to the north, particularly along Segments 1 and 2. However, the USIBWC property boundary in Segment 3 is slightly further north and provides opportunities for constructing bankline terrace steps and revegetation with native riparian species. Construction costs could be controlled if haul distance for disposing excavated soil and cattail/saltcedar biomass could be minimized.

For conceptual planning purposes, however, we assume all spoils are hauled to the Camino Real Landfill. Note that landfill disposal costs are listed, however, as a unique line item in case USIBWC identifies an alternative nearby location. The material quantity, unit price determinations, and detailed cost estimates are provided in **Table 7, Table 8**, and Table 9, respectively. Depending on funding, USIBWC may also consider phasing in various construction elements. Estimated excavation volume for the cattail removal/drain deepening habitat feature versus the side slope terrace features are 13,000 and 12,000 $yd^3$. respectively. Electronic GIS data delivered with this report also include the predicted excavation volume, plant material, etc. on a habitat feature by feature basis.

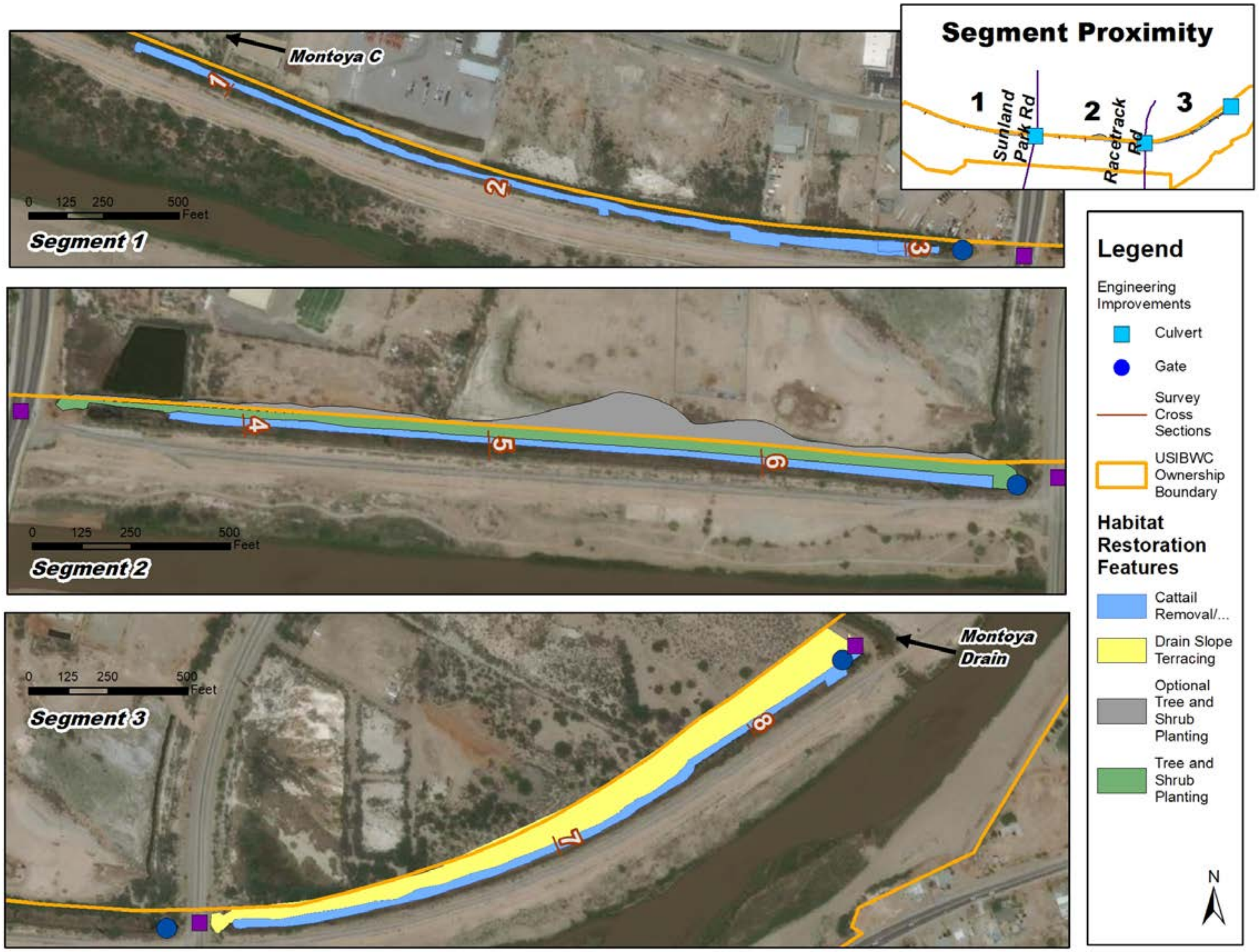



Figure 31. Schematic illustrating restoration design concepts along the three MID segments

## 3.5 Keystone Heritage Park

Keystone Heritage Park (Park, KHP) is 52-acre park in El Paso located approximately 1.5-miles directly east of the Montoya Intercepting Drain. The Park is owned by the City of El Paso and is leased to Keystone Heritage Park, LLC, who is charged with managing the Park, which includes an archeological site, a botanical garden, and a groundwater fed wetland and playa basin complex (B. Sargent, Keystone Heritage Park, personal communication, July 1, 2020).

On July 1, 2020 representatives from GSA, GSRC, SWCA and USIBWC met with KHP managers to observe the wetland and playa lake complex and discuss potential aquatic habitat enhancement opportunities and constraints. The wetland and playa lake complex cover nearly 14-acres. Water levels in the wetland and playa lakes are dependent upon seasonal fluctuations in groundwater levels and monsoon rain events. In years of above average precipitation, the entire wetland-playa complex is full of water and may overflow into surrounding upland areas. In years of below average precipitation (such as calendar year 2020), water is confined to only small portions of the wetland (**Figure 32**).

Park representatives Bernie Sargent and Mike Gaglio expressed interest in collaborating with USIBWC to enhance and diversify the playa basin complex. The playa basins at KHP are essentially void of vegetation, and previous small-scale trial revegetation efforts have been unsuccessful (M. Gaglio, personal communication). Playa basins can be particularly harsh environments for vegetation establishment and growth due to dramatic groundwater fluctuations and associated soil salinization (NMNHP 2000). While not all playa basins have extreme soil salinity, those that do may have relatively low plant species richness and cover (NMNHP 2000).

Site observations indicate the playa basins at KHP are very saline. Extensive salt crusts were visible across the playa surface during the July 1 site visit (**Figure 32**), and Park managers conveyed that limited soil sampling performed in the past documented high salinity values. However, the specific values or units were not readily available, and managers were unclear precisely where within the Park the samples were collected. Park managers also explained that limited monitoring from an existing groundwater monitoring well on Park property indicates the groundwater in the vicinity of the playa can decline to at least 10-feet below the ground surface, although no data had been collected from the well in several years.

While some habitat enhancement of the playa basins may be possible, the consensus among USIBWC, GSRC, GSA and SWCA was that considerable data would be needed to better understand site opportunities and constraints. Soil salinity and groundwater level data within the playa basins are a key data gap that should be filled. While a detailed sampling and analysis plan should be developed to guide data collection details, we preliminarily recommend three groundwater monitoring wells should be strategically installed within or along the margins of the playa basin(s). The wells should be instrumented with multi-parameter probe so that continuous water-level and chemistry data (such as salinity, TDS, and pH) can be collected. The goal would be two-fold: 1) to understand chemistry dynamics under different water level conditions, and 2) combine the water level data with existing LiDAR to develop a groundwater contour map. Similarly, soil samples should be collected along a topographic gradient within one or more playa basins and analyzed to characterize texture and salinity levels within different potential planting zones (from playa bottom to upper edge). These data sets are considered essential for determining revegetation potential and to identify other potential habitat management opportunities.

Although GSA did not return to KHP after the July 1, 2020 site visit, we have used information from previous site visits to develop a preliminary map showing vegetation conditions on the property (**Figure 33**) and plant species list (**Appendix A**).

a. Looking east across a dry playa basin towards remnant groundwater wetland with cattail and hardstem bulrush.

b. Looking north at dry playa basin

c. Salt crusts on the ground surface along the margin of the receding groundwater

Figure 32. Representative photographs of playa basins at Keystone Heritage Park

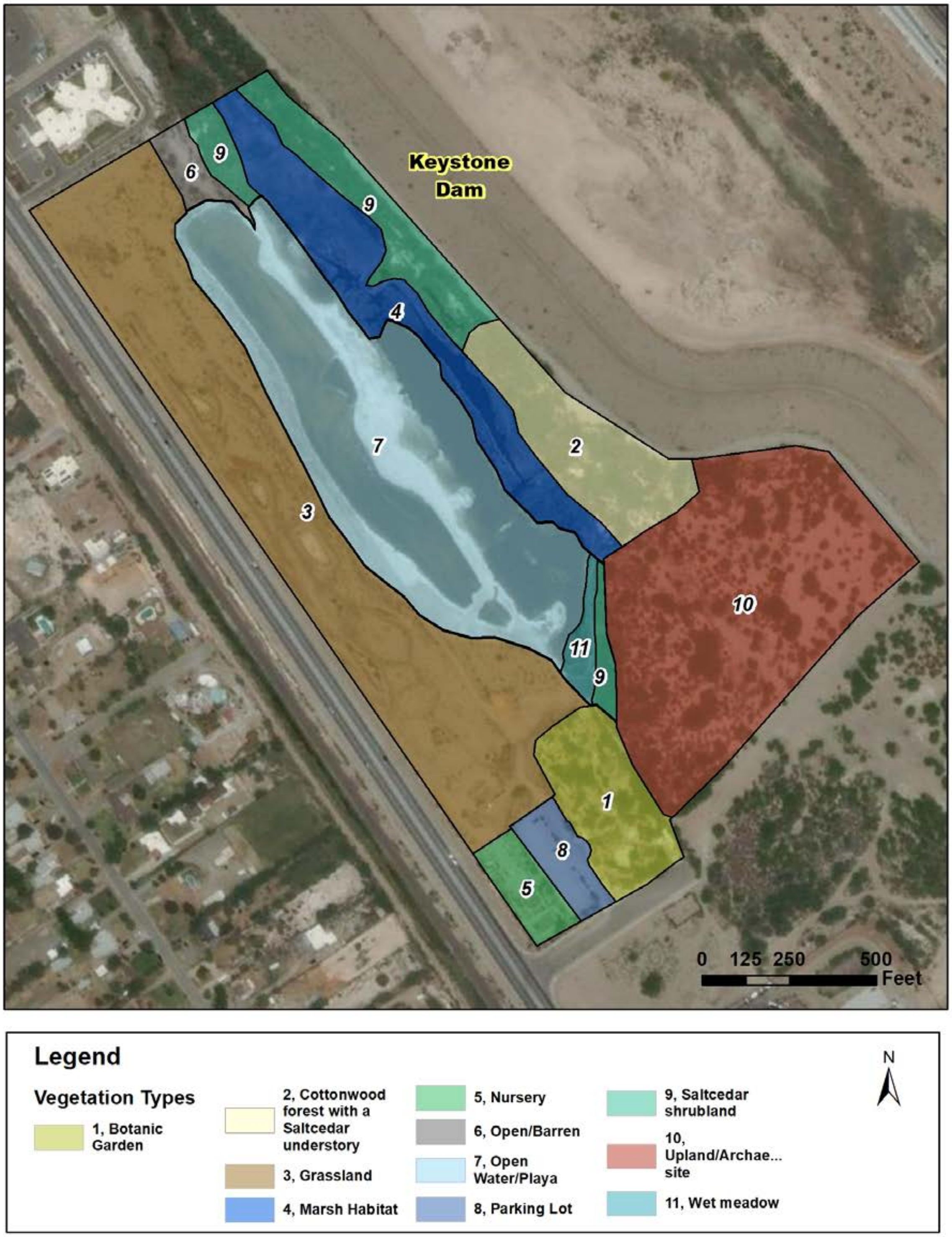



Figure 33. Current vegetation map of the Keystone Heritage Park.

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## 4.0 ESTIMATED CONSTRUCTION QUANTITIES, CONSUMPTIVE WATER USE, AND COSTS

Implementation costs were determined for each project by assessing unit costs for various restoration activities from similar sized projects in the Rio Grande watershed. The basic method for determining construction quantities for major restoration activities is described in **Table 5**. Consumptive water use was quantified for each restoration project with an identical method as USACE 2009 and summary results are shown in **Table 6**.

Table 5. Summary of process used to determine quantities for various restoration activities. Note that future maintenance costs are not predicted as part of this report but recommended during engineering phase of this project.

| **Activity** | **Notes** |
|---|---|
| ***All costs only include predicted initial construction costs. Operational and maintenance costs not included in this table or otherwise in this report.*** | |
| Earthwork (cu yds) | Quantities based on analysis that combines HEC-RAS derived water surface elevations at target discharges, target discharges discussed in this report, and 2011 LiDAR based elevation (where available). Supporting GIS shapefiles include the average estimated excavation depth and estimated quantity for each feature at MID and Trujillo. Note that Trujillo earthwork quantities assume existing spoil pile is moved prior to habitat enhancement. MID quantity includes dredging the intercepting drain 2 feet on average after cattail aboveground biomass is removed. Unit costs based on recently completed projects for the USIBWC in Dona Ana County, New Mexico. |
| Offsite haul and disposal | Costs based on regional cost estimates and predicted haul distance to offsite location, per preliminary offsite spoil location preferences expressed by USIBWC. |
| Landfill disposal | Disposal fees per nearby landfill rates. Camino Real landfill (near MID site) standard dump fees per cubic yard. Las Cruces landfill disposal rates are significantly lower than Camino Real. Alternative disposal options may be preferable. |
| Contingencies | Contingencies include uncertain construction elements that may become necessary, predicted to include, mobilization/admin/SWPPP, care of water and pumping, dust control, wheel wash, concrete pour-outs, stockpiling, and other potential uncertain costs that may come up during engineering. Calculated at 7% of the total construction cost. |

| Activity | Notes |
|---|---|
| Woody Vegetation Installation | For MVBSP and LCE, units/quantities calculated by SWCA during previous engineering design creation but additional material was added for the LCE northern swale. Costs include 24-month warranty, supplemental watering, beaver/wildlife screens. |
| Recreation Improvements | Cost for pedestrian bridge includes Conspan prefabricated pedestrian bridge with a larger span that is 1.4min. bankfull, and load bearing for small maintenance equip to drive across. Effluent site includes asphalt path repaving to realign bridge to appropriate width for side channel, includes crusher fine trail and signs to designate pathways and minimize recreation disturbance to habitat areas. MVBSP recreation improvements currently unspecified but expected to include trail enhancement and a pedestrian bridge. |
| Site Controls (silt fence, traffic control, construction fencing and public signs) | Effluent traffic control assumes signs and wheel wash at turn out. Costs do not include potential special permit requirements (signs, shoulder closure, labor to maintain safe access) at the turn-out lane and access from W. Picacho Ave. |
| Miscellaneous Hydraulic Engineering Elements (Check Structures, Culverts, Gates, Diversions, Riprap, Liner) | At MVBSP EBID offered to pay/install these elements: new gate structures (2), riprap at new pedestrian bridge/irrigation embankments, new culvert to improve augmenting wetlands west of Picacho Drain, maintenance road improvements, and improved permanent access locations for sediment cleanout. At LCE costs include installation of a new gate, plus other hydraulic engineering features that may be recommended during engineering design. At Trujillo, costs include EPDM liner at $2-3/sq ft, wetland depression area is about 12,000 sq ft, and optionally, a 12’’ culvert and radial gate to control irrigation flow. New gates and culvert are included at MID. |
| Grass Seeding | Assumes retired spoil areas and staging areas would be targeted for seeding. Unit costs for upland versus riparian seeding are $1800 and $5420, respectively. |
| Flow monitoring | Costs are from supplier quote for equipment and installation. LCE costs include flume structure under pedestrian bridge, and solar power continuous meter acoustic SonTek IQ, with data logger, and mount/cage to protect the equipment from vandalism. |
| Exotic Species Control (ac) | Cost includes exotic phreatophyte removal plus clearing and grubbing (as required). |

Table 6. Consumptive water use by site under existing condition, after restoration activities, and the predicted change.

| Site | Pre-Restoration (ac-ft/yr) | Post-Restoration (ac-ft/yr) | Difference (ac-ft/yr) |
|---|---|---|---|
| Trujillo | 77.5 | 85.0 | 7.7 |
| Las Cruces Effluent | 43.9 | 53.7 | 8.8 |
| Mesilla Valley Bosque State Park | 491.8 | 502.0 | 10.2 |
| Montoya Intercepting Drain | 84.5 | 93.2 | 8.7 |

Planting rates recommended in this report are intended to achieve specific cover goals by 10 years after revegetation. Electronic GIS data created in support of this report include the recommended tree, shrub, willow whip, and herbaceous wetland plug planting rate for each map feature. In summary, specific plant installation density classes (low, moderate, and high) were used to recommend plant quantities as shown in **Table 7**.

Table 7. Plant installation quantities, classes, and cover goals.

| | Tree Poles | | Potted Shrubs | | Willow Whips | | Herbaceous Wetland Plugs | |
|---|---|---|---|---|---|---|---|---|
| Density | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate | Cover Goal Increase | Per Acre Planting Rate |
| Low | 10% | 8 | 10% | 100 | 10% | 250 | 10% | 200 |
| Mod | 25% | 20 | 25% | 375 | 25% | 700 | 25% | 500 |
| High | 50% | 40 | 50% | 750 | 50% | 1400 | 50% | 1000 |

Since the extent to which ephemeral habitats will be used by and of value to riverine fish and other aquatic species, among many factors, will depend on duration of inundation; the designs in this report intend to provide prolonged wetting of the floodplain whenever possible. Among the sites considered, two (Las Cruces Effluent and Mesilla Valley Bosque State Park) will provide perennial habitats while all others will provide habitats mainly during irrigation season elevated flows. As summarized in **Table 8**, the projects proposed in this report are predicted to benefit fish species in varying degrees. The projects also range significantly in cost, size, potential benefits to southwestern willow flycatcher and yellow-billed cuckoo, and numerous additional factors. A detailed description of our preliminary cost estimate for constructing the sites as indicated in the conceptual designs within this report is shown in **Table 9**.

The complexity with estimating cost at this stage of the project also varies by site, so contingencies were added to cover potential additional costs that might arise during subsequent project design and engineering phases.

Table 8. Site alternatives summary including acreage, site proximity, ownership, total estimated costs, benefits to important fish and wildlife including southwestern willow flycatcher (WiFL) and yellow-billed cuckoo (YBCU).

| Site Name | River Mile and Bank | Proximity | Total Acres | Aquatic Features (excludes riparian enhancement) | Acres of Newly Constructed Aquatic Features | ET difference (ac-ft/yr) | Ownership | Estimated Restoration Cost | Direct Benefits to WiFL/YBCU |
|---|---|---|---|---|---|---|---|---|---|
| Trujillo Arroyo | | Arrey, NM | 20.2 | Arroyo widening, backwater, swale, channel extensions, wetland depression | 3.8 (which includes optional features) | 7.7 | USIBWC | $628,808 (which includes optional features) | Yes |
| Las Cruces Effluent | 44 E | Las Cruces, NM | 17.6 | Channel and wetlands | 3.4 | 8.8 | USIBWC | $424,785 | Yes |
| Mesilla Valley Bosque State Park | 41 W | Mesilla, NM | 159.9 | Backwater channel, wet meadow, drain terracing, cattail control, riparian woodlands | 3.9 (which excludes EBID aquatic improvements in Picacho Drain) | 10.2 | USIBWC, EBID, NM State Parks, private | $1,072,033 | Yes |
| Montoya Intercepting Drain | 2 E | Sunland Park, NM | 21.1 | Cattail control, drain widening and deepening | 8.0 | 8.7 | USIBWC | $1,189,174 | Yes |

Table 9. Detailed Cost Table.

| | Las Cruces Effluent | Mesilla Valley Bosque State Park | Trujillo Arroyo | Montoya Intercepting Drain |
|---|---|---|---|---|
| **Earthwork Onsite Disposal (cu yds)** | | | | |
| *Unit Cost* | *$9* | *$9* | *$9* | *$9* |
| *Units (cu yd)* | 1,041 | 12,765 | 54,750 | 0 |
| *Total Cost* | *$9,365* | *$114,885* | *$492,750* | *$0* |
| **Earthwork and Offsite Haul (cu yds)** | | | | |
| *Unit Cost* | *$15* | *$15* | *$15* | *$15* |
| *Units (cu yd)* | 3,659 | 17,518 | 0 | 25,372 |
| *Total Cost* | *$54,885* | *$262,770* | *$0* | *$380,580* |
| **Landfill Disposal (cu yds)** | | | | |
| *Unit Cost* | *$4* | *$4* | *$10* | *$24* |
| *Units (cu yd)* | 3,659 | 0 | 0 | 25,372 |
| *Total Cost* | *$14,636* | *$0* | *$0* | *$596,242* |
| **Contingencies** | | | | |
| *Unit Cost* | *7% construction costs* | | | |
| *Units (misc)* | 0 | 1 | 1 | 1 |
| *Total Cost* | $27,505 | $67,978 | $40,614 | $76,292 |
| **Unspecified Riparian/Wetland Revegetation** | | | | |
| *Unit Cost* | *LS* | *LS* | *$0* | *$0* |
| *Units (poles)* | 0 | LS | Detailed below | Detailed below |
| *Total Cost* | *$75,000* | *$286,000* | *$0* | *$0* |
| **Cottonwood/Willow Trees** | | | | |
| *Unit Cost* | - | | *$60* | *$60* |
| *Units (poles)* | 0 | 0 | 53 | 182 |
| *Total Cost* | *$0* | *$0* | *$3,180* | *$10,920* |
| **Potted Riparian Shrubs** | | | | |
| *Unit Cost* | - | | *$25* | *$25* |
| *Units (shrubs)* | 0 | 0 | 504 | 1,670 |
| *Total Cost* | *$0* | *$0* | *$12,600* | *$41,750* |
| **Wetland Plugs** | | | | |
| *Unit Cost* | - | | *$ 2.50* | *$ 2.50* |
| *Units (plugs)* | 0 | 0 | 250 | 2,000 |
| *Total Cost* | *$ -* | *$ -* | *$ 625.00* | *$ 5,000.00* |
| **Willow Whips** | | | | |
| *Unit Cost* | - | | *$6* | *$6* |

| | Las Cruces Effluent | Mesilla Valley Bosque State Park | Trujillo Arroyo | Montoya Intercepting Drain |
|---|---|---|---|---|
| *Units (whips)* | 0 | 0 | 1,540 | 1,540 |
| *Total Cost* | *$0* | *$0* | *$9,240* | *$9,240* |
| **Grass Seeding** | | | | |
| *Unit Cost* | *LS* | | *$1,800* | *$1,800* |
| *Units (acres)* | 0 | LS | 1 | 1 |
| *Total Cost* | *$17,934* | *$36,015* | *$1,800* | *$1,800* |
| **Flow Monitoring** | | | | |
| *Unit Cost* | *LS* | *$0* | *$0* | *$0* |
| *Units (station)* | 0 | 0 | 0 | 0 |
| *Total Cost* | *$15,000* | *$0* | *$0* | *$0* |
| **Recreation Improvements (earthen trails, crusher fine, bridges, signage, misc)** | | | | |
| *Unit Cost* | *LS* | *$75,000* | *$0* | *$0* |
| *Units (bridge)* | *0* | *LS* | *0* | *0* |
| *Total Cost* | *$91,110* | *$75,000* | *$0* | *$0* |
| **Misc Hydraulic Engineering Elements (Check Structures, Culverts, Gates, Diversions, Riprap, Liner)** | | | | |
| *Unit Cost* | *$15,000* | *$46,450* | *$60,000* | *$30,000* |
| *Units (facility)* | *LS* | *LS* | *LS* | *LS* |
| *Total Cost* | *$15,000* | *$46,450* | *$60,000* | *$30,000* |
| **Site Controls (silt fence, traffic control, fencing)** | | | | |
| *Unit Cost* | | | *$5,000* | *$5,000* |
| *Units (facility)* | *0* | *LS* | *LS* | *LS* |
| *Total Cost* | *$4,350* | *$4,435* | *$5,000* | *$5,000* |
| **Misc Aquatic Habitat Improvements (riffle gravel, rock, boulder, log, J hook)** | | | | |
| *Unit Cost* | | | *$0* | *$0* |
| *Units (facility)* | *0* | *LS* | *LS* | *LS* |
| *Total Cost* | *$100,000* | *$150,000* | *$0* | *$0* |
| **Cattail Control (ac)** | | | | |
| *Unit Cost* | - | | *$3,500* | *$3,500* |
| *Units (acres)* | *0.0* | *0.0* | *0.0* | *4.1* |
| *Total Cost* | *$0* | *$0* | *$0* | *$14,350* |
| **Exotic Woody Species Control (ac)** | | | | |
| *Unit Cost* | - | $3,000 | $3,000 | $3,000 |
| *Units (acres)* | 0.0 | 9.5 | 1.0 | 6.0 |
| *Total Cost* | *$0* | *$28,500* | *$3,000* | *$18,000* |
| **TOTAL** | **$424,785** | **$1,072,033** | **$628,809** | **$1,189,174** |

## 5.0 CITED REFERENCES

Blue Earth Ecological Consultants. 2008. Mesilla Valley Bosque State Park Resource Management Plan. Prepared for New Mexico State Parks. March 2008.

Brady, C.N. and Weil, R.R. (2008) The nature and properties of soils. 14th Edition, Pearson Education, Inc.

Hink, V.C. and R.D. Ohmart. 1984. Middle Rio Grande Biological Survey. Final Report to the U.S. Army Corps of Engineers, Albuquerque, NM.

Lower Colorado River Multi-Species Conservation Program. 2004. Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan. (J&S 00450.00) Sacramento, CA.

New Mexico Natural Heritage Program (NMNHP). 2000. Playa wetlands in Northeast New Mexico: A comparative study of vegetation diversity and ecology. Prepared by S. Wood and E. Muldavin, NMNHP, University of New Mexico. Prepared for the New Mexico Environment Department, Santa Fe, NM. May 2000.

Parametrix. 2008. Order 2 Soil Survey and Vegetation Mapping of Five Private Land Parcels Along the Rio Grande Floodplain, Radium Springs, NM. Prepared for World Wildlife Fund. August 2008.

Propst, D.L. and K. Bixby 2018. Conserving native Rio Grande fishes in southern New Mexico and west Texas: A conceptual approach. Funded by the Peso del Norte Watershed Council. September 2018.

Sojda, Richard S. and Solberg, Kent L. 1993. Management and Control of Cattails. Waterfowl Management Handbook. 33. https://digitalcommons.unl.edu/icwdmwfm/33

Tetra Tech. 2014. Preliminary Analysis of Channel Seepage and Water Budget Components Along the Rio Grande. Prepared for USIBWC.

United States Bureau of Reclamation (USBR). 2017. Southwestern Willow Flycatcher Habitat Classification: Lower Rio Grande from Elephant Butte Dam, NM to El Paso, TX. Prepared by the USBR Technical Service Center, Denver, Co. Prepared for the USBR Albuquerque Area Office, Albuquerque, NM. January 2017.

United States Fish & Wildlife Service (USFWS) 2020. Rio Grande Habitat Restoration Work Conducted by San Andres National Wildlife Refuge, October 2019 to March 2020. IWO# IBM13W0015. April 1, 2020.

USIBWC 2016. USIBWC Rio Grande Canalization Project, River Management Plan. December 8, 2016.

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

United States Army Corps of Engineers (USACE). 2009. Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande – Caballo Dam to American Dam, New Mexico and Texas. Prepared by Mussetter Engineering, Inc. and Riada Engineering, Inc, under contract with USACE.

USACE 2007. Baseline Report: Rio Grande-Caballo Dam to American Dam FLO-2D Modeling, New Mexico and Texas. Prepared by the USACE Albuquerque District, Albuquerque, NM. Prepared for the USIBWC, El Paso, TX. September 2007.

# APPENDIX A

# PLANT SPECIES LIST

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*Table A-1. Relative abundance of plant species observed at five potential aquatic habitat restoration sites. R = rare; U = uncommon; C = common; A = abundant*

| Common Name | Scientific Name | Keystone | Las Cruces Effluent | Mesilla Valley | MID | Trujillo |
|---|---|---|---|---|---|---|
| **Tree** | | | | | | |
| Whitethorn acacia | *Acacia constricta* | U | R | R | | U |
| Netleaf hackberry | *Celtis reticulata* | | | | | R |
| Desert willow | *Chilopsis linearis* | U | | | | |
| Green ash | *Fraxinus pennsylvanica* | | | | | R |
| Rio Grande cottonwood | *Populus deltoides* | U | R | C | | U |
| Honey mesquite | *Prosopis glandulosa* | C | U | C | C | C |
| Screwbean mesquite | *Prosopis pubescens* | U | R | C | C | |
| Goodding's willow | *Salix gooddingii* | U | | U | | U |
| Saltcedar | *Tamarix chinensis* | A | U | C | A | C |
| | | | | | | |
| **Shrub** | | | | | | |
| Iodinebush | *Allenrolfea occidentalis* | U | | | R | |
| False indigo-bush | *Amorpha fruticosa* | | R | | | |
| Fourwing saltbush | *Atriplex canescens* | U | | C | U | C |
| Seep willow | *Baccharis salicifolia* | | R | U | | R |
| Seep willow | *Baccharis salicina* | C | | C | A | U |
| Desertbroom | *Baccharis sarothroides* | U | | | U | |
| Bird-of-paradise | *Caesalpinia gilliesii* | | | | | U |
| Broom snakeweed | *Gutierrezia sarothrae* | U | R | | | |
| Singlewhorl burrobrush | *Hymenoclea monogyra* | U | | | | U |
| Jimmyweed | *Isocoma pluriflora* | | | C | A | A |
| Creosote | *Larrea tridentata* | U | | R | | |
| Wolfberry | *Lycium torreyi* | C | | C | C | C |
| Purple pricklypear | *Opuntia macrocentra* | U | | | | |
| Arrowweed | *Pluchea sericea* | | | C | | A |
| Indigobush | *Psorothamnus scoparius* | | | | | |
| Skunkbush sumac | *Rhus trilobata* | | | U | | |
| Coyote willow | *Salix exigua* | U | U | C | R | A |
| lilac chastetree | *Vitex agnus-castus* | R | | | | |
| Soaptree yucca | *Yucca elata* | U | | R | | |
| Graythorn | *Ziziphus obtusifolia* | U | | | | |

| Common Name | Scientific Name | Keystone | Las Cruces Effluent | Mesilla Valley | MID | Trujillo |
|---|---|---|---|---|---|---|
| **Forb** | | | | | | |
| Trailing four o'clock | *Allionia incarnata* | | | | | R |
| Careless weed | *Amaranthus palmeri* | | | | | R |
| flatspine bur ragweed | *Ambrosia acanthicarpa* | | | | A | A |
| Yerba mansa | *Anemopsis californica* | | | U | | |
| Milkweed | *Asclepias* sp. | | U | U | | |
| Whorled milkweed | *Asclepias subverticillata* | | | | U | |
| Asparagus | *Asparagus officinalis* | | | R | | |
| Australian saltbush | *Atriplex semibaccata* | | | | C | |
| Desert marigold | *Baileya multiradiata* | U | | | | R |
| Kochia | *Bassia scoparia* | C | C | C | A | C |
| Spiderling | *Boerhavia* sp. | | | | | |
| Field mustard | *Brassica rapa* | | R | | | |
| Rose heath | *Chaetopappa ericoides* | | | | | C |
| Goosefoot | *Chenopodium* sp. | | | | R | R |
| Spiny chloracantha | *Chloracantha spinosa* | | U | U | | |
| Spreading alkaliweed | *Cressa truxillensis* | | | R | A | |
| Texas croton | *Croton texensis* | | | | | R |
| Woolly prairie clover | *Dalea lanata* | | | | | R |
| Sacred thorn-apple | *Datura wrightii* | U | | R | | |
| Western tansymustard | *Descuriania pinnata* | C | U | U | U | C |
| Hoary tansyaster | *Dieteria canescens* | C | C | | U | A |
| Spectacle pod | *Dimorphocarpa wislizenii* | | | | R | R |
| Fleabane | *Erigeron* sp. | | | | R | |
| Fringed twinevine | *Funastrum cynanchoides* | C | | C | U | C |
| Common sunflower | *Helianthus annuus* | | | | | U |
| Salt heliotrope | *Heliotropium curassavicum* | U | | | | R |
| Indian rushpea | *Hoffmannseggia glauca* | | | U | | |
| Flaxflowered ipomopsis | *Ipomopsis longiflora* | | | | | C |

| Common Name | Scientific Name | Keystone | Las Cruces Effluent | Mesilla Valley | MID | Trujillo |
|---|---|---|---|---|---|---|
| **Forbs cont.** | | | | | | |
| Prickly lettuce | *Lactuca serriola* | U | R | | U | |
| Coulter's horseweed | *Laennecia coulteri* | U | | | U | |
| Perennial pepperweed | *Lepidium latifolium* | R | | | U | |
| Mountain pepperweed | *Lepidium montanum* | C | | U | | |
| Pepperweed | *Lepidium* sp. | | | | C | |
| Tansyaster | *Machaeranthera tanacetifolia* | | | | | U |
| Alkali mallow | *Malvella leprosa* | U | | | | |
| Snapdragon vine | *Maurandya antirrhiniflora* | | R | | | R |
| Sweetclover | *Melilotus officinalis* | | U | | R | U |
| Blazingstar | *Mentzelia* sp. | | | | | U |
| Bristly nama | *Nama hispidum* | | | | | R |
| Bicolor fanmustard | *Nerisyrenia camporum* | R | | | | |
| Velvetweed | *Oenothera curtiflora* | | | | U | U |
| Lemoncillo | *Pectis angustifolia* | U | | | | |
| Scorpionweed | *Phacelia* sp. | | R | | | U |
| Saltmarsh fleabane | *Pluchea odorota* | U | | | R | |
| Curlytop knotweed | *Polygonum lapathifolium* | | R | | | |
| Purslane | *Portulaca oleracea* | U | | | | |
| Cottonbatting plant | *Pseudognaphalium stramineum* | | R | | R | |
| Dock | *Rumex* sp. | | R | | | R |
| Russian thistle | *Salsola tragus* | U | U | | U | C |
| Verrucose seapurslane | *Sesuvium verrucosum* | C | R | | | |
| London rocket | *Sisymbrium irio* | | U | U | A | |
| Silverleaf nightshade | *Solanum elaeagnifolium* | U | U | U | U | C |
| Common sowthistle | *Sonchus oleraceus* | | R | | R | |
| Globemallow | *Sphaeralcea* sp. | | C | U | | C |
| Alkali swainsonpea | *Sphaerophysa salsula* | | | R | | |
| Mojave seablite | *Suaeda nigra* | C | | C | A | C |
| Hopi tea | *Thelesperma megapotamicum* | | | | | R |

| Common Name | Scientific Name | Keystone | Las Cruces Effluent | Mesilla Valley | MID | Trujillo |
|---|---|---|---|---|---|---|
| **Forbs cont.** | | | | | | |
| Desert horse-purslane | *Trianthema portulacastrum* | A | | | | A |
| Puncturevine | *Tribulus terrestris* | | | | | U |
| Golden crownbeard | *Verbesina encelioides* | U | | R | | |
| Lacy sleepy daisy | *Xanthisma spinulosum* | | R | | | |
| Rough cocklebur | *Xanthium strumarium* | U | R | | | |
| Arizona centaury | *Zeltnera calycosa* | | | | U | |
| | | | | | | |
| **Graminoid** | | | | | | |
| Sixweeks threeawn | *Aristida adscensionis* | | U | U | | |
| Purple threeawn | *Aristida purpurea* | U | | | | |
| Cane bluestem | *Bothriochloa barbinodis* | | | | | R |
| Needle grama | *Bouteloua aristidoides* | | | U | | |
| Sixweeks grama | *Bouteloua barbata* | C | | | | |
| Blue grama | *Bouteloua gracilis* | | U | | | |
| Brome | *Bromus* sp. | | R | | | |
| Sedge | *Carex* sp. | | | U | | |
| Feather fingergrass | *Chloris virgata* | U | U | | | |
| Pampas grass | *Cortaderia selloana* | | | R | | |
| Bermuda grass | *Cynodon dactylon* | | A | U | | C |
| Yellow nutsedge | *Cyperus esculentus* | | R | | | R |
| Saltgrass | *Distichlis spicata* | C | U | C | A | U |
| Spike rush | *Eleocharis* sp. | | | | U | |
| Canada wildrye | *Elymus canadensis* | | R | | | |
| Stink grass | *Eragrostis cilianensis* | | | | R | |
| Lehmann lovegrass | *Eragrostis lehmanniana* | | U | | | |
| Foxtail barley | *Hordeum jubatum* | U | | | | |
| Mouse barley | *Hordeum murinum* | | | | U | |
| Arctic rush | *Juncus arcticus* | | | U | | R |
| Scratchgrass | *Muhlenbergia asperifolia* | C | U | | U | R |
| Common reed | *Phragmites australis* | | | | C | |

| Common Name | Scientific Name | Keystone | Las Cruces Effluent | Mesilla Valley | MID | Trujillo |
|---|---|---|---|---|---|---|
| **Graminoid cont.** | | | | | | |
| Annual rabbit's-foot grass | *Polypogon monspeliensis* | C | | | U | |
| Split grass | *Schismus* sp. | | U | | | |
| Hardstem bulrush | *Schoenoplectus acutus* | C | U | | C | |
| Common threesquare | *Schoenoplectus pungens* | | | U | | |
| Bristlegrass | *Setaria* sp. | | | | | R |
| Johnsongrass | *Sorghum halapense* | | U | | | U |
| Alkali sacaton | *Sporobolus airoides* | A | U | C | R | |
| Spike dropseed | *Sporobolus contractus* | C | | C | R | C |
| Sand dropseed | *Sporobolus cryptandrus* | | U | | | |
| Mesa dropseed | *Sporobolus flexuosus* | U | | | | |
| Giant dropseed | *Sporobolus giganteus* | | | R | | U |
| Big sacaton | *Sporobolus wrightii* | U | | | | C |
| Cattail | *Typha domingensis* | A | U | C | A | |

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GeoSystems Analysis, Inc.
Innovations in Hydrology

# TECHNICAL MEMORANDUM

September 22, 2020


| | | |
|---|---|---|
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Wetland Delineation Results from Two Sites Proposed as
Aquatic Habitat Restoration Sites


Prepared by William Widener & Chad McKenna
GeoSystems Analysis, Inc.
Albuquerque, NM

# INTRODUCTION

In accordance with the Record of Decision (ROD) signed following the Environmental Impact Statement (EIS) for the Rio Grande Canalization Flood Control Project (RGCP) affecting 105 miles of the Rio Grande through southern New Mexico (NM) and west Texas (TX), the U.S. Section of the International Boundary and Water Commission (USIBWC) is planning to implement aquatic habitat improvement projects along the Rio Grande Canalization Project (RGCP) reach. Wetland determination and delineation evaluations are required for any sites under consideration that may impact existing delineated wetlands or waters of the United States.

This technical memo describes wetland determination and delineation methods and results conducted at two project sites along the RGCP project reach under consideration by IBWC. Actual jurisdictional status will need to be evaluated with the U.S. Army Corps of Engineers. Conceptual restoration plans for these two sites, Trujillo and Montoya Intercepting Drain, propose performing soil excavations within floodplain and irrigation drain environments that have potential to impact existing jurisdictional wetlands. Detailed site descriptions and restoration concepts are described in a separate report recently completed by GeoSystems Analysis, Inc. (GSA 2020), with technical support from Gulf South Research Corporation and SWCA Environmental Consultants.

# SITES

## MONTOYA INTERCEPTING DRAIN

The Montoya Intercepting Drain (MID) is a 3.4-mile long irrigation and stormwater drainage canal that parallels the Rio Grande on the north-east side of the river in Sunland Park, Doña Ana County, NM. The MID segment evaluated for this project (herein “MID project site”) extends approximately 1.5-miles from the MID intersection with the Montoya Lateral Branch C Wasteway 37 (Montoya C Wasteway) to the Montoya Drain adjacent to the El Paso Electric power plant (Figure 1). The MID project site is generally characterized as a linear drain feature with dense saltcedar (*Tamarix chinensis*) growing along the north bankline of the drain and a relatively monotypic stand of Southern cattail (*Typha domingensis*) growing within the drain bottom along much of its length. Proposed habitat improvements consist of cattail removal from the drain bottom, saltcedar removal along segments of the drain bankline, and riparian plantings in areas where saltcedar is removed (GSA 2020).

## TRUJILLO ARROYO

The Trujillo Arroyo site is located at the confluence of Trujillo Arroyo and the Rio Grande near the unincorporated town of Arrey, NM in Sierra County (Figure 1). The site consists of approximately 14-acres along the Rio Grande floodplain on the west side of the river (herein “Trujillo project site”). Recent habitat enhancements implemented at the Trujillo project site by the U.S. Fish and Wildlife Service include willow and cottonwood pole plantings and construction of an open irrigation channel and turnout to deliver irrigation water from the Trujillo Lateral to some of the riparian plantings. Coarse alluvium excavated from the Trujillo Arroyo as part of routine IBWC maintenance were temporarily spoiled on the south side of the arroyo and form a large pile near the confluence with the Rio Grande. Proposed habitat improvements for the Trujillo project site include widening the arroyo mouth, excavating a wetland depression, planting native riparian-wetland vegetation, and extending the irrigation channel to irrigation water to the wetland. An optional task includes excavating a backwater channel and wetland swale along the river bank, and extending the agricultural runoff channel to provide supplemental irrigation water to riparian plantings installed in the wetland swale (GSA 2020).

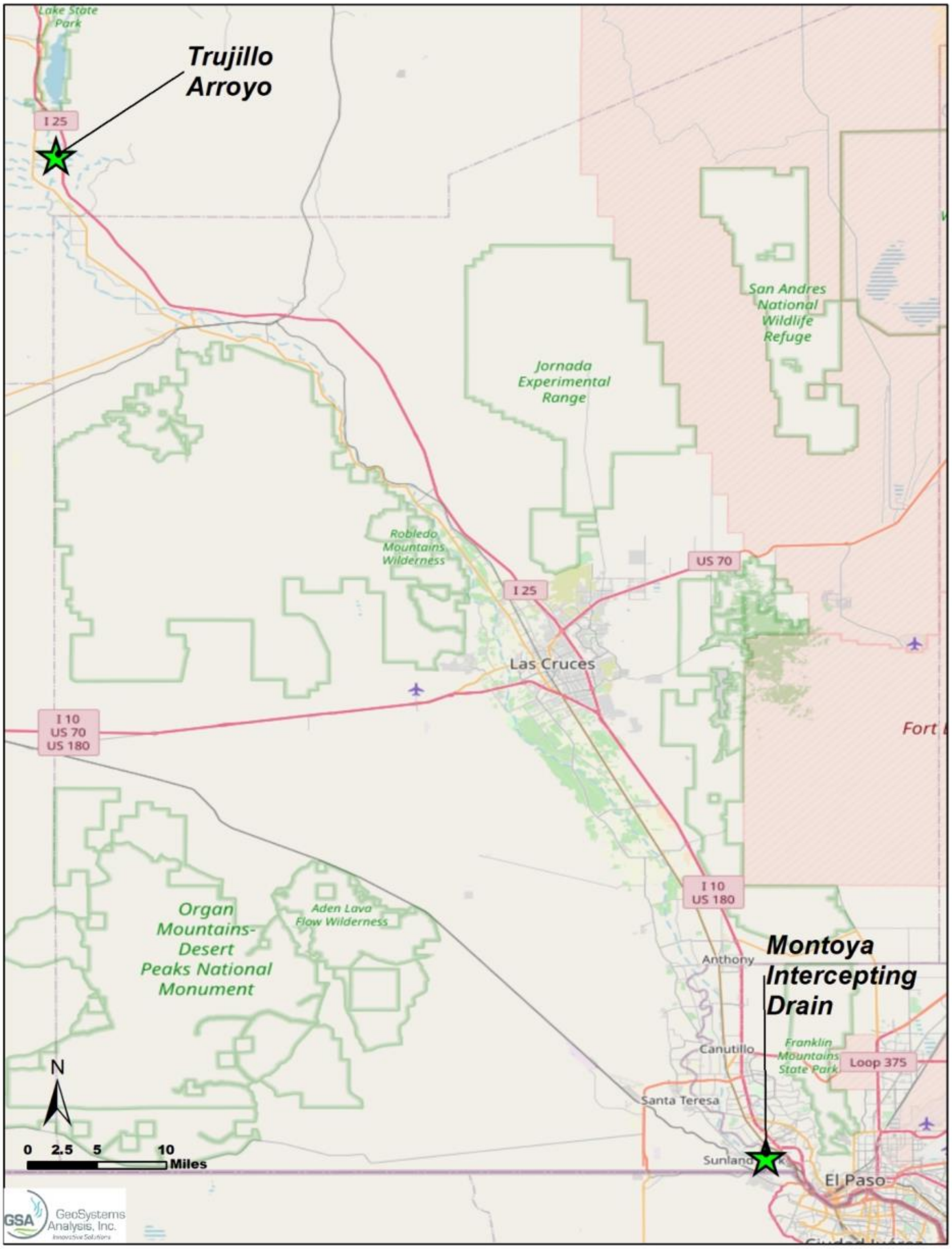


**Figure 1. Overview map**

## Project Understanding

This wetland delineation was conducted to evaluate the presence of delineated wetlands within proposed excavation features at each of these two sites. If it is determined that delineated wetlands are present within these features, this report should provide the supporting documentation for the application of any permits required by any agency, such as the U.S. Army Corps of Engineers (USACE).

# METHODS

The delineation was performed in accordance to the on-site methodology described in the *Corps of Engineers Wetlands Delineation Manual* (1987 Manual), and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008; Regional Supplement).

To qualify as a wetland, a site must meet the following three situations as defined in the 1987 Manual (USACE 1987):

- The prevalent vegetation must be hydrophytic as identified in *The 2016 National Wetland Plant List.*
- Soils must have either been classified as hydric by the United States Department of Agriculture's Natural Resources Conservations Services (NRCS) and/or exhibit field characteristics indicative of hydric soils, such as oxidation reduction (redox reactions); and,
- Exhibit hydrologic characteristics of areas that are periodically inundated or have saturated soils to the surface during portions of the growing season.

## Off-Site Evaluation

Prior to field work, existing data were gathered from multiple sources to characterize environmental conditions at each site. Soil Survey Database (SSURGO) map unit locations and descriptions were assessed via data downloaded from the U.S. Department of Agriculture Natural Resources Conservation Service's Web Soil Survey website (NRCS 2019). Possible wetlands were identified at the sites using data obtained from the U.S. Fish and Wildlife Services National Wetlands Inventory (NWI) website.

## Field Investigation and Delineation

A field botanist conducted the wetland delineations between August 18$^{h}$ and August 19$^{th,}$ 2020. Per our contract with USIBWC, the survey area was expected to be ten acres but a total of 16.5-acres were surveyed. Overall, weather conditions were favorable with fair skies and daytime high temperatures ranging from the high 80's to high 90's.

A Bluetooth Global Positioning System (GPS) and tablet containing georeferenced maps of NRCS soil data, NWI wetland data, and proposed habitat enhancement locations, was used to initially inspect locations for wetland indicators. Within each proposed habitat improvement footprint, a 12- to 14-inch hole was shoveled to determine the presence of hydrophytic soils. If hydrophytic vegetation was present, the soil sample was extracted in close proximity. When hydrophytic soil characteristics were observed, hydrological sources and indicators were evaluated, characterized, and documented. "*Wetland Determination Data Form – Arid West Region*" datasheets were used to guide data collection as the field scientist evaluated vegetation, soil, and hydrology conditions at sample locations within the excavation footprints, in accordance with the Corps Manual (USACE 1987, USACE 2008). Sample locations were named with abbreviations corresponding to the site name, and/or an identifying feature and a sequential number. A list of sample locations is available in **Appendix A**. Completed field datasheets meeting all three criteria are included in **Appendix C**. Representative photos from sample locations were taken and included in **Appendix D**.

When field indicators (soils, vegetation, hydrology) positively confirmed the presence of potential delineated wetlands, they were named by their associated abbreviation with the letters "WL" for "wetland" and a sequential number. The delineation boundary was logged as a point file with a (sub-meter accuracy rated) Juniper Systems Archer field computer equipped with a Hemisphere GPS. If wetlands were large and extended far beyond the excavation footprint, only the portion of the proposed excavation footprint containing a delineated wetland was recorded. Resulting locations were used to delineate the wetlands shown in the Wetland delineation maps **(Appendix B)**.

## Rationale for Determining Wetland Boundaries

Within each proposed excavation footprint, field data were recorded to assess an area's delineated wetland potential. Wetlands are defined by the presence of a predominance of hydrophytic vegetation, hydric soils and hydrology indicators that demonstrate a site's partial inundation or saturation during a portion of the growing season.

### Vegetation

To meet the hydrophytic vegetation requirement to qualify as a delineated wetland, the site must have 50% or more of its dominant species rated as either an obligate (OBL), facultative wet (FACW) or facultative (FAC) species. The National Wetland Plant List (Lichvar 2016) was originally published as the *National List of Plant Species that Occur in Wetlands* by the USFWS in conjunction with USACE, the Environmental Protection Agency (EPA) and the NRCS. The wetland plant species list was recently updated by the USACE and it now rates the indicator status of 3,519 plant species in the Arid West region. In order to qualify as a dominant species, aerial cover of that species must consist of more than 50% of the total vegetation cover within a single stratum (Tree, Sapling/shrub, Herbaceous or Vine) or at least 20% of the total vegetation over all stratums (USACE 2008). Additionally, the hydrophytic vegetation requirement could by met if the prevalence index is 3.0 or less. The prevalence index is calculated by using a weighted average, and adding the sum of species cover by rank multiplied by OBL (1), FACW (2), FAC (3), FACU (4) and UPL (5) and dividing by the total cover. For more specific information related to prevalence index calculations, see the Corps Manual (USACE 1988, 2008)

### Soils

In the Arid West Subregion, soils must exhibit at least 1 of 19 hydric soil indicators (USACE 2008). Five additional indicators are allowable if disturbed or problematic site conditions are present. The specific soil indicators evaluated include visible characteristics that signify prolonged inundation. Many of these indicators result from oxidation-reduction (redox) reactions that occur under anaerobic (oxygen-poor) atmospheric conditions. Commonly detected indicators are formed as soil microbes respire and oxidize manganese and iron. The water soluble, oxidized minerals are translocated through the soil matrix under saturated conditions. Other indicators include the desiccation process of organic matter that happens within the upper soil horizons when exposed to prolonged anaerobic conditions.

### Hydrology

Sites must also exhibit 1 of 18 hydrologic indicators plus hydrophytic vegetation and hydrophytic soils to qualify as delineated wetlands. Additionally, nine secondary hydrologic indicators are evaluated when primary hydrological indicators are absent due to seasonality or drought. Hydrologic indicators are considered the most transitory wetland indicators because they are often temporary, seasonal, or intermittent, while hydrophytic vegetation and soil indicators exhibit more reliable and permanent characteristics in response to medium to long term exposure to seasonal inundation. There are three major hydrologic indicators assessed: 1) presence of surface water or saturated soils near the surface 2) evidence of recent inundation 3) evidence of recent soil saturation near the surface.

# RESULTS

## Montoya Intercepting Drain

### Off-site Evaluation

SSURGO soil map units within the proposed excavation footprints at the MID project site consists entirely of *Agua variant* and *Belen variant* soils, and *Riverwash. Agua* and *Belen variant* soils are rated as hydric soil Groups C and D, respectively, though *Riverwash* is not (NRCS 2020). NWI data indicates the Rio Grande and a portion of Montoya drain as *Riverine*. Additionally, *Freshwater Forested/Shrub Wetlands* and a *Freshwater Pond* are present just north of Montoya Intercepting Drain in the eastern and middle segment, all but the Rio Grande are outside of the USIBWC ownership boundary.

### Field Investigation and Delineation

The MID project site is split into three segments by the crossings of Racetrack Dr. and Sunland Park Dr. These roads along and associated culvert crossings allowed segmenting the project site into three wetland segments, and were named MID-WL 1, MID-WL 2, and MID-WL 3, from west to east, respectively. The vegetation along all three MID segments is relatively similar and consists of a band of near monoculture saltcedar (*Tamarix chinensis*) on the north edge of the drain. Dense stands of Southern cattail (*Typha domingensis*) growing throughout the bottom of the drain. The vegetation along the southern edge of the drain transitions rapidly from a narrow band of hardstem bulrush (*Schoenoplectus acutus*), common threesquare (*Schoenoplectus pungens*) and occasionally common reed (*Phragmites australis*) along the water's edge to a vegetation dominated by scratchgrass (*Muhlenbergia asperifolia*), saltgrass (*Distichlis spicata*) and occasional commonreed, seepwillow (*Baccharis salicifolia* and *B. salicina*), and saltcedar. As the elevation increases moving upslope towards the levee toe, Mojave seablite (*Suaeda nigra*) is commonly found growing over otherwise bare soil, with occasional shrubs before reaching the levee.

Due to the convex nature of the MID, the ground elevation above the groundwater level increases as one moves in either direction (north and south) away from the drain. To determine the north-south limits of potential wetland, several soil bore holes were dug in each of the three wetland segments to determine how far hydrophytic indicators were present as distance increases away from the drain. Hydrophytic vegetation such as Mojave seablite (designated as an OBL species), and saltcedar (designated as FAC species) are present within the entire project site. Several non-documented "test" samples were dug in addition to the official samples to determine that trends were consistent. Field investigations indicated that the cattail and bulrush dominated segments of MID meet the technical requirements for delineated wetlands but their jurisdictional status needs to be confirmed with the USACE since the wetland feature is within an irrigation facility. The slope toward the saltcedar to the north is very steep and several test holes indicated that no hydric soils present more than 1-foot away from the water's edge. The slope to the south was more gradual and the hydric soil boundaries south of the MID water edge was more variable.

The first segment, MID-WL1, is approximately 2.3 acres. Sample location MID-1-1A was dug approximately 2.5-feet from the edge of the channel, in the scratchgrass band, which is designated as FACW. No hydrophytic soil indicators were present. Sample MID-1-1B was located right at the channel edge, where the cattail (designated as OBL) in the channel met the band of scratchgrass. A depleted soil matrix was present 1-inch below the soil surface, consistent with the contact of the water table. The odor of hydrogen sulfide was also evident. Although hydrophytic vegetation is present upslope from the channel's edge, it was determined the hydrophytic soils were only present right at the water's edge and this was used to determine the boundary of the wetland. Soil sample locations are shown on wetland delineation maps in **Appendix B**.

MID-WL 2 is approximately 2.9 acres. The scratchgrass band along the south bankline is on a gentle slope and is not as elevated above the water level as it is in MID-WL1. Sample MID-2-1A was located within 1-foot of the water's edge. A loamy, gleyed soil matrix was present from 7- to 12-inches, consistent with the water table. Sample MID-2-1B was located about 5-feet from the water's edge and within the lowered scratchgrass band. There was redox evidence in the top 10-inches. Sample MID-2-1C was located about 8.5-feet from the water's edge, just above the scratchgrass band in the Mojave seablite vegetation type. No hydrophytic soil indicators were present. Sample MID-2-2 was later taken from about 4-feet from the water's edge to confirm that redox features were consistently present throughout the scratchgrass band. Soil sample locations are shown on wetland delineation maps in **Appendix B**.

MID-WL 3 is approximately 2.4 acres. Sample MID-3-1A was taken approximately 5-inches below the water surface. The top 4-inches of soil were completely gleyed. Sample MID-3-1B was taken in the scratchgrass band, which was integrated with Bermudagrass (*Cynodon dactylon*) in this segment, approximately 3-feet from the water's edge. This segment has a steep incline from the water's edge toward the south, and therefore has a narrow scratchgrass band. No soil redox features were present. MID-3-1C was taken within 1-foot of the water's edge, in the narrow band of hardstem bulrush and common threesquare. A loamy gleyed soil matrix was present at approximately 8- to 12-inches. In this segment, it was determined that the hardstem bulrush and common threesquare are better indicators of the wetland boundary than the scratchgrass growing along the middle of the south slope. Soil sample locations are shown on wetland delineation maps in **Appendix B**.

## Trujillo Arroyo

### Off-Site Evaluation

SSURGO soil map units described within the Trujillo project site show the soil type as entirely composed of *Brazito loamy fine sand*, which is a hydric soil group A. NWI data includes a *Riverine* wetland along the river bankline and up Trujillo Arroyo. Additional *Freshwater Pond* and *Freshwater Forested/Shrub* wetlands were mapped in portions of the interior part of site. The only mapped wetlands that overlapped with proposed habitat improvements designs are the arroyo widening, and where the backwater connects to the Rio Grande bankline. Only habitat improvement design footprints were surveyed for wetlands, and sample locations were named by the proposed improvement activity.

### Field Investigation and Delineation

Wetland determinations and boundary delineations were only conducted in locations of proposed habitat improvements. Sample locations described in the following sub-sections reference the location of the proposed habitat improvement area.

### Wetland Depression

Sample location WLD-1 was located near the middle of the proposed wetland depression (see maps in **Appendix B**). The site of the proposed wetland depression consisted entirely of dry loamy soils, and was dominated by saltcedar in the shrub vegetation layer, and kochia (*Bassia scoparia*), designated as FAC, in the herb layer. Although the vegetation community technically passes the wetland determination *Dominance and Prevalence Tests*, no hydrophytic soil indicators were present. No hydrology indicators were present either.

### Drain Extensions

The two proposed drain extensions are adjacent to the wetland depression and consist almost entirely of the same soil and vegetation types as the proposed wetland depression. However, a portion of one drain extension crossed a section of coyote willow (*Salix exigua*) and seep willow, designated FACW and FAC respectively, and had higher potential to have hydric soil indicators, so sample location DXT-1 was dug. No hydrophytic soil or hydrology indicators were present.

### BACKWATER CHANNEL AND SWALE

The footprint for the optional backwater channel and swale excavation is in a mostly barren area of gravelly loamy sand. The site is dominated by hoary tansyaster (*Dieteria canescens*) which is designated as NOL (Not on List) by National Wetlands Plant List. This NOL designation indicates the species is proposed to be added to the wetland plant list but at this time cannot be used to make a wetland determination. Minor species components were rated FACU, FAC and NOL, so the site does not pass *Dominance or Prevalence Tests*. Sample BWC-1 was taken near the center of where the swale would transition into to the backwater channel. No hydrophytic soil indicators were present at this sample location (see maps in **Appendix B**). Portions of the proposed optional backwater channel would extend through existing cottonwood (*Populus deltoides*) and coyote willow plantings installed by the USFWS. These native riparian species are FAC and FACW, respectively. However, it is apparent that these were planted by excavating and planting poles into the water table, and thus the vegetation and disturbed soils would not be indicative of prevalent conditions, so these sites were not sampled.

### ARROYO WIDENING

A narrow band of coyote willow and arroweed (*Pluchea sericea*), both designated FACW, are growing along the arroyo bankline and the west bank of the Rio Grande at the arroyo confluence. The wetland type is characterized as *Riverine* in the NWI database. Sample AW-1 was taken at the bankline, and redox features were present in the 9- to 12-inch soil layer. While both hydric soils and hydrology indicators were present at this sample location, there was no vegetation (hydrophytic or otherwise) rooted in the immediate soil sampling location. However, overhead areal cover above the sample location was dominated by coyote willow that was rooted within a floodplain tier positioned above the immediate bankline. Sample AW-2 was taken in this upper terrace of alluvial sediment where the coyote willow was rooted, and no redox features were present in the top 12-inches.

This circumstance qualifies as a “Problematic hydrophytic vegetation” and “Problematic hydric soils” under Chapter 5: *Difficult Wetland Situations in the Arid West* of the Corps’ Arid West Supplement, specifically sections 4c: *Riparian areas*, and 1.3: *Vegetated Sand and Gravel Bars within Floodplains*, respectively. USACE guidance under these circumstances encourages the emphasis on understory species in the case of *Riparian areas*, and close examination for redox concentrations in coarse fragments in the case of *Vegetated Sand and Gravel Bars within Floodplains*. No understory species were present at Sample location AW-1, and no redox concentrations in coarse fragments were found at sample AW-2. The size of the coyote willow at Sample AW-2 in the elevated tier indicate it was established many years ago, during a high flow event, and the sediment layer is so far above current water levels, it appears to no longer be connected to the current hydrology of the river.

Using best professional judgement, it was determined that the lower tier bankline, where sample AW-1 was located and where hydrology is connected to the backed-up arroyo bottom, qualifies as a delineated wetland, but periodic scouring has prevented the establishment of wetland vegetation. Additionally, the higher-tiered floodplain terrace where the coyote willow is rooted is disconnected from the current hydrology and does not qualify as a wetland. Therefore, AW-WL1 was delineated, a narrow 1- to 2- foot band along the bank of the arroyo, comprising approximately 0.09-acres.

## CONCLUSIONS AND RECOMMENDATIONS

A total of approximately 16.5 acres within 19 proposed excavation features spanning the two sites were the focus of the wetland delineation work conducted under this project. A total of 7.73 acres of delineated wetlands were identified across the two sites. All, but 0.09 of the 7.73 acres are attributed to the Montoya Intercepting Drain and will potentially be impacted by the cattail removal and slope terracing habitat improvement activities.

Only 0.09-acres of habitat improvement activities proposed at Trujillo Arroyo occur within delineated wetlands. This is entirely located within the arroyo widening habitat improvement activity.

The nature of the proposed projects is to improve and expand wetland habitats at the proposed sites. Implementation of these projects is likely to improve conditions in existing wetlands that lie within or adjacent to the proposed aquatic features and increase total acreage of wetland habitat in the reach.

# REFERENCES

GeoSystems Analysis, Inc. (GSA) 2020. Rio Grande Canalization Project Aquatic Habitat Restoration Site Alternatives and Conceptual Designs: Addendum 1. Prepared by GeoSystems Analysis, Albuquerque, NM. Prepared for Gulf South Research Corporation. August 2020.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The 2016 National Wetland Plant List*. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X

Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for Dona Ana County, New Mexico. Available online. Accessed March 1, 2019.

U.S. Army Corps of Engineers. 1987. *Wetland Delineation Manual*. Technical Report Y-87.1, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers, 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0), ed. J.S. Wakely, R.W., Lichvar, and C.V. Noble. ERDC/ELTR-08-29. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

# APPENDIX A – SAMPLE LOCATIONS

**Table 1. Sample Locations and wetland determination**

| Site Name | Sample Name | Conclusion | Feature |
|---|---|---|---|
| Montoya Intercepting Drain | MID-1-1A | Non-Wetland | N/A |
| | MID-1-1B | Wetland | MID-WL1 |
| | MID-2-1A | Wetland | MID-WL2 |
| | MID-2-1B | Wetland | MID-WL2 |
| | MID-2-1C | Non-Wetland | N/A |
| | MID-2-2 | Wetland | MID-WL2 |
| | MID-3-1A | Wetland | MID-WL3 |
| | MID-3-1B | Non-Wetland | N/A |
| | MID-3-1C | Wetland | MID-WL3 |
| Trujillo Arroyo | WLD-1 | Non-Wetland | N/A |
| | DXT-1 | Non-Wetland | N/A |
| | BWC1 | Non-Wetland | N/A |
| | AW-1 | Wetland | AW-WL1 |
| | AW-2 | Non-Wetland | N/A |

# APPENDIX B – SAMPLING LOCATION MAPS


**Figure 2. Sample locations and wetland delineation boundaries at MID-WL 1**


**Figure 3. Sample locations and wetland delineation boundaries at MID-WL 2**


**Figure 4. Sample locations and wetland delineation boundaries at MID-WL 3**


**Figure 5. Sample locations and wetland delineation boundaries at Trujillo.**

# APPENDIX C – PHOTO PLATE

## MID-1-WL1

**MID-2-1A**

**MID-WL3**

# WLD-1

**BWC-1**

**DXT-1**

## AW-1

# AW-2

# APPENDIX D
# CONCEPTUAL DESIGN COMMENTS

# Elephant Butte Irrigation District
## Of New Mexico

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November 5, 2020

Elizabeth Verdecchia
Natural Resources Specialist
International Boundary and Water Commission
4171 N. Mesa St, Suite C-100
El Paso, TX 79902-1441

Also sent via email to: elizabeth.verdecchia@ibwc.gov

Subject: EBID Comments on RGCP Aquatic Habitat Restoration Site Alternatives and Conceptual Designs: Addendum 1, September 18, 2020

Mrs. Verdecchia,

EBID appreciates the opportunity to comment on the Addendum 1 to the Environmental Planning and Design for Aquatic Habitat Restoration in the Rio Grande Canalization Project (RGCP). The USIBWC's management of the RGCP is crucial to our role and responsibilities as an irrigation district within the project area.

Below we have listed comments specific to each of the sites discussed in the Addendum 1. We reserve the right to comment on the revised draft Environmental Assessment (EA) but appreciate the opportunity to comment on this draft in advance of that formalized process.

Trujillo Arroyo:

1. It is not clear that widening the mouth of the arroyo will improve aquatic habitat at the site. The velocity is essentially zero as the Rio Grande backs into the existing arroyo mouth, and that will not change. Arroyo runoff flow conditions will not be appreciably altered by widening. Additionally, the extent to which widening the arroyo mouth will allow for settling of sediment and reduce frequency for sediment removal from the Rio Grande is not evident. If the arroyo mouth is to be widened, the river channel would need to be clean out as well to optimize the effects of the widening. Finally, it is not clear that the area of backwater habitat is a limiting factor in its value as habitat.
2. The pond feature, which includes a membrane or clay liner, appears to be ill-conceived. With the liner, there will, by design, be no surface water-groundwater interaction. The pond will dry entirely on a fairly regular basis. If the pond feature were to remain in the design and the liner to be done away with to allow for surface water-groundwater interaction, the impact/infringement on groundwater rights will need to be assessed and properly managed. We recommend the pond be removed from the site design.
3. It could be considered to connect the north end of the backwater swale to an upstream portion of the Rio Grande to more readily allow flow out of and back into the Rio Grande. With both this consideration and the current design concept for the backwater channel and swale, water rights

may need to be acquired since there may be depletion of water resources from the Rio Grande that are due downstream to EP1.

4. The prevalent flow at the site is release water from Caballo Reservoir, which has very low sediment content. Episodic flows from the Trujillo Arroyo do bring in sediment. The sediment dynamics of the site should be considered in the design.

Las Cruces Effluent Site:

1. While the report states that the City of Las Cruces (CLC) is required to return its waste water treatment plant effluent to the Rio Grande (this only applies when EBID's allotment is less than two feet), the requirement is not part of a coherent offset program. There is no specific amount of effluent required to be returned to the river, and the impacts of groundwater pumping by CLC on the Rio Grande have not been quantified by the OSE that we are aware of. This is an unfortunately thorny issue as indicated by litigation in the US Supreme Court in Texas and the United States v. New Mexico. The OSE's requirement for returning effluent to the river is nothing more than a nod to the hydrologic fact that CLC's pumping groundwater from the Mesilla Aquifer impacts the surface water of the Rio Grande Project. It is not an offset program. IBWC should be careful and guard against misplaced reliance on this water without first sorting out the legal impacts currently being litigated in TX v. NM.
2. EBID does support water management measures that require offsets for the impacts of non-Project groundwater pumping on the surface water supply of the Rio Grande Project. Such measures will likely come out of the litigation, and that is clearly beyond the scope of this study.
3. Since it is the OSE that requires the return of effluent to the river, the OSE's input on this proposed project should be sought.
4. The site to the north of the effluent channel appears to be suitable for EBID surface water rights under the district's Environmental Water Policy. If water is to be delivered to the site through the wasteway on the northern end of the site, the wasteway will need significant work on the reach between the Mesilla Lateral and the outlet of the wasteway.
5. The site to the south of the effluent channel, which is to have the effluent stream routed through it, is more complicated. The effluent is not EBID surface water. It is a byproduct of extraction of groundwater that is hydrologically connected to the surface water system. This is a subject for further discussion.
6. Flow measurement needs to be described further. Monitoring stations proposed for the inlet and outlet of the constructed channel likely will not properly measure the amount of water depleted within the southern site due to the percent error of flow measurement devices.
7. The intent to reintroduce fish species that have been extirpated from the Lower Rio Grande is a concern for EBID. Any restoration efforts should consider the possibility of die-off of fish and vegetation species. Bringing in Threatened or Endangered species could force changes in river operations that would be catastrophic to the water users of the Rio Grande Project. Even Least Concern species may create political pressure to modify operations. Periodic drought, climate change, and the development of the Rio Grande Project area have altered the hydrology of the river, which led to the extirpation of these species. EBID favors a "build it and they will come" approach to populating aquatic habitat sites but EBID is adamantly opposed to any options that consider or make possible the introduction of Threatened or Endangered species.

Mesilla Valley Bosque State Park:

1. Deepening ponds to maintain open water may be ineffective. As the current drought deepens and the climate in the Rio Grande basin becomes permanently more arid, further groundwater declines are likely.
2. It is recommended that the concept of creating a side channel off of the Picacho Drain is modified so that instead of it discharging directly into the Rio Grande it can be rerouted to discharge back into the downstream side of the drain, before the drain discharges into the Rio Grande. This would be preferred because it reduces concerns about depletions from the Rio Grande directly.
3. EBID still has questions about where the IBWC and NM State Park stand with regard to its commitments to acquire water-rights.

Montoya Intercepting Drain:

1. The report does not reflect a clear understanding of the hydraulics and hydrology of the Montoya Intercepting Drain. Installing hydraulic structures and checking up the drain to improve habitat and kill cattails would fly in the face of the purpose of the drain's construction – to protect the land to the east of the Rio Grande from high groundwater resulting from the near proximity to the river by intercepting the subsurface flow of river seepage and lowering the drainage base.
2. Widening the drain raises questions about the limited land associated with the Montoya Intercepting Drain, but if one bank is sacrificed or additional land is acquired, as it appears is shown by Figure 31, terracing and plantings could be accomplished without raising the water surface elevation of the drain. The maintenance of drain will need to be mechanical to address cattails.
3. As I proposed and we discussed on site, EBID would like to see a direct discharge to the river from Montoya C Lateral wasteway. A direct discharge would not only address the severe chocking of the wasteway discharges experienced in recent years but could add flexibility for the discharge to either the river or the drain. This would also make the wasteway performance less dependent on maintenance of the drain, which could be an issue that will arise from the vegetation planting of the restoration design concepts presented.

Please feel free to contact me with any questions or concerns at gesslinger@ebid-nm.org.

Sincerely,

Gary Esslinger
Treasurer-Manager

Cc: Zack Libbin, District Engineer
Samantha Barncastle, EBID General Counsel

| Response to EBID Comments dated Nov 5, 2020 | | |
|---|---|---|
| **Comment #** | **Topic** | **Response** |
| ***Trujillo Arroyo*** | | |
| 1 | Arroyo Widening | Creating slack water habitat is a common restoration technique implemented on the MRG. Slack water habitat provides spawning and young of year habitat for many species, particularly small-bodied desert fishes. While the function of the drain may not change appreciably, creating additional slack water habitat provides valuable habitat diversity in the reach that is currently limiting. |
| 2 | EPDM Pond liner | One downside of a liner is that it will need to be replaced at some time in the future, anticipated to be approximately 20 years. The other option would be to use bentonite clay. The EPDM liner option was considered to because the EPDM liner is thought to be better than bentonite clay at retaining water and would avoid groundwater—surface water interactions. If the pond option is implemented, using bentonite clay could be considered. This is costed out as using EPDM as it is a higher cost. |
| 3 | Connecting a channel upstream of the site | This was discussed but not carried forward due to concerns regarding water rights and a potential Rio Grande diversion. There were also concerns regarding impacts on the USFWS restoration work. |
| 4 | Sediment dynamics | Sediment modeling was not completed for this preliminary analysis; however, the project team did consider sediment dynamics. We concur that the major sediment load would come from Trujillo Arroyo. The lack of sediment from upstream coming out of Caballo Reservoir may provide a benefit as this may result in reduced maintenance due to sedimentation in the restored features, which is a common maintenance issue. On the other hand, there may also be scouring during high flows, but team experience indicates that this happens during high snowmelt runoff years even in sediment laden systems, such as the Rio Grande upstream of Elephant Butte. |
| ***Las Cruces Effluent Site*** | | |
| 1 | Water consumption | Concur that this is a legal issue. We address this issue in the EA in a cursory manner. Further discussions are required. |
| 2 | Water offsets | No comment |
| 3 | OSE input required | Addressed in the EA |
| 4 | Mesilla Lateral Diversion | Concur. The statement regarding “significant work on the reach between the Mesilla Lateral and the outlet of the wasteway” should be addressed during the design phase. |
| 5 | Use of effluent water | USIBWC would work with stakeholders to address offsets to increased consumption. |
| 6 | Flow Measurements | This issue should be addressed during the design phase. |

| Response to EBID Comments dated Nov 5, 2020 | | |
|---|---|---|
| **Comment #** | **Topic** | **Response** |
| 7 | Extirpated fish | Concur. Deleted references to extirpated fish in the Conceptual Designs Report, Addendum 1 and the EA. If a species is extirpated, by definition, that species would not be present and therefore, there would be no benefit to these species. USIBWC has no plans to reintroduce extirpated species or conduct fish management activities. |
| ***MVBSP*** | | |
| 1 | Pond Deepening | As stated in the Conceptual Designs Report and the EA, the water supply is from high flows in the Rio Grande and stormwater runoff. The designs prepared by SWCA from the first EA do not depend upon groundwater. This was identified by USIBWC as a design constraint due to water rights issues. The Conceptual Designs Report, Addendum 1 and the Amended EA Proposed Action section reflects the constraint of not using groundwater to supply water for the proposed restoration features. The source of water is stated in these documents. |
| 2 | Side channel connect to Picacho Drain | The Conceptual Designs Report, Addendum 1 proposed the revised side channel to avoid private property issues, to provide the greatest habitat value, and to keep the channel length roughly the same l to keep the costs approximately the same. Discharging the side channel directly to the river provides greater benefits in terms of providing habitat for fish. The benefits are similar as described for Trujillo Arroyo, and include creating slack water habitat for spawning and year-of-young habitat that is in limited supply in the reach. Water depletions would require offsets and were included in the evapotranspiration differences estimates. Connecting the side channel to discharge to Picacho Drain is addressed in the EA as an alternative design concept. |
| 3 | Water rights commitments – NMSP and USIBWC. | This was addressed in the EA. This alternative would require implementation of agreements that include water rights. |
| ***MID*** | | |
| 1 | Understanding of the hydraulics | Added a statement in the EA regarding the concerns raised by USIBWC and EBID. This is in regard to manipulating flows to control cattail and would be episodic, temporary changes. |

| Response to EBID Comments dated Nov 5, 2020 | | |
|---|---|---|
| **Comment #** | **Topic** | **Response** |
| 2 | Terrace widening and the need to install a structure to raise water to support native planting. | The comment appears to reference raising the water level in Segment 1, where the consultant team recommend **no** saltcedar removal or native revegetation be completed. The only habitat rehabilitation option available in Segment 1 would involve cattail removal and installing a water control gate. However, this was not recommended and is not included in the cost estimates, nor is it addressed in the EA. The EA addresses restoring native vegetation in Segment 3 where it is possible to create the terraces and plant native vegetation without raising the water level, as suggested in the EBID comment. |
| 3 | Direct discharge to the Rio Grande from Montoya C Lateral Wasteway | The Conceptual Designs Report did not consider this due to its preliminary nature. . The EA notes that this option could be analyzed further if the site moves forward. |

# APPENDIX E

# STAKEHOLDER MEETING

**FINAL**
**Irrigation District Meeting Minutes**
**Environmental Planning and Design for Aquatic Habitat Restoration**
**in the Rio Grande Canalization Project**

**Location:** USIBWC Headquarters/Teleconference
**Date:** December 11, 2018
**Time:** 9:00 AM (Mountain)

**Participants:**

Elizabeth Verdecchia, U.S. International Boundary and Water Commission (USIBWC)
Howard Nass, Gulf South Research Corporation (GSRC)
Wendy Arjo, Aegis Environmental, Incorporated (Aegis)
Zachary Libbin, Elephant Butte Irrigation District (EBID)
Gary Esslinger, EBID
Jesus Reyes, El Paso Water Improvement District Number 1 (EPCWID1)
Jay Ornelas, EPCWID1
Phillip King, EBID consultant
Al Blair, EBID consultant

The meeting began with Ms. Verdecchia, USIBWC Contracting Officer, giving a brief introduction; she went over the background of the project. She explained GSRC was the prime contractor for the Aquatic Restoration Project, and GSA and SWCA were on the GSRC Team. She further explained the project will be done in two phases. Phase I will include the development of the alternatives and completing of an Environmental Assessment (EA). Phase II will include the development of the two preferred alternatives from the EA. GSRC is responsible for the EA, GSA is responsible for alternatives development, and SWCA is responsible for the design. Ms. Verdecchia provided the following schedule for the project:

**Phase I**
a. Alternatives Development – February
b. Draft EA - March
c. Final EA – Early June (prior to expiration of the Record of Decision)

**Phase II**
c. Final Designs – September 2019

Ms. Verdecchia opened the floor to EBID to present comments and additional alternatives.

EBID is concerned the proposed preliminary aquatic restoration alternatives may degrade the purpose of the Canalization Project. There is policy in place to obtain water rights for riparian restoration but it does not cover aquatic restoration. Aquatic restoration is a change of purpose with New Mexico State law and Reclamation law. EBID also has flood conveyance concerns.

EBID also has a concern about permanence of restoration sites and where water will come from. Is the objective to keep the site wet?

Ms. Verdecchia explained there are different levels of aquatic habitat and different levels of wetness. She explained the environmental groups would like fish habitat available when the Rio Grande is dry.

EBID questioned how USIBWC plans to keep the restoration sites wet? EBID does not want to release water to maintain the restoration sites.

EBID indicated that as part of previous riparian restoration projects, trees were planted where there was available water. They indicated that aquatic restoration sites should be located where there is a constant source of water (e.g., Montoya or Picacho Drains) to avoid offset requirements.

EBID indicated that Yeso and Angostura Arroyos are not good restoration sites due to lack of water outside irrigation season.

Ms. Verdecchia indicated that proposed projects at Yeso and Angostura Arroyos involve destabilization of the river bank opposite of the arroyo mouth and letting the river meander. No water offset would be needed for these sites. The projects have not been implemented because USIBWC has concerns about potential impacts on the levee. Potential impacts on the levee need to be analyzed as part of these projects.

EBID is concerned the proposed restoration projects at Yeso and Angostura could increase flood stage, and that the arroyo could destroy the restoration sites.

EBID questioned why choose potential restoration sites where there is not permanent water. They suggested looking at Trujillo Arroyo below Percha Dam where the arroyo and river have permanent water. EBID indicated the site is always wet.

Ms. Verdecchia indicated that U.S. Fish and Wildlife would like this site, and that USIBWC is currently scoping the project and current proposed alternatives are preliminary and asked for EBID to provide any alternatives they may know about.

**Las Cruces Effluent Site**

EBID indicated that the effluent is tied to water return to the Rio Grande.

Ms. Verdecchia indicated the City of Las Cruces supports the proposed restoration site. USIBWC has groundwater rights they can use to supplement water loss.

EBID suggested looking at diverting effluent to Picacho Drain, and establishing wood habitat and cleaning up Picacho Drain. This would improve habitat at the Mesilla Valley Bosque State Park.

Ms. Verdecchia indicated the effluent site has constant water. The current alternative at the Las Cruces Effluent Site is looking at fish passages, oxbow lake, and wetlands. USIBWC will need to offset water before it is returned to river.

EBID indicated that when water enters the Rio Grande it is project water and cannot be used for aquatic habitat restoration. This can be avoided by diverting the effluent to Picacho Drain before it enters the river. The cost would be to pipe the water under the river.

Ms. Verdecchia indicated water used for the restoration site would need to be metered and any losses would need to be offset.

EBID questioned if USIBWC's decision is consistent with Supreme Court decision?

Ms. Verdecchia indicated that any decision to use primary groundwater would need to go through the Department of Justice. USIBWC does not have a final answer on groundwater.

**Mesilla Valley Bosque**

EBID is concerned that the preliminary alternatives matrix indicates that Picacho and Montoya Drains are not used by EBID. Montoya Drain is still used to drain water to the Rio Grande, and Picacho Drain has to be maintained for public safety, agricultural return and flood water control.

EBID questioned if Mesilla Valley Bosque State Park is under the authority of New Mexico State Parks?

Ms. Verdecchia indicated that USIBWC has not received a definitive answer. New Mexico Department of Game and Fish (NMDGF) could not provide a definitive answer during the Stakeholder Scoping Meeting. USIBWC believes the deed was transferred to NMDGF but litigation is holding up the transfer of the property. USIBWC has a Memorandum of Understanding with New Mexico State Parks. The USIBWC has been in discussion with both entities. .

EBID is concerned that the wetlands identified in the Southwest Environmental Center's Fish report at Mesilla Valley Bosque are a part of Picacho Drain and not separate wetlands. When the drain is dry the wetlands are dry.

**El Paso Electric Site**

Ms. Verdecchia indicated this alternative includes developing a wetland site west of Montoya Drain utilizing overflow from Montoya Drain.

EPCWID1 indicated that this water is their water. Montoya Drain is an overflow return to the Rio Grande. Dr. Blair indicated this could be a good project, since it is all connected. This is part of El Paso Water's $20million pumping project. Water would overflow during storm events and stay on-site. However, the analysis for a separate stormwater study for Doniphan showed the wetland here didn't solve the stormwater issue. The water in this area is very salty.

Ms. Verdecchia indicated the proposed restoration site is not USIBWC land and would be difficult for USIBWC to use. She indicated that there is a lot of potential for wetland development at this site. Ms. Verdecchia indicated that GSRC will evaluate up to seven alternatives in the EA and this site may be a site considered but not carried forward. There is a potential to do a collaborative project at the Montoya Drain site. El Paso Electric owns a portion of the site.

**Downstream to Courchesne Gage Site**

Ms. Verdecchia indicated the site was previously identified as a wetland prior to construction of the highway by Texas Department of Transportation. There is a potential to enhance wetlands at the site. USIBWC intends to use the site for mitigation to offset impacts associated with levee projects. Any acreage above the acreage required for levee mitigation can be used for the wetland enhancement.

EPCWID1 indicated the District is opposed to development of woody vegetation at the site. Urban flooding currently creates trash problems at the flood gates, and the District is concerned the establishment of wood vegetation would increase the trash issue at the flood gates. Ms. Verdecchia clarified that here is would likely be wetland vegetation. Dr. Blair clarified he is concerned with cottonwoods or development; herbaceous plants (like bulrush) are not such an issue.

**Montoya Intercepting Drain**

EBID inquired if USIBWC has funding to acquire land?

Ms. Verdecchia indicated that land acquisition can be considered. She also indicated that portions of the drain may be on lands owned by USIBWC.

EBID indicated that there could be an opportunity to develop an oxbow off the intercepting drain. EBID may consider selling the interceptor drain. Currently, there is a pond by the bridge with permanent groundwater. EBID does not have much use for the drain, and it has not been cleaned in years.

Ms. Verdecchia indicated that USIBWC needs to rebuild the levee, and may consider purchasing the intercepting drain to assist with construction of the levee is certain areas where the slope is too steep on the drain side.

**Ne Mexas Siphon Site**

Ms. Verdecchia indicated that the preliminary alternative site is located adjacent to EBID property. USIBWC tried to purchase the property but there is an ownership dispute between the City of Sunland and the Boy Scouts. The property dispute needs to be settled before USIBWC would consider moving forward with purchasing the property.

EBID indicated they could pump water from the drain into the Rio Grande. EBID also suggested constructing an oxbow and EBID could lift water to the site. Pumps could be used to evacuate flood water and keep site wet. EBID likes the potential of the site if USIBWC could purchase and develop.

Ms. Verdecchia indicated the levee has not been finished and existing borrow pits adjacent to the levee are wetlands. USIBWC does not want to impact those wetlands. USIBWC will re-evaluate the tie-back levee location.

EBID indicated the subdivision adjacent to the Rio Grande and project site has been impacted by flood water because the drain does not have the capacity to carry flood water.

**General Concerns**

EBID indicated the District has to be assured aquatic restoration sites will not be used as leverage for year around flow in the Rio Grande.

Ms. Verdecchia indicated that year round water flow is not USIBWC's objective of the aquatic restoration project. One purpose for stakeholders is for a place for fish to go when the river is dry. EBID indicated SWEC's La Mancha wetland connection to the river is impractical. Who will close the flood gates for this?

EBID indicated the best sites for fish are generally at siphons. EBID indicated ponds 5-foot or less in depth adjacent to river are detrimental to fish because they are vulnerable to predators. Small pockets will dry up and there will be a fish kill. Will USIBWC be introducing fish? No. EBID indicated that fish populations will come and go with water availability and the sites must be "expendable."

EBID is willing to work with USIBWC but cannot change their use of water.

Ms. Verdecchia indicated that environmental groups are pushing for fish habitat but USIBWC is ok with restoring wetlands. Fish passages may not be feasible due to water and channel maintenance. USIBWC would like EBID to put comments in writing for EA administrative record and feasibility analysis.

EBID questioned if the alternative sites need to extend along the current reach of the river? No, they can be clumped together geographically.

EBID indicated that if the deed has been transferred to NMDGF, there is an opportunity for EBID to work with NMDGF. Water backs up in Picacho Drain (EBID showed where the water backs up on aerial photograph). If effluent gets in river, IBWC could make a meander and plant trees. Can widen Picacho Drain, but EBID has to have the ability to maintain a primary channel in the drain. EBID would like the focus on Mesilla Valley Bosque State Park and Picacho Drain instead of the Las Cruces Effluent Site.

EBID will provide written comments by December 17, 2018.

Meeting on the Aquatic Restoration Project ended at 10:12 (Mountain Time).

# APPENDIX F
# PUBLIC HEARING

## Public Hearing

## Draft Environmental Assessment
## Aquatic Habitat Restoration in the Rio Grande Canalization Project
## Sierra and Doña Ana Counties, New Mexico and El Paso County, Texas

**Date:** June 12, 2019

**Location:** Las Cruces City Hall
Rooms 2007B and C
700 N. Main Street
Las Cruces, New Mexico

**Time:** 5:00 PM to 7:00 PM

**BACKGROUND INFORMATION**

The United States Section of the International Boundary and Water Commission (USIBWC) is considering identifying, designing, and constructing aquatic habitat restoration projects in the Rio Grande Canalization Project. On June 4, 2009, the USIBWC issued a Record of Decision (ROD) on the long-term management of the Rio Grande Canalization Project. The 2009 ROD authorized restoration of aquatic habitat and a mosaic of native riparian plant communities at 30 sites over 10 years (through 2019).

The purpose is to identify, design, and develop aquatic habitat restoration sites to satisfy USIBWC's commitment in the 2009 ROD. Restoration actions could include vegetation removal, disposal of wood debris, native vegetation planting, overbank lowering, bank cuts, natural levee breaches, secondary channels, bank destabilization, channel widening, arroyo mouth management, construction of inset floodplains, and use of supplemental water for on-site irrigation.

**DRAFT ENVIRONMENTAL ASSESSMENT**

The USIBWC released the *Draft Environmental Assessment (EA) and Finding of No Significant Impact for Aquatic Habitat Restoration in the Rio Grande Canalization Project* on May 31, 2019. In compliance with the National Environmental Policy Act (NEPA), the Draft EA is available for public comment until July 5, 2019.

The Draft Environmental Assessment evaluates potential environmental impacts of the No Action Alternative and seven alternatives (Exhibit 1):

1. Alternative A - No Action Alternative
2. Alternative B - Yeso Arroyo Alternative
3. Alternative C - Angostura Arroyo Alternative
4. Alternative D - Broad Canyon Arroyo Alternative
5. Alternative E - Selden Point Bar Alternative
6. Alternative F - Las Cruces Effluent Alternative

7. Alternative G - Mesilla Valley Bosque State Park Alternative
8. Alternative H - Downstream of Courchesne Bridge Alternative

USIBWC's Preferred Alternative is to implement four aquatic habitat restoration sites (Broad Canyon Arroyo, Selden Point Bar, Las Cruces Effluent, and Downstream of Courchesne Bridge). A brief description of the four aquatic habitat restoration sites included in the Preferred Alternative is provided below:

**Broad Canyon Arroyo Site**

Broad Canyon Arroyo is a tributary to the Rio Grande that enters from the west side of the river near River Mile (RM) 68. The Broad Canyon Arroyo site is an approximately 2-acre site, and the site has been the focus of previous USIBWC riparian habitat enhancement through U.S. Fish & Wildlife Service (USFWS), as well as nearby restoration work by other entities. The conceptual restoration design for the Broad Canyon Arroyo site would create 0.2 acre of aquatic habitat by enhancing backwater function and habitat diversity as a result of creating a series of embayments supplemented with diverse riparian-wetland revegetation (Exhibit 2).

**Selden Point Bar Site**

The Selden Point Bar site is a vegetated, bank-attached (point) bar located on the east side of the Rio Grande near RM 66. The site is owned by USIBWC and is approximately 9 acres in size. An arroyo enters the Rio Grande just downstream of the site. The proposed conceptual restoration design for the Selden Point Bar site is designed to create a high-flow channel and a backwater channel supplemented by revegetation with native riparian and wetland plant species (Exhibits 3 and 4). The conceptual design for the Selden Point Bar site would create 0.8 acre of aquatic habitat.

**Las Cruces Effluent Site**

The Las Cruces Effluent site is an approximately 4-acre site located on the east side of the Rio Grande near RM 44. The conceptual design is to replace the straight concrete-lined channel currently used to convey treated wastewater from the Las Cruces Waste Treatment Facility to the Rio Grande with a relatively long, meandering channel with diverse aquatic habitat features (Exhibit 5). The conceptual design for the Las Cruces Effluent site would create 0.9 acre of aquatic habitat. A check structure would be constructed off the concrete-lined channel to reroute water into the constructed channel. The aquatic habitats would be enhanced by planting aquatic vegetation within backwaters, and riparian vegetation (cottonwood and willow) along the channel margins. A fish passage structure is being considered as an option under this alternative.

**Downstream of Courchesne Bridge Site**

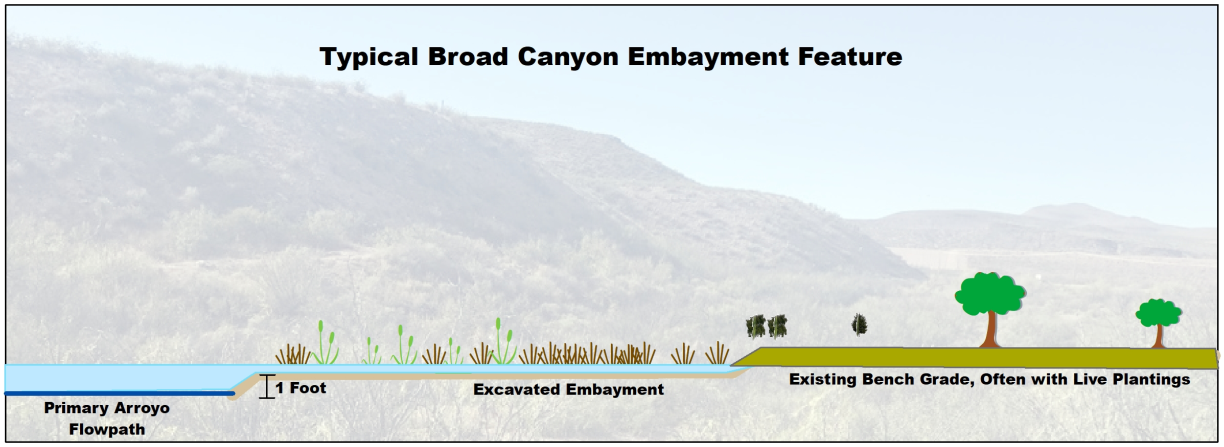
The Downstream of Courchesne Bridge site is an approximately 13-acre site located near RM 1 in El Paso, Texas. The site is owned by USIBWC and USIBWC is considering using a portion of the site for wetland mitigation for levee construction. The conceptual design at this site focuses primarily on creating a meandering channel that routes stormwater from below Highway 85, through the site, and into the Rio Grande (Exhibit 6). Design elements would include terraces, embayments, and pools within the channel and the along the margins. Supplemental herbaceous wetland plug plantings and low density, overhanging woody vegetation will increase native wetland species diversity and aquatic habitat complexity at this site.


Exhibit 1. Project Area Map Showing the Location of Alternative in the Environmental Assessment

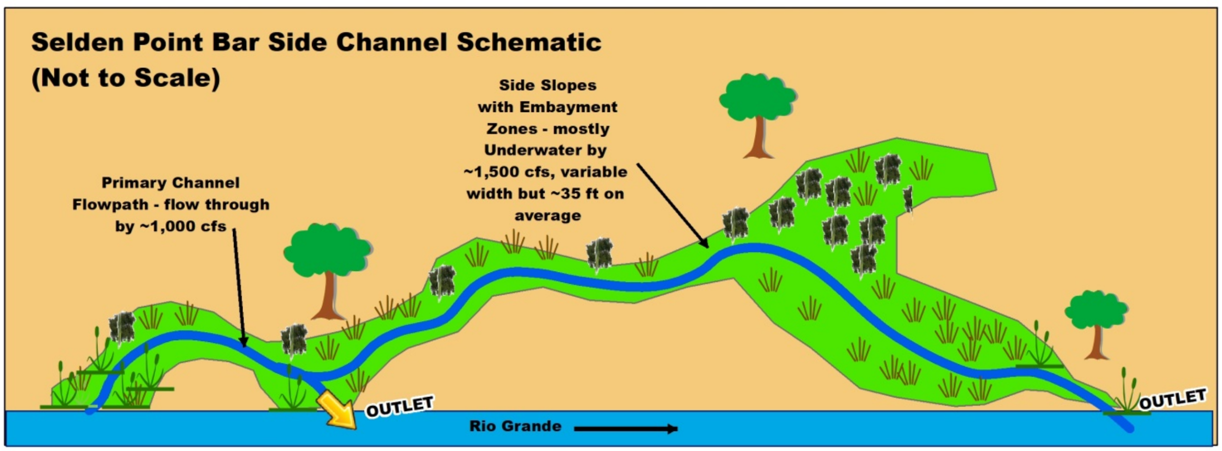
GSRC

June 2019

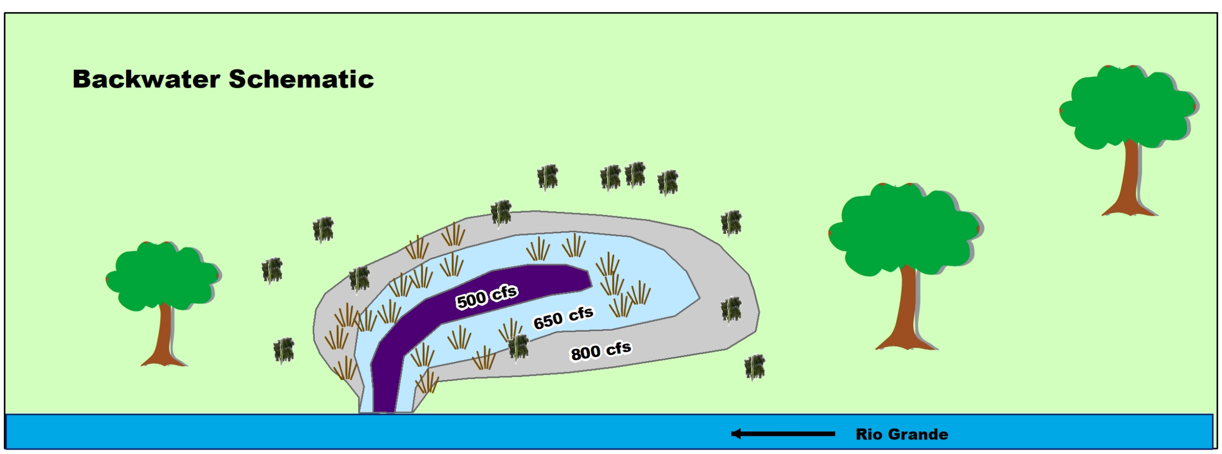
## Exhibit 2. Broad Canyon Arroyo Conceptual Design




## Exhibit 3. Selden Point Bar Side Channel Conceptual Design




## Exhibit 4. Selden Point Bar Backwater Conceptual Design



## Exhibit 5. Las Cruces Effluent Conceptual Design

### Las Cruces Effluent

**Construction Elements**

1. Construct meandering clearwater channel
2. Install selective fish passage structure
3. Install flow monitoring stations, pedestrian bridge, and pump
4. Plant cottonwood-willow in surrounding riparian enhancement area
5. Plant wetland plugs in channel

**Legend**

Check structure

Flow Monitoring station

Pedestrian bridge

**Proposed Design Feature**

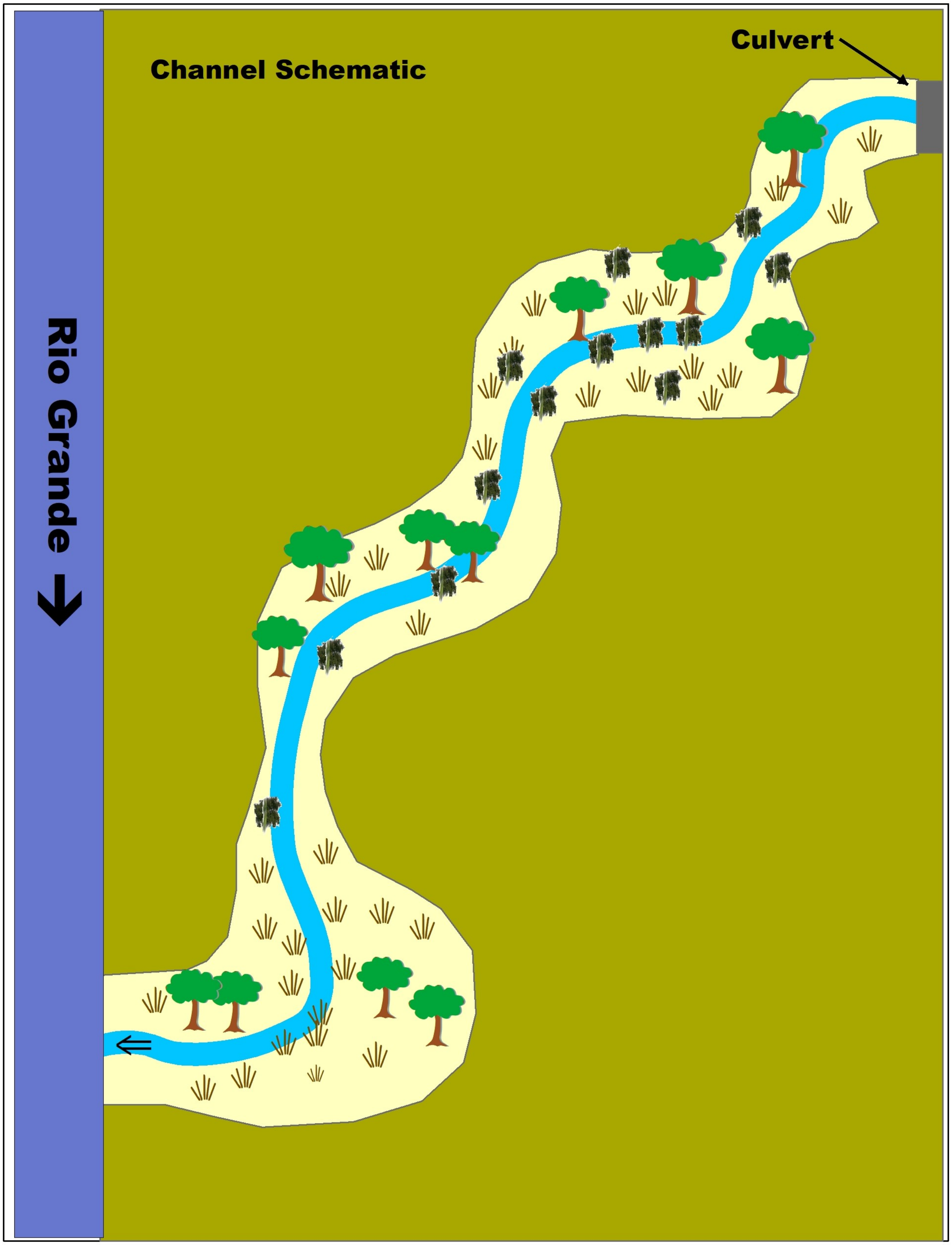
Riparian Enhancement

Channel

0 50 100 200 Feet

N

**Exhibit 6. Downstream of Courchesne Bridge Conceptual Design**



**FINDINGS**

The evaluation performed in the Draft EA concludes that there would be no significant impacts to the natural or human environment as a result of the implementation of any of the alternatives in the Draft EA. Therefore, the USIBWC is issuing a Findings of No Significant Impact (FONSI) and will not prepare an environmental impact statement unless additional information which may affect this decision is brought to the agency's attention within the 30-day public comment period.

**COMMENTS**

The public comment period for the Draft Environmental Assessment is until **July 5, 2019**. The Draft EA is on USIBWC's website at http://www.ibwc.gov/EMD/EIS_EA_Public_Comment.html. The Notices of Availability for the Draft EA was published in the Federal Register on May 31, 2019. Written public comments are due by **July 5, 2019** and should be submitted to:

Elizabeth Verdecchia, USIBWC Natural Resources Specialist
Elizabeth.Verdecchia@ibwc.gov
4191 N Mesa
El Paso TX 79902
(915) 832-4701

A comment sheet is provided at the end of this handout for your convenience. If you wish, the comment sheet can be turned in at the reception table at the end of this meeting. Thank you for your participation.

**Comment Sheet**
**Draft Environmental Assessment for Aquatic Habitat Restoration in the Rio Grande Canalization Project**
**(Written public comments are due by July 5, 2019 and should be submitted to Elizabeth Verdecchia, USIBWC Natural Resources Specialist, Elizabeth.Verdecchia@ibwc.gov, 4191 N. Mesa, El Paso, TX 79902)**

**FINAL**
**Public Hearing Meeting Minutes**
**Environmental Assessment for Environmental Planning and Design for Aquatic Habitat Restoration in the Rio Grande Canalization Project**

| | |
|---|---|
| **Location:** | City Hall, Las Cruces, New Mexico |
| **Date:** | June 12, 2019 |
| **Time:** | 5:00 PM (Mountain) |

**Participants:**

Elizabeth Verdecchia, U.S. Section of the International Boundary and Water Commission (USIBWC)
Mr. Howard Nass, Gulf South Research Corporation (GSRC)
Sandra Villarreal, GSRC
Chad McKenna, GeoSystems Analysis (GSA)
Gill Sorg, Audubon Society/City of Las Cruces
Sidney Webb, Audubon Society
Conrad Keyes, Jr., Paso del Norte Watershed Council (PdNWC)
Kevin Bixby, Southwest Environmental Center
Kurt Anderson, Sierra Club
Woody Irving, Bureau of Reclamation (Reclamation)
Jerry Melendez, Reclamation
Davena Crosley, New Mexico Environment Department Surface Water Quality Bureau (NMED-SWQB)
Gary Esslinger, Elephant Butte Irrigation District (EBID)
Samantha Salopek, EBID
Zack Libbin, EBID
Gordon Michaud, Bureau of Land Management (BLM)

The meeting began with Ms. Verdecchia, U.S. Section of the International Boundary and Water Commission (USIBWC) Project Manager, giving a brief introduction about the Draft Environmental Assessment (EA) and explaining the timeline for public comments, which extends through July 5, 2019. Ms. Verdecchia introduced Gulf South Research Corporation (GSRC) as the USIBWC contractor responsible for managing the Aquatic Restoration project and preparing the EA. Ms. Verdecchia also introduced GeoSystems Analysis, Inc. (GSA) as a subcontractor to GSRC and responsible for preparation of the conceptual design plan.

Mr. Nass, GSRC Project Manager, then proceeded to describe the 2009 Conceptual Plan and concept design drafted by GSA, and gave a brief background of the project. Mr. Nass explained that there were seven alternatives reviewed in the Draft EA, as well as the No Action Alternative, and that the preferred alternative consists of four sites: the Las Cruces Effluent Site, the Downstream of Courchesne Bridge Site, the Broad Canyon Arroyo Site, and the Selden Point Bar Site. He then gave an overview of each site and explained the conceptual designs for each site.

Mr. Sorg, Audubon Society, asked if the fish passage structure, an option in the Las Cruces Effluent Site Alternative, would be designed to allow fish into the restoration area or keep fish out. Mr. Nass responded that the fish passage structure would be designed to keep non-native fish out of the restoration site.

Ms. Verdecchia then mentioned that the Draft EA found no significant impacts to natural and human environments, and repeated that any comments or concerns could be submitted during the comment period, which ends July 5, 2019. She added that a copy of the Draft EA can be found on the USIBWC website, and that comments would also be accepted at this meeting or to her address.

Ms. Verdecchia then asked everyone to introduce themselves.

Mr. Bixby, Southwest Environmental Center, asked how much aquatic habitat would result from the Downstream of Courchesne Bridge Site, and if the technical report was also available on the website. Ms. Verdecchia responded that the information is in the Draft EA, which lists total acres of restoration for each site; specifically, Tables 2-3 and 2-4. Mr. Nass mentioned that Table 2-1 of the Draft EA contained more information. Mr. Nass responded that it would be 1.4 acres.

Ms. Verdecchia then mentioned that the Mesilla Bosque State Park Site would be the site with the most aquatic habitat restored, and that many activities were considered (e.g., deepening and adding ponds, and installing a channel from the river). Ms. Verdecchia mentioned that there was considerable stakeholder input for this site, and that USIBWC is interested in receiving comments for the site. However, land ownership is an issue. She then explained that the preferred alternative sites were more manageable in the short-term, even though they do not meet the 50-acre goal described in the 2009 Conceptual Plan. She also explained that Angostura Arroyo and Yeso Arroyo Sites were not selected because of their net evapotranspiration (ET) values and because of potential effects on the levee structure. Ms. Verdecchia commented that USIBWC's objective was habitat quality, not acreage. She added that there were no objectives designed for specific species, and that two sites focused on creating wetlands and not necessarily aquatic habitat. Ms. Verdecchia also conveyed that the acreages provided in the 2009 Conceptual Plan were likely overestimated because the entire site was used to calculate acreage and not just the aquatic restoration area.

Mr. Anderson, Sierra Club, asked if there was a target acreage, and what the target objective was. Ms. Verdecchia responded that the number in the 2009 Conceptual Plan was 50 acres, but acreage is not as important as feasibility and sustainability.

Mr. Bixby then asked if there would be a land dispute between the New Mexico Department of Game and Fish and New Mexico State Parks for the Mesilla Valley Bosque State Park Site. Ms. Salopek, Elephant Butte Irrigation District (EBID), commented that new legislation stated that there cannot be a transfer of a state park.

Mr. Bixby then asked how loss of ET was calculated. Mr. McKenna, GSA, replied that the ET calculations used were the same as the 2009 Conceptual Plan, and that GSA used additional calculations for marshes.

Mr. Anderson asked what fraction of the water used for the sites would not make it back to the Rio Grande. Mr. McKenna replied that it would be a small percentage, and gave a brief explanation of the water source at each preferred alternative.

Ms. Salopek asked why water rights were a constraint at the Las Cruces Effluent Site, but not at the other preferred alternative sites. Mr. Nass replied that the water used needed to be replaced at that site. Ms. Salopek then commented that water rights were not obtained or explained for any of the other preferred alternative sites, and that there are no mechanisms in EBID to obtain surface water rights for aquatic habitat, since the Rio Grande Project is only authorized for agriculture; she added that the State of New Mexico (NM) does not give EBID surface water, and that water rights should be a constraint for all sites. Ms. Verdecchia replied that USIBWC could use its groundwater at Las Cruces Effluent Site, and the beneficial use would have to be changed from agriculture to aquatic habitat; she added that all USIBWC groundwater use is subject to the review and approval of the U.S. Department of Justice. She then explained that ET values were used to make water right determinations, and pointed out that Table 2-1 of the Draft EA listed positive ET rate predictions at the Selden Point Bar, Broad Canyon, and Downstream of Courchesne Bridge Sites. Ms. Verdecchia explained that water rights were not constraints at these sites because they save water. Mr. McKenna added that riparian habitat experiences less ET loss, and the conversion to riparian habitat would save water. Ms. Verdecchia also added that the Las Cruces Effluent Site is the only site that loses water from ET, so it is the only one that has water right constraints. Ms. Verdecchia also mentioned that there was a possibility to potentially expanding the site further north to offset the loss of water by possibly using the EBID lateral to deliver surface water offset for riparian areas.

Mr. Bixby asked where the water pumping would occur at the Las Cruces Effluent Sites. Ms. Verdecchia responded that a well would be drilled because the State of NM requires beneficial use. Mr. Bixby indicated that the State of NM considers a pond to groundwater to be a point of diversion.

Mr. Sorg asked if water rights from city lands could be used to offset water usage. Ms. Verdecchia responded that it could be proposed. Mr. Bixby indicated that the water rights for the La Mancha Wetland Project were obtained from somewhere else. Ms. Salopek added that everyone is subject to the same constraints as USIBWC. Ms. Verdecchia commented that the Las Cruces Effluent Site was almost not considered due to water right constraints.

Mr. Esslinger, EBID, asked why there could not be a pipeline installed under the Rio Grande that connects the Las Cruces Effluent Site to the Picacho Drain. He added that the pipeline could supply ponds and perennial water. Mr. McKenna responded that he liked the idea of keeping water in the Rio Grande as removing this perennial stretch could actually reduce the overall acreage of aquatic habitat, and that engineers and David Propst (fish biologist) discouraged the pipeline based on a cost-benefit perspective. Mr. McKenna added that the engineering for a pipeline was outside of the scope.

Ms. Salopek asked for clarification to Mr. McKenna's response. Mr. McKenna responded that the Las Cruces Effluent Site returns water to the Rio Grande by creating a perennial reach, and that there are benefits to having a perennial segment in the Rio Grande.

Mr. Keyes, Paso del Norte Watershed Council (PdNWC), asked if there would be a separate EA for the final design. Ms. Verdecchia replied that there would not, unless the actions change substantially. Mr. Keyes commented that two of the sites may not change. Ms. Verdecchia replied that the other two of the alternative sites (Las Cruces Effluent and Downstream of Courchesne Bridge Sites) would go to design phase; if the design phase warrants a supplemental evaluation, then USIBWC would perform it.

Mr. Bixby asked how often the Downstream of Courchesne Bridge Site contains stormwater. Mr. McKenna replied that the site contains perennial water.

Mr. Bixby then asked if water quality was assessed at the Downstream of Courchesne Bridge Site. Ms. Verdecchia replied that it had not. Mr. Esslinger commented that the salinity at the site was approximately 30,000 parts per million (ppm).

Ms. Verdecchia asked Mr. McKenna if any soil sampling has been done at the site as part of the 2009 Conceptual Plan. Mr. McKenna replied that no soil salinity sampling has been performed, but that he believed the soils were saline.

Mr. Sorg asked why a fish passage structure was included at the Las Cruces Effluent Site. Mr. McKenna responded that the structure was a recommendation in the 2018 report *Conserving native Rio Grande* *fishes in southern New Mexico and west Texas: A conceptual approach*. The report recommends a fish passage barrier to select for fish species and manage the channel.

Mr. Keyes asked if an additional EA would be drafted for the other three sites evaluated but not selected as part of the preferred alternative. Ms. Verdecchia responded that it depended on USIBWC; if the projects do not have additional impacts then the current EA would still stand.

Mr. Keyes asked if the other sites that were evaluated but not selected could be included as supplemental sites in the final EA. Ms. Verdecchia replied that she had proposed including the other three sites as supplemental sites to USIBWC, but that the general consensus was that a decision document (i.e. the EA) should not contain vague language, and that there were property issues with the Mesilla Valley Bosque State Park Site. Mr. Keyes commented that the Mesilla Valley Bosque State Park Site could be added vaguely to the current Draft EA, or that USIBWC could prepare a new EA for that site. Ms. Verdecchia responded that USIBWC wanted a clean decision document.

Mr. Anderson inquired on how the Mesilla Valley Bosque State Park Site could be considered. Ms. Verdecchia responded that it would be valuable for stakeholders to submit comments; USIBWC may consider the site if there is a high interest in the site.

Mr. Webb, Audubon Society, asked if the EA addresses public access to the sites. Mr. Nass responded that it does not.

Mr. Webb then asked if the sites would be open to the public. Ms. Verdecchia responded that Selden and Broad Canyon sites would not, but the City of Las Cruces Effluent and the Downstream of Courchesne Bridge sites would be, as well as the Mesilla Valley Bosque site if selected.

Mr. Sorg asked if the concrete channel at the Las Cruces Effluent Site would be replaced, or if the concrete would be removed in order to fill. Ms. Verdecchia responded that she does not know, that would be evaluated in the design phase. Mr. Sorg wondered if there was a use to leave it in place.

Mr. Sorg asked if there was an interest in letting water through the concrete channel. Ms. Verdecchia responded that there was not.

Mr. Bixby asked why the Las Cruces Effluent Site does not go past Interstate 10 (I-10). Mr. McKenna responded that previous experiences with sites located further north have shown that road maintenance and construction crews can have negative impacts on sites, and extending the Las Cruces Effluent Site beyond I-10 would risk potentially impacting the site. Mr. McKenna added that not extending the site beyond I-10 made more sense from a cost-benefit perspective.

Mr. Sorg asked if there would be any changes in the soils under the wetland channel. He commented that when soils change from dry to wet, there may be issues with ephemeral water. Mr. McKernna replied that the soils are coarse within the site, and that lining the channel with clay or fabric would minimize water depletion. Ms. Verdecchia commented that USIBWC would like to have a discussion with the City of Las Cruces regarding the Las Cruces Effluent Site; she mentioned a possible exchange of site maintenance from the City as part of the current trail lease. She added that long-term maintenance at the Las Cruces Effluent is an issue (e.g., selecting for fish at the fish passage structure), and that a formal agreement/contract would be necessary.

Mr. Bixby asked why a fish passage structure was not considered at the Downstream of Courchesne Bridge Site. Ms. Verdecchia and Mr. Nass responded that it was because the water at the site is stormwater. Mr. Bixby commented that it would be important to keep fish out of this site.

Mr. Sorg asked how ET was measured for the Las Cruces Effluent Site. Mr. McKenna responded that it was predicted using the same method included in the 2009 Conceptual Plan.

Mr. Sorg asked what the results of the calculations were. Mr. McKenna responded that it was 6.5 acre-feet per year. Ms. Salopek commented that the calculated ET seemed high. Mr. McKenna responded that the calculation for marsh habitat is usually approximately 5 acre-feet per year.

Mr. Sorg asked if ET was measured at the sites in their current state. Mr. McKenna responded ET values were also predicted for both pre-restoration states and post-restoration states for the sites. Pre-restoration and post-restoration ET values were used to quantify water usage at each site.

Ms. Verdecchia then thanked everyone for attending and participating and apologized for a late notice for the meeting. She then added that comments and questions could be sent to her or Mr. Nass.

Mr. Sorg asked if this would be the only public hearing for this Draft EA. Ms. Verdecchia responded that there would be public hearings for other projects.

Meeting Adjourned at 6:22 PM (Mountain).

Public Hearing
Draft Environmental Assessment Aquatic Habitat Restoration in the Rio Grande Canalization Project
Sierra and Doña Ana Counties, New Mexico and El Paso County, Texas
June 12, 2018

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# APPENDIX G
# PUBLIC REVIEW COMMENTS

**COMMENT RESOLUTION**

**DRAFT ENVIRONMENTAL ASSESSMENT
AQUATIC HABITAT RESTORATION IN THE
RIO GRANDE CANALIZATION PROJECT
SIERRA AND DOÑA ANA COUNTYIES, NEW MEXICO AND
EL PASO COUNTY, TEXAS**

**Comment 1) Molly Molloy (Email dated June 20, 2019):**

I want to express my enthusiastic support for **Alternative F--Las Cruces Effluent,** to create a meandering channel for this water to create habitat for birds along the trail from La Llorona Park down to the I-10 bridge near Las Cruces. As friends and family of the late Charles Bowden (1945-August 30, 2014), we know of his love for the river and for the wildlife who depend on its waters. Soon after Bowden moved to Las Cruces in 2009, he discovered this river trail and spent hours walking there and watching birds. He shared his idea to find a way to use this treated wastewater as it is returned to the river to restore wetland habitat along the trail and to make spaces for birds and other animals.

I'll share with you a few words from Charles Bowden in which he describes this stretch of the Rio Grande:

Tortured rivers wander my life. They weep behind levees, suffocate in locks, vanish without a cry in desert flats. The lakes die also, fish rot on the cracked bottoms. River empty out. Marshes burn in the white light. I walk a strand of effluent, a trickle of green slime fingering the dry bed of the Rio Grande.

In 1843, Audubon is coming down the Missouri on his last great jaunt to draw the mammals of the west. He has one tooth left, many aches and sees white pelicans. His party kills two for supper.

Four white pelicans stand in gray light of early morning. The ribbon of reclaimed sewage runs for five miles or so. The great white birds with long beaks and pouches loom like statues. The warty bump on their top bill looms large, mating time is at hand. ... A black crowned night heron moves up the river ahead of me. A ring necked gull flows over my head and lands on the sand of the Rio Grande.

We would love to see this restoration project on the river created as a Memorial to Charles Bowden. It would be a fitting tribute to his efforts to draw attention to the need for habitat, to do what we can to reclaim spaces from our cities, and to make them wild for the birds and the other lives who need them. Thank you for your efforts and we hope that this wetland will grow in honor of Charles Bowden's life and work, and especially to his enduring love for the wild places.

**Response 1: Thank you for comments. Alternative F – Las Cruces Effluent is currently one of the design alternatives included as part of the Preferred Action.**

**Comment 2) Larry Gioannini (Email dated July 9, 2019):**

I won't take your time to paraphrase what Molly and Chuck have said below. Chuck Bowden was a lover of birds, a guardian of the environment and a protector of human rights via journalism. He deserves the honor of having this wetland named after him and the people of Las Cruces deserve to have such a facility where they can reconnect with nature and be inspired by Chuck's example.

Thank you for considering this proposal to honor my gone but not forgotten friend and neighbor, Chuck Bowden.

**Response 2: Thank you for comments. Alternative F – Las Cruces Effluent is currently one of the design alternatives included as part of the Preferred Action.**

**Comment 3) Peg Bowden (Email dated June 14, 2019):**

To all involved in the aquatic restoration in the Rio Grande canalization project:

I enthusiastically support a wetlands project in Las Cruces, honoring my brother, Charles Bowden, who died in 2014. Brother Chuck was a well-known author and champion of all that is wild and beautiful in the natural world. The "Las Cruces effluent wetland" is Alternative F in your proposal submitted by the International Water and Boundary Commission, June 10, 2019.

Chuck was an avid birder, often walking in the early morning hours along the area being assessed for an effluent wetlands area. This spot along the Rio Grande in Las Cruces would be a beautiful memorial to my brother. I have personally walked in this area and see the potential for a peaceful place for people and wildlife to visit and enjoy. Thank you for your interest in developing an area of beauty and calm. Now, more than ever perhaps, we need places to walk and restore ourselves.

**Response 3: Thank you for comments. Alternative F – Las Cruces Effluent is currently one of the design alternatives included as part of the Preferred Action.**

**Comment 4) Sidney Webb, Messila Valley Audubon Society (Correspondence post marked June 27, 2019):**

Excellent meetings for public input. Concerns: 1) Is the Rio Grande Trail still a work in progress? Does USIBWC have a working relationship with them? 2) Las Cruces Effluent: Closest public access is the *inlegible* at La Llorona Park. Can access be developed?

**Response 4:**

**1) The Rio Grande Trail is not a part of the Aquatic Habitat Restoration project. The Rio Grande Trail is being considered under USIBWC's *Environmental Assessment for the Continued Implementation of the River Management Plan*.**

**2) The Las Cruces Effluent site would be open to the Public and the City of Las Cruces maintains an existing walking trail adjacent to the proposed aquatic restoration site. Public access and public parking would be through the La Llorona Park approximately 1.25 miles north of the site.**

**Comment 5) Matt Wunder, Ph.D., Chief, Ecological and Environmental Planning Division, State of New Mexico, Department of Game and Fish (Correspondence date July 3, 2019):**

The New Mexico Department of Game and Fish (Department) has reviewed the Aquatic Habitat Restoration in Rio Grande Canalization Project Draft Environmental Assessment (DEA). The United States Section of the International Boundary and Water Commission (USIBWC) is identifying, designing, and constructing aquatic habitat restoration projects with the Rio Grande Canalization Project. On 4 June 2009 the USIBWC issues a Record of Decision (ROD) for the long-term management of the Rio Grande Canalization Project. The 2009 ROD authorized restoration of aquatic habitat and a mosaic of native riparian plant communities at 30 sites over 10 years (through 2019). To date, 22 (approximately 508 acres) out of the 30 restoration sites (553 acres) identified in the ROD have been developed. Restoration of aquatic sites authorized in the 2009 ROD must be initiated in 2019. Approximately 45 acres of aquatic restoration remains to be completed based on the ROD restoration acreage. The purpose is to identify, design, and develop aquatic habitat restoration sites to satisfy USIBWC's commitment in the 2009 ROD, with an objective of identifying the best and most feasible sites for aquatic habitat. Restoration actions could include vegetation removal, disposal of woody debris, native vegetation planting, overbank lowering, bank cuts, natural levee breaches, secondary channels, bank destabilization, channel widening, arroyo mouth management, construction of inset floodplains, and use of supplemental water for on-site irrigation.

The DEA did not select Alternative G, Mesilla Valley Bosque State Park (MVBSP) project, which would create 15.8 acres of aquatic restoration features. This amount is almost five times the amount of aquatic habitat restoration as proposed by the selection of Alternative D,E, F, and H combined (3.39 acres of aquatic habitat restoration). Page 2-17 state "One of the major constraints of this alternative is the propose land transfer of MVBSP from NMSP to NMDGF. If the land transfer is litigated, the proposed project may not be initiated for several years until a settlement is decided".

In March 2019, Governor Lujan Grisham signed Senate Bill 533 (Act), which directs the State Game Commission to transfer more than 13 acres to New Mexico State Parks Division as part of the MVBSP. The Act supersedes the previous administrative transfer of the thirteen-plus acre property from the Commissioner of Public Lands to the State Game Commission in June 2018. Therefore, the MVBSP is now solely operated by the New Mexico State Parks Division.

The Department requests that the USIBWC seriously reconsider implementation of Alternative G to maximize acreage of aquatic habitat restoration and potential benefits to federally listed species such as southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and to native fish species. The Department has reviewed multiple existing restoration plans for MVBSP, and offers its assistance to USIBWC in developing project designs to maximize benefits from implemented habitat restoration activities.

We appreciate the opportunity to comment on these proposed restoration activities. Should you have any questions regarding our comments, please contact Mark Watson, Terrestrial Habitat Specialist, at (505) 476-8115 or Mark.Watson@state.nm.us.

**Response 5: Based on the recent Act by the New Mexico Legislature concerning MVBSP ownership, public comments, and interest expressed at the Public Hearing for Alternative G, USIBWC reevaluated Alternative G and included it in the Preferred Alternatives.**

**Comment 6) Kurt Anderson, Rio Grande Chapter of the Sierra Club and Doña Ana Domestic Water Consumers Association (Email dated June 14, 2019):**

My compliments on Wednesday's presentations regarding the Draft EA for aquatic habitat restoration on our portion of the Rio Grande. It was an informative session; indeed, I found it more informative than the materials I was able to obtain on-line. The links on the IBWC webpages, or those provided in the Notice of Availability all lead to a document entitled "Environmental Assessment for the Continued Implementation of the River Management Plan for the Rio Grand Canalization Project" dated 24 May 2019. Unfortunately, neither I nor my search engine have been able to find anything entitled "Draft Environmental Assessment and Finding of No Significant Impact for Aquatic Habitat Restoration in the Rio Grande Canalization Project". Can you point me to a source? Accordingly, my (brief) comments below are based solely on the materials presented at last Wednesday's Public Hearing.

Kurt Anderson
kurt@nmsu.edu

Comments on DEA for Aquatic Habitat Restoration in the Rio Grande Canalization Project (14 June, 2019)

1. The total acreage of "aquatic restoration features" in the Preferred Alternatives D, E, F, and H is a disappointingly small 3.3 acres. As I recollect, the original Record of Decision mentioned something like 50 acres.

2. It is unclear to me just how much of the acreage is to be "wet year round" in the sense of being able to maintain a population of fish or even amphibians.

3. As was probably clear from the Public Input, many were disappointed that Alternative G, the Mesilla Bosque State Park, was not included among the IBWC's Preferred Alternatives. The ownership of that facility, is by act of the NM Legislature, now firmly back in the hands of State

Parks. It is also adjacent to the Picacho Drain which, as far as I know, is the only "perennial stream" in the Mesilla Valley that currently contains fish!

4. It seems to me that the only other alternative that might have this potential is Alternative F.

5. I inquired as to what extent each of the presented Alternatives would prevent water , including water initially diverted from the Rio Grande, from entering or reentering the Rio Grande due to water being "lost" to evaporation and/or groundwater recharge. This might raise a legal issue since, as I understand it, all local runoff is considered Project Water and can't be impounded for other purposes. (I may be wrong on that, but …)

6. Your (very knowledgeable) consultant mentioned that herbaceous meadows have about half the evapotranspiration rate of a stand of salt cedars. Could I get a reference? How do these ET rates compare to the evaporation rate from open water?

Again, I am disappointed that Alternative G, which I thought most promising of the lot, was not first among your Preferred Alternatives. I suggest reconsideration.

Thanks for a well-managed and informative Public Hearing.

**Response 6:**

**1) According to acreages expressed in the 2009 Conceptual Plan approximately 50 acres remain to be restored. However, the acreage restored is not as important as the feasibility and sustainability of the restoration project. USIBWC's objective for the aquatic restoration project is habitat quality and not acreage.**

**2) Alternatives F (Las Cruces Effluent) would have perennial flow in the created channel. The total acreage of perennial aquatic habitat would be 0.09 acres. Sites upstream (Alternative D – Broad Canyon Arroyo) appear to have perennial open water habitat in the adjacent Rio Grande. At these sites the purpose is to improve the ecological functionality and biological productivity via new aquatic/wetland habitat in the floodplain areas at these sites.**

**3) Based on the recent Act by the New Mexico Legislature concerning MVBSP ownership, public comments, and interest expressed at the Public Hearing for Alternative G, USIBWC will reevaluated Alternative G and included it in the Preferred Alternatives.**

**4) Alternative F is currently included as one of the Preferred Alternatives in the Draft Environmental Assessment. Alternative F does have a perennial flow as a result of effluent being returned to the Rio Grande.**

**5) Three (Alternative D – Broad Canyon Arroyo, Alternative G – MVBSP, and Alternative H – Downstream of Courchesne Bridge) of the four alternatives included as part of the revised Preferred Alternatives would result in a reduction of evapotranspiration. This reduction in evapotranspiration would not limit water entering or returning to the Rio**

**Grande. Alternative F – Las Cruces Effluent would increase evapotranspiration by 6.5 acre-feet per year. This alternative would reduce the amount of effluent entering the river compared to the baseline. The USIBWC would need to obtain water rights to offset this water loss. USIBWC's use of groundwater is subject to review and approval by the U.S. Department of Justice. USIBWC's use of surface water must be for riparian habitat only (not aquatic habitat) and is subject to approval from the irrigation districts.**

**6) An evapotranspiration rate of 2.4 acre-feet per year was used for wet meadows per the grasslands in the 2009 Conceptual Plan (USACE 2009). For open water/marsh areas, an evapotranspiration rate of 5.8 acre-feet per year, per Multi-Species Conservation Program, was used to calculate evapotranspiration (2004. Lower Colorado River Multi-Species Conservation Program Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan. J&S 00450.00. Sacramento, California).**

**Comment 7) Gill Sorg, City of Las Cruces and Mesilla Valley Audubon Society (Comment Sheet submitted at Public Hearing on June 12, 2019):**

I'm so pleased these projects are making progress. What is the difference in the two ways the water is treated – can that be explained, even if with metrics? So its (evapotranspiration) 6.5 acre-feet/year (Mr. Sorg drew a schematic of water loss from the existing concrete channel and proposed channel).

**Response 7: The evapotranspiration rate for the proposed aquatic restoration site was calculated based on proposed vegetation included in the conceptual aquatic restoration site design. The calculated evapotranspiration rate for Alternative F is 6.5 acre-feet per year. The evapotranspiration rate of the exiting concrete channel was not calculated nor was groundwater recharge for the proposed habitat restoration site or existing concrete channel. Under the proposed aquatic restoration site conceptual design, effluent will be metered at the head of the proposed channel and at the confluence with the Rio Grande. USIBWC will compensate for water loss that occurs within the aquatic restoration site.**

**Comment 8) Zack Libbin, P.E., District Engineer, Elephant Butte Irrigation District (EBID) (Correspondence dated July 22, 2019):**

EBID appreciates the opportunity to comment on the Environmental Assessment (EA) for the Environmental Planning and Design for Aquatic Habitat Restoration in the Rio Grande Canalization Project (RGCP). The USIBWC's management of the RGCP is crucial to our role and responsibilities as an irrigation district within the project area.

EBID is concerned that the proposed aquatic restoration plans do not reflect a realistic understanding of the Rio Grande Project's hydraulics and hydrology. It is a simple fact that this is a heavily engineered river reach, and changes to the engineering design and function can have unanticipated consequences that propagate through the system. Lack of channel maintenance, which was an integral part of the Canalization Project design, already compromise primary functions of the system, water conveyance efficiency, and flood control. Further impairing these functions will lead to reduced allocation to EBID farmers, depriving them of the full exercise of their rights, and a greater risk of damage to property from flooding.

As we have explained before, the Rio Grande Project is in a severe and sustained drought that has persisted for more than 15 years and shows no sign of abating. [1)]The restoration sites appear to rely on deepening depressions in the riverbed to provide groundwater-fed pools as habitat when the release from the Caballo Reservoir is shut down. We have seen dramatic drops in the groundwater level, particularly in 2013 and 2014 that could dry out any likely restoration sites. [2)]In designing and assessing the habitat value of these sites, the very likely drying up of the sites should be considered. Complete drying is not necessary to wipe out a site's fish population. When the Caballo release is off and the river recedes to form pools, wading birds, raccoons, skunks, and other wildlife converge on the pools to take advantage of the near-literal fish in a barrel. The fish population that would inhabit these sites would be very vulnerable. For at least 80 years, and very likely more, the fish population in this river reach has been ephemeral, ebbing in times of drought and reestablishing from upstream in wetter times. Any introduced populations should be considered expendable, and the Rio Grande Project water users, including EBID, El Paso County Water Improvement District No. 1, and Mexico will require legal protection from extreme actions to maintain artificial populations of fish.

| Page | Comment |
|---|---|
| 3. | [3)]No distinct statement of what is an acceptable aquatic habitat. Without this objective, hard to measure success or failure of project. |
| 6. Biological Resources | [4)]Again, no mention of direct objective to achieve goals. No mention of long term monitoring of results through survey and inspections at any or all of these sites. [5)]Little or no mention of both long-term and short-term impacts on non-listed species due to loss of habitat in creation of aquatic habitat. |
| 8. Selden Point Bar | [6)]The statement that sediment control is needed means that sediment removal is ongoing and frequent removal will inhibit development of long-term success of habitat. |
| 23. | Description of possible actions in the areas selected.<br>[7)]All areas have no mention of armoring cottonwoods planted to reduce beaver predation.<br>[8)]Many of the area are dependent on surrounding habitat to create necessary nesting of SWFL due to limited size of project. [9)]Many of the sites suggest some sediment removal and additional disturbance to the area. This will certainly affect the long-term success of enhanced habitat. Additional information of frequency and extent is needed. |
| 29. Broad Canyon Arroyo | [10)]Enhancing backwater flow at the entrance appears to require significant river channel maintenance to maintain this condition. |
| 31. Selden Point Bar | [11)]This area is small with little adjacent suitable vegetation for YBCO and SWFL success. Both species require large tracts of suitable vegetation to ensure success. Much of the surrounding area lacks large deciduous trees needed by YBCO. |

| Page | Comment |
|---|---|
| 35. Las Cruces Effluent | [12)]Little or no mention of impact of easy accessibility by members of the public, which could have a negative effect on the project's success. Aquatic species that prefer this treated water are not documented. Fish passage structure is not explained thoroughly and seems infeasible. |
| 35. Mesilla Bosque State Park | [13)]Public ability to enter the area suggested will impact the ability of the project to enhance habitat for listed species. The clearing of the drain will also remove valuable nesting habitat for many non-listed species. This area has not recovered its previous diverse habitat from clearing of drain and removal of salt cedar. Many species formerly found in the area, no longer are present. |

Finally, and possibly the most important during the current litigation climate, is the issue of water rights. [14)]While the EA expressed the need for offsets for the consumptive use of water due to the proposed activities, no mechanism for offsets is discussed. In fact, there is currently no offset mechanism available in the Rio Grande Project area. The EA also mentions the potential connection with EBID's Mesilla Lateral Waterway 11 without documenting how this could be achieved. EBID has policy that was developed in partnership with USIBWC and Audubon New Mexico for providing water to riparian vegetation habitat sites, but it is clearly not applicable to aquatic habitat. It is questionable whether dedication of water rights to aquatic habitat with the Rio Grande Project could be achieved under both New Mexico Law and Rio Grande Project objectives. One key reason that the existing policy is limited to providing water for riparian vegetation is that the Rio Grande Project is a single purpose project, and the purpose is irrigation. Providing water to riparian vegetation is irrigation. Providing water for aquatic habitat is not irrigation and would require a change of purpose and point of use under New Mexico state law and perhaps a change of purpose of use under the federal 1920 Miscellaneous Purposes Act in order to comply with Reclamation law. New Mexico law may not recognize instream flows to support these aquatic habitat projects as proposed as a "beneficial use". Further, under the 1920 Miscellaneous Purposes Act, water would not be free, and cost to obtain water seems to have been completely ignored in this EA. At the end of the day, aquatic habitat projects will likely be extremely costly given the claims of the United States and the State of Texas in the Supreme Court Original Action, currently pending, known as Texas v. New Mexico. EBID must oppose any action that would further impair the water rights of irrigators with the Rio Grande Project as those water rights are consistently under attack from all angles.

[15)]EBID has long been an innovative and engaged participant in local water issues including habitat restoration. We recognize the potential for establishing aquatic restoration site but consider it irresponsible to do so when water rights are impaired or where habitat is not resilient to drought.

**Response 8:**

**1) Deepening groundwater-fed depressional pools within the riverbed is not recommended at any of the proposed aquatic habitat restoration sites/features.**

**2) In the conceptual plan, several of the proposed restoration sites (Mesilla Valley Bosque State Park, Las Cruces Effluent, and Downstream of Courchesne Bridge) rely on water sources other than in-stream flows to sustain newly created aquatic habitats because of the potential for the sites to dry up. The aquatic restoration sites would provide habitat for native fish species. Fish may remain in the ephemeral channels created year around but would retreat upstream in those alternatives that do not have ephemeral channels. The project is designed to provide habitat for native fish species but does not afford them any protection.**

**3) The objectives of the project and potential aquatic habitats that could be created are provided on page 1-2, 4th paragraph of the draft EA.**

**4) The objectives of the project are provided on page 1-2, 4th paragraph of the draft EA.**

**5) We do not anticipate significant short-term or long-term effects on non-listed species during creation of aquatic habitat. In the short-term non-listed species may be disturbed but will relocate to adjacent suitable habitat. The creation of additional habitat would have a long-term beneficial impact on non-listed species under any alternative. Effects on non-listed species of wildlife are discussed in Section 3.1.2 Wildlife.**

**6) Periodic sediment maintenance may be required based on results of monitoring and adaptive management.**

**7) USIBWC will consider the addition of beaver protection (i.e. cages, etc.) for riparian plantings.**

**8) Not all sites (i.e. Las Cruces Effluent) are anticipated to provide breeding (nesting) habitat for SWFL due to the size of the project as stated. However, these smaller sites could provide roosting and foraging habitat for SWFL which would have a beneficial impact on the species.**

**9) It is anticipated that the frequency, extent, and necessity for regular sediment removal will vary by site and feature. For example, sediment maintenance at Las Cruces Effluent and Downstream of Courchesne is expected to be less frequent than other sites, because they will be supplied with water sources with a very low sediment load. Other sites supplied by river flows will require periodic sediment maintenance depending on how the site evolves over time and future management goals for a particular site.**

**10) No in-channel modification is recommended. The purpose of the project is to expand a backwater that already forms under existing in-channel conditions at the confluence.**

**11) Much of the site includes a dense coyote willow bankline that extends upstream and downstream. Supplemental revegetation is recommended to improve site conditions for YBCU and SWFL.**

**12) Additional analysis of impacts on the aquatic restoration site from public access are included in the final EA. Native fish species potentially supported at the Las Cruces effluent site are identified on page 3-16 of the draft EA and in GSA's Aquatic Habitat Restoration Site Alternatives and Conceptual Design report included as Appendix B of the draft EA. The fish passage structure is an option and additional details are be provided in the final EA; however, more details will be developed during the design phase.**

**13) Because this is a state park, pedestrian access is allowed and management policies allow for multi-use of recreation and habitat protection. Clearing of the drain was recommended per recommendations voiced during a site visit with EBID. A high density of supplemental plantings is recommended to offset previous habitat loss that occurred when salt cedar was removed from the site.**

**14) Subject to the review and approval of the U.S. Department of Justice, USIBWC could use its current groundwater rights at the Las Cruces Effluent site, and the beneficial use would have to be changed from agriculture to aquatic habitat. USIBWC would need to install a water well at the Las Cruces Effluent site and these costs would need to be added to the cost of the alternative. At some of the other sites (MVBSP), water will be routed to floodplain areas for the purpose of watering nearby new and existing riparian plantings.**

**15) Two of the preferred alternatives Alternative F – Las Cruces Effluent and Alternative H – Downstream of Courchesne Bridge rely on alternative water sources other than the Rio Grande. One other alternative, Alternative G – Mesilla Valley Bosque State Park includes an alternative water source as well as the Rio Grande. These alternatives offer viable alternatives from a standpoint of drought resilience.**

# APPENDIX H
# NHPA CONCURRENCE LETTERS

From: Cunnar, Geoff, DCA <Geoff.Cunnar@state.nm.us>
Sent: Tuesday, October 22, 2019 3:33 PM
To: Mark Howe
Subject: RE: Broad Canyon Aquatic Habitat Restoration HPD Log 111659

OFFICIAL RESPONSE OF THE NEW MEXICO STATE HISTORIC PRESERVATION OFFICER (SHPO)
Hi Mark,
The SHPO concurs that the undertaking in Broad Canyon will have no effect to historical properties provided that site LA131204 is avoided and a temporary barrier (lathing flagging tape or plastic fencing) is installed somewhere between the access road and the area of the site in order to prevent any accidental incursions into the site boundary. The SHPO acknowledges that the exact location of the temporary barrier will be determined by Mark Howe or another qualified archaeologist.

Best Regards,

Geoff

Geoff Cunnar, PhD RPA
Staff Archaeologist
State of New Mexico Department of Cultural Affairs
Historic Preservation Division
407 Galisteo Street, Suite 236
Santa Fe, New Mexico 87501
505-476-0530

Best,

Geoff

Geoff Cunnar, PhD RPA
Staff Archaeologist
State of New Mexico Department of Cultural Affairs
Historic Preservation Division
407 Galisteo Street, Suite 236
Santa Fe, New Mexico 87501
505-476-0530

From: Mark Howe [mailto:mark.howe@ibwc.gov]
Sent: Tuesday, October 22, 2019 3:08 PM
To: Cunnar, Geoff, DCA
Subject: [EXT] Broad Canyon Aquatic Habitat Restoration

Geoff,
After discussion and clarification with you, the area south of LA 131204 as mapped in 2000, that is located north of Broad Canyon Arroyo will be avoided. Restoration work with heavy equipment will stay on the south side of the arroyo from NM 185 and continue around the arroyo bend to the Rio Grande. Work will be done in the area that was all sandy sediment / river from the 1967 air photo as discussed. Any discovery during restoration work will result in work stoppage on USIBWC's part and they will contact me for further investigation at which time I will contact you.
Thanks.

Mark L Howe, MA
Cultural Resources Specialist
International Boundary and Water Commission - U.S. Section
4191 North Mesa
El Paso, Texas  79902-1423
(915) 832-4767
Mark.Howe@ibwc.gov
www.ibwc.gov

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

October 8, 2019

Dr. Jeff Pappas, State Historic Preservation Officer
New Mexico Historic Preservation Division
C/O Bob Estes
407 Galisteo Street, Suite 236
Santa Fe, NM 87501

Subject: Proposed *Aquatic Habitat Restoration in the Rio Grande Canalization Project* in Doña Ana County, NM.

The United States Section of the International Boundary and Water Commission (USIBWC) is finalizing the *Environmental Assessment Aquatic Habitat Restoration in the Rio Grande Canalization Project Sierra and Doña Ana Counties, New Mexico and El Paso County, Texas.*

USIBWC is proposing to restore aquatic habitat on land in the Rio Grande Floodplain in New Mexico. This project will have ground disturbing activity in the floodplain with excavation no greater than 2 meters depth, and restoration work would reshape the area for planting of wetland and riparian vegetation. One location for Aquatic and Riparian Enhancement is downstream of Courchesne Bridge (Figure 1), in orange.

The work at the Courchesne Bridge site, located east of Sunland Park, NM on the Texas/New Mexico boundary, is a project to excavate a meandering channel that routes stormwater from below the highway, through the site, and into the Rio Grande and create about 13 acres of diverse aquatic habitat features, including benches, embayments, pools, and enhancement of existing wetlands. The proposed Area of Potential Effect (APE) for Courchesne Bridge is a maximum of 15 acres (Figure 1), but the whole area is highly disturbed from previous Canalization Project construction from 1937 to 1943 (Figures 2-3, 5-6), railroad and highway construction, and flooding and sediment deposition events. Access will be on established roads in the area and in the river channel. There are no sites (Figure 4) near this proposed restoration site. USIBWC will have a Field Environmental Monitor (FEM) on site when work is proceeding.

This location was archeologically surveyed by TRC, and results are stated in the *USIBWC Rio Grande Canalization Project River Restoration Implementation Plan: Cultural Resources Management Task* from March 2011. USIBWC has determined that the restoration activities at this location would not result in adverse effects to cultural properties as no historic properties will be affected.

4191 N. Mesa Street • El Paso, Texas 79902-1423
915.832.4100 • Fax: 915.974.2270 • http://www.ibwc.gov

USIBWC requests your concurrence for this action covered under the 2017 Programmatic Agreement Stipulation VII.C. If you have questions, please contact Mr. Mark Howe, Cultural Resources Specialist, at (915) 832-4767 or by email at mark.howe@ibwc.gov.

Sincerely,

Gilbert Anaya
Division Chief
Environmental Management Division

No Historic Properties Affected.

10-16-19

for NM State Historic Preservation Officer

January 16, 2020

Martina Callahan
Comanche Indian Tribe
6 SW D Avenue
Lawton, OK 73502

Subject: Request for Tribal Comments Regarding Concerns of Traditional, Religious, or Cultural Importance on the *Aquatic Habitat Restoration in the Rio Grande Canalization Project*

Dear Ms.Callahan:

The International Boundary and Water Commission, United States Section (USIBWC) is in the process of identifying aquatic habitat restoration projects within the Rio Grande Canalization Project (RGCP).

In the 1940s, USIBWC constructed the RGCP 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, 49 Stat. 1463). The RGCP spans a 105-mile reach of the Rio Grande from Percha Diversion Dam, Sierra County, New Mexico to American Dam in El Paso, El Paso County, Texas. The USIBWC's 2009 *Record of Decision on River Management Alternatives for the RGCP* (ROD) committed the USIBWC to restore riparian and aquatic habitat at up to 30 sites. In June 2019, the USIBWC prepared a *Draft Environmental Assessment* (EA) *and Finding of No Significant Impact for Aquatic Habitat Restoration in the Rio Grande Canalization Project,* in compliance with the National Environmental Policy Act (NEPA). The purpose of the EA was to identify, design, and implement aquatic habitat restoration sites to satisfy USIBWC's commitment for aquatic habitat in the 2009 ROD. Restoration actions could include invasive vegetation removal, native vegetation planting, overbank lowering, bank cuts, natural levee breaches, secondary channels, bank destabilization, channel widening, arroyo mouth management, construction of inset floodplains, and use of supplemental water for on-site irrigation.

This EA evaluated potential environmental impacts of eight alternatives, shown in Figure 1. The USIBWC is anticipating finalizing the Draft EA by March 2020. The Draft EA is available at: https://www.ibwc.gov/EMD/EIS_EA_Public_Comment.html. However, the Draft EA was since modified to incorporate stakeholder and public input, including modification of the Preferred Alternative.

USIBWC's new Preferred Alternative is to implement the following four alternatives (Alternatives D, E, F, and H).

- Alternative D - Broad Canyon Arroyo (Radium Springs, NM): USIBWC would excavate a series of embayments at the mouth of the arroyo, creating 0.2 acres of aquatic restoration features

- Alternative F - Las Cruces Effluent (Las Cruces, NM): USIBWC would replace the straight concrete-lined channel currently used to convey treated wastewater to the Rio Grande with a relatively long, meandering channel, creating 0.9 acres of diverse aquatic habitat features.
- Alternative G - Mesilla Valley Bosque State Park (Mesilla, NM): USIBWC would work with property owners, including state agencies and the irrigation district, to create a variety of habitat features such as several shallow depressions (swales) and enhancement of existing wetlands, creating 15.8 acres of diverse aquatic habitat features. The original Draft EA included a connection between Picacho Drain and the Rio Grande; however, based on stakeholder input, this design aspect is being modified to create a secondary Picacho Drain channel which meanders throughout the southern portion of the park, rather than a direct connection to the river.
- Alternative H - Downstream of Courchesne Bridge (El Paso, Texas): USIBWC would excavate a meandering channel that routes stormwater from below the highway, through the site, and into the Rio Grande, creating 1.4 acres of diverse aquatic habitat features.

The other four alternatives evaluated in the EA which USIBWC does not anticipate selecting in the decision document include:

- Alternative A - No Action: USIBWC would not implement aquatic habitat restoration projects
- Alternative B - Yeso Arroyo: USIBWC would create nested terraces along the bankline opposite the arroyo, creating 6.9 acres of aquatic restoration features
- Alternative C - Angostura Arroyo: USIBWC would create nested terraces along the bankline opposite the arroyo, creating 7.5 acres of aquatic restoration features
- Alternative E - Selden Point Bar: USIBWC would to excavate a high-flow channel and a backwater channel supplemented by revegetation with native riparian and wetland plant species, creating 0.8 acres of aquatic restoration features.

In accordance with 36 C.F.R. Part 800, "Protection of Historic Properties," regulations that implement Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470f), the USIBWC is contacting you to determine if your tribe may attach traditional, religious or cultural importance to any historic resources affected by the proposed project/activity. The goal of consultation under Section 106 is to allow your tribe the opportunity to help identify historic properties potentially affected by this proposed project; assess the effects of the project on any historic resources; and consider ways to avoid, minimize or mitigate any adverse effects. While USIBWC has determined that the probability is low, all the aquatic habitat alternatives have the potential to impact undiscovered cultural resources during ground disturbing activities. Best Management Practices for cultural resources protection are identified in USIBWC's River Management Plan and standard USIBWC construction specifications and would continue to be implemented under all alternatives. The USIBWC Cultural Resources Specialist would coordinate with the appropriate State Historic Preservation Office under USIBWC's Programmatic Agreements for New Mexico (2017) and Texas (2013).

Please also note that should human remains or any other cultural materials be discovered during construction, we will require all partners to halt work and contact any potentially affected federally-recognized Tribes, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation within forty-eight (48) hours of discovery (pursuant to the protocol established at 36 C.F.R. Part 800, Section 800.13(b)(3)).

USIBWC respectfully request any comments or concerns you may have be sent by **February 12, 2020** to Ms. Elizabeth Verdecchia at elizabeth.verdecchia@ibwc.gov or by mail to 4191 N. Mesa, El Paso, TX 79902.

We look forward to hearing from you. Please contact Ms. Elizabeth Verdecchia at (915) 832-4701 or the contact information provided above if you have questions or for additional information.

Sincerely,

Gilbert Anaya
Division Chief
Environmental Management Division

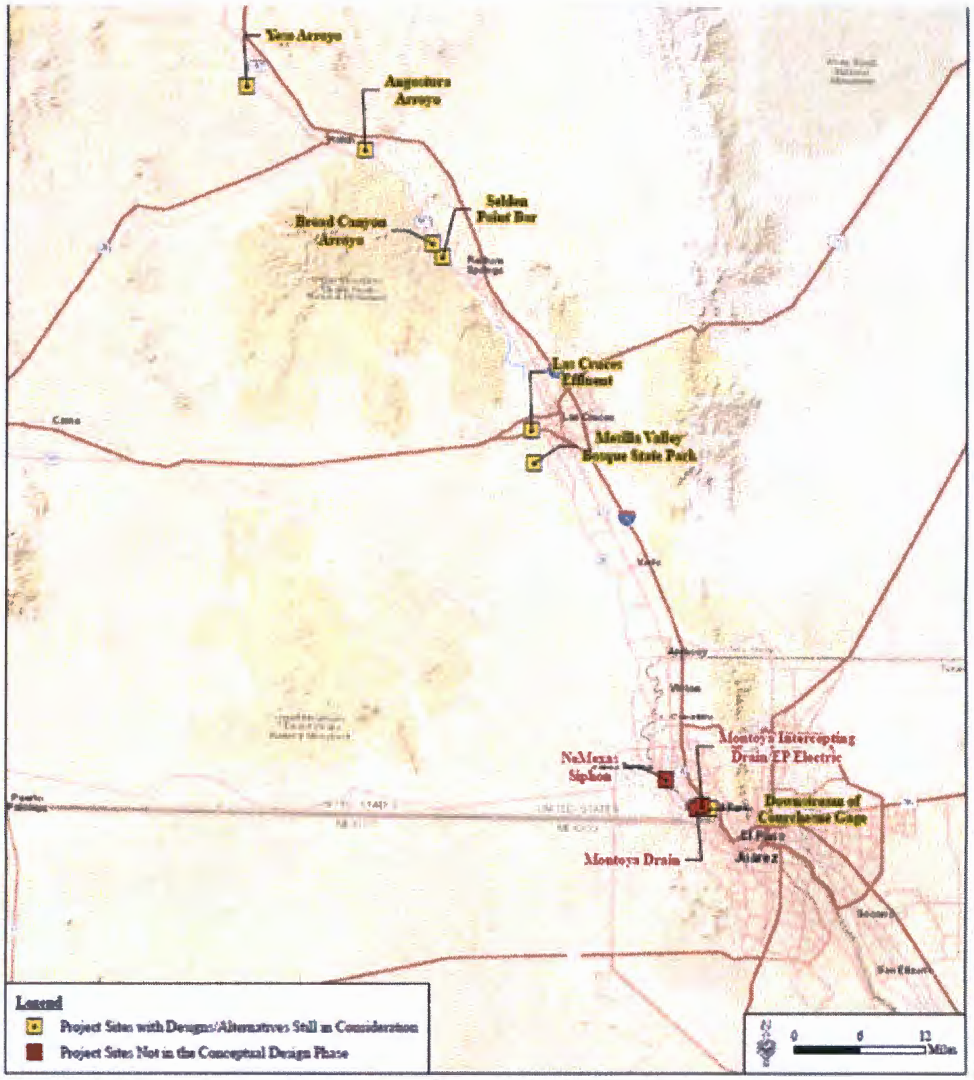


Figure 1 Project Area Map Showing the Location of Project Sites

GSRC

April 2019

Distribution List

| Tribes | | | | | | | |
|---|---|---|---|---|---|---|---|
| Comanche Indian Tribe | 6 SW D Avenue | Lawton | OK | 73502 | Martina Callahan | THPO | martinac@comanchenation.com |
| Fort Sill Apache Tribe | 43187 US Highway 281 | Apache | OK | 73006-8038 | Michael Darrow | Tribal Historian | michael.darrow@fortsillapache-nsn.gov |
| Isleta Pueblo | PO Box 1270 | Isleta Pueblo | NM | 87022 | Max Zuni | Governor | POIgov@isletapueblo.com; POI90009@isletapueblo.com |
| Kiowa Tribe | PO Box 369 | Carnegie | OK | 73015 | Amber Toppah | Chairman | dbearshield@kiowatribe.org |
| Mescalero Apache Tribe | PO Box 227 | Mescalero | NM | 88340 | Holly Hougten, THPO | Tribal Historic Preservation Officer | holly@mathpo.org |
| Navajo Nation | PO Box 4950 | Window Rock | AZ | 86515 | Richard Begay | Tribal Historic Preservation Officer | r.begay@navajo-nsn.gov |
| Tesuque Pueblo | Route 42, Box 360-T | Santa Fe | NM | 87506 | Mark Mitchell | THPO | mamitchell@pueblooftesuque.org |
| White Mountain Apache Tribe | PO Box 1032 | Fort Apache | AZ | 85926 | Mark Altaha | Tribal Historic Preservation Officer | markaltaha@wmat.us |
| Ysleta del Sur Pueblo | 119 S. Old Pueblo Road | El Paso | TX | 79907 | Javier Loera | THPO | jloera@ydsp-nsn.gov |
| The Hopi Tribe | PO Box 123 | Kykotsmovi | AZ | 86039 | Timothy L. Nuvangyaoma | Chairman | TNuvangyaoma@hopi.nsn.us |

STATE OF NEW MEXICO
**DEPARTMENT OF CULTURAL AFFAIRS**
**HISTORIC PRESERVATION DIVISION**

Michelle Lujan Grisham
Governor

BATAAN MEMORIAL BUILDING
407 GALISTEO STREET, SUITE 236
SANTA FE, NEW MEXICO 87501
PHONE (505) 827-6320 FAX (505) 827-6338

November 5, 2020

Mr. Gilbert Anaya
Division Chief, Environmental Management Division
International Boundary and Water Commission United States and Mexico
The Commons, Building C, Suite 100
4171 N. Mesa Street
El Paso, Texas 79902-1441

***Re: Proposed Aquatic Habitat Restoration in the Rio Grande Canalization Project-Broad Canyon (HPD Log 111659, part 2.***

Dear Mr. Anaya:

Thank you for consulting with the SHPO's office on the proposed aquatic habitat restoration area in Doña Ana County, NM. Mark Howe indicated that we did not comment on the Las Cruces Effluent portion of the undertaking. I apologize for this as I believe we got into conversation on the Broad Canyon portion and forgot to address the effluent portion. Anyway, the SHPO concurs with the IBWC's recommendations for the undertaking. There will be no historical properties affected.

If you would like to discuss this further, please do not hesitate to contact me. I can be reached by telephone at (505) 476-0530 or email at geoff.cunnar@state.nm.us.

Sincerely,

Geoffrey Cunnar

Geoff Cunnar, PhD RPA
Staff Archaeologist
State of New Mexico Department of Cultural Affairs
Historic Preservation Division
407 Galisteo Street, Suite 236
Santa Fe, New Mexico 87501
505-476-0530

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

OFFICE OF THE COMMISSIONER
UNITED STATES SECTION



October 8, 2019

Dr. Jeff Pappas, State Historic Preservation Officer
New Mexico Historic Preservation Division
C/O Bob Estes
407 Galisteo Street, Suite 236
Santa Fe, NM 87501

Subject: Proposed *Aquatic Habitat Restoration in the Rio Grande Canalization Project* in Doña Ana County, NM.

Dear Dr. Pappas:

The United States Section of the International Boundary and Water Commission (USIBWC) is finalizing the *Environmental Assessment Aquatic Habitat Restoration in the Rio Grande Canalization Project Sierra and Doña Ana Counties, New Mexico and El Paso County, Texas.*

USIBWC is proposing to restore aquatic habitat on land in the Rio Grande Floodplain in New Mexico. This project will have ground disturbing activity in the floodplain with excavation no greater than 2 meters depth, and restoration work would reshape the area for planting of wetland and riparian vegetation. One location for Aquatic and Riparian Enhancement is at Mesilla Valley Bosque State Park (Figure 1).

The work at the Mesilla Valley site, located southwest of Las Cruces, NM, is a project that USIBWC would work with property owners (New Mexico State Parks, New Mexico Department of Game and Fish, Elephant Butte Irrigation District, and possibly a private landowner) to create 15.8 acres of various aquatic habitat features within the park. Aspects of this project include constructing a channel connecting the Picacho Drain and the Rio Grande (Figure 1 in blue), excavating several shallow depressions (swales) (Figure 1 in tan), terracing of the southern portion of the Picacho Drain (Figure 1 in green), enhancing riparian habitat (Figure 1 in orange) and enhancing existing wetlands (Figure 1 in pink). The proposed Area of Potential Effect (APE) for Mesilla Valley is a maximum of 31.3 acres (Figure 1), but the whole area is highly disturbed from previous Canalization Project construction, flooding and sediment deposition events (Figures 2-3, 5-6). The proposed restoration will mimic the natural floodplain which existed at this location prior to the Canalization Project construction from 1937 to 1943. Access will be mostly on established roads in the area and in the river channel. Heavy equipment may need to work outside established roads or trails to excavate the connecting channel and swales. There are sites (Figure 4) near this proposed restoration site (LA 149307, LA 43946 and LA 16315); however, none will be impacted as they are outside of the excavation area, and USIBWC will have a Field Environmental Monitor (FEM) on site when work is proceeding.

USIBWC's property at this location was archeologically surveyed by TRC, and results are stated in the *USIBWC Rio Grande Canalization Project River Restoration Implementation Plan: Cultural Resources Management Task* from March 2011. New Mexico property and private property were also previously surveyed, as indicated in NMCRIS. USIBWC has determined that the restoration activities at these locations would not result in adverse effects to cultural properties as no historic properties will be affected.

USIBWC requests your concurrence for this action covered under the 2017 Programmatic Agreement Stipulation VII.C. If you have questions, please contact Mr. Mark Howe, Cultural Resources Specialist, at (915) 832-4767 or by email at mark.howe@ibwc.gov.

Sincerely,

Gilbert Anaya
Division Chief
Environmental Management Division

No Historic Properties Affected.

10-16-19

for NM State Historic Preservation Officer

November 8, 2019

Gilbert Anaya
Division Chief
Environmental Management Division
4191 North Mesa Street
El Paso, Texas 79902-1423

Re: Review under Section 106 of the National Historic Preservation Act of 1966: *Proposed Aquatic Habitat Restoration in the Rio Grande Canalization Project in El Paso County, Texas.*
(THC Tracking No. 202002116)

Dear Mr. Anaya:

Thank you for submitting to us the proposed project referenced above. This letter serves as comment on the proposed undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission.

The History Programs Division review staff, led by Caitlin Brashear, has completed its review of the above-referenced project and has determined that the Rio Grande Canalization Project was previously determined eligible for inclusion in the National Register of Historic Places under Criterion A for Government/Public Works and Agriculture/Irrigation; and under Criterion C for Engineering (see THC Tracking No. 200908498). Additionally, the aquatic habitat restoration project falls within the Elephant Butte Irrigation District, a historic district listed in the National Register of Historic Places (NRHP).

The Archeology Division review staff, led by Drew Sitters, and Pamela Opiela of the Division of Architecture have completed their review of the proposed aquatic habitat restoration project. After examining the documentation, we have concluded that **no historic properties are present or adversely affected** by the project as proposed. We also concur with your finding of **no historic properties affected** if the proposed undertaking avoids impacts to elements contributing to the Elephant Butte Irrigation District. However, if buried cultural materials, or historic properties, are encountered during construction or disturbance activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096, or the THC's History Programs Division at 512-463-5853, to consult on further actions that may be necessary to protect the cultural remains or historic properties.

Thank you for your cooperation in this federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review or if we can be of further assistance, please contact **Drew Sitters at 512-463-6252** or **Drew.Sitters@THC.Texas.gov.**

Sincerely,

William A. Martin

for
Mark Wolfe, State Historic Preservation Officer
MW/ds

# COMANCHE NATION

International Boundary and Water Commission
United States and Mexico
ATT: Mr. Gilbert Anaya
4191 N. Mesa Street
El Paso, TX 79902-1423

February 19, 2020

RE: Aquatic Habitat Restoration in the Rio Grande Canalization Project (RGCP)

Dear Mr. Anaya,

In response to your request, the above reference project has been reviewed by staff of this office to identify areas that may potentially contain prehistoric or historic archeological materials. The location of your project has been cross referenced with the Comanche Nation site files, where an indication of ***"No Properties"*** have been identified. (IAW 36 CFR 800.4(d)(1)).

This review is performed in order to identify and preserve the Comanche Nation and State cultural heritage, in conjunction with the State Historic Preservation Office. Please contact the Comanche Nation Tribal Historical Preservation Office at (580) 595-9618, if you require additional information on this project.

Best Regards,

*Martina Minthorn*

Comanche Nation Historic Preservation Office
Martina Minthorn, Tribal Historic Preservation Officer
#6 SW "D" Avenue, Suite C
Lawton, OK. 73501
martina.minthorn@comanchnation.com
(580) 595-9618/Fax (580) 595-9733

*"To preserve historic and sacred landmarks of the Comanche Nation"*

# White Mountain Apache Tribe
**Office of Historic Preservation**
**PO Box 1032**
**Fort Apache, AZ 85926**
**Ph: (928) 338-3033 Fax: (928) 338-6055**


**To:** Gilbert Anaya, Division Chief / Environmental Management Division

**Date:** January 31, 2020

**Re:** *Aquatic Habitat Restoration in the Rio Grande Canalization Project*

The White Mountain Apache Tribe Historic Preservation Office appreciates receiving information on the project dated; January 16, 2020. In regards to this, please attend to the following statement below.

Thank you for allowing the White Mountain Apache tribe the opportunity to review and respond to the above proposed aquatic habitat restoration projects within the Rio Grande Canalization Project, in El Paso County, Texas. Upon reviewing the information provided, we've determined the project will ***"Not have an Adverse Effect"*** on White Mountain Apache tribe's historic properties and/or traditional cultural properties.

Thank you for your continued collaborations in protecting and preserving places of cultural and historical importance.

Sincerely,

*Mark T. Altaha*

White Mountain Apache Tribe – THPO
Historic Preservation Office

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

October 4, 2021

Received October 4th, 2021
HPD Log 115990

Dr. Jeff Pappas, State Historic Preservation Officer
New Mexico Historic Preservation Division
C/O Geoff Cunnar
407 Galisteo Street, Suite 236
Santa Fe, NM 875 01

Subject: Proposed Maintenance and Aquatic Habitat Implementation in Montoya Intercepting Drain, Sunland Park, NM

Dear Dr. Pappas:

The United States Section of the International Boundary and Water Commission (USIBWC) is proposing to conduct work within the USIBWC-owned portion of the Montoya Intercepting Drain (MID) in Sunland Park, NM.

USIBWC is in the process of finalizing the *Environmental Assessment for Aquatic Habitat in the Rio Grande Canalization Project*. The Amended Draft EA from February 2021 included proposed aquatic habitat enhancements along the MID, and the USIBWC anticipates selecting a modified version (Option A) of the MID alternative, as shown in Figure 1, with work concurrent with the construction of the Sunland Park East Levee Improvements scheduled for spring of 2022. Option A of the MID Alternative includes removal of cattails and saltcedar vegetation, removal of accumulated sediment, installation of a culvert at the Montoya C Lateral, and construction of access ramps from the levee.

The Montoya Intercepting Drain was constructed in 1938 as part of the Rio Grande Canalization Project levee construction, in coordination with U.S. Bureau of Reclamation as part of the Rio Grande Project. MID was constructed parallel to the levees in order to aid with irrigation return flows in the area when the USIBWC straightened the river channel, eliminating a river meander (the Jundt Cut-Off), to construct the levee system (Figure 2).

The proposed Area of Potential Effect (APE) for the project is the lower 3.4-mile portion of the Montoya Intercepting Drain which is USIBWC property. While USIBWC owns this property, it is considered part of the Elephant Butte Irrigation District (EBID) drainage system, and EBID traditionally maintained this irrigation drain, until USIBWC levee improvements in 2010 limited access of equipment. USIBWC intends to construct access ramps from the levee to facilitate future routine maintenance. Additionally, the culvert at Montoya C Lateral will facilitate return flows reaching the Rio Grande more efficiently, mimicking the historical flow pattern of the river, rather than flowing through the MID prior to entering the river.

Figure 1 also shows that Option B would include terracing and subsequent planting of native vegetation at the lower end of the drain near its confluence with the Montoya Drain. At this time, USIBWC is not selecting the Option B in the selected alternative.

Figure 3 shows the 1967 aerial image, and Figure 4 shows a screenshot of the NMCRIS database for the area. There are no cultural resources along the MID. Because the action is limited to the footprint of the existing canal, USIBWC has determined that there are no impacts to cultural resources.

USIBWC requests your concurrence for this action covered under the 2017 Programmatic Agreement Stipulation VII.C. If you have questions, please contact Elizabeth Verdecchia, Natural Resources Specialist, at (915) 832-4701 or by email at elizabeth.verdecchia@ibwc.gov.

Sincerely,

Gilbert G. Anaya
Division Chief
Environmental Management Division

No Historical Properties Affected

Geoffrey Cunnar

for the NM Historic Preservation Officer
10/15/2021


Figure A-20. Montoya Intercepting Drain Alternative Site Conceptual Restoration Design

*Basemap: ESRI World Imagery (5/12/2020)*

GSRC

September 2021

Figure 1. Conceptual Design of MID Alternative in the Final EA (pre-publication)

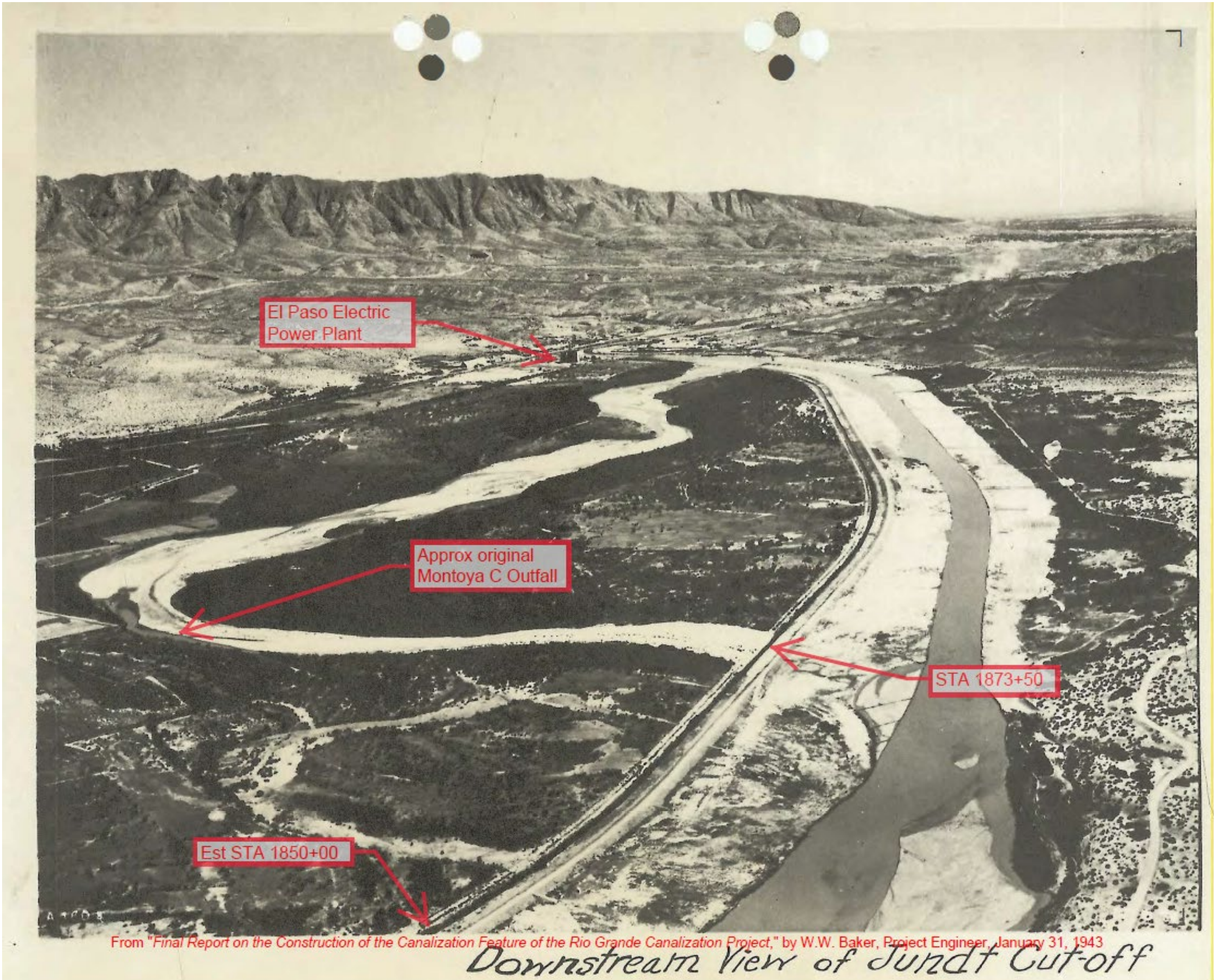


Figure 2: Jundt Cut-off and MID, 1943


Figure 3. 1967 ariel image

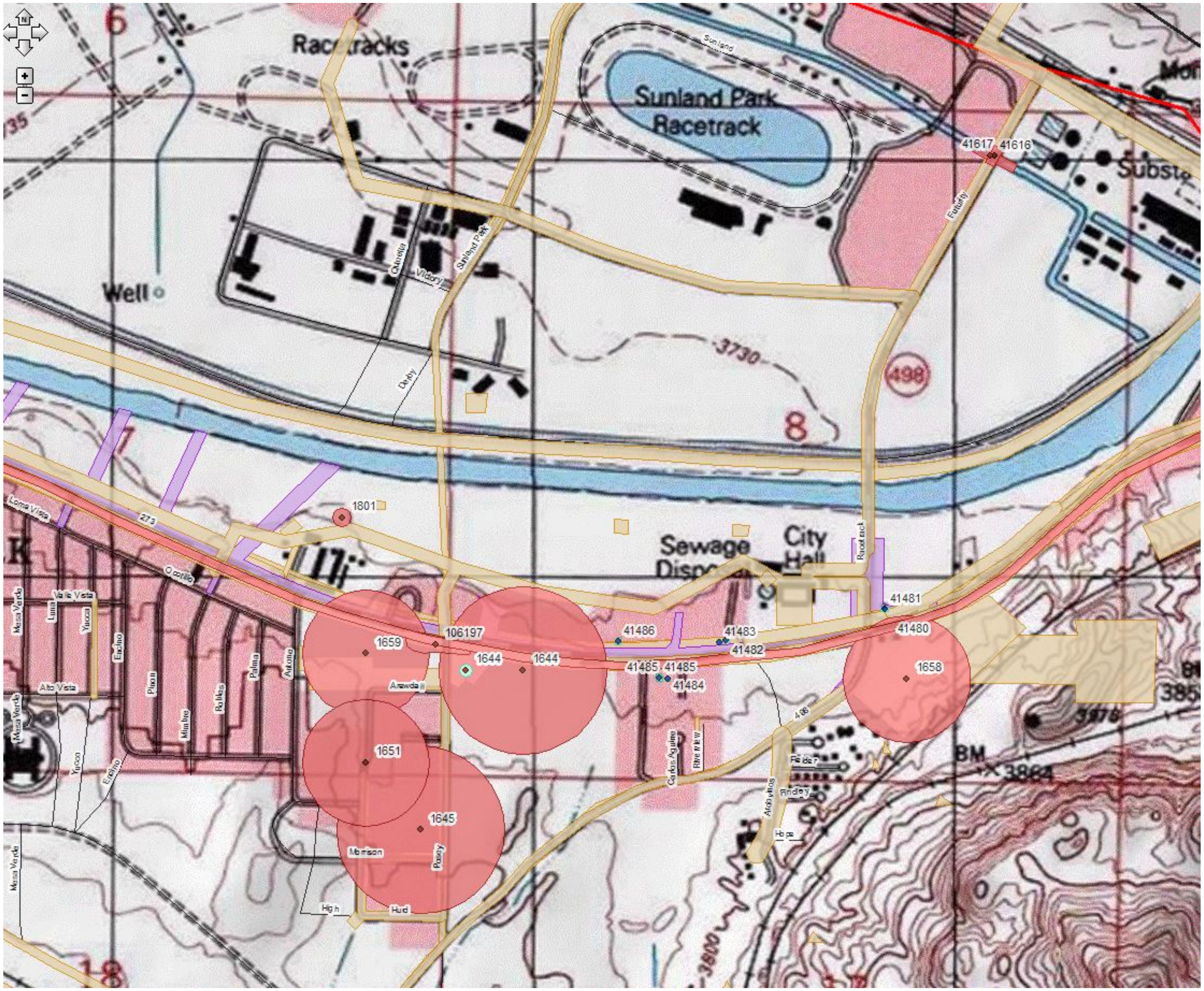


Figure 4. NMCRIS screenshot of the area