La Mancha Wetland Design and Analysis Report

Prepared for

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KEY TERMS

cfs  cubic feet per second
EBID  Elephant Butte Irrigation District
HEC-RAS  Hydrologic Engineering Centers River Analysis System
NEPA  National Environmental Policy Act of 1969
OSE  Office of the State Engineer
RERI  River Ecosystem Restoration Initiative
ROD  Record of Decision
SHPO  State Historic Preservation Office
SWEC  Southwest Environmental Center
USACE  U.S. Army Corps of Engineers
USBOR  U.S. Bureau of Reclamation
USFWS  U.S. Fish and Wildlife Service
USIBWC  United States Section of International Boundary and Water Commission
WSE  Water Surface Elevation
WSEPond  water surface elevation in the pond
WSERiver  water surface elevation in the river
1. PROJECT DESCRIPTION

1.1 BACKGROUND

In southern New Mexico, more than 100 miles of the Rio Grande below Caballo Dam has been heavily modified by human activity. Dam construction, flow diversions and channelization have had substantial ecological impacts. The federal canalization project of the late 1930s and early 1940s straightened the river to increase conveyance efficiency and flood control. In addition, the river flows in the Rio Grande in southern New Mexico have been entirely appropriated for agriculture and river discharge is predominantly determined by downstream irrigation needs. Since there is no need for irrigation water in the winter months, water stored in reservoirs is not released from November through most of February and flows are reduced to minor inputs from groundwater and precipitation. Canalization and flow management have greatly reduced the availability of low velocity floodplain and backwater habitat that are important to many riverine species. The U.S. Fish and Wildlife Service (USFWS), and others have identified habitat loss as a strong contributing factor to decreased biodiversity and abundance of many native fish species found in the Rio Grande (Hatch 1986, USFWS 2001).

In 2009, the Southwest Environmental Center (SWEC) received funding from the State of New Mexico’s River Ecosystem Restoration Initiative (RERI) to restore aquatic and riparian habitats along the canalized reach of the Rio Grande near the City of Las Cruces, New Mexico (Figure 1-1). The project aims to simulate backwater habitat that is seasonally connected to the main channel and to provide spawning and rearing habitat for native fish. Native wetland and riparian plants will be reestablished in the littoral zone along the periphery of the backwater to provide spawning substrate and encourage regeneration of native riparian vegetation in the project area.

SWEC contracted Parametrix in June of 2009 to design a constructed pond and backwater channel consistent with the RERI grant and to develop engineering drawings and cost estimates for the project. Parametrix was also contracted to obtain letters of concurrence and to assist with the permitting requirements from the State Historic Preservation Office (SHPO), USFWS, U.S. Army Corps of Engineers (USACE), and the United States Section of International Boundary and Water Commission (USIBWC).

1.2 GOALS AND OBJECTIVES

SWEC’s primary goal for this project is to restore aquatic and riparian habitat along the Rio Grande in southern New Mexico. The overall project objectives include:

1. Create 2 to 3 acres of aquatic habitat that will enable fish and other species to survive through the non-irrigation season, when the main channel is dewatered.

2. Provide spawning and nursery habitat for native riverine fish by shaping channel and pond habitat to create a diversity of water depths, including shallow areas that will support emergent vegetation.

3. Restore native riparian and wetland vegetation by planting native vegetation along the ponds and channel, improving the hydrologic connectivity between the river and its floodplain and curtailing annual mowing in the immediate project area.
Figure 1-1. Project Location Map for the Constructed Pond and Wetland
1.3 HABITAT CHARACTERISTICS AND DESIGN CONSIDERATIONS

SWEC identified several target fish species that should benefit from the proposed project, which included gizzard shad (*Dorosoma cepedianum*), blue catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), longnose gar (*Lepisosteus osseus*), and river carpsucker (*Carpiodes carpio*). The pond and backwater habitat was designed around the specific habitat requirements of these species. A brief summary of the habitat characteristics for each species can be found in Appendix A.

The preferred habitat characteristics of the constructed pond and backwater channel were determined based upon the habitat preferences of the target fish species. Many of the desired habitat characteristics can be served by constructing a perennially wetted backwater pool that is intermittently connected to the main stem of the canalization reach of the Rio Grande. Many of these desired habitat characteristics will benefit two or more of the target fish species and include:

- Backwater/slow velocity water connected to main channel.
- Diversity of depths (shallow to deep).
- Habitat structure/cover.
- Sandy/silty bottom substrate.
- Aquatic and emergent vegetation as substrate/food source.

Based upon the identified habitat characteristics of the target fish community, a design concept was developed (Figure 1-2). The conceptual design includes an excavated pond with a diversity habitat at varying depths (shallow, moderate and deep as defined in Table 1-1) that will be constructed on land owned by SWEC.

The pond would be connected to the river via a backwater channel on property managed by the USIBWC. The pond to river connection will be managed by the use of a gated culvert set at an elevation that prevents the exchange of surface water at depths less than 1,200 cfs.

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Depth (feet) at 1,200 cfs</th>
<th>Depth (feet) at 100 cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow, ephemerally wet</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moderate depth, ephemerally wet</td>
<td>0 – 3.5</td>
<td>0 – 1.7</td>
</tr>
<tr>
<td>Deep, perennially wet</td>
<td>3.5 – 6.0</td>
<td>1.7 – 4.2</td>
</tr>
</tbody>
</table>

*cfs = cubic feet per second*
Figure 1-2. Conceptual Design for the Constructed Pond and Backwater Channel
2. SITE ASSESSMENT

2.1 BASELINE SITE CONDITIONS

The project area is located on land adjacent to the Rio Grande in the town of Mesilla (Figure 1-1). Most of the area is private land owned by SWEC, but a portion of the project is on federal land managed by the U.S. Section of the International Boundary and Water Commission.

The project site owned by SWEC contains a portion (0.02 acres) of a small wetland (0.1 acres total size) and 0.4 acres of a larger pond (whose total size is 1.1 acres). In a July 2009 field visit, the small wetland appeared to be anoxic, filled primarily with cattails, covered in filamentous green algae, and provided little habitat diversity. The larger pond had a much more diverse habitat assemblage. It had cattails on its periphery with a large area of open water that showed varying degrees of colonization by aquatic plants. A diverse assemblage of ducks, shorebirds, fish, amphibians and reptiles were observed using the pond and the immediate area. SWEC’s remaining property is vegetated with upland vegetation associated with semi-arid desert scrub habitat except for a large debris pile that was created after construction of the existing pond.

A single soil core was taken in July 2009 to assess soil conditions to determine the approximate depth of the permanent groundwater table. Soil mottling is indicative of a seasonal groundwater table, while the gleying in soil layers beneath the mottled soil layers is indicative of the permanent groundwater table.

2.2 SURVEY

A topographic survey was conducted by Donahue Land Surveys in July 2009. The survey was tied to the City of Las Cruces Benchmark 283 in US Survey feet (NAVD 88). The survey extent included the entire property owned by SWEC and the USIBWC managed property between the levee and the river. SWEC’s property includes a spoils pile that was likely created from the construction of a pond by a neighboring property owner. The neighboring pond extends onto SWEC’s property. Donahue Land Surveys did not survey the spoils pile, because it was SWEC’s intent that the previous property owner would remove the dirt and debris from the property prior to project construction. As a result, Parametrix and Wolf Engineering have assumed a constant elevation of 4,882 feet in the area covered by the debris pile that was omitted from the survey. The topographic survey also tied into an elevational control benchmark utilized by LIDAR aerial topographic surveys. Elevations for the survey were different than the elevations in the USACE Hydrologic Engineering Centers River Analysis System (HEC-RAS) model (described in the Engineering Design section of this report). A difference of 2.55 feet between the two was found (HEC-RAS elevation – Surveyed elevation = 2.55 feet).

2.3 HYDROLOGY

An analysis of the hydrology of this reach of the Rio Grande was required to determine the desired water surface elevation that would inundate the particular habitat types and to estimate their frequency of inundation. The hydrologic analysis was initiated by contacting the Elephant Butte Irrigation District (EBID) to discuss the river operations in this river reach. An EBID hydrologist recommended the Picacho gaging station (operated by EBID) as the most relevant due to its proximity (1.25 miles upstream) to the project area. The online records for the Picacho gaging station were only available since January 2008, however, and
provide a limited snapshot of the hydrology in the project reach (Figure 2-1). EBID was unable to gather additional historical data for this gage without charging a fee, so due to the limited resources available for this project, an alternative approach was pursued.

Mr. Henry Magallanez (EBID) provided background information about river operations pertaining to irrigation requirements in the region during two phone conversations in February 2010. He stated that water flows in this river reach can fluctuate unpredictably depending upon the irrigation needs at any particular moment. As a result, flows within the river are relatively unpredictable during the irrigation season (typically March 1 to November 1). He also indicated that typical flows in the river during the irrigation season exceed 1,000 cfs and river discharge in May and/or June regularly exceeds 1,200 cfs. Throughout the year, storms may produce high intensity, short-lived peak flows that exceed 2,000 cfs. These peak discharges are unpredictable and may exceed 2,000 cfs, but are quickly attenuated in the river channel. Mr. Magallanez stated that target discharges of 1,200 to 1,300 cfs (at Picacho gaging station) would be exceeded at the project site for at least 4 weeks annually during the irrigation season.

Since there was not much data available for the Picacho gaging station, an analysis of the flood recurrence intervals could not be performed for that dataset; however, the Army Corps of Engineers (USACE) and others (2008) did perform an analysis of the flood recurrence intervals at Caballo, Leasburg, and El Paso gaging stations (Figure 2-2). None of these sites are near the project site, however, little weight was given to this analysis in determining the target discharges for the project area. An analysis of flood recurrence intervals provides estimates of the return period of peak flow events of a particular magnitude.
Figure 2-2. Flood Recurrence Interval (Return Period) and Exceedance Probability for the Canalization Reach of the Rio Grande in New Mexico and Texas (USACE et al. 2008)

Using the Picacho gaging station data and the information from EBID, it was determined that river discharges between 1,200 and 2,000 cfs would provide habitat connectivity between the river and the pond during a biologically important period for the target fish species. In addition, it was determined that between March 1 and November 1, discharge in the river would typically exceed 1,000 cfs. This information was used to determine how the pond would be contoured to provide habitat at particular depths over a range of discharges (Table 2-1). The analysis of the flood recurrence interval at Leasberg (USACE 2008) was used to confirm that the target discharge in this reach had a comparable recurrence interval to other reaches in the Rio Grande.

2.4 NET WATER DEPLETIONS

William J. Miller Engineering (Santa Fe, NM) was subcontracted to analyze the net water depletions for pre- and post-project conditions by estimating the amount of water that would be lost through evapotranspiration. The results of the net depletions analysis indicate that in a typical water year (in which EBID provides 3.0 acre-feet of irrigation water per acre), the constructed pond/wetland would consume approximately 9 acre-feet of water. In low or moderate water years, however, EBID may allocate less than 3 acre-feet of water per acre to its constituents, while the project would maintain the same rate of water consumption (9 acre-feet/year). Table 2-2 estimates the annual consumptive rate and net depletions of each habitat type that will be constructed in the proposed project.

The complete net depletions analysis is provided in Appendix B.

<table>
<thead>
<tr>
<th>Table 2-1. Elevation Ranges and Total Acreage of Habitat Types in Constructed Pond and Backwater Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat Type</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
</tr>
<tr>
<td>Moderate depth, ephemerally wet</td>
</tr>
<tr>
<td>Deep, perennially wet</td>
</tr>
<tr>
<td>Existing Habitat Types</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Tamarisk - Riparian</td>
</tr>
<tr>
<td>Semi-arid grassland scrub</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
</tr>
<tr>
<td>Moderate depth, ephemerally wet</td>
</tr>
<tr>
<td>Deep, perennially wet</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
</tr>
</tbody>
</table>
3. PROJECT DESIGN

The design concept consists of a perennially wetted pond connected intermittently by surface water to the Rio Grande at river discharges greater than 1,200 cfs (Figure 1-2). Water will flow through a constructed channel and a gated culvert through the levee and into the constructed pond. The culvert will be placed at an elevation that allows the exchange of surface water between the river and the pond only at flows exceeding 1,200 cfs which is estimated to occur regularly in May and June and occasionally in July (Figure 2-1).

The habitat characteristics of the target fish species (Appendix A), the topographic survey, the engineering limitations, and the net depletions analysis were all used to develop the design concept for the constructed pond and backwater channel. The design maximizes the zero-velocity, moderate, and deep water habitat while maintaining less than 9.0 acre-feet in annual net depletions. The deep water habitat has been designed to maintain water quality and provide surface water (via exchange of surface flows and groundwater seepage) throughout the year. A large volume of water in the pond will help maintain water quality by minimizing water temperature in the summer, thus helping to maintain higher dissolved oxygen concentrations. The zero-velocity habitat will encourage the settling of entrained sediment, while minimizing the inflow of turbid surface water during periods of surface water connectivity with the river.

Shallow habitat with emergent wetland vegetation will be wetted intermittently at flows exceeding 1,200 cfs. It is estimated that these areas will be inundated for less than two months annually. The transition between the shallow and deep habitats is typically designed with a 3:1 slope and will be wetted intermittently.

Habitat structure would enhance fish habitat and are recommended to be incorporated into the deep water habitats. Various types of habitat structure would be appropriate depending upon its availability, including large woody debris, fallen trees, hollow logs, root wads, used culverts, barrels, or rip/rap. Habitat structure will enhance habitat and benefit the target fish species particularly blue catfish, flathead catfish, and river carpsucker.

3.1 REVEGETATION

The constructed habitat will be greatly enhanced through supplemental revegetation. It is anticipated that SWEC might be able to use volunteers to harvest and transplant the recommended species as a cost saving measure. It is also possible to purchase plant materials if needed, and numerous regional businesses are able to provide plant materials [cost per plant provided based upon costs for Hydra Aquatic, Inc. (www.hydraaquatic.com)].

Different assemblages of plant species are recommended for planting in each constructed habitat type. The native plant species appropriate for each habitat type are presented in Table 3-2. Wetlands are well-known for naturally becoming revegetated with wetland species, however, natural colonization of the wetland habitats may result in a cattail monoculture colonizing the periphery of the constructed pond. Therefore, it is recommended that SWEC revegetate the constructed habitats with species that are less likely to be an eventual management concern. While cattails should be expected to colonize the backwater and pond habitats, active revegetation with other species may allow the revegetated species to become established before cattails become the dominant plant species.
3.2 ENGINEERING DESIGN

Sheets 1 through 6 in Appendix C provide engineering designs for project construction. Wolf Engineering (Albuquerque, NM) produced the drawings using design parameters from the above analyses, the topographic survey, and input from Parametrix staff and SWEC. Water surface elevations (Table 3-1) for particular discharges were modeled using the 2-dimensional HEC-RAS model developed for this reach by Mussetter Engineering for the USACE (2008). The elevational difference between the topographic survey and the HEC-RAS model was corrected by adjusting the HEC-RAS elevations by -2.55 feet to correlate with the topographic survey which was tied to an elevation benchmark near the project location.

3.3 COSTS

Cost estimates for project implementation were also developed by Wolf Engineering. The cost estimates were developed using the assumptions stated previously in the report, including: 1) the debris pile would not need to be removed prior to project implementation; 2) obtaining plant materials and revegetation would be accomplished using volunteers and therefore it would not be necessary to purchase plant materials or pay labor costs for their installation. According to the cost estimates, construction costs are estimated to be $231,520. Appendix C has additional detail about the cost estimates.

3.4 CHALLENGES

After project construction, a number of operational issues will need to be considered. These issues include flood protection; the deposition of sediment in the backwater channel; tracking of net depletions; management of non-native, invasive fish species; and management of emergent and aquatic vegetation. Each issue is discussed in greater detail below.

3.4.1 Flood Protection

Management of the gated culvert will be a primary issue of concern. The culvert is intended to allow water exchange between the pond and the backwater channel when the river discharge exceeds 1,200 cfs and the newly constructed berm around the constructed pond is designed to contain water surface elevations associated with river discharges of approximately 11,000 cfs (according to the USACE HEC-RAS model). As designed, the gated culvert will be placed through the levee and represents a location of potential compromise during flood events; therefore, the culvert gate is recommended to be closed during flood events. While flows up to 11,000 cfs will be contained by the newly created berm around the pond, USIBWC and USACE should be consulted prior to construction to determine the maximum river discharge that is an acceptable method of gate management for all parties, while the gate remains open.

<table>
<thead>
<tr>
<th>Discharge (cfs)</th>
<th>WSE a at Proposed Culvert Location (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3878.2</td>
</tr>
<tr>
<td>600</td>
<td>3879.2</td>
</tr>
<tr>
<td>1,000</td>
<td>3879.8</td>
</tr>
<tr>
<td>1,200</td>
<td>3880.0</td>
</tr>
<tr>
<td>1,500</td>
<td>3880.3</td>
</tr>
<tr>
<td>2,000</td>
<td>3880.8</td>
</tr>
<tr>
<td>5,000</td>
<td>3882.9</td>
</tr>
<tr>
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<td>3884.6</td>
</tr>
<tr>
<td>11,000</td>
<td>3884.9</td>
</tr>
<tr>
<td>15,000</td>
<td>3885.9</td>
</tr>
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</table>

a Adjusted from HEC-RAS model by -2.55 feet as described in text.
<table>
<thead>
<tr>
<th>Habitat</th>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Preferred Water Depth</th>
<th>Height Range</th>
<th>Rate of Spread</th>
<th>General Wetland Status</th>
<th>Plant Type</th>
<th>Family</th>
<th>Adapted to Coarse Textured Soils</th>
<th>Adapted to Medium Textured Soils</th>
<th>Adapted to Fine Textured Soils</th>
<th>Anaerobic Tolerance</th>
<th>Salinity Tolerance</th>
<th>Shade Tolerance</th>
<th>Cost per Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Anemopsis californica</td>
<td>Yerba manza</td>
<td>Seasonal flooding</td>
<td>8-12&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Forb</td>
<td>Saururaceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>Medium</td>
<td>Intolerant</td>
<td>$2.50</td>
</tr>
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<td>Shallow, ephemerally wet</td>
<td>Calamagrostis canadensis</td>
<td>Bluejoint reedgrass</td>
<td>Seasonal flooding</td>
<td>Up to 6&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Grass</td>
<td>Poaceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Carex aquatilis</td>
<td>Water sedge</td>
<td>Moist soil to 3&quot;</td>
<td>15-36&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Sedge</td>
<td>Cyperaceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Carex emoryi</td>
<td>Emory's sedge</td>
<td>Seasonal flooding</td>
<td>15-40&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Sedge</td>
<td>Cyperaceae</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>$0.75</td>
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<tr>
<td>Shallow, ephemerally wet</td>
<td>Carex microptera</td>
<td>Small winged sedge</td>
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<td>8-16&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Sedge</td>
<td>Cyperaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Carex praegracilis</td>
<td>Clustered field sedge</td>
<td>Seasonal flooding</td>
<td>8-30&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Sedge</td>
<td>Cyperaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intermediate</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Carex utriculata</td>
<td>Beaked sedge</td>
<td>Moist soil to 6&quot;</td>
<td>10-40&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Sedge</td>
<td>Cyperaceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>Low</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Eleocharis accularis</td>
<td>Needle spike rush</td>
<td>Moist soil to 2&quot;</td>
<td>8-12&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Spike rush</td>
<td>Cyperaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Eleocharis palustris</td>
<td>Creeping spike rush</td>
<td>Moist soil to 4&quot;</td>
<td>12-30&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Spike rush</td>
<td>Cyperaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus acuminatus</td>
<td>Spiny rush</td>
<td>Seasonal flooding</td>
<td>12-24&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus arcticus</td>
<td>Baltic rush, wire rush</td>
<td>Seasonal flooding</td>
<td>18-30&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus confusus</td>
<td>Colorado rush</td>
<td>Seasonal flooding</td>
<td>3-20&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus dichotomus</td>
<td>Rush species</td>
<td>Seasonal flooding</td>
<td>15-40&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus effusus</td>
<td>Common rush</td>
<td>Moist soil to 1&quot;</td>
<td>15-48&quot;</td>
<td>slow</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus interior</td>
<td>Intact rush</td>
<td>Seasonal flooding</td>
<td>18-30&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus longistyris</td>
<td>Meadow rush</td>
<td>Seasonal flooding</td>
<td>8-24&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus mertensianus</td>
<td>Merten's rush</td>
<td>Seasonal flooding</td>
<td>4-16&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus nodosus</td>
<td>Knotted rush</td>
<td>Seasonal flooding</td>
<td>4-16&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus tenuis</td>
<td>Path rush</td>
<td>Seasonal flooding</td>
<td>20-28&quot;</td>
<td>medium</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Juncus torreyi</td>
<td>Torry's rush</td>
<td>Seasonal flooding</td>
<td>8-32&quot;</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Rush</td>
<td>Juncaceae</td>
<td>$0.75</td>
<td></td>
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</table>

(Table Continues)
Table 3-2. Plant Species List Appropriate for Supplemental Revegetation of Constructed Habitat Types at La Mancha Wetland (Continued)

<table>
<thead>
<tr>
<th>Habitat, Wet Type</th>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Preferred Water Depth</th>
<th>Height Range</th>
<th>Rate of Spread</th>
<th>General Wetland Status</th>
<th>Plant Type</th>
<th>Family</th>
<th>Adapted to Coarse Textured Soils</th>
<th>Adapted to Medium Textured Soils</th>
<th>Adapted to Fine Textured Soils</th>
<th>Anaerobic Tolerance</th>
<th>Salinity Tolerance</th>
<th>Shade Tolerance</th>
<th>Cost per Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Muhlenbergia asperifolia</td>
<td>Scratchgrass muhly</td>
<td>Seasonal flooding</td>
<td>12-30”</td>
<td>rapid</td>
<td>FACW/FACW+</td>
<td>Grass</td>
<td>Poaceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium</td>
<td>High</td>
<td>Tolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Puccinellia nuttaliana</td>
<td>Nutall’s alkali grass</td>
<td>Seasonal flooding</td>
<td>6-12”</td>
<td>medium</td>
<td>FAC-OBL</td>
<td>Grass</td>
<td>Poaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Schoenoplectus pungens</td>
<td>Three square rush</td>
<td>Moist soil to 6”</td>
<td>12-24”</td>
<td>rapid</td>
<td>OBL</td>
<td>Rush</td>
<td>Cyperaceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Scirpus microcarpus</td>
<td>Small fringed bulrush</td>
<td>Moist soil to 3”</td>
<td>2-5”</td>
<td>medium</td>
<td>OBL</td>
<td>Bulrush</td>
<td>Cyperaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Shallow, ephemerally wet</td>
<td>Scirpus pallidus</td>
<td>Cloaked bulrush</td>
<td>Moist soil to 3”</td>
<td>Up to 5”</td>
<td>slow</td>
<td>OBL</td>
<td>Bulrush</td>
<td>Cyperaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$0.75</td>
</tr>
<tr>
<td>Moderate depth, intermittent</td>
<td>Berula erecta</td>
<td>Water parsnip</td>
<td>Moist to 12”</td>
<td>12-24”</td>
<td>rapid</td>
<td>OBL</td>
<td>Forb</td>
<td>Apiaceae</td>
<td>$2.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate depth, intermittent</td>
<td>Sagittaria cuneata</td>
<td>Arrowhead</td>
<td>Saturated to 12”</td>
<td>6-18”</td>
<td>rapid</td>
<td>OBL</td>
<td>Forb</td>
<td>Alismataceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$2.50</td>
</tr>
<tr>
<td>Moderate depth, intermittent</td>
<td>Schoenoplectus americanus</td>
<td>Common three square rush</td>
<td>Moist soil to 12”</td>
<td>24-48”</td>
<td>rapid</td>
<td>OBL</td>
<td>Rush</td>
<td>Alismataceae</td>
<td>$0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate depth, intermittent</td>
<td>Sparganium eurycarpum</td>
<td>Broadfringed burreeed</td>
<td>Moist soil to 12”</td>
<td>24-48”</td>
<td>rapid</td>
<td>OBL</td>
<td>Forb</td>
<td>Sparganiaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intermediate</td>
<td>$2.50</td>
</tr>
<tr>
<td>Deep, perennially wet</td>
<td>Sagittaria cuneata</td>
<td>Arrowhead</td>
<td>Saturated to 12”</td>
<td>6-18”</td>
<td>rapid</td>
<td>OBL</td>
<td>Forb</td>
<td>Alismataceae</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$2.50</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Baccharis salicifolia</td>
<td>Seaepilow</td>
<td>Seasonal flooding</td>
<td>6-10”</td>
<td>rapid</td>
<td>FAC/FACW</td>
<td>Tree/Shrub</td>
<td>Asteraceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Low</td>
<td>High</td>
<td>Intolerant</td>
<td>$6.50</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Populus deltoides ssp. wislizeni</td>
<td>Rio Grande cottonwood</td>
<td>Seasonal flooding</td>
<td>To 75”</td>
<td>rapid</td>
<td>FAC/FACW</td>
<td>Tree/Shrub</td>
<td>Salicaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>Intolerant</td>
<td>$22.00</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Prosopis pubescens</td>
<td>Screwbean mesquite</td>
<td>None</td>
<td>To 50”</td>
<td>medium</td>
<td>FACU/FAC</td>
<td>Tree/Shrub</td>
<td>Fabaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Median</td>
<td>High</td>
<td>Intermediate</td>
<td>$6.50</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Rhus tripartata</td>
<td>Three leaf sumac</td>
<td>None</td>
<td>4-12”</td>
<td>medium</td>
<td>UPL/FACU</td>
<td>Tree/Shrub</td>
<td>Anacardiaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>Intermediate</td>
<td>$6.50</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Ribes aureum</td>
<td>Golden current</td>
<td>None</td>
<td>4-10”</td>
<td>medium</td>
<td>FACW</td>
<td>Tree/Shrub</td>
<td>Grossulariaceae</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Rosa woodsii</td>
<td>Wood’s rose</td>
<td>None</td>
<td>3-6”</td>
<td>rapid</td>
<td>FACU/FAC</td>
<td>Tree/Shrub</td>
<td>Rosaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>Low</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Salix exigua</td>
<td>Coyote willow</td>
<td>Seasonal flooding</td>
<td>6-12”</td>
<td>rapid</td>
<td>FACW/OBL</td>
<td>Tree/Shrub</td>
<td>Salicaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>Low</td>
<td>Intolerant</td>
<td>$2.75</td>
</tr>
<tr>
<td>Perimeter</td>
<td>Salix gooddingii</td>
<td>Gooding’s willow</td>
<td>Seasonal flooding</td>
<td>To 50”</td>
<td>rapid</td>
<td>FACW/OBL</td>
<td>Tree/Shrub</td>
<td>Salicaceae</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>None</td>
<td>Intolerant</td>
<td>$22.00</td>
</tr>
</tbody>
</table>
3.4.2 Sediment Deposition

Sediment deposition will be another issue of concern in the constructed backwater channel. Low-velocity water flowing into the backwater channel will have a low retention capacity for entrained sediment and will be associated with increased rates of sediment deposition. Deposition rates are expected to be greatest close to the river where turbidity is greatest. As a result, the backwater channel may require periodic excavation as sediment accumulation may decrease or eliminate surface water connectivity between the river and the pond. Channel maintenance in this area may be required as frequently as every 1 to 3 years.

Sediment deposition is also expected to occur in the pond, but at a slower rate than in the backwater channel. This is expected to be a minor concern because the amount of sediment flowing into the pond is expected to be minimal other than during the initial influx of water into the pond during the spring. The decay of organic matter could also contribute to accretion in the constructed pond, particularly in the shallow areas, but the diversity of habitat types constructed in the project area should continue to provide a diversity of habitat depths for an extended period of time.

3.4.3 Monitoring Water Deliveries

Henry Magallanez (EBID) was consulted in February 2010 to discuss acceptable methods to monitor water deliveries at the La Mancha project site. During these phone conversations, it was concluded that the monitoring method that was most agreeable to EBID while meeting the project objectives would be to track the change in water storage within the pond while the culvert gate is open and water is being exchanged with the river.

The amount of water stored within the constructed pond will be directly correlated with the water surface elevation within the pond. Prior to the irrigation season, the culvert gate will be closed and the water surface elevation in the pond (WSEPond) is expected to be lower than the water surface elevation in the river (WSERiver). The amount of water stored within the pond can be determined from WSEPond by examining a staff gage.

After the culvert gate is opened and WSERiver exceeds the elevation of the bottom of the culvert (referred to as the culvert invert elevation), water will flow from the river into the pond until WSEPond is equal to WSERiver. If the gate remains open, the WSERiver will likely fluctuate. When the WSERiver rises, water will move into the pond and when the WSERiver decreases, water will move out of the pond. If the WSERiver decreases below the culvert invert elevation, however, the WSEPond will remain equal to the culvert invert elevation and water exchange with the river will cease. Therefore, the total amount of water delivered to the pond through the culvert would equal the difference between the water storage of the pond with a WSEPond equal to the culvert invert elevation (or the WSEPond at the time the gate is closed) and the WSEPond prior to the culvert gate being opened.

A water level data logger will be installed within a well pipe on-site to provide a method to track the water surface elevation of the pond over time. The logger should track the water surface elevation every hour and be downloaded regularly to prevent the loss of data due to insufficient memory.

This method of tracking water deliveries does not account for groundwater seepage from the river or any other source. It simply monitors surface water deliveries through the culvert. Mr. Magallanez indicated that EBID does not track the groundwater consumption of farmers in the region either and, therefore; tracking groundwater consumption for this project would not be necessary.
3.4.4 Net Water Depletions

Mr. Henry Magallanez (EBID) expressed that tracking net depletions or consumptive losses from evapotranspiration would not be necessary for this project. This is beneficial to the project, in that tracking net depletions in this project will not be a simple and straightforward process. While some of the water will flow into the pond through the backwater channel and culvert, groundwater seepage is also expected to feed the pond. Further discussion of net depletions is provided in Appendix D.

3.4.5 Non-Native Wildlife

In an email dated November 13, 2009, David Propst of New Mexico Department of Game and Fish expressed his concern about non-native species using the constructed pond (particularly bullfrogs and common carp) and suggested that a unidirectional fish barrier may be appropriate to inhibit their movement into the pond. While this may seem attractive, it is not conducive to achieving many of the project goals. The primary goal in the design of this project was to provide habitat for the targeted native riverine fish species at high discharges by providing access to slow-velocity backwater habitat via a surface water connection between the Rio Grande and the constructed pond. Preventing the movement of non-native fish into the pond would also prevent access by native fish. Amphibians (such as bull frogs) will be able to gain access to the pond via overland or aquatic pathways and would not be prevented from accessing the pond using a fish barrier. In addition, there is not a good method to selectively allow native fish to move into the pond while preventing access by non-native wildlife; therefore, based upon the available technology, the use of a unidirectional fish barrier is not recommended at this time.

An alternative approach to control the population of non-native wildlife in the pond would be to release large specimens of desirable native fish species into the pond. Large blue or flathead catfish (that were identified by SWEC as desirable fish species) would feed upon a sizable quantity of native and non-native fish and frogs and help to control non-native wildlife populations in the pond.

3.4.6 Vegetation Management

The designs for the constructed wetland include shallow and moderate depth habitats that will be revegetated by emergent plant species. The revegetation approach was described in Section 3.1. Over time (estimated to be 3 to 10 years), cattails (*Typha* spp.) may become the dominant plant species in these habitat zones. Active revegetation will help prevent this scenario, but may not be entirely effective. In the past, cattail management has been accomplished using several non-herbicidal approaches including fire, mowing, flooding, or excavation of the root stock (Motivans and Apfelbaum 1987). Herbicidal control methods can also be used, but are not considered to be a preferred method of management by Parametrix biologists. Appendix E provides a good summary of effective techniques to control cattail species.
4. AGENCY COORDINATION

Parametrix completed agency coordination by sending out scoping letters to USBOR, EBID, SHPO, USFWS, USACE, Office of the State Engineer (OSE), and USIBWC soliciting comment, permitting requirements, and coordination if appropriate. Copies of the letters and associated responses are included in Appendix F. As a result of the initial scoping, Parametrix initiated further coordination between the USBOR and EBID, on behalf of SWEC. A stakeholder meeting was held on January 29, 2010 with BOR, EBID, IBWC, SWEC, and Parametrix. Many of the design concerns were discussed and addressed at that time; however, coordination will continue with stakeholder agencies throughout project design and implementation to ensure compliance and agreement. A clear record of communication with stakeholder agencies will need to be maintained for the life of the project.

It was determined through coordination with the USBOR that all National Environmental Policy Act (NEPA) and SHPO requirements would meet compliance under the Record of Decision (ROD) associated with the Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande - Caballo Dam to American Dam, New Mexico and Texas (USACE 2008). No further NEPA coordination is expected for the project.
5. REFERENCES


APPENDIX A

Habitat Characteristics of Target Fish Species
APPENDIX A
Habitat Characteristics of Target Fish Species

Gizzard Shad (*Dorosoma cepedianum*)
Gizzard shad are also known as shad, hickory shad, herring, or skipjack. They are a schooling species that are found in low-velocity surface water as juveniles and near the bottom of low-velocity water. They spawn in the shallow water during the spring and the eggs become randomly scattered, while adhering to plants, rocks, or other types of firm substrate. Adults are bottom filter feeding detritivores, primarily from littoral zones. Gizzard shad is native to eastern North America, and are found as far west as New Mexico. They are often found in major streams and reservoirs. They provide forage for most game fish species and are often used as bait fish. This species typically grows to lengths of 9 to 14 inches (Texas Parks and Wildlife 2009).

Blue Catfish (*Ictalurus furcatus*)
Blue catfish are sometimes referred to as channel catfish or humpback blue catfish. Blue catfish are very similar to channel catfish; however, only the Rio Grande population has dark spots on the back and sides (Texas Parks and Wildlife 2009). Most blue catfish are not sexually mature until they reach about 24 inches in length. The blue catfish seeks a varied diet, but tends to eat fish earlier in life, although invertebrates still comprise the major portion of the diet. Blue catfish are primarily large-river fish, usually occupying main channels, tributaries, and impoundments of major river systems. Blue catfish prefer riverine and reservoir habitats and often congregate around submerged treetops (DCNR 2008). Blue catfish commonly attain weights of 20 to 40 pounds, but are found weighing up to 100 pounds.

Flathead Catfish (*Pylodictis olivaris*)
Flathead catfish can also be referred to as Yellow Cat, Mud Cat, or Shovelhead Cat. Flathead catfish are typically pale yellow (hence the name “yellow cat”) to light brown on the back and sides, and highly mottled with black and/or brown. The belly is usually pale yellow or cream colored (Texas Parks and Wildlife 2009).

Males use hollow logs, caves, or areas beneath the banks for their nest sites. After an incubation period of four to six days, the fry will school together at the nest for several days after hatching, but afterwards seek...
shelter beneath rocks, roots and other cover. Adults are usually solitary and stake out a location under a tree or in a cove, in deep water. At night, they move into shallow areas to feed. Flathead catfish prefer deep pools of streams, rivers, canals, lakes and reservoirs, where the water is turbid (cloudy) and the currents are slow (Texas Parks and Wildlife 2009). Young flathead catfish feed mostly on invertebrates such as worms, insects, and crayfish. When 10 inches or larger, their diet consists of entirely live fish including fish-shad, carp, suckers, sunfish, largemouth bass, and other catfish. Spawning season is from late May through August, when the water temperature is between 75 degrees and 80 degrees F. They can reach a length of 3 to 4 feet and can exceed 100 pounds (Texas Parks and Wildlife 2009).

**Longnose Gar (Lepisosteus osseus)**

Longnose gar are typically associated with backwaters, low inflow pools, and moderately clear streams. They often do very well in man-made impoundments. Spawning activity occurs as early as April, in shallow riffle areas. Although nests are not prepared, gravel is swept somewhat by the spawning action itself. Each female may deposit a portion of her eggs at several different locations. The adhesive eggs are mixed in the gravel, hatching in six to eight days. Fry feed primarily on insect larvae and small crustaceans. Longnose gar range widely throughout the eastern U.S. and north into southern Quebec. The species is especially common in the Mississippi River drainage and in the Carolinas. It may be found as far south and west as the Rio Grande drainage in New Mexico.

**River Carpsucker (Carpiodes carpio)**

The river carpsucker has a widespread distribution in warm-water prairie streams, rivers, and reservoirs. They prefer the slow moving water common in reservoirs and pool and backwater habitats of rivers (Baker et al. 1991; Winemiller et al. 2000; Winemiller et al. 2004). They typically spawn in larger streams with backwater areas. They are seldom located or observed in clear water and adults in muddy shallows typically retreat to deep water when threatened (Dalquest and Peters 1966). They can be greatly abundant over sand or sandy silt bottoms in water less than or equal to 12 meters, and are generally found within 1.5 meters of the bottom (Riggs and Bonn 1959). Carpsuckers are more commonly associated with large woody debris than open areas without cover (Willis and Jones 1986). Suckers often feed upon diatoms and filamentous algae in addition to insects, snails, and clams. The chief value of suckers is considered to be forage and bait for sport fishes. Carpsuckers typically spawn between May and July at night over vegetation in shallow water along shorelines of reservoir and quiet areas of streams or over silt, sand, or sand substrate, but they have been observed spawning in rock and gravel (Walburg and Nielson 1966). They are found in the central U.S. and Mexico in the Mississippi River basin and other western gulf drainages to Mexico (Lee and Platania 1980; Hubbs and Black 1940).
APPENDIX B

Net Depletions Analysis
Summary

The La Mancha Project involves the proposed development of a 1.87 acre wetland on alluvial lands adjacent to the Rio Grande near Las Cruces, NM. Development of the proposed wetland habitat might deplete about 6.6 acre-feet of surface water per annum. Existing conditions estimated net depletion at the site ranges between approximately 5.1 and 1.5 acre-feet of surface water per annum, depending upon water levels in the Rio Grande. Surface water rights up to nine acre-feet per annum are available to offset depletions associated with the proposed development.

The La Mancha Wetland Project is located along the west bank of the Rio Grande, approximately 1.7 miles northwest of Mesilla, NM. The proposed wetland area includes 1.87 acres of land that currently supports a mixture of tamarisk and grassland scrub. The proposed development calls for removal of the tamarisk and grassland scrub and the establishment of open water and wetland habitat land use types.

Project Description:

The proposed perennial open water habitat construction would result in an open water surface (.485 ac.) the entire year. The proposal also calls for construction of a moderate depth ephemeral open water habitat (.139 ac), which would provide an open water surface during the months of March through July. The largest portion of the Project area would be ephemeral wetland habitat (1.244 ac.) that would be inundated during the months of May and June.

The existing and proposed vegetation types are summarized in Table 1.
Table 1. Existing and proposed vegetation types

<table>
<thead>
<tr>
<th>Current condition land use (acres)</th>
<th>Tamarisk</th>
<th>Grassland scrub</th>
<th>Perennial open water</th>
<th>Ephemeral open water</th>
<th>Wetland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.082</td>
<td>1.786</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.868</td>
</tr>
<tr>
<td>Proposed condition land use (acres)</td>
<td>--</td>
<td>--</td>
<td>0.485</td>
<td>0.139</td>
<td>1.244</td>
<td>1.868</td>
</tr>
</tbody>
</table>

Hydrology

Groundwater in the Project area is in direct connection with the flow of water in the channel of the Rio Grande. The depletion resulting from the proposed Project development is derived from surface water flow.

Records indicate that water level conditions at the site range from near the ground surface during periods of high surface water flow to approximately 4.5 feet below ground surface during the non-irrigation season. Depletion at the Project area consists of evaporation from open water surface and evapotranspiration loss from vegetation and the adjacent soil surface. Evaporation loss from open water surface areas is based on historic pan evaporation data and the application of a pan to pond coefficient of 0.80. Evapotranspiration losses are based on the application of consumptive use coefficients and the Blaney-Criddle method of estimating vegetation consumptive use.

The monthly coefficients and data used in the analysis are tabulated in Table 2.

Table 2. Data used in consumptive use computations

<table>
<thead>
<tr>
<th>MONTH</th>
<th>Tamarisk consumptive use coefficient (k)</th>
<th>Effective precipitation at State University (in.)</th>
<th>Pan evaporation at State University (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAN</td>
<td>0.50</td>
<td>0.45</td>
<td>2.94</td>
</tr>
<tr>
<td>FEB</td>
<td>0.41</td>
<td>0.48</td>
<td>4.39</td>
</tr>
<tr>
<td>MARCH</td>
<td>0.34</td>
<td>0.28</td>
<td>7.61</td>
</tr>
<tr>
<td>APRIL</td>
<td>0.32</td>
<td>0.16</td>
<td>10.01</td>
</tr>
<tr>
<td>MAY</td>
<td>0.87</td>
<td>0.29</td>
<td>12.20</td>
</tr>
<tr>
<td>JUN</td>
<td>1.22</td>
<td>0.5</td>
<td>13.20</td>
</tr>
<tr>
<td>JULY</td>
<td>1.37</td>
<td>1.21</td>
<td>11.96</td>
</tr>
<tr>
<td>AUG</td>
<td>1.36</td>
<td>1.56</td>
<td>10.33</td>
</tr>
<tr>
<td>SEPT</td>
<td>1.19</td>
<td>1.15</td>
<td>8.37</td>
</tr>
<tr>
<td>OCT</td>
<td>0.88</td>
<td>0.71</td>
<td>6.10</td>
</tr>
<tr>
<td>NOV</td>
<td>0.73</td>
<td>0.28</td>
<td>3.78</td>
</tr>
<tr>
<td>DEC</td>
<td>0.60</td>
<td>0.46</td>
<td>2.64</td>
</tr>
</tbody>
</table>

7.53 93.53
Depletion computations

Construction of open water and wetland type habitat might involve lowering the current ground surface to enhance this type of habitat. This activity results in a more shallow water table and the potential for an increase in water losses. For the purposes of this analysis, it is assumed that construction of the ephemeral open water (.039 ac.) and wetland (1.244) type habitats will result in additional water loss in an amount equal to 25% of the total monthly evaporation loss. This loss is applied outside the months of March through July when open water is not anticipated to be present.

Table 3 is a summary tabulation of depletion of water from 1.868 acres under the current or pre-Project conditions at the Project site. The tamarisk depletion computation is based on the Blaney-Criddle method. The consumptive use for grassland / scrub is based on studies of salt grass depletion in Mesilla, NM, and assumes that the water table is at 14 inches below ground surface. When the water level drops deeper than 14 inches, the depletion rate will approach the effective precipitation rate due to decrease in the amount of groundwater available.

<table>
<thead>
<tr>
<th>MONTH</th>
<th>Consumptive Use Rate (ft.)</th>
<th>Depletion on 0.082 ac. (af)</th>
<th>Grassland / scrub</th>
<th>Consumptive Use Rate (ft.)</th>
<th>Depletion on 1.786 ac. (af)</th>
<th>Total consumption (af)</th>
<th>Effective Precipitation (ft.)</th>
<th>Net Consumptive Use (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAN</td>
<td>0.12</td>
<td>0.01</td>
<td>--</td>
<td>0.00</td>
<td>--</td>
<td>0.01</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>FEB</td>
<td>0.11</td>
<td>0.01</td>
<td>--</td>
<td>0.00</td>
<td>--</td>
<td>0.01</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>MARCH</td>
<td>0.12</td>
<td>0.01</td>
<td>--</td>
<td>0.00</td>
<td>--</td>
<td>0.01</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>APRIL</td>
<td>0.14</td>
<td>0.01</td>
<td>0.17</td>
<td>0.30</td>
<td>--</td>
<td>0.31</td>
<td>0.01</td>
<td>0.30</td>
</tr>
<tr>
<td>MAY</td>
<td>0.47</td>
<td>0.04</td>
<td>0.18</td>
<td>0.31</td>
<td>--</td>
<td>0.35</td>
<td>0.02</td>
<td>0.33</td>
</tr>
<tr>
<td>JUN</td>
<td>0.75</td>
<td>0.06</td>
<td>0.32</td>
<td>0.57</td>
<td>--</td>
<td>0.63</td>
<td>0.04</td>
<td>0.59</td>
</tr>
<tr>
<td>JULY</td>
<td>0.89</td>
<td>0.07</td>
<td>0.77</td>
<td>1.37</td>
<td>--</td>
<td>1.44</td>
<td>0.10</td>
<td>1.34</td>
</tr>
<tr>
<td>AUG</td>
<td>0.82</td>
<td>0.07</td>
<td>0.66</td>
<td>1.18</td>
<td>--</td>
<td>1.24</td>
<td>0.13</td>
<td>1.11</td>
</tr>
<tr>
<td>SEPT</td>
<td>0.59</td>
<td>0.05</td>
<td>0.51</td>
<td>0.91</td>
<td>--</td>
<td>0.96</td>
<td>0.10</td>
<td>0.86</td>
</tr>
<tr>
<td>OCT</td>
<td>0.35</td>
<td>0.03</td>
<td>0.34</td>
<td>0.61</td>
<td>--</td>
<td>0.64</td>
<td>0.06</td>
<td>0.58</td>
</tr>
<tr>
<td>NOV</td>
<td>0.21</td>
<td>0.02</td>
<td>--</td>
<td>0.00</td>
<td>--</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>DEC</td>
<td>0.15</td>
<td>0.01</td>
<td>--</td>
<td>0.00</td>
<td>--</td>
<td>0.01</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>4.72</td>
<td>0.39</td>
<td>2.93</td>
<td>5.24</td>
<td>5.63</td>
<td>0.63</td>
<td>5.10</td>
<td></td>
</tr>
</tbody>
</table>
The proposed development includes a total of 1.868 acres of open water and wetland habitats and the depletions associated with these uses are summarized in Table 4. These depletion computations assume normal flows in the Rio Grande and that a full supply of water is available to meet depletions in the Project area.

Table 4. Proposed Project depletion

<table>
<thead>
<tr>
<th></th>
<th>Deep, perennial open water habitat</th>
<th>Moderate depth, ephemeral open water habitat</th>
<th>Shallow, ephemeral wetland water habitat</th>
<th>Depletion (af)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Consumptive Use Rate (ft.)</td>
<td>Depletion (af), (485 ac.)</td>
<td>Consumptive Use Rate (ft.)</td>
<td>Depletion (af), (139 ac.)</td>
</tr>
<tr>
<td>JAN</td>
<td>0.20</td>
<td>0.10</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>FEB</td>
<td>0.29</td>
<td>0.14</td>
<td>0.07</td>
<td>0.01</td>
</tr>
<tr>
<td>MARCH</td>
<td>0.51</td>
<td>0.25</td>
<td>0.51</td>
<td>0.07</td>
</tr>
<tr>
<td>APRIL</td>
<td>0.67</td>
<td>0.32</td>
<td>0.67</td>
<td>0.09</td>
</tr>
<tr>
<td>MAY</td>
<td>0.81</td>
<td>0.39</td>
<td>0.81</td>
<td>0.11</td>
</tr>
<tr>
<td>JUN</td>
<td>0.88</td>
<td>0.43</td>
<td>0.88</td>
<td>0.12</td>
</tr>
<tr>
<td>JULY</td>
<td>0.80</td>
<td>0.39</td>
<td>0.80</td>
<td>0.11</td>
</tr>
<tr>
<td>AUG</td>
<td>0.69</td>
<td>0.33</td>
<td>0.17</td>
<td>0.02</td>
</tr>
<tr>
<td>SEPT</td>
<td>0.56</td>
<td>0.27</td>
<td>0.14</td>
<td>0.02</td>
</tr>
<tr>
<td>OCT</td>
<td>0.41</td>
<td>0.20</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>NOV</td>
<td>0.25</td>
<td>0.12</td>
<td>0.06</td>
<td>0.01</td>
</tr>
<tr>
<td>DEC</td>
<td>0.18</td>
<td>0.09</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>6.24</td>
<td>3.02</td>
<td>4.31</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Conclusion

These computations show that development of 1.868 acres of habitat at the proposed Project might result in the depletion of 6.5 acre-feet.

The water rights associated with the Project area total nine acre-feet based on an allocation of three acre-feet per acre, delivered at the farm. The delivery of nine acre-feet is adequate to meet demands associated with the as-built estimated Project depletion of 6.5 acre-feet.

During years of below normal water allocation, the amount of water available to the Project area under its water right may not be adequate to meet the anticipated Project depletions.

2 Consumptive Use and Water Requirements in New Mexico. Technical Report 32, NM State Engineer, Santa Fe, NM 1965. P. 72

3 Ibid., p. 53


APPENDIX C

Engineering Design and Cost Estimates
### Engineers Opinion of Probable Costs

**Project:** La Mancha Wetland Restoration Project  
**Location:** Las Cruces, NM  
**Design Level:** 95%  
**Client:** Parametrix, Inc.  
**Developed By:** Wolf Engineering

**Item / Category** | **Unit** | **Unit Cost ($)** | **Quantity** | **Cost ($)** | **Notes:**  
--- | --- | --- | --- | --- |  
Equipment Mobilization | | **Lump Sum** | $5,000 | | equipment, coordination, etc.  
Contractor / Equipment Staging | day | 300 | 30 | $9,000 | assumes no weather delays  
Care and Diversions of Water | | | | $1,000 | prep during levee cut  
De-Watering | | **Lump Sum** | $2,000 | | assumes ground water will be present  
Site Clearing / Preparation | acre | 800 | 3 | $2,400 |  
Earth Work  
*Pond and Channel*  
Excavation | cubic yard | 4 | 13800 | **$55,200** | includes labor and equip  
Compacted Fill | cubic yard | 6.5 | 6000 | **$36,000** | includes labor and equip  
Waste | cubic yard | 2.5 | 7800 | **$19,500** | assumed haul of >5 miles (this figure can vary substantially)  
Levee Cut  
Excavation | cubic yard | 4 | 150 | **$600** | includes labor and equip  
Compacted Fill | cubic yard | 6.5 | 150 | **$975** | includes labor and equip  
Concrete  
Structural (includes reinforcing steel) | cubic yard | 1500 | 12 | **$18,000** | complete HW structure = 8CY, outlet apron & seepage collar = 4CY  
Non-structural | cubic yard | 400 | 25 | **$10,000** |  
36" Dia Reinforced Concrete Pipe (RCP) | linear foot | 30 | 100 | **$3,000** | product, includes gaskets  
36" RCP | **Lump Sum** | 3000 | | **$3,000** | handling, installation  
Soil Bentonite Liner | ton | 600 | 7 | **$4,200** | product - 2 lb / square foot application  
Sub-Grade Prep | square yard | 1.5 | 780 | **$1,170** |  
GEOtextile | square yard | 2.5 | 70 | **$175** |  
Rip-Rap | square yard | 30 | 70 | **$2,100** | D100 = 12"  
Miscellaneous | ton | | | |  
CS-20 Canal Gate | ea | 5500 | 1 | **$5,500** | 4.9K for gate & 1K for installation  
Project Monitoring Instrumentation | **Lump Sum** | 1200 | | **$1,200** | Fiberglass staff gage & Rickly Hydrologger or similar  
Contractor’s Quality Control | **Lump Sum** | 4000 | | **$4,000** | assume 80 hrs at 50/hr  
Contingencies | | | | **$18,913** |  
NM Gross Receipts Sales Tax | | | | **$12,482** |  
**TOTAL PROBABLE CONSTRUCTION COST:** | | | | **$225,520**  
Engineering & Design | **Lump Sum** | 5000 | | **$5,000** | Consultant Fee - Design Drawings  
Construction Inspection / Management | **Lump Sum** | 6000 | | **$6,000** | assume 80 hrs at 75/hr  
**Sub-Total:** | | | | **$11,000** |  
**TOTAL ESTIMATED PROJECT COST:** | | | | **$231,520**
APPENDIX D

Net Depletions Monitoring
APPENDIX D

Net Depletions Monitoring

Consumptive use at the constructed wetland could be used to determine whether SWEC’s annual water right is adequate to offset the depletion caused by project implementation (in excess of pre-project depletion). Project water supply will be delivered via two mechanisms: 1) water flowing into the pond through the culvert and backwater channel; and 2) water entering as groundwater seepage.

The most accurate and feasible method for monitoring water consumption at the constructed pond and wetland would be to calculate depletions based upon the surface area of the pond and wetlands as it varies throughout the year. After construction of the pond, a topographic survey of the area would be performed to determine the relationship between the water surface elevations of the pond (which can be recorded with a water level data logger) and the surface area of the pond and adjacent wetland areas. From this relationship, the area of each habitat type (shallow, moderate, or deep) inundated through time could be determined. Regional meteorological data could then be used to estimate the annual amount of water lost through evapotranspiration.

Restoration science in the lower Rio Grande valley is in its infancy. As a result, precedents for the methodological tracking of net depletions have not been firmly established for restoration projects. In theory, “net” depletions of any particular restoration project would account for the difference in water use between pre- and post-project conditions. For instance, Table 2-2 shows the results of the net depletions analysis for this project (see Appendix B for additional detail). Water consumption for existing (pre-construction) conditions during an average water year is estimated to be 7.5 acre-feet. The estimated water consumption for the project area after implementation is 9.0 acre-feet in an average water year. Therefore, the net depletions during an average water year for this project is estimated to be +1.5 acre-feet (9.0 acre-feet – 7.5 acre-feet = 1.5 acre-feet). However, it should be anticipated that a water management agency may prefer not to provide credit for pre-project depletions. The issue is worth debating as projects similar to La Mancha may provide precedent for tracking water deliveries for restoration projects throughout the Rio Grande watershed and the arid southwest.
APPENDIX E

Vegetation Management
ELEMENT STEWARDSHIP ABSTRACT
for

Typha spp.

North American Cattails

To the User:

Element Stewardship Abstracts (ESAs) are prepared to provide The Nature Conservancy's Stewardship staff and other land managers with current management-related information on those species and communities that are most important to protect, or most important to control. The abstracts organize and summarize data from numerous sources including literature and researchers and managers actively working with the species or community.

We hope, by providing this abstract free of charge, to encourage users to contribute their information to the abstract. This sharing of information will benefit all land managers by ensuring the availability of an abstract that contains up-to-date information on management techniques and knowledgeable contacts. Contributors of information will be acknowledged within the abstract and receive updated editions. To contribute information, contact the editor whose address is listed at the end of the document.

For ease of update and retrievability, the abstracts are stored on computer at the national office of The Nature Conservancy. This abstract is a compilation of available information and is not an endorsement of particular practices or products.

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Authors of this Abstract:
K. Motivans, S. Apfelbaum Applied Ecological Services, Inc

THE NATURE CONSERVANCY
1815 North Lynn Street, Arlington, Virginia 22209 (703) 841 5300
I. IDENTIFIERS

Scientific-Name: *Typha* spp.

Common-Name: cattail

Description:
The cattail genus (*Typha* spp.) is an erect, perennial freshwater aquatic herb which can grow 3 or more meters in height. The linear cattail leaves are thick, ribbon-like structures which have a spongy cross-section exhibiting air channels. The subterranean stem arises from thick creeping rhizomes. North American cattails have minute, brown colored male flowers (staminate) thickly clustered on a club-like spadix. The lower portion of the spadix bares the female flowers (pistillate). There are three species and several hybrids in the cattail genus which occur in North America (Smith 1961, 1962, 1967). *Typha latifolia*, broad-leaved cattail, is distinguished from *T. angustifolia*, narrow-leaved cattail, by the relative width of the leaf and the position of the staminate and pistillate portions of the spadix (heads).

*Typha latifolia* has 6-23 mm wide leaves that are flat, sheathing, and pale grayish-green in color. *T. angustifolia* has 3-8 mm wide leaves that are full green and somewhat convex on back (Agricultural Rea. Service 1971). In *T. latifolia* the staminate and pistillate heads are contiguous or nearly so, whereas in *T. angustifolia* the heads are separated by approximately 3 cm. Cattail fruits differ among the two major species. *T. angustifolia* fruits are about 5-8 mm long with hairs arising above the middle. *T. latifolia* fruits are about 1 cm long with hairs arising near the base (Agricultural Rea. Service 1971). The tall cattail (*Typha domingensis*) may be difficult to separate from *T. angustifolia*. *T. domingensis* is usually taller and has flattened and more numerous leaves (Apfelbaum 1985). Hybrids of intermediate appearance have been reported, and are often referred to as the species *Typha x glauca*.

Elements included in EMG:
*Typha latifolia*
*Typha angustifolia*
*Typha X glauca*
*Typha domingensis*

II. STEWARDSHIP SUMMARY

Cattail control is an important consideration for natural areas. Monitoring the spread of cattails by aerial surveys and sampling transects can help determine the extent of cattail monocultures. Research into new biological control methods and the recovery of communities after cattail management needs
to be conducted. Control techniques of fire and physical removal (cutting) in conjunction with flooding are most appropriate.

III. NATURAL HISTORY

Range:
Cattails have a cosmopolitan distribution and a wide ecological amplitude.

Typha latifolia is found throughout North America from sea level to 2134 M (7000 feet) elevation.

Typha angustifolia is widely distributed in the eastern and northern United States.

Typha domingensis has a range which extends from the southwest United States, southern California and east to southeastern Virginia.

Habitat:
Typha can be found in wetlands, sedge meadows, along slow moving streams, river banks, and lake shores. The plant is found in areas of widely fluctuating water levels such as roadside ditches, reservoirs and other disturbed wet soil areas. Cattails commonly invade the pelagic zones of bogs (Gustafson 1976). Typical associates include Phragmites australiis, Lythrum salicaria, Spartina sp., Acorus calamus, Scirpus sp., and Sagittaria latifolia. Typha augustifolia is generally restricted to unstable environments, often with basic, calcareous, or somewhat salty soils (Fassett and Calhoun 1952). Narrow-leaved cattail can grow in deeper water compared to T. latifolia, although both species reach maximum growth at a water depth of 50 cm (20 inches) (Grace and Wetzel 1981). A robust hybrid between narrow-leaved and broad-leaved cattail, Typha x glauca, has similar habitat requirements to T. angustifolia.

Typha latifolia is the only species of cattail usually found in relatively undisturbed habitats throughout North America (Smith 1967). The tolerance of T. latifolia to high concentrations of lead, zinc, copper, and nickel has been demonstrated (Taylor and Crowder 1984). This species has been employed in secondary waste water treatment schemes (Gopal and Sharma 1980).

Typha latifolia is found in the most favorable sites where it competes against other species. T. angustifolia and T. domingensis are restricted to less favorable and more saline habitats when they occur with T. latifolia (Gustafson 1976). Typha latifolia often displaces T. angustifolia in shallow (&lt;15 cm) water, restricting the latter species to deep water (Grace and Wetzel 1981). Typha angustifolia is considered a pioneer in secondary succession of disturbed bogs (Wilcox et al. 1984). Presumably, an increase in the acidity of a bog would lower the pH and reduce the invasion of T. angustifolia. Theodore Cochran (pers. comm), of the University of Wisconsin-Madison herbarium states that most early herbarium specimens are T. latifolia and only recently have T. angustifolia specimens been collected from Wisconsin wetlands.

Cattails can grow on a wide gradient of substrate types. Wet pure sand, peat, clay and loamy soils have been documented under cattail stands. World wide distribution of cattails is summarized by Morton (1975).
Ecology:

Cattails flower in late May and June and sometimes later (up to late July) depending, perhaps, on soil and water temperatures as influenced by climate and litter in a stand. The wind-borne pollen attaches to stigmas of female florets to eventually produce achene fruits. The elongated embryo and stalk are covered with fine, unmatted hairs that aid in wind dispersal. Fruits are mature in August and September. Seeds are very small, weighing 0.055 mg each (Keddy and Ellis 1985).

Many cattail germination studies have been conducted. Some of these suggest that germination requirements are few. Seed germination can be 100 percent in slightly flooded conditions (Smith 1967). Typha latifolia seeds are less tolerant to salt (NaCl) concentrations in the substrate when compared to T. angustifolia seeds. However, seeds of both species which had been soaked in salt solution would germinate after being returned to non-saline conditions (McMillan 1959). Typha angustifolia seeds showed no significant germination response when sprouted along a moisture gradient which ranged from 5 cm below substrate to 10 cm above (Keddy and Ellis 1985). Other studies have confirmed that water is required at a depth of 2.54 cm for germination. Sifton (1959) showed light and low oxygen tensions affected germination of broad-leaved cattail.

Van der Valk and Davis (1976) suggested that the germination of Typha seeds could be inhibited by an allelopathic interaction caused by Typha litter. Seed longevity and dormancy may be affected by soil moisture, temperature and soil atmosphere (Schafer and Chilcote 1970, Roberts 1972, Meyer and Poljakoff-Mayber 1963, Morinaga 1926).

Young Typha shoots grow rapidly from seeds in favorable substrates. Cattail colonies are commonly maintained by vegetative reproduction. A perennial root stock is the major organ responsible for reproduction (Apfelbaum 1985). Cattail productivity has been well documented. Net annual production has usually been estimated as the maximum standing crop (shoot biomass) values for a good site are generally between 1000 and 1700 g/m (d.w.) (Gustafson 1976). Figures for Typha production mostly exceed the average standing crop yields for maize and sorghum.

Shoot density reports (numbers of stems per square meter) range from 28/m2 (Curtis 1959) in Wisconsin to an extreme example reported by Dykyjova, et al. (1971) of 108/m2. In a greenhouse experiment, ninety-eight vegetative shoots and 104 crown buds were produced on a single seedling during it's first year (Timmons et al. 1963). Cattails can produce 20,000-700,000 fruits per inflorescence (Prunster 1941, Marsh 1962, Yeo 1964). Vegetative growth by broad-leaved cattails of 518 cm (17 feet) annually have been recorded (McDonald 1951), and plants grown from seed flowered the second year (Smith 1967, Yeo 1964).

Cattail plants produce a dense rhizome mat and the clustered leaves produce a thick litter layer. Dense cattail growth and litter may reduce the opportunity for other plants to establish or survive (Wessson and Waring 1969).

Calculations show that a natural stand of cattails may fix 18 kg nitrogen/ha/yr or approximately 8% of the total nitrogen present in the standing crop (Biesboer 1984).
The structure of cattail stands as it is, with upright leaves, high leaf area, balanced horizontal and vertical distribution of leaf area and shifts in leaf angle are all factors which permit monoculture success. An open, generously sunny habitat and abundant moisture can provide the setting for maximum cattail production.

Typha plants are mined by caterpillars of the moths Arzama obliqua and Nonagria oblonga (Klots 1966). Aphids and Colandra pertinax (the snout beetle) also feed on Typha leaves and stems. The stems may have many species of pupa living within them (Klots 1966). The cattail rhizomes provide food to mammals such as the muskrat. The grazing of muskrats may greatly influence cattail communities. A cycling population of muskrats may reach such a density so as to totally set back a cattail stand for the season. These "eat outs" are important to maintain open water in a balanced system. Muskrats utilize leaves and stems for houses and eat the rhizomes (Zimmerman pers. comm.). Cattail fruits provide nesting material for terrestrial birds and dry stems may be used by aquatic birds. Above ground portions die in the late fall and rhizomes overwinter. In Wisconsin, it was found that average winter marsh temperatures greater then 8 degrees C reduced carbohydrate reserves in Typha latifolia to an extent sufficient to inhibit shoot growth in the spring (Adriano et al. 1980). Cattail population success has been correlated with nutrient fertility (Boyd 1971), water level and substrate temperature (Adriano et al. 1980).

The plant tissues can store relatively high concentrations of some metals. Typha appears to have an internal copper and nickel tolerance mechanism. It is not likely that there is an evolutionary selection for heavy metal tolerance, but rather it is inherent in the species (Taylor and Crowder 1984).

Impacts:

Cattail management may be desired in situations where cattails have responded to wetland disturbance by growing in dense monocultures. The genus Typha can behave like aggressive introduced weeds in a variety of natural communities throughout North America (Apfelbaum 1985). Cattails are considered serious weeds in some countries (Holm et al. 1979, Morton 1975) but not necessarily in North America. In high-quality natural communities, cattails usually occur as scattered sterile plants (Apfelbaum 1985). With disruptions to a community, cattail populations may respond by spreading vegetatively at a rapid rate. The effect of the growth spurt is closing open water, eliminating habitat and species diversity, and reducing the opportunity for other plants to become established and survive. Shading is a significant effect on other plants. Cattails are successful because they form extensive monocultures very rapidly through vegetative reproduction and maintain their dominance with the formation of dense rhizomes mats and litter.

Cattails have a wide ecological amplitude compared to other species (Pianka 1973). They are tolerant to habitat changes, pollutants in the water system, and saline or basic substrates. A study in Indiana concluded that the three basic events precede the growth of cattails monocultures:

1. modified surface hydrology,
2. wildfire suppression, and
3. wetland enrichment (Wilcox et al. 1984).
Claims that hybrid cattails are responsible for monoculture growths have not been confirmed.

IV. MANAGEMENT/MONITORING

Management Requirements:
Cattails are often purposefully encouraged in some areas to stabilize shorelines from wave action erosion, or ice heaving. Two-thirds of wave energy will dissipate in two meters of cattail beds (Bonham 1983). They have been used to reduce salinity in rice field (Marsh 1962) and have been considered "scrubbers" in polluted aquatic systems (Gopal and Sharma 1980). Commercial uses of cattails include footwear, roofing and floor mats. The species has been considered as an important source of protein (Morton 1975) and a fuel source. The objective of management is not to eradicate cattails, but rather to control their spread in natural communities. Specifically, the goals of management should be to:

(1) Control the spread and domination of potential habitat by cattail in and adjacent to natural areas.
(2) Circumvent declines in other plant species with cattail proliferation.
(3) Prevent development of monotypic cattail growth and loss of habitat heterogeneity (Patten 1975, Martin et al. 1957).

Management of cattails should be site specific and could include such active measures as hand cutting root stalks, burning and flooding, or shading.

WATER LEVEL MODIFICATION:
High water conditions in a cattail stand can affect the growth of seedlings, can break off mature stalks, or can be followed by the immigration of muskrats which eat the cattail (Zimmerman pers. comm.). The effect of flooding does not always have negative impacts on cattails -- plants have been known to float up and continue growing until water returns to a previous lower levels.

As with any control measure, temporary conditions, such as flooding, do not prevent later seed establishment. Cattail seeds can arrive from a great distance, and it doesn't take but a few seeds to germinate and rapidly produce clones as adults. The cost of management actions should be considered when dealing with unknown response variables.

Low water conditions, maintained by draining a wetland, significantly effects the overall community (Mallik and Wein 1985). Harris and Marshall (1963) concluded that draining techniques have possible detrimental effects because the plant composition of a wetland can be radically changed. Draining alone can cause a significant increase in Typha cover under some conditions (Mallik and Wein 1985). However, to inhibit Typha growth, a wetland can be drained and then burned during the summer. If there is no reserve of water over winter cattails will not survive the following spring, according to Zimmerman (pers. comm.) but there have been no controlled experiments to show this.

Two years of 65 cm (26 in) deep flooding was required before established cattail began to die and open water conditions were created at Sinnissippi Marsh. Cattail initially survived flooding from 1973-1977 and became the dominant emergent plant. A light green color, noticeably narrower
leaves, and absence of fruiting heads indicated stress in 1976. Cattail stem densities declined 57 percent with all emergent plants dead in 1977. Horicon Marsh, flooded to a depth of 40 cm (16 in), showed declines in emergent and aquatic plants. Cattail required two years before it declined (Wisconsin DNR 1969 and 1971).

Mature T. latifolia and seedlings less than one year old are killed by water depths of 63.5 cm (25 in) and 45 cm (18 in) or more, respectively. Narrow-leaved cattail was unaffected by this degree of flooding. Narrow-leaved cattail establishment was prevented when water levels were maintained at 1.2 m (47 in) or deeper (Steenis et al. 1958). Dryer conditions allowed more clones of T. angustifolia to be spread (McMillan 1959).

Because cattails can transpire significant quantities of water (2-3m of water/acre/year) (Fletcher and Elmendor 1955, Zohary 1962), their establishment may serve to exacerbate water level instability and further contribute to disruptive influences supporting increased cattail. Flooding must account for evapotranspirational losses of water to maintain a level effective in cattail control.

CHEMICAL CONTROL:
For designated preserves or natural areas, especially where system-orientated stewardship is used, chemical applications may not be appropriate. This is particularly true because cattail is an element of certain natural communities. However, use of chemicals to control an overabundance of cattail may have certain applications. Spraying Dalpan (Nelson and Dietz 1966) at 8.8-35.3 kg/acre (4-16 lb/acre) produced 74-97 percent reductions in cattails ten months after a mowed area was sprayed. Cattail regrowth was sprayed at 58-90 cm (24-36 in) height in September. Control was most effective when treated areas could be flooded to 10-15 cm (4-5 in) or deeper. Dalpan spray achieved varied success but greatest control occurred where cattail stems were cut below water depths regardless of the herbicide quantity used. Poorest results were attained in areas with shallow fluctuating water levels. Spraying mature cattails rather than regrowth after cutting gave better results. Weller (1975) had similar results with spraying where Amitrol, Rodopan, and Douupon herbicides were effective in creating and maintaining openings for at least three years after spraying, but areas were quickly invaded by peripheral cattail. High doses of MCPA or 2,4-D in diesel oil (2.2-4.5 kg per acre) were effective if applied during flowering. Dalpan (9 kg/acre) and Amino-triazole (91-1.36 kg/acre) gave good control results in Montana (Timmons et al. 1963). Herbicide applications were found necessary for up to three years in some areas. Similar results were found by Grigsby et al. (1955), Heath and Lewis (1957), Krolikowska (1976), Pahuja et al. (1980), Singh and Moolani (1973), and Wisconsin Department of Natural Resources (1969).

Wick and spray applications of Roundup followed by manual clipping of all cattail stems was the treatment conducted by Applied Ecological Services and All Services Company (1985) at a pond in northern Illinois. Cattail seeds were just at ripening stage at the time of treatment. Retreatment of Roundup several weeks later and subsequent die-off proved this method successful.

Herbicide treatment at flowering may stress the cattail plants more than at other stages since the energy investment by the plant has been channeled into flowering.

PHYSICAL CONTROL:
Hand or mechanical cutting of cattails followed by submergence of all cattail stems results in high control. Up to 100 percent cattail control was measured two growing seasons after treatment. No visible cattail regrowth occurred in one year and cattail rhizomes were dead. The highest cattail control of any method tested was achieved by two clippings followed by stem submergence to at least 7.5 cm (3 in) (Nelson and Dietz 1966). Control was best if plants were cut in late summer or early fall.

In Iowa (Weller 1975), cutting cattail and reflooding with at least 8 cm (3.1 in) of standing water over plant stems was effective. Weller (1975) also found clipping cattails too early in the growing season (e.g. May) stimulated their growth and resulted in a 25 percent increase in stem counts the following year, with an eventual decline to preclip levels. August clipping controlled up to 80 percent of cattail only if followed by submergence. It was important to remove all dead and live cattail stems to achieve this control. Cutting shoots below the water surface two or three times in one growing season before flower production reduced a cattail stand by 95-99 percent in Montana and Utah (Stodola 1967). Similar results were demonstrated by Shekhov (1974) and Sale and Wetzel (1983).

When shoots are cut below the water level, nearly all the oxygen is consumed in a short time, necessitating anaerobic respiration. In Typha, ethanol is produced accompanied by tissue breakdown after an oxygen shortage. Typha is ill adapted to deprivation of oxygen. Cuttings later than flowering stage are effective only in preventing regrowth for that year and may have no effect on subsequent years (Shekhov 1974).

Cattail control by injuring developing rhizomes and shoots was investigated (Weller 1975). Crushing and reflooding showed that cattails injured after June had poor recoveries. Success of crushing depended on the load used, number of times an area was crushed, and standing water depths after treatment. Spring and early summer treatments generally created favorable seedbeds for cattail and required a fall crushing to control seedlings. Crushing involved pulling a 55 gallon water filled drum behind a tractor. Deeper water areas showed highest control (up to 100 percent) while regrowth occurred in shallow areas. Although not practical for natural areas management, discing (Weller 1975) and blasting (Nelson and Dietz 1966) have also been investigated as methods of cattail control.

PRESCRIBED BURNING:
Fire alone was found to provide little or no cattail control (Nelson and Dietz 1966). Fires that destroyed cattail roots offered control; however, most fires only burned above-ground biomass and did little to control cattail. Drying in readiness for burning was effective cattail control when done for two years in arid Utah. Water was pumped from wetlands and then cattail stands were allowed to sun dry.

Water level drawdown, burning (Spring, Fall, and mid-growing season), and reflooding to 20-35 cm (8-18 in) water depth or deeper controlled cattail. Fire was found useful for cattail litter cleanup and assisted access for mowing or hand clipping (Nelson and Dietz 1966, Weller 1975, Mallik and Wein 1985).

SHADING:
Black polyethylene tarps were used to cover cattails in an attempted control measure (Nelson and Dietz 1966). Actively growing cattail tips were killed when completely covered for at least sixty days. Greatest control was achieved in July when food resources of cattail were presumed to be lowest (Linde et al. 1976). Problems with holding tarps down and their degradation confounded this investigation. Cattail is generally not shade tolerant.

Monitoring

Cattail control or reduction may be desirable where noticeable increases threaten natural plant diversity and habitat heterogeneity. Increases in the rate of spread and growth of a colony may signal management action. The establishment of cattails in non-wetland areas should be monitored. Gross area monitoring is necessary to determine the effects of management practices and the needs for future management.

Aerial surveys are used to document by photographs the spread of cattail colonies (Wilcox et al. 1984). The advance of cattail clones can also be documented by placing permanent markers at the leading edge of colonies. Sampling along shore to water transects using 1 square meter quadrats allows an estimate of percent cover, stem density, and importance value of species. Shore to water transects with the line intercept methods show changes in density and spread.

Monitoring Programs:
2. University Bay Marsh, University of Wisconsin-Madison, Madison, Wisconsin 53706. Contact: Jim Zimmerman or the Institute of Environmental Studies.

V. RESEARCH

Management Research Programs:

2. Louis Toth, Research environmentalist, South Florida Water Management District (SFWMI), 3301 Gun Club Rd., P.O. Box V, West Palm Beach, FL (305)686-8800 ext. 365. Previously did research on nutrient uptake in cattails in everglades water conservation areas. Now works on restoration of Kissimmee River.
Management Research Needs:
Research objectives in the past have concentrated on the effect of cattails on waterfowl production, sewage treatment, fuel production or recreational opportunities. There have been few studies on the methods of control of cattails in designated nature preserves or natural areas. More effort needs to be put into research with biological diversity and natural area maintenance as the major objectives.

Biological control has not been documented or researched. The effects of shading, day length, or varying light intensity on cattail reproduction is largely unknown (Apfelbaum 1985). There is no data to test the concerns that a fire used to control or destroy Typha rhizomes would destroy other plants or the wetland seed bank. Recent evidence (Apfelbaum unpub. data) suggests repeated annual spring burning in cattail dominated systems stimulates Cyperaceous seed germination even beneath a dense cattail canopy. Whether this is related to litter removal, actual fire scarification or other causes is unknown. More case studies and data related to the recovery of the natural community after cattail control, particularly fall burning, is an important need for future study. The interactions between animals, water level, and cattail growth need to be studied (Zimmerman pers. comm.). Cost effectiveness of the various methods available for cattail control is an important consideration.

VI. INFORMATION SOURCES

Acknowledgements:
We are indebted to all of the botanist and ecologist who took the time to provide the information necessary for the preparation of this Element Stewardship Abstract.

Bibliography:


Curtis, J.T. 1959. The Vegetation of Wisconsin. University of Wisconsin Press, Madison, WI.


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VII. DOCUMENT PREPARATION & MAINTENANCE

Edition Date: 87-10-27

APPENDIX F

Agency Correspondence

Important: Please note that an email from Cheryl Thacker (OSE; Timestamp September 09, 2009, 12:43 PM) and forwarded to Kevin Bixby (SWEC) by Jesse Shuck (Parametrix) on October 28, 2009, was marked as confidential and has not been included in this packet.

Also included are the application packets for USIBWC and EBID which have not been submitted by Parametrix. They will also be provided to SWEC electronically.
January 12, 2005

Mr. Kevin Bixby
Executive Director
Southwest Environmental Center
275 North Downtown Mall
Las Cruces, New Mexico 88001

Re: Proposed Acquisition of Farmlands by SWEC Within EBID

Dear Mr. Bixby:

SWEC has proposed to acquire a parcel of approximately 15 acres along the Rio Grande just north of the Picacho Avenue bridge. By letters to EBID of October 25 and November 4, 2004, SWEC has proposed to acquire this farmland with water rights and use the property to grow native plants and food crops for habitat and forage for wildlife, remove non-native vegetation, preserve existing riparian “bosque” habitat and conduct research on crops and vegetation on the property. SWEC has requested the endorsement or approval by the Board of Directors of EBID of this proposed acquisition. EBID does not endorse or approve proposed transactions regarding irrigated farmland within EBID boundaries, but this letter expresses what EBID can do if SWEC acquires this farm property.

EBID appreciates that SWEC seeks to acquire farmland, water and water rights through the open market rather than seeking to have those resources made available for SWEC’s purposes through involuntary methods, such as those forced through application of the Endangered Species Act. EBID has encouraged SWEC and other groups for years to use the market and become “farmers”, rather than forcing the availability of water through legal means or purchasing water away from productive agricultural uses. EBID will continue to work with SWEC and other groups and individuals to encourage the use of EBID water supply by its constituent members for beneficial use for agricultural purposes. EBID never favors one particular use of EBID water supply over any other use, so long as those uses remain in agriculture. On the other hand, EBID has a broad interpretation of what constitutes agricultural use of its water supply, as including the production of an agricultural crop or the growing of plants and vegetation to meet the needs, desires and goals of people. EBID always has and always will treat its constituent members equally, in accordance with all applicable water laws and regulations, the concept of beneficial use under New Mexico water law, and under EBID regulations, policies and procedures.

EBID is also committed to insuring compliance by all federal and state agencies, local governments and individuals with all treaties, laws and regulations regarding the proper division of Rio Grande Project water supply between and among the United States and Mexico, between and
Mr. Kevin Bixby, Executive Director  
Southwest Environmental Center  
January 12, 2005  
Page 2 of 2

among the States of New Mexico and Texas, between and among EBID and the El Paso County Water Improvement District No. 1, and between and among constituent members of EBID. EBID is also committed to complying with all state laws and regulations regarding the legal and proper beneficial use of water and water rights, both within and outside District boundaries. EBID always has been and always will be a good neighbor to the people of Southern New Mexico, and their governments, associations and organizations. EBID remains committed to working with other governmental units, with private organizations, and with citizens regarding environmental, restoration, conservation, wildlife, agricultural, and restoration of projects for the common good.

The Elephant Butte Irrigation District commends the Southwest Environmental Center for its commitment to work within the existing water rights and water distribution systems and to become a constituent member of EBID. Should SWEC become a member of EBID through its acquisition of irrigated farmland and water rights, the Board of Directors of EBID offers all benefits of EBID membership to SWEC and commits to cooperating with its new member in the use of EBID water supply for agricultural purposes.

Sincerely,

ELEPHANT BUTTE IRRIGATION DISTRICT

James Salopek, Chairman
Mr. Danny Duran  
Permits and Right of Way  
Elephant Butte Irrigation District  
P.O Drawer 1509  
Las Cruces, New Mexico 88004

RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County;  
Request for information on permitting requirements

Dear Mr. Duran:

By this letter, I am requesting information on any permit applications, memoranda of 
agreement, licenses, and other requirements that may be necessary for the referenced project. We will be filling out the *Fact-Use of EBID Facilities* form for Southwest Environmental Center (SWEC) and would like to ensure that we meet all other requirements that may pertain to this project.

**Background.**  
SWEC has acquired approximately 15 acres of land north of the Picacho Avenue bridge and along the Rio Grande, and is proposing a wetland restoration/creation project at the location (Figure 1. Project Location Map). They have contracted with Parametrix to complete the design and meet all permitting requirements.

Project activities are expected to include the creation of a small (1/4 to 1/2 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC) and will include the construction of either one or two channels within the flood plain also controlled by the USIBWC in order to provide access for targeted fish species. We expect that this project will be covered by the Rio Grande Programmatic Environmental Impact Statement *Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas–Mexico Border.*

Please feel free to contact me at 505-821-4700 with any questions you may have. We look forward to working with the EBID on this important project.

Sincerely,

Jesse Shuck  
Biologist
October 22, 2009

Kevin Bixby
Southwest Environmental Center
275 N. Downtown Mall
Las Cruces, NM

Re: La Mancha pond

Dear Kevin:

Dr. Phil King looked over the sketch you gave me of the ponding area that you would like to create near the La Mancha development off the Picacho Lateral. The schematic is very general, and Phil's comments will follow suit. Phil does not think that the proposed pond is feasible, either from an institutional framework perspective or a flood safety perspective and his comments are below.

The plan appears to divert water through the levee into the ponding area, with a return to the south. This requires breaching the levee in two places. While I don't have details on how the passages through the levee are to be constructed, any penetration of the levee is a very serious undertaking, as it compromises the flood protection function of the levee. You will recall the flooding in 2006 in El Paso that resulted from gated structures through the levee that could not be closed. I don't think that any organization that is capable of accepting responsibility for maintaining and operating gated structures - I'm thinking of IBWC - would be willing to do so. Ungated structures would place the neighborhood at high risk of flooding.

Another problem I see is that there is no way to cast this plan as anything other than a new river diversion. Under the terms of the operating agreement, we would have to get buy-in from El Paso County Water Improvement District No. 1, Reclamation, and perhaps IBWC. Aside from a slew of state, interstate, federal, and international issues that arise from a new diversion, this will present EBID with another accounting task, as we would be required to meter the flow into the pond and the return flow. These would be difficult measurements, with very low velocities and low head. Even if we can overcome the technical issues, it is one more administrative task on top of an already heavy work load for the Hydrology Department.

We would also need to consider how to control the flow into the ponds to ensure that the deliveries to the site do not exceed the district's allotment. The plan I have shows the land area to be 2.99 acres, which I presume would make it farm rate. EBID is required to allot water pro rata to its constituents, so the proposed use would be treated like any other farm. If the allotment is 2.5 feet, as it was in 2009, and the flow was held constant for the irrigation season, the average inflow would be about 8 gallons per minute. This would roughly equal the evaporation rate for a two acre pond, meaning there would be no return flow. Such low flow rates would probably not be able to sustain a healthy pond - I think it would turn stagnant and nasty.

If we face an allotment of eight or nine inches, as we did in 2003 and 2004, the situation would be worse. Even with no diversion into the pond, if it intersects groundwater, there would be evaporative losses in excess of the allotment. This would constitute a new appropriation of groundwater, and among others,
the State Engineer would not be too keen on it. The plan I have and Google Map suggest that there is already ponding there. I am not aware of any permitted water rights for ponding in that area.

We have managed to implement restoration efforts elsewhere in the district with the understanding that applying Project Water to riparian vegetation is irrigation, and not a change in purpose or use of water. I think that a diversion from the river into the pond is not irrigation and would constitute a change in use, and require all of the red tape associated with that process. We will certainly have to go through those hoops when we get a surface water treatment plant on line, but I don’t think a two acre pond justifies the extensive legal and staff expenses that will be required.

In our discussions with IBWC on the restoration plan associated with the record of decision on maintenance of the Canalization Project, we addressed the above issues. We held the flood protection function of the levies paramount, and created the institutional framework for water rights to be put to beneficial use on restoration sites. I think that some of the basic objectives of this proposed pond - varied velocity and depth conditions for aquatic habitat - can be achieved in several of the restoration sites identified in the ROD without the flood control and institutional impediments of a new diversion through the levee.

Let me know if I can provide any other input on this issue. I would be receptive to meet with you or his design engineer and further discuss this issue. I understand that Henry would also be available and has discussed this proposed plan with you.

Kevin, let me know if I can be of more assistance if you are interested in coordinating a meeting.

Sincerely,

Gary L. Essinger
Treasurer/Manager

GLE/gen
Mr. Kevin Bixby, Executive Director  
Southwest Environmental Center  
275 North Downtown Mall  
Las Cruces, NM 88001

Dear Mr. Bixby:

The United States Section of the International Boundary and Water Commission (USIBWC) would like to affirm their support of the La Mancha Wetlands Project.

It is the intent of the USIBWC to provide equipment and manpower to perform the excavation of the trench system to supply water to the wetlands and to install the culvert crossings under our levees. All materials required to perform this work including but not limited to floodgate, fill, base, concrete work, etc. will be at the expense of the Southwest Environmental Center and must meet the design criteria specified by the USIBWC. In addition, a license will be required and an MOA between USIBWC and Southwest Environmental Center will be necessary for the operation of the gated structure during flooding conditions.

This project will be required to go through design and environmental review at the USIBWC.

If you have any further questions, please contact Mr. Brad Sargent, our Boundary and Realty Officer, at 915-832-4139.

Sincerely,

Carlos Marin, P.E.  
Commissioner
(8/18/09)

Mr. Brad Sargent  
Boundary and Realty Officer 
International Boundary and Water Commission  
The Commons, Building C Suite 310  
4171 Mesa Street  
El Paso, TX 79902

RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County; Request for information on permitting requirements

Dear Mr. Sargent:

By this letter, I am requesting information on any permit applications, memoranda of agreement, licenses, and other requirements that may be necessary for the referenced project. We will be completing the Permits and License Checklist form on behalf of SWEC and wish to ensure that we are meeting all permitting requirements of the USIBWC.

Background

Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge, and has contracted with Parametrix to complete the design and meet permitting requirements for a proposed wetland restoration/creation project at this location (Figure 1. Project Location Map).

The USIBWC has expressed its support for this project (please see attached letter) and has stated its intention to provide equipment and manpower to install the required culvert crossings and various other necessary improvements, the expenses of which will be borne by SWEC.

Project activities are expected to include the creation of a small (1/4 to 1 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee, which is maintained by the United States Section of the USIBWC, and will include the construction of either one or two channels within the flood plain, also controlled by the USIBWC, in order to provide access for targeted fish species. These proposed activities are expected to be covered by the Rio Grande Programmatic Environmental Impact Statement Improvements to the USIBWC Rio Grande Flood Control Projects Along
the Texas-Mexico Border. In addition, the SWEC has acquired water rights for this project and has become a constituent member of the Elephant Butte Irrigation District.

Please feel free to contact me at 505-821-4700 if you have any questions regarding this project. We look forward to working with the USIBWC on this important project.

Sincerely,

Jesse Shuck
Biologist

Attachment

USIBWC letter of support
To: Wally Murphy

RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County.

By this letter, I am requesting information on any permit applications, memoranda of agreement, licenses, and other requirements that may be necessary for the referenced project.

Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge and has contracted Parametrix Inc. to complete the design and permitting aspect of a proposed wetland restoration/creation project at this location (Figure 1 Project Location Map).

The project activities are expected to include the creation of a small (1/4 to 1/2 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC) and will include the construction of either one or two channels within the flood plain also controlled by the USIBWC in order to provide access for targeted fish species.

This action is expected to be covered by the Rio Grande Programmatic Environmental Impact Statement Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas-Mexico Border.

Please feel free to contact me at 505-821-4700 with any questions regarding this project and we look forward to working with your agency.

Sincerely,

Jesse Shuck
United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

AUG 28 2009

Thank you for your recent request for information on threatened or endangered species or important wildlife habitats that may occur in your project area. The New Mexico Ecological Services Field Office has posted lists of the endangered, threatened, proposed, candidate and species of concern occurring in all New Mexico Counties on the Internet. Please refer to the following web page for species information in the county where your project occurs:

http://www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm. If you do not have access to the Internet or have difficulty obtaining a list, please contact our office and we will mail or fax you a list as soon as possible.

After opening the web page, find New Mexico Listed and Sensitive Species Lists on the main page and click on the county of interest. Your project area may not necessarily include all or any of these species. This information should assist you in determining which species may or may not occur within your project area.

Under the Endangered Species Act of 1973, as amended (Act), it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with us further. Similarly, it is their responsibility to determine if a proposed action has no effect to endangered, threatened, or proposed species, or designated critical habitat. On December 16, 2008, we published a final rule concerning clarifications to section 7 consultations under the Act (73 FR 76272). One of the clarifications is that section 7 consultation is not required in those instances when the direct and indirect effects of an action pose no effect to listed species or critical habitat. As a result, we do not provide concurrence with project proponent’s “no effect” determinations.

If your action area has suitable habitat for any of these species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts. Please keep in mind that the scope of federally listed species compliance also includes any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects.
Candidates and species of concern have no legal protection under the Act and are included on the web site for planning purposes only. We monitor the status of these species. If significant declines are detected, these species could potentially be listed as endangered or threatened. Therefore, actions that may contribute to their decline should be avoided. We recommend that candidates and species of concern be included in your surveys.

Also on the web site, we have included additional wildlife-related information that should be considered if your project is a specific type. These include communication towers, power line safety for raptors, road and highway improvements and/or construction, spring developments and livestock watering facilities, wastewater facilities, and trenching operations.

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. We recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands. These habitats should be conserved through avoidance, or mitigated to ensure no net loss of wetlands function and value.

The Migratory Bird Treaty Act (MBTA) prohibits the taking of migratory birds, nests, and eggs, except as permitted by the U.S. Fish and Wildlife Service. To minimize the likelihood of adverse impacts to all birds protected under the MBTA, we recommend construction activities occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until nesting is complete.

We suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding fish, wildlife, and plants of State concern.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We appreciate your efforts to identify and avoid impacts to listed and sensitive species in your project area.

Sincerely,

[Signature]
Wally Murphy
Field Supervisor
(8/18/09)

Calvin Chavez  
Office of the State Engineer  
1680 Hickory Tree, Suite 3  
Las Cruces, NM 88005

RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County; Request for information on permitting requirements

Mr. Chavez

By this letter, I am requesting information on any permit applications, memoranda of agreement, licenses, and other requirements that the Office of State Engineer may require for the referenced project. We will be submitting permit applications to other agencies on behalf of SWEC and wish to ensure that we are meeting all permitting requirements of the OSE as well.

Background
Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge and has contracted Parametrix to complete the design and address permitting requirements for a proposed wetland restoration/creation project at this location (Figure 1 Project Location Map).

The project activities are expected to include the creation of a small (1/4 to 1 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC) and will include the construction of either one or two channels within the flood plain, also controlled by the USIBWC, in order to provide access for targeted fish species. The SWEC has acquired water rights for this project and has become a constituent member of the Elephant Butte Irrigation District.

This action is expected to be covered by the Rio Grande Programmatic Environmental Impact Statement Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas-Mexico Border.

I would appreciate any information you might be able to provide. Please feel free to contact me at 505-821-4700 if you have any questions regarding this request, or I can be reached by email at jshuck@parametrix.com.

Sincerely,

Jesse Shuck  
Biologist
Ms Katherine Slick  
State Historic Preservation Officer  
Bataan Memorial Building  
407 Galisteo Street, Suite 236  
Santa Fe, NM 87501

**RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County; Request for information on permitting requirements**

Dear Ms Slick:

By this letter, I am requesting information on the level of effort necessary from your office to fulfill all Cultural Resource Inventory requirements of the referenced project. The project area falls within the Rio Grande floodplain and is currently covered with fill roughly 4-6 ft high hauled in from a road construction project.

**Background**

Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge, and has contracted Parametrix to complete the design and address the permitting requirements of a proposed wetland restoration/creation project at this location (Figure 1. Project Location Map).

The project is expected to include the creation of a small (1/4 to 1 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC), and will include the construction of either one or two channels within the flood plain, also controlled by the USIBWC, in order to provide access for targeted fish species. The SWEC has acquired water rights for this project and has become a constituent member of the Elephant Butte Irrigation District. In addition, this project is expected to be covered by the Rio Grande Programmatic Environmental Impact Statement **Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas-Mexico Border**.

I would appreciate any information you could provide to assist us in meeting all cultural resource related issues relating to this proposed project. Please feel free to contact me at 505-998-55 or by email at jshuck@parametrix.com, with any questions regarding this project.

Thank you for your assistance.

Sincerely,

Jesse Shuck
RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County.

Mr. Gatewood,

By this letter, I am requesting information on any permit applications, memoranda of agreement, licenses, and other requirements that may be necessary for the referenced project. It is expected that Nationwide Permit Number 27, which pertains to stream and wetland restoration activities, will apply to the activities associated with this project.

Background
Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge and has contracted Parametrix Inc. to complete the design and permitting aspect of a proposed wetland restoration/creation project at this location (Figure 1 Project Location Map).

The project activities are expected to include the creation of a small (1/4 to 1 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC) and will include the construction of either one or two channels within the flood plain also controlled by the USIBWC in order to provide access for targeted fish species.

A narrow “bathtub rim” wetland is present along the channelized section of the Rio Grande where the proposed channels are to be placed and these may be destroyed in the creation of the channel. These small wetlands may be salvaged as “seed” wetland soils and plants to line the edge of the channels after the channels have been excavated. The width of the excavated wetlands is anticipated to be roughly 15 feet wide.

This action is expected to be covered by the Rio Grande Programmatic Environmental Impact Statement Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas-Mexico Border.

Please feel free to contact me at 505-821-4700 with any questions regarding this project and we look forward to working with the USACE on this project.

Sincerely,

Jesse Shuck
RE: Proposed Wetland Creation/Restoration Project in Mesilla, Doña Ana County.

Mr. Poland,

By this letter, I am requesting information on any permit applications, memoranda of agreement, licenses, and other requirements that may be necessary for the referenced project.

Southwest Environmental Center (SWEC) has acquired approximately 15 acres of land along the Rio Grande, north of the Picacho Avenue bridge and has contracted Parametrix Inc. to complete the design and permitting aspect of a proposed wetland restoration/creation project at this location (Figure 1 Project Location Map).

The project activities are expected to include the creation of a small (1/4 to 1/2 acre) wetland, roughly 5-12 feet deep. It will be located on the west side of the levee maintained by the United States Section of the International Boundary and Water Commission (USIBWC) and will include the construction of either one or two channels within the flood plain also controlled by the USIBWC in order to provide access for targeted fish species.

This action is expected to be covered by the Rio Grande Programmatic Environmental Impact Statement Improvements to the USIBWC Rio Grande Flood Control Projects Along the Texas-Mexico Border.

Please feel free to contact me at 505-821-4700 with any questions regarding this project and we look forward to working with your agency.

Sincerely,

Jesse Shuck
PERMITS AND LICENSE CHECKLIST

1. LETTER OF APPLICATION - 3 copies
   a. Identify your organization and state what is requested: Permit or License.
   b. List the type of structure, improvement, or work that is to be constructed.
   c. Statement of reason for said work, i.e., commercial, public, or private venture.

2. MAPS AND DRAWINGS - General
   a. Letter-size drawings are the minimum acceptable.
   b. Meridian or north arrow shown.
   c. Drawn to scale with scale stated and shown graphically.

3. VICINITY MAP – 3 copies
   a. Show a town, highway, bridge, or major identifiable feature.
   b. General location of work outlined should be circled in red.

4. LOCATION MAP – 3 copies
   a. Area where facilities are to be constructed should be outlined in red.
   b. Show property lines (metes and bounds, if possible) and/or location of property line markers, such as steel pipes driven into the ground with permanent identification data.

5. PLANS AND SPECIFICATION – 3 copies
   a. Drawings of sufficient details to determine exactly what is proposed, how it is to be constructed, and by whom.
   b. In any operation involving earthwork, such as an excavation, drilling or boring, a cross sections and profile of the proposed works must be furnished. See examples in Attachments I-IV at http://www.ibwc.state.gov/Files/construction_criteria.pdf

6. If the construction is also on land owned by personnel other than the government, the applicant must include a statement in triplicate from the owners giving permission for such construction on their property and access thereto.

7. If the proposed work requires clearing, excavation, or dredging on government property, you must first contact the following agencies:
   a. Appropriate Historic Preservation Officer(s), to find out if you need a cultural resources survey of the area.
   b. U.S. Department of Interior, Fish and Wildlife Service, to determine the impact of the project on threatened and endangered species, both animal and plant life.
   c. U.S. Army Corps of Engineers, to determine the effects of the proposed project on the waters of the U.S., (wetlands, streams, and rivers) in the area.
   d. The Texas Parks & Wildlife and TCEQ, if applicable, for projects along the Rio Grande.

8. The letters from these various state and federal agencies, concurring with the proposed work, must be obtained by the requestor before the International Boundary and Water Commission will issue the requested permit.

9. A permit from the State Water Commissions, to divert waters from rivers or reservoirs, is necessary before a permit for pumps and water lines can be issued.

10. LICENSE FEES, (EFFECTIVE JANUARY 1, 1977) ARE AS FOLLOWS:
    a. Commercial License -$150 per year plus $28 per year per acre or part thereof.
    b. Permanent Commercial Utilities -$115 per year
INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO
UNITED STATES SECTION

INSTRUCTIONS ON REQUESTS FOR LICENSES
TO CONSTRUCT FACILITIES ON
INTERNATIONAL BOUNDARY AND WATER COMMISSION
RIGHTS-OF-WAY

INSTRUCTIONS

The purpose of this pamphlet is to help you in applying for authority to perform work or place structures on or across rights-of-way of projects under the jurisdiction of the United States Section, International Boundary and Water Commission (USIBWC), and to describe briefly such jurisdiction and your responsibility under the Federal laws and the method of compliance therewith. The United States Section is responsible for the construction, operation and maintenance of all United States properties under its jurisdiction and, the administration of laws for the protection and preservation of these properties. Licenses for all work to be performed on rights-of-way must be approved by the Commissioner for the United States Section before such work is begun. The authorization is ordinarily granted in the form of a revocable license. The license does not authorize any trespassing upon or injury to private property, or the invasion of private rights, nor does it affect water rights or concede that the licensee has any water rights.

FEE - Generally, in the Upper Rio Grande Canalization Project, an administrative fee of $150.00 is charged for each license issued. No fee will be charged to Cities, States or political subdivisions thereto, or to owners of lands over which the Government has an easement only, and to others where the purpose of the license is for the direct benefit of such landowners.

If licensed works will cause additional cost to the United States a special fee for such license will be assessed in an amount determined appropriate in the circumstances by the United States Commissioner.

HOW TO APPLY FOR A LICENSE - An application for a license shall consist of a letter, in duplicate, requesting the license and accompanied by four copies each of a location map, vicinity map, and plan of the proposed work. The letter of application will be addressed to the Engineer in Charge of the Commission activities of the locality in which the proposed work lies. The letter will bear the date, the applicant's address and telephone number and, the location and description of work. It will give an explanation of the plans in sufficient details to enable the Commission to determine exactly what work is proposed and, to show that the structure or other works will not create a hazard or interfere with any project operations. The letter will be signed by the owner or proprietor of the proposed work, or his duly authorized agent, but not by the contractor who it is proposed to be employed to do the work. In case the application is from a corporation, the letter will give the name and location of principal office, telephone number, State in which incorporated and, title and name of official who will sign the license.
If the proposed work requires clearing, excavation or any other form of ground disturbance on government property, the applicant must first contact the following agencies for the state where the works will be performed:

a. The Historical Preservation Commission

b. The U. S. Fish and Wildlife Service

c. The U. S. Army Corps of Engineers

Letters from these state and federal agencies, concurring with the proposed work, must be obtained and provided with the application, as required under the National Environmental Policy Act of 1969, as amended, (42 U.S.C. 4321 et. seq.). Where a major adverse impact will result, the applicant may also be required to furnish a detailed Environmental Impact Statement (EIS) as is further required by said National Environmental Policy Act.

Since all of the lands administered by the United States Section are within floodplain areas, no permanent improvements will be licensed except those that are not subject to flood damages and are floodproofed in accordance with the Unified National Program for Flood Plain Management of the Water Resources Council.

In the event a license is requested for the purpose of constructing facilities to convey water diverted from the Rio Grande, independent of, or in connection with any project works of the United States Section of the International Boundary and Water Commission, or for the purpose of enlarging or expanding facilities to increase the conveyance of such diversions, the applicant must submit a copy of his Water Rights Certificate with his application or, if he has a riparian right, state by affidavit under what authority or law the water has been, or is to be diverted.

The vicinity map will show the location of the proposed work with reference to a town, highway, or some major topographical feature. The location map will show the specific location of the proposed work with reference to some established monument on the Commission’s project. Ideally, each map will be on an 8-1/2” x 11” sheet, or if practical, the vicinity map may be shown as an inset on the location map.

The location of the work will be outlined in red on each map. All drawings and maps should be drawn to scale and the scale shown graphically. Maps must have the usual meridian arrow. In general, the meridian arrow should be parallel with the 10-1/2” dimension of the drawing.

If, upon examination of the application, it is found that the proposed work or its operation and maintenance will not interfere with the operation and maintenance of any project works of the United States Section, and is consistent with permissible flood plain uses defined in the Unified National Program for Flood Plain Management of the United States Water Resources Council, a license will be prepared by the Commission and transmitted to the applicant, in duplicate, for his signature and return to the office from which it was received. The applicant shall send, if applicable, a postal money order or certified check, made out to the International Boundary and Water Commission, United States Section, in the amount of the appropriate fee for each license. Upon final execution of the license, a duplicate-original copy will be sent to the licensee for his files.
Applicants desiring to make application for authority to perform work or plan structures on or across right-of-way of projects under the jurisdiction of the United States Section of the Commission will often find it in the interest of economy and convenience to write or visit the nearest office of the Commission relative to their desires before incurring any expense in connection with the preparation of maps and plans.

GENERAL CONDITIONS - For the information of the applicant, the general conditions established by this Commission, relative to licensing, are given below. Special conditions may be added if it is determined that the interests of the United States so require:

1. The work shall be subject to the inspection and approval of the Engineer in Charge of the area in which the proposed work is to be done to determine if the work is being performed in conformance with the plans, as approved. The Engineer in Charge may temporarily suspend the work at any time if, in his judgment, the interests of the Commission so require.

2. The United States will not be held liable for any damage or injury to the structure or work herein authorized which may be caused by, or result from, the future operations of Government-operated and maintained properties under the jurisdiction of the Commission, and no claim or right to compensation shall accrue from any such damage.

3. The licensee is required to operate and maintain the facilities for which the license is requested and such operation and maintenance shall be performed in such manner as not to interfere with the construction or operation of project works. The license granted is personal and shall not be assigned without the written permission of the Commissioner of the United States Section or his duly authorized representative.

4. The license will continue so long as, in the opinion of the Commissioner, it is considered to be expedient and not detrimental to the public interests, and shall be revocable by said Commissioner upon 90 days written notice to the licensee. Upon such revocation, or if the project is abandoned, the structure or other works shall be removed by licensee without delay and at his sole expense.
Interstate Boundary and Water Commission

To Whom It May Concern:

Parametrix was contracted by Southwest Environmental Consulting (SWEC), a private non-profit organization, to provide permitting and design plans for a wetland to be constructed in Mesilla, New Mexico. SWEC is requesting a license to construct a channel to connect the Rio Grande to the proposed wetland. The design concept consists of a perennially wetted pond connected intermittently by surface water to the Rio Grande at river discharges greater than 1500 cfs. Water will flow through a constructed channel and a gated culvert through the levee and into the constructed pond. The culvert will be placed at an elevation that allows the exchange of surface water between the river and the pond only at flows exceeding 1500 cfs which is estimated to occur regularly in May and June and occasionally in July. This pond is being constructed in order to create fish habitat.

Location The proposed project is located along the west side of the Rio Grande, roughly 250 yards from the bank of the Rio Grande. The project location is roughly one mile south of Interstate 10 and one mile north of Calle Del Norte (New Mexico State Route 359) and is on the west edge of the existing levee. Attached is the USGS topographical map showing the project location.

Project Drawings (Attached)

Construction Plan (3 sets)

Construction Dates
RIGHT OF USE APPLICATION

1. APPLICATION DOES NOT GUARANTEE APPROVAL.
2. THE APPLICATION FEE IS $50.00 PLUS TAX AND IS NON-REFUNDABLE WHETHER YOUR APPLICATION IS APPROVED OR DENIED.
3. THIS APPLICATION WILL NOT BE PROCESSED UNLESS ALL ITEMS ARE LEGIBLE, COMPLETED IN ENTIRETY, AND ATTACHED AS DESCRIBED BELOW.
4. ALLOW 60-90 DAYS FOR PROCESSING.
5. CONTACT THE EBID ENGINEERING DEPARTMENT FOR ASSISTANCE IN COMPLETING ALL REQUIREMENTS.

Applicant’s Name: Kevin Bixby

Business Name: Southwest Environmental Center

Mailing Address: 275 N. Downtown Mall, Las Cruces, NM 88001

Phone: 575-522-5552  Cell: 575-526-7733

Type of Use (or Agreement)  

Area:  
Beehive
Crossing:  
Bridge
Discharge:  
De-watering
Parallel:  
Harvest Gate
Removal:  
Sediment (dirt, sand)
Other:  

Purpose (describe what you propose to do, quantities, dimensions, etc.)  
(see attached)

Location (describe exactly where the activity will take place – name the canal, lateral, drain or other EBID facility.)  

EBID Facility:  

Address (if different from above):  

Account No.  

Parcel No.  

Vicinity Map Attached/Other:  

Site Plan (plan view of construction/installation)  
1. Attach a map(s) showing location and site of structures or installation including EBID facilities.
2. Include a north arrow, rights-of-way, easements, property lines, and features affected by construction.
3. Provide site photos, three (3) sets. For crossings and harvest gates, provide photos of all directions (north, south, east, west).

Construction/Design Drawing (engineering design details-exact size, length, width, height, materials, etc.)  
1. Drawings and materials must comply with design criteria (available at the EBID office or on the Internet at www.ebid-nm.org).
2. Provide detailed construction plan, three (3) sets. Include a digital data file if available (NM-Central State Plane Coordinates, 83).
3. Provide estimated construction dates. Include beginning and ending dates. (Notify EBID when construction begins and ends.)
4. A cross section or design profile is required for crossings and harvest gates.
5. Design/construction to be performed by:  

Licensee  

Signature  

Title  

Date  

The words “Right of Use Permit” are handwritten on this page.

This application will be researched and presented to the EBID Board of Directors for approval. If approved and the permit fees are paid in full, a permit will be issued to you. If denied, a letter will be mailed to you.

This is NOT a Permit.
SECTION 1. Rights of Elephant Butte Irrigation District (EBID): The Elephant Butte Irrigation District (hereinafter Licensor) operates and maintains the New Mexico portion of the Rio Grande Project. It has fee simple and easement rights over canals, ditches and other rights-of-way within the District boundaries.

SECTION 2. Assignment and Indemnification: Licensee shall not assign this license, in whole or in part, without Licensor’s prior written consent, and absent such consent, any attempted assignment shall be void. Licensee shall make all requests for Licensor’s consent to an assignment by written instrument and shall indemnify Licensor for any such request with a service charge of $50.00. Such service charge shall be the property of Licensor and not refundable to Licensee.

SECTION 3. Termination of the License:
3.1 Either party may terminate this license with or without cause upon not less than thirty (30) days notice.
3.2 If Licensee fails to comply with the conditions set forth herein, or if either party terminates this license, Licensor shall have the right to rescind all of its rights and obligations under this license. Licensor shall have the right to rescind or declare a default under this license in the event of the occurrence of any default of any kind by Licensee under this license. Such default shall be deemed a breach of this license and shall result in Licensor’s right to rescind the license.
3.3 Licensor reserves the right to terminate this license at any time, for any reason, with or without cause, by giving at least thirty (30) days written notice to Licensee. Licensee shall comply with all terms and conditions of this license during the thirty (30) day notice period.

SECTION 4. Maintenance of Licensed Property and Interface with Licensor’s Use of Licensed Property:
4.1 Licensee, at its own expense, shall maintain the Licensed Property and all improvements, appurtenances and facilities therein in good, sanitary and safe condition as conclusively determined by Licensor. Such maintenance shall involve but not be limited to, (a) repair and upkeep of the structures; (b) the removal of deposited sediment, trash, and other debris from within and adjacent to the structure(s); (c) control of vectors and other pests associated with the structure(s); and (d) repair of damages to the affected facilities of the Rio Grande Project as determined by the EBID. Such maintenance shall be conducted by the Licensee annually by the EBID between the end of each irrigation season and December 31 of the current year, or at other times upon written notification by the EBID. Such maintenance shall not interfere with any maintenance, construction, operation, and maintenance of any part of the Rio Grande Project. EBID shall be notified at least forty-eight (48) hours in advance of any planned maintenance, unless under emergency conditions when notifications shall be timely.

SECTION 5. Nonexclusive Rights:
5.1 This license is nonexclusive and nothing herein shall prevent Licensee from correcting such default, including without limitation those damages resulting to Licensee from correcting such default, including without limitation those damages arising from all repairs or modifications to or removal of any materials, improvements, or facilities on the Licensed Property.

SECTION 6. Existing Easements and Licenses:
6.1 This license is subject to all existing easements, licenses and matters of record.

SECTION 7. For “Individual, Permits Only”, Indemnification: Licensee (Indemnitee), its successors, and assigns, shall indemnify and hold harmless Licensor and its agents, employees, directors, officers, employees, agents, successors and assigns thereof, against and from any claim, demand, judgment or proceeding of any kind for damages or loss, whether directly or indirectly arising out of (a) acts or omissions of Licensee, its directors, officers, employees, agents, successors, or assigns; (b) Licensee’s use of occupied by the Licensed Property for the purposes contemplated by this License, including but not limited to claims by third parties who are invited or permitted onto the Licensed Property, either expressly or implied, by the nature of Licensee’s development or otherwise pursuant to this License, or (c) Licensee’s failure to comply with or fulfill its obligations established by this License or by law, and whether such damage or loss is to person or property. Such obligation to indemnify shall extend to all acts, omissions, and/or failures to act, including but not limited to, claims by third parties who are invited or permitted onto the Licensed Property, either expressly or implied, by the nature of Licensee’s development or otherwise pursuant to this License, or by law.

SECTION 8. Insurance: Without limiting any liabilities or any other obligations or duty of Licensee/Permitee, EBID at its option may require insurance and proof of insurance as condition to this Permit. If the insurance is required, the Licensee/Permittee will be notified by letter, which letter shall specify the amount and type of insurance required by EBID.

SECTION 9. Construction:
9.1 Prior to making any installations on the Licensed Property, Licensee shall submit to Licensor for its approval a detailed plan showing the location of any such installations, and pay Licensor all review and inspection fees required by Licensor. All construction on the Licensed Property shall be permitted in accordance with specifications approved by Licensor. At least ten (10) days prior to the beginning of any construction on the Licensed Property, Licensee shall provide Licensor notice in writing of the intended construction which shall not commence until the Licensee has received written notice from Licensor that the construction will not interfere with any maintenance, construction, operation, and maintenance of any part of the Rio Grande Project. EBID shall give Licensee written notice of all changes in the schedule and delays in construction immediately upon any being reasonably foreseeable that such change or delay will occur.

9.2 Licensee shall contact Licensor a minimum of 72 hours in advance of start of construction to obtain the required Permit. Notwithstanding the requirement of this section, no construction may be performed on the Licensed Property without License, or (c) Licensee’s failure to comply with or fulfill its obligations established by this License, or (d) repair of damages to the affected facilities of the Rio Grande Project as determined by the EBID.

SECTION 10. Permits, Statutes and Codes: Licensee shall comply with the applicable requirements of all statutes, acts, ordinances, regulations, codes, and standards of legally constituted authorities with jurisdiction. Licensee shall obtain or cause to be obtained at its own expense all permits, approvals and authorizations required by Licensor’s actions pursuant to this license.

SECTION 11. Licensee’s Right to Inspect:
11.1 Licensee may enter any part of the Licensed Property at all reasonable times to make an inspection thereof. During any construction by Licensee, Licensee may inspect all trenching, backfilling and other related items and require conformance with all requirements and specifications established by Licensor.

11.2 Licensee shall release Licensor for all damages arising out of any delay, whether reasonable or unreasonable, or foreseeable or unforeseeable, by Licensor in permitting or inspecting any work on the Licensed Premises. The provisions of this section shall survive termination of this license.

SECTION 12. Service of Notice: All notices and demands required or permitted by this license or any addenda and exhibits, if any, shall be served upon the other party to this license by service of the same (postage fully prepaid) to the respective address as furnished by either party to the other pursuant to this section; (i) delivered personally to the parties hereto.

SECTION 13. WAIVER: No waiver by either party of any breach of any of the covenants or conditions of this license which are performed in accordance with the terms of this license shall be construed as a waiver of any succeeding breach of the same or any other covenants or conditions.

SECTION 14. Attorneys’ Fees upon Default: If Licensee defaults in the timely performance of its obligations, under this license, the Licensor shall be entitled to recover court costs and reasonable attorney’s fees, as determined by a court, in any suit or proceeding to enforce its rights under this License. The foregoing shall not in any way limit or restrict any right or remedy at law or equity which would otherwise be available to such party in default.

SECTION 15. Force Majeure: If either party is rendered unusable, wholly or in part, by force majeure to carry out its obligations under this License, other than the obligation of Licensee to make payments of amounts due hereunder, then the obligations of both Licensee and Licensor, so far as it shall be affected by such force majeure, shall be suspended during the continuance of any inability so caused, but for no longer period, and such cause shall so far as possible be remedied with reasonable time. The term “force majeure” as employed in this License shall mean acts of God, strikes, lockouts, or other industrial disturbances, acts of public enemies, wars, blockades, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, storms, floods, washouts, interruptions of transportation due to the fault of the party, civil disturbances, explosions, or unforeseeable action or nonaction by governmental bodies in approving the applications for approvals or permits or any material change in circumstances arising out of legislation, regulation or litigation. Nothing in this section shall require Licensor to settle a strike.

SECTION 16. Entire Agreement; Changes After Execution: This License, including its specified addenda and exhibits, constitutes the entire agreement between the parties, and any amendment hereto must be in writing, signed by both parties.

SECTION 17. Water Damage: This License agreement, including its specified addenda and exhibits, constitutes the entire agreement between the parties, and any amendment hereto must be in writing, signed by both parties.

For Government Permits Only – Tort Claims Act: By entering into this Agreement, the District and its public employees are defined in the New Mexico Tort Claims Act, and the Licensee and its ‘public employees’ as defined in the New Mexico Tort Claims Act, do not waive sovereign immunity, do not waive any defense(s) and/or do not waive any limitation(s) of liability pursuant to law. No provision in this Agreement modifies or waives any provision of the New Mexico Tort Claims Act. However, within the limitations above stated, each party shall be responsible for their own negligent acts. This Agreement is not intended by any of its provision to create in the public,
Elephant Butte Irrigation District application attachment

**Purpose**  The design concept consists of a perennially wetted pond connected intermittently by surface water to the Rio Grande at river discharges greater than 1500 cfs. Water will flow through a constructed channel and a gated culvert through the levee and into the constructed pond. The culvert will be placed at an elevation that allows the exchange of surface water between the river and the pond only at flows exceeding 1500 cfs which is estimated to occur regularly in May and June and occasionally in July. This pond is being constructed in order to create fish habitat.

**Location**  The proposed project is located along the west side of the Rio Grande, roughly 250 yards from the bank of the Rio Grande. The project location is roughly one mile south of Interstate 10 and one mile north of Calle Del Norte (New Mexico State Route 359) and is on the west edge of the existing levee. Attached is the USGS topographical map showing the project location.

**Project Drawings Attached**

**Construction Plan** (3 sets)

**Construction Dates**