TEXAS COASTAL WATERSHED PROGRAM

COASTAL RESTORATION SERIES

Freshwater Coastal Prairie Wetland Restoration—Case Study: Sheldon Lake State Park

Freshwater coastal prairie wetlands once covered large expanses of the Houston-Galveston landscape. A complex wetland matrix of mima mounds and low wetland basins known as prairie potholes provided important ecological services including habitat, flood control and water cleansing. Many of these areas were land leveled for agricultural and development purposes, erasing these features from the coastal landscape. Over 50 years, agricultural development and use altered the land surface and subsurface to an extreme degree—removing natural features, mixing soils and creating a hard-packed, almost-impenetrable clay pan, while burying the natural wetland basins with soils scraped from neighboring mima mounds and surrounding high areas.

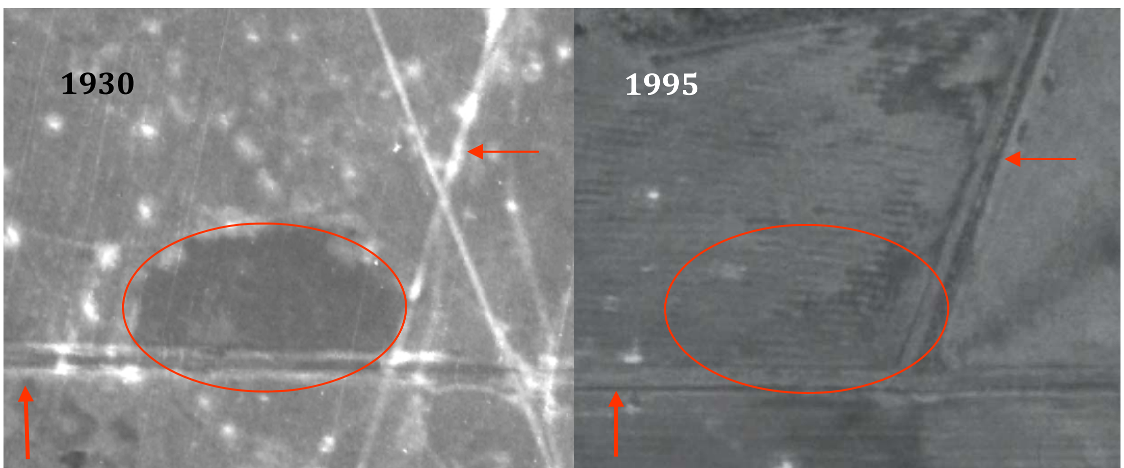

Figure 1— Comparative pictures to identify common features (e.g. arrows mark the irrigation canal and the original farm road). The 1995 photo demonstrates the difficulty in finding the original wetland boundaries which are clear in the 1930 photo.

Successful restoration of these landscapes can be a difficult process at best. It requires identifying the true boundaries of the original basins, which are only distinguished by the soil signatures present in older aerial photographs and by matching key landscape features in current photography (Figure 1).

New Methodology, Old Material

The wetland restoration project at Sheldon Lake State Park involved new planning and development methods combined with traditional restoration techniques. Most restoration projects involve the creation of new wetland basins within the project site without regard to past wetland locations. This project changed that process to an investigation of the landscape history.

This method was first created and tested by the Texas Parks and Wildlife Department Natural Resource Coordinator, Andrew Sipocz, at Sheldon Lake State Park as part of the master plan goal of restoring former agriculture fields to pre-settlement conditions. To start, several key mapping materials were collected and/or digitized: 1920 1-foot contour-interval topographic map,

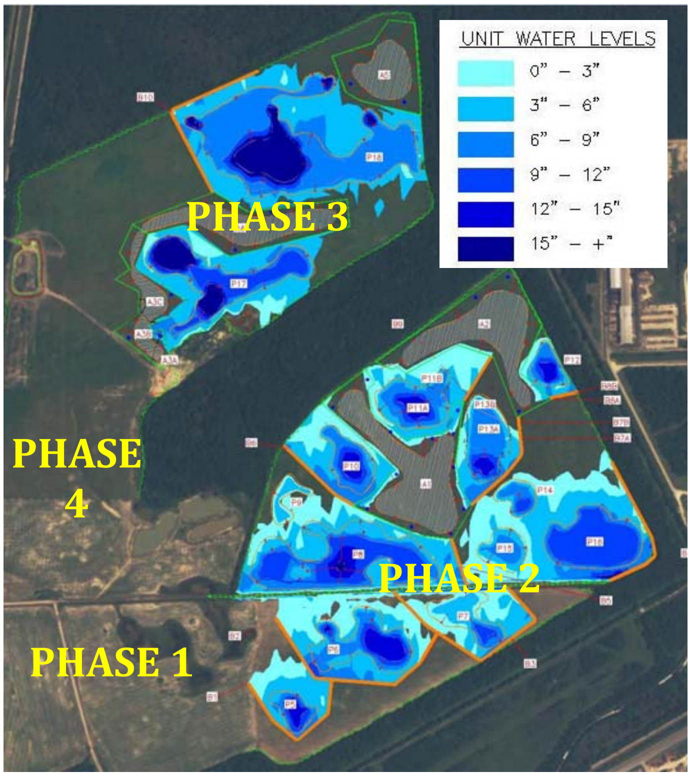

Figure 2—Each of the 6 colors represents a different water depth zone which corresponds to a micro-habitat zone. The shallowest zone (0 to 6 inches) reflects vegetation which is emergent and hydrophytic and may be found both in wetlands and open prairie. Whereas the deepest blue section designates the deep pools of open water and floating and/or submerged strictly aquatic vegetation.

1930 aerial photographs, and digitized 1994 and 1995 color infrared photographs. Further, the Natural Resource Coordinator identified a consistent mima mound signature, distinguished upland brush from wetland brush, and determined both shallow and deep inundation photo signatures.

Photo signatures of old mima mounds, the main irrigation canal, and pipelines were used to corroborate the alignment of the photographs. Once the common features between the photographs were identified, less obvious, but important wetland boundaries were located on the modern map using the 1930s original photograph taken before the land was leveled. Using GIS technology, the boundaries were mapped onto the 1995 color-infared photograph (Figure 2).

The process of identifying the high mima mounds (lighter white circular marks as shown in Figure 1) and the depressional areas was the most tedious portion of the planning and development phase. The pothole outlines were then overlaid onto georectified maps to define the wetland boundaries for this restoration project. The precise outlines for the basins could then be drawn onto these georectified maps.

Further, several proposed wetland sites were groundtruthed using soil cores to verify the methodology accurately defined the potential historical wetland site locations. Appropriate excavation depths were carefully examined from soil cores to determine how deep the original soil horizons were present (Figure 3).

With verification complete, the georectified maps were then translated into engineering (construction) documents, with accurate excavation depths that varied across each pothole (Figure 2 and 3).

The ponds were excavated according to these plans and subsequently planted with local native wetland plants.

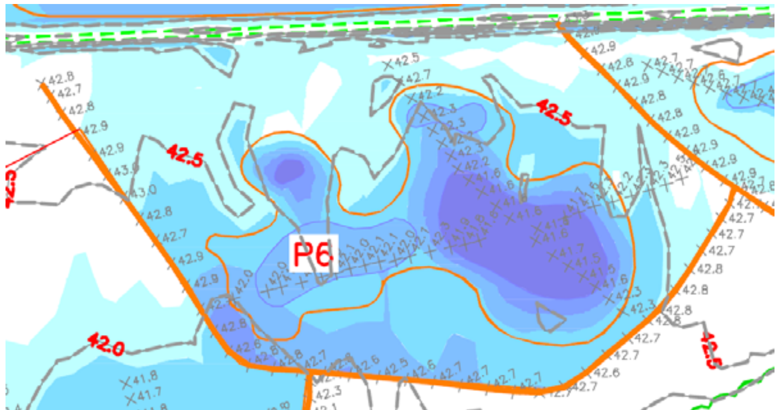

Figure 3—Close-up of the excavation and berm boundaries for Pond 6, Phase 2.

Our Native Communities

All the plant material for this project was collected from a four county region (Harris, Galveston, Brazoria and Chambers) approximately 50 miles or less from the state park. This collection methodology maintains the genetic integrity of the plant stock placed in the restoration site. In other words, it ensures that only plants adapted for local soil, hydrology and regional conditions are introduced to the site. This precaution increases the overall success rate of the restoration effort as survival potential is higher.

Plant collection began up to one year in advance of construction. Plants were propagated and maintained onsite at the Park in shallow, raised artificial grow-out ponds. The extended collection time allowed for collection of seasonally available desirable species. For instance, Southern Blue Flag (*Iris virginica)*, is available and actively growing in December and January and unavailable in the summer months, compared to Thin-scaled Sedge, (*Carex hyalinolepis)* which is most available in later summer. Additionally, the extended collection period allowed the plants to recover from transplant shock. Ideally, plant material was collected such that material had sufficient time to propagate at least 2-to 4-fold, thereby decreasing the overall amount collected from wild populations.

Wetland Restoration Team working with Eagle Scout Troop 505 to restore coastal prairie wetlands in Phase I, which is completely vegetated after 5 years.

Plants were installed as densely as feasible, and species with the capacity to recover and self-propagate in a short time period were selected including Arrowhead (*Sagittaria platyphylla)* and Southern cutgrass (*Leersia hexandra*) (Figure 5). This provided additional protection against the establishment of undesirable noxious weeds, such as Alligator weed (*Alternanthera philoxeroides*) or Cattail (*Typha spp.)* which can present a long-term problem once established.

Figure 5—Arrowhead, *Sagittaria platyphylla*, is showy local native plant

Another equally important consideration for the planting plan was seasonal impacts from wildlife. Migratory waterfowl can present a problem for establishing vegetation, as the birds are likely to consume the young plant sprigs. Planting began early in the season (February) once migratory birds were off-site. Feral hogs present a more difficult issue and local eradication is likely the only solution.

Labor and Education

The planting phases of the restoration project at Sheldon Lake State Park were managed and completed by the Wetland Restoration Team, a collaborative effort between the local Texas Master Naturalist volunteers, Texas AgriLife Extension Service, and Texas Sea Grant.

Throughout the planting process at the Sheldon Lake State Park, the Wetland Restoration Team mentors worked with volunteer groups and students. This was an opportunity for Team members to engage eager volunteers and educate them about the function and importance of wetlands, specifically the diminishing coastal prairie pothole wetland matrix.

Six years later

Vegetation monitoring, conducted quarterly for six years post-construction, showed the most varied succession of species within the shallowest zone. This zone was originally planted with 5 major species; currently the wetlands sustain a minimum of 10 to 15 species seasonally. The remaining deeper zones, which are fully vegetated, provide sustainable waterfowl/water bird habitat as well as a barrier to invasive plant species.

The Sipocz method of re-excavating and restoring intact buried wetlands has proven to be a success, such that Phases 2 and 3 are currently in progress with additional work projected for Phase 4 (Figure 2).

Winter 2010, Phase 2 Pond

The Wetland Restoration and Education Program and the Wetland Restoration Team are programmatic efforts supported by the following entities:

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