

# Vegetation and Floral Survey



## HOG AND SCHWINGS' BAYOUS PRESERVE

Calhoun, County Texas

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# Contents

|  |    |
|--|----|
| Title Page .....                                     | 1  |
| LIST OF FIGURES .....                                | 3  |
| LIST OF TABLES .....                                 | 3  |
| Summary .....  | 4  |
| 1. Property Background .....                         | 4  |
| 1.1 Property layout.....                             | 4  |
| 1.2 Geological layout.....                           | 4  |
| 1.3 Manmade features .....                           | 6  |
| 2. Floral Survey.....                                | 6  |
| 2.1 Survey Methods .....                             | 6  |
| 2.2 Vegetation Community Complexes.....              | 7  |
| 2.3 Site Flora.....                                  | 13 |
| 2.4 Flora/Fauna Associations .....                   | 19 |
| 3. Restoration and Conservation Considerations ..... | 20 |
| Works Cited .....                                    | 22 |

## LIST OF FIGURES

|   |    |
|---|----|
| Figure 1. Soil map of property showing the dominant Austwell clay formation (yellow) with Austwell silty clay (mauve) located along Hog Bayou. .... | 5  |
| Figure 2. We sampled 53 vegetation survey points across the property.....   | 7  |
| Figure 3. Vegetation community types mapped on the property.....  | 8  |
| Figure 4. Mapped species complexes. ....  | 10 |
| Figure 5. Open understory of the Ash/Elm/Hackberry/Sabal community. ....  | 11 |
| Figure 6. Spiny aster dominates the interior of the property.....   | 11 |
| Figure 7. <i>Sabal X texana</i> a rare native palm tree common on the property.....   | 18 |
| Figure 8. A colony of American crinum lily.....   | 18 |
| Figure 9. A specimen of Montezuma bald cypress located along Hog Bayou.....   | 19 |

## LIST OF TABLES

|  |    |
|--|----|
| Table 1. Vegetation community descriptions. ....   | 12 |
| Table 2. Comprehensive species list .....  | 15 |
| Table 3. Plant species of greatest conservation need in Calhoun, County. Bold represents species collected within a 20-mile radius of the property. Highlighted indicates plant species strongly associated with a specific vegetation community on the property. .... | 17 |

# Summary

This report summarizes the surveys conducted by BIO-WEST, Inc. on the Guadalupe Blanco River Trust Hog Bayou tract. BIO-WEST conducted field surveys and mapping on July 25 - 26 and September 12 – 13 of 2023. The Hog Bayou property consists of multiple habitat types including aquatic, riparian, isolated wetland pools and coastal wetlands. Over the course of the survey, we documented 80 plant species and nine plant communities located on the property. The two most unique plant communities are the mature riparian forest located along the Hog Bayou property boundary and the pothole ponds located intermittently along the southwestern edge. The interior of the property is dominated by Spiny aster. In some areas the habitat quality of the landcover and vegetation is good while some areas, particularly those dominated by Spiny aster habitat, are of lower quality. Selective management of the property could vastly improve its ecological function.

## 1. Property Background

### 1.1 Property layout

The Hog Bayou property is situated in the mid Gulf Coast region of Texas and upper Coastal Bend subregion. Located in Calhoun County, it is 22 miles Southeast of Victoria, Texas and 58 miles northeast of Corpus Christi, Texas. The property is located near the Guadalupe River, a waterbody of environmental and economic significance in the state. The Guadalupe River Delta occurs just 9 miles south of the property. Green Lake, the largest natural freshwater lake within Texas, is located adjacent to the property on the opposite bank of Hog Bayou. The Hog Bayou property is located amongst a rapidly developing economic area with several large manufacturing facilities in close proximity. The overall local economy is supported by manufacturing followed by commercial fishing. Ranches and other undeveloped properties border the site, although the property is accessed through a rural lot housing development. The site is not open to the public and there are no constructed trails, stabilized roads, or pathways to or on the property. The main constructed feature is an old roadway bisecting the southern edge of the property parallel to State Highway 35. This roadway has mostly been reclaimed by nature and a majority of it is flooded.

### 1.2 Geological layout

Situated on the Gulf Coastal Plains, the property is low lying with few distinct topographic features. Site elevations range between one to seven feet above mean sea level. The property is bordered by Hog Bayou on the east side and Schwings Bayou on the west side. The property boundary along Hog Bayou has the highest elevation, up to seven feet above MSL. A vertical bank, one to three feet in profile, is present along most of the Hog Bayou shoreline. The northern edge is bordered by a canal linking Hog Bayou to the Guadalupe River. In this area the Guadalupe River has been diverted and channelized into multiple canals and interchanges before flowing into the Gulf of Mexico. The property boundary along Schwings Bayou is lower elevation and swampy although there is some vertical relief along this border.

The underlying geology of the area is Beaumont formation consisting primarily of unconsolidated fine detrital clay to 100 meters thick (**Bureau of Economic Geology, 1992**). The property is dominated by Austwell Clay (Au), 88% of the site, with Austwell Silty Clay (At), 9% of the site, present along Hog Bayou only (**Figure 1**). Austwell Clay is characterized as 0 to 1% slope and frequently flooded, occasionally ponded. Austwell silty clay is characterized as 0 to 1% slope frequently flooded, occasionally ponded (**Natural Resource Conservation Service, 2024**). Due to the low-lying elevation, geology, soil types and situation between two major streams, the entire property is flooded frequently and can stay wet for long periods of time. During our survey we encountered multiple observations of frequent flooding over most of the site including debris piles, bent vegetation and silt berms. At the time of our surveys the area was drier than usual due to a prolonged drought.

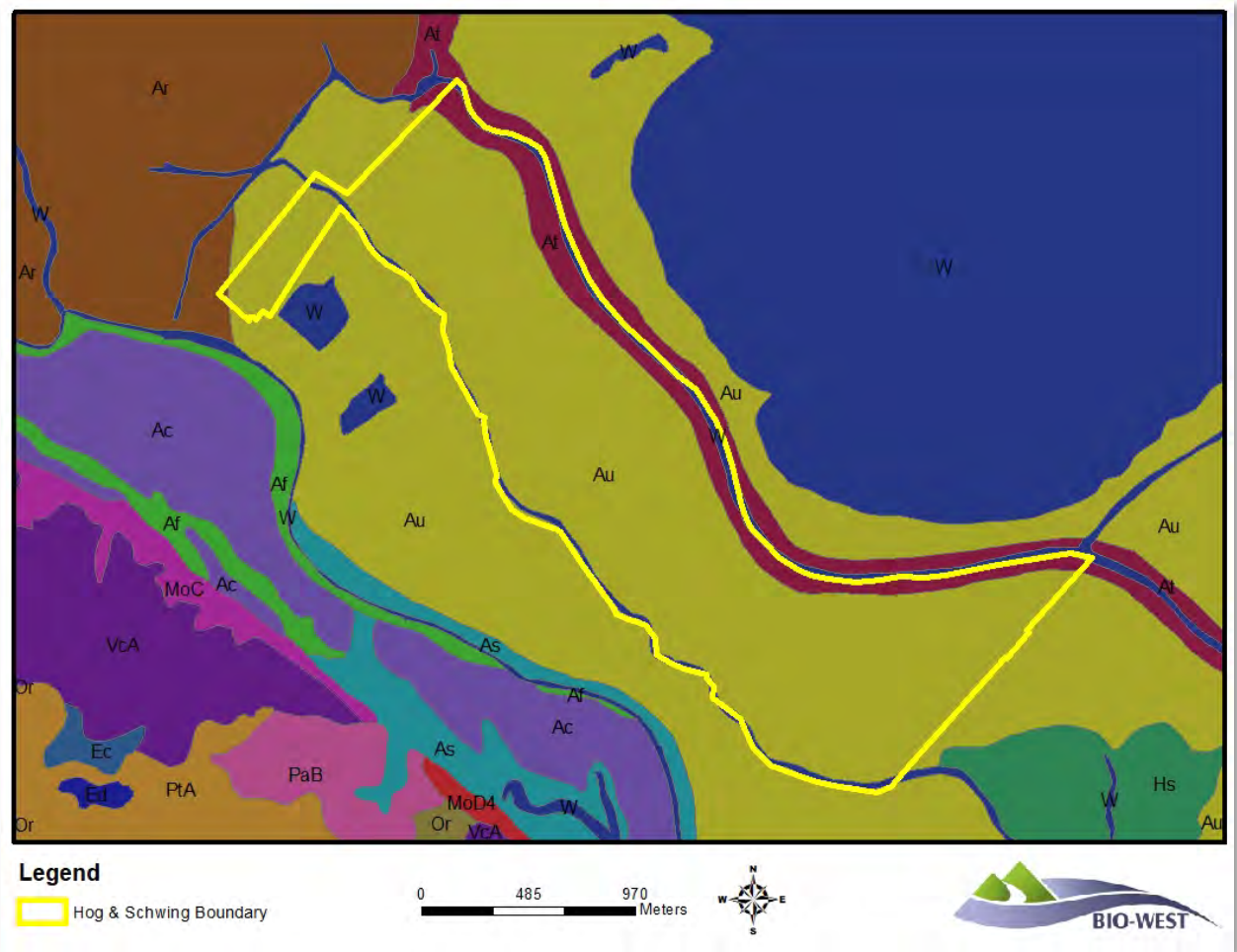


Figure 1. Soil map of property showing the dominant Austwell clay formation (yellow) with Austwell silty clay (mauve) located along Hog Bayou.

Erosional features were absent on the property and no gullies or washouts were noted. Shallow sloughs, small creeks and low areas were present along both Hog Bayou and Schwings Bayou. However, these seemed to be in a stable state with ample vegetation and natural debris present to prevent erosion. Several depressional wetlands “pothole ponds” were observed and mapped on the western edge of the property.

These were holding water and were abundant with wetland vegetation. The wetland ponds are occurring within the Ash/Swamp privet/Sea myrtle vegetation complex. The density of this complex made it impossible to observe and delineate all the pothole ponds. They likely occur intermittently within the Ash/Swamp privet/Sea myrtle complex adjacent to Schwings Bayou.

Due to the density of the woody cover it was difficult to access some areas. The southern third portion of the property as well as the panhandle portion were completely inaccessible by vehicle or walking. Based on aerial imagery and geological layout it is unlikely that any significant geological features were missed.

## 1.3 Manmade features

There are few distinctive manmade features and structures on this property. A constructed depressional wetland is present in the center of the property. This wetland is not connected to any waterbody and only receives water from rain or when over-bank events inundate the property. The wetland is laid out with a slight berm around a portion of the perimeter to collect pond water. Due to drought conditions at the time of the survey the wetland was empty although identifiable obligate wetland plants were present including Cattail, California bulrush and Creeping burhead in a small portion. The southern boundary of the property parallels State Highway 35. Adjacent to the highway within property boundaries is an historical county road. Although paved, the road is mostly covered in vegetation and flooded from Schwings Bayou. The only other significant constructed features noted during our survey was the presence of two cross fences. One fence (Fence A, coordinates 28° 29'37"N; 96° 51'33"W) cuts across the property 1,400 feet from Hog Bayou to a dense brush line located along the southwest edge of the property. In some areas the fence was intact and in others it was removed or downed. Large debris mats and driftwood were piled against the northern side of the fence, providing further evidence of inundation and water flow patterns across the property. The second fence (Fence B) is partially intact and runs across the northwestern portion of the property.

## 2. Floral Survey

### 2.1 Survey Methods

The primary objective for the property survey was to ascertain the vegetation communities on the property and compile a more thorough list of plant species present on site. To complete this task the survey team conducted meander surveys during July and September. During the July survey we accessed the property along Hog Bayou, kayaking from the Hog Bayou boat ramp to randomly selected survey points along the shoreline. This allowed us to identify plant species and delineate plant communities. At points where inland access was open, we hiked into the interior of the property to gather points and identify plant species present. We surveyed a total of 53 points (**Figure 2**), collecting a waypoint and recording observed vegetation species in the immediate area at each survey point. During the September survey event we utilized both kayak and UTV to access Schwings Bayou and the interior of the property following the same meandering methodology. During this time, we also mapped any notable features, structures and vegetation communities.

Access to the entirety of the property was difficult. Vegetation along both Hog Bayou and Schwings Bayou was dense and open areas to the interior of the property were limited. In some areas the vegetation in the interior of the property was waist- to neck-high and navigating longer distances was difficult. Use of a UTV allowed greater access at a faster pace, but there were still portions of the property the team could not acquire access to including a large portion of the southern third section and the panhandle. Despite this we were able to sample enough points to represent the vegetation communities. The point coordinates and their corresponding plant species are located in Appendix A.

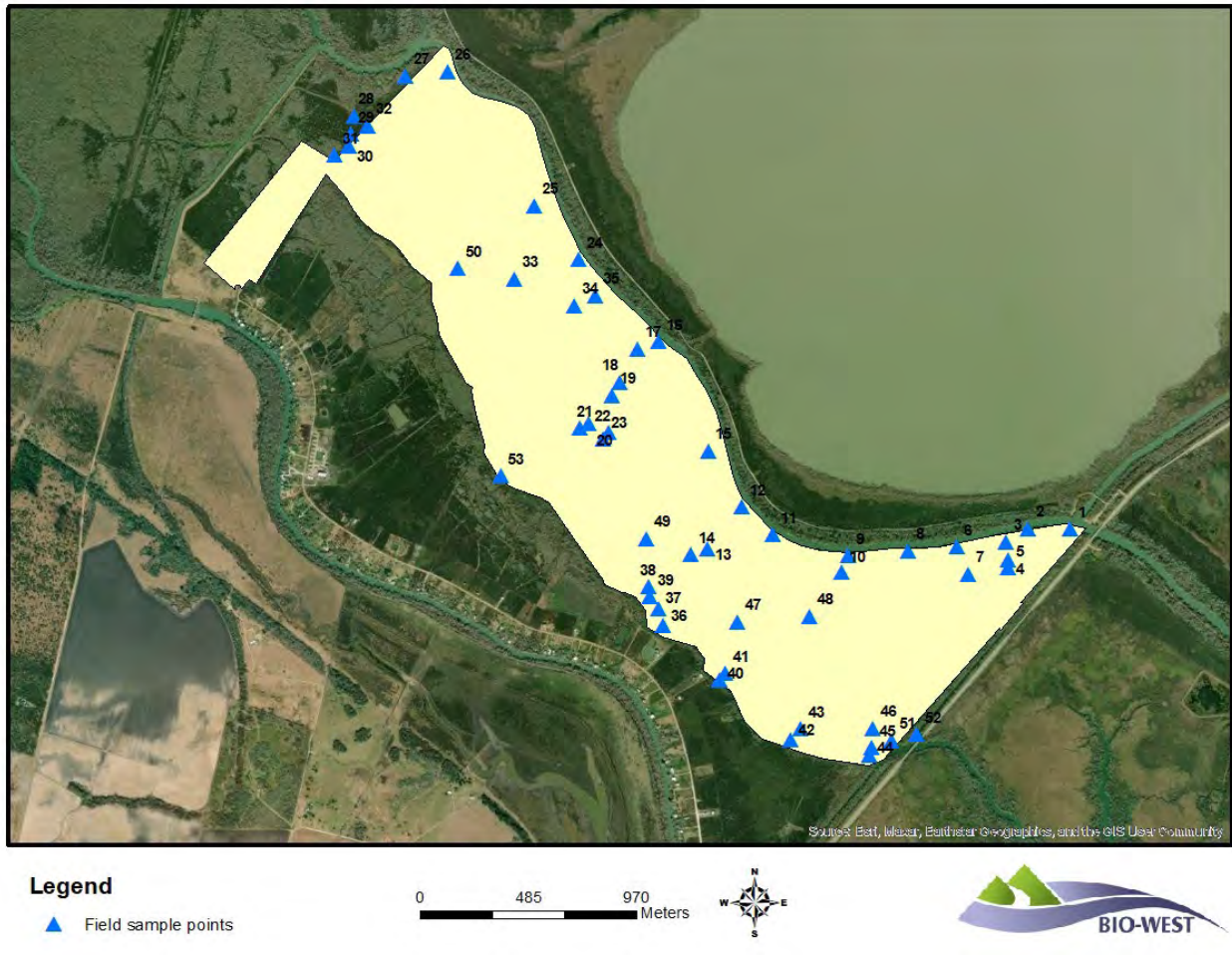


Figure 2. We sampled 53 vegetation survey points across the property.

## 2.2 Vegetation Community Complexes

We delineated five community habitat types (**Figure 3**) and described nine distinct vegetation communities. Vegetation communities can be further divided into multiple species complexes based on species patchiness (**Figure 4**). Riparian plant communities were common along both Hog Bayou and Schwings Bayou with the interior of the property dominated by lowland forbs. Wetland plant communities were present in limited locations on the property. These regions were mostly intermixed with the riparian communities located along Schwings Bayou and consisted of small ravines and back

waters. The isolated wetlands we are referring to as “pothole ponds” were observed within the riparian community along Schwings Bayou but located more interior and away from the bayou itself and appeared to be small natural basins with connection to the water table. Despite the drought and dry conditions across the property these small wetlands were filled with water and heavily vegetated with aquatic plants.

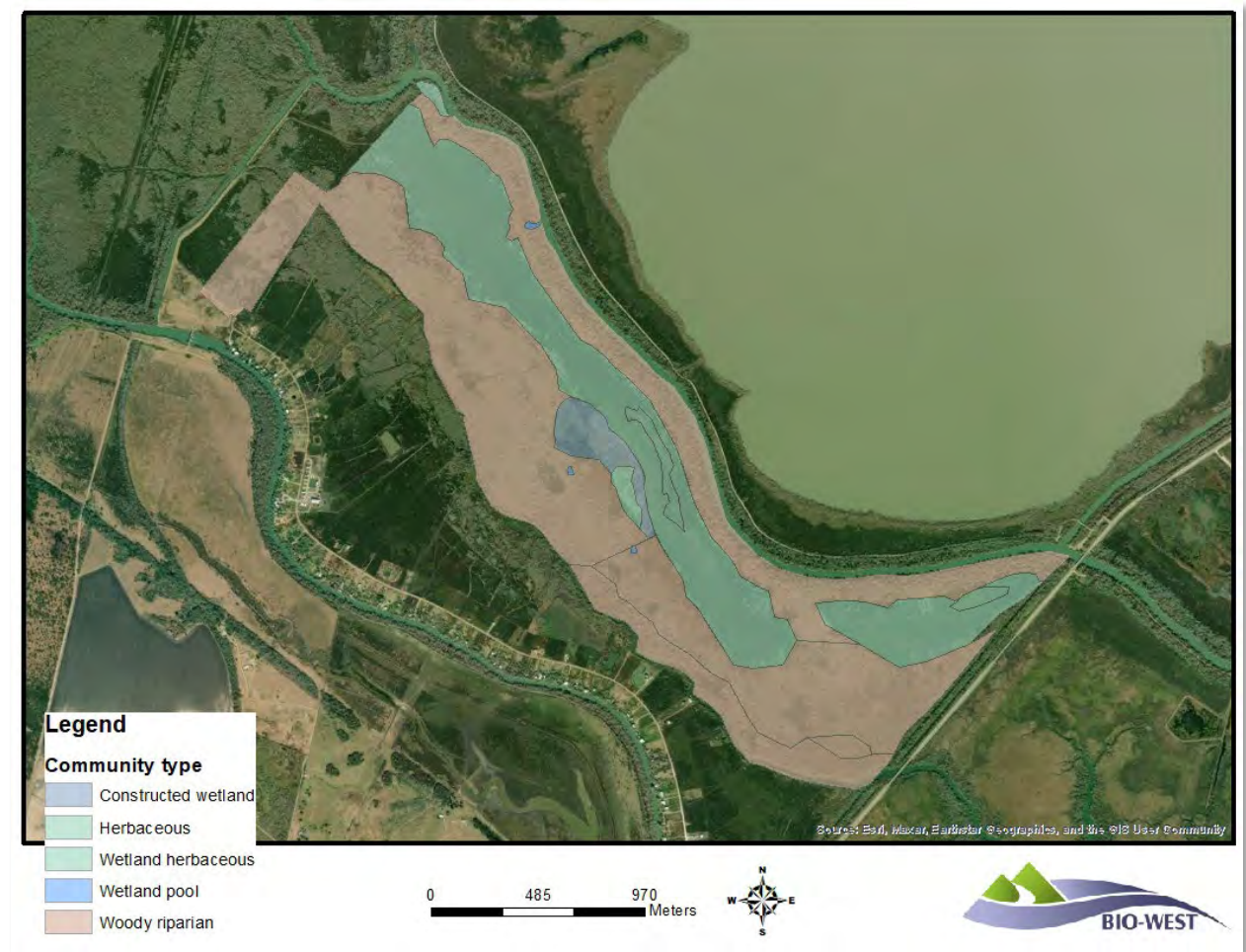


Figure 3. Vegetation community types mapped on the property.

### Vegetation Community Descriptions

1. Ash/Elm/Hackberry/Sabal – This woody riparian vegetation community is located exclusively in a narrow band along Hog Bayou and associated with Austwell Silty Clay formation. The dominant trees in this community are Green ash (*Fraxinus pennsylvanica*), Cedar elm (*Ulmus crassifolia*) and Hackberry (*Celtis laevigata*). The native palm *Sabal X texensis* was also dominant throughout. Coastal Live oak (*Quercus virginiana*) was common. Montezuma cypress (*Taxodium mucronatum*) occur but are rare. The canopy height of this riparian forest exceeds 10 feet with dense canopy cover. While vegetation growth is dense where sunlight is available the habitat opens up further inward. An open but shady understory provides habitat for vines and other plants (**Figure 5**). Poison ivy is the most common understory plant



creating dense and sprawling growth. Other common species included Turk's cap, *Dicliptera brachiata* and *Ampelopsis arborea*.

2. Ash/Swamp privet/Sea myrtle – This woody riparian vegetation community is widespread across the property, occurring in wide bands along Schwings Bayou and extending well into the interior. It is also the dominant community type in the southern third of the property and occurs in a thin band adjacent to Elm/Hackberry/Oak/Sabal community. It is associated with the Austwell Clay formation. Berlandier ash (*Fraxinus berlandieriana*), Eastern swamp privet (*Forestiera acuminata*) and Sea myrtle (*Baccharis halimifolia*) are the dominant species within the community. These are small trees species with canopies topping 10 feet or less in height. Other tree species associated with the community include Black willow, Retama and Chinese tallow. In wetter areas *Sabal X texana* and buttonbush is present. Canopy structure is less dense for this community type and therefore more light is available for groundcovers and forbs. Spiny aster, Sumpweed and climbing hempvine are commonly associated forbs within this community.

3. Spiny aster/Sea tansy/Wolfberry – This forb community is the most widespread and dominant on the property and associated with the Austwell Silty Clay formation. Spiny aster (*Chloracantha spinosa*) is the most dominant single species found on the property. Occurring in the open areas of the property, Spiny aster reaches a height of four to five feet (**Figure 6**), making it extremely difficult to traverse during meander surveys. Although native, Spiny aster is an aggressive colonizer and competitor to disturbed soils and coverage of Spiny aster at any one location within this community was nearly 100%. Other associated species such as Sea tansy and Carolina wolfberry are common but rarely occur in dense quantities. In some locations Spiny aster gives way to a Sumpweed dominated community. In areas where the soil remains saturated patches of obligate wetland plants dominate. The dried carapaces of blue crab are commonly observed, indicating this habitat is regularly inundated.

4. Sumpweed – The Sumpweed community co-occurs with Spiny aster/Sea tansy/Wolfberry. Generally, it is found adjacent to Ash/Elm/Hackberry/Sabal community. Although Sumpweed is common throughout the property it is only dense within this community type. Associated species with Sumpweed include Spiny aster and Sea tansy.

5. Green Ash/Common Reed – This riparian wetland community occupies only a small portion of the property along Hog Bayou. Although associated with Ash/Elm/Hackberry/Sabal it is distinctive enough to be delineated and classified separately. This community is associated with the Austwell Silty Clay formation. It is characterized as a low lying and inundated wetland dominated by Green ash, Common reed and Giant cutgrass. Other associated species include Water primrose, Duck potato and White smartweed.

6. Sabal palm marsh – The Sabal palm marsh is yet another localized riparian community associated with the more extensive Ash/Swamp privet/Sea myrtle. The Sabal palm marsh occurs in a narrow band adjacent to Schwings Bayou in low lying areas. It is characterized by inundated or muddy bottoms with dense stands of *Sabal X texensis* and other wetland associates including American crinum lily, Bulltongue and Crowfoot sedge.

7. Isolated pothole ponds – Several isolated wetlands were observed and delineated adjacent to Schwings Bayou and associated with the Ash/Swamp privet community. The ponds are inundated but have no obvious surface connection to Schwings Bayou. Wetland species including Smart weed, Giant cut grass and Delta duck potato are common. More of these features likely exist on the property than were mapped, and they are likely occurring within the Ash/Swamp privet/Sea myrtle community.

8. Chinese tallow mixed woodland – Although Chinese tallow is noted as intermixed within the wooded riparian habitats there are localized areas where this non-native species dominates. More of this community likely exist on the property than were mapped and it is likely occurring within the Ash/Swamp privet/Sea myrtle community.

9. Aquatic – Although not occurring directly on the property, the aquatic plant community cannot be disregarded. Hog Bayou and Schwings Bayou provide ample habitat for native and non-native aquatic plants. Water hyacinth and Alligatorweed are the two most abundant aquatic plant species within this community. Both species can float freely along the water’s surface. Native species including Hornwort and Mosquito fern were observed but uncommon.

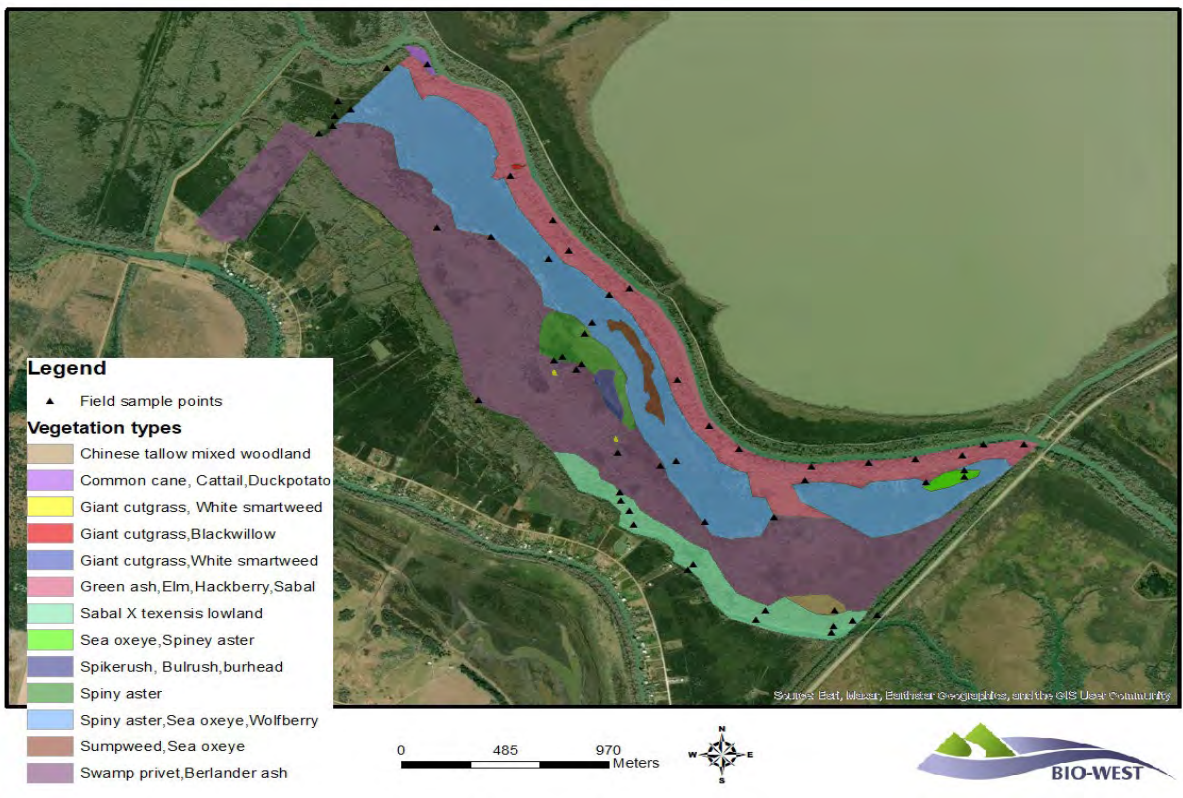


Figure 4. Mapped species complexes.



Figure 5. Open understory of the Ash/Elm/Hackberry/Sabal community.



Figure 6. Spiny aster dominates the interior of the property.

Table 1. Vegetation community descriptions.

| Vegetation Communities                     | Habitat Type    | Description   |
|--|-----------------|---|
| Elm, Hackberry, Oak, Sabal                 | Woody Riparian  | Dominant trees include <i>Ulmus crassifolia</i> , <i>Celtis laevigata</i> , <i>Quercus virginiana</i> , <i>Sabal X texensis</i> . Other dominants include <i>Smilax bonanox</i> , Turks cap, Poison ivy. Montezuma bald cypress rare. |
| Ash, Swamp privet, Sea myrtle              | Woody Riparian  | Dominated by Berlandier ash and swamp privet. Short woody vegetation with an understory of Spiny aster and Sumpweed.  |
| Spiny aster, Sea tansy, Carolina wolfberry | Forb/Herbaceous | Dominated by spiny aster, sometimes a monoculture, but occasionally Sea tansy and Carolina wolfberry associated. Lack of woody species. Occasionally inundated.   |
| Sumpweed                                   | Forb/Herbaceous | A monoculture of Sumpweed with Sea tansy and Spiny aster sporadically associated. Occasionally inundated.   |
| Green ash, Common reed                     | Woody Riparian  | Mature Green ash with dense stands of Common reed. Other herbaceous wetland plants present. Inundated.  |
| Sabal palm marsh                           | Woody Riparian  | Dominated by large mature <i>Sabal X texensis</i> palm with mix of other various woody species. Inundated to wet, with wetland herbaceous species present.  |
| Wetland pothole ponds                      | Forb/Herbaceous | Isolated wetland ponds dominated by Smart weed, Giant cut grass and Delta duck potato. Inundated even during drought.   |
| Chinese tallow mixed woodland              | Woody Riparian  | Localized areas dominated by non-native Chinese tallow but also including a mix of other riparian trees.  |
| Aquatic                                    | Forb/Herbaceous | Open water habitat of Schwings and Hog Bayou with submerged and floating aquatic plant species including Water hyacinth, Alligatorweed and Water lettuce.   |

## 2.3 Site Flora

To gather a more complete list of plant species present on the property the team conducted a meandering survey as mentioned above. A significant portion of the property was surveyed to provide a more comprehensive list of plant species than previous surveys. Through the meander survey method, we collected plant species occurrences at 53 points. At each point we observed and identified the plant species within the immediate area and a combined list of species was composed from these 53 points. A total of 80 plant species were documented for the property during our survey (**Table 2**). While somewhat thorough in spatial extent more species could be documented during other seasons or during different growing conditions. Over half of the species documented require wetland conditions with a wetland indicator status of FACW or OBL (**United States Army Corps of Engineers, 2020**). The complete list of species and their indicator status can be found in Appendix A. Photographs of individual species and habitats can be found in Appendix B.

Grasses were uncommon and mostly nonexistent in the interior of the property. The most common herbaceous species encountered was Spiny aster (*Chloracantha spinosa*). This plant was found throughout the property both as a near monoculture but also associated with other vegetation communities and plant species. Species such as Carolina wolfberry (*Lycium carolinianum*) and Sea tansy (*Borrchia frutescens*) were commonly intermixed with Spiny aster. These two species are indicators of saline bottomlands. The woody riparian habitats present along Schwings Bayou and extending inward were dominated by Berlandier ash (*Fraxinus berlandieriana*) and Swamp privet (*Forestiera acuminata*), both short multi-branching trees with medium canopy density. Larger riparian trees were common along Hog Bayou. These included Green ash, Cedar elm and Hackberry. Live oak was common but not dominant. Montezuma bald cypress (*Taxodium distichum var. mexicanum*) was rare and indicative of freshwater wetlands with short duration or zero salinity influence. Other common plants in the riparian area along Hog Bayou included Turk's cap, Poison ivy, Tievine and Peppervine.

Several non-native species were observed occurring on the property. Chinese tallow was the most common and almost exclusively associated with the Ash/Swamp privet/Sea myrtle community along Schwings Bayou. Salt cedar was noted occurring intermittently within the center of the property. Aquatic non-native plants were observed with the most common species being Water hyacinth (*Eichhornia crassipes*). These species can form dense floating mats covering the entirety of the water surface.

No federal or state listed threatened or endangered plant species were encountered during our survey times and none are expected for Calhoun, County. However, **Table 3** lists the globally rare or endemic plant species (**TPWD, 2024**) potentially present in Calhoun, County. The species highlighted have been collected and vouchered within a 20-mile radius of the Hog Bayou Property (**TORCH Portal, 2024**). Indianola beakrush (*Rhynchospora indianolensis*) has been collected from a nearby ranch pothole pond and could be present in the pothole ponds on the property. Marsh-elder dodder has not been vouchered nearby but it is heavily associated with the Sumpweed (*Iva annua*) community and could also exist on the property. We did identify Dodder (*Cuscuta*) at point 13 but it was not identified to species as this is difficult in the field. Texas pinkroot (*Spigelia texana*) is a Texas endemic plant which could likely be associated with the Elm, Hackberry, Oak, Sabal riparian community. It has not been collected or observed in Calhoun County but has been vouchered near Linn Bayou at Mcfaddin Ranch in southern Victoria County (**TORCH Portal, 2024**). Striped rosemallow (*Hibiscus striatus*) occurs along Highway 35 and Hog Bayou adjacent to, but not within, the Hog Bayou property. Although this species is not endemic to Texas it is rare.

Uncommon plants which do occur on the property include *Sabal X texana*, American crinum lily and Montezuma cypress.

*Sabal X texana* (**Figure 7**) is a natural hybrid between the native *Sabal mexicana* and *Sabal minor* palm trees. *Sabal X texana* is distributed intermittently along the Gulf coastal bend. Data is sparse on the exact taxonomy, ecology, and distribution of the plant with some botanical work completed on a population along Garcitas Creek near Matagorda Bay. It is a relatively new discovery (**Locket et al., 1991**). Its presumed parent species, *Sabal mexicana* and *Sabal minor*, are known to persist along water courses and in low-lying wetlands.

American crinum lily (*Crinum americanum*) (**Figure 8**) is more common along the Texas Gulf Coast east of Houston with a disjunct distribution located around the Guadalupe River Delta. American crinum lily was noted as quite common along both Hog Bayou and Schwings Bayou. The presence of the plant indicates the persistence of freshwater inflows as its salinity tolerance is very low (**Stutzenbaker, 1999**).

Montezuma bald cypress (*Taxodium distichum* var. *mexicanum*) is considered a unique subspecies of Bald cypress, the latter commonly found in acidic swamps and lowlands of east Texas except for human plantings along watercourses elsewhere (**Adams et al., 2012**). Montezuma bald cypress lacks the development of pneumatophore “knees” commonly associated with Eastern bald cypress. The root structure of Montezuma bald cypress is flared resulting in buttress roots and a wide spreading base (**Figure 9**). Montezuma bald cypress is also more pyramidal in growth form. The presumed distribution of Montezuma bald cypress in Texas includes the Rio Grande Valley, extending north into the Edwards Plateau region. The species distribution also extends along the Guadalupe River to the Guadalupe Delta as a disjunct arm. Montezuma bald cypress are known from the Guadalupe River at Gonzalez, Coletto Creek and the Guadalupe Delta. However, their occurrence is highly intermittent and uncommon in the watershed.

Table 2. Comprehensive species list

| <b>Tree</b>                           |   |
|---------------------------------------|---|
| Chinese tallow*                       | <i>Triadica sebifera</i> (L.) Small   |
| Green ash                             | <i>Fraxinus pennsylvanica</i> Marshall  |
| Berlandier ash                        | <i>Fraxinus berlandieriana</i> DC.  |
| Montezuma bald cypress                | <i>Taxodium distichum</i> var. <i>mexicanum</i> ( <i>T. mucronatum</i> ) Ten. |
| Live oak                              | <i>Quercus virginiana</i> Mill.   |
| Slippery elm                          | <i>Ulmus rubra</i> Muhl.  |
| Cedar elm                             | <i>Ulmus crassifolia</i> Nutt.  |
| Boxelder                              | <i>Acer negundo</i> L.  |
| Hackberry                             | <i>Celtis laevigata</i> Willd.  |
| Pecan                                 | <i>Carya illinoensis</i> (Wangenh.) K. Koch                                   |
| Salt cedar*                           | <i>Tamarix</i> (species uncertain)  |
| Black willow                          | <i>Salix nigra</i> Marshall   |
| Palo verde                            | <i>Parkinsonia aculeata</i> L.  |
| Sabal palm hybrid                     | <i>Sabal</i> × <i>texensis</i>  |
| Gum bumelia                           | <i>Sideroxylon lanuginosum</i> Michx.   |
| <b>Shrub</b>                          |   |
| Buttonbush                            | <i>Cephalanthus occidentalis</i> L.   |
| Eastern swamp privet                  | <i>Forestiera acuminata</i> (Michx.) Poir.                                    |
| Yaupon holly                          | <i>Ilex vomitoria</i> Aiton   |
| Roughleaf dogwood                     | <i>Cornus drummondii</i> C. A. Mey.   |
| Coral bean                            | <i>Erythrina herbacea</i> L.  |
| Indigo bush                           | <i>Amorpha fruticosa</i> L.   |
| Sea-myrtle                            | <i>Baccharis halimifolia</i> L.   |
| <b>Herb, Vine, Woody vine , Grass</b> |   |
| Heartleaf peppervine                  | <i>Ampelopsis cordata</i>   |
| Peppervine                            | <i>Ampelopsis arborea</i>   |
| Trumpet vine                          | <i>Campsis radicans</i>   |
| Poison ivy                            | <i>Toxicodendron radicans</i>   |
| Virginia creeper                      | <i>Parthenocissus quinquefolia</i> (L.) Planch                                |
| Dodder vine                           | <i>Cuscuta</i> sp.  |
| Mustang grape                         | <i>Vitis mustangensis</i> Buckley   |

|                       |   |
|-----------------------|---|
| Sweet grape           | <i>Vitis riparia</i> Michx.                             |
| Tievine               | <i>Ipomoea cordatotriloba</i> Dennst.                   |
| Turks cap             | <i>Malvaviscus arboreus</i> var. <i>drummondii</i> Cav. |
| Giant ragweed         | <i>Ambrosia trifida</i> L.                              |
| Green briar           | <i>Smilax bona nox</i> L.                               |
| Lanceleaf frogfruit   | <i>Phyla lanceolata</i> (Michx.) Greene                 |
| Sea tansy             | <i>Borrichia frutescens</i> DC.                         |
| Spiny aster           | <i>Chloracantha spinosa</i> (Benth.) G.L. Nesom         |
| Carolina wolfberry    | <i>Lycium carolinianum</i> Walter                       |
| Southern dewberry     | <i>Rubus trivialis</i> Michx.                           |
| Flatsedge             | <i>Cyperus</i> undet.                                   |
| Branched foldwing     | <i>Dicliptera brachiata</i> (Pursh) Spreng.             |
| Groundcherry          | <i>Physalis</i> undet.                                  |
| Drummond's leafflower | <i>Phyllanthus abnormis</i> Baill.                      |
| Sumpweed              | <i>Iva annua</i> (L.)                                   |
| Jointed flatsedge     | <i>Cyperus articulatus</i> L.                           |
| Winged loosestrife    | <i>Lythrum alatum</i> Pursh                             |
| Shrubby boneset       | <i>Ageratina havanensis</i> (Kunth) R.M.King & H.Rob.   |
| Heliotrope            | <i>Heliotropium angiospermum</i> Murray                 |
| Canadian germander    | <i>Teucrium canadense</i> L.                            |
| Climbing hempvine     | <i>Mikania scandens</i> (L.) Willd.                     |
| Wild petunia          | <i>Ruellia</i> sp.                                      |
| Common reed           | <i>Phragmites australis</i> (Cav.) Trin. ex Steud.      |
| Wild cow pea          | <i>Vigna luteola</i> Benth.                             |

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### Herbaceous Aquatic

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|                         |  |
|-------------------------|--|
| Giant cutgrass          | <i>Zizaniopsis miliacea</i> (Michx.) Döll & Asch.  |
| Alligatorweed*          | <i>Alternanthera philoxeroides</i> (Mart.) Griseb. |
| Halberd leaf rosemallow | <i>Hibiscus laevis</i> All.                        |
| American crinum lily    | <i>Crinum americanum</i> L.                        |
| Water lettuce*          | <i>Pistia stratiotes</i> L.                        |
| Big foot water clover   | <i>Marsilea macropoda</i> Engelm. ex A. Braun      |
| Southern cut grass      | <i>Leersia hexandra</i> Sw.                        |
| Water hyacinth*         | <i>Eichhornia crassipes</i> (Mart.) Solms          |



|                            |   |
|----------------------------|---|
| Common duckweed            | <i>Lemna minor</i> L.                                 |
| Floating marsh pennywort   | <i>Hydrocotyle ranunculoides</i> L. f.                |
| Creeping water primrose    | <i>Ludwigia peploides</i> (Kunth) P. H. Raven         |
| Mosquito fern              | <i>Azolla filiculoides</i> Lam.                       |
| Raven foot sedge           | <i>Carex crus-corvi</i> Shuttlew. ex Kunze            |
| Bulltongue sedge           | <i>Sagittaria lancifolia</i> L.                       |
| Water primrose             | <i>Ludwigia repens</i> J.R. Forst                     |
| Tall horn beak sedge       | <i>Rhynchospora macrostachya</i> Torr. ex A. Gray     |
| Southern cattail           | <i>Typha domingensis</i> Pers.                        |
| Common spikerush           | <i>Eleocharis palustris</i> (L.) Roem. & Schult.      |
| Marsh fleabane             | <i>Pluchea odorata</i> (L.) Cass.                     |
| Creeping burhead           | <i>Echinodorus cordifolius</i> (L.) Griseb.           |
| Creeping spotflower        | <i>Acmella repens</i> (Walter) R.K. Jansen            |
| Coastal water hyssop       | <i>Bacopa monnieri</i> (L.) Pennell                   |
| California bulrush         | <i>Schoenoplectus californicus</i> (C.A. Mey.) Palla  |
| Hornwort                   | <i>Ceratophyllum demersum</i> (L.)                    |
| Smooth beggar's ticks      | <i>Bidens laevis</i> (L.) Britton, Sterns, & Poggenb. |
| Delta arrowhead            | <i>Sagittaria platyphylla</i> (Engelm.) J.G. Sm.      |
| White smartweed            | <i>Persicaria hydropiperoides</i> (Michx.) Small      |
| Angle stem primrose willow | <i>Ludwigia leptocarpa</i> (Nutt.) H. Hara            |

Table 3. Plant species of greatest conservation need in Calhoun, County. Bold represents species collected within a 20-mile radius of the property. Highlighted indicates plant species strongly associated with a specific vegetation community on the property.

|                              |   |
|------------------------------|---|
| Coastal gay-feather          | <i>Liatris bracteata</i>                    |
| <b>Indianola beakrush</b>    | <b><i>Rhynchospora indianolensis</i></b>    |
| Marsh-elder dodder           | <i>Cuscuta attenuata</i>                    |
| Sand Brazos mint             | <i>Brazoria arenaria</i>                    |
| Seaside beebalm              | <i>Monarda maritima</i>                     |
| <b>Texas peachbush</b>       | <b><i>Prunus texana</i></b>                 |
| Texas willkommia             | <i>Willkommia texana</i> var. <i>texana</i> |
| <b>Threeflower broomweed</b> | <b><i>Thurovia triflora</i></b>             |



Figure 7. *Sabal X texana*, a rare native palm tree common on the property.



Figure 8. A colony of American crinum lily.



Figure 9. A specimen of Montezuma bald cypress located along Hog Bayou.

## 2.4 Flora/Fauna Associations

Based on the vegetation community types and location the Hog Bayou property could serve as vital habitat for various animal species, some rare or imperiled. The property lies within the recognized wintering habitat and suitability area for the federally endangered Whooping Crane (*Grus americana*) (Golden et al., 2022). There are multiple observations of Whooping Cranes within a 30-mile radius (eBird). The primary diet items for wintering Whooping Cranes include Blue crabs (*Callinectes sapidus*), Rangia clams (*Rangia cuneata*), Carolina wolfberry fruit, and Live oak acorns (Nelson et al., 1996). We observed blue crab carapaces, wolfberry and Live oak on the property. Crane habitat would most likely be associated with the herbaceous wetland plant community currently dominated by Spiny aster or Sumpweed. However, the tall, dense structure of these plant communities likely decreases the habitat suitability of the property for cranes. Additionally, the property becomes quite dry during periods of drought, as evidenced during our surveys, and probably will not harbor cranes during dry times. Despite these current circumstances it is likely the property could be managed to support Whooping Cranes to some degree. The intact forested riparian community is an important habitat for many migratory birds. During our survey we observed Yellow billed cuckoo (*Coccyzus americanus*) and American redstart (*Setophaga ruticilla*). Other avian species of concern which may be closely associated with or utilize vegetation communities on the property include the Reddish Egret (*Egretta rufescens*),

multiple rail species including the Black Rail (*Laterallus jamaicensis*) and Wood Stork (*Mycteria americana*) (TPWD, 2023).

The Northern Yellow Bat (*Lasiurus intermedius*) is listed as a state species of greatest conservation need (TPWD, 2023) and could be closely associated with the wooded riparian community and Sabal palm marsh community on the property. It occurs mainly along the Gulf Coast and prefers roosting in Spanish moss and in the hanging fronds of palm trees. It can be common where this vegetation occurs, is found near water and forages over grassy, open areas (TPWD, 2023).

Several rare or imperiled reptile and amphibian species could be associated with the wetland pothole ponds and other aquatic habitats. Black Spotted Newt (*Notophthalmus meridionalis*) is a likely inhabitant in the pothole pond community and has been documented in similar habitat from nearby properties in Calhoun County (Robinson et al., 2022). The Saltmarsh Snake (*Nerodia clarkia*) has been observed along the Guadalupe River adjacent to Hog Bayou Property (iNaturalist). While this species is generally restricted to the brackish marshes and islands of the mid- and upper coastline it can be found further inland in shallow freshwater marshes (TPWD, 2023).

### 3 Restoration and Conservation Considerations

The Hog Bayou property contains a diverse suite of vegetation communities and these in turn can offer habitat for a wide array of plant and animal species. While some vegetation communities represent historical reference species composition others deviate from historical reference species composition. The Spiny aster/Sea tansy/Wolfberry community, although native, should be composed of a more diverse mix of coastal wetland grass and forb species based on soil type. These include Gulf cordgrass (*Sporobolus spartinae*), Marsh hay cordgrass (*Spartina patens*), Shoregrass (*Monanthochloe littoralis*), Seashore dropseed (*Sporobolus virginicus*) and Glasswort (*Salicornia* spp.). The reference community for the Austwell Clay soil calls for up to 75% shortgrass to midgrass cover (Natural Resources Conservation Service, 2024). Past human or natural disturbance to the site likely resulted in drastic changes to this vegetation community as mature vegetation was damaged and new seed sources were brought in. This is especially true for quick growing forb species including Spiny aster. Spiny aster is highly undesirable due to its lack of wildlife or agricultural value. Dense colonies of this plant can serve as a barrier to other animals (Gonzalez et al., 2010). Improvements to the Spiny aster/Sea tansy/Wolfberry community can be made. Spiny aster can be effectively controlled by specific herbicide application methods (Gonzalez et al., 2010) followed by successive rounds of seeding or sprigging of coastal grasses and forbs.

Non-native Chinese tallow (*Triadaca sebifera*) was interspersed and common within the Ash/Swamp privet/Sea myrtle community with some locally dense stands. It was present but uncommon in the Elm/Hackberry/Oak/Palm community. A relatively new invader to the mid-coastal region, Chinese tallow can spread aggressively especially after a natural disturbance such as a hurricane or flood event as seeds are mostly water dispersed. Management options are variable depending on site conditions, but can be successful (DiTomaso and Keyser, 2010).

Very few other non-native invasive species were observed on the Hog Bayou property. A few individual Salt cedar (*Tamarisk* sp.) were observed. Invasive aquatic plants including Water hyacinth, Alligatorweed and Water lettuce are managed by the local river authority (Guadalupe Blanco River Authority) and not a particular concern for conservation of habitat on the property.

The Hog Bayou property offers a multitude of conservation possibilities for a variety of common, rare and imperiled species. It is located within a valuable ecological region. The Guadalupe Delta/Green Lake area is home to multiple unique plants and animals. Some vegetation management to the property could improve ecological function for a variety of species and installation of some minor infrastructure could provide opportunities for coastal restoration research and education which is lacking in the area.

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## Appendix A: Supporting tables and maps

Table A1. Complete plant list with site occurrence, common ( c ) or uncommon ( uc ), and wetland indicator status denoted.

| Tree                                  |   | Site Occurrence | Wetland Indicator status |
|---------------------------------------|---|-----------------|--------------------------|
| Chinese tallow*                       | <i>Triadica sebifera</i> (L.) Small   | c               | FAC                      |
| Green ash                             | <i>Fraxinus pennsylvanica</i> Marshall  | c               | FACW                     |
| Berlander's ash                       | <i>Fraxinus berlandieriana</i> DC.  | c               | FAC                      |
| Montezuma bald cypress                | <i>Taxodium distichum</i> var. <i>mexicanum</i> ( <i>T. mucronatum</i> ) Ten. | uc              | OBL                      |
| Live oak                              | <i>Quercus virginiana</i> Mill.   | c               | FACU                     |
| Slippery elm                          | <i>Ulmus rubra</i> Muhl.  | c               | FAC                      |
| Cedar elm                             | <i>Ulmus crassifolia</i> Nutt.  | c               | FAC                      |
| Boxelder                              | <i>Acer negundo</i> L.  | uc              | FAC                      |
| Hackberry                             | <i>Celtis laevigata</i> Willd.  | c               | FACW                     |
| Pecan                                 | <i>Carya illinoensis</i> (Wangenh.) K. Koch                                   | uc              | FACU                     |
| Salt cedar*                           | <i>Tamarix</i> (species uncertain)  | uc              | FACW                     |
| Black willow                          | <i>Salix nigra</i> Marshall   | c               | OBL                      |
| Palo verde                            | <i>Parkinsonia aculeata</i> L.  | uc              | FAC                      |
| Sabal palm hybrid                     | <i>Sabal</i> × <i>texensis</i>  | c               | nd                       |
| Gum bumelia                           | <i>Sideroxylon lanuginosum</i> Michx.   | uc              | FACU                     |
| <b>Shrub</b>                          |   |                 |                          |
| Buttonbush                            | <i>Cephalanthus occidentalis</i> L.   | uc              | OBL                      |
| Eastern swamp privet                  | <i>Forestiera acuminata</i> (Michx.) Poir.                                    | c               | OBL                      |
| Yaupon holly                          | <i>Ilex vomitoria</i> Aiton   | c               | FAC                      |
| Roughleaf dogwood                     | <i>Cornus drummondii</i> C. A. Mey.   | uc              | FAC                      |
| Coral bean                            | <i>Erythrina herbacea</i> L.  | uc              | nd                       |
| Indigo bush                           | <i>Amorpha fruticosa</i> L.   | uc              | FACW                     |
| Sea-myrtle                            | <i>Baccharis halimifolia</i> L.   | c               | FAC                      |
| <b>Herb, Vine, Woody vine , Grass</b> |   |                 |                          |
| Heartleaf peppervine                  | <i>Ampelopsis cordata</i>   | c               | FAC                      |
| Peppervine                            | <i>Ampelopsis arborea</i>   | c               | FAC                      |
| Trumpet vine                          | <i>Campsis radicans</i>   | uc              | FAC                      |
| Poison ivy                            | <i>Toxicodendron radicans</i>   | c               | FAC                      |
| Virginia creeper                      | <i>Parthenocissus quinquefolia</i> (L.) Planch                                | uc              | FACU                     |
| Dodder vine                           | <i>Cuscuta</i> sp.  | uc              | nd                       |
| Mustang grape                         | <i>Vitis mustangensis</i> Buckley   | c               | nd                       |
| Sweet grape                           | <i>Vitis riparia</i> Michx.   | c               | FACW                     |
| Tievine                               | <i>Ipomoea cordatotriloba</i> Dennst.   | c               | FACU                     |
| Turkscap                              | <i>Malvaviscus arboreus</i> var. <i>drummondii</i> Cav.                       | c               | FAC                      |
| Giant ragweed                         | <i>Ambrosia trifida</i> L.  | c               | FAC                      |
| Green briar                           | <i>Smilax bona nox</i> L.   | c               | FAC                      |

|                           |   |    |      |
|---------------------------|---|----|------|
| Lanceleaf frogfruit       | <i>Phyla lanceolata</i> (Michx.) Greene               | c  | OBL  |
| Sea tansy                 | <i>Borrchia frutescens</i> DC.                        | c  | OBL  |
| Spiny aster               | <i>Chloracantha spinosa</i> (Benth.) G.L. Nesom       | c  | FACW |
| Carolina wolfberry        | <i>Lycium carolinianum</i> Walter                     | c  | FACW |
| Southern dewberry         | <i>Rubus trivialis</i> Michx.                         | c  | FACU |
| Flatsedge                 | <i>Cyperus</i> undet.                                 | c  | nd   |
| Branched foldwing         | <i>Dicliptera brachiata</i> (Pursh) Spreng.           | c  | FACW |
| Groundcherry              | <i>Physalis</i> undet.                                | uc | nd   |
| Drummond's leafflower     | <i>Phyllanthus abnormis</i> Baill.                    | uc | UPL  |
| Sumpweed                  | <i>Iva annua</i> (L.)                                 | c  | FACW |
| Jointed flatsedge         | <i>Cyperus articulatus</i> L.                         | c  | OBL  |
| Winged loosestrife        | <i>Lythrum alatum</i> Pursh                           | c  | OBL  |
| Shrubby boneset           | <i>Ageratina havanensis</i> (Kunth) R.M.King & H.Rob. | c  | nd   |
| Heliotrope                | <i>Heliotropium angiospermum</i> Murray               | uc | FACU |
| Candian germander         | <i>Teucrium canadense</i> L.                          | uc | FACW |
| Climbing hempvine         | <i>Mikania scandens</i> (L.) Willd.                   | c  | FACW |
| Wild petunia              | <i>Ruellia</i> sp.                                    | c  | nd   |
| Common reed               | <i>Phragmites australis</i> (Cav.) Trin. ex Steud.    | c  | FACW |
| Wild cow pea              | <i>Vigna luteola</i> Benth.                           | c  | FACW |
| <b>Herbaceous Aquatic</b> |   |    |      |
| Giant cutgrass            | <i>Zizaniopsis miliacea</i> (Michx.) Döll & Asch.     | c  | OBL  |
| Alligator weed*           | <i>Alternanthera philoxeroides</i> (Mart.) Griseb.    | c  | OBL  |
| Halberd leaf rosemallow   | <i>Hibiscus laevis</i> All.                           | uc | OBL  |
| American crinum lily      | <i>Crinum americanum</i> L.                           | c  | OBL  |
| Water lettuce*            | <i>Pistia stratiotes</i> L.                           | c  | OBL  |
| Big foot water clover     | <i>Marsilea macropoda</i> Engelm. ex A. Braun         | c  | OBL  |
| Southern cut grass        | <i>Leersia hexandra</i> Sw.                           | c  | OBL  |
| Water hyacinth*           | <i>Eichhornia crassipes</i> (Mart.) Solms             | c  | OBL  |
| Common duckweed           | <i>Lemna minor</i> L.                                 | c  | OBL  |
| Floating marsh pennywort  | <i>Hydrocotyle ranunculoides</i> L. f.                | c  | OBL  |
| Creeping water primrose   | <i>Ludwigia peploides</i> (Kunth) P. H. Raven         | c  | OBL  |
| Mosquito fern             | <i>Azolla filiculoides</i> Lam.                       | c  | OBL  |
| Raven foot sedge          | <i>Carex crus-corvi</i> Shuttlew. ex Kunze            | c  | OBL  |
| Bull tongue sedge         | <i>Sagittaria lancifolia</i> L.                       | uc | OBL  |
| Water primrose            | <i>Ludwigia repens</i> J.R. Forst                     | uc | OBL  |
| Tall horn beak sedge      | <i>Rhynchospora macrostachya</i> Torr. ex A. Gray     | c  | OBL  |
| Southern cattail          | <i>Typha domingensis</i> Pers.                        | uc | OBL  |
| Common spikerush          | <i>Eleocharis palustris</i> (L.) Roem. & Schult.      | c  | OBL  |
| Marsh fleabane            | <i>Pluchea odorata</i> (L.) Cass.                     | c  | OBL  |
| Creeping burhead          | <i>Echinodorus cordifolius</i> (L.) Griseb.           | uc | OBL  |
| Creeping spotflower       | <i>Acmella repens</i> (Walter) R.K. Jansen            | uc | OBL  |
| Coastal water hyssop      | <i>Bacopa monnieri</i> (L.) Pennell                   | c  | OBL  |
| California bulrush        | <i>Schoenoplectus californicus</i> (C.A. Mey.) Palla  | uc | OBL  |
| Hornwort                  | <i>Ceratophyllum demersum</i> (L.)                    | uc | OBL  |
| Smooth beggar's ticks     | <i>Bidens laevis</i> (L.) Britton, Sterns, & Poggenb. | uc | OBL  |
| Delta arrowhead           | <i>Sagittaria platyphylla</i> (Engelm.) J.G. Sm.      | uc | OBL  |



|                            |  |    |     |
|----------------------------|--|----|-----|
| White smartweed            | <i>Persicaria hydropiperoides</i> (Michx.) Small | uc | OBL |
| Angle stem primrose willow | <i>Ludwigia leptocarpa</i> (Nutt.) H. Hara       | uc | OBL |

Table A2. Plant species of greatest conservation need from Calhoun, County.

|   |   |                  |                         |
|---|---|------------------|-------------------------|
| Coastal gay-feather   | <i>Liatris bracteata</i>                    |                  |                         |
| Coastal prairie grasslands of various types, from salty prairie on low-lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams; flowering in fall   |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G2G3                           | State Rank: S2S3 |                         |
|   |   |                  |                         |
| Indianola beakrush  | <i>Rhynchospora indianolensis</i>           |                  |                         |
| Locally abundant in cattle pastures in some areas (at least during wet years), possibly becoming a management problem in such sites; Perennial; Flowering/Fruiting April-Nov  |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G3Q                            | State Rank: S3   |                         |
|   |   |                  |                         |
| Marsh-elder dodder  | <i>Cuscuta attenuata</i>                    |                  | <b>Could be present</b> |
| Parasitizes a particular sumpweed ( <i>Iva annua</i> ) almost exclusively as well as ragweed and heath aster. Host plants typically found in open, disturbed habitats like fallow fields and creek bottomlands; Annual; Flowering late summer through October                                       |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: N  | Global Rank: G1G3                           | State Rank: S2   |                         |
|   |   |                  |                         |
| Sand Brazos mint  | <i>Brazoria arenaria</i>                    |                  |                         |
| Sandy areas in South Texas; Annual; Flowering/Fruiting March-April  |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G3                             | State Rank: S3   |                         |
|   |   |                  |                         |
| Seaside beebalm   | <i>Monarda maritima</i>                     |                  |                         |
| Occurs in grasslands and pastures on sandy soil near the coast (Carr 2015).   |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G2Q                            | State Rank: S2   |                         |
|   |   |                  |                         |
| Texas peachbush   | <i>Prunus texana</i>                        |                  |                         |
| Occurs at scattered sites in various well drained sandy situations; deep sand, plains and sand hills, grasslands, oak woods, 0-200 m elevation; Perennial; Flowering Feb-Mar; Fruiting Apr-Jun  |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G3G4                           | State Rank: S3S4 |                         |
|   |   |                  |                         |
| Texas willkommia  | <i>Willkommia texana</i> var. <i>texana</i> |                  |                         |
| Mostly in sparsely vegetated shortgrass patches within taller prairies on alkaline or saline soils on the Coastal Plain (Carr 2015).  |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G3G4T3                         | State Rank: S3   |                         |
|   |   |                  |                         |
| Threeflower broomweed   | <i>Thurovia triflora</i>                    |                  |                         |
| Near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G2G3                           | State Rank: S2S3 |                         |
|   |   |                  |                         |
| velvet spurge   | <i>Euphorbia innocua</i>                    |                  |                         |
| Open or brushy areas on coastal sands and the South Texas Sand Sheet; Perennial; Flowering Sept-April; Fruiting Nov-July  |   |                  |                         |
| Federal Status:   | State Status:                               | SGCN: Y          |                         |
| Endemic: Y  | Global Rank: G3                             | State Rank: S3   |                         |

Table A3. Animal species of greatest conservation need from Calhoun, County which could be associated with delineated vegetation communities located on the property.

|  |                                   |                     |
|--|-----------------------------------|---------------------|
| salt marsh snake   | <i>Nerodia clarkii</i>            |                     |
| This species is generally restricted to the brackish marshes and islands of the mid and upper coastline. It can be found further inland in shallow freshwater marshes.   |                                   |                     |
| Federal Status:  | State Status:                     | SGCN: Y             |
| Endemic: N   | Global Rank: G4                   | State Rank: S3      |
| northern yellow bat  | <i>Lasiurus intermedius</i>       |                     |
| Occurs mainly along the Gulf Coast but inland specimens are not uncommon. Prefers roosting in spanish moss and in the hanging fronds of palm trees. Common where this vegetation occurs. Found near water and forages over grassy, open areas. Males usually roost solitarily, whereas females roost in groups of several individuals.   |                                   |                     |
| Federal Status:  | State Status:                     | SGCN: Y             |
| Endemic: N   | Global Rank: G5                   | State Rank: S4      |
| black-spotted newt   | <i>Notophthalmus meridionalis</i> |                     |
| Terrestrial and aquatic: Terrestrial habitats used by adults are typically poorly drained clay soils that allow for the formation of ephemeral wetlands. A wide variety of vegetation associations are known to be used, such as thorn scrub and pasture. Aquatic habitats used for reproduction are a variety of ephemeral and permanent water bodies.  |                                   |                     |
| Federal Status:  | State Status: T                   | SGCN: Y             |
| Endemic: N   | Global Rank: G3                   | State Rank: S3      |
| wallow-tailed kite   | <i>Elanoides forficatus</i>       |                     |
| The county distribution for this species includes geographic areas that the species may use during migration. Time of year should be factored into evaluations to determine potential presence of this species in a specific county. Lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees.   |                                   |                     |
| Federal Status:  | State Status: T                   | SGCN: Y             |
| Endemic: N   | Global Rank: G5                   | State Rank: S2B     |
| whooping crane   | <i>Grus americana</i>             |                     |
| The county distribution for this species includes geographic areas that the species may use during migration. Time of year should be factored into evaluations to determine potential presence of this species in a specific county. Small ponds, marshes, and flooded grain fields for both roosting and foraging. Potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties.  |                                   |                     |
| Federal Status: LE   | State Status: E                   | SGCN: Y             |
| Endemic: N   | Global Rank: G1                   | State Rank: S1S2N   |
| wood stork   | <i>Mycteria americana</i>         |                     |
| The county distribution for this species includes geographic areas that the species may use during migration. Time of year should be factored into evaluations to determine potential presence of this species in a specific county. Prefers to nest in large tracts of baldcypress ( <i>Taxodium distichum</i> ) or red mangrove ( <i>Rhizophora mangle</i> ); forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960. |                                   |                     |
| Federal Status:  | State Status: T                   | SGCN: Y             |
| Endemic: N   | Global Rank: G4                   | State Rank: SHB,S2N |
| western box turtle   | <i>Terrapene ornata</i>           |                     |
| Terrestrial: Ornate or western box turtles inhabit prairie grassland, pasture, fields, sandhills, and open woodland. They are essentially terrestrial but sometimes enter slow, shallow streams and creek pools. For shelter, they burrow into soil (e.g., under plants such as yucca) (Converse et al. 2002) or enter burrows made by other species.  |                                   |                     |
| Federal Status:  | State Status:                     | SGCN: Y             |
| Endemic: N   | Global Rank: G5                   | State Rank: S3      |

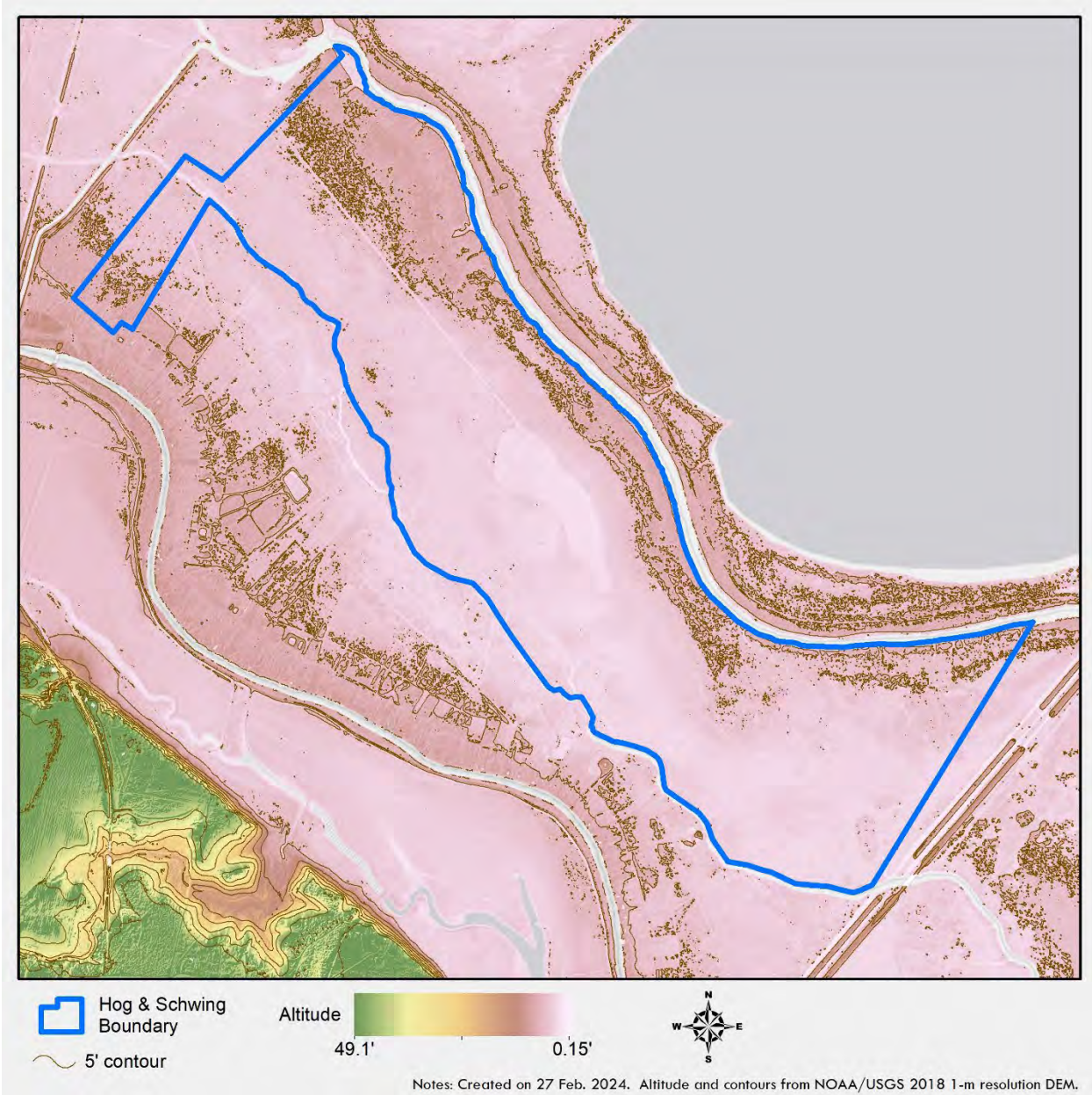


Figure A1. Elevation profile of the property and surrounding area.

↘  
Chinese tallow  
*Zizaniopsis milacea*  
Alligator weed  
water hyacinth  
Black willow  
*Hibiscus laevis*  
*Crinum americanum*  
Vitis sp  
Water lettuce  
Green ash  
Buttonbush  
Roughleaf dogwood  
*Sabal X texensis*  
*Ulmus americana*  
Ulmus crassifolia  
*Ampelopsis arborea*  
*Ampelopsis cordata*  
Gum bumelia  
*Campsis radicans*  
*Ilex vomitoria*  
*Toxicodendron radicans*

↘  
Coral bean  
Mustang grape  
*Ipomea sagittata*  
Turkscap

↘  
3 dry waterway  
Giant ragweed  
*Smilax bona nox*  
*Phyla lanceolata*  
*Celtis*

↘  
4  
*Borrichia frutescens*  
*Marsilea macropoda*  
Spiney aster

↘  
5 inundated wetland  
*Borrichia frutescens*  
*Lycium carolinianum*  
*Rubus trivialis*  
*Baccharis halimifolia*  
*Taxodium mucronatum*

6 Good entry to interior

Cyperus sp

*Diclipta brachiata*

1

Retama

Spiny aster

*Ampelopsis arborea*

*Ulmus crassifolia*

*Sabal X texensis*

*Marsilea macropoda*

2 yellow billed cuckoos 8

Live oak

*Amorpha fruticosa*

Virginia creeper

Pecan

American redstarts Riparian 9

Live oak

*Acer negundo*

Celtis

*Ilex vomitoria*

*Sabal X texensis*

10  
Spiny aster

large tree 11  
*Taxodium mucronatum*

12 good landing spot  
Live oak  
Green ash  
Poison ivy

13  
*Borrichia frutescens*  
*Teucrium canadense*  
*Cuscuta* sp.  
*Physalis* sp.

14  
Berlander's ash  
*Lycium carolinianum*  
spiny aster  
*Phyla lanceolata*  
*Ampelopsis arborea*  
*Acmella repens*  
*Ipomea cordatotriloba*

15 Walkable

Green ash  
Poison ivy  
*Ipomea sagittata*

16 Walkable to interior

Green ash  
Poison ivy  
*Smilax bona nox*

17

Cedar elm  
Spiny aster  
*Marsilea macropoda*  
*Sabal X texensis*  
*Toxicodendron radicans*

18

*Borrichia frutescens*  
Spiny aster

19

*Phyla lanceolata*  
*Eleocharis palustris*  
*Pluchea odorata*  
*Echinodorus cordifolius*  
*Acmella repens*

20

Spiny aster  
*Lycium carolinanum*  
*Iva annua*  
*Tamarix sp*  
*Borrichia frutescens*

21

*Forresteria angustifolia*  
*Baccharis halimifolia*  
Spiny aster

22

*Echinodorus cordifolius*  
*Typha domingensis*  
*Eleocharis palustris*  
*Cyperus pendulatus*  
*Salix nigra*  
*Phyla lanceolata*  
*Lythrum alatum*  
*Bacopa monierri*  
*Schoenoplectus californicus*

23

*Fraxinus berlanderi*  
*Salix nigra*  
*Eupatorium havanense*  
Spiny aster  
*Smilax bona nox*  
*Baccharis halimifolia*

Aquatic 24

Coontail  
*Bidens laevis*

25

*Iva annua*  
*Ulmus crassifolia*  
Green ash  
*Sabal X texensis*  
*Baccharis halimifolia*  
Spiny aster



swamp26

Green ash  
*Salix nigra*  
*Zizaniopsis milacea*  
*Sagittaria platyphylla*  
Cyperus sp.  
*Iva annua*  
*Persicaria hydropeperoides*  
*Sabal X texensis*  
*Ludwigia peploides*  
*Phyla lanceolata*  
*Azolla filiculoides*  
*Hydrocotyle ranunculoides*  
*Heliotropium angiospermum*

27

*Ulmus crassifolia*  
*Sabal X texensis*  
Berlaners ash  
Spiny aster  
Palo verde  
*Ilex vomitoria*  
*Baccharis hamilifolia*  
*Amplepsis arborea*

28

*Fraxinus berlanderi*  
spiney aster  
*Iva annua*  
*Phyla lanceolata*

29

Spiney aster  
Palo verde  
*Fraxinus berlandieriana*

old fence 30

*Fraxinus berlandieriana*  
Spiny aster  
*Iva annua*  
Swamp privet

31

*Fraxinus berlandieriana*  
Spiny aster  
Swamp privet  
*Iva annua*  
Rubus  
Chinese tallow  
Cyperus sp.  
*Paspalum setaceum*

along fence 32

*Lycium carolinianum*  
*Iva annua*  
spiny aster  
*Borrchia frutescens*  
*Marsilea macropoda*

Pasture road 33

*Phyla lanceolata*  
*Borrchia frutescens*  
Spiny aster  
*Iva annua*  
*Eleocharis palustris*  
Swamp privet  
*Fraxinus berlanderi*  
Baccharis  
*Lycium caroliniana*

34

*Sabal X brazoriensis*  
spiny aster  
Borrchia  
*marsilea macropoda*  
*Ampelopsis arborea*

wooded 35

Green ash  
Slippery elm  
Live oak  
*Baccharis hamilifolia*  
*Ilex vomitoria*  
Celtis  
*Iva annua*  
Cyperus sp.  
*Toxicodendron radicans*  
*Ampelopsis cordata*  
*Ampelopsis arborea*  
*Teucrium canadensis*  
*Heliotropium angiospermum*

swamp 36

Black willow  
Green ash  
*Sabal X texensis*  
*Ilex vomitoria*  
Swamp privet  
Baccharis  
*Crinum americanum*  
*Rynchospora macrostachya*  
*Carex crus corvi*  
*Sagittaria lancifolia*  
*Ampelopsis cordata*  
*Ludwigia repens*

dense thicket 37

Green ash  
Baccharis  
Chinese tallow  
Black willow  
*Mikania scandens*  
*Ipomea cordotriloba*  
spiney aster  
*Phyla lanceolata*  
*Rynchospora macrostachya*  
*Acmella repens*

wooded wetland 38

Green ash  
Black willow  
Chinese tallow  
Baccharis  
*Ilex vomitoria*  
*Crinum americanum*  
*Rynchospora macrostachya*  
*Hydrocotyle umbellata*  
*Ipomea cordotriloba*  
*Mikania scandens*

creek 39

Buttonbush  
*Crinum americanum*  
Green ash  
*Sabal X brazoriensis*  
*Leersia monandra*  
Baccharis  
*Zizaniopsis milacea*  
*Ampelopsis arborea*  
*Ilex vomitoria*  
*Mikania scandens*  
Chinese tallow  
*Ruellia nudiflora*  
*Phragmites australis*  
*Persicaria hydropiperoides*

dry upland 40

Green ash  
*Sabal X brazoriensis*  
*Ampelopsis arborea*  
Iva annua  
*Toxicodendron radicans*  
Baccharis  
*Ilex vomitoria*  
Spiney aster  
*Mikania scandens*

41

Swamp privet  
spiney aster  
*Mikania scandens*

42

*Fraxinus berlandieriana*  
Black willow  
*Sabal X texensis*  
buttonbush  
*Zizaniopsis milacea*  
*Vigna luteola*  
*Carex crus corvi*  
*Leersia hexandra*  
*Crinum americanum*  
*Ilex vomitoria*  
*Rynchospora macrostachy*  
Chinese tallow  
*Phyla lanceolata*

dense growth 43

*Baccharis hamifolia*  
Black willow  
Chinese tallow  
*Fraxinus berlandieriana*  
Spiney aster

A4

Green ash  
Chinese tallow  
Black willow  
*Sabal X texensis*  
Buttonbush  
*Ilex vomitoria*  
*Crinum americanum*  
*Amplepsis arborea*

A5

*Sagittaria lancifolia*  
*Teucrium canadense*  
*Schoenopectus californicus*

A6

Chinese tallow  
Green ash  
*Phragmites australis*  
Blackwillow  
*Carex crus corvi*  
*Mikania scandens*  
*Panicum atidole*

A7

Green ash  
*Phyla lanceolata*  
*Carex crus corvi*  
*Acmella repens*  
*Persicaria hydropiperoides*  
*Pluchea odorata*  
Buttonbush

A8

Spiney aster  
*Baccharis hamilifolia*  
*Borricea frutescens*

49

*Crinum americanum*  
black willow  
Chinese tallow  
*Ampelopsis arborea*  
*Vigna luteola*  
*Leersia hexandra*  
*Ilex vomitoria*

50

*Fraxinus berlanderi*  
spiney aster

51

*Colocasia esculenta*  
*Crinum americanum*  
*Hydrocotyle bonariensis*  
Alligator weed  
Green ash  
*Sabal X texensis*  
Spiney aster  
Chinese tallow  
*Sagittari latifolia*  
*Ampelopsis arborea*  
*Zizaniopsis milacea*  
*Mikania scandens*  
*Phragmites australis*  
Black willow  
*Lemna minor*  
*Ludwigia repens*

flooded canal 52

*Mikania scandens*  
*Phragmites australis*  
Black willow  
*Lemna minor*  
*Ludwigia repens*

53

*Crinum americanum*  
*Mikania scandens*  
Water hyacinth  
Alligator weed  
Swamp privet  
Chinese tallow  
*Vigna luteola*  
*Ampelopsis arborea*

|    |              |              |
|----|--------------|--------------|
| 1  | 28°29'46.8"N | 96°50'39.4"W |
| 2  | 28°29'47.0"N | 96°50'46.5"W |
| 3  | 28°29'45.1"N | 96°50'50.2"W |
| 4  | 28°29'42.4"N | 96°50'49.9"W |
| 5  | 28°29'41.3"N | 96°50'49.8"W |
| 6  | 28°29'44.5"N | 96°50'58.3"W |
| 7  | 28°29'40.5"N | 96°50'56.4"W |
| 8  | 28°29'44.1"N | 96°51'06.3"W |
| 9  | 28°29'43.5"N | 96°51'16.1"W |
| 10 | 28°29'41.2"N | 96°51'17.3"W |
| 11 | 28°29'46.8"N | 96°51'28.6"W |
| 12 | 28°29'50.9"N | 96°51'33.6"W |
| 13 | 28°29'44.9"N | 96°51'39.4"W |
| 14 | 28°29'44.1"N | 96°51'42.2"W |
| 15 | 28°29'59.1"N | 96°51'39.0"W |
| 16 | 28°30'15.2"N | 96°51'46.9"W |
| 17 | 28°30'14.2"N | 96°51'50.3"W |
| 18 | 28°30'09.4"N | 96°51'53.4"W |
| 19 | 28°30'07.5"N | 96°51'54.7"W |
| 20 | 28°30'03.4"N | 96°51'58.6"W |
| 21 | 28°30'02.8"N | 96°51'60.0"W |
| 22 | 28°30'02.1"N | 96°51'55.3"W |
| 23 | 28°30'01.1"N | 96°51'56.2"W |
| 24 | 28°30'27.4"N | 96°51'59.7"W |
| 25 | 28°30'35.3"N | 96°52'07.0"W |
| 26 | 28°30'55.1"N | 96°52'20.9"W |
| 27 | 28°30'54.6"N | 96°52'27.8"W |
| 28 | 28°30'48.9"N | 96°52'36.3"W |
| 29 | 28°30'46.2"N | 96°52'36.9"W |
| 30 | 28°30'44.5"N | 96°52'37.3"W |
| 31 | 28°30'43.2"N | 96°52'39.8"W |
| 32 | 28°30'47.4"N | 96°52'34.2"W |
| 33 | 28°30'24.7"N | 96°52'10.5"W |
| 34 | 28°30'20.7"N | 96°52'00.6"W |
| 35 | 28°30'22.1"N | 96°51'57.2"W |

|    |              |              |
|----|--------------|--------------|
| 36 | 28°29'33.8"N | 96°51'47.0"W |
| 37 | 28°29'36.2"N | 96°51'47.7"W |
| 38 | 28°29'39.5"N | 96°51'49.2"W |
| 39 | 28°29'38.0"N | 96°51'49.0"W |
| 40 | 28°29'25.7"N | 96°51'37.7"W |
| 41 | 28°29'26.7"N | 96°51'36.9"W |
| 42 | 28°29'16.9"N | 96°51'26.2"W |
| 43 | 28°29'18.4"N | 96°51'24.5"W |
| 44 | 28°29'14.4"N | 96°51'13.2"W |
| 45 | 28°29'15.5"N | 96°51'12.9"W |
| 46 | 28°29'18.3"N | 96°51'12.7"W |
| 47 | 28°29'34.2"N | 96°51'34.6"W |
| 48 | 28°29'34.8"N | 96°51'22.8"W |
| 49 | 28°29'46.5"N | 96°51'49.5"W |
| 50 | 28°30'26.4"N | 96°52'19.8"W |
| 51 | 28°29'16.5"N | 96°51'09.6"W |
| 52 | 28°29'17.3"N | 96°51'05.3"W |
| 53 | 28°29'56.0"N | 96°52'13.3"W |



| Tree                                  |   | Site Occurrence |
|---------------------------------------|---|-----------------|
| Chinese tallow*                       | <i>Triadica sebifera</i> (L.) Small   | C               |
| Green ash                             | <i>Fraxinus pennsylvanica</i> Marshall  | C               |
| Berlander's ash                       | <i>Fraxinus berlandieriana</i> DC.  | C               |
| Montezuma bald cypress                | <i>Taxodium distichum</i> var. <i>mexicanum</i> ( <i>T. mucronatum</i> ) Ten. | UC              |
| Live oak                              | <i>Quercus virginiana</i> Mill.   | C               |
| Slippery elm                          | <i>Ulmus rubra</i> Muhl.  | C               |
| Cedar elm                             | <i>Ulmus crassifolia</i> Nutt.  | C               |
| Boxelder                              | <i>Acer negundo</i> L.  | UC              |
| Hackberry                             | <i>Celtis laevigata</i> Willd.  | C               |
| Pecan                                 | <i>Carya illinoensis</i> (Wangenh.) K. Koch                                   | UC              |
| Salt cedar*                           | <i>Tamarix</i> (species uncertain)  | UC              |
| Black willow                          | <i>Salix nigra</i> Marshall   | C               |
| Palo verde                            | <i>Parkinsonia aculeata</i> L.  | UC              |
| Sabal palm hybrid                     | <i>Sabal</i> × <i>texensis</i>  | C               |
| Gum bumelia                           | <i>Sideroxylon lanuginosum</i> Michx.   | UC              |
| <b>Shrub</b>                          |   |                 |
| Buttonbush                            | <i>Cephalanthus occidentalis</i> L.   | UC              |
| Eastern swamp privet                  | <i>Forestiera acuminata</i> (Michx.) Poir.                                    | C               |
| Yaupon holly                          | <i>Ilex vomitoria</i> Aiton   | C               |
| Roughleaf dogwood                     | <i>Cornus drummondii</i> C. A. Mey.   | UC              |
| Coral bean                            | <i>Erythrina herbacea</i> L.  | UC              |
| Indigo bush                           | <i>Amorpha fruticosa</i> L.   | UC              |
| Sea-myrtle                            | <i>Baccharis halimifolia</i> L.   | C               |
| <b>Herb, Vine, Woody vine , Grass</b> |   |                 |
| Heartleaf peppervine                  | <i>Ampelopsis cordata</i>   | C               |
| Peppervine                            | <i>Ampelopsis arborea</i>   | C               |
| Trumpet vine                          | <i>Campsis radicans</i>   | UC              |
| Poison ivy                            | <i>Toxicodendron radicans</i>   | C               |
| Virginia creeper                      | <i>Parthenocissus quinquefolia</i> (L.) Planch                                | UC              |
| Dodder vine                           | <i>Cuscuta</i> sp.  | UC              |
| Mustang grape                         | <i>Vitis mustangensis</i> Buckley   | C               |
| Sweet grape                           | <i>Vitis riparia</i> Michx.   | C               |
| Tievine                               | <i>Ipomoea cordatotriloba</i> Dennst.   | C               |

|                           |   |    |
|---------------------------|---|----|
| Turkscap                  | <i>Malvaviscus arboreus</i> var. <i>drummondii</i> Cav. | C  |
| Giant ragwed              | <i>Ambrosia trifida</i> L.                              | C  |
| Green briar               | <i>Smilax bona nox</i> L.                               | C  |
| Lanceleaf frogfruit       | <i>Phyla lanceolata</i> (Michx.) Greene                 | C  |
| Sea tansy                 | <i>Borrichia frutescens</i> DC.                         | C  |
| Spiny aster               | <i>Chloracantha spinosa</i> (Benth.) G.L. Nesom         | C  |
| Carolina wolfberry        | <i>Lycium carolinianum</i> Walter                       | C  |
| Southern dewberry         | <i>Rubus trivialis</i> Michx.                           | C  |
| Flatsedge                 | <i>Cyperus</i> undet.                                   | C  |
| Branched foldwing         | <i>Dicliptera brachiata</i> (Pursh) Spreng.             | C  |
| Groundcherry              | <i>Physalis</i> undet.                                  | UC |
| Sumpweed                  | <i>Iva annua</i> (L.)                                   | C  |
| Jointed flatsedge         | <i>Cyperus articulatus</i> L.                           | C  |
| Winged loosestrife        | <i>Lythrum alatum</i> Pursh                             | C  |
| Shrubby boneset           | <i>Ageratina havanensis</i> (Kunth) R.M.King & H.Rob.   | C  |
| Heliotrope                | <i>Heliotropium angiospermum</i> Murray                 | UC |
| Candian germander         | <i>Teucrium canadense</i> L.                            | UC |
| Climbing hempvine         | <i>Mikania scandens</i> (L.) Willd.                     | C  |
| Wild petunia              | <i>Ruellia</i> sp.                                      | C  |
| Common reed               | <i>Phragmites australis</i> (Cav.) Trin. ex Steud.      | C  |
| Wild cow pea              | <i>Vigna luteola</i> Benth.                             | C  |
| <b>Herbaceous Aquatic</b> |   |    |
| Giant cutgrass            | <i>Zizaniopsis miliacea</i> (Michx.) Döll & Asch.       | C  |
| Alligator weed*           | <i>Alternanthera philoxeroides</i> (Mart.) Griseb.      | C  |
| Halberd leaf rosemallow   | <i>Hibiscus laevis</i> All.                             | UC |
| American crinum lily      | <i>Crinum americanum</i> L.                             | C  |
| Water lettuce*            | <i>Pistia stratiotes</i> L.                             | C  |
| Big foot water clover     | <i>Marsilea macropoda</i> Engelm. ex A. Braun           | C  |
| Southern cut grass        | <i>Leersia hexandra</i> Sw.                             | C  |
| Water hyacinth*           | <i>Eichhornia crassipes</i> (Mart.) Solms               | C  |
| Common duckweed           | <i>Lemna minor</i> L.                                   | C  |
| Floating marsh pennywort  | <i>Hydrocotyle ranunculoides</i> L. f.                  | C  |
| Creeping water primrose   | <i>Ludwigia peploides</i> (Kunth) P. H. Raven           | C  |
| Mosquito fern             | <i>Azolla filiculoides</i> Lam.                         | C  |

|                            |   |    |
|----------------------------|---|----|
| Raven foot sedge           | <i>Carex crus-corvi</i> Shuttlew. ex Kunze            | c  |
| Bull tongue sedge          | <i>Sagittaria lancifolia</i> L.                       | uc |
| Water primrose             | <i>Ludwigia repens</i> J.R. Forst                     | uc |
| Tall horn beak sedge       | <i>Rhynchospora macrostachya</i> Torr. ex A. Gray     | c  |
| Southern cattail           | <i>Typha domingensis</i> Pers.                        | uc |
| Common spikerush           | <i>Eleocharis palustris</i> (L.) Roem. & Schult.      | c  |
| Marsh fleabane             | <i>Pluchea odorata</i> (L.) Cass.                     | c  |
| Creeping burhead           | <i>Echinodorus cordifolius</i> (L.) Griseb.           | uc |
| Creeping spotflower        | <i>Acmella repens</i> (Walter) R.K. Jansen            | uc |
| Coastal water hyssop       | <i>Bacopa monnieri</i> (L.) Pennell                   | c  |
| California bulrush         | <i>Schoenoplectus californicus</i> (C.A. Mey.) Palla  | uc |
| Hornwort                   | <i>Ceratophyllum demersum</i> (L.)                    | uc |
| Smooth beggar's ticks      | <i>Bidens laevis</i> (L.) Britton, Sterns, & Poggenb. | uc |
| Delta arrowhead            | <i>Sagittaria platyphylla</i> (Engelm.) J.G. Sm.      | uc |
| White smartweed            | <i>Persicaria hydropiperoides</i> (Michx.) Small      | uc |
| Angle stem primrose willow | <i>Ludwigia leptocarpa</i> (Nutt.) H. Hara            | uc |

Weltand Indicator status

FAC

FACW

FAC

OBL

FACU

FAC

FAC

FAC

FACW

FACU

FACW

OBL

FAC

nd

FACU

OBL

OBL

FAC

FAC

nd

FACW

FAC

FAC

FAC

FAC

FAC

FACU

nd

nd

FACW

FACU





## APPENDIX C Supporting photographs



Figure C1. Riparian habitat along Hog Bayou



Figure C2. Riparian habitat along Hog Bayou



Figure C3 Wetland forb community dominated by Spiny aster.



Figure C4 Wetland forb community dominated by Spiny aster.





Figure C5 Debris pile along center fence indicating inundation of the wetland forb community.



Figure C6. (Left) Carapace of blue crab found while surveying the wetland forb community a clear indication of inundation. (Right) Surveying the waist high vegetation.



Figure C7. Pothole ponds were clearly inundated despite the dry conditions.



Figure C8. Ash/ Swamp privet/ Sea myrtle vegetation complex.



Figure C9. Sabal palm marsh vegetation complex.



Figure C10. Riparian habitat along Schwings Bayou.



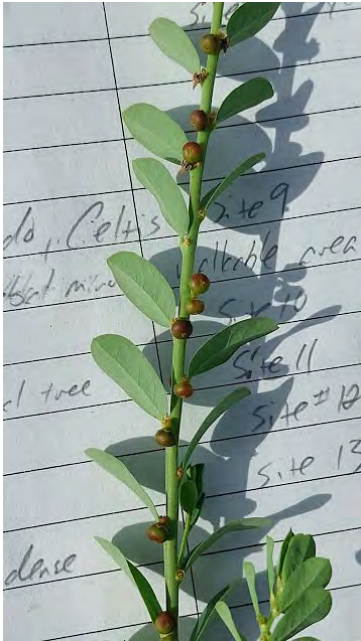
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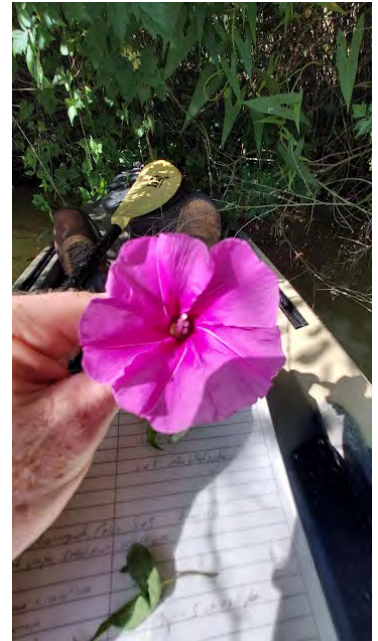
13



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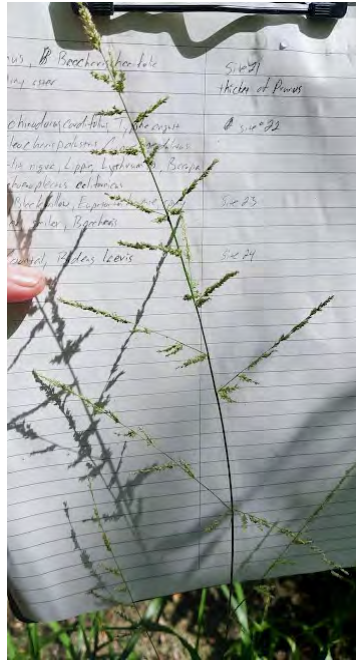


16

Figure C 11-12 *Phyla lanceolata*. Figure C 13. *Teucrium canadense*. Figure C 14. *Phylanthus abnormis*. Figure C 15. *Cuscuta* species. Figure C 16. *Ipomea cordatotriloba*



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Figure C 17 *Lythrum alatum*. Figure C 18. *Leersia hexandra*. Figure C 19. *Heliotropium angiospermum*. Figure C 20. *Carex crus corvi*. Figure C 21. *Rynchospora macrostachya*. C 22. *Tamarix* sp.



Figure C 23. (Left) Palm frond of *Sabal X texana*. (Right) Collecting a data point.



Figure C 24. Kayaking Hog Bayou.