

**Armand Bayou Nature Center, Inc.**  
**Coastal Prairie, Tidal Marsh, and Forested Wetland Restoration Project**  
**SEP No. 2011-37**

**Project Description:**

Armand Bayou Nature Center, Inc. ("ABNC") manages 2,500 acres located in southeast Harris County (the "Property"). The Property contains three unique and vanishing ecosystems: coastal tallgrass prairie ("Coastal Prairie"), forested wetland ("Forested Wetland"), and the tidal marsh stream ("Tidal Marsh") of Armand Bayou. Armand Bayou is a slow-moving water body that flows through the Property and on to Galveston Bay. After the 1950's, the Coastal Prairie, Forested Wetland, and Tidal Marsh ecosystems experienced significant ecological degradation from both natural and human disturbances. The Coastal Prairie, once a common ecosystem in Texas and the United States, has been reduced to less than 1% of its original 750 million acres. The Tidal Marsh, which serves as wildlife habitat and nursery habitat to over 90% of the commercial and recreation fish and shellfish harvested from Galveston Bay, has suffered a 93% reduction. Invasion of non-native and exotic species greatly have reduced the Forested Wetland.

In 1974, ABNC was established to protect, restore, and enhance these important ecosystems as environmental assets. ABNC developed a comprehensive, long-term ecological restoration and management plan to restore and manage these ecosystems with the goals of improved water quality, soil erosion reduction, storm water retention, water purification, and improved wildlife habitat for both terrestrial and aquatic species.

ABNC shares the Armand Bayou Watershed with portions of five cities - Houston, Pasadena, Deer Park, La Port, and Taylor Lake Village. Although most natural areas are subject to loss through development, the Property remains one of the largest protected urban nature centers in the region. The scope and scale of the ecosystem services provided by ABNC would be prohibitively expensive to replace should they disappear or become degraded without proper management.

Through this SEP, ABNC will expand its initial restoration efforts to address the continuing challenges in this watershed. Armand Bayou is on TCEQ's list of impaired water bodies due to low dissolved oxygen levels, high algal populations, high bacteria counts, and relatively high turbidity. Galveston Bay suffers from eutrophication and resulting hypoxia.

The impact of invasive species particularly the Chinese tallow tree, on the Coastal Prairie and Forested Wetlands displaces the historically diverse plant and animal communities. The Chinese tallow tree shades out native plants. The tree's leaves, fruit, and sap are toxic to most animals, including humans. The Chinese tallow tree's fallen leaves contain toxins that create unfavorable soil conditions for native plant species. Invasion of the tree on prairie land reduces habitat and forage areas for wildlife. The taproot system of the tree is adapted to withstand drought, but the tree is not adapted to withstand prairie fires as native prairie species are. In the absence of management practices, the Chinese tallow will transform native habitats into single species tallow forests. If Chinese tallow is not treated it may take over prairies and forested wetlands, which then cannot capture, store, and transform nutrients in rainwater and filter out pollutants in the water. Recent drought in the Property area killed an unprecedented number of native trees, which has allowed further invasion by the Chinese tallow tree despite ongoing management efforts.

The Chinese tallow tree can be controlled by prescribed burns, herbicide applied to bark, leaves, and cut stumps, pulling up seedlings by hand, and mowing.

The use of invasive plant control methods is also critical for good water quality. Exotic and highly invasive aquatic plants, such as water hyacinth, water lettuce, alligator weed, and elephant ear, can negatively impact natural tidal marsh and forested wetlands ecosystems by

out-competing native aquatic plants and animals for resources. These floating invasive species may completely blanket the water surface, causing depleted oxygen levels that result in hypoxia. Hypoxia can be fatal to aquatic organisms, it damages restoration sites, and it prohibits recreational activity. Hypoxia leads to compromised ecological function, which reduces ecosystem service potential and results in poor water quality. To address these water quality challenges, ABNC will continue its work through this SEP.

The restoration and management work tasks described below combine specialized contractors and equipment with ABNC personnel and equipment, to perform the work. This allows the SEP to be completed in the most cost-effective and efficient manner throughout the course of the SEP. ABNC shall only use federally approved specialized herbicides or other invasive species control products, best practice methods, and licensed herbicide applicators where necessary.

ABNC shall use the following work methods, which are described in more detail below: prescribed burns; invasive species chipping; herbicide broadcast application; herbicide spot treatment; prescribed mowing; greenhouse and nursery irrigation and ventilation system upgrades; and plant propagation and installation.

ABNC shall also purchase and install signs at the Property as described below.

### **I. Prescribed Burns**

Prairie plant species are adapted to fire, and some species require fire in order to grow. Budding cells of prairie plants are at or below ground level and are protected from heat and fire. Fire removes dead plant material and thatch and converts it to ash, which recycles nutrients into the soil. The black soil resulting from burns warms the ground, promoting plant growth. Fire suppresses non-native plants, such as Chinese tallow tree and invasive shrubs.

ABNC shall use its own personnel and contractors to conduct prescribed burns. ABNC shall determine when burns are necessary and which areas require burns and shall conduct the burns on Coastal Prairie areas.

ABNC shall obtain, at its own expense, all permits and approvals required to conduct controlled burns from all relevant entities, including TCEQ, Harris County Public Health and Environmental Services (previously Harris County Pollution Control), and the City of Pasadena Fire Marshall.

### **II. Invasive Species Chipping**

ABNC shall hire contractors with specialized machinery and equipment to cut and chip invasive trees and shrubs in the Coastal Prairie and Forested Wetland. Trees will be cut at ground level or at a level low enough to allow mowing equipment to safely pass over the cut stump without damage to machinery. Specialized cut stump herbicide will be applied to all stumps to prevent regrowth of non-native trees without harming native plants.

### **III. Herbicide Broadcast Application**

ABNC shall conduct ongoing treatment of invasive species in targeted areas using herbicide broadcast treatment methods in the Coastal Prairie. Only specialized herbicides that will not harm native species will be used. Contractors shall be hired to conduct broadcast applications with boom sprayers or equivalent methods that apply foliar herbicide to large areas which are heavily dominated by invasive species. ABNC shall select broadcast application sites based on high stem densities per acre that exceed spot treatment capability.

This work requires dry soil conditions for heavy equipment to access the restoration site and not create permanent ruts or land surface scars. Foliar treatment work requires that deciduous invasive trees and shrubs have leaves present to receive the herbicide and transport the chemical to the root system for complete control.

ABNC shall determine when conditions are appropriate for this work to be effectively conducted.

ABNC shall monitor non-native aquatic plant populations in the Property's Tidal Marsh on a monthly basis during the growing season and determine when broadcast herbicide treatments are needed. ABNC shall hire licensed herbicide applicators contractors to conduct the broadcast treatments from the contractor/s specially designed boats.

#### **IV. Herbicide Spot Treatment**

ABNC shall conduct ongoing control of invasive species in targeted areas of the Coastal Prairie, Tidal Marsh, and Forested Wetlands using a specialized spot treatment method that will not harm native plants. Treatment areas will be selected by ABNC based on low stem density per acre. ABNC's personnel shall conduct these herbicide applications with hand held pump sprayers using basal bark herbicide on individual stems.

#### **V. Prescribed Mowing**

ABNC's personnel shall conduct rotational prescribed mowing operations on the Coastal Prairie grasslands as needed for maintenance of native species and removal of non-native species.

#### **VI. Greenhouse and Nursery Irrigation and Ventilation System Upgrades**

ABNC maintains a greenhouse and plant nursery. Native plants are cultivated in the nursery and used for restoration in the Coastal Prairie, Tidal Marsh and Forest Wetland habitats. Prairie grasses, wildflowers, and forest and marsh plants are grown onsite. These diverse native plants are largely unavailable commercially. For plants that are available commercially, propagation of the plants by ABNC is much less expensive than retail price.

The greenhouse was constructed in the early 1980's and its utility systems are inefficient for this work. Greenhouse and nursery upgrades are necessary to successfully conduct restoration work. ABNC shall use its own personnel and contractors to update the greenhouse and nursery by purchasing and installing lights, making necessary upgrades and repairs to the water and ventilation systems, and installing fencing to exclude wildlife from grazing on nursery plant material.

#### **VII. Plant Propagation and Installation**

ABNC's personnel shall use the greenhouse and nursery to propagate terrestrial and aquatic native plants and install them to restore the Coastal Prairie, Tidal Marsh, and Forested Wetlands.

ABNC shall not sell the plants raised in the greenhouse and nursery; the plants shall be used only for on-site restoration at ABNC.

#### **VIII. Signs**

ABNC shall purchase and install two weatherproof permanent signs in prominent locations on the Property that describe the Project and include the language required by General Condition 18.

#### **Project Scope**

The work described in this Agreement is estimated to take three years. Therefore, the scope of this SEP is three years. The estimated budget in Exhibit 2 for this SEP is for three years. Pursuant to General Condition Section 9, this Agreement renews annually for its three year term, unless terminated by either Party in accordance with this Agreement.

#### **Environmental Benefit**

The ecological services provided by the restoration and management of the Coastal Prairie, Tidal Marsh, and Forested Wetlands ecosystems working in concert will help minimize pollution, reduce the amount of pollutants reaching the environment, and enhance water quality and wildlife habitat.

Coastal prairie grasslands are considered fire-dependent plant communities and require frequent exposure to fire effects for full ecological function. Prescribed fire in prairies helps control invasive species, minimize accumulated grass thatch, promote enrichment of soil nutrients and improve prairie plant vigor. One additional benefit of controlled prescribed burns is the reduction of fuels and the prevention of wildfires. This is particularly critical in the urban environment to protect human life and property and to minimize the release of large amounts of particulate matter resulting from uncontrolled wild fire. This treatment ensures that these coastal prairie grasslands will perform at their highest ecological function and provide the maximum potential ecological service to benefit water quality.

Mowing and targeted application of specialized herbicides will also help manage prairie species and remove non-native species.

Propagation and installation of native plants will restore the natural balance to these ecosystems, reduce erosion, and increase habitat for wildlife. Plant installation in the Forested Wetland and Tidal Marsh will improve water quality by restoring depleted oxygen levels, providing habitat and nourishment for aquatic organisms, and reclaiming the area for native plants.

Proper management and restoration of these ecosystems will maximize the ecological services that they provide to Armand Bayou and Galveston Bay.

#### **Eligible Counties for Contributions**

This project may receive contributions from the following:

San Jacinto River Basin and the Gulf Coast Aquifer including Angelina, Aransas, Atascosa, Austin, Bee, Brazoria, Brazos, Brooks, Calhoun, Cameron, Chambers, Colorado, Dewitt, Duval, Fayette, Fort Bend, Galveston, Goliad, Gonzales, Grimes, Hardin, Harris, Hidalgo, Jackson, Jasper, Jefferson, Jim Hogg, Jim Wells, Karnes, Kenedy, Kleberg, Lavaca, Liberty, Live Oak, Matagorda, McMullen, Montgomery, Newton, Nueces, Orange, Polk, Refugio, Sabine, San Jacinto, San Patricio, Starr, Trinity, Tyler, Victoria, Walker, Waller, Washington, Webb, Wharton, Willacy, and Zapata Counties.

#### **Minimum Contribution Amount**

\$1000

#### **Total Project Budget**

\$573,969