

CONSERVATION ACTION PLAN  
FOR THE  
REFUGIO-GOLIAD PRAIRIE  
CONSERVATION AREA

*Cooperative Conservation  
Through Private Partnerships*

Updated May 2009



Photo © Lynn McBride/The Nature Conservancy (Attwater's prairie-chicken)

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## Conservation Area Information

**Ecoregion:** Gulf Coast Prairies and Marshes

**County/State:** Victoria, Refugio, Goliad, Aransas and Calhoun counties, Texas

**Total Area of the Refugio-Goliad Prairie Conservation Area:** 268,574 ha (663,662 ac)

## Planning Team

*Over **forty** people helped create this plan; those listed below are members of the core planning team. For the full list of workshop participants and invitees, see Appendix E.*

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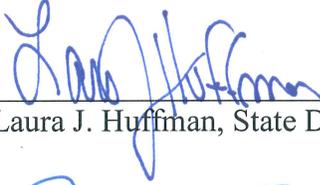
**Date:** May, 2009

## Acknowledgements

The Nature Conservancy of Texas wishes to thank the planning team for their hard work and thoughtful contributions. The knowledge and information shared by the planning team were invaluable in helping the Conservancy to evaluate progress to date and refine our implementation plan to address conservation issues in ways that can benefit all stakeholders.

## Reviews and Approvals

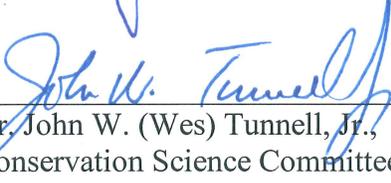
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Date



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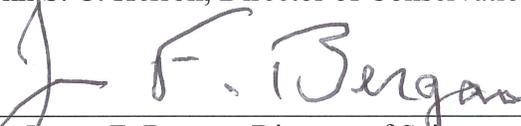
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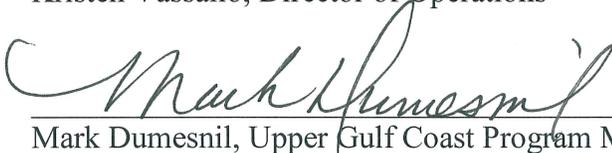
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## Executive Summary

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### Project Vision

*The Refugio-Goliad Prairie contains one of the largest and highest-quality expanses of coastal tallgrass prairie remaining in Texas. Texas has lost roughly 99% of its coastal tallgrass prairie, areas which supported hundreds of resident and migratory species. These grasslands were also home to the Attwater's prairie-chicken, endangered since 1967; the Refugio-Goliad Prairie supported one of the last known wild populations until 1998. In 2007, the Conservancy and partners began reintroducing Attwater's prairie-chickens on private ranches, realizing one of the original goals of the project ten years ahead of the original schedule, as outlined in the initial (2003) version of this plan.*

*Through collaborative private lands projects, an alliance of partners--state and federal natural resource agencies, non-profit conservation groups, community leaders and private landowners--will help maintain and enhance this vibrant prairie landscape and its associated floodplain forests so they may once again be home to wild populations of Attwater's prairie-chickens, as well as the multitude of other native plants and wildlife. All of this work will be done to support not only natural systems but also the agricultural communities that have helped keep this ecosystem intact.*

### The Planning Process

Over forty people—including landowners and representatives of state and federal natural resource agencies and non-governmental organizations—helped create this plan.

The Nature Conservancy's mission is to conserve a set of places that will ensure the long-term survival of all native life and natural communities—not just those that are threatened. We call these places *conservation areas*. We plan to protect networks of conservation areas across large landscapes defined by their distinct climate, geology and native species. We call these large areas *ecoregions*. Using our collaborative, science-based approach to conservation, The Nature Conservancy, along with our partners, first creates conservation plans for each ecoregion. We then develop conservation action plans for each high priority conservation area in the ecoregion. These plans form a conservation blueprint that guides the Conservancy's actions.

These plans follow what we call the 5-S Framework:

- **Systems.** The conservation action planning team identifies the species and natural communities that will be the conservation elements for the area. This is done using element lists developed during ecoregional planning and modifying the list to include site-specific conservation elements.
- **Stresses.** The team determines how conservation elements are compromised, such as by habitat reduction or fragmentation, or changes in the number of species in a forest or grassland.
- **Sources.** The team then identifies and ranks the causes, or sources, of stress for each element. The analysis of stresses and sources together make up the *threat assessment*.
- **Strategies.** An important step in the process is finding practical cooperative ways to mitigate or eliminate the identified threats and enhance biodiversity.

- **Success.** Each plan outlines methods for assessing our effectiveness in reducing threats and improving biodiversity. This is usually accomplished by monitoring our progress toward established biological and programmatic goals.
- An understanding of the cultural, political and economic *situation* behind the threats is essential for developing sound strategies. This human context is often referred to as the sixth “S”.

### **Focal Conservation Elements**

The conservation action planning process produced a list of priority natural resources, or broad-scale focal conservation elements. Typically, focal conservation elements are rare in part or all of their range, or fairly common but decreasing in viability. These elements were chosen at a coarse enough scale to encompass the diverse guilds and individual species of concern. The hypothesis behind this approach is that by conserving coarse-scale elements like natural communities, we will also conserve the finer-scale elements that depend upon them. The selection process produced a list of three focal conservation elements:

- ***Coastal tallgrass prairie***
- ***Attwater’s prairie-chicken***
- ***Floodplain forest complex***

Under coastal tallgrass prairie and floodplain forest complex are nested individual species such as northern aplomado falcon, northern bobwhite, mottled duck, plains gumweed, Texas pinkroot and Refugio rainlily, and guilds or assemblages such as grassland bird guild and waterbird colonies.

### **Critical Threats**

A threat assessment is the identification, evaluation, and ranking of threats that affect priority natural resources, including the determination of critical threats. Critical threats are highly ranked threats that jeopardize multiple conservation elements, or threats ranked “very high” that affect at least one element. Critical threats necessitate development of immediate conservation strategies. While fourteen threats overall were identified for the Refugio-Goliad Prairie, two of these threats were deemed critical:

- ***Lack of fire:*** Fire is an ecological process that helps maintain the composition and structure of coastal prairies. Historical evidence indicates that, during early settlement times, fires occurred at 3- to 5-year intervals, both from wildfires and those intentionally set by native Americans and European settlers. Fire suppression has been actively pursued in this area for about 100 years, as people sought to protect livestock forage, crops, and their own houses from burning. Lack of fire has contributed to the spread of woody shrubs and trees, both native and exotic. Returning fire to coastal grasslands significantly improves the condition of these areas.
- ***Invasive/alien species:*** This threat refers to invasive native and non-native plants. This threat is critical for both coastal tallgrass prairie and Attwater’s prairie-chicken. Invasive shrubs contribute to fragmentation of prairie habitat and make prairie habitat unsuitable for wildlife such as grassland birds. Woody invasives are especially problematic for prairie-chickens because they provide perch sites for raptors.

## Project Goals

The conservation vision is the end toward which the Conservancy and its partners will be working: the desired future state for the site. The vision helps guide the creation of overarching project goals: our benchmarks along the path to conservation success.

- **Goal 1 - Coastal prairie conservation:** Maintain and restore a desired mosaic of coastal tallgrass prairie uplands on private lands, with plant species composition and vegetation structure within the natural range of variability.
- **Goal 2 - Attwater's prairie-chicken reestablishment:** Reestablish a self-sustaining population of Attwater's prairie-chickens on private lands in the conservation area.
- **Goal 3 - Floodplain forest conservation:** Maintain and restore a desired landscape mosaic of floodplain forest vegetation, with plant species composition and vegetation structure within the natural range of variability.

## Top Priority Strategies

Strategies are designed to achieve objectives, abate critical threats, and improve viability of conservation elements. Most of these strategies are designed to be accomplished not by the Conservancy alone but in collaboration with project partners. The top priority strategies for each goal are:

Goal 1 – Coastal prairie conservation:

- *Fire management*
- *Reduce woody plant encroachment*
- *Invasive species management*

Goal 2 – Attwater's prairie-chicken reestablishment:

- *Private lands release program*
- *Maintain and restore habitat*

Goal 3 – Floodplain forest conservation

- *Maintain intact forest*
- *Invasive species management*
- *Minimize impacts resulting from ranchette development*

## Measures

Tracking progress toward our goals and evaluating the effectiveness of our actions provides feedback we need to adjust our priorities and strategies, closing the loop of our conservation approach. Measures of success for the project involve assessing both programmatic capacity and the effect of our work on the biological resources we seek to conserve. As part of this planning process, an analysis of the project's programmatic capacity was undertaken. This assessment showed that while many of the resources needed for programmatic success are already in place, program capacity has suffered due to the current economic recession. In order to track ecological success over time, a goal- and strategy-associated ecological monitoring plan has been developed which outlines a minimum set of monitoring commitments required to track progress on the project.

# I. Project Background

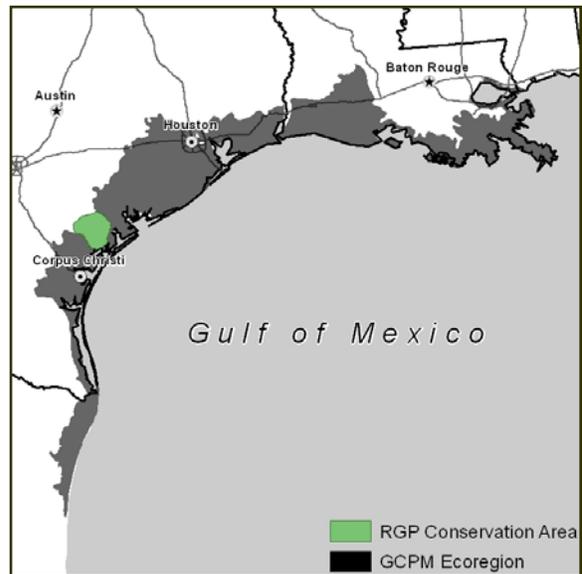
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## Introduction

The Refugio-Goliad Prairie is a name used to reference the general location and extent of a large prairie landscape within the Gulf Coast Prairies and Marshes ecoregion (Figure 1). The Nature Conservancy’s emphasis here is on helping private landowners maintain the network of large landholdings that have protected this area in the past, and on helping sustain and enhance the biological diversity that makes the Refugio-Goliad Prairie so remarkable.

Grasslands are a globally imperiled community, one experiencing significant habitat loss. Rare species such as Attwater’s prairie-chicken, northern aplomado falcon, white-tailed hawk, and Texas prairie dawn have suffered concomitant declines as a result of the cumulative effects of habitat loss and modification within the coastal tallgrass prairies of the Texas Gulf coast. Local landowners have long appreciated the importance of these grasslands: ranching families have lived in the conservation area for 150 years or more. More recently, Grazing Lands Conservation Initiative (GLCI), Texas Parks and Wildlife Department (TPWD), Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), and The Nature Conservancy, among others, have identified the Refugio-Goliad Prairie as a high priority for conservation and have initiated partnerships designed to help landowners maintain and enhance grasslands in the project area.

Figure 1. Gulf Coast Prairies and Marshes Ecoregion



## Project Overview

One such partnership is the Coastal Prairie Conservation Initiative (CPCI). The CPCI project is a multi-agency, public/private cooperative effort being carried out by the GLCI, USFWS, TPWD, NRCS, The Nature Conservancy, and private landowners. Landowner cooperators enter into management agreements with one or more of the CPCI partner agencies and agree to implement specific practices on their property to restore and enhance coastal tallgrass prairie. Landowners and the CPCI share the cost of restoration and enhancement projects. These projects also enhance range condition for livestock and wildlife, adding to the profitability of ranching enterprises. As of October 2008, 28,328 hectares (70,000 acres) of private land had already been enrolled in formal management agreements with CPCI partners, and owners of tens of thousands additional acres are informally collaborating with CPCI or otherwise supporting prairie conservation (Anderson 2008).

As an outgrowth of the CPCI, these same partners have expanded the array of available strategies and conservation tools available to landowners and other stakeholders. Building upon the initial

successes of the CPCI, the partners hope to accomplish three primary goals in the Refugio-Goliad Prairie:

*Maintain large tracts:* Part of the aim of the CPCI and an underlying theme for all projects in the Refugio-Goliad Prairie is to help current landowners retain their holdings so as to avoid the ecologically damaging effects of habitat fragmentation and loss. Partners in the CPCI provide programs such as cost-sharing for habitat restoration and maintenance, land stewardship assistance and conservation easements to private landowners to ease economic burdens of land ownership and thus help prevent ranch subdivision or loss.

*Maintain or enhance tallgrass prairies:* Brush encroachment is the major habitat threat on much of the prairie. Invading brush reduces livestock grazing capacity and wildlife habitat for ranchers. Effective strategies for reducing brush encroachment, used by CPCI and its partners to date, have included the creation of a Conservancy-operated private lands-based prescribed fire crew, a local landowner cooperative focused on private lands burning, providing cost-share incentives to landowners for chemical and mechanical brush reduction, and assisting in implementing ecologically compatible grazing management. Future strategies to maintain or enhance tallgrass prairies are further outlined in this plan.

*Reintroduce Attwater's prairie-chickens:* An effort to reintroduce Attwater's prairie-chickens on private lands was initiated by CPCI with the initial release of 55 birds in the fall of 2007 and a follow-up release of 133 birds in 2008. This reintroduction establishes a third distinct population of Attwater's prairie-chickens within their historic range on the Texas coast, better ensuring that a natural disaster will not wipe out the species. CPCI and partners will work with private landowners to release birds within the conservation area for a minimum of three years; lessons learned will be used in the overall recovery strategy for the species. CPCI continues to work with private landowners in securing new potential release sites and in developing Safe Harbor [see Glossary] agreements for future reintroductions.

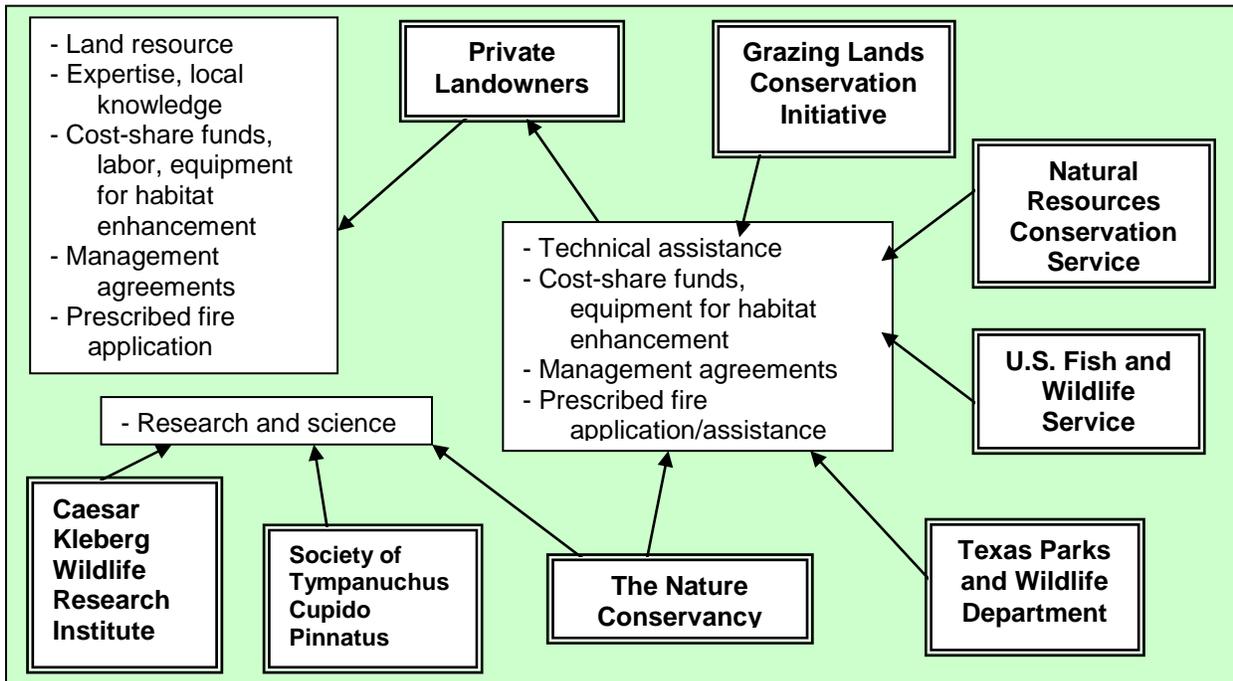
## II. Conservation Area Overview

### Introduction

Several partners were invited to convene an initial planning meeting in August 2002, at the TPWD offices in Victoria. The product of that meeting and subsequent work by the planning team and others was the first iteration of this conservation plan. The first iteration was preliminary and general, reflecting scarce knowledge and the partners' limited resources. Conservancy field staff began working in the conservation area in the summer of 2003. After five years of working with partners and landowners, these stakeholders reconvened to update the first conservation plan, using the information gleaned from project implementation. The update now reflects the substantial progress in land stewardship, research, and project capacity.

The overarching aim of this project is to maintain and restore functional ecosystems in the conservation area through ensuring sustainable ranching enterprises. The objectives of the project are to work cooperatively to alleviate stresses and address threats to the health and functionality of coastal tallgrass prairies and floodplain forests. The specific strategies and steps identified in this plan to address ecosystem-wide stresses and threats will guide the Conservancy's work. They also offer unique opportunities to combine resources with other partners (Figure 2) in order to maximize effectiveness.

**Figure 2. CPCI partners and cooperators and their roles**



## What is a Conservation Area?

A conservation area is an area that is, or has the potential to be, an ecologically functional system. Ecologically functional means that it supports all the plant and animal species native to the area and that sustaining ecological processes (e.g., hydrologic cycles and fire regimes) are occurring. Conservation areas are thus defined primarily as biological units. The Refugio-Goliad Prairie conservation area boundary (Figure 3 and Appendix A) describes the general extent of this prairie ecosystem; it is not a hard-and-fast project boundary and may not wholly delineate the area within which the Conservancy and its partners work. The boundary does define the ecological system that the Conservancy and its partners used in assessing conservation needs and designing strategies. The nature and scope of on-the-ground work in the Refugio-Goliad Prairie has and will continue to be determined by community members and project partners and will be based on biological needs, feasibility, and a respect for private property rights.

Figure 3. Refugio-Goliad Prairie conservation area



## Conservation Area Description

The Refugio-Goliad Prairie conservation area as first defined in the Gulf Coast Prairies and Marshes Ecoregional Plan covered 148,006 ha (365,733 ac) (The Nature Conservancy 2002). This original site boundary was delineated based on data available at the time, but was not extensively ground-truthed. The current project boundary was set during the current planning process after five years of on-the-ground implementation by the Conservancy and partners. This boundary better represents the extent of relatively intact and restorable coastal prairie: 268,574 ha (663,662 ac) (Appendix A).

Considering the Refugio-Goliad prairie from an ecoregional and landscape perspective, one quickly notices that it lies within a portion of one of the few relatively intact natural landscapes along the coast of Texas (Appendix A). To the south of the conservation area lies a large cultivated area extending nearly to the sandsheet regions of Kenedy and Willacy counties. This region's natural vegetation was converted to cultivation a hundred or more years ago due to its rich, arable blackland soils that are used primarily for cotton and grain production (Walraven 2000). Going west from the conservation area, the landscape quickly grades into the Tamaulipan thornscrub ecoregion, which, outside of small patches of grassland, is composed of different vegetation than that found within the conservation area. To the north of the conservation area, some relatively intact sandy prairie exists just north of Victoria. These grasslands are not as extensive as the Refugio-Goliad Prairie and are probably more vulnerable to suburban expansion from Victoria, but they should be considered for portfolio inclusion the next time the Gulf Coast Prairies and Marshes ecoregional plan is updated. It is worth noting that, during workshops for

this conservation action plan, several area landowners pressed for Conservancy effort to be placed into private lands conservation work in these grasslands north of Victoria. Evidence suggests that Attwater's prairie-chickens (APC) used these grasslands as recently as the 1980s (United States Fish and Wildlife Service 2007). Directly to the east of the conservation area, much of the remaining natural habitat is already protected via public lands (Aransas National Wildlife Refuge, Guadalupe Delta Wildlife Management Area). This area of the coast is used as habitat by wintering whooping cranes, and the Conservancy is actively engaged in conservation of these lands through cooperative prescribed burning efforts with the USFWS and working with willing landowners to acquire conservation easements within priority habitat. Moving northeast of the conservation area toward the Attwater's Prairie Chicken National Wildlife Refuge (APCNWR), the landscape is composed of a variety of land uses including row crops, rice cultivation, introduced pasture grasses and small, remnant tracts of coastal prairie (such as the Stovall Flats portfolio site in the Gulf Coast Prairies and Marshes ecoregional plan). From an ecoregional perspective, this is an area where a corridor of APC habitat will need to be developed if reintroduced prairie-chickens are to move between the Refugio-Goliad Prairie and APCNWR. In its current suite of land uses, this portion of the landscape is unlikely to be used by APC as an expansion corridor to gain access to larger blocks of habitat.

The Refugio-Goliad landscape is almost entirely privately owned and has been managed by many of Texas' oldest ranching families. It is also the site of what is generally recognized as the largest and highest quality remaining example of coastal grasslands, outside of those on the Kenedy Sand Sheet in Willacy and Kenedy Counties (Harrell pers. comm. 2008) and contains the largest contiguous blocks of coastal prairie in the Texas coastal bend (United States Fish and Wildlife Service 2007). Elsewhere, much coastal prairie has been converted for crop production, suburban development or other uses, or has suffered substantial brush encroachment. This site was identified as a conservation priority for two primary reasons: 1) it is a high quality example of an ecologically functional or restorable landscape, and 2) it is widely accepted as one of the few suitable locations for reintroduction of an additional population of endangered [see Glossary] Attwater's prairie-chickens (*Tympanuchus cupido attwateri*) (United States Fish and Wildlife Service 2007).

While much of the Refugio-Goliad Prairie may not be urbanized or in crop production, its ecological function is threatened by invasive woody species such as native mesquite (*Prosopis glandulosa*) and huisache (*Acacia farnesiana*), and non-native Macartney rose (*Rosa bracteata*) and Chinese tallow (*Triadica sebifera*). Some landowners have, to varying degrees and with varying levels of success, undertaken invasive species control efforts in the conservation area, and a drive through the prairie will reveal properties that are brush-infested directly adjacent to native rangelands that appear free of woody invasives by comparison.

Parts of the San Antonio and Guadalupe Rivers flow through the conservation area. Second- and third-order streams partly or wholly within the conservation area include Blanco Creek, Medio Creek, Melon Creek, Salt Creek, Sarco Creek, Kuy Creek, Manahuilla Creek, Copano Creek, the Mission River and Coletto Creek. Some of these streams and rivers support another important ecological component, labeled herein as the floodplain forest complex. This complex includes riparian floodplain communities with trees such as cedar elm (*Ulmus crassifolia*), pecan (*Carya illinoensis*), live oak (*Quercus virginiana*), green ash (*Fraxinus pennsylvanica*), and

baldecypress (*Taxodium distichum*). The floodplain forest complex provides important habitat for native mammals, upland game birds, and migratory birds, wading birds, colonial waterbirds and waterfowl.

## Human Dimensions

The Refugio-Goliad Prairie primarily spans the intersection of three south Texas counties: Refugio, Goliad and Victoria. A small portion of Aransas County, near the Tatton Unit of the Aransas National Wildlife Refuge, and an even smaller portion of Calhoun County, near Green Lake, extend into the conservation area. The three main counties, with county seats in the cities of Refugio, Goliad and Victoria, are generally sparsely populated (Table 1), with the county seats serving as the population centers. The largest city in the vicinity (although not actually located within the conservation area) is Victoria, with an estimated population of 61,410 in 2003 (United States Census Bureau 2008). The population in Victoria County in 2006 was 86,191; in Refugio County it was 7,596; and in Goliad County, the 2006 population was 7,192. These county populations represent a change between 2000 and 2006 of +2.5%, -3.0%, and +3.8% in Victoria, Refugio, and Goliad, respectively. In 2006, about one quarter of the three-county population was under 18 years of age (28% in Victoria, 24% in Refugio, and 22% in Goliad County), which is a little less than the Texas under-18 population of 28%. Across the three counties, about 16% of residents were 65 or older in 2006 (13% in Victoria, 18% in Refugio, and 18% in Goliad County), compared to 10% for the state. Across the counties, the population is between 47% and 59% white, non-Hispanic, and between 35% and 45% Hispanic, both categories slightly more than the state figures of 48% and 36% respectively. Census respondents indicated that an average 29% of tri-county residents speak a language other than English in the home (most speak Spanish) (United States Census Bureau 2008).

**Table 1. Population and human diversity in Victoria, Goliad, and Refugio counties**

Category	Victoria	Refugio	Goliad	Texas
Population, 2006 estimate	86,191	7,596	7,192	23,507,783
Percent change from 2000 to 2006	+2.5	-3.0	+3.8	12.7
Percent under 18 years old, 2006	28	24	22	28
Percent 65 years or older, 2006	13	18	18	10
Percent white, non-Hispanic, 2006	51	47	59	48
Percent Hispanic, 2006	41	45	35	36
Percent speaking other than English at home, 2000 (mostly Spanish)	27	32	29	31

Data from United States Census Bureau (2008).

Income levels for the three counties are slightly worse than the statewide average, but percent of people below poverty level and unemployment are close to the statewide average (Table 2).

**Table 2. Workforce and economic demographics in Victoria, Goliad, and Refugio counties**

Category	Victoria	Refugio	Goliad	Texas
Median Household Income, 2004	\$38,388	\$31,906	\$38,038	\$41,645
Per Capita Income, 1999	\$18,379	\$15,481	\$17,126	\$19,617
Percent Persons Below Poverty, 2004	16	15	15	16
Percent Adults Unemployed, 2006	4	5	4	5

Income figures from United States Census Bureau (2008). Unemployment data from Texas Workforce Commission (2008).

Across the three counties, an average 72% of residents have graduated from high school, only slightly worse than the statewide average. However, at 13%, the percentage of those who have earned a college degree is significantly less than the statewide average of 23% (Table 3) (United States Census Bureau 2008).

**Table 3. Educational attainment within in Victoria, Goliad, and Refugio counties**

Category	Victoria	Refugio	Goliad	Texas
Percent High School Graduates, 2000	76	68	72	76
Percent Bachelor's Degree or Higher, 2000	16	12	12	23

The conservation area is rural in character, and the economy therein is heavily dependent upon agriculture and oil and gas production. Cattle ranches, many with deer or quail hunting enterprises, continue to dominate the local agricultural industry. However, most employment in the area is focused in other sectors, such as: health care and related services (including hospitals, clinics, nursing homes, and home health care); retail trade; education (both public and higher education, since Victoria is the location of a campus of the University of Houston and Victoria College); accommodation and food services (hotels, motels and restaurants); and manufacturing (an active manufacturing sector and a port associated with the Victoria Barge Canal are located in the vicinity of Victoria) (Victoria Economic Development Corporation, 2008).

### **Project History**

The Coastal Prairie Conservation Initiative (CPCI) is an expanding partnership among private landowners, GLCI, USFWS, NRCS, TPWD, and the Conservancy. Originally conceived in 1995 by USFWS and the NRCS-Sam Houston Resource Conservation and Development Agency, the CPCI is designed to provide financial, technical, and regulatory assistance to private landowners interested in restoring and enhancing native coastal prairie habitats. Habitat enhancement

practices such as prescribed burning, brush control, invasive species management, and development of grazing management infrastructure such as cross fencing and water development have been implemented (Harrell pers. comm. 2008). As of October 2008, CPCI partners have executed a variety of cost-sharing management agreements with private landowners to restore, enhance and maintain over 28,328 ha (70,000 ac) of coastal prairie. Additional landowners choose not to enter into formal management agreements yet nevertheless collaborate with CPCI partners to implement conservation actions such as fire, brush or grazing management, or to provide access to biologists to conduct surveys (Anderson 2008).

The Nature Conservancy became a CPCI partner in 2002, when all partners identified prescribed fire planning and implementation, ecological monitoring and biological inventory, and ranch management planning as limiting resources within the group. The Conservancy had funding for Attwater's prairie-chicken recovery; with CPCI partners, we identified the Refugio-Goliad Prairie as a potential site for prairie-chicken reintroduction as well as coastal prairie restoration work. In 2003, the Conservancy opened its Victoria office by staffing a prescribed fire crew and hiring a prairie ecologist. Recognizing that focusing on a large private landscape would require a strategy different from our typical land acquisition approach, we began conducting prescribed burns, ecological monitoring and biological inventory work within the conservation area. Currently, ranches covering 87,800 ha (217,000 ac), or 33% of the landscape, have cooperated in fire management on their properties.

### III. Conservation Elements

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#### Introduction

As the first step in its conservation planning process, the planning team evaluated the array of species and natural communities present or historically occurring in this area to determine if they were in need of conservation or restoration (The Nature Conservancy 2000b). This process produced a list of broad-scale focal conservation elements [see Glossary]. Typically, focal conservation elements are rare in part or all of their range, or fairly common but decreasing in viability. The Conservancy's methodology, which the team used, allows selection of focal conservation elements at various scales (e.g., species, guild, community) but limits the number of elements in a conservation plan to eight (The Nature Conservancy 2000b). Since the conservation area contains far more than eight elements of conservation interest, the team chose focal conservation elements at a coarse enough scale to encompass the diverse guilds and individual species of concern. The hypothesis behind this approach is that by conserving coarse-scale elements like natural communities, we will also conserve the finer-scale elements that depend upon them. To address fine-scale elements that may require special attention, nested elements [see Glossary] were listed under the broader focal conservation elements (Table 4). Nested elements are generally more imperiled than the focal conservation element, ecologically linked to the focal conservation element, and can be conserved via strategies designed for that focal conservation element (The Nature Conservancy 2000b). The selection process produced a list of three focal conservation elements (below), two with accompanying nested elements.

- **Coastal tallgrass prairie**
- **Attwater's prairie-chicken**
- **Floodplain forest complex**

Some caveats are necessary regarding the list of conservation elements developed by the team. First, The Nature Conservancy uses the National Vegetation Classification System (Grossman et al. 1998) to identify and describe plant communities whenever possible. However, many communities in this area have not yet been described in detail for the National Vegetation Classification System (NVCS). Described communities in NVCS may represent more broadly distributed community types, and local occurrences may vary somewhat from those descriptions. During the ecoregional assessment process, approximate matches were made between communities generally known from Refugio-Goliad Prairie and those described in the NVCS (The Nature Conservancy 2002). Two of these approximate matches were listed as elements, or "targets" in the ecoregional plan: the Little Bluestem - Brownseed Paspalum - Yellow Indiangrass - Few-flower Witchgrass - Slender Paspalum - Western Silvery Aster Alfisol Herbaceous Vegetation (*Schizachyrium scoparium* - *Paspalum plicatulum* - *Sorghastrum nutans* - *Dichanthelium oligosanthes* - *Paspalum setaceum* - *Symphotrichum pratense* Alfisol Herbaceous Vegetation) and the Chaparro Prieto Shrubland (*Acacia rigidula* Shrubland) (The Nature Conservancy 2002). Similar plant communities are part of the coastal prairie matrix. However, these communities need formal description. For instance, few-flower witchgrass (*Dichanthelium oligosanthes*) and slender paspalum (*Paspalum setaceum*) are not characteristic here; big bluestem (*Andropogon gerardii*), meadow dropseed (*Sporobolus asper*), *Panicum* spp.,

crinkleawn (*Trachypogon secundus*), and Florida paspalum (*Paspalum floridanum*) are more common (Harrell pers. comm. 2008). Therefore, associations were not used as targets. Also, while Chaparro Prieto Shrublands occur here as inclusions within the prairie, it is unclear whether these Tamaulipan shrublands—and associated animal species—were historically an ecologically important part of this matrix, or whether they were late-arriving “invaders” after alteration via overgrazing and fire suppression. The current biological importance of these shrublands within Refugio-Goliad Prairie is yet to be determined (Harrell pers. comm. 2008). Lastly, comprehensive inventories have not been conducted for faunal elements. The conservation element descriptions and nested element lists will continue to be refined as field biologists conduct further surveys.

**Table 4. Focal and nested elements in the conservation area**

Scientific Name	Common Name	Conservation Status Ranking*
<b>1. Coastal Tallgrass Prairie</b>		
<i>Hypopachus variolosus</i>	sheep frog <sup>1</sup>	G5S2
<i>Rana areolata</i>	crawfish frog <sup>2</sup>	G4S3
<i>Notophthalmus meridionalis</i>	black-spotted newt <sup>1</sup>	G1S1
<i>Phrynosoma cornutum</i>	Texas horned lizard	G4G5S4
<i>Holbrookia propinqua</i>	keeled earless lizard <sup>3</sup>	G4S3?
<i>Drymarchon melanurus erebennus</i>	Texas indigo snake	G5T4S3
<i>Sistrurus catenatus</i>	massasauga	G3G4S3S4
<i>Grus americana</i>	whooping crane	G1S1 LE
--	shorebirds	--
--	waterfowl	--
--	grassland bird guild (including, but not limited to, the bird species below)	--
<i>Falco femoralis septentrionalis</i>	northern aplomado falcon	G4T2S1 LT
<i>Buteo albicaudatus</i>	white-tailed hawk	G4G5S4B
<i>Numenius americanus</i>	long-billed curlew	G5S3BS5N
<i>Anas fulvigula</i>	mottled duck	G4S4B
<i>Colinus virginianus</i>	northern bobwhite	G5S4B
<i>Athene cunicularia</i>	burrowing owl	G4S3B
<i>Lanius ludovicianus</i>	loggerhead shrike	G4S4B PS
<i>Sturnella magna</i>	eastern meadowlark	G5S5B
<i>Ammodramus henslowii</i>	Henslow's sparrow	G4S2S3N,SXB
<i>Cistothorus platensis</i>	sedge wren	G5S4
<i>Ammodramus leconteii</i>	Le Conte's sparrow	G4S3
<i>Anthus spragueii</i>	Sprague's pipit	G4S3N

Scientific Name	Common Name	Conservation Status Ranking*
<i>Ammodramus savannarum</i>	grasshopper sparrow	G5S3B PS
<i>Rhododon angulatus</i>	Tharp's rhododon, lonestar sand-mint	G1QS1
<i>Grindelia oolepis</i>	plains gumweed	G2S2
<i>Allium elmendorffii</i>	Elmendorf's onion	G2S2
<i>Chloris texensis</i>	Texas windmillgrass	G2S2
<i>Psilactis heterocarpa</i>	Welder machaeranthera	G2G3S2S3
<i>Thurovia triflora</i>	three-flower broomweed	G2G3S2S3
<i>Liatris bracteata</i>	coastal gayfeather	G2G3S2S3
<i>Brazoria arenaria</i>	sand brazos-mint	G3S3
<i>Calliandra biflora</i>	two-flower stick-pea	G3S3
<i>Euphorbia innocua</i>	velvet spurge	G3S3
<i>Helianthus occidentalis</i> ssp. <i>plantagineus</i>	plantainleaf sunflower, Shinners' sunflower	G5T2T3S2
<i>Hoffmannseggia drummondii</i> ( <i>Caesalpinia drummondii</i> )	Drummond's rushpea	G4S3 <sup>4</sup>
<i>Houstonia croftiae</i>	Croft's bluets	G3S3
<i>Paronychia setacea</i>	nailwort	G3S3
<i>Prunus texana</i>	Texas peachbush	G3S3
<i>Tetraneuris turneri</i>	Billie's bitterweed	G3S3
<i>Trichocoronis wrightii</i> var. <i>wrightii</i>	Wright's trichocoronis	G4T3S2
<i>Willkommia texana</i> var. <i>texana</i>	Texas willkommia	G3G4T3S3
<i>Zephyranthes jonesii</i> ( <i>Cooperia jonesii</i> )	Jones's rainlily	G3QS3
<i>Zephyranthes refugiensis</i>	Refugio rainlily	G2G3SNR
<b>2. Attwater's Prairie Chicken</b>		
No Nested Elements		
<b>3. Floodplain Forest Complex</b>		
<i>Austrotinodes texensis</i>	Texas austrotinodes caddisfly	G2S2
<i>Drymarchon melanurus erebennus</i>	Texas indigo snake	G5T4S3
<i>Crotalus horridus</i>	canebreak rattlesnake, timber	G4S4
<i>Terrapene ornata</i>	western box turtle <sup>6</sup>	G5S5
--	waterfowl	--
--	waterbird colonies	--
--	shorebirds	--
--	neotropical migrant bird guild	--

Scientific Name	Common Name	Conservation Status Ranking*
<i>Haliaeetus leucocephalus</i>	bald eagle	G5S3B,S3N
<i>Anas fulvigula</i>	mottled duck	G4S4B
<i>Echinocereus reichenbachii</i> var. <i>albertii</i>	black lace cactus <sup>7</sup>	G5T1QS1 LE
<i>Spigelia texana</i>	Texas pinkroot	G3S3
<i>Tauschia texana</i>	Texas tauschia	G3S3

\*For an explanation of conservation status rankings, see Appendix B.

<sup>1</sup>Edge of range; found in prairie wetlands.

<sup>2</sup>A 1998 record places the species within the conservation area, but little is known about its status here.

<sup>3</sup>Known from sparsely vegetated sandy areas in all of the counties.

<sup>4</sup>Ranking in table is from NatureServe (2008); ranking per William R. Carr (2008) is G3S2.

<sup>5</sup>County record for Refugio; possibly extirpated.

<sup>6</sup>Ranked G5, but declining and vulnerable.

<sup>7</sup>Known from southwestern Refugio County.

In developing the above list of nested conservation elements, several species were suggested and considered, but not enough information about their occurrence and/or status within the conservation area was available to justify adding them. These species are shown in Table 5 below. No Refugio or Goliad county records were found for Texas scarlet snake (*Cemophora coccinea lineri*) and Aransas short-tailed shrew (*Blarina hylophaga*), but both are known from Aransas National Wildlife Refuge, a small portion of which extends into the conservation area. Both Texas scarlet snake and Aransas short-tailed shrew occur on deep sandy sites, a few of which can be found within the conservation area. Texas tortoise (*Gopherus berlandieri*), although known from all the counties in the conservation area, is a Tamaulipan thornscrub species, not prairie-dependent; its presence in the conservation area may only be associated with small inclusions of thornscrub which themselves might be artifacts of human alteration of the prairie (see discussion above). Texas indigo snake (*Drymarchon melanurus erebennus*), although like Texas tortoise primarily found in Tamaulipan thornscrub, was included on the conservation element list because it likely can be found along riparian corridors, not just in shrubland inclusions. American hog-nosed skunk (*Conepatus leuconotus*) apparently has been extirpated from much of the southern and eastern parts of its range and is in decline in Texas. There are no county records for this species within the conservation area, but the species has been unofficially reported in the vicinity (Duran 2008).

**Table 5. Potential elements**

Scientific Name	Common Name and Comments	Conservation Status Ranking*
<i>Cemophora coccinea lineri</i>	Texas scarletsnake – known from Aransas NWR, grasslands with sandy soils	G5T2S2
<i>Gopherus berlandieri</i>	Texas tortoise – known from all the counties	G4S3
<i>Blarina hylophaga (plumbea)</i>	Aransas short-tailed shrew – known from Aransas NWR, oak mottes in grasslands; sandy soils	G5T1Q S1
<i>Conepatus leuconotus</i>	American hog-nosed skunk	G4S4

\*For an explanation of conservation status rankings, see Appendix B.

## Description of Conservation Elements

### COASTAL TALLGRASS PRAIRIE

The Refugio-Goliad Prairie conservation area encompasses some of the largest and most intact coastal prairie sites in the ecoregion, with a total of 200,963 ha (496,591 ac) of prairie (Appendix A, Map 5). Coastal tallgrass prairie is one of the most imperiled natural communities in Texas, with less than 1% of pristine prairie remaining (The Nature Conservancy 2002; Diamond 1984). Coastal tallgrass prairies along the Texas coast are similar in composition and structure to tallgrass prairies throughout the midwestern United States. Some representative species include little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), big bluestem, Indian blanket (*Gaillardia pulchella*), bracted winecup (*Callirhoe involucreata*), and nodding wild indigo (*Baptisia bracteata*). Southern grassland species found here include brownseed paspalum (*Paspalum plicatulum*), and various windmill grass species (*Chloris* sp.). Small inclusions of chaparral exist within the grassland matrix, usually on shallow soils over caliche. Small depressional wetlands dot the grasslands matrix, adding compositional and structural diversity to the prairie, with various species of rushes and sedges. Small areas of wind-blown deep sand ridges and sandy pimple mounds are also occasionally found in the grasslands, where several rare plant species occur, such as Texas peachbush (*Prunus texana*) and Elmendorf onion (*Allium elmendorffii*).

In addition to supporting ranching enterprises, Refugio-Goliad grasslands are home to native mammals like bobcat (*Lynx rufus*) and black-tailed jackrabbit (*Lepus californicus*) (Davis and Schmidly 1997), and a diverse array of avian life, including mottled duck (*Anas fulvigula*), northern bobwhite (*Colinus virginianus*), and white-tailed hawk (*Buteo albicaudatus*) (Benson and Arnold 2001). An important nested conservation element, the grassland bird guild (below), relies on this matrix community. Small depressional wetlands collect rainwater and provide habitat that is used by native and declining migratory wildlife such as mottled duck.

The grassland bird guild has many members, including white-tailed hawk, burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), grasshopper sparrow (*Ammodramus savannarum*), Sprague's pipit (*Anthus spragueii*), Le Conte's sparrow (*Ammodramus leconteii*), and eastern meadowlark (*Sturnella magna*) (Table 4). Members of this guild winter in Texas latitudes and as far south as Latin America, and breed in prairies, north into Canada. Along this extended route, prairies are vital habitat, the loss of which is considered a significant contributor to the decline in bird numbers. This guild, listed as a conservation element in the ecoregional plan, has shown continental-wide declines (Igl and Ballard 1999).

### ATTWATER'S PRAIRIE-CHICKEN

The Refugio-Goliad Prairie was the locus for one of the last reported wild populations of the endangered Attwater's prairie-chicken (APC) before the species almost disappeared from the wild in the early 1990s (United States Fish and Wildlife Service 2007). There is no consensus as to why this species disappeared from the Refugio-Goliad landscape. Hypotheses include habitat loss and fragmentation, catastrophic weather related events, a pathogen or parasite, predation or some unknown behavioral phenomenon within the species. Small populations of APC at the Conservancy's Texas City Prairie Preserve (TCPP) and at the USFWS's Attwater's Prairie

Chicken National Wildlife Refuge (APCNWR) near Eagle Lake continued to persist after the APC were locally extirpated from the Refugio-Goliad Prairie. The APCNWR supports only captive-reared, released prairie-chickens; wild birds have not been confirmed there. The population at TCPP is maintained through captive-reared releases, but there may yet be a few remaining wild birds: all released birds are marked, yet some unmarked birds have been observed on the preserve. The first ever private lands release of captive-reared APC within the Refugio-Goliad Prairie was begun when the CPCI and partners released 55 APC onto a private Goliad county ranch in the fall of 2007. This new reintroduction was made possible through a USFWS Private Stewardship grant. At the time of this writing, this reintroduction appears to be somewhat successful with annual survival and breeding activities similar to that of captive releases at the APCNWR. Plans are to release and intensively monitor APC on the Refugio-Goliad Prairie site for at least one more year and use data gathered from this experiment to guide future recovery efforts for the species. Lack of brood survival from captive-reared APC continues to be the limiting factor in the near-term recovery of the species; until May 2009, no chicks hatched in the wild from captive-reared hens—with one exception from the Texas City Prairie Preserve—had survived past two weeks of age without the active intervention of a brood box. For more information on APC recovery efforts, refer to the APC Recovery Plan (draft second revision), currently available at: [http://www.fws.gov/southwest/es/Documents/R2ES/Draft\\_Revised\\_APC\\_Recovery\\_Plan\\_11-19-07.pdf](http://www.fws.gov/southwest/es/Documents/R2ES/Draft_Revised_APC_Recovery_Plan_11-19-07.pdf).

#### FLOODPLAIN FOREST COMPLEX

The floodplain forest complex, as defined by the planning team, can be characterized as a woodland corridor following major drainages of the conservation area, covering a total of 16,363 ha (40,434 ac) (Appendix A, Map 5). There are few rare organisms wholly dependent upon riparian corridors, although many native and migratory species use riparian forests and floodplain areas during the year (Table 4). Among these species are migratory waterfowl, upland game birds like turkey, and native mammals like white-tailed deer (*Odocoileus virginianus*) and bobcats. Waterbird colonies represent a restricted but important nested element within the floodplain. At least 14 species in the waterbird guild—which includes herons, ibises and egrets—may be found here (Kushlan et. al. 2002). In the Refugio-Goliad prairie conservation area, waterbird colonies have been documented at the confluence of the Guadalupe and San Antonio Rivers. Species seen include great blue heron (*Ardia herodias*), great egret (*Ardea alba*), cattle egret (*Bubulcus ibis*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), anhinga (*Anhinga anhinga*), neotropic cormorant (*Phalacrocorax brasilianus*), and roseate spoonbill (*Platalea ajaja*) (Ortego 2009). Other waterbirds are anecdotally known.

## IV. Assessing Challenges: Viability and Threats

Identifying priority natural resources, or focal conservation elements, is a preliminary step in planning for conservation action. The next step is to examine the *viability* of focal elements, and the effect of any *threats* acting at the site. *Viability* is the likelihood that a natural resource will persist long-term (The Nature Conservancy 2000a). *Threats* are conditions or activities that negatively affect natural resources, either directly or indirectly. Threats and viability are examined within a ten-year time frame, using current conditions and trends. Assessments are updated every three to five years, each time projecting ten years ahead.

Viability is assessed for each focal conservation element. For simplicity, viability ranks are given qualitative categories; however, each category has a specific ecological meaning (for methodology and rank definitions, see Appendix C). When the planning team evaluates current viability, they also determine measurable criteria for each viability rank and set a current and desired future viability rank, which is based on desired and achievable changes in established viability benchmarks (Appendix C). All focal elements with a current viability rank of “fair” or “poor” merit immediate conservation attention. Conservation goals and strategies (section IV) will focus, in part, on actions that will raise viability ranks to “good” or “very good” (The Nature Conservancy 2000b). Appendix C details the criteria and benchmarks used to evaluate the viability of each focal element; those interested in the detailed biological assessment are encouraged to read this section.

A threat assessment is the identification, evaluation, and ranking of threats that affect priority natural resources (for methodology, see Appendix C). The planning team must identify and rank threats for each focal conservation element (Table 7). One important part of the threat assessment is the determination of critical threats (Table 6). Critical threats are highly ranked threats that jeopardize multiple conservation elements, or threats ranked “very high” that affect at least one element. Critical threats necessitate development of immediate conservation strategies. The threats analysis serves as a prioritization guideline; it does not limit action to critical threats and highly imperiled natural resources.

**Table 6. Summary of top conservation needs**

Conservation Element	Overall Viability Rank for the Conservation Element*	Overall Threat Rank for the Conservation Element	Critical Threats	
			Invasive native and exotic species	Lack of fire
Coastal Tallgrass Prairie	Fair	High	High	High
Attwater’s Prairie-chicken	Fair**	High	High	High
Floodplain Forest Complex	Fair	High	Medium	N/A

\*“Fair” = not reliably viable long-term; requires human intervention

\*\*This rating is for the current APC habitat, as the release program is still in its initial stages and there is not enough data to evaluate viability.

**Table 7. Threat summary**

<b>Threats</b>	<b>Coastal Tallgrass Prairie</b>	<b>Attwater's Prairie-chicken</b>	<b>Floodplain Forest Complex</b>	<b>Overall Threat Rank</b>
<i>Invasive/alien species</i>	High	High	Medium	<b>High</b>
<i>Lack of fire</i>	High	High	N/A	<b>High</b>
Ranchette development	High	Medium	Medium	<b>Medium</b>
Dam construction, resulting residential development	N/A	N/A	High	<b>Medium</b>
Highway construction/operation	High	N/A	N/A	<b>Medium</b>
Severe grazing/overgrazing	Medium	Medium	Medium	<b>Medium</b>
Crop production practices	Medium	Low	Medium	<b>Medium</b>
Oil and gas production/infrastructure	Medium	Medium	N/A	<b>Medium</b>
Excessive wildlife herbivory	N/A	N/A	Medium	<b>Low</b>
Invasive non-natives – animals	N/A	Low	Low	<b>Low</b>
Construction of low dams, impoundments	N/A	N/A	Low	<b>Low</b>
Excessive predation	N/A	Unranked	N/A	Unranked
Industrial activity	N/A	N/A	Unranked	Unranked
Operation of dams or reservoirs	N/A	N/A	Unranked	Unranked
<b>Threat Status for Conservation Elements</b>	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>

Threats in *italics* are considered critical threats.

N/A = This threat does not apply to this conservation element.

Unranked = Either the team felt that they did not have enough knowledge to rank these threats, or else they felt that the threats were likely to have very low impact yet still wanted to acknowledge the potential for impact.

### ***Critical Threats***

#### Invasive/alien species

This threat refers to invasive native and non-native plants. This threat is critical for both coastal tallgrass prairie and Attwater's prairie-chicken. Many species of invasive plants are found in the conservation area, but those of particular concern to stakeholders as well as conservationists are native and non-native woody species such as mesquite, huisache, Macartney rose, and Chinese tallow. Also of concern are introduced, non-native grasses such as Old World bluestems

(*Dichanthium* spp. and *Bothriochloa ischaemum* var. *songarica*), Guinea grass (*Panicum maximum*), Bahia grass (*Paspalum notatum*), and Bermuda grass (*Cynodon dactylon*). A relatively new invasive species, deep-rooted sedge (*Cyperus entrerianus*), appears to invade both prairies and floodplain forests.

Heavy livestock grazing and fire suppression help invasive woody plants--both nonnative such as Chinese tallow and native such as mesquite--gain a competitive advantage in coastal tallgrass prairies, altering species composition and structure. Invasive shrubs contribute to fragmentation of prairie habitat by forming dense thickets, preventing the growth of understory vegetation, changing fuel loads, and thereby managing with prescribed fire becomes more challenging. These changes make prairie habitat unsuitable for some wildlife (e.g., certain grassland bird species) and degrade the productivity of rangelands for livestock, thereby potentially incurring economic losses for landowners. Woody invasives are especially problematic for prairie-chickens because they provide perch sites for raptors.

Except where they become a monoculture, exotic grasses may not significantly degrade prairie-chicken habitat, but they affect the native coastal prairie, which the Conservancy seeks to protect and restore as a goal in addition to and apart from prairie-chicken management. When monocultures of exotic grasses are formed, altered vegetation structure may eliminate habitat and reduce food sources for grassland birds and prairie-chickens.

In floodplain forests, replacement of hardwoods by Chinese tallow results in loss of nesting sites for pileated woodpeckers. Control or elimination of tallow is possible but extremely labor-intensive, especially once stands are established. Tallow trees produce a prodigious seed bank and grow extremely well in wet coastal areas where frequent fire is excluded.

### Lack of fire

Fire is an ecological process that helps maintain the composition and structure of coastal prairies. Historical evidence indicates that, during early settlement times, fires occurred at 3- to 5-year intervals, both from wildfires and those intentionally set. Fires were intentionally set by native Americans and European settlers. Settlers stopped intentionally burning the prairie when fencing began to be widely used and the complications of burning became too burdensome (Walraven 2000). Fire may have occurred at any time of the year when vegetation was dry enough to burn – fire therefore may have occurred year-round, but probably peaked in dormant winters and dry, droughty summers. Fire suppression has been actively pursued in this area for about 100 years, as people sought to protect livestock forage, crops, and their own houses from burning. At that time, a perception existed that burning reduced the amount of available livestock forage. Lack of fire has contributed to the spread of woody shrubs and trees, both native and exotic. Returning fire to coastal grasslands significantly improves the condition of these areas. Fire creates more open habitat structure and enhances native plant diversity by encouraging grass and forb growth. This type of structure often favors wildlife species such as grassland birds by enhancing food sources through increased insect and seed production. Although most of the shrub species that have invaded coastal grasslands re-sprout following fire, fire does work to lower shrub dominance and make shrubs more susceptible to other treatment methods such as herbicide application. Reduced shrub dominance benefits ranchers by increasing forage over the long term.

Since the Conservancy began working in the conservation area, we have observed increased activity by private landowners burning on their own: during the winter of 2007-2008, we documented through systematic aerial surveys 9621 ha (23,773 ac) of private land burned without Conservancy assistance (Harrell pers. comm. 2008).

## **Medium Threats**

### Ranchette development

Ranchette development is the subdivision of large ranches (greater than 1,214 ha [3,000 ac]) into smaller tracts (less than 121 ha [300 ac]). Development is a primary contributor to habitat fragmentation and loss in coastal prairie and forest floodplains, and it is effectively irreversible once it has occurred. Ranchette development is linked to other threats, such as invasive/alien species, fire suppression, severe grazing/overgrazing, and dam construction.

### Dam construction and resulting residential development

Although no proposals for large reservoirs within the conservation area are known at this time, dam construction could have adverse impacts on areas near riparian corridors. In addition to the changes in flood cycles and alteration of hydrology that attend construction of dams, the resulting reservoirs attract residential development (single family homesites of 1 to 10 acres) that contributes to habitat fragmentation or loss. Water quality may also be degraded due to leakage from septic tanks and runoff from lawns and streets.

### Highway construction/operation

Two major divided highways, U.S. 77 and U.S. 59, traverse the conservation area. These routes will be developed into a portion of the I-69/Trans-Texas Corridor. This proposed multi-modal transportation corridor may include car and truck lanes, freight and passenger rail lines, and utilities, significantly increasing the footprint of the highway. Construction of the corridor would occur in phases over the next 50 years, and there is no information available on when construction might begin within the conservation area. Most recent information is that expanded highway routes will stay within existing corridors, which would lessen impacts; however, increased development along highways would continue to be a cause for concern. Potential impacts of expanded highways include habitat loss and fragmentation, barriers to movement of wildlife, noise disturbance to wildlife, increased potential for introduction or spread of invasive species, and wildlife mortality.

### Severe grazing/overgrazing

Severe grazing/overgrazing is defined as grazing that promotes homogeneous prairie with little structural variation. High stocking rates, over time, can alter species composition and structure needed for wildlife. Heavy grazing slowly removes the most palatable plant species such as big bluestem, Indiangrass, crinkleawn and little bluestem because of selective grazing behavior. Such grazing, coupled with the loss of fire, has allowed mesquite and huisache to invade the prairie and plant species composition changes to occur. In the floodplain, heavy livestock use

may be detrimental to hardwood recruitment, removes understory herbaceous vegetation and decreases soil stability.

### Crop production practices

Acreage of crop production within the conservation area is relatively limited (about 15,137 ha [37,405 ac] or less than 6%), but significant crop acreage exists just outside the area. Crop production practices such as heavy application of pesticides, herbicides and fertilizers, and tillage practices that do not minimize erosion, are detrimental to soil and habitat health. Chemicals and fertilizers may run off into surface waters or may leach into groundwater and move into wetlands, streams and rivers over time. Sediment loading is another problem associated with row crop agriculture.

### Oil and gas production/infrastructure

Oil and gas production can contribute directly to altered species composition when production roads and movement of equipment act as vectors for invasive species. Some habitat fragmentation and loss occur not only due to actual well locations but also due to infrastructure associated with production and exploration, such as roads, power lines, pipelines and seismic activity. Petroleum exploration and production companies are increasingly committed to being responsible corporate citizens; thus, opportunities for collaborating on best management practices (such as cleaning equipment before entering natural areas, minimizing infrastructure impacts, avoiding sensitive areas, etc.) may exist.

## **Low Threats**

### Excessive wildlife herbivory

White-tailed deer are the primary browsing species across the site. Deer, as browsers, mainly affect shrubs and trees, though they can put considerable seasonal pressure on forbs as well. White-tailed deer have contributed to altered species composition and vegetation structure in many locales. In floodplain forests in particular, heavy browsing can result in reduced hardwood recruitment. Although there is no conservation area-wide data on deer densities, land managers who attended planning workshops reported that excessive wildlife herbivory was a concern for them. The assumption is that this excessive browsing pressure observed on the lands they manage is due to overabundance of deer. Some landowners may focus more effort on quail hunting, therefore a limited deer harvest may not be adequately controlling deer populations.

### Invasive non-natives – animals

Red imported fire ants (*Solenopsis invicta*) are a significant threat to ground-nesting birds, including Attwater's prairie-chicken, because these ants kill nestlings and consume insects that adult and young birds use for food. The Attwater's prairie chicken recovery team is also investigating the possibility that fire ants alter insect species composition and lower abundance, potentially reducing the overall fitness of nesting hens and chicks. Feral hogs (*Sus scrofa*) affect habitat more through rooting, wallowing and other physical disturbance than plant consumption;

physical damage can be significant for certain plant species or sensitive areas (e.g., streams and wetlands).

### Construction of low dams, impoundments

In contrast to dam and reservoir construction and operation, construction of small ditches, dikes, and drainage or diversion systems alters hydrology on a more localized scale, in streams and riparian forests. Impoundments are often constructed for recreational use, while drainage systems are constructed for flood control. Impacts of these structures include altered hydrology, altered vegetation structure and composition, and permanent flooding of forested wetlands. However, dams and impoundments are not rated a threat for waterbirds because they usually respond positively to these changes, foraging and even nesting around dams and ponds.

## **Unranked Threats**

### Excessive predation

Feral cats (*Felis felis*), dogs (*Canus lupus familiaris*) and hogs, and raptors, snakes, skunks (*Mephitis mephitis*) and raccoons (*Procyon lotor*) prey on Attwater's prairie-chickens. Adult prairie-chicken survival rates appear not to be significantly greater in release areas where predator control is practiced (APC NWR) versus those where control is not consistently practiced (Goliad County private lands). Minimizing habitat for predators, i.e., removing raptor perches, and minimizing habitat fragmentation which increases populations and movements of mesocarnivores, may be the best strategy for abating this threat.

### Industrial activity

Part of the conservation area boundary follows the Victoria Barge Canal, which parallels the Guadalupe River. This 35-mile-long canal runs from a turning basin at the inland Port of Victoria (south of the city of Victoria) through the delta of the Guadalupe River, exiting in San Antonio Bay at the mouth of the Guadalupe. Power plants, liquefied natural gas (LNG) terminals for gathering and storage, and chemical plants are located along the northeast side of the Victoria Barge Canal and not actually within the conservation area. These plants can contribute to water body pollution. Also, land development for expansion of existing plants and construction of new plants results in loss and fragmentation of habitat. However, industrial development on the side of the Canal that is within the conservation area is unlikely due to lack of existing infrastructure (roads) (Ortego 2008). A nuclear power plant has been proposed for construction near McFaddin on the south side of the Victoria Barge Canal in Victoria County. This plant could affect as much as 4,047 ha (10,000 ac) of prairie.

### Operation of dams or reservoirs

Operation of upstream dams and reservoirs affects flood cycles necessary for plant recruitment in riparian forests and may alter hydrology in streams and in the larger floodplain.

## V. Vision, Goals, and Strategies

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### Project Vision

*The Refugio-Goliad Prairie contains one of the largest and highest-quality expanses of coastal tallgrass prairie remaining in Texas. Texas has lost roughly 99% of its coastal tallgrass prairie, areas which supported hundreds of native and migratory species. These grasslands were also home to the Attwater's prairie-chicken, endangered since 1967; the Refugio-Goliad Prairie supported one of the last known wild populations until 1998. In 2007, the Conservancy and partners began reintroducing Attwater's prairie-chickens on private ranches, realizing one of the original goals of the project ten years ahead of the original schedule, as outlined in the initial (2003) version of this plan.*

*Through collaborative private lands projects, an alliance of partners--state and federal natural resource agencies, non-profit conservation groups, community leaders and private landowners--will help maintain and enhance this vibrant prairie landscape and its associated floodplain forests so they may once again be home to wild populations of Attwater's prairie-chickens, as well as the multitude of other native plants and wildlife. All of this work will be done to support not only natural systems but also the agricultural communities that have helped keep this ecosystem intact.*

### Goals and Strategies

The conservation vision is the end toward which the Conservancy and its partners will be working: the desired future state for the site. The vision, along with our assessment of current conditions, trends, and organizational capacity (Appendix D), help guide the creation of goals: our benchmarks along the path to conservation success. The overarching project goals and objectives (below) are articulated to identify a desired future condition. The project goals are (in order of priority): 1) coastal prairie conservation; 2) Attwater's prairie-chicken reestablishment; and 3) floodplain forest conservation. The strategies that follow suggest steps that can be taken to progress toward that condition.

#### PROJECT GOALS AND OBJECTIVES

**Goal 1: Coastal prairie conservation:** Maintain and restore a desired mosaic of coastal tallgrass prairie uplands on private lands, with plant species composition and vegetation structure within the natural range of variability.

#### Objectives:

- a) By 2015, maintain an average fire return interval of 3 to 5 years within at least 50% of the upland prairie portion of the conservation area (100,481 ha or 248,295 ac).
- b) By 2025, 50% of the upland prairie is subjected to grazing at appropriate stocking rates that maintain key native grass species (little bluestem, Indiangrass, brownseed paspalum and others) at 25 to 50% of species composition by weight.

- c) By 2025, woody species are reduced to less than 5% canopy cover on 50% of the upland prairie portion of the conservation area.
- d) By 2025, there is no more than 10% canopy cover of exotic grasses in the upland prairie portion of the conservation area.

**Goal 2: Attwater’s prairie-chicken reestablishment:** Reestablish a self-sustaining population of Attwater’s prairie-chickens on private lands in the conservation area.

**Objectives:**

- a) By 2025, 50% of the upland prairie portion of the conservation area is suitable Attwater’s prairie-chicken habitat, connected by corridors no less than 1 mile wide.
- b) By 2025, 50 to 75% of upland prairie in the conservation area exhibits the following conditions: nesting cover with residual grass cover 25 to 100 centimeters (cm)\* in height, and obstruction of vision (OV) of >2.5 decimeters (dm)\*; brood rearing cover is 25 to 50 cm in height, and OV is 1 to 2.5 dm open at ground level; less than 5% woody species cover.
- c) By 2025, the Attwater’s prairie-chicken population increases 10% every 3 out of 5 years.
- d) By 2025, there is a population of 300 reproducing birds that are only augmented in years when extreme circumstances, such as severe drought, cause a severe population crash or lack of breeding success.

\*See Glossary.

**Goal 3: Floodplain forest conservation:** Maintain and restore a desired landscape mosaic of floodplain forest vegetation, with plant species composition and vegetation structure within the natural range of variability.

**Objectives:**

- a) By 2050, 50 to 75% of the area’s floodplain is covered by forest.
- b) By 2030, there are an average 150 saplings/acre (at least 2 years old), and <5% of canopy species are exotic species.
- c) By 2030, average colonial waterbird numbers exhibit less than 50% decline for 10 years.
- d) By 2050, at least 75% of floodplain forest is continuous or in patches at least 81 ha (200 ac) in size (i.e., the patch size necessary for pileated woodpeckers).

**PROJECT STRATEGIES**

Through consultation with planning team members and project partners, strategies were developed which will best help us achieve the three conservation goals and their associated objectives. Most of these strategies are designed to be accomplished not by the Conservancy alone but in collaboration with project partners, and for some strategies other partners or

stakeholders may take a leading role with the Conservancy playing a supporting role. The strategies described below constitute a framework from which a workplan will be developed to guide the Conservancy's day-to-day work within the project area. Strategies are listed under each goal; note that some strategies apply to more than one goal and therefore are repeated. Top priority strategies are so indicated.

### **Goal 1: *Coastal prairie conservation***

**Strategy 1 - Fire Management (*top priority*):** Collaborate with multiple partners (private landowners, GLCI, NRCS, Coastal Bend Prescribed Burn Association [CBPBA], volunteer fire departments and USFWS) to burn 25,090 ha (62,000 ac) of prairie annually in the conservation area. (Based on 100,481 burnable hectares [248,295 ac] at a 3- to 5-year fire return interval.)

**Strategy 2 - Reduce woody plant encroachment (*top priority*):** Collaborate with multiple partners (GLCI, NRCS, TPWD and USFWS) to assist landowners in finding cost-share funding to apply fire, mechanical and chemical treatments to reduce woody plant encroachment on upland coastal prairie sites. Primary goal of this funding should be to increase habitat for grassland-dependent wildlife species.

**Strategy 3 - Invasive species management (*top priority*):** In consultation with other non-governmental organizations and conservation agencies, create a prioritized list of non-native invasive species that are the greatest contributors to altered structure and function in coastal prairie, and engage landowners in controlling and avoiding priority species via additional cost-share support and the potential establishment of a cooperative weed management area (CWMA).

**Strategy 4 - Minimize impacts of new highway construction:** Collaborate with Texas Department of Transportation (TXDOT) and other appropriate partners to address best management practices and avoidance of sensitive habitat areas in relation to the planning and construction of the I-69/Trans-Texas corridor and other new large highway projects.

**Strategy 5 - Minimize impacts resulting from ranchette development:** By 2020, acquire conservation easements on 10% of the upland prairie portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.

**Strategy 6 - Minimize impacts of oil and gas infrastructure:** By 2015, work with area landowners and oil and gas producers to provide best management practices, particularly in relation to siting, emphasizing avoidance of high conservation value habitats and ensuring practices that minimize impacts related to facilities and infrastructure. Consider advocating the Environmentally Friendly Drilling Program sponsored by the Houston Advanced Research Center (HARC) and Texas A&M University (TAMU).

## **Goal 2: Attwater's prairie-chicken reestablishment**

**Strategy 1 - Private lands release program (*top priority*):** Collaborate with CPCI, USFWS, Attwater's prairie-chicken recovery team and private landowners to release at least 200 birds within the Refugio-Goliad Prairie conservation area initially, and 100+ per year thereafter, until a self-sustaining population is established. Consider establishing a captive rearing facility and program within or near the conservation area if current captive breeding facilities can't meet this goal.

**Strategy 2 - Maintain and restore habitat (*top priority*):** Collaborate with CPCI, USFWS, Attwater's prairie-chicken recovery team and private landowners to maintain and restore at least 50% of the upland prairie portion of the conservation area such that is suitable Attwater's prairie-chicken habitat. Focus on finding funding to assist private lands cost-share programs and increase prescribed fire capacity.

**Strategy 3- Minimize impacts resulting from ranchette development:** By 2020, acquire conservation easements on 10% of the upland prairie portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.

**Strategy 4 - Minimize impacts of oil and gas infrastructure:** By 2015, work with area landowners and oil and gas producers to provide best management practices, particularly in relation to siting, emphasizing avoidance of high conservation value habitats and ensuring practices that minimize impacts related to facilities and infrastructure. Consider advocating the Environmentally Friendly Drilling Program sponsored by HARC and TAMU.

## **Goal 3: Floodplain forest conservation**

**Strategy 1 - Maintain intact forest (*top priority*):** Collaborate with multiple partners (private landowners, GLCI, NRCS, CBPBA and USFWS) to protect existing floodplain forest through fee title acquisition and/or conservation easements by the Conservancy or others where appropriate, and through outreach to landowners to encourage maintenance of intact forest, with a focus on restoring floodplain forest and/or implementing management practices that ensure overstory recruitment and understory maintenance (i.e., U.S. Department of Agriculture/NRCS Wetlands Reserve Program and riparian buffer program).

**Strategy 2 - Invasive species management (*top priority*):** In consultation with other non-governmental organizations and conservation agencies, create a prioritized list of non-native invasive species that are the greatest contributors to altered structure and function in floodplain forests, and engage landowners in controlling and avoiding priority species via additional cost-share support and the potential establishment of a CWMA.

**Strategy 3 - Minimize impacts resulting from ranchette development (*top priority*):** By 2020, acquire conservation easements on 10% of the floodplain forest portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.

**Strategy 4 – Minimize impacts resulting from dam construction:** By 2010, coordinate with Texas Water Development Board and U.S. Army Corps of Engineers to identify sensitive habitats and identify dam construction sites where easement acquisition may reduce threat of secondary impacts associated with residential and commercial development around the resulting reservoir.

#### **ACTION STEPS FOR STRATEGIES**

The planning team, during a workshop held in April 2008, suggested a set of specific action steps to implement each of the strategies. At that time, entities appropriate for executing each action were identified. From these suggested actions, a formalized implementation plan will be developed under the guidance of the Conservancy's Texas Coastal Prairies Project Director. The complete list of suggested actions and implementers as developed during the April 2008 workshop is recorded in Appendix F.

## VI. Measuring Success: Organizational Capacity and Ecological Monitoring

Measures of success for the project involve assessing both programmatic capacity and the effect of our work on the biological resources we seek to conserve. Tracking progress toward our goals and evaluating the effectiveness of our actions provides feedback we need to adjust our priorities and strategies. Measuring results closes the loop of our conservation approach.

### Project Capacity

Determining the important biological elements at a site and the pressures affecting those elements is a vital part of organized conservation. However, to successfully address these conservation needs, we must have the necessary human and fiscal resources. Thus, the next step toward conservation action is an assessment of available resources, or project capacity. Computer software assists the team in analyzing factors that have been shown to be important determinants of a project’s success (key success indicators). These factors are ranked from low to very high and used to estimate the likelihood of success for the project from a programmatic standpoint (for more detail on methodology, see Appendix D). This process shows where capacity is lacking and allows the Conservancy to proactively address deficiencies. Just as we re-evaluate threats and biodiversity health, we will measure our success also by changes in project capacity. Under the current conditions of an economic recession, the Conservancy’s ability to address conservation concerns at this site is Medium (Table 8). Following the table is an itemized explanation of the rankings given to each success indicator.

**Table 8. The Nature Conservancy’s capacity for conservation in Refugio-Goliad Prairie**

Category	Score
<b>People</b>	
Staff leadership	High
Multidisciplinary team	Medium
<b>Internal Resources</b>	
Institutional leadership	High
Funding	Medium
<b>External Resources</b>	
Social/legal framework for conservation	Very High
Community and constituency support	High
<b>Overall Project Resource Rank</b>	<b>Medium</b>

*Staff Leadership:* This project has regular oversight from an experienced program manager; while that individual is not hands-on with this project, the program manager’s leadership covers the areas of authority and accountability. Further, there is a project director in charge of this conservation area who has been with The Nature Conservancy for 6 years and a prescribed fire specialist with a total of 10 years with the Conservancy; thus the components of responsibility and experience are well-covered. The project director’s time for this conservation area, however, is limited to about 60%, leading to the score of High rather than Very High for this capacity category.

*Multidisciplinary Team:* The project receives support from an experienced team that includes skills in conservation science, GIS, protection, philanthropy and operations. In addition, on-site staff have adequate to extensive expertise in prairie ecology, fire management, GIS, protection, and landowner contact. However, the current economic recession has resulted in loss of staff, potentially affecting the landowner outreach component so important to the success of this project. For this reason, the score for this category is Medium.

*Institutional Leadership:* The Nature Conservancy, backed by decades of experience in conservation, provides overall institutional support and leadership for the project. However, the current economic recession has forced layoffs that have reduced the capacity of the Refugio-Goliad Prairie project, resulting in a score of High rather than Very High for this category.

*Funding:* The project currently receives operational funding from year to year, but the amount, during this period of economic recession, has been significantly reduced. Also, long-term funding (five years into the future) has not been identified, resulting in the score of Medium for this capacity category.

*Social/Legal Framework for Conservation:* In Texas, instruments such as conservation easements, Safe Harbor agreements, management agreements with landowners, memoranda of understanding among partners and others are legal and allowable; all of these tools can be or are being used in the project.

*Community and Constituency Support:* While some community resistance exists, the project, its goals and its staff are largely viewed favorably or at least benignly by most landowners and community members. Stakeholder (particularly landowner) support for the project is vital to the success of this project, and project staff are effectively engaging this key constituency.

### **Programmatic Measures of Success**

The capacity assessment showed that many of the resources needed for programmatic success are already in place. The project has adequate resources in terms of staff, leadership, and community support. However, the current economic recession has resulted in loss of staff, significantly affecting the overall capacity of this project. The programmatic aspects of this project will be also more successful if funding can be secured for two years in advance, and if funding sources can be identified for five years into the future.

### **Ecological Measures of Success: Monitoring**

The other aspect of success measurement involves assessing the effect of our work on the biological resources we seek to conserve. The detailed viability and threats assessments help elucidate necessary benchmarks for success in this area, and the implementation and monitoring plans will guide our measurement of ecological indicators. However, before any measure of success can be applied, it is critical to know the current state of the resource--to establish a baseline upon which benchmarks can be measured. The Refugio-Goliad Prairie project team has been working with the CPCI range management specialist, a Conservancy (Texas Natural History Survey) botanist, and others to determine baseline conditions and develop appropriate

broad-scale monitoring plans. Also, each ranch enrolled in the USFWS's Safe Harbor program and the CPCI has a site-specific management and monitoring plan.

Appendix G presents a preliminary goal- and strategy-associated ecological monitoring plan for the conservation area. The monitoring plan outlines a minimum set of monitoring commitments required to track progress on the project. Not every commitment identified is currently within our fiscal or staff resources, but fortunately, data collection suitable for use in monitoring some items is already being conducted by partners, such as breeding bird surveys, Christmas bird counts, and various aspects of Attwater's prairie-chicken recovery. For some monitoring items, more information is needed in order to determine optimum frequency, duration and method. In the next iteration of this conservation action plan, we will refine the monitoring plan.

## VII. Conclusion

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Since the initial plan was completed in 2003 at the inauguration of the project, The Nature Conservancy of Texas and other partners have made great strides in understanding the systems, situations, and constituencies of the Refugio-Goliad Prairie. Still, this is just the beginning of our work. As we work toward our goals over the next few years, we will continue to collect data that will inform and improve the next iteration of this plan.

Therefore, the conservation action plan is not a static document. Periodically, the planning team should re-evaluate the plan and make necessary changes. The planning team will reassess the plan, the conservation vision and the overarching goals approximately every 5 years to ensure they are still appropriate and feasible (The Nature Conservancy 2000b). When next the plan is revised, we will update and refine short- and long-term goals and corresponding strategies. These refined goals and strategies will be based on accomplishments made during the early years of the project and upon the changing needs and conditions across the conservation area. These steps will help ensure that the Conservancy uses its resources at this site most effectively, and that our actions are in concert with our goals in the ecoregion and the organization. Working with partners on multiple fronts, the Conservancy hopes to conserve the Refugio-Goliad Prairie for generations to come.

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## Glossary

association: a group of plant species with similar habitat requirements that are found growing together (alternate term: *plant community*).

biodiversity: the variety of life forms and ecological systems, the genetic variability they contain and the ecological processes that maintain them.

centimeter, cm: metric unit of measure for length, equal to 0.3937 inch.

compatible (as in *wildlife compatible, habitat compatible, ecologically compatible*): having a benign influence on wildlife or habitat, or on conservation efforts.

community, ecological community, ecological system: an interdependent assemblage of plant and animal species.

conservation element: a species, guild, community or assemblage of communities that has been selected by The Nature Conservancy as a priority for conservation planning or action (alternate terms: *conservation target, target*). See also *focal conservation element*.

conservation area: specific area that the Conservancy is interested in maintaining. Conservation areas may be a few acres large, up to thousands of acres. Conservation areas should support or have the potential to support species or communities of conservation interest (alternate term: *site*).

conservation status: a federal or state legal designation usually indicating some degree of threat or imperilment.

decimeter, dm: metric unit of measure for length, equal to 3.937 inches.

ecoregion: a relatively large area of land and water characterized by similar climate, vegetation and geology, and other ecological and environmental patterns.

ecoregional planning: planning for long-term conservation goals within ecoregions.

element: plant or animal species, community or other entity of biodiversity; may serve as a focus for conservation efforts (see *conservation element*).

endangered: legal term, meaning at immediate risk of extinction, and probably unable to survive without direct human intervention. Indicates the species has been listed on federal and/or state endangered species lists.

extirpated: extinct from a given location.

focal conservation element: a limited suite of species, communities and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area. They

are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. In theory, conservation of the focal conservation elements will ensure the conservation of all native biodiversity within functional landscapes. Also referred to as *focal targets*, *priority natural resources* or *conservation targets*.

functional conservation site/functional site: a site that maintains species and their supporting ecological processes. A functional conservation site typically supports a small number of species.

functional conservation landscape/functional landscape: similar to a *functional site*, but supports a large number of species over a large area.

functional conservation network/functional network: a set of *functional sites* and *landscapes* that allow species survival and reproduction on a regional scale (e.g., neotropical migrant bird ranges span thousands of miles and include many separate sites that birds use).

hectare, ha: metric unit of measure for land area, equal to 2.47 acres.

landscape: a heterogeneous land area of interacting ecosystems that are repeated in similar form throughout.

nested element: a species, ecological community, or ecological system whose conservation needs are subsumed by one or more *focal conservation elements*.

prescribed burn: the skilled application of fire to forest or grassland fuels under predetermined conditions, used to reach specific conservation or management objectives.

riparian: forested or wooded streamside or riverside.

Safe Harbor agreement: a voluntary agreement between the USFWS and cooperating non-Federal landowners which benefits federally endangered and threatened species by relieving landowners from liability under the Endangered Species Act if conservation actions undertaken by landowners result in attracting or perpetuating federally listed species on their land. To view the GLCI Safe Harbor agreement executed in 2007, visit:

[http://ecos.fws.gov/docs/plan\\_documents/tsha/tsha\\_584.pdf](http://ecos.fws.gov/docs/plan_documents/tsha/tsha_584.pdf). For a brochure about the Sam Houston Resource Conservation and Development Area Safe Harbor agreement, developed in 1999, visit: [http://library.fws.gov/Pubs9/Texas\\_prairies\\_HCP.pdf](http://library.fws.gov/Pubs9/Texas_prairies_HCP.pdf)

site: see *conservation area*.

system: a collection of interdependent living and non-living elements and the natural processes that maintain them.

threatened: legal term, meaning species is: 1) abundant in parts of its range but declining in overall numbers and at risk of extinction; or 2) present in low numbers across its range and at risk of extinction. Indicates the species has been listed on federal and/or state threatened species lists.

## Appendices

## **Appendix A: Maps**

Map 1: Refugio-Goliad Prairie Conservation Area - Location

Map 2: Refugio-Goliad Prairie Conservation Area

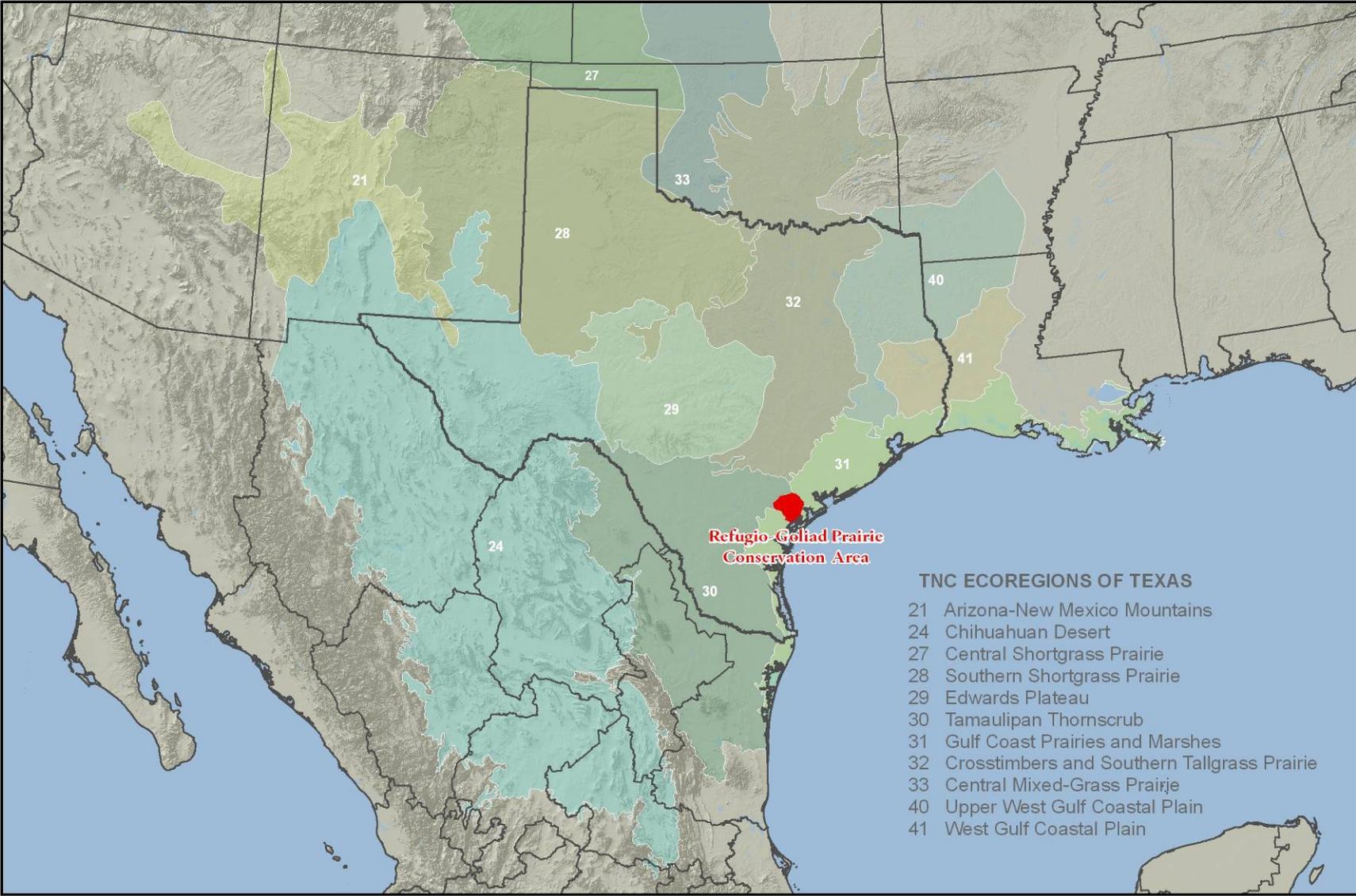
Map 3: Refugio-Goliad Prairie Conservation Area – LANDSAT Imagery

Map 4: Refugio-Goliad Prairie Conservation Area – Good Condition Prairie Contrast: 2004 and 2008

Map 5: Refugio-Goliad Prairie Conservation Area – National Land Cover Data 2001

Map 6: Refugio-Goliad Prairie Conservation Area – Comprehensive Fire History

Map 7: Refugio-Goliad Prairie Conservation Area – Prairie Change 1955, 1990, 2008

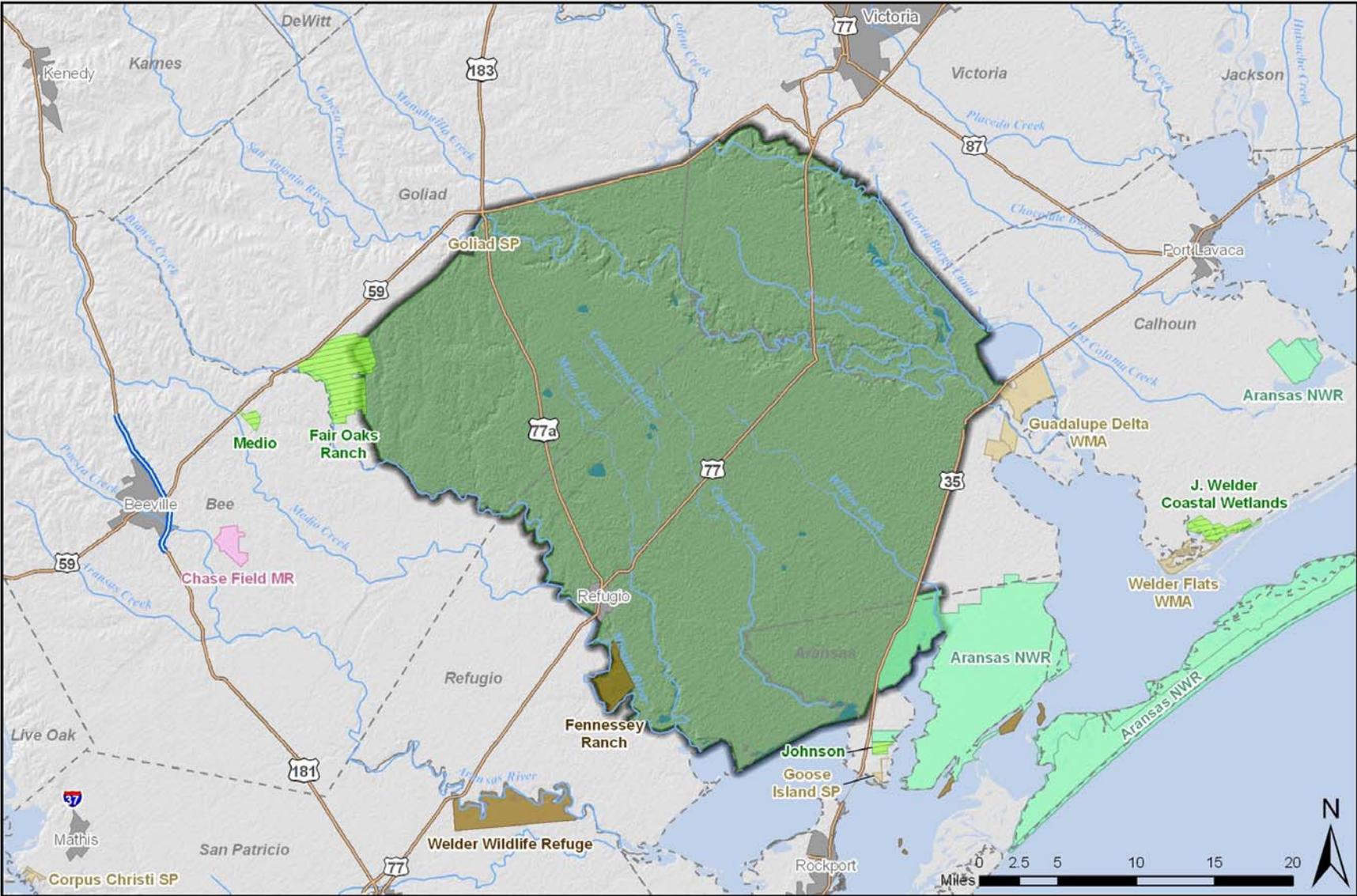


1 inch = 180 miles

Map created by the GIS Department, cap---RGP\_location.mxd (02/24/2009)  
Base Map: North America Shaded Relief (1999), USGS, EROS Data Center and National Atlas of the U.S.

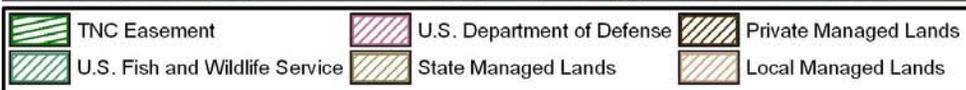
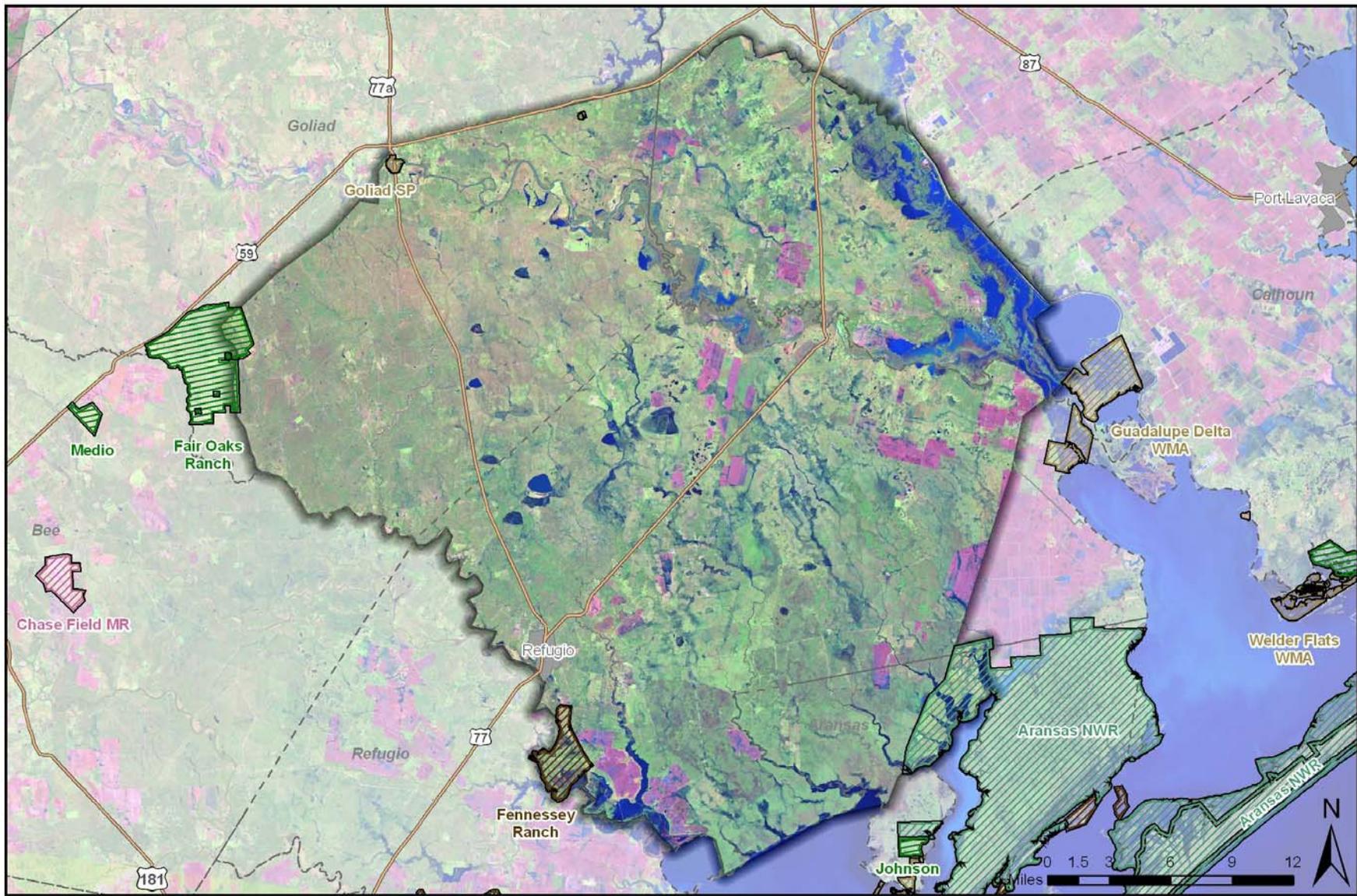
# Refugio-Goliad Prairie Conservation Area

## Gulf Coast Prairies and Marshes Ecoregion



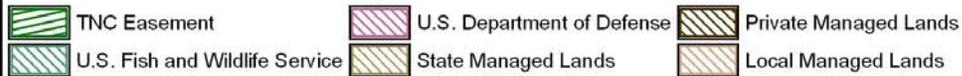
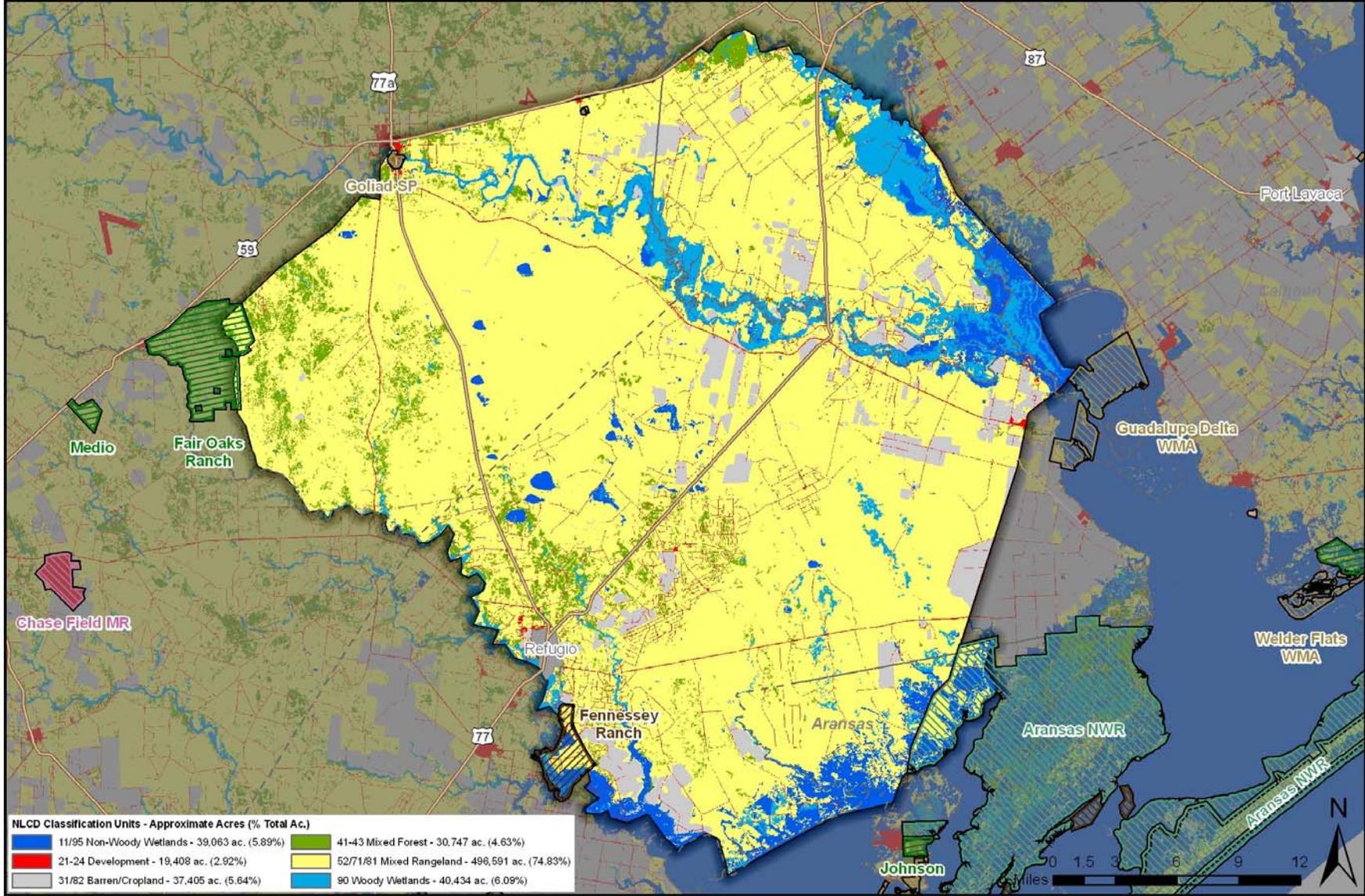
Refugio-Goliad Prairie Conservation Area	U.S. Fish and Wildlife Service	State Managed Lands	Local Managed Lands
TNC Easement	U.S. Department of Defense	Private Managed Lands	

Map created by  
The Nature Conservancy of Texas GIS Department  
cap-RGP\_ConsArea.mxd 7/12/09



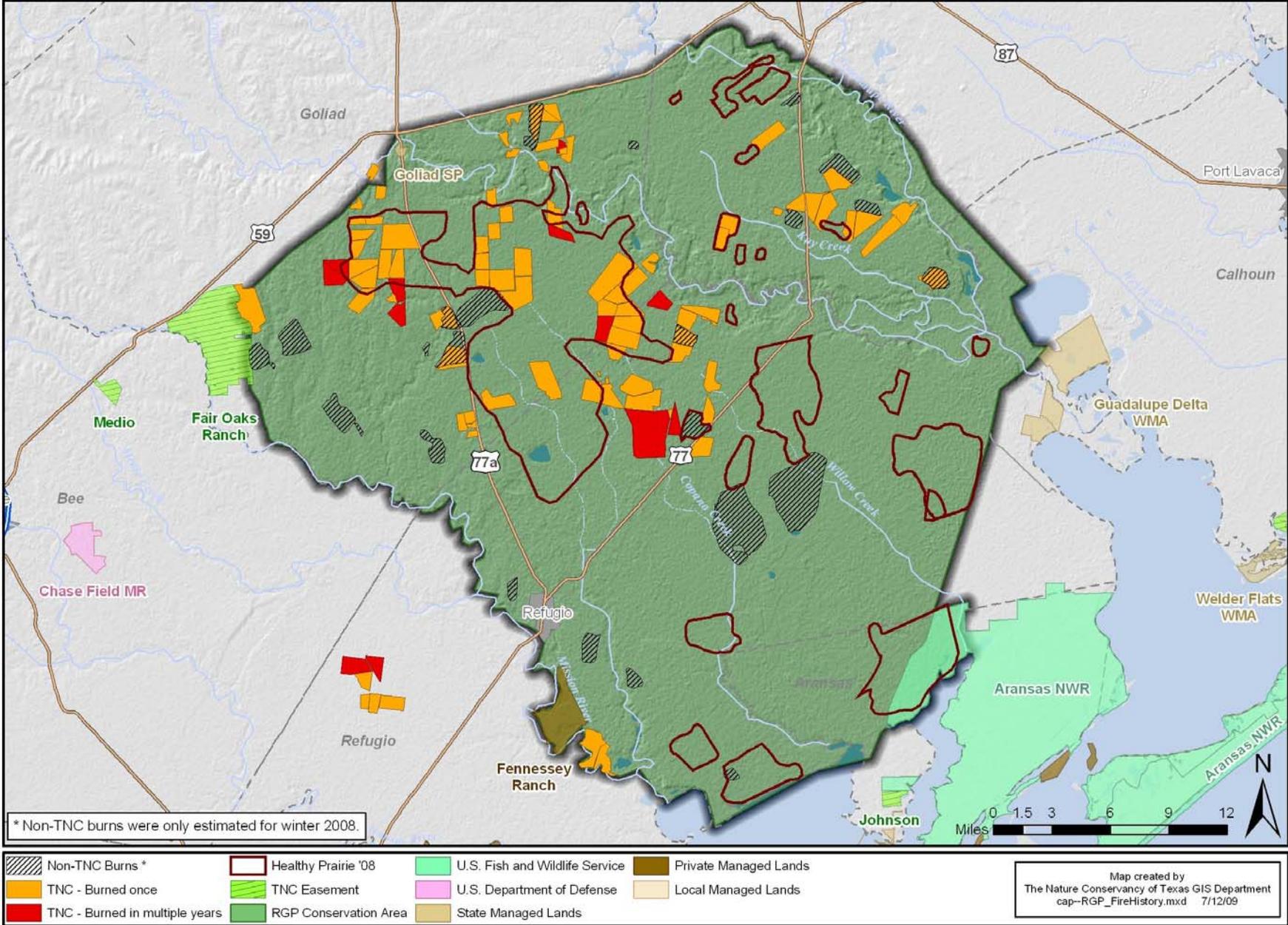
Map created by  
The Nature Conservancy of Texas GIS Department  
cap-RGP\_Landsat.mxd 7/13/2009





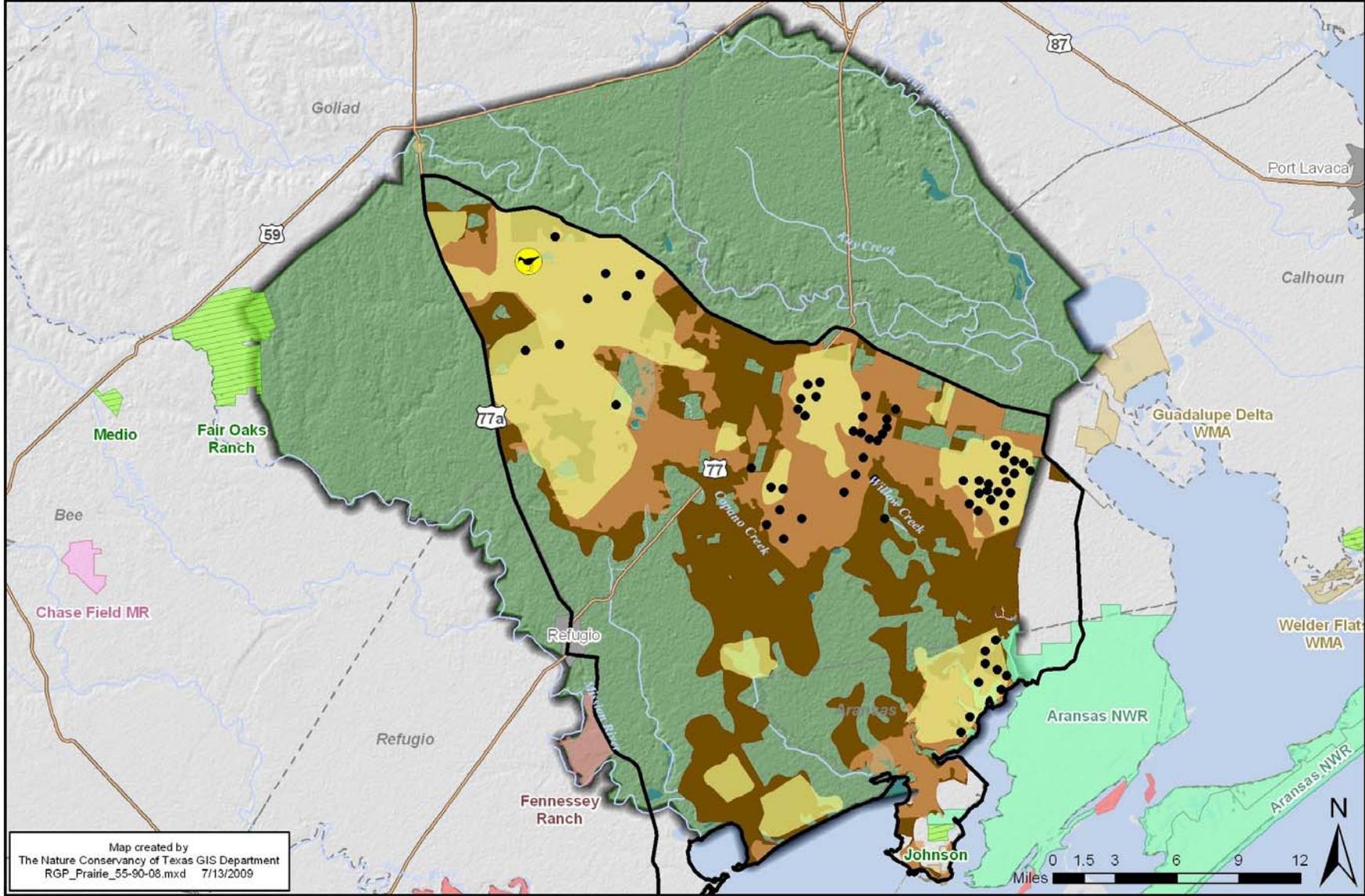
Map created by  
The Nature Conservancy of Texas GIS Department  
cap-RGP\_NLCD.mxd 7/13/2009

# Refugio-Goliad Prairie Conservation Area Comprehensive Fire History



# Refugio-Goliad Prairie Conservation Area

## Prairie Change within McKinney Study Area: 1955, 1990, & 2008



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RGP\_Prairie\_55-90-08.mxd 7/13/2009

- |                       |                               |                                         |                                        |                                |                       |
|-----------------------|-------------------------------|-----------------------------------------|----------------------------------------|--------------------------------|-----------------------|
| RGP Conservation Area | APC Release/Repatriation Site | 1955 Prairie - 20% Shrub<br>252,700 ac. | 2008 Prairie - 5% Shrub<br>101,373 ac. | U.S. Department of Defense     | State Managed Lands   |
| McKinney Study Area   | Historic Lek Locations        | 1990 Prairie - 20% Shrub<br>135,563 ac. | TNC Easement                           | U.S. Fish and Wildlife Service | Private Managed Lands |

## Appendix B: Conservation Status Ranking System and Federal/State Status

### **Deciphering Conservation Status (Heritage) Ranks**

The conservation status rank of an element within a given area is designated by a G (Global), N (National) or S (State or Subnational), as appropriate, followed by a number and/or other rank symbol as described below. The numerical value summarizes the conservation status of the element with 1 representing the most at-risk condition and therefore of high conservation interest, and 5 being the most secure and of relatively low conservation concern. Species with low global ranks of G4 or G5 may be of conservation concern in a particular area due to conditions within that area. The rank numbers have the following meaning:

- 1 = critically imperiled, less than 6 known occurrences of the species
- 2 = imperiled, 6-20 known occurrences
- 3 = vulnerable to extirpation or extinction, 21-100 known occurrences; species very rare and local throughout its range or found locally (even abundantly) in a restricted range
- 4 = apparently secure, though may be quite rare in parts of its range; over 100 known occurrences
- 5 = demonstrably widespread, abundant, and secure, though may be quite rare in parts of its range

*Rank numbers may be combined when there is uncertainty over the status (e.g., an element may be given an G-rank of G2G3, indicating global status is somewhere between imperiled and vulnerable).*

### **Other Rank Symbols**

- Q = Questionable taxonomy that may reduce conservation priority
- ? = Inexact numeric rank. May also be seen as a combination of numbers (G2G3).
- G? = unassessed global rank
- R = reported, not yet ranked
- X = presumed extirpated
- H = historic

### **Rank Criteria**

Ranking is a qualitative process, with multiple factors considered in ranking decisions. For species elements, the following factors are applied: 1) total number and condition of occurrences (sighting/records) of that species, 2) population size, 3) range extent and area of occupancy, 4) short- and long-term trends in the first three factors, 5) threats to the element, and 6) fragility of the element.

### **Federal and State Listing**

Although widely used throughout the conservation community, conservation status ranks convey no legal protection. The U.S. Endangered Species Act, however, does provide federal legal protection for the "take" or harming of species listed as threatened or endangered. Penalties include fines and imprisonment. In addition, many states, including Texas, offer legal protection at the state level. Species listed at the state level may or may not correspond to those protected at the federal level. The federal or state protection status of a species is designated as follows:

- C = candidate species for federal imperiled status
- PT = proposed for listing as federally threatened
- PE = proposed for listing as federally endangered
- PDL = proposed for delisting
- LT = federally threatened
- LE = federally endangered
- ST = state threatened
- SE = state endangered

*For more information about conservation status ranks for species and ecological communities, visit the NatureServe website: <http://www.natureserve.org/>. For more information about the U.S. Endangered Species Program and listed species, visit <http://www.fws.gov/endangered/>.*

## Appendix C: Viability Ranking System and Threats Ranking Guidelines

### Viability Ranking System

The viability of the selected conservation elements should be assigned a rank using a four-level scale. The **viability ranking system** uses simple categorical ranks, as follows:

**Very Good** = viability criteria at or above desired future status: key ecological factor/s is/are functioning at an ecologically desirable status, and requires little or no human intervention

**Good** = viability criteria at or above minimum threshold for biological integrity: key ecological factor/s is/are functioning within the range of acceptable variation; may require limited human intervention

**Fair** = viability criteria at or above minimum restorable level: key ecological factor(s) lie(s) outside of the range of acceptable variation & require(s) human intervention. If unchecked, the conservation element will be vulnerable to serious degradation.

**Poor** = viability criteria below minimum restorable status, and allowing key ecological factor(s) to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible

#### **The assessment of viability is based on 3 viability criteria:**

Size is a measure of the area or abundance of the conservation element's occurrence. For ecological systems and communities, size is simply a measure of the occurrence's geographic coverage. For species, size takes into account the area of occupancy and number of individuals. Minimum area needed to ensure survival or re-establishment of an element after natural disturbance is another aspect of size.

Condition is an integrated measure of the composition, structure, and biotic interactions that characterize the occurrence. This includes factors such as reproduction, age structure, biological composition (e.g., presence of native versus exotic species; presence of characteristic patch types for ecological systems), structure (e.g., canopy, understory, and groundcover in a forested community), and biotic interactions (e.g., levels of competition, predation, and disease).

Landscape context is an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element occurrence, and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbance. Connectivity includes such factors as species elements having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems, and the ability of any element to respond to environmental change through dispersal, migration, or re-colonization.

## Threats Ranking Guidelines

Threats are composed of stresses and sources of stress (or sources). A stress is defined as a process or event with direct negative consequences on the conservation element (e.g., alteration of water flow into a marsh). The source of stress is the action or entity that produces a stress (e.g., channel building). The planning team must identify and rank the stresses and sources for each of the conservation elements. Guidelines for selection and ranking of stresses and sources are below. A natural resource's stress and source ranks are analyzed together to provide an overall threat rank for each element and source

The stress ranks and source ranks for individual elements 1) help elucidate the factors influencing that element and subsequently, the necessary conservation strategies, and 2) contribute to the analysis of threats for the conservation area. A conservation element's stress and source rankings are analyzed together via computer to provide threat ranks for the element. Once element threat ranks have been generated, the threat ranks are further examined via computer to assess threat ranks across elements and for the conservation area as a whole (Table 6). One important part of the threat assessment is the determination of critical threats. Critical threats are highly ranked threats that jeopardize multiple conservation elements or threats that affect at least one element and are ranked "very high." *Critical threats necessitate development of immediate conservation strategies.*

### Stress Ranking

<b>Severity of Damage -- what level of damage can reasonably be expected within 10 years under current circumstances (given the continuation of the existing management/conservation situation)</b>	
Very High	The stress is likely to <i>destroy or eliminate</i> the conservation element over some portion of the element's occurrence at the conservation area
High	The stress is likely to <i>seriously degrade</i> the conservation element over some portion of the element's occurrence at the conservation area
Medium	The stress is likely to <i>moderately degrade</i> the conservation element over some portion of the element's occurrence at the conservation area
Low	The stress is likely to <i>only slightly impair</i> the conservation element over some portion of the element's occurrence at the conservation area

<b>Scope of Damage – what is the geographic scope of impact on the conservation element at the conservation area that can reasonably be expected within 10 years under current circumstances (given the continuation of the existing situation)</b>	
Very High	The stress is likely to be <i>very widespread or pervasive in its scope</i> , and affect the conservation element <i>throughout the element's occurrences</i> at the conservation area
High	The stress is likely to be <i>widespread in its scope</i> , and affect the conservation element at <i>many of its locations</i> at the conservation area
Medium	The stress is likely to be <i>localized in its scope</i> , and affect the conservation element at <i>some of the element's locations</i> at the conservation area
Low	The stress is likely to be <i>very localized in its scope</i> , and affect the conservation element at a <i>limited portion of the element's location</i> at the conservation area

### Stress Ranking Chart

Severity	Scope			
	Very High	High	Medium	Low
Very High	Very High	High	Medium	Low
High	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
Low	Low	Low	Low	-

### Source Ranking

<b>Contribution -- Expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/conservation situation)</b>	
Very High	The source is a <i>very large</i> contributor of the particular stress
High	The source is a <i>large</i> contributor of the particular stress
Medium	The source is a <i>moderate</i> contributor of the particular stress
Low	The source is a <i>low</i> contributor of the particular stress

<b>Irreversibility – Difficulty of reversing the impact from the projected Source of Stress; also an inverse measure of the source’s responsiveness to corrective action</b>	
Very High	Impact of the projected stress from the source, for all intents and purposes, is not reversible (e.g., wetland converted to shopping center)
High	Impact of the projected stress from the source is reversible, but not practically affordable (e.g., wetland converted to agriculture)
Medium	Impact of the projected stress from the source is reversible with a reasonable commitment of additional resources (e.g., ditching and draining of wetland)
Low	Impact of the projected stress from the source is easily reversible at relatively low cost (e.g., ORVs trespassing in wetland)

### Source Ranking Chart

Irreversibility	Contribution			
	Very High	High	Medium	Low
Very High	Very High	High	High	Medium
High	Very High	High	Medium	Medium
Medium	High	Medium	Medium	Low
Low	Medium	Medium	Low	Low

## Appendix D: Determining Project Capacity

### Definitions of Categories and Explanation of Scoring Methodology

#### People: Staff Leadership

Definition: The presence of a talented staff member with lead responsibility for conserving the area. If multiple staff leaders are involved, they must also have a shared vision of success and successful collaboration mechanisms in place.

■ Very High: A staff leader has (1) clearly assigned responsibility, authority, and accountability for conserving the area, (2) experience in implementing conservation strategies, and (3) sufficient time to focus on developing and implementing conservation strategies at the area. If multiple staff leaders are involved, they have a shared vision of success and successful collaboration mechanisms in place.

■ High: A staff leader has any two, but not all three elements of focused staff responsibility (responsibility, experience, time). If multiple staff leaders are involved, there may be some difficulties in collaboration.

■ Medium: A staff leader has no more than one of the three elements of focused staff responsibility (responsibility, experience, time). If multiple staff leaders are involved, they have conflicting visions of success and no collaboration mechanisms.

■ Low: No staff member(s) with designated job responsibility for site conservation.

#### People: Multidisciplinary Team

Definition: Project receives support from an experienced, multidisciplinary team to develop and implement key strategies - located on site, within the lead institution(s) or provided by partner organizations.

■ Very High: The project receives sufficient experienced support from a project team in all functions needed for successful strategy implementation.

■ High: The project receives support from a project team – but regular assistance is not available in a few important programmatic areas needed for successful strategy implementation.

■ Medium: The project receives support from a project team – but regular assistance is not available in many important programmatic areas needed for successful strategy implementation.

■ Low: The project receives insufficient assistance in most programmatic areas.

## **Internal Resources: Institutional Leadership**

Definition: A private conservation organization (NGO), government agency, other private sector institution or some combination of institutions is providing leadership for developing and implementing conservation strategies at the project area. If multiple institutions are involved they must have a shared vision of success and successful collaboration mechanisms in place.

■ Very High: There is clear leadership provided by one or a combination of institutions that (1) have established clear responsibility and (2) developed adequate capacity to implement conservation strategies. If multiple institutions are involved they have a shared vision of success and successful collaboration mechanisms in place.

□ High: Institutional leadership is being provided but assignment of responsibility or adequate capacity is not at a sufficient level. If multiple institutions are involved, there may be some difficulties in collaboration.

□ Medium: Institutional leadership is failing to provide adequate capacity to implement conservation strategies even though responsibility for project area is has been accepted by one or more institutions. If multiple institutions are involved, there are serious difficulties in collaboration.

■ Low: No institution has clear responsibility or adequate capacity to implement conservation strategies.

## **Internal Resources: Funding**

Definition: Existence of sufficient operational funding to support the staff and operating costs, as well as program funding to implement and sustain key strategies. Funding may come from both private and public sectors and be available through a variety of mechanisms and sources, such as appropriation of public funds, contributions by donors, endowment and other sources.

■ Very High: Funding to implement key conservation strategies and for core operations has been secured, pledged, or is highly probable for at least two years, and the project has developed likely sources of long-term funding to sustain core costs and key conservation strategies for the next 5 years

□ High: Funding to develop and launch key conservation strategies and for core operations has been secured, pledged, or is highly probable for at least two years, and the project has undertaken the necessary financial planning and achieved partial success in developing sources of long-term funding to sustain core costs and key conservation strategies for the next 5 years.

□ Medium: Funding has been secured or pledged for core operations for at least one year and some planning underway to develop diversified sources of long-term support for operations and conservation strategies.

■ Low: Funding has not been secured or pledged for core operations for one-year and no planning or implementation of long-term funding sources.

### **External Resources: Social/Legal Framework for Conservation**

Definition: Existence of an appropriate framework of protection tools and policy instruments that can be deployed to secure enduring conservation results at the project area. The potential legal protection tools include many types of ownerships and forms, such as parks, privately owned conservation areas, community reserves, conservation easements or public designations. The potential policy instruments also include many types, such as development ordinances, legal permits, seasonal restrictions or no-take fisheries zones. This factor seeks to assess whether the potential legal framework for conservation at the project area exists, not whether it has been fully deployed or fulfilled.

■ Very High: An appropriate framework of protection tools and policy instruments exists, and is either being deployed, or has the potential to be deployed at the project area.

■ High: Most key elements of a legal framework exist, but one key protection tool or policy instrument needs to be authorized or substantially amended.

■ Medium: Some elements of a legal framework exist, but two or more key protection tools or policy instruments need to be authorized or substantially amended.

■ Low: Few or no elements of a legal framework for conservation exist.

### **External Resources: Community and Constituency Support**

Definition: The project team effectively engages and gains the support of key constituencies, including those in the local community.

■ Very High: The project team and their program are favorably received and supported by key constituencies, including those in the local community. There are no major obstacles to key strategy implementation due to community resistance.

■ High: The project team and their program are largely favorably received and supported by key stakeholders, but there is some difficulty in strategy implementation due to community resistance.

■ Medium: The project team and their program have mixed support in the community and there is some significant community opposition to strategy implementation.

■ Low: The project team and their program have very little support in the community and there is significant community opposition preventing most key strategy implementation.

### Scores for This Project

Categories & Measures	Score
<b>People</b>	
Staff Leadership	High
Multidisciplinary Team	Medium
<b>People Average</b>	Medium
<b>Internal Resources</b>	
Institutional Leadership	High
Funding	Medium
<b>Internal Resources Average</b>	Medium
<b>External Resources</b>	
Social/Legal Framework for Conservation	Very High
Community and Constituency Support	High
<b>External Resources Average</b>	Very High
<b>Overall Project Resource Rank</b>	Medium



### Appendix E: Planning Meeting Participants

Invited	Attended 1st Mtg	Attended 2nd Mtg	Other Contribution	First Name	Last Name	Organization
X				Steve	Anderson	Martin O'Connor Cattle Co.
X	X	X	Team Member	Tim	Anderson	USFWS/Partners for Fish & Wildlife & Coastal Programs
X		X	Team Member	Jim	Bergan	The Nature Conservancy
X		X		Terry	Blankenship	Welder Wildlife Foundation
X				Dan	Braman, Jr.	D. H. Braman Jr. Ranches
X	X	X		Kai	Buckert	Wexford Cattle
X				Mr. & Mrs. Chris	Bush	Bush Ranch
X	X	X	Team Member	Bill	Carr	The Nature Conservancy
X	X	X	Team Member	Clifford	Carter	The Nature Conservancy
X		X		David	Crow	Crow Ranches/Parks Ranch Co.
X		X	Team Member	Stephen	Diebel	GLCI
X				Lynn	Drawe	Welder Wildlife Foundation
X		X	Team Member	Mark	Dumesnil	The Nature Conservancy
X			Team Member	Mike	Duran	The Nature Conservancy
X	X		Team Member	Lee	Elliott	The Nature Conservancy
X	X	X		Kirk	Feuerbacher	McFaddin Enterprises, Ltd.
X			Team Member	Steve	Gilbert	The Nature Conservancy
X				Milton	Greeson	Sarco Creek Ranch
X	X	X	Team Member	Ray	Guse	The Nature Conservancy
X	X		Team Member	Lacey	Halstead	The Nature Conservancy
X	X	X	Team Member	Wade	Harrell	The Nature Conservancy
X		X		Joe	Keefe	O'Connor Brothers
X	X			Bob	McCan	McFaddin Enterprises, Ltd.
X				Mike	Morrow	USFWS/APCNWR
X				Mark	Moseley	NRCS
X	X	X		Clay	Neel	J.F. Welder Heirs Cattle Co., LP
X				Thomas Marion	O'Connor	O'Connor Brothers
X				T. Michael	O'Connor	O'Connor Brothers
X	X	X	Team Member	Brent	Ortego	TPWD
X	X			Stan	Reinke	USDA-NRCS
X		X	Team Member	Tim	Reinke	USDA-NRCS
X		X	Team Member	Terry	Rossignol	USFWS/APCNWR
X				Steven	Schaar	Sorenson Ranch
X			Team Member	Ryan	Smith	The Nature Conservancy
X			Team Member	Malcolm	Swan	The Nature Conservancy
X			Team Member	Jesse	Valdez	The Nature Conservancy
X		X		Ryan	Vice	USFWS/Aransas NWR
X		X		Roger	Welder	J.F. Welder Heirs Cattle Co., LP
X				Mark	Wheelis	D. H. Braman Jr. Ranches
X		X	Team Member	Lisa	Williams	The Nature Conservancy

**Appendix F: Goal-Associated Strategies and Actions  
With Suggested Implementers**

**(Summary Of April 10, 2008, Planning Workshop Results)**

(See “Key to Abbreviations and Acronyms” at end of document.)

**GOAL 1: COASTAL PRAIRIE CONSERVATION**

<b>STRATEGY</b>	<b>ACTION</b>	<b>BY WHOM</b>
<p><b>1. Fire Management:</b> Collaborate with multiple partners (private landowners, GLCI, NRCS, CBPBA, Volunteer Fire Departments and USFWS) to burn 60,000 acres of prairie annually in the conservation area. (Based on 240,000 burnable acres at a 3 – 5 year fire return interval.)  <b>Threats addressed:</b> 1. Invasive/ alien species 2. Lack of fire</p>	Burn 60,000 acres annually.	TNC, USFWS, NRCS, private landowners
	Work to educate policymakers (including Texas Forest Service) and clarify law regarding burn ban policy.	GLCI CBPBA
	Stimulate use of private contractors in conducting burns to build industry.	CBPBA
	Hold local training for prescribed fire.	CBPBA, TNC, NRCS, USFWS, NWS
	Develop MOU with TPWD to conduct burns.	TNC
	Create additional MOUs with other partners to increase capacity to conduct prescribed burns.	TNC, NRCS
	Involve volunteer fire departments to increase capacity to conduct burns.	TNC, CBPBA
	Develop a Burn Coordinator position.	TNC, CBPBA , TNLA
<p><b>2. Reduce Woody plant encroachment:</b> Collaborate with multiple partners (GLCI, NRCS, TPWD and USFWS) to assist landowners in finding cost-share funding to apply fire, mechanical and chemical treatments to reduce woody plant encroachment on upland coastal prairie sites. Primary goal of this funding should be to increase habitat for grassland dependent wildlife species.  <b>Threats addressed:</b> 1. Invasive/ alien species 2. Lack of fire</p>	Help GLCI seek more funding.	CPCI
	Assist private landowners with brush control through cost-share, cooperative agreements.	CPCI
	Include follow-up treatments in design of cost-share/cooperative agreement projects.	USFWS, NRCS, TPWD
	Seek re-creation of a program similar to NRCS’s Conservation Security Program to provide incentives for brush control.	GLCI, NRCS, USFWS
	Encourage research on huisache control.	GLCI, chemical companies, TAES, universities
	Develop markets (recreational, tourism) for coastal prairie to generate funds for conservation.	Private landowners, TNLA
	Establish endowment to support strategies.	CPCI

<p><b>3. Invasive Species Management:</b> In consultation with other non-governmental organizations and conservation agencies, create a prioritized list of non-native invasive species that are the greatest contributors to altered structure and function in coastal prairie, and engage landowners in controlling and avoiding priority species via additional cost-share support and the potential establishment of a cooperative weed management area.</p> <p><b>Threat addressed:</b> 1. Invasive/alien species</p>	Research benefits of establishing a Cooperative Weed Management Area (CWMA).	TNC
	Require oil and gas operators to clean equipment prior to entering land.	Private landowners
	Develop and distribute best management practices for utility easement maintenance.	CWMA (if established)
	Require, enforce and monitor use of best management practices for utility easement maintenance.	Private landowners, CWMA (if established)
	Research to determine if seasonality, intensity of burns will help control invasives.	Welder Wildlife Foundation, universities, TAES
<p><b>4. Minimize new highway construction impacts:</b> Collaborate with TXDOT and other appropriate partners to address best management practices and avoidance of sensitive habitat areas in relation to the planning and construction of the I-69/Trans Texas corridor and other new large highway projects.</p> <p><b>Threat addressed:</b> 5. Highway construction/operation</p>	Collaborate with TXDOT to address best management practices and avoid sensitive habitats.	CPCI
	Continue to voice concerns as a group.	CPCI, agencies, Texas Farm Bureau
	Agency collaboration on talking points.	Agencies
<p><b>5. Minimize oil and gas infrastructure impacts:</b> By 2015, work with area landowners and oil and gas producers to provide best management practices, particularly in relation to siting, emphasizing avoidance of high-value habitats and ensuring practices that minimize impacts related to facilities and infrastructure. Consider participating in the Environmentally Friendly Drilling Program sponsored by HARC and TAMU.</p> <p><b>Threat addressed:</b> 8. Oil and gas production/infrastructure</p>	Participate in environmentally friendly drilling program with HARC.	To be determined
	Use surface agreements to minimize impacts.	To be determined
	Provide examples of surface agreements to landowners.	To be determined

<p><b>6. Minimize impacts resulting from ranchette development:</b> By 2020, acquire conservation easements on 10% of the upland prairie portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.</p> <p><b>Threat addressed:</b> 3. Ranchette development</p>	Land protection/land acquisition.	TNC
	Explore use of Young Rancher Program to support ranching industry.	CPCI
	Develop economic incentives to help landowners maintain large intact landholdings – such as through conservation rentals.	To be determined
	Develop landowner outreach to offer alternatives to selling off land.	To be determined

GOAL 2: ATTWATER'S PRAIRIE-CHICKEN REESTABLISHMENT		
STRATEGY	ACTION	BY WHOM
<p><b>1. Private lands release program:</b> Collaborate with the CPCI, USFWS, Attwater's prairie-chicken recovery team and private landowners to release at least 200 birds within the Refugio-Goliad prairie conservation area initially, and 100 + per year thereafter, until a self-sustaining population is established. Consider establishing a captive rearing facility and program within the conservation area if current captive breeding facilities can't meet this goal.</p> <p><b>Threats addressed:</b> N/A</p>	Release at least 200 birds initially.	CPCI, STCP, private landowners
	Release 100 birds per year after initial release.	CPCI, STCP, private landowners
	Work with recovery team to increase output.	TNC, STCP
	Add another <i>dedicated</i> APC facility within or near conservation area.	USFWS
	Develop incentives for landowners, monetary or in-kind.	CPCI
	Achieve brood survival.	Attwater's Prairie Chicken Recovery Team

<p><b>2. Maintain and restore habitat:</b> Collaborate with the CPCI, USFWS, Attwater’s prairie-chicken recovery team and private landowners to maintain and restore at least 240,000 acres of coastal prairie that is suitable Attwater’s prairie-chicken habitat. Focus on finding funding to assist private lands cost-share programs and increase prescribed fire capacity.</p> <p><b>Threats addressed:</b> 1. Invasive/ alien species 2. Lack of fire 3. Ranchette development 6. Severe grazing/ overgrazing 7. Crop production practices 8. Oil and gas production/ infrastructure</p>	Develop funding to provide incentives for landowners that does not depend on landowner cost-share.	To be determined
	Develop brush-free corridors between areas of open prairie (minimum 1 mile wide).	CPCI, private landowners
	Identify mitigation funding to use for habitat protection/maintenance/restoration.	CPCI
<p><b>3. Minimize oil and gas infrastructure impacts:</b> By 2015, work with area landowners and oil and gas producers to provide best management practices, particularly in relation to siting, emphasizing avoidance of high-value habitats and ensuring practices that minimize impacts related to facilities and infrastructure. Consider participating in the Environmentally Friendly Drilling Program sponsored by HARC and TAMU.</p> <p><b>Threat addressed:</b> 8. Oil and gas production/ infrastructure</p>	Participate in environmentally friendly drilling program with HARC.	To be determined
	Use surface agreements to minimize impacts.	To be determined
	Provide examples of surface agreements to landowners.	To be determined
<p><b>4. Minimize impacts resulting from ranchette development:</b> By 2020, acquire conservation easements on 10% of the upland prairie portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.</p> <p><b>Threat addressed:</b> 3. Ranchette development</p>	Land protection/land acquisition.	TNC
	Support ranching industry, such as through a Young Rancher program.	CPCI
	Develop economic incentives to help landowners maintain large intact landholdings – such as through conservation rentals.	To be determined
	Develop landowner outreach to offer alternatives to selling off land.	To be determined

**GOAL: FLOODPLAIN FOREST CONSERVATION**

STRATEGY	ACTION	BY WHOM
<p><b>1. Maintain intact forest:</b> Collaborate with multiple partners (private landowners, GLCI, NRCS, CBPBA and USFWS) to protect existing floodplain forest through fee title acquisition and/or conservation easements by the Conservancy or others where appropriate, and through outreach to landowners to encourage maintenance of intact forest, with a focus on restoring floodplain forest and/or implementing management practices that ensure overstory recruitment and understory maintenance (i.e., U.S. Department of Agriculture Wetlands Reserve Program and riparian buffer program).</p> <p><b>Threats addressed:</b> 3. Ranchette development 4. Dam construction and resulting residential development 7. Crop production practices</p>	Develop incentives for landowners.	NRCS
	Establish baseline data for coverage of intact forest (including wetlands) and successional stages.	TPWD, USFWS
	Use NRCS riparian buffer program to maintain/restore forest.	NRCS, private landowners
	Investigate carbon sequestration strategies as funding.	TNC, HARC
<p><b>2. Invasive species management:</b> In consultation with other non-governmental organizations and conservation agencies, create a prioritized list of non-native invasive species that are the greatest contributors to altered structure and function in floodplain forests, and engage landowners in controlling and avoiding priority species via additional cost-share support and the potential establishment of a cooperative weed management area.</p> <p><b>Threat addressed:</b> 1. Invasive/ alien species</p>	Research benefits of establishing a Cooperative Weed Management Area (CWMA).	TNC
	Require oil and gas operators, others to clean equipment prior to entering land.	Private landowners
	Develop and distribute best management practices for utility easement maintenance.	CWMA (if established)
	Require, enforce and monitor use of best management practices for utility easement maintenance.	Private landowners, CWMA (if established)

<p><b>3. Minimize impacts resulting from ranchette development:</b> By 2020, acquire conservation easements on 10% of the floodplain forest portion of the conservation area to assist landowners in efforts to retain properties in large blocks, and provide new owners of smaller habitat areas with management options that reduce habitat impacts associated with this change in land tenure.  <b>Threat addressed:</b> 3. Ranchette development</p>	Land protection/land acquisition.	To be determined
	Develop economic incentives to help landowners maintain large intact landholdings – such as through conservation rentals.	To be determined
	Develop landowner outreach to offer alternatives to selling off land.	To be determined
<p><b>4. Minimize dam construction impacts:</b> By 2010, coordinate with Texas Water Development Board and Corps of Engineers to identify sensitive habitats and identify dam construction sites where easement acquisition may reduce threat of secondary impacts associated with development.  <b>Threat addressed:</b> 4. Dam construction and resulting residential development</p>	Coordinate with TWDB to identify sensitive areas to avoid.	To be determined
	Link to Trans-Texas corridor.	To be determined

**Key to Abbreviations and Acronyms:**

CBPBA	Coastal Bend Prescribed Burn Association
CPCI	Coastal Prairie Conservation Initiative; includes USFWS, NRCS, TPWD, TNC, and GLCI
CWMA	Cooperative Weed Management Area
GLCI	Grazing Lands Conservation Initiative
HARC	Houston Advanced Research Center
MOU	Memorandum of Understanding
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
STCP	Society of Tympanuchus Cupido Pinnatus, Ltd.
TAES	Texas AgriLife Extension Service
TAMU	Texas A&M University
TNC	The Nature Conservancy
TNLA	Texas Native Lands Alliance
TPWD	Texas Parks and Wildlife Department
TXDOT	Texas Department of Transportation
USFWS	United States Fish and Wildlife Service

## Appendix G: Ecological Monitoring Plan

### Refugio-Goliad Prairie Conservation Area Ecological Monitoring Plan

ITEM/STRATEGY MONITORED	SAMPLE SIZE	FREQUENCY	DURATION <sup>1</sup>	METHOD	PURPOSE	BY WHOM <sup>2</sup>	FOR WHOM <sup>3</sup>
<b>Coastal Tallgrass Prairie</b>							
Acres burned • <i>Fire management</i>	Conservation area	Annually	Indefinite	Remote sensing or aerial survey	Determine progress towards meeting prescribed fire goals for the CA	TNC	TNC
Key bird species • <i>Fire management</i> • <i>Reduce woody plant encroachment</i> • <i>Invasive species management</i>	Any existing CBC circles (Guadalupe, Aransas) and BBS routes within the CA	Annually	10 years	Breeding Bird Surveys and Christmas Bird Counts	Determine trend (increasing/decreasing)	Volunteer groups	TNC
Acres treated for brush control • <i>Reduce woody plant encroachment</i>	CA	Every 5 years	Indefinite	Remote sensing, aerial survey, reports from partners & landowners	Determine extent of brush control efforts in the CA	TNC	TNC
Species composition at key sites • <i>Invasive species management</i>	Key sites within CA	?	?	?	Determine if recommended stocking rates/grazing management practices result in desired species composition	? (Need to determine if NRCS is already collecting this data)	TNC, CPCI partners
Acres under recommended management • <i>Reduce woody plant encroachment</i> • <i>Invasive species management</i>	CA	Every 5 years	Indefinite	Tally acres under management agreements w/ CPCI or other entity	Estimate percentage of prairie with cooperating landowners	CPCI	TNC, CPCI partners

ITEM/STRATEGY MONITORED	SAMPLE SIZE	FREQUENCY	DURATION <sup>1</sup>	METHOD	PURPOSE	BY WHOM <sup>2</sup>	FOR WHOM <sup>3</sup>
<b>Coastal Tallgrass Prairie, continued</b>							
Acres of good condition prairie <ul style="list-style-type: none"> <li>• <i>Fire management</i></li> <li>• <i>Reduce woody plant encroachment</i></li> <li>• <i>Invasive species management</i></li> </ul>	CA	Every 5 years	Indefinite	Remote sensing, aerial survey	Determine trend (increasing/decreasing)	TNC	TNC

<b>Attwater's Prairie-chicken</b>							
Number of live radio-collared birds <ul style="list-style-type: none"> <li>• <i>Private lands release program</i></li> </ul>	Reintroduction area	Weekly (depending on funding)	Indefinite	Radio tracking	Track survival of individual birds	STCP; TAMUK	TNC, CPCI partners
Number of birds on booming grounds <ul style="list-style-type: none"> <li>• <i>Private lands release program</i></li> </ul>	CA or reintroduction area	Annually	Indefinite	Visual counts	Determine number of breeding males	STCP; TAMUK	TNC, CPCI partners
Number of chicks that survive to 6 wks old <ul style="list-style-type: none"> <li>• <i>Private lands release program</i></li> </ul>	CA or reintroduction area	Annually	Until population is established	Visual counts, radio tracking	Measure brood survival of wild-reared birds	STCP; TAMUK	TNC, CPCI partners

<b>Floodplain Forest</b>							
Extent of floodplain forest <ul style="list-style-type: none"> <li>• <i>Maintain intact forest</i></li> </ul>	CA	10 years	Indefinite	Remote sensing??	Determine trend (increasing/decreasing)	TNC	TNC, CPCI partners
Species composition and recruitment at key sites <ul style="list-style-type: none"> <li>• <i>Invasive species management</i></li> </ul>	CA	?	?	?	Determine if desired species composition and recruitment exist	? (Need to determine if NRCS is already collecting this data)	TNC, CPCI partners

ITEM/STRATEGY MONITORED	SAMPLE SIZE	FREQUENCY	DURATION <sup>1</sup>	METHOD	PURPOSE	BY WHOM <sup>2</sup>	FOR WHOM <sup>3</sup>
<b>Floodplain Forest, continued</b>							
Number and size of waterbird colonies • (None)	Riparian corridors within CA	Biannually	Indeterminate, while colonies remain active	Aerial surveys	Determine status and trends of colonies	? (Need to determine if TPWD is already collecting this data)	TNC, CPCI partners

<sup>1</sup>“Duration” is the period of time over which the monitoring will be conducted.

<sup>2</sup> “By Whom” refers to the entity or group of individuals who will conduct the monitoring.

<sup>3</sup>“For Whom” refers to the entity or group of individuals who will use the resulting data *in the implementation of this plan*.

**Key to Abbreviations and Acronyms:**

- BBS Breeding Bird Survey
- CA conservation area
- CBC Christmas Bird Count
- CPCI Coastal Prairie Conservation Initiative; includes USFWS, NRCS, TPWD, TNC, and GLCI
- NRCS Natural Resources Conservation Service
- STCP Society of Tympanuchus Cupido Pinnatus, Ltd.
- TAMUK Texas A&M University - Kingsville
- TNC The Nature Conservancy
- TPWD Texas Parks and Wildlife Department

Appendix H: Site Fire Management Plan

Refugio-Goliad Prairie Site Fire Management Plan - 2009



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PREPARED BY *Raymond A. Guse* TITLE Prescribed Fire Specialist DATE 06/16/09  
Raymond Guse

APPROVED BY *Larry D. Belles* TITLE Fire Manager DATE 6/23/09  
Larry Belles

REVIEWED BY *Wade Harrell* TITLE Coastal Prairies Proj. Dir. DATE 17 June 09  
Wade Harrell

*Prescribed Burn Unit Plans are filed separately*

## **SECTION A**

### Site Background Information

Historically, indigenous peoples on the Gulf Coast used fire to manage vegetation, as did the early European settlers. Some land managers in the Refugio Goliad Prairie Conservation area likely never ceased using fire as a tool, but modern infrastructure such as highways, fencing and other developments made the use of fire more complex, risky and rare. Additionally, a cultural negativity toward fire developed in the 20<sup>th</sup> century and its benefits were largely lost in the eyes of the general public. Natural lightning ignitions occur frequently throughout the Gulf Coast and we can infer that historical wildfires and pre-modern human ignitions in these open grasslands spread rapidly over vast areas until stopped by natural barriers such as bodies of water. With the development of highways and other manmade landscape features serving as fire breaks, in addition to modern fire suppression activities, the size of wildfires is now very limited (Vice per. comm. 2009). This interruption of a frequent fire regime on the conservation area led in part to the encroachment, and in many areas dominance of invasive woody species over what had formally been coastal tallgrass prairie. Over the past several years a grassroots local private landowner prescribed burn association was created, and with support of a state prescribed burn board we are seeing an increase in the use of prescribed fire as a management tool. It is exciting to see a lost fire culture being reinvigorated.

In 2003, TNC began working on this privately owned conservation area, and currently ranches comprising 87,800 ha (217,000 ac), or 33% of the landscape have cooperated in fire management on their properties (i.e. TNC crews have burned at least 1 unit on a give ranch once or more). When fully staffed the on-site prescribed fire module has potential to burn in excess of 8,100 ha (20,000 ac) per year, and TNC burn efforts have for the most part been focused in priority areas (see RGP Conservation Action Plan, Appendix A – Map 7). TNC demonstrated that prescribed fire can be used as an effective vegetation management tool providing economic benefits to ranching operations. This landscape scale project with actively engaged state, federal, NGO and private partners is recognized as a model for private lands conservation throughout the nation. It is a scientifically based site specific solution to the loss of native grasslands prairie and repatriation of an endangered species in the only remaining area large enough for recovery. The project also serves as a core Demonstration Landscape within the larger Great Plains Fire Learning network (Decker. Per. Comm. 2009) (Harrell. Per. Comm. 2009).

## **SECTION B**

### Fire Management Justification

Lack of fire ranks High as a Critical Threat for two of the three conservation elements in the Conservation Action Plan: Coastal Tallgrass Prairie and Attwater's Prairie Chicken (Table 6). The third element, Floodplain Forest Complex is likely not influenced by fire except in rare and extreme drought conditions. A primary source of this threat to the two elements impacted by decreased fire occurrences is invasion of native shrubs, mesquite (*Prosopis glandulosa*) and huisache (*Acacia farnesiana*) into coastal tallgrass prairie. These shrubs rapidly resprout

following fire, but their structure (eg. height and density) can be managed under a frequent fire return interval (< 5 yrs).

Analysis of 1955 landuse classification data within a portion of the conservation area covering much of the upland prairie habitats indicates there were nearly 102,000 ha (253,000 ac) of grasslands with less than 20% shrub canopy cover (McKinney 1996). Within that same geographic area there was an estimated 51,000 ha (136,000 ac) of prairie in 1990, and there was still good connectivity (McKinney 1996). A March 2008 aerial survey, systematically covering the entire conservation area documented 21 disjunct tracts of good condition prairie with less than 5% shrub canopy over 48,358 ha (118,565 ac), or 18% of the entire conservation area. Within McKinney's study area, 2008 prairie area with < 5% shrub canopy cover was 40,549 ha (101,373 ac) (see RGP Conservation Action Plan, Appendix A – Map 7). The largest area of good condition prairie is 28,909 ha (71,438 ac), but currently large portions of prairie are separated by 6 km (3.7 mi) or more.

## **SECTION C**

### Fire Management Goals and Objectives

Goal 1: Maintain and restore a desired mosaic of coastal tallgrass prairie uplands on private lands, with plant species composition and vegetation structure within the natural range of variability.

#### Objectives:

- a. By 2015 reduce and manage woody vegetation abundance and cover by engaging all partners to burn 97,000 ha (240,000 ac) of the upland prairie portion of the conservation area on a 3 to 4 year interval.
- b. By 2011 grow TNC's prescribed fire capacity by fully staffing and equipping two independent modules that burn 16000 ha (40,000) acres in priority upland areas annually.

Goal 2: Stimulate private lands burning by reinvigorating the fire culture.

#### Objectives:

- a. By 2011 provide leadership, guidance, training and coordination to the Coastal Bend Prescribed Burn Association so their members are burning 24,000 ha (60,000 ac) annually in and around the conservation area.
- b. By 2010 engage, and provide training for Volunteer Fire Departments so they assist private landowners burning 4,000 ha (10,000 ac) annually. By 2014 VFD's provide a prescribed fire service burning 12,000 ha (30,000 ac) in and around the conservation area annually.
- c. By 2010 contract prescribed burn companies are burning 8,000 ha (20,000 ac) annually in the conservation area.

Goal 3: Use fire in conjunction with other treatments to expand the size of existing good condition prairie and create connectivity corridors amongst these areas (Fig. 2).

Objectives:

- a. By 2010 utilize GIS models to track and strategically guide TNC's fire implementation in the conservation area.
- b. By 2010, use remote sensing in the conservation area to track burns independent of TNC operations, along with wildfire occurrences to spatially and temporally quantify fire return intervals.
- c. By 2015 improve connectivity using fire and other treatments so existing prairie areas are separated by no more than 2 km (1.2 mi).

## **SECTION D**

### Fire Regime Proposal

Prescribed fire is used at this site to both maintain grasslands, and as a component of integrated restoration techniques used to manage and reduce woody shrub dominance. Most shrub species in this area are only top-killed by fire, but with short return fire intervals shrubs can be reduced to the level required to restore and maintain coastal tallgrass prairie. Fire also provides important ecological benefits such as nutrient cycling which results in more nutritious forage for livestock and wildlife.

Fire as a restoration tool in coastal tallgrass prairie is often applied in concert with mechanical and chemical treatments, and the frequency of fire introductions may be as short as one year depending on site goals. For maintenance of coastal tallgrass prairie a fire return interval of three years is optimal, but four to five years is within the acceptable range. If burning a unit is prolonged beyond five years, a threshold may be crossed where grass fuels that provide fire intensity needed to meet objectives is lost and shrubs once again dominate the site. At that point, more costly mechanical and chemical treatments are required to restore the site to a coastal tallgrass prairie community, which can then be maintained with fire.

## **SECTION E**

### Key Constraints

#### **Staff Capacity:**

To meet goals of the RGP CAP, the need for a second prescribed fire module based in Victoria was discussed in 2007. However, in the spring of 2009 funding the current module became difficult for the Texas Chapter and we have lost 2/3rds of our local staff. On such a large and complex project, the loss of trained and established permanent employees who are well

networked among our partners, and have built the respect and trust of private landowner's has been devastating at a time when we are on the cusp of seeing a revival of the fire culture. We have seen dramatic loss in amount of grassland prairie throughout the conservation area in only a few decades, and with additional staff we can reverse this trend. Loss of staff directly affects our ability to provide leadership, guidance, coordination to landowners and other partners and hinders our capacity for planning, coordination, and maintenance of TNC infrastructure to facilitate our own operations. Fuel Model 3 (tall grass) dominates areas where we burn and even at the low end of prescription parameters fire behavior can be extreme. Controlling fire that has spread outside of burn units in these fuels is a concern due to fast rates of spread and high fire intensity, which in part we were able to mitigate with experienced local firefighters familiar with the environment in which we work.

Prior to the economic set-backs and subsequent loss of staff, in FY09 the module was able to burn 2,157 ha (5,331 ac) in priority upland portions in the conservation area. We also led or assisted burning 5,538 ha (13,684 ac) on TNC preserves and other cooperators lands throughout the state, and 3,324 ha (8,213 ac) on the Aransas Wildlife Refuge Complex. In FY08 we burned 4,560 ha (11,366 ac) on the conservation area, 5004 ha (12,364 ac) on Aransas, and 2049 ha (5,062 ac) on TNC preserves and cooperators private lands. Over the past two fiscal years the RGP prescribed fire module has led or assisted burns on 22,670 ha (56,020 ac).

#### **Weather:**

Timing and amount of precipitation fluctuate widely throughout the conservation area, and the past two years we have witnessed record rains and extreme drought, which has brought about challenging burn conditions. Some units require north winds to mitigate smoke issues, and cold fronts arrive with north winds, but also low relative humidity often resulting in the issuance of red flag conditions. Even if within prescription parameters of an approved burn plan, conducting prescribed burns under red flag conditions can be politically unwise. Despite these challenges that are beyond our control, we have been quite successful in accomplishing significant burning. When weather conditions are more favorable we will be able to implement many burns in priority areas if we have trained staff infrastructure in place to do so.

#### **Land Management Practices:**

To meet objectives when burning, ranchers often defer grazing for varying lengths of time to allow for fuel build-up, but in times of drought maintaining a supply of forage for livestock usually takes precedence over burning. This causes burn units to miss one season or more, and land managers risk losing control of woody vegetation, and their least costly management option. They also lose the benefits of fire removing decadent material and promoting more nutritious available forage (Carter Per. Comm.). We must work more closely within our network of partners, particularly the Natural Resources Conservation Service and Grazing Lands Conservation Initiative to advise land managers to ensure best management practices are being utilized.

## **Burn bans and Texas:**

Texas Commission on Environmental Quality regulates outdoor burning and provides counties authority to issue burn bans (TCEQ 2006). Within this statute, Texas Certified Prescribed Burn Managers are authorized to conduct prescribed burns during burn bans and recently this has gained favor among land managers in Texas. However, this legitimate practice is looked down on by some local authorities and not widely used because of this political liability. Counties can issue exemptions to burn bans to specific individuals and units, and two counties, Refugio and Goliad, which span most of the conservation area have been cooperative in issuing TNC exemptions to burn bans in the past. However, continuation of this relationship is not assured as county commissioners and judges are elected entities. NWCG Burn Bosses can obtain the Certified Prescribed Burn Manager certification, but we risk losing public support for burning during a ban, especially if there any escapes resulting in resource loss.

## **SECTION F**

### Smoke Management

Highways are primary sensitive smoke receptors in this largely rural area and it is rare that communities are impacted. Prescriptive parameters have requirements for smoke dispersion and transport winds and they have worked well. TCEQ regulations state that ignitions cannot begin until one hour after sunrise and must cease one hour before sunset, and a minimum 6 mph wind is required. These constraints rarely present problems.

## **SECTION G**

### Neighbor and Community Factors

Landowners with no intention to use fire management on their properties usually protect their infrastructures against wildfire, and most properties have lines disced around them with the objective of precluding wildfire from spreading onto their properties. This lessens the risk of resource damage, and the disced lines also offer opportunities to stop escaped fires.

Fire management on rangelands within and around the conservation area is on the verge of a revolution as we see a revitalization of the fire culture. We will continue pursuing all opportunities to promote the use of prescribed fire on the conservation area via training, media relations, meetings and one on one interaction.

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