Appendix 3.2 Upper West Gulf Coastal Plain Ecoregional Assessment

Note: The boundaries used in this assessment differ somewhat from those of Woods and others (2004) used elsewhere in this document. They most closely approximate the boundaries of the South Central Plains ecoregion.

Upper West Gulf Coastal Plain Ecoregional Plan

Terre Noire – S. Simon, 2001

June 2002 Final Implementation Draft

Prepared by
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The Nature Conservancy®

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This iteration of the Upper West Gulf Coastal Plain Ecoregional Plan is published as the final draft implementation version. This version incorporates the results of peer review of previous draft and results of the UWGCP Implementation meeting in March, 2002. All information contained in this draft should be considered Business Confidential.

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List of Appendices

UWGCP Ecoregional Management Plan

Executive Summary

In 1996 The Nature Conservancy developed an ecoregional approach to conservation, outlined in *Conservation by Design: A Framework for Mission Success*, stating that biodiversity conservation requires working at larger scales and along ecological instead of geopolitical lines. Ecoregions, large units of land and water delineated by characteristic biotic and abiotic factors, provide a better geographic basis than states for organizing our conservation priorities and actions. Strategic planning on an ecoregional scale encourages review of many species and ecological communities at once, providing a structure for capturing genetic and ecological variability within species or communities.

The major products of an ecoregional plan include: 1) identification of a portfolio of sites that, if protected, collectively conserve the biodiversity of the ecoregion, 2) an implementation strategy to protect the sites, including strategies and conservation partners, and 3) identification of data gaps to improve the quality of future conservation decision-making and ensure ecoregional plan updates capture relevant and useful data. A critical element of the conservation portfolio sites is the data captured through the plan, which not only provides a science-based foundation for ecoregional planning but also provides a starting point for site conservation planning in the implementation phase.

The Upper West Gulf Coastal Plain (UWGCP) is an area of approximately 26,250,000 acres or 40,970 square miles, covering parts of Arkansas, Louisiana, Oklahoma, and Texas. The ecoregion extends south approximately from Little Rock, Arkansas to south of Shreveport, Louisiana, southwest to Houston and northwest to outside the Dallas/Fort Worth area. Physiographically the UWGCP is bordered by the Lower West Gulf Coast Plain to the south, the Gulf Coast Prairies and Marshes to the southeast, the Crosstimbers and Southern Tallgrass Prairie to the West, the Ouachita Mountains to the north, and the Mississippi River Alluvial Plain to the East. The delineation between the Lower West Gulf Coastal Plain and the UWGCP is the northern limit of the natural range of longleaf pine.

Terrestrial systems in the UWGCP include both mesic bottomland and upland dry-mesic and hydric areas. Bottomlands are dominated by hardwood communities, primarily oak species, and more deeply flooded areas frequently have cypress and cypress-tupelo swamp vegetation. Upland areas have shortleaf and loblolly pines, mixed pine-hardwood communities, glades, and woodlands. Prairies occur on blackland sites, depending on fire history and soil depth. Barrens and woodlands occur on saline soil flats. Ancient volcanic intrusions form bauxite deposits that are home to globally rare and endemic nepheline syenite communities. Aquatic systems are low-slope, medium- to high-order streams and riverine systems. Streams are sheet-, surface- and groundwater fed. Slower, larger rivers that originate in other ecoregions flow through the UWGCP and are home to diverse mussel and fish communities. Rivers are the predominant aquatic system in the UWGCP, and contain a diverse assembly of mussels and fish. Substrates range from gravel, sand-gravel, to mud and silt. Natural lakes are few, and are remnants of river reaches; the most prominent is Caddo Lake on the Texas/Louisiana border. It is the remnant of a

pre-settlement “Great Raft,” an expansive natural logjam on the Red River that created a series of wetlands and lake areas that covered thousands of acres.

The UWGCP is home to 15 endemic species and 59 species with limited ranges. Six federally listed endangered species and two listed threatened species occur in the ecoregion. Many of the endemic species are crayfishes and mussels. There are 13 terrestrial community groups endemic to the ecoregion, and several endemic community associations.

Fire is the most pervasive natural terrestrial process in the UWGCP. Almost all terrestrial communities in the ecoregion benefit from seasonal burning; many plant species require burning to germinate. Fire also helps prevent invasive species from overrunning endemic natural areas. Wind action is another major natural process in the ecoregion. Tornadoes are frequent and high winds are regular occurrences. Seasonal and ephemeral flooding is similarly a common natural aquatic process for river systems in the UWGCP.

Though the UWGCP is 51% forested, most of that area is under commercial management. Additional uses include grazing and agriculture. Habitat fragmentation caused by urban growth and suburban sprawl occur throughout the region. Following the national trend, urban and suburban land uses are increasing though not as intensely as in other ecoregions (US Dept of Census, 2000).

In this iteration of the ecoregional plan, the portfolio conservation areas cover a total of 4,193,851 acres, or 16% of the ecoregion. Currently 1,697,294 acres or 40% of those portfolio conservation areas are being managed for biodiversity. Of the portfolio conservation areas that are managed for biodiversity, 1,447,496 acres or 85 % are federally owned; 234,095 acres or 14% are state or locally owned; and 15,704 acres or 1% are privately owned.

Terrestrial ecosystems in the UWGCP are stressed by habitat destruction or conversion, habitat fragmentation, and alteration of natural fire regimes. These stresses have improper forestry practices, development, conversion and agriculture, and fire suppression as their source. Aquatic systems are stressed by incompatible land use practices leading to sedimentation and runoff, and nonpoint source pollution. Fragmentation and loss most often occurs in the form of conversion. Conversion includes grazing and agriculture. Habitat alteration and incompatible land use include incompatible agricultural and commercial use as well as development. Invasive species include exotics such as lespedeza, cedars, and kudzu, and invasive fire-intolerant species in fire-suppressed landscapes.

The portfolio conservation areas depicted in this iteration of the UWGCP ecoregional plan are intended as a prioritization management tool for conservation action and resources. This plan also contains the supporting data for each portfolio conservation area, as well as an ecoregional management strategy applicable to the portfolio management areas. Portfolio management action areas are prioritized by biodiversity, threats, complementarity, and leverage. Results and data from this ecoregional planning process should be used to create working site conservation plans as part of the initial implementation phase of the plan.

Introduction

The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive (TNC, 2001). The Nature Conservancy has worked to fulfill this mission for over 50 years through land acquisition and management, creating partnerships and involving stakeholders and communities in the conservation process. As the threats to biodiversity and their corresponding immediacy increase, TNC has been growing and changing to better fulfill its mission; one key change has been the movement from opportunistic towards strategic conservation management. Strategic conservation is represented here in the ecoregional plan. *Conservation by Design* (TNC, 1996) defined the framework on which this ecoregional plan is based by planning for biodiversity at the landscape scale. Ecoregional plans are aligned with the mission of The Nature Conservancy.

An ecoregion is generally defined as relatively large areas containing geographically distinct assemblages of natural communities, where communities share a large majority of their species, dynamics, and environmental conditions, and the communities also function together as a conservation unit at large scales (Ricketts, et al. 1999). TNC based initial ecoregion design on the efforts of the US forest Service (Bailey, 1995) and further refined to sub-ecoregions (Keys, et al., 1995). The Upper West Gulf Coastal Plain (UWGCP) ecoregion boundary is based on Bailey, though the need to modify some boundaries became apparent during the planning process.

Ecoregional plans endeavor to set the groundwork for regional, state, local, and community based conservation through strategic, long-term priorities and strategies. An ecoregional plan should

- Prioritize TNC resources and management action
- Provide a scientific basis for community based conservation action by delineating geographic areas that should be managed for conservation and biodiversity,
- Provide a general conservation strategy for those sites.
- Clearly illustrate data gaps discovered during the planning and implementation process, and provide a roadmap for reconciling those gaps.

A complete ecoregional plan contains not only the sites, but tools for the conservation planners and implementers:

- Data to support those sites and priorities,
- Strategy to implement the plan,
- A mechanism to review, update and measure the success of a plan.

The portfolio conservation areas, supporting data, and the applicable management and conservation strategies are based on the best available science, and therefore provide a roadmap for the best use of TNC and partner resources. An ecoregional plan is also useful as a data bank and data gap analysis. As such, it is a living document that requires review and updates as necessary.

Note that while the goal of an ecoregional planning effort is to delineate the minimum or priority area necessary to conserve an ecoregion's biodiversity, different portfolio sites represent different goals and not all sites represent functional landscapes. Plan users should carefully review each site description and strategy to ensure plan success (Appendix 1).

Within ecoregions, portfolio conservation areas are designed to conserve biodiversity by managing viable native community, zoology and botany targets identified during the planning process. Protection of high quality sites that conserve multiple, unprotected or nontarget occurrences are preferred conservation strategies. To best fulfill the conservation goals of the plan, implementers need to restore and maintain ecosystem patterns and processes that species and communities need to survive (Turner, 2000).

This document represents the initial ecoregional conservation planning effort for the Upper West Gulf Coastal Plain. The plan will provide a portfolio of conservation areas, including priority or action areas, the data compiled and created during this planning effort, methodology, the data gaps identified, and a strategies for plan implementation. It is hoped that conservation planners, site-based conservation staff, and TNC partners use this plan to effectively manage the biodiversity of the ecoregion. Successful use, however, will require a commitment of cooperation, resources and time, as well as the sharing of responsibility and effort.

Overview and General Description of The Upper West Gulf Coastal Plain

The Upper West Gulf Coastal Plain ecoregion is approximately 26,500,000 acres or 41,400 square miles and encompasses parts of four states, Arkansas, Oklahoma, Texas, and Louisiana. The UWGCP extends south approximately from Little Rock, Arkansas to Shreveport, Louisiana, southwest to Houston and Northwest to outside the Dallas/Fort Worth area. Physiographically it is bordered by the Lower West Gulf Coast Plain to the south, the Gulf Coast Prairies and Marshes to the southeast, the Crosstimbers and Southern Tallgrass Prairie to the West, the Ouachita Mountains to the north, and the Mississippi River Alluvial Plain to the East. The delineation between the Lower West Gulf Coastal Plain and the UWGCP is the northern limit of the longleaf pine terrestrial community.

Physiographic and Geologic Features

Following is a general description of the physiographic and geologic features of the UWGCP. More detail on the physiographic and geologic features of each portfolio conservation area will be discussed at the site conservation level of planning.

The Upper West Gulf Coastal Plain is composed largely of clays, sands, marl, gravels, bedded gravels and clays, and marine sediments associated with the Cretaceous period, approximately 50 million years ago (Shepherd, 1984). Recent geologic formations include Quaternary age Pleistocene deposits and Holocene alluvial deposits (McInnis, 1995). Further south in the gulf coastal plain, Cretaceous deposits are overlain with Tertiary Pliocene and Claiborne Eocene deposits (Bernard & LeBlanc, 1965).

This late Cretaceous marine geology in the Upper West Gulf Coastal Plain is represented by the Trinity Group, Goodland Limestone, Kiamichi, Woodbine, Tokio, Brownstown, Ozan, Annona, Saratoga Chalk, and Nacatoch sand formations. Marginally marine depositional groups from the Tertiary period include the Midway and the Jackson group. Non-marine sands, silty sands, clays, gravels, and quartzite and lignite deposits from the tertiary period are represented in the Wilson and Claiborne, groups. (Bernard & LeBlanc, 1965).

Marine, marginally marine, and nonmarine deposits are found throughout the ecoregion in Arkansas, Louisiana, Oklahoma, and Texas (McFarland, 1998). Sands underlie large parts of the UWGCP, and alkaline Lafe soils are present as well (Shepherd, 1984). There are some igneous intrusions in the ecoregion as evidenced by the bauxite and nepheline syenite formations in south central Arkansas (McFarland, 1998).

The UWGCP is bordered by the Mississippi River Alluvial Plain to the east, the Ouachita Mountains to the North, the Crosstimbers and Southern Prairies to the West, and the Lower West Gulf Coastal Plain to the south. The division between the lower and upper west gulf coastal plains is the northern extent of the Southern Longleaf Pine community.

Topography ranges generally from flat to rolling hills, with occasional ravines and erosional bluffs. Elevation ranges from 850 to less than 10 feet above sea level. A series of depositional plains make up the ecoregion; the Willis plain is the highest, to 200 feet, then the Bentley from 200 –100, the Montgomery from 125 to 70, and the Beaumont from 100 to 10 feet above sea level. Most of the UWGCP lies between 150-300 feet above sea level (Bernard & LeBlanc, 1965).

The UWGCP has microtopographic natural hillocks or "pimple mounds," approximately 3 feet high and 50 feet in diameter, and are most evident in Wrightsville soils. They are found on Tertiary and Quaternary deposits in Louisiana, Arkansas, Texas, Missouri, and Kansas, but have not been reported east of the Mississippi River. The pimple mounds support islands of upland vegetation on otherwise wetland forests or savannas. No single theory significantly explains the origin of these mounds (Bernard & LeBlanc, 1965).

All Quaternary gulf coastal plains are depositional. Each progressively older Pleistocene coastal plain passes under the deposits forming the next younger plain; each successively younger plain slopes seaward at progressively smaller rates, varying in different areas along the coast because of different initial depositional slopes and differential coastal warping (Bernard & LeBlanc, 1965).

Settlement Use History and Current Human Interaction/Demographics

It is believed that nomadic hunter-gatherers first occupied the Upper West Gulf Coastal Plain at the end of the last glacial advance, approximately 14,000 to 10,000 years ago. Approximately 2,500 years ago Native Americans began to transition from a gathering to an agricultural lifestyle (Peter, et. al., 1990). European visitors to the Upper West Gulf Coastal Plain in the early 1800s reported Native Americans were engaged in limited farming, as well as hunting and gathering. It is believed that the Caddo tribe augmented the natural fire process in the ecoregion to clear areas, enhance crops, and flush game. Though there was a European presence in the area since the 17th century, the 1820s are considered the real beginning of settlement in the ecoregion (Shepherd, 1984).

Most Native Americans were relocated from the Upper West Gulf Coastal Plain by the 1840s. Relocation coincided with increasing western settlement aided by Federal land grant programs (McInnis, 1995). Agriculture became one of the primary land uses in the UWGCP with the rise of several large plantations in the 30 years before the civil war, with cotton and corn the dominant crops (Peter, et. al., 1990). The civil war curbed large-scale agricultural development. After the civil war property was sold off in smaller tracts so that by 1900 numerous smaller farms and tenants occupied the area. Cattle grazing also became popular in the ecoregion after the civil war (McInnis, 1995).

Cotton farming grew as more lands were cleared from timber harvesting, to the point were cotton farming was attempted in nearly every terrestrial system in the ecoregion. Many of the smaller farms that were abandoned during the Great Depression in the 1920s and 1930s were purchased

by the Federal Government and became elements of Kisatchie, Davy Crockett, and Sabine National Forests (Turner, 2001).

Timber production has been the other primary land use in the ecoregion. Railroad construction through the UWGCP in the early 1800 facilitated traffic and development into the ecoregion, expanding timber and agriculture markets. Lumber mills followed rail lines into the ecoregion. The timber industry reached its peak in the UWGCP in the 1880s, and by the 1920s most of the ecoregion had been logged and cut over at least once. By 1925 almost all virgin pine had been cut over. After a decrease in large-scale timber harvesting, the timber industry moved to managed plantation harvesting. Timber harvesting for both sawmill and pulpwood continues to be a major land use in the Upper West Gulf Coastal Plain.

Mineral extraction in the UWGCP began in the late 1800s and included coal, lignite, clays, sand, gravel and metals. Many of these resources continue to be extracted from the ecoregion. Oil and gas extraction began in the 1920s following the decrease of timber production (McInnis, 1995). The Nepheline Syenite formations in the northern part of the ecoregion were mined extensively beginning in the 1930s for bauxite for the aluminum industry. In addition to creating a huge demand for aluminum, World War II was also responsible for the number of munitions plants, depots and military bases in the ecoregion (Shepherd, 1984). As munitions plants and depots were constructed in remote areas with plenty of surrounding land, they provide excellent conservation opportunities owing to their scale and use patterns.

Natural resource-based industries in the Upper West Gulf Coastal Plain have expanded this century to include recreation and tourism, though much of the local economy is still based on forestry, agriculture, and traditional resource extraction. Suburban sprawl and development of natural lands continues to increase (Shepherd, 1984; U.S. Dept. Census, 1998).

Generally land use in the UWGCP has resulted in disturbance of various types and levels throughout the ecoregion. Many areas of biodiversity have experienced some kind of past disturbance including clearing for timber, agriculture, grazing, or mineral extraction. However, some of these areas have been or are in the process of being returned to a level of pre-settlement state. Following the first round of timber extraction, many cleared areas were converted to pasture or cotton fields. Cleared areas that have failed to grow cotton may have been abandoned to return to a wooded state, and areas that were clearcut for the first time in the 1920s or 1930s are now showing older-growth forest; similarly, areas that have proven unsuccessful at hosting commercial forest are being restored to their natural state. Unfortunately suppression of the natural fire regime has resulted in stressed or ecologically incomplete landscapes (Foti and Zollner, pers. comm, 2001).

Climatology

The climate of the UWGCP is considered transitional, between subtropical humid areas of the south and gulf, and the continental climates of the great plains and midwest. Generally south or southwesterly winds contribute to hot, humid summers and mild winters. Spring and fall are usually mild. Winter temperatures average In the winter temperatures range from an average of 50º – 63º F in the afternoons and 39º – 50º F in the early mornings; there are approximately 30 – 40 days of freezing temperatures in the winter. In warmer months the temperature varies less,

with afternoon temperatures averaging between 85º – 95º F and morning temperatures averaging 68º – 75º F (NOAA, 2001a).

Precipitation occurs throughout the year, though most rainfall occurs in the spring and fall. Thunderstorms and extreme weather can occur throughout the year, though they are more prevalent in the spring and fall in the northern part of the ecoregion, and in the spring and summer in the southern part of the ecoregion. The UWGCP receives approximately 46 – 50 inches of precipitation a year with approximately 100 days receiving measurable rainfall (NOAA, 2001b).

Extreme weather includes convective thunderstorms, which may have historically been the source of lightning-ignited low-intensity fires. Tornadoes, straight-line winds, and hailstorms also occur and have historically affected natural communities as periodic disturbances. More common in the southern section of the ecoregion, hurricanes and tropical storms from the Gulf of Mexico also affect climatology and natural communities.

Systems

Terrestrial Systems

The UWGCP terrestrial community targets were chosen at the complex level (see attached Data Management Plan for a full description and methodology, Appendix 3). Summaries for each complex as it is represented in the UWGCP follow. Terrestrial system names have been generalized to conform to the Southern Resource Office's and Association for Biodiversity Information's database. Though complex names may be used across ecoregions, the composition of each complex as it occurs in the ecoregion is unique and endemic to the ecoregion. Further, community associations as they are described for this ecoregion that belong to a terrestrial community complex are endemic to the UWGCP; therefore even though some groups are noted for not containing localized endemic or rare species, the associations themselves may be rare or endemic. For a breakdown of the complexes and descriptions of each association, see Appendix 5.

Gulf Coastal Plain Xeric Sandhill Forests and Woodlands (CEGR030510)

This "sandhills" ecological system occurs in isolated large patches across the region on uplands underlain by deep, coarse sandy soils. These sites are typified by low fertility and low moisture retention which contribute to open tree canopies, usually <60% canopy closure. Sparse understory vegetation and abundant patches of bare soil are typical. Vegetation indicators are species tolerant of droughty sites, especially Bluejack Oak (*Quercus incana*) and Arkansas Oak (*Quercus arkansana*). This system may support the largest concentration of endemic vascular plant species in the WGCP (*MacRoberts, Sorrie, Evans in prep*). In addition to these endemics and near endemics are a number of species essentially restricted to such habitats in the region. Elsewhere in the southeastern United States, including most of the adjacent ecoregion (Lower West Gulf Coastal Plain, 41), these sandhills sites are closely associated with longleaf pine.

Gulf Coastal Plain Upland Pine & Pine-Hardwood Forests (CEGR030550) & (CEGR030560)

This ecological system was the historical matrix type for the ecoregion, and was present on nearly all uplands except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). These sites are underlain by loamy to fine textured soils of variable depths. These are upland sites on ridge tops and adjacent sideslopes, with moderate fertility and moisture retention. Vegetation indicators are shortleaf pine (*Pinus echinata*) and to a lesser extent Loblolly pine (*Pinus taeda*). Both may occur in combination with a host of dry to dry-mesic site hardwood species. There are no known herbaceous species restricted to the habitat, and overall this system may have supported relatively low levels of vascular plant species diversity. This system is not currently known to support any local endemic or globally rare plant species. This system has undergone major transformations since European settlement of the region.

Gulf Coastal Plain Mesic Acid Upland Hardwood Forests (CEGR031010)

This ecological system is found in limited upland areas (especially sideslopes and narrow ridgetops) which were topographically isolated from historically fire prone, pine dominated uplands. Soils can be quite variable ranging from coarse to loamy in surface texture, although all are acid in surface reactions. These areas have moderate to high fertility and moisture retention. Sites are often found along slopes above perennial streams in the region. Vegetation indicators are mesic hardwoods such as American Beech (*Fagus grandifolia*), White Oak (*Quercus alba*), and American Holly (*Ilex opaca*), although scattered, large diameter pines are also often present. Spring blooming herbaceous species are typical in the understory of most examples. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Hardwood and Pine-Hardwood Flatwoods Forests (CEGR033040)

These "flatwoods" are usually found on non-riverine, Pleistocene high terraces. Soils are fine textured and may be saturated for lengthy periods of the year. Saturation occurs not from overbank flooding, but typically whenever precipiation events occur and especially when evapotranspiration is low (primarily late fall through early spring). This ecological system occurs in a complex of ridge and swale topography. Ridges support loblolly pine, White oak, and other mesic species such as Sweetleaf (*Symplocus tinctoria*), and Viburnum (*Viburnum dentatum*). Swales are heavily oak dominated with species tolerant of some inundation such as Willow Oak (*Quercus phellos*) Laurel Oak (*Quercus laurifolia*) with sparse coverage of wetland herbs such as *Carex glaucescens.* This system is not known to support any localized endemic or globally rare plant species.

Southeastern Coastal Plain Upland Longleaf Pinelands (320 series)

This system is exceedingly rare in the ecoregion, and is not found naturally in Louisiana, Arkansas, or Oklahoma portions of the ecoregion. While Longleaf pine (*Pinus palustris*) was the dominant vegetation type throughout most of the southeastern United States coastal plain, it reached the western limits of natural distribution in portions of eastern Texas in the Upper West Gulf. This type is found only in limited, relictual areas. The unifying feature of this system is the presence of longleaf pine. Other vegetation can be quite variable, and much like that of other

ecological systems (notably Pine and Pine – Hardwood Forests, and Xeric Sandhills). Most known sites occur on loamy uplands but the type also occurred historically on some deep, xeric sandhills in the region. This system is not known to support any localized endemic or globally rare plant species in this ecoregion.

Gulf Coastal Plain Circumneutral Upland Mesic Mixed Hardwood Forests (CEGR031020)

This system is analagous to "Mesic Acid Hardwood Forests" and is found in related topographic settings. However, this system is found on soils which exhibit somewhat higher surface soil pH reactions. Consequently, the vegetation may include Chalk Maple (*Acer leucoderme*), Southern Sugar Maple (*Acer barbatum*), Carolina basswood (*Tilia americana va. caroliniana*), Hop horn-beam (*Ostrya virginiana*) and other indicators with calciphilic tendencies. These indicators have essentially eastern distributions (as opposed to species typical of CEGR037530, which are more midwestern). A rich understory of herbaceous species may also be present, but this system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Open Ponds and Emergent Marshes (CEGR048010)

This ecological system includes upland ponds which retain water for long periods of year, at sufficient depth and duration to allow presence of truly aquatic species. In well developed examples, this system tends to develop zonal vegetation patterns with emergent vegetation zones forming around the periphery of deeper waters, which in turn tend to support various floating leaved and submersed aquatic vegetation such as Floating Hearts (*Nymphoides aquatica*, *Nymphaea odorata*), Watershield (*Braseni schreberi*), Coontail, (*Ceratophyllum spp*.), Duck Weed (*Lemna spp*.), Duckmeat (*Spirodela spp*.). Emergent zone plants may include Smart Weed (*Polygonum spp*.), Maidencane (*Panicum hemitomon*), Plumegrass (*Saccharum spp*.) and a variety of other species. In most of the region, natural ponds are exceedingly rare and invariably occur as small patches on the landscape. Most "natural" examples form as a result of beaver activity or other natural impoundments of flowing waters. A wide variety of successional environments have been created which appear to be floristically similar to natural examples. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Upland Depression Forested Ponds (CEGR034010)

This ecological system occurs in upland depressions on poorly drained, often fine textured soils. Much like swales in "flatwoods", these areas typically receive moisture from precipitation instead of overbank flooding. These areas retain water for shorter duration than do open ponds and emergent marshes and consequently develop woody vegetation layers. These areas can range in appearance from fairly open aspects with widely scattered trees to quite densely stocked with small diameter saplings and small trees. Typical woody species include Willow Oak (*Quercus phellos*), Bottomland Post Oak (*Quercus similis*), Pop Ash (*Fraxinus caroliniana*), and Mayhaws (*Crataegus spp*). This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Herbaceous Seepage Bogs (CEGR034710)

This small patch ecological system consists of herbaceous dominated seepage fed wetlands. This system may occur in settings similar to "Gulf Coast Baygalls and Bayheads", and differs primarily in lacking a substantial woody vegetation layer. It is unclear whether or not a key ecological process difference separates the two systems, although fire frequency is often presumed to be of importance. In some areas, herbaceous seepages may be rapidly encroached by vegetation in the absence of fire. In addition, most examples of this ecological system co-occur spatially with either the "shrubby" or densely wooded phase of Baygalls and Bayheads. Plant communities of this system range from bogs in which pitcher plants (*Sarracenia alata*) are potentially present (primarily Texas and Louisiana portions of the region), to those occurring outside the native range of pitcher plants. So called "muck bogs" of Texas, with a host of regionally rare species, and the local endemic Rough-stemmed Aster (*Aster puniceus var. scabricaulis*) are also found in this system.

Gulf Coastal Plain Carbonate Glades and Barrens (CEGR035010)

This system is found only on shallow carbonate soil exposures in the region. These areas are derived from chalky or glauconitic geology such as the Weches formation of eastern Texas. These areas are often sparsely vegetated, at least relative to surrounding areas. Overstory trees are often absent or represented by occasional stems of cedar (*Juniperus viginiana, Juniperus ashei*). This system provide habitat for at least 2 rare, locally endemic plant species; White Bladderpod (*Lesquerella pallida*), and Texas Glade Cress (*Leavenworthia texana*).

Gulf Coastal Plain Acidic Glades and Barrens (CEGR035010)

This system is exceedingly rare in the ecoregion, found only in association with the Catahoula geologic formation in eastern Texas. These areas support exposed sandstone or mudstone with sparse vegetation, surrounded by slightly deeper soils with prairie-like vegetation, and pockets or "mottes" of post oak (*Quercus stellata*). This system provides habitat for at least one rare, locally endemic plant; Branched Gayfeather (*Liatris cymosa*).

Gulf Coastal Plain Salt Glades and Barrens (CEGR035030)

This system occurs in association with the inland salt domes. Soils are highly saline (Natraqualfs) with predominately silty textures. Subsoils are often essentially cemented into an impervious hardpan by calcium. This condition contributes to alternate phases of extremely dry and extremely wet conditions (sometimes described as "xerohydric"). As with most glades and barrens, these areas are locally variable or zonal in appearance. An interior zone with patchy vegetation and abundant bare soil openings or "slicks" is usually present. Vegetation in this zone consists of mostly low growing forbs, many of them annuals, and many with "weedy" habits. Low, wet, shrubby zones may be present in some areas, while on the edges of sites, where the soil is deeper. This community may grade into hardwood or pine - hardwood forest, depending on the specific location. This system provides habitat for at least one rare, locally endemic plant; Geocarpon (*Geocarpon minimum*).

Gulf Coastal Plain Nepheline Syenite Glades and Barrens (CGER035040)

This small patch ecological system is only present on distinctive, massive outcrops of igneous substrate ("nepheline syenite") in Saline and Pulaski counties, Arkansas. Vegetation in these areas exhibits some degree of zonality. The outcrops themselves are relatively extreme environments for plant growth due to mild alkalinity, exfoliation of rock surfaces, and surface moisture and temperature fluctuations. They are sparsely vegetated with low-growing forbs, mosses, and lichens. Around the periphery on somewhat deeper, better developed soils vegetation cover is greater. Perennial grass cover and a diverse herbaceous layer is typical, along with a scattered, often stunted canopy of trees. This system provides habitat for at least one rare, locally endemic plant; Small-headed Pipewort (*Eriocaulon kornickianum*).

Gulf Coastal Plain Baygalls and Bayheads (CEGR036010)

This ecological system consists of densely wooded, seepage fed wetlands and adjacent (often shrubby) seepage slopes. These wetlands may occur in depressions, poorly developed upland drainages, toe-slopes, and small headwaters stream bottoms. These environments are prone to long duration standing water, and tend to occur on highly acidic, nutrient-poor soils. In most cases, these wetlands are embedded in uplands with deep sandy soils. When these communities are associated with streams, they tend to be low gradient, with narrow, often braided channels and diffuse drainage patterns. Due to excessive wetness, these habitats are normally protected from fire except those which occur during droughty periods. This system is not known to support any localized endemic or globally rare plant species.

Southeastern Coastal Plain Small Stream Forests (365 series)

This ecological system occurs in fairly small, mostly linear patches across the ecoregion, wherever small to intermediate sized perennial streams bisect the landscape. These areas have minor floodplains and valleys associated with well-developed channels. Flooding is infrequent and of shorter duration than larger rivers although available soil moisture and nutrient availability is usually high. Small areas of groundwater seepage supporting obligate wetland plants may occur, but overall, vegetation will closely resemble that of Pine and Pine-Hardwood Forests (CEGR030560). Characteristic trees include white oak (*Quercus alba*), Sweetgum (*Liquidambar styraciflua*), and loblolly pine (*Pinus taeda*). Well developed examples may exhibit a great degree of similarity to Mesic Acid Upland Hardwood Forests (CEGR031010) with species such American holly (*Ilex opaca*), American beech (*Fagus grandifolia*), and others**.**

Gulf Coastal Plain Patch Prairies (CEGR037520)

This system is characterized by naturally herb-dominated vegetation occurring over deep soils (as opposed to "glades and barrens"), with almost exclusively circumneutral surface soil pH. This system tends to occur in a matrix of acid soils, and forested vegetation although in some instances examples may co-occur spatially with other circumneutral communities locally (see CEGR037530, CEGR037540). Distinguished from related prairies to west (see CEGR051010) which occur in much larger patches across the landscape (at least historically), maintenance by somewhat more extreme disturbance regimes, and consequently support more typically midwestern species composition. The largest examples of this system are found in Southwestern Arkansas and known as blackland prairies. They include much more isolated and smaller patches

present primarily on the Fleming Formation of Texas and Louisiana. Nearly all examples are naturally isolated from one another due to large intervening areas of unsuitable habitat.

Gulf Coastal Plain Circumneutral/Calcareous Praire-Associated Upland and Slope Forests and Woodlands (CEGR037530)

This system consists of forests or woodlands on circumneutral, deep upland soils adjoining calcareous prairies characterized by a more extreme, basic pH than "Gulf Coastal Plain Circumneutral Upland Mesic Mixed Hardwood Forests." Such a characterization results in species composition more typical of Midwestern Prairie regions and less so of eastern deciduous forests. This system is also assumed to be more fire prone due to proximity to prairies. Edaphic and fire factors maintain fairly open canopies (typically < 60%). Typical woody species include; Durand Oak (*Quercus sinuata var. sinuata*), Shumard Oak, Chinkapin Oak, and Hawthorn (*Crataegus spp*.).

Gulf Coastal Plain Patch Circumneutral/Calcareous Praire-Associated Riparian Woodlands and Forests (CEGR037540)

This system consists of small stream/riparian influenced forests and woodlands on circumneutral soils. In all cases, these forests or woodlands adjoin calcareous prairies and/or calcareous forest (Compare with group small stream acid forests). These areas were likely subjected to frequent fires originating in adjacent calcareous prairies, thus in natural condition may have been more open and woodland in structure than closed forest. Vegetation indicators, such as Hackberry (*Celtis laevigata*), Shumard Oak (*Quercus shumardii*), Chinkapin Oak (*Quercus muehlenbergii*), Osage Orange (*Maclura pomifera*), and Soapberry (*Sapindus saponaria var. drummondii*) are indicative of calacareous conditions. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Backswamp/Slough Floodplain Forests (CEGR038510)

This system type may occur in floodplain depressions of major rivers throughout the ecoregion, and the entire southeastern Coastal Plain. These areas tend to occur in oxbows and/or abandoned river channels where they receive overbank flooding. Soils are most often fine-textured and are very poorly drained (often flooded for long periods of the year). Soil color is usually gray as a result of continual anoxia. Characteristic vegetation of this system includes trees that are tolerant of inundation, such as water elm (*Planera aquatica*), baldcypress (*Taxodium distichum*), and water tupelo (*Nyssa aquatica*). Herbaceous ground cover and shrub layers tend to be sparse or patchy. This system is not known to support any localized endemic or globally rare plant species.

Gulf Coastal Plain Bottomland Hardwood Forests (CEGR038520)

Bottomland hardwood forests are found within the active floodplains of large and small rivers of the ecoregion. Regular flooding occurs in the winter and spring. Local microtopography and location within the floodplain greatly influence the amount and duration of standing water as well as the amount of scour and alluvial deposition. Soils are locally variable as well. Deciduous hardwood species, often attaining large sizes, characterize forests in this system, with oak species being most characteristic. Characteristic species include water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), swamp chestnut oak (*Quercus michauxii*),

and overcup oak (*Quercus lyrata*) are commonly encountered. This system is not known to support any localized endemic or globally rare plant species.

Cross Timbers Upland Oak Forests and Woodlands (CEGR051010)

This system is dominated by upland oak vegetation found in the Post Oak Savanna and Cross Timbers natural regions, largely outside the native range of pine (excluding the "Lost Pines" area of Bastrop, TX). This system is the presumed historical matrix vegetation type along the western boundary of the ecoregion grading into the Cross Timbers ecoregion. Characteristic trees are Post Ok (*Quercus stellata*) and Blackjack Oak (*Quercus marilandica*). This system is broadly defined across site types, and could occur on nearly any upland soils except those which support prairies or other similar vegetation. This system is not known to support any localized endemic or globally rare plant species.

Crosstimbers Tallgrass Clay Prairies (CEGR052010)

This system represents upland prairies found in the Post Oak Savanna and Cross Timbers natural regions. As opposed to "patch prairies" listed previously, these prairies occupy large portions of the landscape (at least historically), and are typified by species composition more midwestern. In this ecoregion, Cross Timbers Prairies are present only in a narrow strip in eastern Texas often called the "Post Oak Savanna" natural region. This system is not known to support any localized endemic or globally rare plant species.

Aquatic Systems

Though all aquatic systems in upper west gulf coastal plain do not drain into the Mississippi River basin, all are zoogeographically classified in the Mississippi province (Moyle and Cech, 1998), and as such, contain the richest assemblage of fish and mussel species in the Nearctic region. Further, the lower Mississippi River basin is considered a glacial age species refuge, allowing for historic reoccupation and evolution throughout the range. Aquatic systems represented in the UWGCP include lacustrine systems as natural lakes, riverine systems as high-order/big rivers, and low-order/small streams, and seeps, and palustrine systems as sloughs and swamps. The majority of aquatic systems in the UWGCP are fluvial, and natural lakes are uncommon. Man-made lakes and impoundments are not included in this summary.

Low-order/small streams and rivers

Small streams originate in the ecoregion through surface and sheetflow-fed seeps and through sheetflow, groundflow, and surface flow drainage from adjacent ecoregions. Reaches of low-order streams and rivers originating in adjacent ecoregions (e.g., Ouachita Highlands) are considered more typical upland cold low-order streams. Low-order riverine systems begin the lowland fish faunal group, and offer the most diverse fish communities in the ecoregion. Substrates can be composed of sand, gravel, or cobble; and some form from decay of bedrock uplifts at ecoregional boundaries. Pool/riffle systems are a common feature of these systems. Water is commonly clear, and cool with medium gradients. These systems will flow into higher-order/big rivers directly and contribute to slough/swamp systems as well. These systems provide critical habitat for mussel communities and beds, many of which are species targets. Fish target

species found in low-order streams include suckers, chubs, shiners (e.g., taillight and blacknose shiners), redhorses, all target darters (Robison, 1988, Smith, 1992).

High-order/large rivers

Small streams feed into high-order larger rivers in the ecoregion, which in turn contribute to slough/swamp systems. Larger rivers are part of the Red, Mississippi, Sabine, or Trinity drainage systems. Transitioning from low-order streams, Gravel and cobble give way to sand and mud stubstrates. Upstream reaches of large rivers contain significant mussel communities. Sandbars on the main channels of large rivers, (.e.g., the Red River) are habitat for the endangered Least Interior Tern. Large river fish include some chubs and shiners, alligator gar, shovelnose sturgeon, and the paddlefish. Ecological processes in most, if not all large-order rivers in the UWGCP have been affected by locks, dams, dredging, or channelization.

Sloughs and Swamps

Sloughs and swamps occur throughout the ecoregion, in connection with both higher- and lower-order riverine systems. Wetlands occur with varying levels of saturation in the UWGCP, though the typical aquatic system considered here is a permanently-flooded cypress-tupelo swamp or shrub swamp. Attributes for consideration of terrestrial management of these systems is described and through terrestrial community planning. Fish communities are similar to those found in large-river and natural lake communities.

Natural Lakes

Most natural lakes in the UWGCP originated through riverine action, either as high-order cut-offs or meanders (i.e., oxbow lakes), however some formed from riverine systems that were naturally jammed from presettlement events. Caddo Lake is the largest natural lake in the ecoregion and is the remainder of the "Great Raft," in large series of log jams, lakes, and sloughs formed on the Red River. US Army Corps of Engineers cleared the Great Raft in the mid-1800s in an effort to open the Red River to navigation (McInnis, 1995). Natural lakes in the ecoregion are generally shallow with mud, sand or silt substrates. Common fish species include most gamefish; target species found at natural lakes include the alligator snapping turtle and the alligator gar. The dominant community complex surrounding natural lakes is the gulf coastal plain Plain Backswamp/Slough Floodplain Forest.

Conservation Goals and Rollout Data

Following is the rollout data for the UWGCP ecoregional plan first iteration; attached to this plan are more detailed reports of the rollout data, including a viable target occurrences captured by conservation areas, occurrence goal fulfillment status, and target breakdown by Global rank and type.

Rollout Information

Planning teams identified 78 portfolio conservation areas necessary to preserve the biodiversity in the UWGCP. Of the 130 targets, 20% or 26 met their established goals; 54% of the targets that met their goals did so by inclusion of expert recommendation/non-heritage occurrences. Of the 26 targets that met their goals, 35% were communities, 23% were plants, and 42% were animals.

72% made progress some progress towards their goals, that is, a portion of the occurrences necessary to complete a goal were met. The remaining 36, or 28% are not represented in the portfolio. Of the unrepresented targets, 6% were terrestrial communities; 55% were zoology targets, and 39% were botany targets.

Of the species that met their conservation goals 4% are ranked as G1. 12% are listed endangered or threatened, and 8% are ranked as G2. 7% of all G1 and G2 targets met their goals. 16% of the zoology targets, 30% of the community targets, and 17% of the plant targets met their goals.

The total approximate acreage of the portfolio conservation areas is 4,193,851. These sites compose approximately 16% of the ecoregion. It should be noted that this is a dynamic plan, influenced by the addition of new or missing data; and implementation at the site level; therefore this percentage or acreage should be considered an approximate minimum necessary to conserve biodiversity in the UWGCP.

Many, though not all conservation areas in the UWGCP contain areas that are already managed for conservation or protected by a state, federal, TNC, or other privately entity. However, rarely do these management areas encompass the entirety or even a majority of the individual portfolio sites. There are approximately 1,697,295 acres or 40% already under some kind of conservation or wildlife management within the ecoregion. 48 of the 78 have some protection component, while only 4 sites can be considered 100% protected. An additional 12 sites could be considered more than 50% protected. Of the areas in the portfolio conservation sites that are already managed for biodiversity, 1,447,496 acres or 85% is under federal management; 234,095 acres or 14% is under some form of state management; 15,704 acres or 1% is under TNC or other private conservation management. Table 1 provides a breakdown of protected areas within the portfolio.

Table 1: Basic Conservation Portfolio Breakdown	
Total square miles protected in the UWGCP portfolio	2,652
Total acres protected in the UWGCP portfolio	1,697,294
Total square miles of existing conservation areas	6,553

Total acres of existing conservation areas	4,193,851
Total square miles of landscape scale (> 20,000 acres) in UWGCP	6,144
Total acres of landscape scale conservation areas in UWGCP	3,932,196
Total square miles of federally managed lands in portfolio	2,262
Total acres of federally managed lands in portfolio	1,447,496
Total square miles of state managed lands in portfolio	366
Total acres of state managed lands in portfolio	234,095
Total square miles managed by TNC in UWGCP portfolio	25
Total acres managed by TNC in UWGCP portfolio	15,704

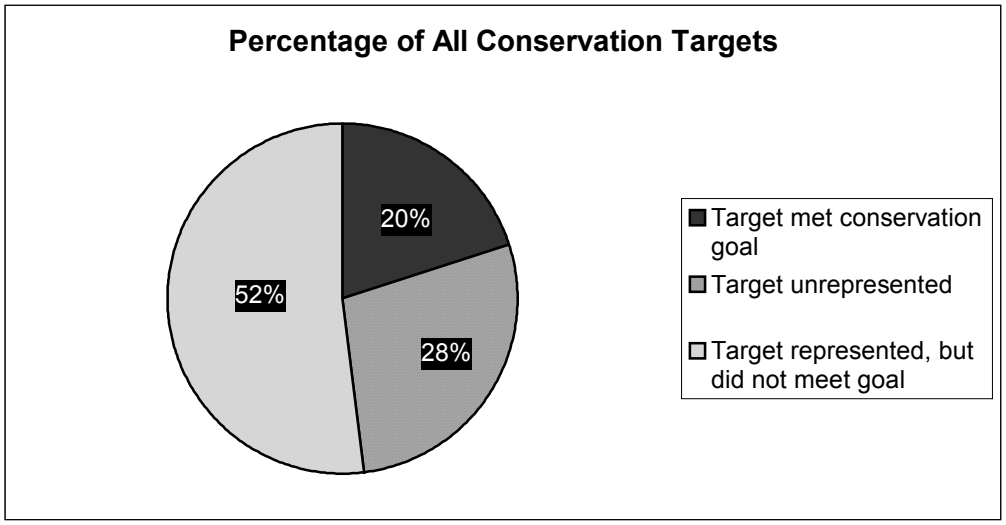
Table 2 provides a breakdown of species conservation targets by G-rank:

Target Type	G1	G2	G3	G4	G5	NA	Total
Animals	13	13	15	18	8	0	67
Plants	3	10	18	4	1	0	36
Terrestrial Communities	0	0	0	0	0	27	27
Total	16	26	33	22	9	27	130

Table 3 provides a geographic distribution of conservation targets:

Geographic Distribution	Terrestrial Communities	Animals	Plants	Total	Percentage of all targets
Endemic	13	9	6	28	22%
Limited	10	38	21	69	53%
Peripheral	1	2	0	3	2%
Widespread	3	18	9	30	23%
Disjunct	0	0	0	0	0%
Total	27	67	36	130	100%

Figure 1 illustrates the percentage of all conservation targets that met their goal, percentage of targets that did not meet their goal, and percentage of unrepresented targets in the portfolio.



Terrestrial Communities

The community team determined a total of 27 community targets; of those they found 13 endemic community targets, and 10 limited targets. Nine of the 27 community targets, or 30% met their goals. Three of the group targets are considered matrix communities, representing 2.3% of all targets for the UWGCP. 11 are considered large patch, and 13 are considered small patch communities. 33% of all terrestrial communities met their goal. 25 out of 27 terrestrial ecological systems are represented in the community targets. The community team set conservation goals based on groups due in part to significant data gaps for accurate association-level or alliance goal setting across the ecoregion; as such a transition to association-level management will be possible when the level and quality of data across the ecoregion is standardized.

Table 5 illustrates community targets met:

Spatial Pattern	Goals met / Total targets	Percent of targets meeting goals
Matrix	0 / 3	0%
Large Patch	4 / 11	36%
Small Patch	5 / 13	38%
Total	8 / 27	30%

Zoology and Botany Targets

Botany team determined that there were 36 plant targets. The botany team found 6 endemic targets, and 21 limited targets. 6 out of 36 or 17% of the plant targets met their goals.

Zoology team members determined that there were 67 animal targets. The zoology team found 9 endemic animal targets and 38 limited targets. 11 of the 67 animal targets, or 16% met their goal.

Table 4 lists the zoology and botany targets met by taxonomic group:

Taxonomic Group	Goals met / Total targets	Percent of targets meeting goals
Amphibians	1 / 3	33%
Birds	2 / 6	33%
Fishes	4 / 15	27%
Mammals	0 / 5	0%
Reptiles	2 / 2	100%
Crustaceans	0 / 13	0%
Insects	0 / 5	0%
Mollusks	2 / 18	11%
Total	11 / 67	16%

Aquatic Communities

62 sites, or 79% of the sites are considered aquatic sites or contain significant aquatic elements. 16 or 21% of the sites are primarily terrestrial sites. All aquatic sites should be considered as having a 10-acre buffer component. Since many terrestrial and aquatic sites are interdependent, many terrestrial sites and aquatic have been merged, making site conservation management efforts more efficient, coordinated, and holistic.

Stresses and Sources of Stress in the UWGCP

UWGCP technical expert teams participated in a Stresses and Sources of Stress assessment to determine and prioritize stresses on the ecological systems and portfolio conservation sites and to address their sources through implementation strategies. Stresses on systems and portfolio sites directly impact the ecoregional plan implementation and site conservation action plans. Results from this analysis were used along with priority ranking criteria to determine the ecoregion's action sites.

In order based on count, the three leading stresses for sites in the UWGCP are:
- habitat destruction or conversion;
- habitat fragmentation; and
- alteration of natural fire regimes.

Other stresses include:
- Altered composition/structure
- Altered hydrologic regime (flow, quantity, etc.)
- Excessive herbivory Habitat disturbance
- Nutrient loading
- Poor water quality (pollution, turbidity, etc.)
- Soil erosion
- Sedimentation
- Toxins/contaminants

The top three sources of stress by count are fire suppression, agriculture, and forestry/improper silvicultural practices. The top three combinations of stress and sources of stress are: fires suppression and alteration of natural fire regimes; forestry –improper silvicultural practices and altered composition/structure; and forestry—conversion and habitat destruction/conversion. Additional stressors in the UWGCP include:
- Biological (exotic species, disease, woody suppression)
- Commercial development
- Dams/reservoirs
- Dredging/diversions
- Forestry/conversion
- Improper management (e.g., managed for incompatible species)
- Industrialized livestock production
- Livestock grazing
- Recreation (includes off-road vehicle use, road/trail construction, trampling/overuse)
- Residential development
- Resource extraction – mining
- Resource extraction – oil and gas exploration and development
- Roads/construction
- Water pollution: non-point source
- Water pollution: point-source

Prioritizing Sites

Expert technical team members completed an action site evaluation matrix to arrive at the ecoregional action sites (included on data CD). The Number and Diversity of Targets field was derived from the data supporting the portfolio; Complementarity and Leverage fields were derived from data but were subject to adjustment by evaluation participants. Urgency/Degree of Threat and Feasibility/Opportunity to Abate Treat fields were similarly subject to change upon review; Biodiversity Health of Targets was the only completely subjective field to be completed by evaluation participants.

After the first round of action site review, there were 12 action sites in the UWGCP. An additional 18 sites scored highly enough to be considered secondary action sites.

Action Sites	Secondary Action Sites
Lorance Creek / Big Lake	Terre Noire
Nepheline Syenite Glades	Little Missouri and Lower Antoine Rivers
Pine Bluff Arsenal	Ross Foundation
Little River from Glover River to Millwood Lake	Nacatoch Ravines
Poison Springs	Palmetto Flats
Miller County Sandhills	Kingsland Prairie, Warren Prairie & Saline River, Ouachita River Terraces / Bastrop Ridge
Bayou Bartholomew	Sulfur River Wildlife Management Area
Caddo Lake Complex	Bayou Dorcheat
Tonkawa Sandhills/Naconiche Creek	Daingerfield State Park
Northern Sabine National Forest	Caney District, Corney Unit - Kisatchie National Forest
Davy Crockett National Forest	Caney District, Caney Unit - Kisatchie National Forest
Lower Trinity River	Bodcau
	Mill Creek Ranch
	Barksdale & Ammo Plant
	Bistineau Calcareous Forest, Bossier Point / Loggy Bayou
	Burkitt Foundation, Gus Engling Wildlife Management Area
	Camp Bette Perot
	Upper Neches River

The Action Site evaluation matrix was reviewed and adjusted at the implementation meeting. This review stemmed from an effort to move away from the yes/maybe/no categorization towards a level of prioritization to reflect the concept that all sites are action sites yet recognize some priority should be given to sites with the highest combination of diversity, health, and threats. Complementarity prioritization was performed according to Geography of Hope (TNC, 2000) as modified by participants who had performed similar prioritization evaluations for the Lower West Gulf Coastal Plain (Turner, 2001).

Sites where conservation will achieve the highest level of Complementarity

- Pine Bluff Arsenal
- Little River from Glover R. to Millwood Lake
- Nacatoch Ravines

- Kingsland Prairie, Warren Prairie & Saline River, Ouachita River Terraces / Bastrop Ridge
- Bodcau
- Caddo Lake Complex
- Barksdale and Ammo Plant
- Camp Bette Perot
- Davy Crockett National Forest

Sites where conservation will achieve the next highest level of Complementarity:
- Nepheline Syenite Glades
- Palmetto Flats
- Bayou Bartholomew
- Red River Macrosite
- Upper Sabine River Complex
- Tonkawa Sandhills/Naconiche Creek
- Mud Creek
- Northern Sabine National Forest

Prioritization of sites should not exclude conservation action at other sites identified in this planning process; especially when connectivity, functional landscapes and multi-site threats and strategies are considered. Note that most multi-site strategies will be most effective when implemented initially at sites with higher complementarity then at remaining applicable sites.

Ecoregional Plan Implementation

This section is provided to summarize the results of the UWGCP ecoregional plan implementation meeting and provide a starting point for implementation strategies throughout the ecoregion. These implementation strategies are designed to fulfill the mission of The Nature Conservancy of ensuring the survivability of biodiversity within the ecoregion by protecting the lands and waters the elements of biodiversity need to survive. Initial implementation will address multi-site strategies and multi-site threat abatement at action and other portfolio sites within the ecoregion.

Multi-Site Strategies

Multi-site strategies were developed to enable implementation of the ecoregional plan through clear, prioritized, cohesive measurable action. Participants in the multi-site strategy were asked to review literature and guidance pertaining to multi-site strategies, including relevant *Geography of Hope* chapters, implementation sections from other ecoregional plans, and the results of multi-site strategy meetings from other ecoregions. Initial activities were to review the major systems in the ecoregion, then review stresses and threats to determine multi-site stresses and their sources. The stresses/sources of stress assessment relied on the Geography of Hope definitions of a stress, source of stress, and threats[1]. For the purposes of this chapter and activity these definitions have been truncated: "stress" is defined as an ecological or biological element, i.e., sediments; "sources" are defined as anthropogenic, i.e., fragmentation or development; "threats" can be any combination of sources or stresses.

Ecoregional planning is translated to implementation through conservation action at individual sites and through implementation of multi-site strategies. Note that many multi-site strategies also address or link several threats. Multi-Site Strategies were developed through an iterative process of review and expert input/workshops. Major terrestrial and aquatic systems in the ecoregion were reviewed, then multi-site threats and top sources of stresses were developed and listed. Experts then identified multi-site strategies and developed each under a specific threat. Action items were identified for each strategy, and objectives were developed for each action item.

The following are system threats identified in the implementation experts meeting. Terminology was structured from the initial Geography of Hope based stresses/sources of stress analyses.

Terrestrial system threats:

- Conversion: Silviculture, Agriculture
- Agricultural conversion (present/historic)
- Incompatible Forestry
- Altered Fire Regime
- Conversion/destruction from commercial and residential development
- Roads and right-of-way construction

Aquatics system threats:

[1] *Stress*: something that impairs or degrades the size, condition, or landscape context of a conservation target, resulting in reduced viability; *Source*: a human or biological factor that infringes upon a conservation target that results in stress; *Threat*: the combined concept of stresses to a target and the sources of that stress to that target.

- Hydrologic alteration: dams/reservoirs, dredging, channelization, levees, Thermal pollution/alteration.
- Agriculture,
- Silviculture/incompatible forestry,
- Roads and right-of-way construction
- Extraction/mining, (mineral as well as water extraction)
- Non-point Source and Point-Source discharge
- Invasive species

The implementation team decided on the following as the top sources of stress:

Fire Suppression/Altered Fire Regime
Agriculture
Roads/Construction of Roads
Dams/Reservoirs
Residential and Commercial Development
Invasive Species

Forestry

The goal of the forestry multi-site strategy is to manage all applicable viable portfolio sites under a compatible program towards a targeted structure/composition within a functional landscape relative to TNC's portfolio conservation areas. The Forestry multi-site strategy addresses the following stresses:

- Altered composition/structure
- Habitat destruction/conversion
- Habitat fragmentation
- Nutrient loading
- Sedimentation

Compatible Forestry Strategy

The most efficient method of addressing these stresses is a compatible forestry strategy implemented across the ecoregion in conjunction with other compatible forest strategies in adjacent ecoregions. The concept behind the compatible forest initiative is that by becoming an active partner in forestry management, TNC can provide meaningful input to all partners, and build defensible data for targeted audiences demonstrating the economic and conservation feasibility of compatible forestry. TNC has identified three groups of forestry professionals to for initiative coordination: industrial foresters, public lands foresters, and private non-industrial forest landowners (PNIFLOs). It was determined that each group represents sectors of ownership for applicable portfolio conservation areas (PCAs), and successful implementation of the multi-site strategy requires a customized approach to each group. As the initiative matures, the program manager should consider compatible forestry demonstration areas for each of the three groups. Clearly defined demonstration area projects and monitoring will provide practical data targeted to group members, thus enabling buy-in to the concept, and therefore build capacity for outreach within each group.

The short-term objectives of the compatible forestry strategy initiative are

- Identify appropriate landholders within eligible PCAs
- ID appropriate national level programs at state-level implementation (e.g., forest legacy) to foster working cooperation.
- Develop relations with extension services

Further, as the initiative will be working on multiple levels with multiple entities, TNC resources should address the following program needs:

- Design and monitor demonstration areas to produce data useful to partners
- Support or introduce tax incentives and other opportunistic regulatory incentives to make the initiative more attractive
- Actively incorporate the initiative into public lands management and planning, especially through forestry plan revisions (USFS)
- Develop or partner with existing economic compatibility study to demonstrate effectiveness and connectivity in an effort to build a national and even
- Assist landowners, particularly PNIFLOs, in classifying their lands through SFI

The compatible forestry initiative should create working demonstration areas in each landowner group to build capacity towards the long-term goal of the initiative, which is to implement compatible forestry with all applicable landowners within portfolio conservation areas. In order to accomplish this goal, the initiative requires action on several levels to many audiences. An immediate need is to design and begin gathering useful data so that partner buy-in and cooperation is established; partners must be presented with data that shows in their terms that compatible forestry is economically as well as environmentally feasible. This assessment should include an appropriate risk analysis. External relations activities should address tax incentives, and identify and actively support other regulatory measures designed to make compatible forestry more attractive to partners.

Critical to the compatible forestry initiative and the demonstration activities in particular is quality information and data dissemination. As targeted towards PNIFLOs, information dissemination should include:

- Success stories
- Workshops
- Consultant/professional organization education
- Mitigation funds tie-in

Further, the initiative should make use of existing systems to disseminate data and promote the initiative. Initiative managers should also investigate the applicability of mitigation funds coordination.

Certification through professional organizations such as American Forest and Paper Association's Sustainable Forestry Initiative (SFI) and Forest Stewardship Council's (FSC) certification towards ISO 9000 standards, and any American Forestry Association standards should be addressed. Professional organizations should be provided the opportunity to use TNC's Compatible Forestry Initiative as a vehicle for their SFI and ISO 9000 certification programs. An opportunity also exists for TNC to review partners and certification standards, and pursue adjustment of those standards if necessary. The initiative will be most efficient if it is able

to reach the entirety of its intended audience; an effort should be made to identify and involve nonparticipating entities as well as non-certified landowners.

The scope of Compatible Forestry Initiative objectives may be best explored through each group's specific need. An overarching need is to identify lead staff within TNC and initiate compatible forestry action; if a full-time manager is to be used, then a job description and terms of reference should be created from this text; further, interim measures should be identified and initiated.

PNIFLOs

- ID owners/partners in PCAs. Some already identified are Winrock, Ross Foundation.
- Develop landowner incentives: private lands strategy
  --tax credits for practices, PNI certification process
  --state forestry and consultant training
- Involvement in state forestry councils/committees
- Develop relations with extension service
- Demonstration sites, field reps
- Identify "niche" partners, markets
- Involvement in government programs

Industrial Forestry Interests

- Develop regional support structure
- Identify certification and professional organization contacts.
- Determine / develop regional and national support and organizational implications
- Explore FWI levels of expertise model and public forest model for long-term organization structure
- Develop and perfect forestry management model in this ecoregion that can be exported to other ecoregions

Public Lands

- Review agency operations guidelines
- Build "unified front" towards agency credibility
- Initiate public lands liaison activities; include state forestry commissions and farm bureaus as well as federal partners
- Align and coordinate with regional FWS offices and management plan
- Assist public lands in filling their data gaps, especially inventory
- Align Compatible Forestry Initiative with USFS forest management plans; incorporate Compatible Forestry Initiative into USFS forest management plans
- Coordinate and initiate government-relations interaction for forest management plan alignment and generation of necessary MOUs
- Review and develop strategy and policy that addresses inholdings
- Gain input to / align with State/federal acquisitions policy and strategies—relates directly to inholdings

Agriculture

The goal of the agriculture multi-site strategy is threefold: successfully prevent excessive sediments and contaminants from entering targeted aquatic communities; successfully prevent incompatible agricultural practices or conversion, and to restore or reforest agricultural lands where applicable. It was generally agreed that agricultural activities have the greatest impacts on bottomland hardwood forest and aquatic systems; though it was also noted that agriculture-related stresses related to upland systems warranted review. The agriculture multi-site strategy addresses the following threats:

- Habitat destruction/conversion
- Habitat fragmentation
- Nutrient loading
- Sedimentation
- Altered Hydrologic Regime
- Non-point source pollution (i.e., FIFRA-related runoff)

The agriculture multi-site strategy addresses stresses emanating from three general types of agriculture. Each general type may require specific or custom approaches:

- Combined Animal Feeding Operation (CAFOs)
- Row Crops
- Pasture

Strategic action can be considered in terms of restoration and prevention activities. Prevention activities concern runoff prevention. Both restoration and prevention activities invite cross-cutting partnerships with neotropical and game migrants, invasive species, fragmentation abatement, and compatible forestry incentives.

Multi-site strategies involving prevention action include:

- Identifying runoff areas in targeted watersheds
- Developing a sediment budget for targeted watersheds
- Develop TNC's roll as a source of credible information to relevant state and federal government sources; e.g., federal EPA, state DEQs, Soil and water agencies, and farm bureaus.
- Use roll as credible information source to initiate conversion disincentives at local, state, and federal regulatory and government levels.
- Link external relations and outreach activities with Compatible Forestry Initiative incentives

Multi-site strategies for agricultural restoration areas

- Identifying and partnering with existing programs, including but not limited to WRP, CRP, FWS, LWCF, Gulf Wings, DU, RC&D, NRCS
- Identifying restoration areas and best management practices (BMPs) for partnership involvement
- Promoting or supporting funds acquisition for FWS to restore agricultural lands
- Pursuing carbon sequestration on restoration/reforestation areas with conservation-centered carbon sequestration guidelines:

Action Items:

- Direct state and federal incentive programs towards PCA success; assess and ID strategic reforestation through existing programs.
- Pursue and direct disincentives to address conversion
- Actively participate in carbon sequestration implementation as well as rules and regulations.
- --coordinate runoff prevention items program w/ NRCS, state agencies

Fire

The Goal of the fire multi-site strategy is to restore the range of appropriate fire regimes where fire is a natural process at portfolio areas. The major stress addressed is alteration or removal of a natural fire regime, or inadequate or incorrect application of a prescribed fire practice. The greatest barrier to threat abatement is a misunderstanding on many levels of alteration of natural fire regime, as evident through the following sources:

- Lack of historic background or data of natural fire regimes
- Risk and liability issues/fear of loss of life, property, and wildland aesthetics
- Continuation of suppression-oriented management and policy

Restoration of a natural fire regime will occur in the public and private arenas. The multi-site fire restoration strategy should initiate fire restoration demonstration sites in both arenas; to do so, TNC must continue to build capacity for fire restoration, promote fire policy towards ecological restoration, educate policy makes as well as landowners and land managers. Additional external relations should promote contract burns for private landowners and investigate costshare efforts for burning. The multi-site strategy for this ecoregion will mirror the strategy and action of the national TNC fire restoration strategy, including adoption of modified measures of success:

- ID appropriate federal, state and local fire managers and ensure their education on the role of fire in maintaining biodiversity at those sites
- Restore fire to 25% of applicable portfolio conservation areas considered moderately to severely altered
- Participate in fire restoration demonstration projects at appropriate sites according to national plan.
- Promote fire restoration literature as an education tool for land managers and land owners.
- Incorporate standardized fire restoration and adaptive management protocols to appropriate portfolio conservation areas.

Roads and R-O-Ws/Road Construction

The goal of the roads/right of way (ROW) multi-site strategy is to prevent stresses caused by road/ROW construction by reducing road/ROW construction in targeted areas, and ensure roads/ROWs that are built and maintained in targeted areas are done so with the least impact possible. Stresses from road/ROW construction include:

- Habitat destruction
- Habitat fragmentation
- Sedimentation
- Altered Hydrologic Regime

- Non-point source pollution

Note that ROWs include all rights of way for transportation, utilities, and mineral extraction activities. The roads/ROW multi-site strategy is focuses on preventing additional road/ROW building in portfolio sites or applicable adjacent areas, and ensuring that roads/ROWs that are constructed with those areas minimally impact conservation targets. Much of the road/ROW strategy uses education and external affairs activities.
Prevention and minimal impact assurance will use

- Promotion and discussion of the ecoregional plan to identified partners, including
  - federal and state highway authorities,
  - state and local planning authorities,
  - heritage programs,
  - utilities entities
  - mineral extraction companies.
- Coordination with the compatible forestry initiative towards instituting best management practices (BMPs) when roadbuilding for forestry activities
- Use of access restrictions, where appropriate
- Establishment of TNC as reliable, science-based environmental data source to above audiences

There is opportunity for crossover of management responsibility here to the compatible forestry multi-site strategy and the fire multi-site strategy. Fire implementers will incorporate the roads/ROW strategy when working with stakeholders to educate and develop procedures for burning around utility and extraction ROWs. Compatible forestry initiative implementers will incorporate compatible road building and maintenance BMPS when working with public, private, and forest partners. There is further opportunity for crossover with the freshwater aquatics multi-site strategy in working with road/ROW stream crossings to ensure their accessibility in ephemeral, high-order, or headwater streams.

An immediate need for implementation of this multi-site strategy was realized in the planning for the I-69 corridor, which will run through the ecoregion. Strategy implementers will attempt to ensure I-69 impacts UWGCP portfolio sites minimally if at all, through preventative planning. Implementers will share the ecoregional plan's areas of significant biodiversity with all levels of appropriate planning entities and agencies.

Road Construction/ROW Action Items:

- Develop federal partnerships—esp. SENRLG
- Develop TNC's information lobbying capacity at the division and state level to all relevant partners. Develop MOUs for early preventative planning.
- Share PCAs with state heritage and DOTs,

Dams/Reservoirs

The goal of the Dams/Reservoirs multi-site strategy is to ensure no new dams, reservoirs, or impoundments are constructed in the ecoregion, and to promote a conservation regime at existing altered systems. The threats addressed through this multi-site strategy are:

- Altered Hydrologic Regime
- Habitat destruction/conversion
- Habitat fragmentation
- Thermal pollution

Prevention and compatible use of existing structure are again the two directions of action for this multi-site strategy. As a preventative measure, again a major element of this strategy is the establishment of TNC as a data source, and the use or preventative planning through promotion/sharing of the areas of significant biodiversity to all appropriate entities, including

- Levee boards,
- River and water authorities
- Drainage districts
- Regional planning groups

Plan implementers should first prioritize areas where new construction will be most damaging—i.e., where a new dam or reservoir would constitute a "killer threat." MOUs could be created for eligible priority areas to be purchased and transferred to federal entities to discourage new construction, currently a provision in federal regulations. A crossover to agricultural BLM action items exists here, in that BLH areas to be acquired and transferred to federal entities should be prioritized in an effort to discourage new reservoir sites. External relations should build cooperation with FWS towards this action item.

As an external relations activity, promotion of the economic benefits of alternative water use regimes should be initiated.

Additional crossover activity exists with the Roads/ROW Construction Multi-Site Strategy, in the promotion of TNC Areas of Significant Biodiversity and availability of TNC as an impartial reliable science-based information source. Preventative planning can be occur through involvement with the Southeast Natural Resource Leaders Group (SENRLG).

Working with existing structures should involve the identification of impoundments affecting priority areas of significant biodiversity, determining natural range and variation of instream flow, and finally working with impoundment authorities towards a flow restoration program.

Action items under the dams and reservoirs multi-site strategy include:

- Work with water/reservoir authority to restore natural range and variation of instream flows
- ID and manage for conservation areas slated for impoundment; prioritize PCAs for this planning.
- Investigate and determine water policy for each state; develop information lobbying capacity here as well.

Residential/Commercial Development

The goal of the residential/commercial development multi-site strategy is to promote sustainable development throughout the ecoregion. The threats addressed by this strategy are:

- Habitat destruction/conversion

- Habitat fragmentation
- Sedimentation
- Non-point source pollution
- Point-source pollution (sewage)

The success of this multi-site strategy lies primarily in preventative measures. As such, a number of partnership opportunities are available towards implementation.

- Tax incentives
- Forest Legacy Programs
- Zoning board influence
- Wildlife exemptions
- External relations and highest/best use category avoidance
- Local land trust development

Crossover exists in this strategy again with the external relations work done under the sustainable forestry strategy towards state-level development of forest legacy programs. Crossover also exists in preventative planning for Roads/ROWs that provide development access to priority areas. External relations are primarily focused on local, county and regional outreach: reclassification of property tax/assessment and zoning use of highest/best use formats; revising state, county or local tax incentives away from sprawl and towards urban redevelopment; property tax wildlife exemptions; and work with state agencies towards focused wildlife exemption incentives. Opportunities with local land trusts, in fostering or partnering, exist; assistance may also be available from state DEQ outreach offices, such as the Arkansas Watershed Advisory Group. In certain areas, it may be beneficial to promote TNC-friendly individuals towards zoning board seats.

Action items include

- Develop state forest legacy programs towards PCAs
- Address tax incentives/disincentives and additional opportunities for informational lobbying
- Identify existing local land trusts and watershed groups as well as areas where local land trusts or watershed groups would be beneficial.
- Identify areas where TNC members or partners can provide tangible benefits by sitting on zoning boards to tax boards.

Invasive Species

The goal of the invasive species multi-site strategy is prevent damage or conversion to native species and communities by minimizing invasive species' spread and exposure. Invasive species strategy addresses the following threats:

- Altered composition/structure
- Excessive Herbivory
- Altered Hydrologic Regime
- Altered Fire Regime

Multi-site management of invasive species will again take the form of both a preventative and active stewardship strategy. The species and their corresponding damage or potential damage from invasive species needs to be identified at areas of significant biodiversity; buffer areas may be required as well. The invasive species workgroup will identify these species and prioritize the conservation areas for action. At sites invasive species control measures will be instituted if the have not already. There exists an opportunity for strategic crossover again between the invasives and the fire restoration multi-site strategy. Preventative actions may also include external relations towards providing information to state agriculture, wildlife, and trade authorities on preventing certain invasive species from entering a state, and focused education of industry and wildlife professionals towards the use, release, or control of invasive species.

Action Items:

- Identify "bad exotics" – i.e., those altering community structure
- Identify portfolio conservation areas at risk from identified invasive species
- Determine distribution of invasives concerned
- Establish partners towards removal/prevention of invasives at PCAs
- Work with other multi-site strategies that address invasives

Data Gaps

Identification and conclusion of data gaps were determined to be a multi-site strategy by the implementation group as the lack of data in certain areas was seen as an impediment for action items under other strategies. The goal of the data gaps multi-site strategy is to identify and fill data gaps preventing the full or accurate execution of other multi-site strategies. The following data gaps were raised during the implementation meeting:

- Aquatic community type and flow requirements for small and large rivers
- Determine role of ground water and aquifer action in surface water related action items: specifically as it relates to agriculture and forestry to include withdrawal as well as point source/non-point source contribution factors. Determine effects of groundwater depletion on terrestrial and aquatic communities
- Identify invasives to be managed, determine extent and potential damage, distribution.
- Identify industrial forestry landholders in portfolio conservation areas
- Identify agricultural uplands composition, location, historic context; determine multi-site strategic implications, if any.
- Determine composition, saturation, application, structure, longevity of FIFRA–related runoff (i.e., any chemical regulated by FIFRA) and its effects on targeted species and communities. Determine Best Management Practices as necessary.
- Identify and fill data gaps that TNC's partners may have on sensitive areas as well as potential mitigation areas (i.e., provide federal, state and local transportation authorities science based data on TNC-identified areas of significant biodiversity towards prevention of fragmentation as well as reception of mitigation efforts).
- Inventory targets not meeting goals from ecoregional plan– primarily crayfish, mussels, and xeric sandhill plants. CBC staff and multi-site strategy leads should review plan and determine applicable targets.

- Determine extent of migratory bird data gaps and partner with relevant agencies/entities to address. Continue partnership with Lower Mississippi River Valley Joint Venture Group (LMRVJVG) Habitat evaluation/Landscape Analysis
- Fill data gaps ecoregion-wide that were identified in the planning process, including targets and viability. Seek additional funding or partnerships as necessary. Though important, this data gap should not prevent multi-site strategies from moving towards implementation.
- Identify additional partners towards multi-site strategy implementation including academic and local county, state, regional, and federal partners.
- As measures of success at portfolio sites will incorporate biodiversity health, threat abatement, and program capacity, determine data gaps for each three areas per site that are not filled by a multi-site strategy and work towards their conclusion.

Multi-Site Strategies Reference and Comparison Table

Multi-Site Strategy **Compatible Forestry Initiative**	Goal: Manage all applicable viable portfolio sites through compatible forestry towards a targeted structure/composition within a functional landscape Establish TNC credibility as a forestry stakeholder / player through data, meaningful forest product, and conservation results	Short-Term Objective: Begin initiative; identify partners, choose demonstration sites and begin management actions; design monitoring protocol for results meaningful to partners.	Long-Term Objective: Use demonstration sites in PNFLO, industrial, public lands to show compatible forestry is economically and ecologically feasible.
	Threats addressed: • Altered composition/structure • Habitat destruction/conversion • Habitat fragmentation • Nutrient loading • Sedimentation	Year 1 Action Items: • ID and categorize landholders in PCAs • ID appropriate national level programs at state-level implementation and state-level program eligibility (i.e., forest legacy); initiate activities towards making compatible forestry economically attractive to private and industrial partners • Develop relations with extension services • ID criteria and monitoring protocol for meaningful data gathering and economic assessment input; initialize monitoring at demo site • Begin development of compatible forestry initiative at 1 PCA; write business plan • Initialize focused/useful economic assessment	Year 3 Action Items • Attain functional compatible forestry initiative site representing each landowner group; public, industrial, PNIFLOs • Implement tax/government incentives so that compatible forestry is more attractive to landowners • Provide results of national-level cooperation in initiative • Develop relationships with regional partners • Have compiled initial 2 years of monitoring data towards economic assessment
	Overall Action Items: • Certification • Compatible forestry • Public lands management (fire, roads, forestry practices, liaison (MOUs), • Demonstration sites		

Multi-Site Strategy: **Compatible Agriculture**	Goal Prevent soils and contaminants from entering water system. Prevent incompatible conversion. Pursue restoration/reforestation of agricultural lands.	Short-Term Objective • Develop specific agriculture action strategies (see below) and link initiative with compatible forest and aquatic strategies. • Establish compatible agriculture as desirable agricultural management option to identified partners; grow support for TNC as an agriculture partner/friend.	Long-Term Objective • Establish TNC as credible carbon sequestration entity for BLH restoration/ reforestation • Lead carbon sequestration efforts for conservation • Establish TNC as agricultural runoff / conversion solution source	Overall Action Items • Direct state and federal incentive programs towards PCA success; • Assess and ID strategic reforestation through existing programs. • Pursue and direct disincentives to address conversion and fragmentation • Actively participate in carbon sequestration implementation as well as regulations and standards-making.
	Threats Addressed • Habitat destruction/conversion • Habitat fragmentation • Nutrient loading • Sedimentation • Altered Hydrologic Regime • Non-point source pollution (FIFRA-related runoff)	Year 1 Action Items • Develop runoff prevention strategy; ID runoff prevention areas • Develop bottomland hardwood (BLH) restoration and reforestation (R&R) strategy; identify agencies and partners • Develop link to compatible forestry • Develop feasible carbon sequestration action plan and biodiversity parameters/ considerations • Ensure exported biodiversity specifications used in carbon sequestration policy • ID external affairs functions: strategic watershed review • Determine sediment budget and link information with appropriate partners, agencies • Export runoff prevention and BLH R&R strategies to appropriate partners, stakeholders • ID of preventative and R&R watersheds with sediment and nutrient budget and restoration characterization goals • ID of partners and business plan for approach	Year 3 Action Items • Show positive ecological influence in carbon sequestration guidelines • Establish working agreements or MOUs with local, state and federal agencies involved with BLH R&R efforts • Develop BLH R&R pilot sites in Identified areas with carbon sequestration elements. • Successful reduction in sedimentation and nutrification by amount determined in year 1 at target sites. • Have developed conversion strategy with active partnerships	

Multi-Site Strategy **Fire Restoration Program**	Goal Restore range of appropriate fire regimes where fire is a natural process to all applicable areas	Short-Term Objective • Build capacity for fire restoration • Reduce number of moderately to severely altered sites • Begin education and policy actions • Initiate cooperative programs	Long-Term Objective • Eliminate site status of moderately to severely altered • Show progress in education and policy arenas through MOUs, education attendance; show cooperative burn partners	Overall Action Items • Promote fire policy towards ecological restoration • Educate policy makers, landowners, land managers • Promote contract burns • Promote costshare efforts
	Threats Addressed • Alteration or removal of natural fire regime (habitat alteration) • Inadequate or incorrect application of a prescribed fire practice	Year 1 Action Items • Restore fire regime to 25% applicable portfolio sites considered moderately to severely altered • Enroll at least 3 participants from each private, public landowner representation in cooperative burning or education programs s	Year 3 Action Items • Restore fire to 50% of applicable portfolio sites considered moderately to severely altered; • by 5th year, to 100% of same. • Show MOUs or contracts	

Multi-Site Strategy **Roads/R-O-W Construction**	Goal Reduce road/ROW-based stresses through reduction in targeted areas, ensure road/ROWs that are built are maintained compatibly	Short-Term Objective Develop TNC's role as science-based info provider to targeted sources; ensure PCAs not damaged by Road/ROW construction	Long-Term Objective Divert any new road/ROW from PCAs; ensure existing roads/ROWs in PCAs are maintained compatibly	Overall Action Items • Develop TNC's role in I-69 planning and mitigation • Develop relationship with state DOTs • Comment on any proposed roads/ROWs affecting PCAs • Work with compatible forestry initiative to ensure logging roads and public roads in state/national forests are constructed maintained compatibly • Work with fire initiative to determine BMPs for prescribed burning around utility / extraction ROWs
	Threats Addressed • Habitat destruction • Habitat fragmentation • Sedimentation • Altered hydrologic regime • Nonpoint source pollution	Year 1 Action Items • Develop presence as science-based resource/partner to state DOTs and federal partners • Ensure TNC listed as concerned party for all ROW/road EISs near PCAs • Participate in federal joint preventive planning/mitigation effort • Establish MOUs w/ state DOTs towards receipt of mitigation consideration for other new roads/ROWs • Review procedure and enforcement of ecologically compatible BMPs concerning runoff by state; determine additional action as necessary • ID all stream crossing that inhibit fish movement	Year 3 Action Items • Management agreements with owners of all ROWs in PCAs • Establish TNC science to state DOTs, MOUs for recognition of PCAs • Crossover action with compatible forestry • In appropriate PCAs, ensure accessibility for large wide-ranging targets in preparation of reintroduction • Identify existing stream crossings that inhibit fish migration and retrofit • Work with DOT, federal partners to ensure new stream crossings are compatible	

Multi-Site Strategy **Dams / Reservoirs**	Goal Promote conservation regime in altered systems affecting PCAs Ensure no new impoundments	Short-Term Objective Bring ecological management regime to existing impoundments	Long-Term Objective Bring all existing PCA-related impoundments under ecological management Prevent any new impoundments to	Overall Action Items ID PCAs where new impoundments would be "killer threats" ID PCAs where current impoundments cause thermal pollution and flow issues Develop and execute MOUs for PCA-related impoundments;
	Threats Addressed • Altered hydrologic regime • Habitat destruction • Habitat fragmentation • Thermal pollution	Year 1 Action Items • Identify impoundments that could affect PCAs • Identify areas where impoundments are being considered that could affect PCAs • Develop ecological management MOUs for half of existing impoundments • Continue Development of TNC's role as science source and mediator in impoundment issues •	Year 3 Action Items • All ecological management MOUs developed • Use monitoring from ecologically-managed impoundments to promote further activity as necessary • Continue TNC's role as science-based info source/mediator; promote alternative water management regimes	

Multi-Site Strategy: **Residential/ Commercial development**	Goal Promote sustainable development throughout the ecoregion. Prevent development from threatening PCAs	Short-Term Objective Establish sustainable development as a priority for TNC; establish TNC as credible partner in topic	Long-Term Objective Show measurable influence in planning, education fields concerning sustainable development	Overall Action Items • Develop state forest legacy programs towards PCAs • Address tax incentives/disincentives an additional opportunities for local lobbying • Identify existing local land trusts and watershed groups; also areas where such entities would be beneficial. • Identify zoning board presence opportunities
	Threats Addressed • Habitat destruction/conversion • Habitat fragmentation • Sedimentation • Non-point source pollution • Point-source pollution (sewage)	Year 1 Action Items • Identify potential partners at all scales • Identify tax and zoning opportunities • Show influence to state forest legacy programs in AR, TX, OK, LA through compatible/sustainable measures • Identify tax incentive/disincentive opportunities and contacts in states; develop state/local/regional incentive/disincentive strategy • Identify existing local land trusts and watershed groups near/in all PCAs; begin/strengthen relationships • Assist in establishing new land trusts/watershed alliances where needed • Begin marketing watershed advisory group model to TX, OK, LA	Year 3 Action Items • Establish partnerships with land trusts and watershed alliances at related to half of all PCAs • Reduce tax unsustainable incentives; enhance sustainable development incentives; show progress towards eliminating "highest/best use" concept • Export watershed advisory group to other state governments; establish 1 additional state watershed advisory group or equivalent • Assist in placing partners or representatives on local zoning boards; establish influence on zoning boards in areas where PCAs are most at risk of incompatible development. • Involve national external affairs to raise awareness of issue and begin partnership/education at higher level.	

Multi-Site Strategy **Invasive Species**	Goal Prevent damage or conversion to native species and communities by minimizing invasives' spread and eliminating invasives at PCAs	Short-Term Objective Identify and begin elimination of invasives at all PCAs	Long-Term Objective Develop partnerships/programs to ensure exposure to invasives is minimized at all PCAs.	Overall Action Items • Identify "bad exotics" • Identify PCAs at risk • Determine distribution, extent of damage from exotics • Establish partners towards removal/prevention of invasives at PCAs • Work with other multi-site strategies that address issue
	Threats Addressed • Altered composition/structure • Excessive herbivory • Altered hydrologic regime • Altered fire regime	Year 1 Action Items Identify type and extent of invasives and damage at PCAs Initialize activity at all PCAs not already active in invasives control Establish ecological methods as preferred control where necessary Identify and propagate local partnerships in invasives control (e.g., LA's hogs)	Year 3 Action Items Positively influence state governments in invasive species control measures (e.g., TX parks and wildlife) Secure funding from state agencies towards control	
Multi-site Strategy **Data Gaps**	Goal Identify and conclude data gaps	Short-Term Objective Address data gaps identified in this iteration of ecoregional plan for UWGCP	Long-Term Objective Show significant progress, if not conclusion, to all data gaps listed in this iteration of plan	Overall Action Items See list in section in ecoregional plan

	Threats Addressed Conservation inaction at PCAs where data gaps occur	Year 1 Action Items • Fully describe aquatic communities • Identify invasives to be managed • Identify industrial forestry landowners, PNIFLOs in PCAs • Characterize uplands agriculture • Characterize/complete data gaps on sensitive areas for partners; include potential mitigation areas • Inventory targets not meeting goals from ecoregional plan; primarily crayfish, mussels, xeric sandhill plants • Characterize target crayfish habitat and life ecology • Determine level/extent migratory bird gaps and partner with relevant agencies • Fill data gaps relating to target • Identify partners on all levels as called for in above multi-site strategies	Year 3 Action Items • Determine role of groundwater and aquifer action in surface water related action items, specifically related to agriculture and forestry • Determine effects of GW depletion on terrestrial and aquatic communities • Determine composition, saturation, application, structure, longevity of FIFRA related runoff and BMPs	

Ecoregional Boundary and Management Decisions

The management regime of certain areas of the UWGCP will be changed due to various terrestrial and aquatic community requirements, which are described below. Graphic representations of these agreements appear in Appendix 2.

Bayou Bartholomew. Previously the Bayou Bartholomew watershed was divided by the ecoregional boundary between the UWGCP and the Mississippi River Alluvial Plain (MSRAP). Until this boundary is officially changed, UWGCP will be considering the entire Bayou Bartholomew watershed as defined by EPA Hydrologic Unit Catalog number 8040205 under its management strategy. UWGCP conservation planning in this watershed will be coordinated with management efforts in MSRAP.

Longleaf Pine. An 420-square-mile piece of longleaf pine community in Bienville Parish, Louisiana, was previously included in the UWGCP. This area contains viable longleaf pine, xeric woodland, baygalls and bayhead communities, and Louisiana Pine Snake, Yellow Brachycercus mayfly, Red-Cockaded Woodpecker, Soxman's milk-vetch, and Mohlenbrock's Umbrella-sedge occurrences. As the defining physiographic feature between upper and lower gulf coastal plains, it was determined that this longleaf pine community should be managed under the Lower West Gulf Coastal Plain's conservation strategies.

Red River West. The Red River and its drainage within HUCs 11140101, 11140103, 11140102, and 11140105 will not be managed under this ecoregional plan. This area of the Red River is more closely aligned with the higher stream reaches upriver and the communities are more aligned with the neighboring ecoregion. Aquatic occurrences in this reach are more representative of upstream communities and are not typical of the Red River in the UWGCP.

In an effort to promote management consistency across ecoregional lines, and recognizing that some communities and portfolio conservation areas are shared by ecoregions, UWGCP planners have made an effort to delineate those areas and work with surrounding ecoregions to jointly form and implement conservation strategies. Those areas include:

WGCP	UWGCP
Central Sabine National Forest	Davy Crockett National Forest (RCW cluster)
Weches Glades	Sabine National Forest (RCW cluster)
Angelina River Bottoms, West	Jackson/Bienville Wildlife Management Area
Long King Creek	

Conservation Goals: Methodology Issues

Use of EOs. Expert teams used lists of state tracked, State ranked, federally listed, and globally ranked species to create target lists, the results of which were used to query state heritage data for element occurrences (EOs). The ecoregional planning conceptual process required the results of these EO requests to be analyzed for viability, and expert teams would then use viable EOs as the foundation from which to build conservation portfolio sites. Please see Appendix 3, Data Management Plan/Methodology for a detailed explanation of the process. Please see Appendix 10 for a list of expert teams.

Significant EO-related data gaps related to state heritage program data were recognized during the viability process. Common data gaps encountered included data missing on individual elements or occurrences, tracking inconsistencies between participating states, or the obsolescence of EOs (i.e., last observation over 20 years). Please see Appendix 4, Data Gaps and implications section for a full discussion.

Overall all planning teams attempted to set quantitative conservation goals. Target goals that defaulted to "all viable" were then given a minimum amount of 5 for nonendemic and 10 for endemic elements. In the rollout data, any conservation targets retaining an "all viable" goal were changed to the actual number of viable goals found.

When creating the portfolio conservation areas for the UWGCP, EOs were used as a threshold for consideration and as a measurement of the site. The primary selection factor for portfolio conservation areas was the ability to capture an ecological function, not simply a cluster of viable EOs. However, monitoring of the EOs at these ecologically functional sites will provide a measure of success for plan and site conservation implementation.

Due to the age and accuracy of heritage EO data, approximately 800 proto-EOs were generated based on technical team experience at a certain portfolio conservation area or citing from relevant literature. Initial proto-EOs were created for obsolete EOs where technical experts could vouch for their viability. Additional proto-EOs were built throughout the site selection process as the question "what other elements occur at this site?" was posed. Proto-EOs were generated during the initial site selection meeting and refined during both portfolio conservation area reviews following that session.

Species distribution during target selection, and goal setting was derived from initial state heritage EO reports or ABI Natureserve data. Some distribution data was weighted according to an occurrence's global rank, as distribution data may not accurately reflect the abundance of a species; for example, though Red Cockaded Woodpeckers are considered widespread in distribution, they are either very rare and local throughout its range, or found locally (G3). Further, the Woodpecker is federally listed as endangered, yet its distribution is ranked as widespread.

Many of the portfolio sites, if properly managed, will provide habitat for species currently extirpated at those sites and possibly in the region. Such management occurs at the site

conservation plan level, but effort should be made in future iterations of this plan to identify, discuss, and manage for those extirpated elements. Further, some sites or parts of sites were created as "placeholder" sites if: insufficient data for habitats or species existed; an element occurrence was non-viable or unverified, yet experts knew of adjacent viable habitat for that element not yet recorded; or if habitat or type locality indicated restoration possibilities for elements. The identity and extent of permanence of these sites will become evident during each site conservation planning event.

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