

Gulf Coast Prairie

Landscape Conservation Cooperative

2012 Development and Operations Plan



Cover photo by Earl Nottingham, TPWD.

Gulf Coast Prairie Landscape Conservation Cooperative

Preface

This Development and Operations Plan (plan) is a living document which is expected to evolve as the Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) partners engage, dialogue, and mature. The plan provides a platform from which to operate in a new era of conservation. The North American Model of Conservation, as successful as it has been for over a century, is at a turning point. To prepare for the dramatic changes that are coming, we must rethink and strategically position our conservation efforts on this landscape of mostly private lands. As we get ready for this next century of change, we will be tasked to respond with actions that will truly be an immense test of our collective wisdom and innovation.

The landscape of the GCP LCC is one of the most naturally and culturally diverse areas of North America; coastal marine and estuary, vanishing prairie, Tamaulipan Brushlands, and the parched watersheds and aquifers throughout beg for large-scale stewardship that transcends our traditional administrative and political boundaries. Coupled with a rapidly growing population, the challenges and complexities for this cooperative at times appear impossible to contain—but manage we must.

Recognition

The initial effort to develop this plan, through further refinement by a newly formed Steering Committee, has created a vision with a true sense of collaborative ownership. There was a genuine team approach—more than 50 people had a direct hand in writing the initial draft and ultimately what is now in our current plan. Federal, State, and nongovernmental partners, through an initial Advisory Team and then through the establishment of the Steering Committee, formed many new concepts and thoughts which all touched the development of this plan. Without the infusion of the partnership, the provision of excellent photographs, the writing and editing skills of the USGS Lafayette Publishing Service Center (Beth Vairin, Victoria Chacheré, and Natalie Trahan), and the support of leaders like Benjamin Tuggle and Carter Smith, the quality of this document would not be possible. I look forward to these challenges and find myself humbled by the opportunity to work with such an outstanding group of people whom I consider friends, mentors, and colleagues.

—Bill Bartush, Coordinator, Gulf Coast Prairie
Landscape Conservation Cooperative

T*his Gulf Coast Prairie landscape is a very important piece of the North American continent—a virtual hub for conservation issues; our collaborative efforts are critical to bridging conservation efforts east and west, north and south. It is my intent for this Development and Operations Plan to be a blueprint for delivering science across this magnificent landscape. I am truly committed to making this GCP LCC a success.”*

—Dr. Benjamin Tuggle, Southwest
Regional Director of the U.S. Fish and
Wildlife Service

W*e face many challenges in the years ahead . . . the landscape around us is changing . . . our farms, ranches, and timber land held in families for generations are being subdivided and sold in smaller parcels. Land fragmentation can result in long-term impacts to ecosystems and native habitats, compelling us to work together for the conservation of what is left.”*

—Carter Smith, Executive Director of
Texas Parks and Wildlife Department
and Chairman of the GCP LCC Steering
Committee (from *Letter to the People of
Texas—Land and Water Plan*)

Acknowledgments

The primary author of this document is William Ostrand (U.S. Fish and Wildlife Service [USFWS] Biologist, Coastal Texas Zone), who was aided by Barry Wilson (USFWS Acting Coordinator, Gulf Coast Prairie Landscape Conservation Cooperative [GCP LCC]). Members of the GCP LCC interorganizational Advisory Team participated in development of the outline, identified important content, provided some text, and reviewed the document. The GCP LCC Advisory Team consists of Tim Anderson (USFWS, Coastal and Partners for Fish and Wildlife Programs), Jim Boggs (USFWS, Louisiana Ecological Services), Mike Carloss (Louisiana Department of Wildlife and Fisheries), Glenn Constant (USFWS, Fish and Wildlife Conservation Office), Jim Giocomo (American Bird Conservancy [ABC], Oaks and Prairies Joint Venture), Mary Gustafson (ABC, Rio Grande Joint Venture), Kelly McDowell (USFWS, South Texas Refuges), Tom Moorman (Ducks Unlimited, Southern

Regional Office), Jay Pruett (The Nature Conservancy of Oklahoma), Jeff Raasch (Texas Parks and Wildlife Department [TPWD]), Scott Robinson (Southeastern Aquatic Resources Partnership), Martha Segura (National Park Service), Allison Shipp (U.S. Geological Survey), Rex UMBER (Oklahoma Department of Wildlife Conservation), Donald J. Voros (USFWS, Southwest Louisiana Refuges), and Barry Wilson (USFWS, Gulf Coast Joint Venture).

Advisory Team members had only a brief opportunity to review this document. Their continued involvement will be essential in continuing to refine this plan and otherwise advise the development of the GCP LCC until the Steering Committee replaces or ceases the Advisory Team function. Others who participated in development of this plan include Mark Parr (USFWS, Gulf Coast Joint Venture), John Huffman (USFWS, Coastal Program), and Chris Pease (USFWS, Southwest Regional Chief of National the Wildlife Refuge System). We also thank Greg Esslinger (USFWS, Southwest Region Migratory Bird Program) and Mike Ray (TPWD) for providing helpful suggestions on an earlier draft.



Accomplishments

October 8, 2010 – Refined draft Development and Operations Plan (plan) to USFWS Southwest and Southeast Regional Offices.

Late October 2010 – USFWS Southwest Region draft plan to USFWS Washington Office (WO); draft plan was distributed broadly to stakeholders.

November 2010–January 2011 – Received comments on plan from the wider audience review.

February–April 2011 – Incorporated comments received into the revised plan and began organizing initial Steering Committee.

March 16, 2011 – Convened Steering Committee informational meeting at North American Wildlife and Natural Resource Conference, Kansas City, Mo.

June 14–15, 2011 – Convened invitational Steering Committee meeting, Austin, Tex. Approved Development and Operations Plan with revisions, governance, and science charter added.

July–December, 2011 – Steering Committee active (conference calls and November 8–9 meeting); Steering Committee reviewed work of the Strike Team and made recommendations to fund seven priority science projects (\$850,000 in total).



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Gulf Coast Prairie *Landscape Conservation Cooperative*

2012 Development and Operations Plan

Introduction

The Gulf Coast Prairie region consists of a suite of unique ecological regions facing major biological challenges (fig. 1). This diverse landscape once had extensive grassland systems that are now impacted by urban encroachment and agricultural development, large river systems with at-risk watershed integrity and base flows, and coastal systems impacted by human-made coastal manipulations and reduced freshwater inputs. Pollution, invasive species and disease, and other threats or stressors hinder ecological function and jeopardize native species and habitats. The causes—human population growth, urban expansion, agriculture, and industrial development—continue to expand. A changing climate compounds these threats, accelerated by demands for energy, including the development of alternative energy sources. Hence, the Gulf Coast Prairie region requires urgent assistance to maintain, enhance, and preserve its exceptional and singular landscape features and biodiversity.

The Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) is intended to operate under the framework of *Strategic Habitat Conservation* (SHC) to provide the *best* science and management information necessary to the GCP LCC Steering Committee and partnership to meet current and future conservation challenges. GCP LCC partners, leaders and managers alike, can through the SHC process make well-informed, science-based decisions at the appropriate scales to enhance priority species populations and their habitats.

Landscape Conservation Cooperatives (LCCs) are a network of applied science and conservation cooperatives that function at a landscape scale (fig. 1). They seek to provide the best science to managers to make informed decisions at the appropriate scales to enhance wildlife populations and their habitats. LCCs are partnerships between the U.S. Fish and Wildlife Service, the U.S. Geological Survey, other Federal agencies, States, tribes, nongovernmental organizations (NGOs), universities, and other entities within a defined geographic area.

This preliminary Development and Operations Plan (plan) describes the form and function of the GCP LCC. The GCP LCC will focus the work of the partnership through the basic components of adaptive management or, to be more specific, a defined landscape-scale conservation strategy which will include the five elements of SHC (fig. 2).



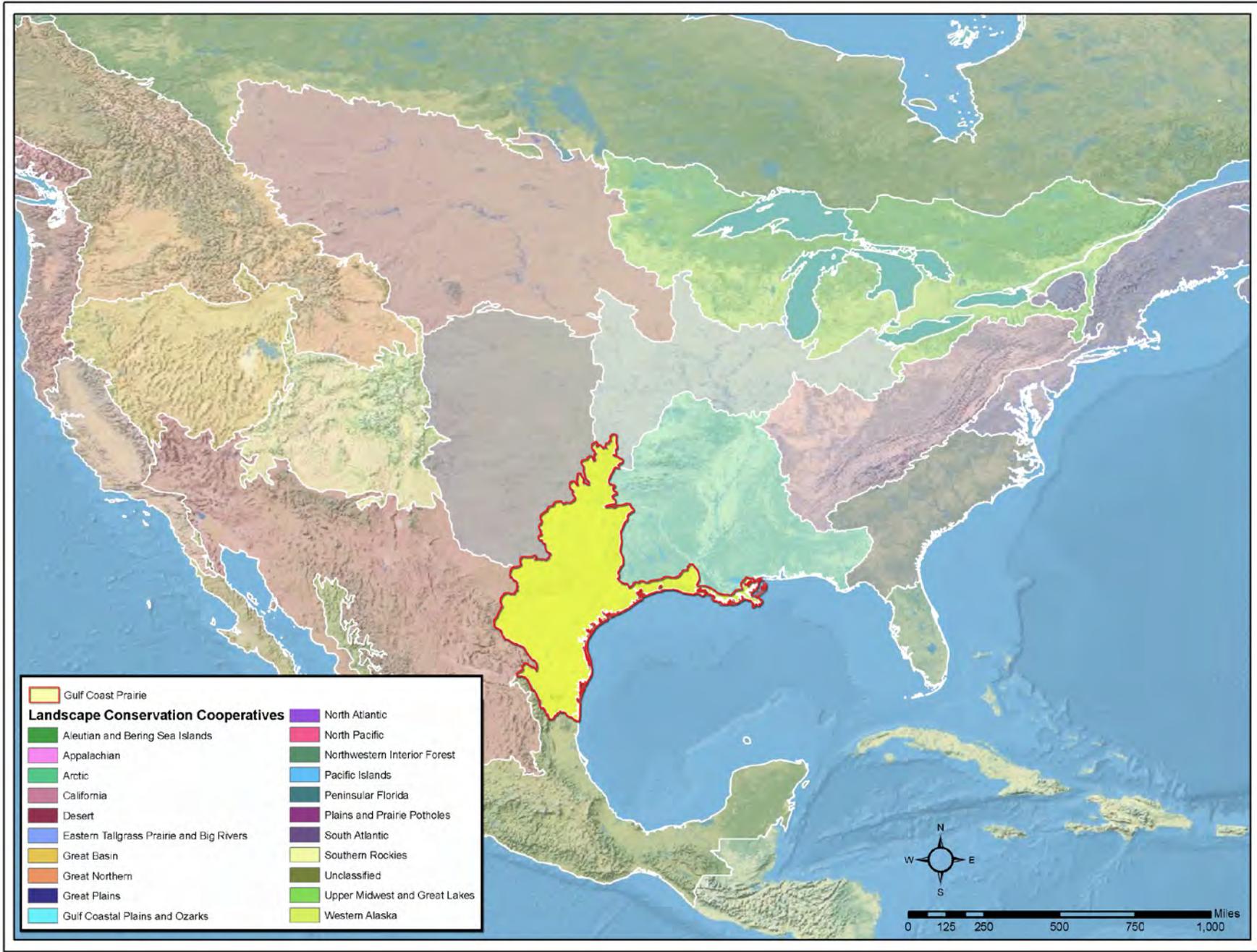


Figure 1. The Gulf Coast Prairie Landscape Conservation Cooperative in relation to other cooperatives in the contiguous United States.

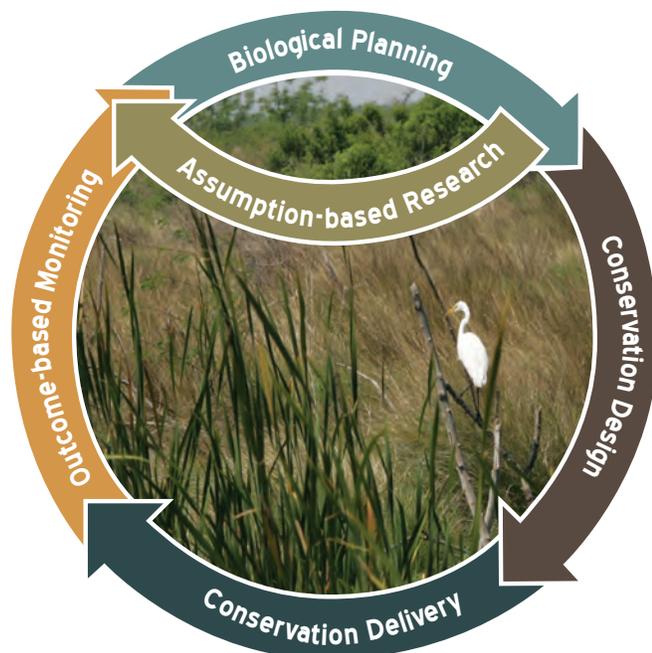


Figure 2. The five elements of Strategic Habitat Conservation.
 Element 1: Biological Planning: Set targets/goals.
 Element 2: Conservation Design: Develop a plan to meet the targets/goals.
 Element 3: Conservation Delivery: Implement the plan.
 Element 4: Outcome-based Monitoring and Adaptive Management: Measure success and improve results.
 Element 5: Assumption-based Research: Increase knowledge and understanding through iteration (repetitive looping) of all five elements in conjunction with one another.

GCP LCC Partners

Background 2010

The GCP LCC Advisory Team, developed in 2010, is composed of participants from the USFWS, National Park Service, USGS, Gulf Coast Joint Venture, Rio Grande Joint Venture, Oaks and Prairies Joint Venture, Southeast Aquatic Resources Partnership, Texas Parks and Wildlife Department, Louisiana Department of Wildlife and Fisheries, Oklahoma Department of Wildlife Conservation, Ducks Unlimited, and The Nature Conservancy. From its inception, this partnership has involved representatives of its stakeholders, and through a workshop held in Austin, Tex., in September 2010, the Advisory Team compiled the initial Development and Operations Plan.

Status 2011

The initial plan was further distributed and discussed through June 2011. Through conference calls and meetings from February through June 2011, the plan was distributed and the partnership expanded to include additional Federal and nongovernmental organization (NGO) partners such as the National Oceanic and Atmospheric Administration, the Natural Resources Conservation Service, and The Conservation Fund. Communication with the Mexico conservation community was initiated during the summer 2011 Trilateral Meeting. In June, the Steering Committee (partnership) was formally established, and a draft governance document (app. A) was drafted, which identifies the scope and the direction of the partnership. The GCP LCC has developed from the small initial Steering Committee that will allow for subsequent growth, as needed, to meet the mission (app. A) of the cooperative and at the discretion of the Steering Committee. The GCP LCC Steering Committee (app. A) currently includes one representative from each of the following partner organizations:

- Ducks Unlimited
- Gulf Coast Joint Venture
- Louisiana Department of Wildlife and Fisheries
- Oaks and Prairie Joint Venture
- Oklahoma Department of Wildlife Conservation
- Reservoir Fish Habitat Partnership
- Rio Grande Joint Venture
- Southeast Aquatic Resources Partnership
- Texas Parks and Wildlife Department
- The Conservation Fund
- The Nature Conservancy
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Department of Commerce National Oceanic and Atmospheric Administration
- U.S. Department of the Interior National Park Service
- U.S. Department of the Interior U.S. Fish and Wildlife Service (Regions 2 and 4)
- U.S. Department of the Interior U.S. Geological Survey

GCP LCC Future

Engagement of a broad array of partners across the GCP LCC area is essential for success of the cooperative, and such engagement will take numerous forms. Some potential GCP LCC partners will have interests or missions that are primarily other than conservation (e.g., municipalities, corporations, landowners, river authorities, and philanthropic organizations) but hold local influence or interest in conservation and are most likely to participate in the cooperative at the scale of specific projects or programs. Universities and research institutions will have common interests with the cooperative that will most likely coalesce around specific collaborative research. Other partner groups whose engagement will be critical are those that hold broad conservation missions likely to be consistent with GCP LCC goals (e.g., some land trusts, some Federal agencies, and urban connect-to-nature organizations) but are without an explicit mission or responsibility to wildlife, fisheries, or plant populations. Some potential GCP LCC partners will be those entities whose conservation interests or missions are species specific and/or span only a small portion of the GCP LCC geography (e.g., some land trusts, species recovery groups, local prescribed-fire cooperatives, and public lands “friends” groups). They are likely to participate in activities of the cooperative that pertain only to their species and/or locale of interest, but engagement with such groups will be essential. The GCP LCC is also expected to lean heavily on multiorganizational partnerships (e.g., bird habitat joint ventures, State prescribed-fire councils, and invasive species councils) that have accepted responsibility for all aspects of strategic habitat conservation across substantial portions of the GCP LCC geography for broad taxonomic groups. Additionally, deep engagement through Steering Committee participation is anticipated among a small group of organizations that typically share broad wildlife missions or responsibilities across substantial portions of the GCP LCC geography, typically make management decisions regarding their conservation lands, and are expected to share in the investment of the cooperative well beyond projects or programs.

Other forums within the GCP LCC will be developed to invite and engage participation of the broader conservation community. A few examples of additional potential partners from this broader conservation community include the following:

- Federal agencies such as the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers;
- State agencies such as the Texas Commission on Environmental Quality and the Louisiana Office of Coastal Protection and Restoration;

- River authorities such as the Mississippi River Commission and the Rio Grande Regional Water Authority;
- Threatened and Endangered Species recovery teams such as the Attwater’s Prairie Chicken and Ocelot teams;
- NGOs such as the Native Plant Association of Texas and Coastal Conservation Association;
- Land trusts such as the Land Trust of Southeast Louisiana and Katy Prairie Conservancy;
- Science institutions and universities;
- Corporations;
- and the many private landowners throughout the GCP LCC area.

By using new and shared resources, the GCP LCC can help partners to (1) organize known and needed information and data; (2) acquire appropriately scaled climate, habitat, and species data; (3) measure, model, predict, and monitor effects of stressors such as climate change on ecological systems, habitats, communities, and species; and (4) target and implement effective conservation measures to reinforce ecosystem resiliency.

Description of the GCP LCC Area

The GCP LCC area encompasses portions of five States (Texas, Oklahoma, Louisiana, Mississippi, and Kansas) (fig. 3), a number of Federal agency regions, and four terrestrial ecoregions (Edwards Plateau, Gulf Coast Prairie, Oaks and Prairies, and Tamaulipan Brushlands) (fig. 4) ([http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm#State Map](http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm#State%20Map)). The area is envisioned to eventually also include portions of three Mexican States (Tamaulipas, Nuevo Leon, and Coahuila). The 100-million-acre area is ecologically diverse and topographically complex (fig. 5) with several different land-cover types represented within each ecoregion (table 1). The GCP LCC includes several large river systems, including the lower Rio Grande, Guadalupe, Brazos, Trinity, Nueces, Sabine, Arkansas, Red, San Antonio, and Mississippi Rivers (see figs. 6 and 7 for water resource boundaries). There are several units of tribal and public lands within the GCP LCC; however, their areas and extents do not dominate the landscape (fig. 8).

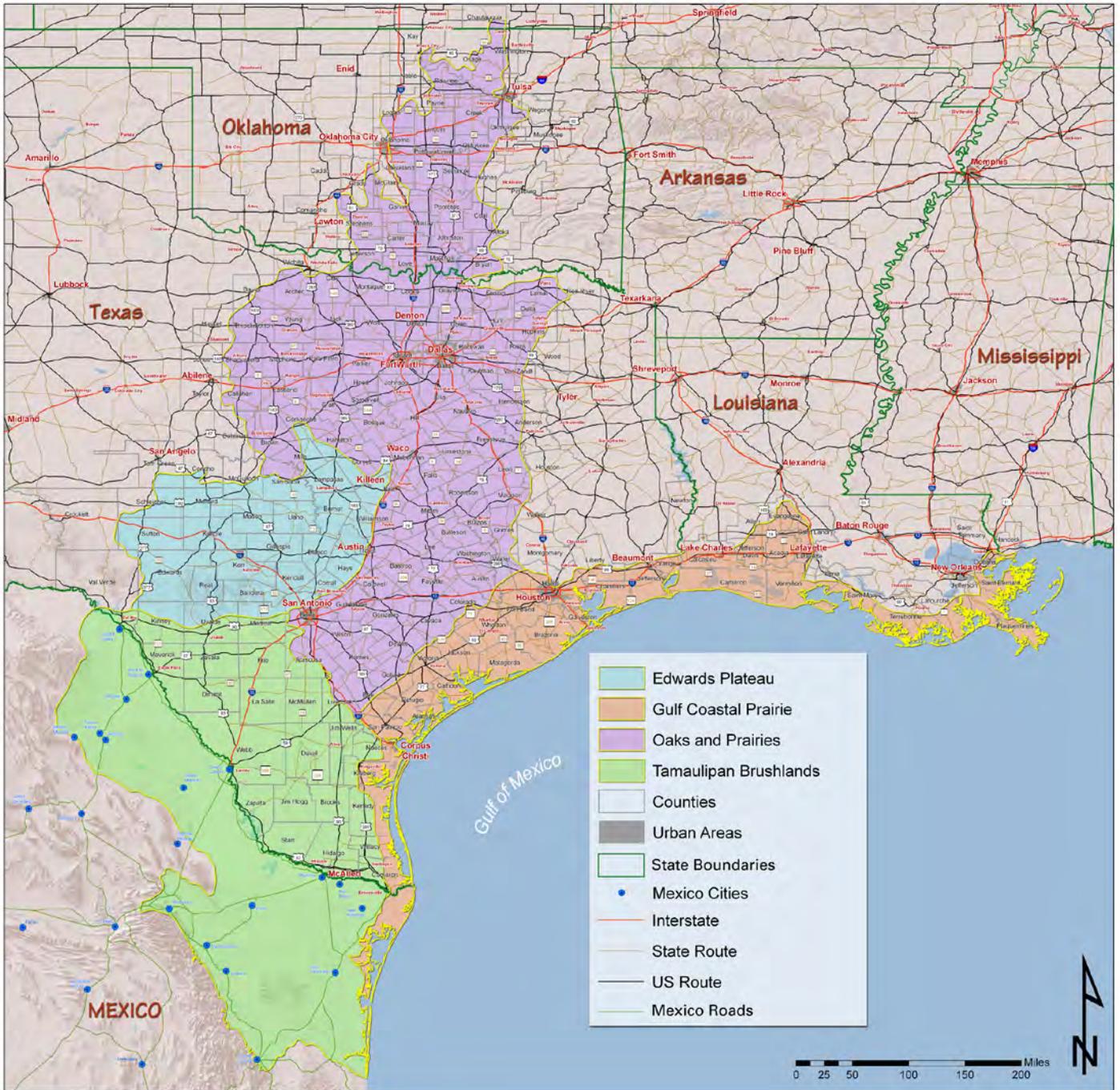


Figure 3. The Gulf Coast Prairie Landscape Conservation Cooperative depicting roads and urban areas.

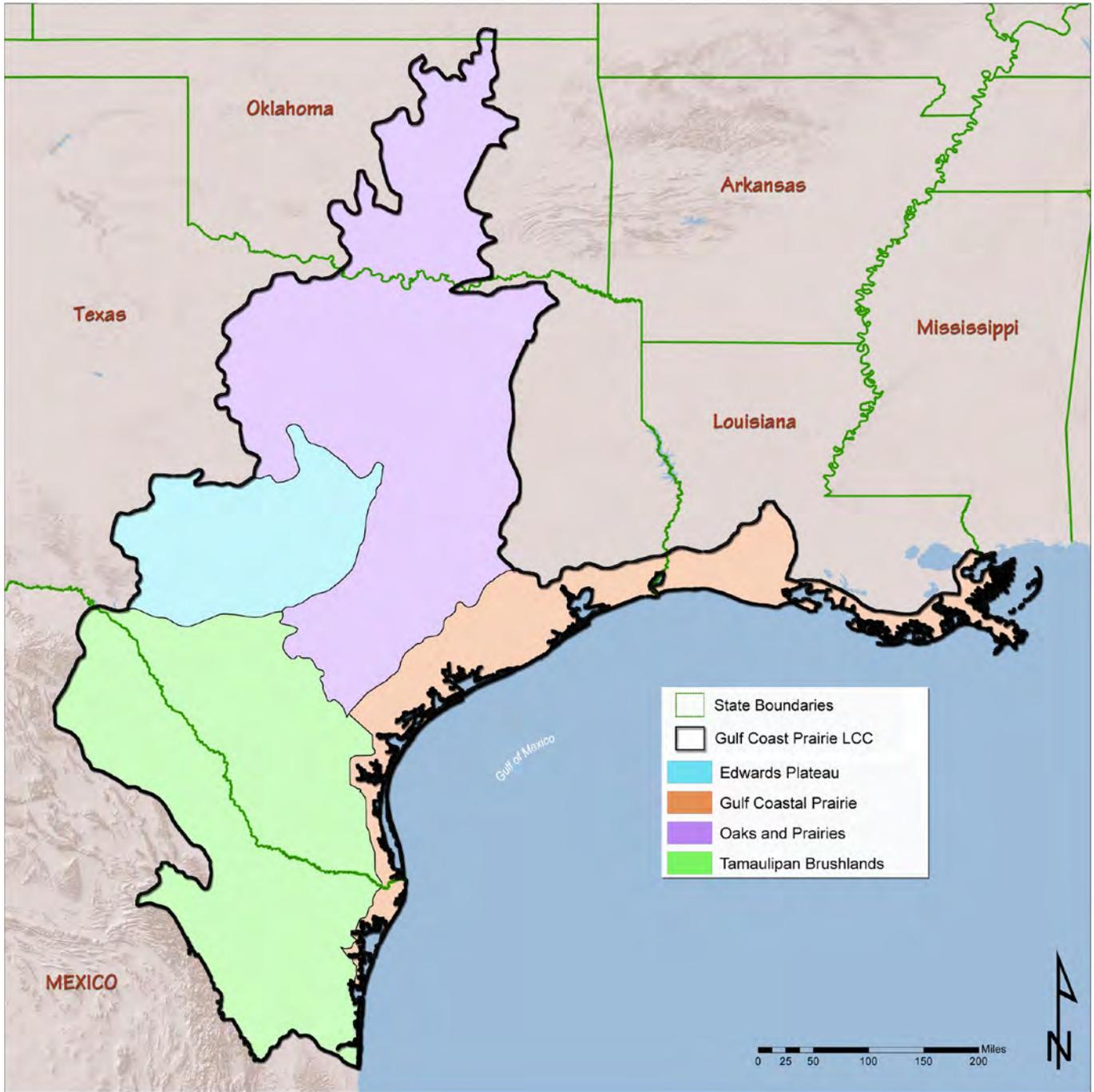


Figure 4. Gulf Coast Prairie Landscape Conservation Cooperative depicting the four ecoregions.

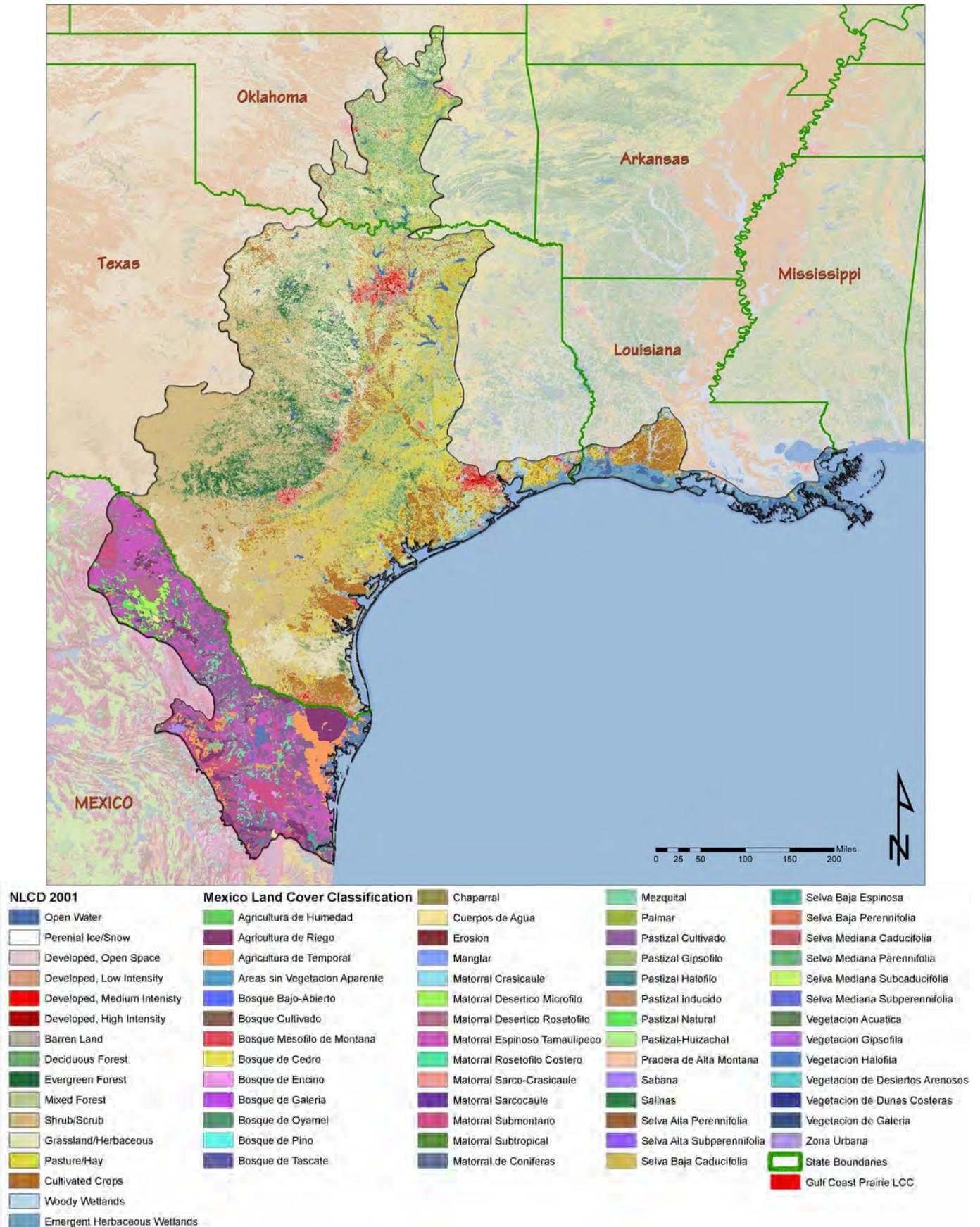


Figure 5. The Gulf Coast Prairie Landscape Conservation Cooperative depicting land-cover types.

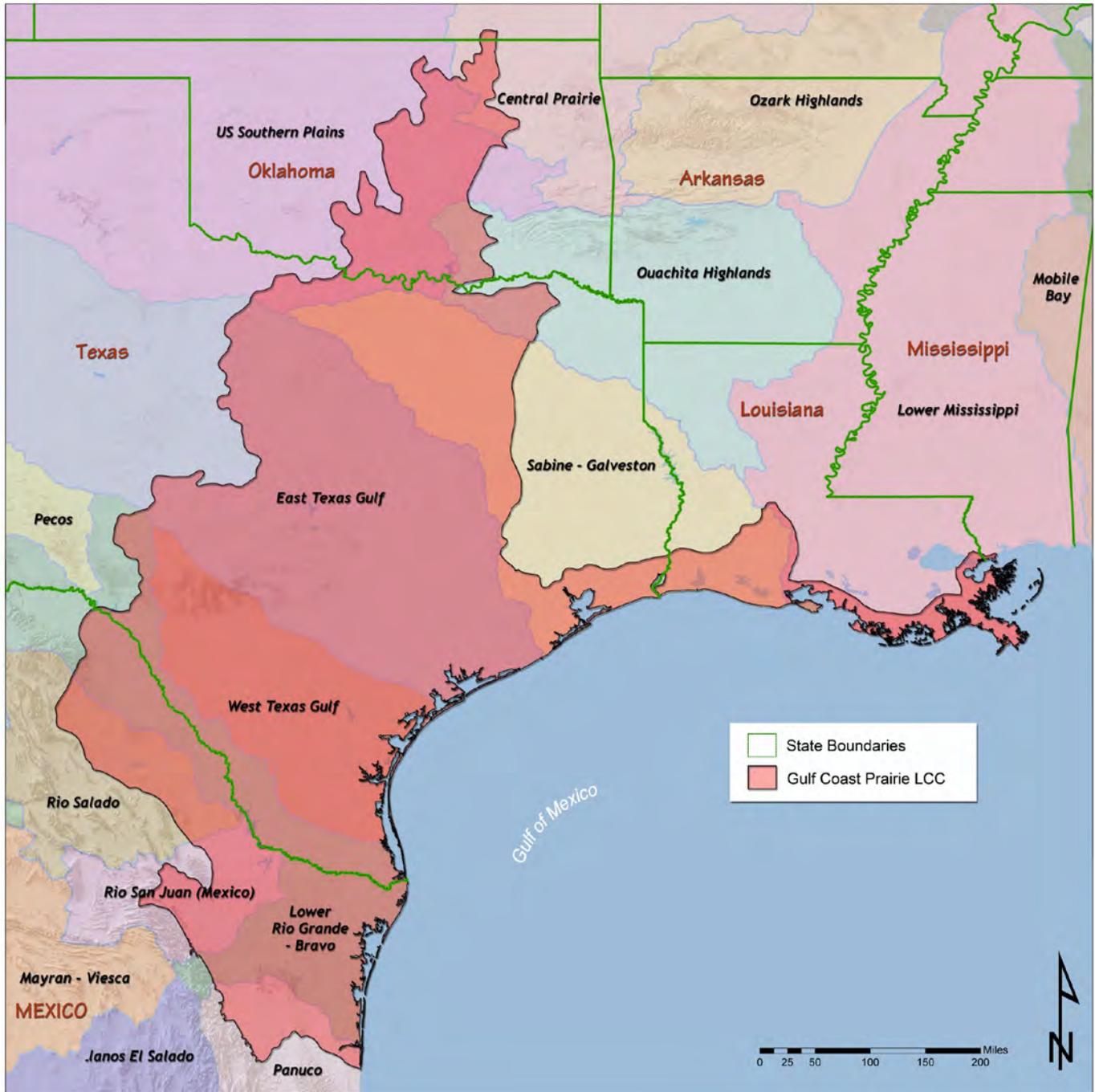


Figure 6. Gulf Coast Prairie Landscape Conservation Cooperative depicting freshwater ecoregions.

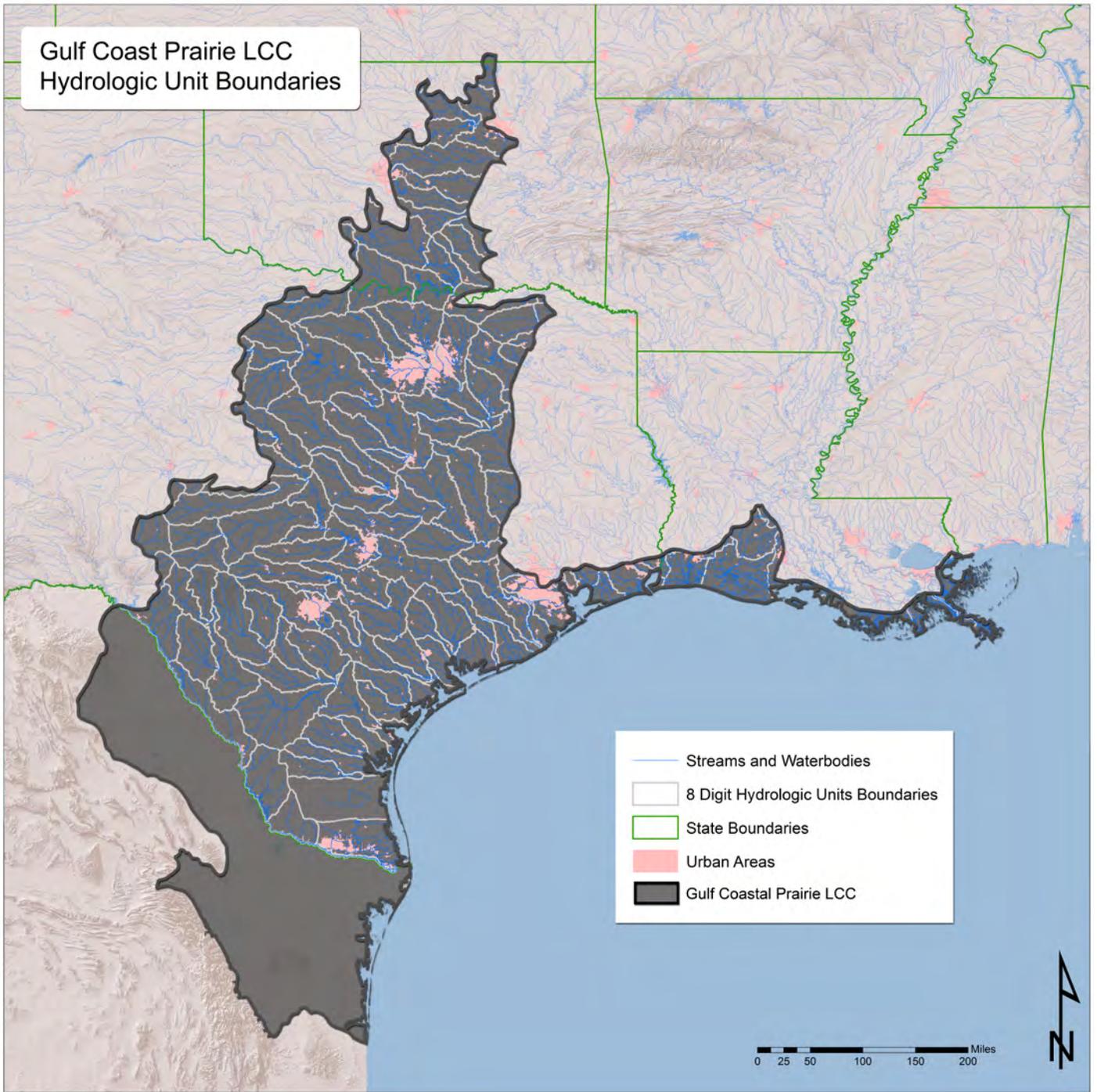


Figure 7. Gulf Coast Prairie Landscape Conservation Cooperative depicting hydrologic unit boundaries.

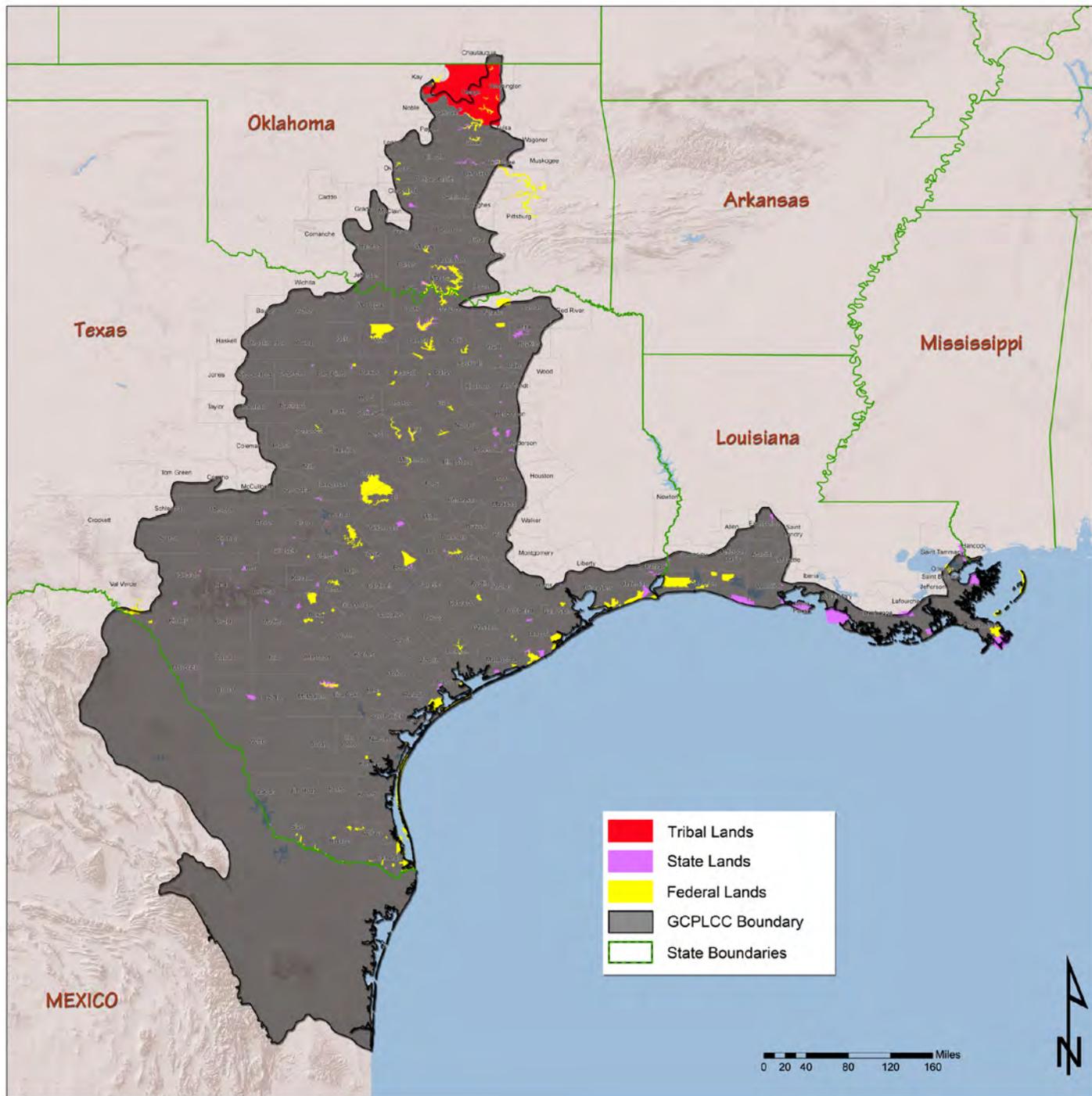


Figure 8. Gulf Coast Prairie Landscape Conservation Cooperative depicting tribal and public lands.

Table 1. Area of land cover within the four ecoregions of the Gulf Coast Prairie Landscape Conservation Cooperative, 2001 data.

	Gulf Coastal Prairie		Edwards Plateau		Oaks and Prairies		Tamaulipan Brushlands	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Open Water	1,206,844.93	488,392.47	99,348.07	40,204.71	959,852.15	388,438.11	58,986.05	23,870.79
Developed, Open Space	604,132.68	244,483.65	210,268.69	85,092.66	2,246,691.67	909,203.22	507,154.45	205,237.98
Developed, Low Intensity	561,994.39	227,430.90	88,458.72	35,797.95	970,463.28	392,732.28	315,478.20	127,669.41
Developed, Medium Intensity	315,324.53	127,607.22	40,786.80	16,505.82	398,830.07	161,400.69	97,376.99	39,407.04
Developed, High Intensity	138,465.35	56,034.90	13,555.42	5,485.68	198,102.79	80,169.30	21,124.19	8,548.65
Barren Land	202,690.14	82,025.73	8,532.41	3,452.94	98,778.07	39,974.04	50,094.70	20,272.59
Deciduous Forest	251,826.31	101,910.42	883,041.14	357,353.82	7,047,787.62	2,852,136.45	150,737.11	61,001.10
Evergreen Forest	258,300.01	104,530.23	2,743,898.61	1,110,415.59	1,640,720.45	663,975.54	75,540.02	30,569.94
Mixed Forest	54,987.83	22,252.77	1,617.70	654.66	502,917.83	203,523.48	9,526.73	3,855.33
Shrub/Scrub	1,021,558.76	413,409.87	8,561,094.64	3,464,549.64	5,333,590.31	2,158,425.90	8,845,759.35	3,579,749.28
Grassland/Herbaceous	642,243.18	259,906.41	1,690,983.05	684,316.08	14,501,766.81	5,868,652.68	2,954,146.62	1,195,499.88
Pasture/Hay	2,753,046.16	1,114,117.47	59,838.93	24,215.94	8,986,738.43	3,636,801.45	1,564,015.52	632,934.18
Cultivated Crops	3,313,031.21	1,340,735.22	85,320.06	34,527.78	3,778,837.54	1,529,240.22	1,776,525.51	718,933.86
Woody Wetlands	1,452,051.65	587,624.04	27,449.33	11,108.34	1,250,488.61	506,054.43	250,596.24	101,412.63
Emergent Herbaceous Wetlands	3,471,219.00	1,404,751.50	84.73	34.29	66,118.48	26,757.18	62,031.97	25,103.43



Ecological Context of the Four Terrestrial Ecoregions of the GCP LCC

Edwards Plateau Ecoregion

The Edwards Plateau ecoregion is a unique part of Texas, clearly demarcated on the east and south by a fault line and grading into the Chihuahuan Desert and Great Plains to the west and north. The native vegetation of mesquite, juniper, and oak savanna is the core of the breeding range of the endangered black-capped Vireo (*Vireo atricapillus*) and golden-cheeked warbler (*Dendroica chrysoparia*). Covering nearly 5.7 million hectares (14 million acres), the Edwards Plateau is the southernmost extension of the Great Plains and comprises four distinct ecological subregions: the Balcones Canyonlands, Llano Uplift, Lampasas Cut Plain, and Semiarid subcoregions.

The southern and eastern boundaries of the Edwards Plateau are marked by the Balcones Canyonlands subcoregion, separating the plateau from the adjacent South Texas Plains and Blackland Prairies. Here, steep-sided canyons are characterized by ash juniper-oak woodlands. To the north, the sandy soils of the Llano Uplift subcoregion support a variety of shrub and mixed shrub-grass communities, but the abundance of woody species is reduced. Farther north, the broad valleys and relatively flatter terrain of the Lampasas Cut Plain subcoregion support woody plant communities similar to the Balcones Canyonlands, but woodlands are typically less dense and interspersed with grass and savanna habitats. The central and western portions of the Edwards Plateau constitute the largest subcoregion, the Semiarid Edwards Plateau subcoregion, bounded on the west by the Chihuahuan Desert and on the north by the High Plains, Osage Plains, and Red Rolling Plains. This subcoregion is also the most arid among those in the GCP LCC, with the westernmost portions receiving about half the annual precipitation of the eastern part of this ecoregion.

Gulf Coast Prairie Ecoregion

The Gulf Coast Prairie ecoregion includes portions of Texas, Louisiana, Mississippi, and coastal Mexico. The prominent features of this ecoregion historically included coastal prairies with depressional wetlands, now largely fragmented by agricultural and urban development with most depressional wetlands drained;

coastal marshes, which are mostly tidal but contain both isolated and transitional fresh and intermediate marshes; bays and lagunas, which support extensive seagrass beds, tidal flats, and reef complexes; barrier islands; and forested riparian corridors, mottes, and what now is considered dense brushy vegetation. The coastal area also contains the Laguna Madre, the second largest hypersaline lagoon in the world.

Natural forces that shape the ecoregion include dominant south to southeast winds, tropical weather systems, and a substantial gradient in rainfall from over 1.5 meters (60 inches) per year on the upper coast to less than 0.5 meters (20 inches) on the lower coast. Other key systemic processes include flooding and freshwater inflows which buffer salinities and provide nutrients and sediments. Prior to colonization, fire was a key factor that influenced plant communities, particularly grasslands.

The Gulf Coast Prairie ecoregion is home to more than 9 million people, and this number continues to increase. Houston, Tex., is the Nation's fourth largest city, and Harris County, Tex., is the Nation's second-most populated county (fig. 9). Though highly impacted, the coast remains quite productive for a wide variety of fish and wildlife species. The zone contains several large estuaries and marshes that provide habitat for hundreds of fish, wildlife, and plant species. The only wild flock of the globally endangered whooping crane (*Grus americana*) winters on the Texas coast, and the endangered Attwater's prairie chicken (*Tympanuchus cupido attwateri*) makes its home in the coastal prairie. Providing crucial winter habitat to many species of ducks and geese, the coast is the year-round home to nearly the entire western Gulf Coast population of the mottled duck (*Anas fulvigula*), includes important stop-over habitat for numerous species of migrating songbirds and shorebirds, and is also important for resident and migrant colonial wading birds. Wetlands, lakes,



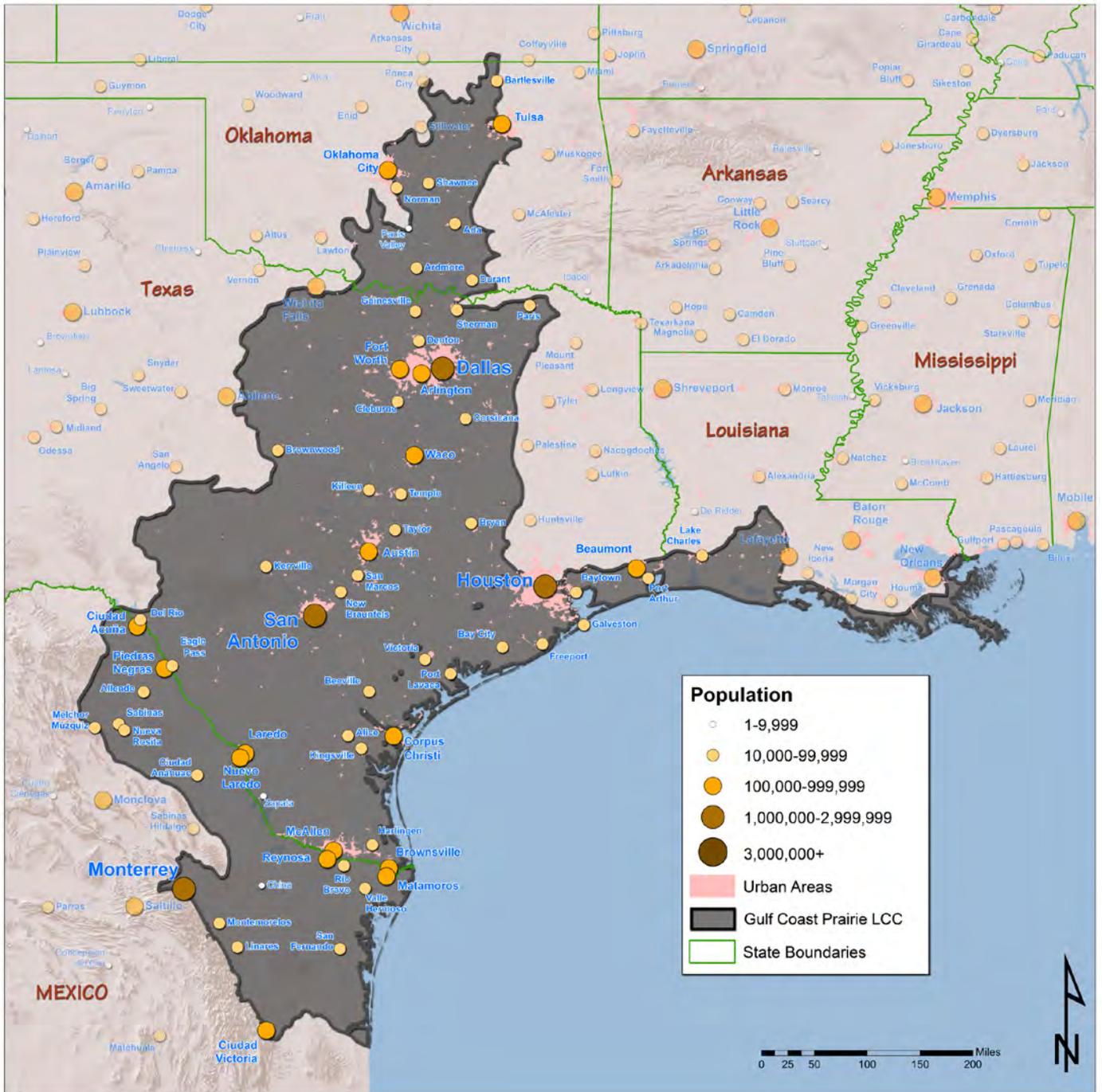


Figure 9. Gulf Coast Prairie Landscape Conservation Cooperative depicting city populations and urban areas.

and estuaries of coastal Louisiana, found at the southernmost extent of the Mississippi Flyway (<http://www.flyways.us/flyways/info>), provide essential forage, cover, and wintering habitat to millions of migratory waterfowl which nest in Canada and the upper Midwest of the United States. The ecosystem wetlands provide migration or winter habitat for substantial portions of waterfowl from the Central and Mississippi Flyways, with over 75% of North America's redheads (*Aythya americana*) wintering in the Laguna Madre alone. Waterfowl and many wetland birds have adapted well to some agricultural grain production practices, particularly those for rice. The bottomland hardwood forests located near the coast are critically important for the Nation's songbird resources. The vast majority of these species utilize this habitat during their transgulf/circumgulf migrations. Though probably equally important during fall migration, the forested habitats in the ecoregion are world famous for the spring "fallouts," when 20 or more species might be seen in a single tree at one time.

Oaks and Prairies Ecoregion

The Oaks and Prairies ecoregion encompasses more than 18.2 million hectares (45 million acres) and contains both the southernmost extent of the "True Prairie" (the Blackland

Prairie subecoregion, a group of prairies) and the westernmost extent of deciduous forests (the Cross Timbers subecoregion). The Texas portion of the Oaks and Prairies ecoregion contains a mix of communities ranging from tallgrass prairie to forested landscapes. To the east, the Post Oak Savanna subecoregion borders the Gulf Coast Prairie ecoregion. Here, tallgrass species form a groundcover with a scattered oak-dominated overstory. To the west, the Blackland Prairie subecoregion (4.3 million hectares [10.6 million acres]) extends from the Red River south to San Antonio, Tex. The Blackland Prairie subecoregion also includes the Fayette subecoregion (1.7 million hectares [4.2 million acres]) and the San Antonio subecoregion (0.7 million hectares [1.7 million acres]); both are surrounded by the Post Oak Savanna subecoregion. Clay soils of this area support a variety of tallgrass communities. The Blackland Prairie subecoregion grades into the Cross Timbers subecoregion, which extends from the Edwards Plateau ecoregion in central Texas and north through central Oklahoma into southern Kansas. The Cross Timbers subecoregion is a complex mosaic of upland forest, savanna, prairie, and glade that forms the broad transition zone between the deciduous forests to the east and the grasslands of the Great Plains to the west. This subecoregion encompasses the Grand Prairie, which supports plant communities similar to the Blackland Prairie subecoregion but has less productive and shallower soils.

The Oaks and Prairies ecoregion is central for a number of wildlife species considered characteristic of the Southern Plains. This region contains 27.4% of the world population of painted buntings (*Passerina ciris*), 28.3% of the scissor-tailed flycatchers (*Tyrannus forficatus*), 7.1% of the northern bobwhites (*Colinus virginianus*), 8.5% of the dickcissels (*Spiza americana*), and 8.5% of the eastern meadowlarks (*Sturnella magna*). The significant human population growth and habitat modification of this ecoregion are considered key factors in declines of some species like the Bell's vireo (*Vireo bellii*), which decreased by 97.2% in the Oaks and Prairies ecoregion between the 1970s and 2000s (10-year average). Other species witnessing significant declines include



the loggerhead shrike (*Lanius ludovicianus*), which has decreased by 78%; the lark sparrow (*Chondestes grammacus*), decreased by 72%; the northern bobwhite, decreased by 66%; and the eastern meadowlark, decreased by 58%.

Within the Oaks and Prairies ecoregion, large tracts of ancient deciduous forests, dominated by centuries-old post oak (*Quercus stellata*), are still present on the ridges and rugged escarpments. The presettlement Cross Timbers are believed to have covered approximately 7.25 million hectares (28,000 square miles). The trees of the Cross Timbers subecoregion have often survived on steep terrain that is unsuitable for farming, creating one of the least disturbed forest types left in the Eastern United States; this subecoregion contains 200- to 400-year-old post oak, and red cedars (*Juniperus virginiana*) over 500 years old have been found on fire-protected bluff lines. Further, the Cross Timbers subecoregion encompasses many low-gradient streams and small rivers that support bottomland hardwood forest habitat. Within the Cross Timbers subecoregion in south-central Oklahoma, there is a unique limestone formation called the Arbuckle Uplift. This area has a similar geologic history and features many of the same plant species as the Edwards Plateau ecoregion. Like the Edwards Plateau ecoregion, the area supports several endemic groundwater invertebrates as well as several biologically diverse springs and gravel-bottom streams.

The Oaks and Prairies ecoregion is highly impacted by human land uses. The ecoregion is home to more than 14 million people and 7 of the largest 50 cities in the United States (population greater than 350,000), including San Antonio (#7), Dallas (#9), Austin (#15), and Fort Worth (#17), Tex.; Oklahoma City (#31) and Tulsa (#47), Okla.; and Arlington, Tex. (#49). According to the U.S. Census Bureau (<http://quickfacts.census.gov/qfd/states/48000lk.html>), these cities have grown by 7%–43% from 1990–2000, and further growth over the next few decades is expected. Results from the U.S. Department of Agriculture's 2005 Natural Resources Conservation Service Agriculture Census indicate that over 80% of the land area in the Oaks and Prairies ecoregion is considered farmland—about half cropland and half grazing land. There are few natural lakes in Texas and Oklahoma, but the Oaks and Prairies ecoregion contains over 100 large, human-made lakes and reservoirs that cover more than 299,467 surface hectares (740,000 acres), ranging in size from 26 hectares (65 acres) to 37,400 hectares (93,000 acres); many smaller impoundments, such as farm ponds and stock tanks, are scattered throughout the ecoregion. The many artificial impoundments, ponds, and tanks have transformed this broad area from a relatively dry-land savanna to an area rich with both seasonal and permanent water bodies, positively impacting the types of resident and migrant species inhabiting this region.

Tamaulipan Brushlands Ecoregion

The unique Tamaulipan Brushlands ecoregion is found in only the Lower Rio Grande Valley (LRGV) of south Texas in the United States and in northeastern Mexico. The LRGV is not really a valley but instead is a delta, or fertile plain, which slopes away from the Rio Grande. The combination of climate, vegetation, and associated wildlife is unlike that in any other region of the United States. The vegetation is influenced by edaphic factors, and plant distribution can be correlated with geologic formations. Characteristic vegetation of the Tamaulipan Brushlands ecoregion is dense and thorny. The most luxuriant brush is found on alluvial soil of the Rio Grande flood plain, and large cedar elms (*Ulmus crassifolia*) dominate in some mesic areas. In the xeric upland areas, vegetation is mostly spiny shrubs and stunted trees. A few characteristic plant species make up the bulk of the brush vegetation. Some of the ubiquitous woody plant species are Texas ebony (*Pithecellobium flexicaule*), retama (*Parkinsonia aculeata*), granjeno (*Celtis pallida*), huisache (*Acacia smallii*), prickly pear (*Opuntia lindheimeri*), and mesquite (*Prosopis glandulosa*), although prevalence of mesquite may be due to human activities.

The Rio Grande is the most significant river within the Tamaulipan Brushlands ecoregion, and much of the aquatic biodiversity of the ecoregion is associated with the river or its tributaries. The Rio Sabinas is a major drainage to the Rio Grande. Rivers of the region that drain to the coast include the Rio San Fernando, Rio Soto la Marina, and Nueces River. In addition to these riverine systems, resacas (oxbows) and depressional wetlands of the ecoregion constitute additional aquatic features important to the biodiversity there. Migratory waterfowl and shorebirds, for which this ecoregion serves as a significant migratory corridor, are dependent on these areas.

The Tamaulipan Brushlands ecoregion is a junction between temperate and tropical life zones. The area serves as a confluence of migration corridors for neotropical and nearctic migrants, large concentrations of soaring raptors, and other migrants, all of which could be impacted by significant alternative energy proposals such as wind turbine development. More than 500 bird species and over 300 butterfly species can be found in this ecoregion. Several threatened and endangered bird species inhabit the ecoregion, including the interior least tern (*Sterna antillarum athalassos*), aplomado falcon (*Falco femoralis*), and black-capped vireo. The native brush habitats of this ecoregion encompass the northeastern range of the ocelot (*Leopardus pardalis*). The region also harbors a number of endemic plant species, including endangered Texas ayenia (*Ayenia limitaris*), South Texas ambrosia (*Ambrosia cheiranthifolia*), star cactus (*Astrophytum asterias*), Walker's manioc (*Manihot walkerae*), ashy dogweed (*Thymophylla tephroleuca*), Johnston's frankenia (*Frankenia johnstonii*), and Zapata bladderpod (*Lesquerella thamnophila*).



Cultural Resource Context of the Four Terrestrial Ecoregions of the GCP LCC

The GCP LCC landscape contains diverse natural and cultural resources steeped in a rich Native American, agricultural, and ranching heritage. Cultural resources and the management of cultural resources may include a wide spectrum of social elements past, present, and future. The social and cultural values incorporate more than archaeology and traditional, historical culture; they include the progressive and innovative demographic changes across this predominantly privately owned (97%) landscape that are rapidly transforming ranches and farmland into an urban culture. By definition, “cultural resources” can be tangible and intangible (living and dead) and represent peoples, cultures, human activities, and events. From pre-European traditions to early European influences (Spanish and French), the GCP LCC landscape has many attributes highly valued by the partnership.

The partnership recognizes and will analyze various aspects of social and cultural elements in defining priority science needs; issues such as historical land ownership,

colonization, architecture, and archeology will be some of the aspects considered. The GCP LCC interests will include not only preserving and presenting traditional forms of culture in this mostly privately owned landscape, but also understanding the ongoing and future changes expected in the landscape—valuing our past but planning for our future. Engaging social scientists to recognize and identify cultural resources specific to local regions or ethnic groups will be valued. Cultural tourism is a significant sector of this landscape’s economy, and the “green infrastructure” movement to include culture in the ecotourism concept should be an area of interest.

At the multi-State, national, and international partnership level, cultural resource management may be concerned with other themes in danger of extinction (Creole Acadiana [“The Spirit of a Culture: Cane River Creoles,” at <http://vimeo.com/13228098>] [Caddo, Chitimacha, Coushatta, Houma, and Osage tribes] and the Tejano culture [“Tejano Origins” by Dr. Andrés Tijerina, at <http://www.tamu.edu/faculty/ccbn/dewitt/tejanoorigins.htm>]). How we develop these cultural interests and values into our GCP LCC through translational science and information, promoting access to cultural resources, continues to be a challenge.

High Priority Science Needs: Species and Habitats

We have identified some priority science needs and species and their habitats from within the GCP LCC area (table 2). Further refinement of science priority was developed through a Rapid Assessment process from June to August 2011. This Rapid Assessment process, with clearly defined objectives, is described in appendix B (enclosure B1, Strike Team charter). We fully recognize that the final GCP LCC priorities will be defined through collaboration among all partner organizations. Therefore, we anticipate that the list will evolve substantially as the GCP LCC develops.

A critical first step to prioritizing the most vulnerable ecosystems and habitats, and the subsequent appropriate conservation delivery response, is to define species priorities that (1) are a vital component of the ecosystem, (2) are sensitive to environmental changes because of low species population levels or other ecological factors, or (3) can serve as a surrogate for species that meet such parameters. Integration of landscape-scale or regional plans (such as The Nature Conservancy Ecoregional Plans, Joint Venture Plans, and State Wildlife Action Plans [SWAP]) will be the foundation for defining species priorities. It is important to establish a process to meet our Strategic Habitat Conservation (SHC) model (app. B) to regularly review our science priorities and adjust these elements of our science needs through time. The Science Team charter described in appendix B (enclosure B1) will be a living document, continually updated to provide the partnership the best current identification of needs and a process to meet our science needs.

Threats, Risks, and Vulnerabilities for the GCP LCC Area

Threats, in terms of ecosystem risks to and vulnerabilities of the GCP LCC landscape—and in particular the fish, wildlife, and plants of the area—are numerous and persistent. Resilience to climate change has been described as varied and multifaceted, but in general it is widely accepted that “*a healthy, biologically diverse environment is increasingly recognized as key to resilience . . . Knowledge about ways of coping with climate variability is essential . . . many nations recognize and prioritize the role of that biodiversity via healthy ecosystems, and natural habitats play an important role in adaptation to climate change* (Hannah Reid, Joanna Phillips, and Melanie Heath, Natural Resilience: Healthy Ecosystems as Climate Shock Insurance, 2009). These threats, risks, and vulnerabilities can also impact cultural resources of the past, present, and future. Demographic change expected in this landscape may be significantly interrupted by systems that become less functional and unhealthy from events like

offshore energy impacts affecting the coastline or change in the quantity and quality of water on which the human population will depend for existence. The GCP LCC can promote a successful conservation future if these threats, risks, and vulnerabilities are identified and strategies are crafted to reduce or minimize the expected impacts to the natural and cultural landscape.

Natural resources are directly influenced by landscape change in this area. Several taxa of exotic and invasive plants such as giant salvinia (*Salvinia molesta*) and hydrilla (*Hydrilla verticillata*) threaten to alter the habitats of most priority species and may even expand their range in a warmer climate. Control of these invasive plants has become a dominant activity of land managers and landowners throughout the area. Invasive animals, such as feral hogs (*Sus scrofa*), alter habitats of native species as well and require continual control measures to minimize their impacts. Roughly half of all nonnative fish species introduced into the Southeastern United States have become established, and many of them threaten native fish populations. Documentation, evaluation, and careful planning and strategic management of invasive threats will be a significant responsibility of conservation efforts in the future.

Hydrologic alterations, water demands, and reduced flows into estuaries have altered the productivity of the entire GCP LCC area, and these effects continue. The impacts of climate change and continued human population growth will continue to have major impacts on a wide variety of natural and cultural resources, and in particular plants and animals. Compiling and identifying these competing and potentially drastic threats to society will be a significant role for the GCP LCC partnership. The hydrology of productive coastal marshes is impacted by the navigational waterways (e.g., the Gulf Intracoastal Waterway) and oil and gas infrastructure, which has allowed more saline waters to reach the inland fresh and brackish wetlands of Texas and Louisiana. Increased salinity kills native freshwater vegetation, leaving already subsided lands unprotected and vulnerable to rapid erosion, culminating in mudflats and open water. Wind-driven wave action then facilitates further erosion.

Alterations of rivers, including dredging, channelization, damming, and diverting flows for urban and agricultural use, affect the productivity of downstream estuaries and the upstream riverine, riparian, and wetland communities. These river alterations have also resulted in reduction of downstream flow of sediment, contributing to beach erosion and a lack of material to support marsh accretion. These marshes and forested wetlands were initially created and maintained through cyclic flooding sediment accretion over thousands of years. Construction of flood-control levees, and management for navigation and water supply, has isolated these wetlands from the rivers and interrupted natural cyclic wetland renourishment. Without continued sediment inputs, natural subsidence converts sediment-starved wetlands to open water, often creating “honeycombed” marsh.

Table 2. Representative species of concern for each ecoregion.

Species	Source	Habitat	Ecoregion
Fountain darter	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2. Texas Wildlife Action Plan.	Springs and spring-fed streams.	Edwards Plateau
Texas wild-rice	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2. Texas Wildlife Action Plan.	Clear, flowing waters of spring origin.	Edwards Plateau
Comal Springs dryopid beetle	NatureServe Conservation Status= Globally threatened to imperiled. Federally listed endangered species recovery priority 1. Texas Wildlife Action Plan.	Comal Springs outlets.	Edwards Plateau
Barton Springs salamander	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2. Texas Wildlife Action Plan.	Spring dweller.	Edwards Plateau
Golden-cheeked warbler	NatureServe Conservation Status= Globally threatened. Federally listed endangered species recovery priority 2. Oaks and Prairies Joint Venture Priority Species. Texas Wildlife Action Plan.	Breeding habitat consists of old-growth and mature regrowth Ashe juniper-oak woodland.	Edwards Plateau
Guadalupe bass	Texas Wildlife Action Plan.	Small streams.	Edwards Plateau
Whooping crane	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2. Oaks and Prairies Joint Venture Priority Species. Texas Wildlife Action Plan.	During migration and winter includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands.	Gulf Coastal Prairie
Slender rush-pea	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2.	Short-grass prairie.	Gulf Coastal Prairie
Pallid sturgeon	NatureServe Conservation Status= Globally threatened. Federally listed endangered species recovery priority 2. Louisiana Wildlife Action Plan.	Freshwater.	Gulf Coastal Prairie
Ringed map turtle	NatureServe Conservation Status= Globally threatened. Federally listed threatened species recovery priority 14. Louisiana Wildlife Action Plan.	Streams with moderate to fast current.	Gulf Coastal Prairie
Alabama heelsplitter	NatureServe Conservation Status= Globally threatened to imperiled. Federally listed threatened species recovery priority 8. Louisiana Wildlife Action Plan.	Sand, mud, silt, and sandy-gravel substrates in streams with slow to moderate currents.	Gulf Coastal Prairie
Mottled duck	NatureServe Conservation Status= apparently secure. GCJV priority species. Texas Wildlife Action Plan. Louisiana Wildlife Action Plan= apparently secure.	Shallow estuarine and palustrine marshes year-round, and nearby grasslands for nesting.	Gulf Coastal Prairie
Houston toad	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2. Texas Wildlife Action Plan.	Pine forest, mixed deciduous forest, coastal prairie.	Oaks and Prairies
Salado salamander	NatureServe Conservation Status= Globally imperiled. Candidate for federal endangered species act listing priority 2. Texas Wildlife Action Plan.	Spring outflows, under rocks and in gravel substrate.	Oaks and Prairies

Species	Source	Habitat	Ecoregion
Concho water snake	NatureServe Conservation Status= Globally threatened. Federally listed threatened species recovery priority 14. Texas Wildlife Action Plan.	Fast-flowing rocky streams and their margins.	Oaks and Prairies
Black-capped vireo	NatureServe Conservation Status= Globally vulnerable. Federally listed endangered species recovery priority 8. Oklahoma Comprehensive Wildlife Conservation Strategy.	Dense low thickets and oak scrub.	Oaks and Prairies
Navasota Ladies'-tresses	NatureServe Conservation Status= Globally vulnerable. Federally listed endangered species recovery priority 8.	Margins of post oak (<i>Quercus stellata</i>) woodlands along intermittent tributaries of rivers.	Oaks and Prairies
Arkansas river shiner	Federally listed threatened species. Oklahoma Comprehensive Wildlife Conservation Strategy.	Canadian River, historically in Cimarron and Arkansas Rivers.	Oaks and Prairies
Star cactus	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 2.	Gravelly, fairly open brushland.	Tamaulipan Brushlands
Red-crowned parrot	NatureServe Conservation Status= Globally threatened. Rio Grande Joint Venture Priority Species.	Lowland deciduous forest and pine-oak woodland, forages in cultivated lands. Also suburban areas where introduced.	Tamaulipan Brushlands
Ocelot	NatureServe Conservation Status= Apparently secure. Federally listed endangered species recovery priority 5. Texas Wildlife Action Plan.	Dense chaparral thickets in Texas.	Tamaulipan Brushlands
Zapata bladderpod	NatureServe Conservation Status= Globally imperiled. Federally listed endangered species recovery priority 5.	Gravelly to sandy loams entangled in small shrubs and cactus clumps.	Tamaulipan Brushlands
Texasayenia	NatureServe Conservation Status= Globally threatened. Federally listed threatened species recovery priority 5.	Dense subtropical woodland communities at low elevations.	Tamaulipan Brushlands



The GCP LCC area has had a history of large-scale petroleum development since the 1901 strike at Spindletop near Beaumont, Tex. Oil production has transformed some areas of the region from predominantly rural to heavily industrialized and urbanized. The Houston area has become home to the largest concentration of refineries and petrochemical plants in the world. Petroleum development can affect fish, wildlife, and plants through habitat destruction, alteration, and contamination, as well as cause direct mortality from spills and exposure to petrochemical toxins. Offshore petroleum development is of great significance to the culture in the GCP LCC area; a major element of this landscape's economy will continue to grow, but the past and present impacts and potential future resiliency of these offshore and coastal ecosystems are significant.

Wind-energy development has been expanding in the GCP LCC area. In 2011, Texas was the Nation's leader in wind-energy production, with major wind farms located within the GCP LCC area. Along with fragmentation and loss of habitat from the footprint of supporting infrastructure, wind farms and their associated power lines located within major migration corridors may result in direct mortality of birds and bats.

Much of the inland portion of the GCP LCC has been affected by the conversion of native prairies and oak woodlands to other land-cover types through urbanization, fragmentation of existing habitat, and alteration of the historical fire patterns that shaped the plant communities. A large percentage of this historical prairie and oak woodland acreage has been converted to pastureland (primarily nonnative Bermuda grass and fescue) or to cropland. Urban development and its associated infrastructure have altered the landscapes surrounding Dallas, Fort Worth, Austin, San Antonio, Corpus Christi, Houston, and Beaumont, Tex.; Lafayette, La.; and Oklahoma City and Tulsa, Okla. Oak woodlands and the remaining prairies have been structurally altered by subtle changes in plant community and species composition; increase in juniper cover is a result of greatly reduced fire frequencies and the shift from periodic grazing to continuous grazing.

Unique Characteristics of the GCP LCC Area

On April 20, 2010, the Deepwater Horizon oil rig exploded, killing 11 workers. The Mississippi Canyon 252 Maconda Well released 7.8 billion liters (500,000 barrels) of oil into the Gulf of Mexico, the largest accidental oil spill of all time. The spill has drawn global attention to the Gulf of Mexico and the coastline of the GCP LCC area in particular. The full extent of the ecological damage caused by the spill is still being assessed. Ongoing studies are aimed at defining the injury and developing a restoration plan to compensate

the public for lost resources. The impacts of the spill may affect fisheries and wildlife for an extended period and will be an ongoing focus of science and management activities until the gulf has recovered. Federal and State entities with natural resource trust responsibilities have initiated efforts such as the Natural Resource Damage Assessment (NRDA) process to assess natural resource injuries caused by the spill and to identify appropriate restoration options. The natural resource trustees have formed a Trustee Council that includes representatives from Alabama, Florida, Louisiana, Mississippi, and Texas, as well as the Departments of Commerce and the Interior. As part of the NRDA process, the Trustees are reviewing and, as appropriate, gathering the vast amount of monitoring data on the Gulf of Mexico to better understand and assess injuries that may have potentially resulted from the Deepwater Horizon oil spill. One of the potentially responsible parties, BP p.l.c., is currently a cooperative partner in these assessments. The Trustees also are beginning to review and develop a suite of potential restoration options that may be scaled to the quantified injuries to fully compensate the public for their lost resources.

In response to the gulf oil spill, U.S. President Obama also directed Navy Secretary Ray Mabus to develop a long-term restoration plan for the Gulf of Mexico. This plan is under development and will include a governance structure to ensure that restoration is well coordinated, transparent, and accountable to all stakeholders. Further, the plan will help identify potential funding sources to support the ecosystem restoration. Sources such as NRDA; the Coastal Wetlands Planning, Protection and Restoration Act; and others will be identified with the goal of improving coordination and direction of gulf ecosystem restoration efforts. Secretary Mabus has emphasized the importance of adaptive management with all restoration actions which are backed by sound science. The GCP LCC will both benefit from the activities and science currently being gathered and contribute sound science to conservation designs, delivery, and monitoring.

The States of Louisiana, Texas, and Mississippi stand to receive millions of revenue shared dollars funded under the authority of the 2006 Gulf Of Mexico Energy Security Act (2005) for Outer Continental Shelf oil and gas production beginning in 2017. These funds are targeted for coastal wetland restoration and are anticipated to constitute the States' cost-share for future Federal restoration efforts as well as their own State-sponsored projects.

Prior to the oil spill, the gulf coast of Louisiana and Mississippi was identified as one of five key ecosystems targeted nationwide for restoration and renewal under the U.S. President's 2011 budget request and the Department of the Interior's Treasured Landscape Initiative. The administration has targeted \$26.9 million for protection, restoration, and associated science support in this region. The GCP LCC will provide a framework around which these efforts can coalesce.

At full potential, the GCP LCC will be an international cooperative with important shared conservation concerns to be addressed with Mexico. As previously indicated, the Lower Rio Grande Valley is the northern extent of several species, and management of these species will be confounded by border issues including the border wall, illegal immigration, and an ongoing crime war. Managing fish and wildlife habitat in the face of these issues will present difficult and demanding challenges.

Hurricanes are not unique to the GCP LCC area, but here they play a major role ecologically and economically. Recent major storms that have hit the area (such as Rita and Katrina in 2005 and Gustav and Ike in 2008) have had landscape-scale impacts and have altered the geography of affected areas. Each of these storms has caused alterations to fish and wildlife habitat within the National Wildlife Refuge System and other public lands. And similar storms are expected in the future: as the Atlantic Ocean warms and the intensity of the storms increases, so too will the impacts increase to the affected fish and wildlife habitats.

U.S. Census data for the year 2000 indicates that 3 of the 10 largest cities in the U.S. are within the GCP LCC area (San Antonio, Houston, and Dallas, fig. 9). The urban populations of these metropolitan areas continue to grow at rates considered to be the highest in the country. These and other urban areas within the GCP LCC area will place increasing demands on the natural resources of the region as they expand and react to stress of climate change. Among the anticipated impacts, as previously described, are increased fragmentation and loss of fish and wildlife habitat, competition for water, hydrological alteration, and coastal subsidence caused by subsurface extraction (drilling and mining). Close coordination with the U.S. Department of the Interior Climate Science Center (<http://nccwsc.usgs.gov/csc.shtml>) efforts in the Southeast and South Central (http://www.doi.gov/whatwedo/climate/strategy/SouthCentral_CSC.cfm) areas will greatly expand science capabilities to understand and manage the growing impacts of climate on a rapidly changing human landscape.

The Cross Timbers and Post Oak Savanna subcoregions form the frontier between the eastern deciduous forest and the grasslands of the southern Great Plains. This great transition zone preserves some of the largest tracts of relatively undisturbed ancient forest and woodland left in the Eastern United States and offers an exceptional opportunity for environmental research, education, and conservation. These rugged old-growth woodlands were not commercially important but have high ecological integrity and preserve vital components of our eroding biodiversity. They form a key link in the oak archipelago that extends from Central America into Southeastern Canada and provide essential habitat for many species.

Anticipated Climate Change Effects for the GCP LCC Area

Climate change is expected to affect the GCP LCC area in several ways. Global climate warming is expected to increase the rate of sea-level rise, which in turn will increase flooding of coastal landscapes. Coastal marshes, beaches, and dunes which provide habitat for many species are particularly sensitive to sea-level rise, and it is anticipated that although some of these habitats will be lost and some will move inland, models do not yet accurately predict such changes. In addition, coastal areas within the GCP LCC area experience high rates of land subsidence, exacerbating the influence of eustatic (global) sea-level rise. Data from the U.S. Geological Survey and the National Oceanic and Atmospheric Administration indicate that in Louisiana sea-level rise is estimated to be as much as 1.7 millimeters (about 0.07 inches) per year, reaching 109 millimeters (4.3 inches) in the next 50 years. Coastal Louisiana wetlands are being converted to open water at a rate of about 13,000 hectares (32,110 acres, or 50 square miles) per year because of sea-level rise and human-induced actions such as maintaining shipping lanes, dredging canals, building flood-control levees, and withdrawing oil and gas. In addition to other, more variable land-loss rates across the Mississippi River Delta and coastal Texas, this rise in sea level will result in rapid wetland losses throughout the coastal zone (the process for which has been described in the previous section). If left unchecked, relative sea-level rise (sea-level rise plus subsidence) is predicted to inundate most of the Louisiana coastal zone and extensive wetlands of Texas over the next 50–100 years.

Another result of climate change is the warming of the Atlantic Ocean, which in turn is predicted to cause an increase in the intensity of tropical weather systems. Hurricanes are a natural part of gulf coast ecosystems, but resiliency of those ecosystems during periodic storm events and their aftermaths has diminished because of altered hydrology, sediment inputs, and relative sea-level rise. Tropical storms and hurricanes can produce flooding of coastal fresh and brackish marshes with more saline waters caused by associated tidal surges, thus causing a resetting of plant succession and other effects. High rainfall over short time periods may also flood upland coastal areas with freshwater. Hurricanes have triggered the conversion of coastal marsh and barrier islands into open water systems. Moreover, the combination of wind and flooding can destroy those structures and engineered physical features which were intended for fish and wildlife management.

Although climate change is expected to increase the intensity of tropical storms that affect the GCP LCC area, overall models on changes in precipitation predict a decrease in rainfall for the area. Under a scenario of reduced

precipitation, and if future water allocations remain the same, it is assumed that water budgets for urban, industrial, and agriculture use will have priority. The surplus, if any, will be available for instream flows, downstream wetlands, and estuaries. Reduced instream flows may affect river fish populations and wildlife associated with riparian vegetation. Fish and wildlife that are dependent on freshwater inflow into downstream habitats are also likely to be impacted. Reduced precipitation may also increase the frequency and intensity of wild land fires, resulting in the alteration of upland vegetation communities.

The Edwards Aquifer underlies the southeastern edge of the Edwards Plateau ecoregion. The area contains numerous limestone caves and springs which are habitat for many federally listed Endangered and Threatened species, including 6 spiders, 4 small fish, 1 pseudoscorpion, 3 harvestman species, 1 amphipod, 8 beetles, and 3 cave salamanders, with an additional 4 unique cave salamander species on the Candidate species list. The two largest karst springs west of the Mississippi River feed water into the Comal and San Marcos Rivers, which are important in maintaining the Guadalupe River ecosystem all the way to the San Antonio Bay Estuary. The Edwards Aquifer is the major water source for some of the largest cities in Texas, including San Antonio, Austin, Killeen, Temple, Round Rock, Georgetown, and San Marcos (fig. 9). Human populations are increasing at tremendous rates in all of these cities; for example, Austin grew by 43% between 1990 and 2000 (<http://quickfacts.census.gov/qfd/states/480001k.html>). Because of the many different, and at times conflicting, needs of this region's unique and little-known wildlife and the growing human populations, GCP LCC collaboration is of utmost importance. The climate change forecasts of reduced rainfall frequency but higher severity (flash) floods for this region and long-term conflicts for water resources will compound the conflicting uses and be a major focus of the GCP LCC in the near future.

Grasslands of the United States, including those of the GCP LCC area, are predicted to become warmer as a result of climate change, and most grasslands are expected to become drier because warmer temperatures will cause increased evaporation. This variability in precipitation is also expected to intensify the frequency of droughts, flooding, and extreme storms such as hailstorms. Rising atmospheric carbon dioxide will probably contribute to invasions of woody shrubs into grasslands; in addition, reduced precipitation may also lead to expansion of grasslands into savanna. According to U.S. Forest Service information, invasion by nonnative species is expected to be exacerbated by changes in climate, which could promote devastating changes in fire frequency and alter the type and quantity of food available to wildlife.

Other impacts of a changing climate include the northward migration of vegetation and animals previously restricted south of this landscape by colder temperatures. For example, the Aransas National Wildlife Refuge is currently undergoing a northward movement of black mangrove (*Avicennia germinans*). Refuge management is concerned

that, because this new plant community may not be suitable wintering habitat for their only wild flock of whooping cranes, the cranes may need to move farther north if they cannot adapt to this change in habitat.

Preliminary Needs Assessment

Overview

One aspect of the LCC concept is consideration for the full array of cultural and natural resources within the landscape (described as the inclusion of all taxa) progressing through an iterative cycle of adaptive conservation planning and delivery. Defining all of the possible needs for all taxa implies identifying information gaps, defining and prioritizing science capacity, and then developing projects to resolve these unknowns and offer possible conservation implementation strategies. Identifying gaps in science and technical capacity is a prerequisite for defining and prioritizing expertise and resources necessary for conservation success. Consideration of our "shared" science capabilities available within the partnership and among adjacent LCCs is also a factor to consider when defining "need." We must begin by asking, "What do we have, what do we need, and who can help us?"

Unique to the GCP LCC is a variety of cultural resources in a landscape that has a rich multicultural heritage, much



rooted in agricultural and ranching history extending almost 500 years. Cultural Resources and the Management of Cultural Resources can include past, present, and future aspects and in all forms (art, heritage, and archeology) including current culture of progressive and innovative demographic change across this landscape. Populations in the GCP LCC area are rapidly transforming into urban cultures, far removed from heritages that included Tejano, Creole, and other traditions. The GCP LCC attentions will be focused not only on our natural resources but also on preserving and including traditional forms of culture as well as understanding the ongoing and future changes expected in the landscape; in this way, we are valuing our past and planning for our future.

Science, Technology, and Capacity Considerations

Strategic Habitat Conservation (SHC), based on adaptive management, is rooted in available science and science capabilities to encourage a process that uses science as a foundation for strategy. An assessment of our current science for priority science needs (app. B) provides the framework on which to identify and prioritize science capacity in both the current and short term (Strike Team, app. B), as well as the long term—2012 and beyond (Science Team charter, app. B, enclosure B1). Developing information on landscape conditions (past and current) and on key species is important for this adaptive management effort because life history information is many times nonexistent for some priority species and habitats recently identified by the Strike Team.

A Rapid Assessment of science priorities, developed by the Strike Team (app. B) of Federal, State, and private organizations, provides a sample of projects needed as well as specific near-term priorities identified and also an initial list of immediate science needs (table 3). This Rapid Assessment effort also clearly identified the need for a long-term science strategy, which evolved into the Science Team charter (app. B, enclosure B1) to formulate a framework for long-term management of science within the GCP LCC. The lists and tables developed are not complete, but they do provide insight into the types of projects considered to be priorities by partners within the GCP LCC landscape.

A more comprehensive approach to identify and prioritize science capacity needs (app. B) will be taken by the GCP LCC, as defined in recent agreements with the Gulf Coast Cooperative Environmental Studies Unit (GC CESU) and with the Wildlife Management Institute (WMI), to assist in developing and managing this iterative planning process. This strategy will include a “Science Summit” hosted by the GCP Steering Committee, WMI, and GC CESU that is designed to (1) develop optimal conservation strategies for dynamic landscapes based on alternative scenarios, (2) develop cultural and natural resource needs to include conservation planning and habitat delivery tools, and (3) describe and prioritize top science capacity projects and capacity needs of the GCP LCC. Downscaled climate models are considered a high priority among partners in the GCP geography, and the partnership will

involve collaboration with scientists of the Climate Science Centers who are responsible for developing and delivering this information to the GCP LCC. This planning process will help define roles and responsibilities shared among organizations and agencies of the GCP LCC, neighboring LCCs, and supporting staff of the partners, all aligned along the functional responsibilities and key products of the cooperative.

Defining Science Capacity, Including Sharing with Adjacent LCCs

In addition to top capacity needs identified by partners of the GCP LCC, the science capacity projects provide significant insight into the capacity and skill sets necessary in the GCP LCC geography to ensure that the goals and objectives of the cooperative can be fully realized. Recurring themes highlight the need for advanced technical skills in the following areas:

- Modeling (e.g., species-habitat, ecological simulations, spatial analyses),
- Remote sensing and geographic information systems (GIS),
- Database development and programming,
- Sampling design and statistical analyses (e.g., population and habitat monitoring), and
- Public engagement (e.g., social science, human dimensions, communications).

A preliminary set of capacity needs are presented above, but the GCP LCC Steering Committee will conduct a more thorough capacity needs assessment to generate a comprehensive list of needed expertise and skills into the future. Many of the skill sets already exist within the agencies and organizations of the partnership. For example, under development at the U.S. Geological Survey (USGS) National Wetlands Research Center is a “Conservation Capacity Commitment” Web application that enables other agencies and organizations operating within the GCP LCC to identify their interest in engaging as cooperators. The application is designed with the LCC matrix in mind and will request interested parties to share their specific expertise as well as the level of time and resources they can contribute in support of the GCP LCC. The USGS will make this application available to other LCCs as well. Armed with a comprehensive assessment of capacity needs measured against capacity commitments, the GCP LCC will be in a position to identify and prioritize capacity shortfalls.

Dedicated capacity to the GCP LCC will be added as resources (personnel, funds, and expertise) are secured from partners of the GCP LCC. The increased partnership resources will be used to meet immediate, high-priority capacity and science capacity project needs.

Table 3. Priority Science Needs.

Science Need - Title	Ecoregion	Brief Description of Science Need/Proposal	Cost & Timeline	Partners-Grantee
Develop Agreement/RFP	Phase I			
a - Conservation Design considering sea level rise impacts on coastal wetland carrying capacity for whooping cranes and other wading birds, piping plover and other shorebirds, waterfowl, and impacts on nesting islands for colonial waterbirds	Gulf Coastal Prairies and Marshes	Use sea level rise scenarios to forecast habitat shifts along coastal prairies and marshes and project their impacts on carrying capacity (e.g., loss or gain in habitat acres, loss or gain in nesting sites, loss or gain in food resources, etc.) for waterfowl, shorebirds, wading birds, and colonial nesting waterbirds. Should address implications for conservation planning, specifically including estimation of amount and spatial configuration of habitat needed to support 1,000 whooping cranes (downlisting goal) and ultimately a recovery goal (as yet undetermined).	\$99,875 - This project could potentially be cost-shared among LCC and partners. Product would be ready for delivery and use by December 2013.	Texas A&M University-Corpus Christi (GCCESU), International Crane Foundation, TNC (GCCESU), UT Austin Marine Science Institute & Mission-Aransas National Estuarine Research Reserve (GCCESU) Texas A&M University-College Station (GCCESU).
b - Mottled duck habitat conservation prioritization tool	Gulf Coastal Prairies and Marshes	Develop spatial prioritization model for guiding delivery of wetland and grassland habitat conservation efforts (e.g., habitat protection, enhancement, and restoration) to benefit mottled ducks. Aim is to maximize conservation efficiency and effectiveness for mottled ducks and other grassland and wetland dependent species in the Gulf Coastal Prairies ecoregion. Interest also exists in developing a more general “grassland conservation prioritization tool,” and the mottled duck could serve as a focal species around which the foundation for a grassland restoration prioritization tool could be developed and eventually expanded to other regions of the GCP LCC landscape.	\$110,000 - Assumes work will be completed over 12-month period by contractor, post-doctoral research associate, or GIS/Remote Sensing analyst already employed by partner agency (e.g., USGS, TPWD, DU, etc.). Product would be ready for delivery and use by December 2012.	USGS - National Wetlands Center, Louisiana State University, University of Louisiana-Lafayette, outside contractor, or other partner agency.
c - Managing Instream Flows and Developing Hydrological Information for the Gulf Coastal Prairie Landscape Conservation Cooperative to benefit stream/river fishes, mollusks, amphibians, stream and wetland dependent wildlife	Gulf Coastal Prairies	Establish methods to develop/improve environmental flow criteria to meet fish and wildlife needs in a variety of stream/river types; 1. develop scientific, baseline information on hydrologic alteration and ecological responses to alteration in rivers and streams across the GCP LCC, and 2. prepare a long-term GCP LCC instream flow research plan. The outcome of this project will help inform water resource managers and policy makers about flow requirements of streams, rivers, and estuaries of the GCP LCC region.	\$150,000 - 180,000 produce a final report which includes a baseline of recommended flow requirements for rivers, major streams, and estuaries by December 2012.	SARP, The Nature Conservancy, TPWD, ODWC.

Table 3. Priority Science Needs.—Continued

Science Need - Title	Ecoregion	Brief Description of Science Need/Proposal	Cost & Timeline	Partners-Grantee
d - “Common Ground” Landcover Classification - STD precision & delineation (focus on OK to connect Crosstimbers year 1 and Rolling Plains year 2 and south Mexico year 3).	All	Includes delineation and inventory of vegetation at 30 meter resolution (TPWD model); a new biologically relevant landcover product is a Priority in OK to plan/expand GIS data & models. Include watershed analysis, species DSS modeling. Seamless landcover data are essential to develop grassland models for many terrestrial species, as well as determine the quality of vegetation within watersheds to assess current and desired conditions.	\$200,000 - Work will be completed Crosstimbers Ecoregion of OK in year 1 by partner/contractor. Product would be ready for delivery and use by December 2012.	TPWD & OK - GIS/Remote Sensing Technique TPWD; MoRAP to develop process by ecoregion in OK - seamless landcover mapping.
Refine by Strike Team	Phase II			
e - Research & MGT Assessment black-capped vireo and delineation of breeding and wintering grounds and benefit other species associated with fire and oak woodlands (golden-cheeked warbler)	Oaks and Prairies, Edwards Plateau, Tamaulipan Brushlands	Assess current research related to on-the-ground conservation efforts; identification of the extent of wintering range to determine how far south these birds winter and to identify potential limiting factors on the winter grounds. More work is needed on identifying the extent of the breeding range in the Tamaulipan Brushlands of Mexico, and on private lands in the USA. Determination of future impacts of fragmentation and urbanization on existing habitat and delineation of future habitat restoration needs.	\$118,000 - Product will be a compendium of existing work and recommended actions to fill gaps. Work will be completed by contractor, graduate student. Product delivery by December 2012.	TPWD, Baylor Univ., Univ. Washington, TAMU, TNC, or other partner agency(s).
f - Remote sensing techniques to differentiate grassland types & promote Vulnerability Assessment - Pilot Project	Gulf Coastal Prairies, Oaks and Prairies, Tamaulipan Brushlands	Development of remote sensing technique and/or landcover products that reliably differentiate among “grassland” types of varying importance to priority birds and other wildlife, perhaps using CRP to develop models for grassland identification. Grasslands are a critical wintering habitat for 15+ grassland obligate species that do not utilize brush-encroached or degraded grasslands. Inability to separate grasslands from pastures from brush-encroached or degraded grasslands hinders conservation efforts. Effort could assist to identify priority landscapes and significant corridors.	\$75,000 - Product will be a report of capability (pilot) to use spatial coverages and other data to determine prairie quality. Includes data collection, analysis, and spatial data generation (TPWD, TNC, NOAA, GCJV, etc.). Product could be ready for delivery by December 2012.	TPWD, TNC, INRI - TAMU, TX A&M - Kingsville), MoRAP & NBCL.

Table 3. Priority Science Needs.—Continued

Science Need - Title	Ecoregion	Brief Description of Science Need/Proposal	Cost & Timeline	Partners-Grantee
g - Migration Corridors between Mexico & US during warming climate to benefit red-crowned parrot, ocelot & neotrop migrants	Tamaulipan Brushlands, Gulf Coast & Oaks & Prairies	Predict how ecological communities will migrate and predict where barriers exist to migration as climate continues to warm. (1) Develop a habitat conservation and restoration plan for thornscrub and riparian corridor dependant species such to enable the recovery of species like the ocelot; INCLUDE a) sufficient habitat to support a genetically diverse breeding population large enough to be likely to remain extant for 100 years; b) best options for developing corridors to allow safe movement between extant populations (Yturria, Willacy Co. Texas; Laguna Atascosa, Cameron Co. Texas; Laguna Madre de Tamaulipas); c) outline a path forward to enable partner participation, with funding opportunities for actual on the ground conservation identified. (2) Obtain a current population estimate for species like the red-crowned parrot (IUCN Globally Endangered) in Mexico and Texas which are shifting range; determine critical habitat and identify limiting factors (likely nest site destruction, nest site limitation, and/or pet trade).	\$75,000 - Includes data collection, analysis, and spatial data generation (TPWD, TNC, GCJV, TAMUK etc.). Reduced cost through efficiency of existing expertise in LCC & JV with FWS and USGS spatial capacity; product could be ready for delivery by end of FY12.	Texas A&M University-Kingsville, TNC (GCCESU), Texas A&M University-College Station (GCCESU); USGS, FWS and JVs.
Defer to Science Team	Phase III			
h - Delineation of fresh, saline and brackish marsh types along Texas coast - Expand Louisiana technique for Texas	Gulf Coastal Prairies and Marshes	This project would contribute to development and implementation of repeatable methodology for delineating and mapping marsh types (fresh, intermediate, brackish, and saline) along the Texas coast. Louisiana has conducted marsh type surveys since 1949. Development and conducting of an analogous survey for Texas would enable comprehensive evaluation of temporal changes in distribution and extent of marsh types across the entire US portion of the GCP LCC landscape. To reduce costs could initiate pilot phase and target priority areas (Chenier Plain) or watersheds in TX (Aransas - San Antonio and Guadalupe).	\$350,000 - Includes approx. \$250K for helicopter rental and pilot, and \$100K for data collection, analysis, and spatial data generation. This project would be good candidate for cost-sharing among LCC and partners (e.g., TPWD, NOAA, GCJV, etc.). Product could be ready for delivery by end of FY13.	Dr. Jennek Visser (Univ. of Louisiana - Lafayette), Steve Hartley (USGS-National Wetlands Research Center), Dr. Bart Ballard (TX A&M - Kingsville), others TBD.
i - Coastal wetlands prioritization tool for the western Gulf Coast	Gulf Coastal Prairies and Marshes	Provides decision support for coastal wetlands conservation/restoration efforts by identifying areas and evaluating potential projects on the basis of their benefit to a suite of priority fish and wildlife resources and their potential for landscape sustainability. Perhaps the most efficient approach is to refine and expand ongoing development of Louisiana CWPPRA project prioritization tool, but with expanded partner input and consultations. Target priority watersheds in TX (San Antonio and Guadalupe).	\$75,000 - This is for expanding the existing LA CWPPRA project prioritization tool to the Texas coastline and adding coastal and estuarine fisheries and other parameters; completion December 2012.	USGS - National Wetlands Center (Steve Hartley) lead and other partner agencies provide input.

Technical Capacities

Geospatial Analyst

Much effort in the LCC will revolve around integrating, developing, and disseminating relevant geospatial data—the building blocks of Conservation Adaptation Strategy (CAS). This will include helping to oversee the ongoing work with Landcover Databases and Conservation Planning Atlas, as well as developing new datasets like landscape-level connectivity analysis. Additionally, these skill sets will provide dedicated support to other Conservation Science Staff of the LCC for mapping, analyses, and assessment needs specific to particular purposes, such as creating a map and table of The Nature Conservancy (TNC) lands within an LCC in preparation for a meeting with TNC State Directors.

Facilitated Modeling Specialist

This specialist will be an ecological modeler who can apply the principles of structured decisionmaking to help solve some existing and new complex problems associated with a CAS. Such a process would include optimizing management strategies, developing a framework for vulnerability analyses, species-habitat modeling at multiple spatial and temporal scales, and integrating terrestrial and aquatic resource management decisions.

Advanced Applications Developer

This specialist will use the most current geospatial, database, and Web technologies to transform the science underlying the CAS into actual applications for managers. This person will make LCC products and various CAS understandable to the partnership and, most importantly, to implementation managers.

Communications Specialist

This specialist will develop and manage communication strategies to include interactive social media to ensure that content is regularly added, a newsletter that summarizes the recent activity among and for members, and consistent messaging on the purpose and value-added proposition of the LCCs.

Monitoring Coordinator

The uncertainty of climate change is emphasizing the need for an adaptive management approach to conservation. Any CAS will certainly highlight monitoring as a key strategy for moving forward. This position will be responsible for researching and collating information on the different monitoring programs on the landscape and help standardize and coordinate efforts among partners and across geographic areas. The coordinator will need to work with and among existing monitoring efforts to include the Fish Habitat Partnerships, Joint Ventures, the National Wildlife Refuge

System, and the established National Park Service Inventory and Monitoring Programs. Key responsibilities would include coordinating existing and emerging capacities among partners, avoiding duplication, and ensuring that development of individual program schemes can work across agencies and geographies as appropriate.

Climate Science Specialist

This specialist will have expertise with climate science and know how climate data can be used to help inform alternative conservation strategies. This person makes the complicated aspects of climate data accessible to conservation planners, managers, and policymakers so they better understand the uncertainties inherent in the data and their appropriate use. This skill set might be provided through the National Oceanic and Atmospheric Administration or the South Central Climate Science Center.

Shared LCC Staff: Combined LCC Capacities in a Seamless Network

Duplication of each skill set within each LCC is unnecessary when expertise can be shared among the seamless network. The long-term outlook for multiple LCC offices and expertise is a reality at the National Wetlands Research Center. The shared services concept includes challenges, such as being able to account for a logical segregation of ecological units, and ensures that regional and national climate change information can be applied easily across the unique geographic responsibilities of these offices.

Steering Committee

The GCP LCC Steering Committee (app. A, enclosure A1) includes one representative from each of the following partner organizations:

- Ducks Unlimited
- Gulf Coast Joint Venture
- Louisiana Department of Wildlife and Fisheries
- Oaks and Prairie Joint Venture
- Oklahoma Department of Wildlife Conservation
- Reservoir Fish Habitat Partnership
- Rio Grande Joint Venture
- Southeast Aquatic Resources Partnership
- Texas Parks and Wildlife Department
- The Conservation Fund
- The Nature Conservancy
- U.S. Department of Agriculture Natural Resources Conservation Service

- U.S. Department of Commerce National Oceanic and Atmospheric Administration
- U.S. Department of Interior National Park Service
- U.S. Department of the Interior U.S. Fish and Wildlife Service (Regions 2 and 4)
- U.S. Department of the Interior U.S. Geological Survey

Science Capacities and Resources Needed

Like all LCCs, the GCP LCC will require an LCC Coordinator and a Science and Technology Coordinator. Initially, the LCC Coordinator will be stationed in Lafayette, La. Additional capability will be required from the onset; however, these functions and how they are fulfilled will be determined by the Steering Committee, with input from the LCC Coordinator. Functions may be met through contracts, existing positions within partner agencies and organizations that can be dedicated to the GCP LCC office, shared partner positions, or by establishing new positions within the U.S. Fish and Wildlife Service (USFWS) or its partners. Close coordination with adjacent LCCs, such as the Gulf Coastal Plains and Ozarks LCC, can add significant capacity and a seamless delivery of products for partners, especially joint ventures and other partners shared by two or more cooperatives.

It has been suggested that a second, more geographically central GCP LCC office would benefit the cooperative. A second GCP LCC office could address factors such as accessibility to partners, interaction with scientific expertise, and availability of in-kind contributions toward any future office location(s). A logical segregation of duties and physical locations of LCC personnel will be defined by the need for specific skills and science capacities by GCP LCC ecological units. This development of sub-LCC expertise would ensure that regional and national climate change information can be applied easily across the unique geographic areas of these offices. Subdivision of responsibilities between two GCP LCC offices would be based on logical ecological division of duties, based on geography, taxonomy, function, or some combination thereof.

Geographic information system (GIS) capacity will be essential to moving forward with landscape-scale science and monitoring with a strong GIS staff focusing directly on GCP LCC issues in the cooperative offices. Currently, several partners within the area have GIS capabilities that can complement GCP LCC efforts.

Modeling capabilities of various types will be needed and could be shared across geographic regions. Areas of desired expertise would include modeling of relations between habitats and populations of fish and wildlife and modeling of the genetics and dynamics of fish, wildlife, and plant populations. Such modeling expertise will position the GCP

LCC to incorporate climate variability and change predictions that are developed elsewhere (e.g., Climate Science Centers). Modeling for such a range of issues that need to be addressed in this LCC is likely to require a breadth of knowledge beyond the capabilities of any individual. This need may be best met through contractual arrangements or in-kind contributions from partners.

Another component of Strategic Habitat Conservation (SHC) is the monitoring of populations, ecological processes, and management activities to evaluate their effectiveness. The design and evaluation of monitoring projects are highly quantitative and will require biometric input. Biometrics will also be essential to the applied field science in which the GCP LCC will be involved. Recently the USFWS's Region 2 refuge program hired a statistician who may be available to provide initial assistance; however, as the GCP LCC quickly moves into full capacity science and monitoring, a full-time statistician will be essential.

Yet another attribute that complements SHC is structured decisionmaking, a systematic and disciplined approach to making difficult or controversial choices through a group process. The GCP LCC will likely be challenged with many difficult decisions and could benefit from application of structured decisionmaking. The USFWS has facilitators who are trained in this structured decisionmaking method, and their assistance can be requested as needed.

The GCP LCC will likely be generating and compiling data of many types and from many sources. Managing and manipulating data from different sources and multiple spatial scales will be a challenge for this and all LCCs. Furthermore, the storage and retrieval of data acquired by the GCP LCC will present additional challenges. Therefore, we foresee the need for data management/coordination capability as the GCP LCC becomes fully functional.

The GCP LCC will also need administrative support from the onset. This support can initially come from the USFWS's Southwest Regional Office but will almost certainly need to be expanded soon through onsite staff.

Although communication and outreach capability is prevalent among conservation organizations operating within the GCP LCC area, coordinating the dissemination of LCC messages is an important function to advance the mission of the GCP LCC. The USFWS's external affairs staff from the Southwest Regional Office will support the GCP LCC, and the external affairs specialist from the South Texas Refuge Complex will also be available. These sources of support should be sufficient for the startup period of the GCP LCC. The development of communication platforms for science-related coordination, as well as translational science needs for "on-the-ground" managers and private landowners, will be a very necessary element in this landscape. Development of a broad communications context that is available to all partners—State, Federal, nongovernmental organization, and private—will be an evolving effort across the GCP LCC and the LCCs across North America. The Steering

Committee will determine when additional communications capability is required.

Examples of Research and Monitoring Needs

In the section “Threats, Risks, and Vulnerabilities for the GCP LCC Area,” we presented many of the future challenges faced by vegetation, fish, and wildlife managers and scientists of the GCP LCC. With such a diverse set of challenges, the possibilities for studies and projects are vast. Here, we provide a list of potential projects that represent the types likely to be considered by the GCP LCC Steering Committee. Some potential programs, studies, and projects are as follows:

Grassland/savanna ecology and restoration for species of conservation concern. Because of the surge in human population and the drastic reduction in savanna and grassland habitats, many species unique to the Southern Plains are witnessing rapidly declining breeding populations. Migratory bird priorities such as Bell’s vireo and lark sparrow, as well as high-profile resident species like northern bobwhite quail, could benefit from strategic identification of existing quality habitat, future definition of landscape linkages and potential restoration areas, and development of incentives for private landowners to make stabilization and perhaps restoration of these populations a reality.

Hydrologic investigations relating water supply to demand. Under the climate change predictions of reduced precipitation, along with expanding human populations, we anticipate greater competition for available water. This project would examine and model how those anticipated changes will affect fish and wildlife.

Monitoring and control of invasive plant species. Invasive plants currently threaten most (if not all) vegetation communities within the GCP LCC area, and managers spend substantial resources controlling these invasive species. This program would coordinate this effort among land management agencies, river authorities, fisheries managers, and participating landowners while monitoring the results of those control efforts. Monitoring would also be directed at understanding the current and future status of invasive species.

Monitoring and modeling the impacts of sea-level rise on coastal wetlands and beaches. The USFWS uses Sea Level Affecting Marshes Modeling (SLAMM) to predict the future conditions of marshes within the National Wildlife Refuge System. The predictions of this and other coastal inundation models are broad and are dependent on poorly understood input variables which describe geological processes. Collecting data on these processes in real time, and at finer spatial scales than currently available, will improve the precision of SLAMM predictions. Iterative improvement of the predictions of SLAMM may provide a more precise capability for this model from its present coarse resolution.

Models such as SLAMM or other sea-level rise models developed by partners at the U.S. Geological Survey, The Nature Conservancy, or the National Oceanic and Atmospheric Administration will become increasingly valuable and allow conservation managers to better prepare for the impacts of sea-level rise.

Louisiana Coastal Area Fish and Wildlife Resource Prioritization Tool. This tool will provide spatially explicit outputs generated from ecological, hydrologic, and land-use data analysis coupled with prioritization criteria relative to fish and wildlife resources that are most vulnerable to existing and future land loss in coastal Louisiana. The model will provide decision support to biologists and managers through iterative identification of areas which support valuable fish (both fresh and marine) and wildlife resources/species populations and possess the greatest potential for long-term sustainability as continued subsidence and sea-level rise occur. The National Wetlands Research Center has initiated preliminary development of this model in cooperation with the Gulf Coast Joint Venture and the USFWS Louisiana Ecological Services Office staff.

Impacts of energy infrastructure (oil, gas, wind, etc.) on a landscape scale. This project would examine the cumulative effects of the alterations to fish and wildlife habitat caused by oil and gas development.

Ocelot population genetics. Ocelots (*Leopardus pardalis*) are federally listed as Endangered and inhabit thorny-shrub habitat of the Lower Rio Grande Valley. This project would determine the level of genetic diversity and complete pre- and post-monitoring necessary to translocate ocelots from Northern Mexico to southern Texas.

Basic life history and monitoring of the unique flora and fauna associated with karst features of the Edwards Plateau. As stated in the section “Anticipated Climate Change Effects for the GCP LCC Area,” the Edwards Plateau ecoregion supports both listed and endemic species. Scientific information on these species is sparse and insufficient for biological planning.

Vulnerability of bats of the GCP LCC area to white-nose syndrome. The Edwards Plateau in particular, and the GCP LCC area in general, supports large populations of bats. This study would evaluate the extent of the disease white-nose syndrome and the risk to several endemic species of bats.

Slender rushpea and star cactus minimum viable populations. The recovery goals of the endangered plants slender rushpea (*Hoffmannseggia tenella*) and star cactus (*Astrophytum asterias*) are currently poorly defined.

Impacts of patch burning on prairie landscapes structure. An assessment is needed of optimal prairie management schemes for long-term sustainability of prairies in the face of climate change.

Kemp’s Ridley sea turtle nesting range requirement. Range requirements are a key parameter needed to quantify nesting habitat needs for a recovered population of Kemp’s Ridley sea turtle (*Lepidochelys kempii*). Modeling habitat requirements could also improve simulations of sea-level rise

impacting habitat and other habitat-specific issues such as those involving catastrophic, stochastic events like oil spills.

Assessment of habitat connectivity related to population viability. The human population in the GCP LCC area is expanding rapidly, and we can anticipate further fragmentation of fish and wildlife habitats. This project will address the level of connectivity required to maintain population viability as the landscape continues to be more fragmented.

Current and projected migration of wildlife and associated habitats in a warming climate. Currently we are witnessing the northward movement of some biological communities. For example, the Aransas National Wildlife Refuge (NWR) has observed a northward migration of black mangrove into wintering whooping crane habitat. This modeling project would predict how ecological communities will be expected to migrate northward or upward in elevation as the climate continues to warm. It will also predict where barriers to migration exist. In the case of the Aransas NWR example, this effort would address the feasibility of whooping cranes to move their wintering grounds north if they are unable to adapt to the changing of their habitat to black mangrove communities.

Prioritization of Guadalupe bass restoration and conservation actions. As the State fish of Texas, Guadalupe bass (*Micropterus treculii*) are identified as a species of

greatest conservation need in the State Wildlife Action Plan. Guadalupe bass are threatened by habitat alteration and loss of connectivity, hydrological alteration, and hybridization with nonnative smallmouth bass (*Micropterus dolomieu*). Existing and historical habitats will be assessed and models developed to identify the stream segments targeted for restoration efforts that will establish self-sustaining Guadalupe bass populations throughout their native range. Sixteen imperiled fish species and six species of freshwater mussels are likely to benefit from habitat conservation targeting Guadalupe bass.

Monitoring and modeling the impacts of sea-level rise on cultural resources. The geospatial locations of valued cultural areas and their short- and long-term impacts through sea-level rise modeling would provide a vulnerability assessment for these resources. Impacts could be easily identified as low, medium, or high risk to support management and protection of these cultural treasures.

Conservation Delivery Mechanisms

There are many agencies and organizations that will use science products and deliver conservation within the GCP LCC area. Tables 4–12 show examples of probable primary end users.



Table 4. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by Federal agencies that provide technical, financial, and regulatory assistance.

Agency	Technical Assistance	Financial Assistance	Regulatory Assistance
Farm Services Agency		Conservation Reserve Program Conservation Reserve Enhancement Program Emergency Conservation Program Farmable Wetlands Program Grassland Reserve Program Voluntary Public Access and Habitat Incentive Program Source Water Protection Program	
Natural Resources Conservation Service	Conservation of Private Grazing Lands Conservation Reserve Program Conservation Technical Assistance Grazing Lands Conservation Initiative	Mississippi River Basin Healthy Watersheds Initiative Environmental Quality Incentives Program Wildlife Habitat Incentive Program Emergency Watershed Protection Program Watershed Protection and Flood Prevention Program Farm and Ranch Lands Protection Program Grassland Reserve Program Healthy Forest Reserve Program Wetlands Reserve Program International Programs	
U.S. Fish & Wildlife Service	Coastal Program Partners for Fish and Wildlife Program	Coastal Program Partners for Fish and Wildlife Program Federal Assistance Grants North American Wetlands Conservation Act Neotropical Migratory Bird Conservation Act National Coastal Wetlands Conservation Grants Endangered Species Grants International Affairs Grants Natural Resources Damage Assessment Program	Safe Harbor Agreements Candidate Conservation Agreements with Assurances

Table 5. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by State agencies that provide technical, financial, and regulatory assistance.

State	Technical Assistance	Financial Assistance
The State of Kansas	Kansas Department of Wildlife and Parks Kansas Forest Service	Kansas Department of Wildlife and Parks Kansas Forest Service
The State of Louisiana	Louisiana Department of Wildlife and Fisheries Louisiana Office of State Parks Louisiana Department of Agriculture and Forestry Louisiana Office of Coastal Protection and Restoration	Louisiana Department of Wildlife and Fisheries Louisiana Office of State Parks Louisiana Department of Agriculture and Forestry Louisiana Office of Coastal Protection and Restoration
The State of Oklahoma	Oklahoma Department of Wildlife Conservation Oklahoma Forestry Services Oklahoma Conservation Commission	Oklahoma Department of Wildlife Conservation Oklahoma Forestry Services
The State of Texas	Texas Parks and Wildlife Department Texas Forest Services	Texas Parks and Wildlife Department Texas Forest Services Texas General Land Office



Table 6. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by nongovernmental organizations that provide technical and financial assistance.

NGO	Technical Assistance	Financial Assistance	Regulatory Assistance
Audubon	Quail and Grassland Bird Initiative		
Coastal Bend Prescribed Burning Association	Conducts prescribed burning workshops in Texas Coastal Bend		Burn Ban Waivers
Coastal Conservation Association		Contributes to numerous projects throughout coastal Louisiana and Texas	
Ducks Unlimited	Texas Prairie Wetlands Project Louisiana Waterfowl Project Design, engineer & construct wetlands on private/public land	Texas Prairie Wetlands Project Louisiana Waterfowl Project NAWCA Grants	Accepts donated conservation easements on priority wetlands
Environmental Defense	Assists landowners with projects to provide habitat for ocelots in the Rio Grande Valley and golden-cheeked warblers on the Edwards Plateau and Balcones Escarpment	Assists landowners with projects to provide habitat for ocelots in the Rio Grande Valley and golden-cheeked warblers on the Edwards Plateau and Balcones Escarpment	Enters into Safe Harbor Agreements with landowners undertaking projects to provide habitat for ocelots in the Rio Grande Valley and golden-cheeked warblers on the Edwards Plateau and Balcones Escarpment
Coastal Bend Coalition of the Grazing Lands Conservation Initiative	Assists landowners with projects to provide habitat for Attwater’s prairie chicken and other coastal prairie species	Assists landowners with projects to provide habitat for Attwater’s prairie chicken and other coastal prairie species	Enters into Safe Harbor Agreements with landowners undertaking projects to provide habitat for black lace cactus, Attwater’s prairie chicken, northern aplomado falcon, and whooping crane
The Nature Conservancy	Assists landowners in TNC’s conservation areas and portfolio sites in Kansas, Louisiana, Oklahoma, and Texas	Purchases conservation easements from landowners in TNC’s conservation areas and portfolio sites in Kansas, Louisiana, Oklahoma, and Texas	
The Peregrine Fund			Enters into Safe Harbor Agreements with landowners that allow the Peregrine Fund to release northern aplomado falcons on their property

Table 7. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by Federal agencies implementing habitat protection and management.

Agency	Habitat Protection	Habitat Restoration, Improvement, and Maintenance
Farm Services Agency	Emergency Watershed Protection Program (Floodplain Easements) Farm and Ranch Lands Protection Program Grassland Reserve Program Healthy Forest Reserve Program Wetlands Reserve Program	Conservation Reserve Program Conservation Reserve Enhancement Program Emergency Conservation Program Farmable Wetlands Program Grassland Reserve Program Voluntary Public Access and Habitat Incentive Program Source Water Protection Program Transition Incentives Program
Natural Resources Conservation Service		Mississippi River Basin Healthy Watersheds Initiative Environmental Quality Incentives Program Wildlife Habitat Incentive Program Emergency Watershed Protection Program Watershed Protection and Flood Prevention Program Farm and Ranch Lands Protection Program Grassland Reserve Program Healthy Forest Reserve Program Wetlands Reserve Program International Programs
U.S. Fish & Wildlife Service	25 National Wildlife Refuges Coastal Program Federal Assistance Grants North American Wetlands Conservation Act Neotropical Migratory Bird Conservation Act Coastal Wetlands Conservation Grants Endangered Species Grants International Affairs Grants Natural Resources Damage Assessment Program	25 National Wildlife Refuges Coastal Program Federal Assistance Grants North American Wetlands Conservation Act Neotropical Migratory Bird Conservation Act Coastal Wetlands Conservation Grants Endangered Species Grants International Affairs Grants Natural Resources Damage Assessment Program
National Park Service	Operates 6 Parks or Preserves in the LCC’s geographic area	Operates 6 Parks or Preserves in the LCC’s geographic area
Department of Defense	Naval Airstation Kingsville McMullen Firing Range Fort Hood	Naval Airstation Kingsville McMullen Firing Range Fort Hood

Table 8. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by State agencies implementing habitat protection and management.

State	Habitat Protection	Habitat Restoration, Improvement, and Maintenance
The State of Kansas	Kansas Department of Wildlife and Parks Kansas Forest Service	Kansas Department of Wildlife and Parks Kansas Forest Service
The State of Louisiana	Louisiana Department of Wildlife and Fisheries Louisiana Office of State Parks Louisiana Office of Coastal Protection and Restoration	Louisiana Department of Wildlife and Fisheries Louisiana Office of State Parks Louisiana Department of Agriculture and Forestry Louisiana Office of Coastal Protection and Restoration
The State of Oklahoma	Oklahoma Department of Wildlife Conservation Oklahoma State Parks	Oklahoma Department of Wildlife Conservation Oklahoma Forestry Services Oklahoma State Parks
The State of Texas	Texas Parks and Wildlife Department Texas General Land Office	Texas Parks and Wildlife Department Texas General Land Office



Table 9. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by nongovernmental organizations implementing habitat protection and management.

NGO	Habitat Protection	Habitat Restoration, Improvement, and Maintenance
Audubon	Dogwood Canyon Audubon Center Mitchell Lake Audubon Center Sabal Palm Audubon Center Trinity River Audubon Center	Quail and Grassland Bird Initiative Coastal Stewardship Program
Coastal Bend Bays and Estuary Program	Numerous projects throughout Texas Coastal Bend	Numerous projects throughout Texas Coastal Bend
Coastal Bend Prescribed Burning Association		Prescribed burning
Coastal Conservation Association		Contributes to numerous projects throughout coastal Louisiana and Texas
Ducks Unlimited	Conservation Easements	Texas Prairie Wetlands Project Louisiana Waterfowl Project
Environmental Defense		Assists landowners with projects to provide habitat for ocelots in the Rio Grande Valley and golden-cheeked warblers on the Edwards Plateau and Balcones Escarpment
Coastal Bend Coalition of the Grazing Lands Conservation Initiative		Assists landowners with projects to provide habitat for Attwater's prairie chicken and other coastal prairie species
The Nature Conservancy	Owns 28 preserves in the Gulf Coast Prairie LCC geographic area Purchases and accepts donated conservation easements from landowners in TNC's conservation areas and portfolio sites in Kansas, Louisiana, Oklahoma, and Texas	Performs habitat restoration, improvement, and maintenance on TNC preserves and easements, and assists landowners in TNC's conservation areas portfolio sites in Kansas, Louisiana, Oklahoma, and Texas

Table 10. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by Federal agencies on public and/or private lands.

Agency	Public Lands and Waters	Private Lands
Farm Services Agency		Conservation Reserve Program Conservation Reserve Enhancement Program Emergency Conservation Program Farmable Wetlands Program Grassland Reserve Program Voluntary Public Access and Habitat Incentive Program Source Water Protection Program Transition Incentives Program
Natural Resources Conservation Service		Mississippi River Basin Healthy Watersheds Initiative Environmental Quality Incentives Program Wildlife Habitat Incentive Program Emergency Watershed Protection Program Watershed Protection and Flood Prevention Program Farm and Ranch Lands Protection Program Grassland Reserve Program Healthy Forest Reserve Program Wetlands Reserve Program International Programs
U. S. Fish & Wildlife Service	25 National Wildlife Refuges Coastal Program Federal Assistance Grants North American Wetlands Conservation Act Neotropical Migratory Bird Conservation Act Coastal Wetlands Conservation Grants Endangered Species Grants International Affairs Grants Natural Resources Damage Assessment Program	Coastal Program Federal Assistance Grants North American Wetlands Conservation Act Neotropical Migratory Bird Conservation Act Coastal Wetlands Conservation Grants Endangered Species Grants International Affairs Grants Natural Resources Damage Assessment Program
National Park Service	Operates 6 Parks or Preserves in the LCC's geographic area	
Department of Defense	Naval Airstation Kingsville Naval Airstation Escondido Fort Hood	

Table 11. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by State agencies on public and/or private lands.

State	Public Lands and Waters	Private Lands
The State of Kansas	Kansas Department of Wildlife and Parks Kansas Forest Service	Kansas Department of Wildlife and Parks Kansas Forest Service
The State of Louisiana	Louisiana Department of Wildlife and Fisheries Louisiana Office of State Parks Louisiana Office of Coastal Protection and Restoration	Louisiana Department of Wildlife and Fisheries Louisiana Department of Agriculture and Forestry
The State of Oklahoma	Oklahoma Department of Wildlife Conservation Oklahoma State Parks	Oklahoma Department of Wildlife Conservation Oklahoma Forestry Services Oklahoma Conservation Commission
The State of Texas	Texas Parks and Wildlife Department Texas Forest Services Texas General Land Office	Texas Parks and Wildlife Department Texas Forest Services Texas General Land Office



Table 12. Conservation delivery in the Gulf Coast Prairie Landscape Conservation Cooperative geographic area by nongovernmental organizations on public and/or private lands.

NGO	Public Lands and Waters	Private Lands
Audubon	Quail and Grassland Bird Initiative Coastal Stewardship Program	Quail and Grassland Bird Initiative
Coastal Bend Bays and Estuary Program	Numerous projects throughout Texas Coastal Bend	
Coastal Bend Prescribed Burning Association		Assist private landowners with prescribed burns
Coastal Conservation Association	Contributes to numerous projects throughout coastal Louisiana and Texas	
Ducks Unlimited	Numerous projects throughout coastal Louisiana and Texas on State and Federal land	Texas Prairie Wetlands Project Louisiana Waterfowl Project NAWCA Grant Preparation
Environmental Defense		Assists landowners with projects to provide habitat for ocelots in the Rio Grande Valley and golden-cheeked warblers on the Edwards Plateau and Balcones Escarpment
Coastal Bend Coalition of the Grazing Lands Conservation Initiative		Assists landowners with projects to provide habitat for Attwater’s prairie chicken and other coastal prairie species
The Nature Conservancy	Assists States and the Federal government with land acquisition	Assists landowners in TNC’s conservation areas and portfolio sites in Kansas, Louisiana, Oklahoma, and Texas
The Peregrine Fund	Releases and monitors northern aplomado falcons	Releases and monitors northern aplomado falcons



Appendix A: Gulf Coast Prairie Landscape Conservation Cooperative Governance

Introduction: This document describes governance (the rules and expectations for consistent management, cohesive policies, guidance, processes, and decision-rights) of the Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC). The GCP LCC is a self-directed, nonregulatory, collaborative partnership formed and governed by conservation entities (cultural and natural resources) having interests and responsibilities in the western Gulf Coast landscape. This document outlines the vision, mission, and goals of the GCP LCC and provides organizational structure. Specific goals, monitoring measures, tasks, and timelines, will be included within the final Development and Operational Plan which will include Governance as an appendix.

Vision (What we want to be)

The GCP LCC is a Collaborative Partnership of agencies, tribes, and organizations working together, realizing common goals, and having a cooperative determination to enhance cultural and natural resource conservation and sustainability across the landscape. By sharing knowledge and building a greater “collective” of resources, we can improve conservation outcomes.

Mission (Purpose - what we intend to do)

The GCP LCC mission is to sustain, protect, and conserve natural and cultural resources in the Gulf Coast Prairie landscape/geography in the face of such threats and stressors as climate change, population growth, and urbanization. To meet this purpose, the GCP LCC will provide to the conservation community scientific and technical support, coordination, and communication. The GCP LCC will also foster a cooperative capacity and facilitate the refinement of that purpose through targeted monitoring, evaluation, and adaptation over time.

Landscape Conservation Cooperative Definition

The Landscape Conservation Cooperatives are a seamless network of conservation-oriented, science-driven partnerships that develop, prioritize, and deliver science to support conservation delivery across North America in the face of climate change. The GCP LCC, one of the 21 LCCs created pursuant to Secretarial Order 3289, is established to address the impacts of climate change on America’s water, land, and other natural and cultural resources. The LCC concept will focus on acquiring and sharing information to support the development of landscape level strategies for understanding and responding to climate change impacts and

other large-scale ecosystem stressors, such as land use change, invasive species, and drought.

Scope

The area includes almost 100 million acres in what is described as the Gulf Coast Prairie, Tamaulipan Brushlands, Edwards Plateau, and Oaks and Prairies ecological regions of the south-central United States and northern Mexico. This landscape includes portions of five (5) U.S. States and three (3) Mexican States, all with varied coastlines, fisheries, and river basins subjected to a rapidly growing population, currently at over 25 million residents.

Goals

The GCP LCC will support, facilitate, promote, and build resource resilience in the face of climate change and other ecosystem stressors through the following:

Science Development and Delivery Collaboration Monitoring and Evaluation Communication and Information Exchange

Science Development and Delivery

Identify science needs of GCP LCC partners related to climate change and ecosystem stressors and facilitate the development, integration, and application of scientific information (including decision support tools) that will inform resource management decisions.

Collaboration

Support, facilitate, promote, and add value to existing conservation entities and partnerships to enhance the ability of these partnerships to respond to climate change and other stressors.

Monitoring and Evaluation

When such actions are mutually agreed upon by the partners involved, provide opportunities to enhance and add value to the monitoring programs of various partners through coordinated data collection, evaluation, and dissemination.

Communication and Information Exchange

Develop communication tools that enable internal collaboration by partners and to the public for a wide range of instructive and informational purposes regarding climate change and ecosystem stressors.

Membership

Membership will be based on an organization's autonomous mission or legislative authority, level of commitment, and breadth of accepted responsibility in furthering the conservation goals of the cooperative. Regardless of membership level, it is acknowledged that the commitment of Member agencies/organizations is voluntary and is subservient to each particular entity's organizational mission, authorities, and budgetary capabilities.

Member: Participation is open to any agency or organization that, by virtue of its mission or legislative authority, is committed to sharing in the responsibility of coordinating and implementing State, national, and international fish and wildlife adaptation strategies and conservation plans within the GCP landscape in the interest of sustaining natural and cultural resources. Member organizations are expected to commit resources (both human and financial) toward developing a shared vision of landscape sustainability for the GCP and to coordinate their otherwise independent actions in the cooperative pursuit and refinement of that vision.

Each member organization will assign a representative to serve on the Steering Committee. Members of the Steering Committee are expected to represent their agency or organization at an administrative and policy level on matters pertaining to allocation of human and financial resources to GCP activities that link science with conservation actions (i.e., biological planning, conservation design, outcome-based monitoring, and inventory and assumption-driven research). Additionally (within the limits of their organization's mission and legislative authority), Steering Committee Members are expected to work to align their organization's conservation delivery actions (e.g., acquisition, restoration, and management) so that they support the shared conservation vision for the GCP.

New members will be considered upon the Chair's receipt of a written request from an agency or organization that documents an interest in participating and identifies the individual chosen to serve as its representative. Consensus of the Steering Committee is required for acceptance of membership. The Steering Committee will review the participation of all Members annually and approve or disapprove Membership to ensure an active and engaged Steering Committee.

A list of the Interim Steering Committee Member organizations and their representatives is included as Enclosure A1.

Associate Member: The GCP LCC Steering Committee is open to any agency, organization, or individual whose mission may not lend itself to sharing fully in the broad spectrum of conservation actions described for members above but has an abiding interest in a special aspect of Landscape Conservation (e.g., carbon sequestration, sustainable agriculture, wetland restoration, water quality enhancement, monitoring, and

research) and is committed to furthering LCC implementation through a joint commitment of effort.

Associate Members will be non-voting but will be invited to participate in all Steering Committee meetings and in Working Group meetings, as appropriate to their areas of interest and expertise. With the exception of non-voting status, only their level of interest and commitment will limit the participation of Associate Members in the development of conservation goals and objectives and the formulation and execution of conservation strategies.

Associate Membership will be considered by the Chair upon receipt of a letter documenting the interest and area of expertise in furthering a particular aspect of LCC implementation. Additionally, the Chair may solicit an organization's participation as an Associate Member, provided the Chair has approval of existing Committee Members. The Steering Committee will review the participation of all Members annually and approve or disapprove Membership to ensure an active and engaged Steering Committee.

Structure and Participation

Participation on the GCP LCC can include (1) Steering Committee, (2) Advisory Team, (3) other working teams, groups, or sub-committee, or as a partner in the network. *The success in this collaboration depends on leadership's ability to expand the cooperative skills, knowledge, and capabilities critical to cultural and natural resources conservation by bringing "VALUE ADDED" to individual entities working in isolation.*

Functions of the Steering Committee are to

Serve as the executive body for decisionmaking to accomplish the GCP LCC mission;

Provide leadership, direction, and guidance to the LCC Coordinator, Science Coordinator, staff, Working Group(s), and/or sub-committee(s);

Provide coordination and communication between the LCC and relevant Climate Science Centers;

Approve the Operational Plan, Governance Document, Annual Work Plans and Reports, coordinated budgets and budget requests, and any other documents relating to the operation of the LCC;

Approve LCC capacity needs (e.g., staff, sub-committees);

Prioritize and approve actions and related activities recommended by Teams and Working Groups for implementation and funding;

Identify sources of funding and other available resources (e.g., staff, in-kind services) to support LCC priority projects and activities;

Provide and promote communication, coordination, collaboration, and consolidation of information on LCC activities and functions;

Identify partners to contribute and participate in the LCC;
Approve additional Steering Committee members.

Steering Committee Composition Criteria

The GCP LCC Steering Committee consists of Members who are representatives from Federal, State, tribal, and non-governmental entities that work on landscape conservation in the area encompassed by the GCP LCC. The Steering Committee shall have discretion to add members to allow for more comprehensive inclusion of partners. Steering Committee representatives shall, collectively, have the following characteristics:

- Jurisdictional responsibility for landscape-scale natural resource management;

- Capacity for furthering the vision and mission of the GCP LCC;

- Actively engaged in addressing significant natural resource management issues;

- Provide direct links and communication with other conservation entities or land managers involved in conservation delivery, particularly at local levels;

- Reflect geographical representation.

Roles of Individual Steering Committee Members

Each member of the GCP LCC Steering Committee should have the following characteristics:

- Executive and management level representative, able to influence successful outcomes for the partnership, make decisions, and commit resources;

- Ability to communicate entity's legal mandates and responsibilities;

- Knowledge and expertise in the substantive capacity of their respective entity;

- Communicate to and influence implementation of LCC work within their entity, and a willingness to hear diverse perspectives.

Steering Committee Operations

Chair and Vice Chair of the Steering Committee

The Steering Committee shall select a Chair and Vice Chair through consensus (see decisions). The Chair and Vice Chair will serve for up to three years (with the Vice Chair succeeding the Chair). Both positions will generally alternate between a Federal and a non-Federal entity.

Primary and Alternate Steering Committee Members

Each Steering Committee organization may name one primary and one alternate representative or designated staff who is authorized to represent the entity on GCP LCC matters, while maintaining the integrity of decisionmaking.

Federal, State, Tribal, and NGO representatives

are Members and will hold permanent seats on the Steering Committee, but the representative may rotate amongst people in the entity. Members may be reappointed at the entity's discretion, and will be selected based on an expression of

interest from their organization, agency, or department. Each entity is entitled to a single vote, even though it may have more than one Steering Committee Member.

Meetings, Decisions, and Communication

Meetings: The Steering Committee will meet at least twice per year. Meetings will be scheduled once each fall and once in the spring. Additional meetings may be called by the Chair, and new business may be conducted via e-mail, teleconference, or web conference.

Decisions: Each Member (organization) carries one vote. The Steering Committee Officers will participate in all votes. Steering Committee decisions and recommendations will be reached through consensus. For the GCP LCC, consensus is defined as a proposed solution or decision that participants can support or accept and abide by, and to which they do not formally object.

In situations where consensus is not achieved and the Steering Committee Chairperson determines that a decision is required, a motion will pass by a simple majority vote of Members (see quorum). Items requiring a decision or vote must be provided to all Steering Committee members not less than ten days prior to a Steering Committee meeting. Decisions or votes may also be conducted via teleconference or e-mail.

Quorum & Proxy: No official business will be completed by the Steering Committee via a meeting, teleconference, or e-mail without the participation of 75% or more Members (including alternates and proxies). Primary and Alternate Members who are unable to attend a meeting may designate a proxy to represent their views.

Advisory Team (See Enclosure A2)

The Steering Committee may establish an Advisory Team to assist with specific issues, or to facilitate details essential for decisionmaking by the Steering Committee. The Advisory Team will mirror the composition of the Steering Committee, with representation as recommended by each respective Steering Committee member. The Advisory Team will generally be tasked for organizational and administrative purposes, but could establish sub-committees for specific technical needs. For example, sub-committees may represent geographic regions (Fish Habitat Partners, Rio Grande, Oaks and Prairies and Gulf Coast Joint Ventures and Bird Conservation Regions, States or conservation partners), or be issue-specific (communications, applications).

Working Groups (See Enclosure A2)

The GCP LCC Steering Committee may establish other Working Groups for more technical and science related needs and interests of the partnership. These Working Groups would propose, develop, or refine products or applications such as plans, documents, or directives and technical applications

involving spatial (GIS) or data management. These groups could be ad-hoc, or standing Working Groups associated with the Steering Committee and Advisory Team.

Working Groups operate under the leadership and coordination of the LCC Coordinator or the Science Coordinator, as appropriate. Working Group participation is based on recommendations from the Steering Committee, but with explicit approval from the respective parent entity. The Working Groups develop foundational concepts, draft governance and operational documents, and provide specific recommendations to the Steering Committee according to their direction on such tasks as the Annual Work Plan, Operational Plan, and other formative and operative needs. The Working Groups also serve as GCP LCC “think tanks” to develop strategic concepts and analyze issues and other operative needs as identified by the Steering Committee under the leadership of the Coordinators.

Partners

Natural resources managers, stakeholders, communities, and others engaged in or supporting natural resource conservation within the boundaries of the GCP LCC who would like to participate in the GCP LCC, but do not wish to participate on a team, working group, sub-committee, or as a Steering Committee member, may participate as a GCP LCC Partner.

Dedicated Personnel

GCP LCC Coordinator – The U.S. Fish and Wildlife Service will dedicate a permanent employee to serve as the GCP LCC Coordinator. The GCP LCC Coordinator works directly with the Steering Committee Chair to communicate

with and receive direction from the Steering Committee. The GCP LCC Coordinator is the primary point of contact between the Steering Committee and staff. Additionally, the GCP LCC Coordinator implements, facilitates, and communicates GCP LCC vision and Steering Committee direction among the staff and, at the direction of the Steering Committee, oversees the development and function of Working Groups and any sub-committees. The GCP LCC Coordinator shall communicate and collaborate with adjacent LCC Coordinators to address trans-boundary issues that may arise during GCP LCC activities. LCCs adjacent to the GCP LCC include Desert, Great Plains, Gulf Coastal Plain and Ozarks, and Tallgrass Prairie.

Science Coordinator – The U.S. Fish and Wildlife Service will dedicate funding for a permanent employee to serve as the Science Coordinator. The Science Coordinator works in coordination with the GCP LCC Coordinator and provides coordination and synthesis of GCP LCC science activities, products, and needs. The Science Coordinator provides leadership on all science-related issues, supports the GCP LCC on specific technical and science-related duties, and tracks and translates status and results of relevant science and research activities among the GCP LCC staff and users. The Science Coordinator also maintains contact with, and supports the needs of, the Working Group and sub-committees.

Additional staff support and duties and responsibilities will be determined by the Steering Committee.

Enclosure A1

2011 Steering Committee Member Organizations, Steering Committee Primary and Alternate Member Representatives

Organization	Primary	Alternate
Ducks Unlimited	Tom Moorman	Jerry Holden
Gulf Coast Joint Venture	Barry Wilson	Jeff Raasch
Louisiana Department of Wildlife and Fisheries	Mike Carloss	Kyle Balkum
National Oceanic and Atmospheric Administration	David Brown	Sally Morehead
National Park Service	Tammy Whittington	Pam Benjamin
Oaks and Prairies Joint Venture	Jim Giocomo	Tim Connolly
Oklahoma Department of Wildlife Conservation	Rex Umber	Buck Ray
Reservoir Fisheries Habitat Partnership	Jeff Boxrucker	David Terre
Rio Grande Joint Venture	Mary Gustafson	Jeff Raasch
Southeast Aquatic Resource Partnership	Scott Robinson	Tim Birdsong
Texas Parks and Wildlife Department	Carter Smith	Ross Melinchuk
The Conservation Fund	Andy Jones	Julie Shackelford
The Nature Conservancy	Rich Kostecke	Steve Gilbert
U.S. Fish and Wildlife Service Region 2*	Benjamin Tuggle	Dana Roth
U.S. Fish and Wildlife Service Region 4*	Emily Jo "E.J." Williams	Bill Uihlein
U.S. Geological Survey	Max Ethridge	Allison Shipp
USDA Natural Resources Conservation Service	Salvador Salinas	Susan Baggett Ron Hilliard Kevin Norton

*Organizations with more than one Steering Committee member will have only one vote for that organization. Efforts to engage other Cooperators – Corps of Engineers (COE); Environmental Protection Agency (EPA); National Bobwhite Quail Conservation Initiative (NBCI); TX General Land Office (GLO); U.S. Department of Agriculture (USFS); U.S. Department of the Army (Fort Hood); and other Federal, State, NGO, university or others will continue.

Enclosure A2

Teams, Working Groups, and Networks

GCP LCC Advisory Team

In 2010 an interim Advisory Team was initially established to develop the GCP LCC. This group has and will evolve to facilitate coordination/integration within the partnership. The Steering Committee agreed by consensus during the June 2011 meeting to continue a GCP LCC Advisory Team; as established the Advisory Team will continue to provide advice and recommendations to the Steering Committee on conservation issues, strategies, and initiatives of mutual interest to the conservation community of the GCP LCC. The Team will provide a forum for (1) formal collaboration on projects of mutual interest; (2) sharing resources and assets to meet mutual goals and objectives; and (3) making recommendations on priority projects, strategies, and initiatives for the collective GCP LCC conservation community. Initially, membership of the GCP LCC Advisory Team will generally mirror Steering Committee Representation, to include NGO, State, and Federal representatives and partnerships (Coordinators or designated staff). The Advisory Team will be chaired by the Coordinator of the GCP LCC.

As the Advisory Team evolves, it may have responsibilities such as proposing revisions to the GCP LCC Governance Document, as necessary, and for developing the Annual Work Plan and Report. The Advisory Team may also be tasked with completing and updating the Operational Plan, coordinating input on science and information needs and initiatives, and recommending priorities to the Steering Committee.

GCP LCC Science Team

The GCP LCC Science Team will have the primary responsibility for identifying, developing, coordinating, and recommending science needs of the partnership. This Team is described in appendix B (Science Team Charter, Enclosure B2) and will be responsible for information and other data, and for developing a strategy for making data accessible to GCP LCC interests.

Other Groups may include

GIS and Data Management Working Group (Geomatics)

Watershed & Aquatic Working Group

Coastal Conservation Working Group

Prairie & Grassland Conservation Working Group

The Adaptive Science-Management Working Group

State Wildlife Action Plan (SWAP) Working Group

Conservation Delivery Network – Working Group

Cultural Resources Working Group

Appendix B: GCP LCC Science

Appendix B provides a summary of elements to be considered by the partnership in their continual effort to collaborate while using sound scientific standards. Within this section are descriptions and examples of a framework for Science Coordination using Adaptive Management as developed within Strategic Habitat Conservation (SHC); the focus of a Science Team Process with Sample Priority science needs will also be described. Enclosure B1 describes how the Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) Strike Team was used (through a Rapid Assessment Charter) to initiate the initial science needs. Enclosure B2 (Science Team Charter) establishes the platform for the Science Team to develop a long-term process to identify, assess, and promote landscape conservation among the partnership.

Science Coordination and Priorities

Science coordination plays a key role within the LCC framework. The Science Coordinator is responsible for facilitation of the GCP LCC current body of science for priority science needs and will provide the framework to identify and prioritize such science needs and existing capacity. For many priority species, background information, habitat requisites, and life histories are almost nonexistent. Developing and maintaining this information, and making the data available in a common, usable conservation atlas, will benefit the partnership as the Science Team develops priorities within the GCP LCC landscape.

In order to assist in developing and managing this process, the Science Coordinator will facilitate a more comprehensive approach to identify and prioritize science capacity needs for the GCP LCC, as defined in recent agreements with the Gulf Coast Cooperative Environmental Studies Unit (GC CESU) and the Wildlife Management Institute (WMI). This strategy will include the GCP Steering Committee hosting a “Science Summit” designed to (1) develop optimal conservation strategies for dynamic landscapes based on alternative scenarios; (2) develop cultural and natural resource needs for conservation planning and habitat delivery tools; (3) describe and prioritize top science capacity projects and needs of the GCP LCC; and (4) collaborate with scientists of the Department of the Interior’s Climate Science Centers (DOI CSCs). Downscaled climate models are considered a high priority among partners in the GCP geography, and the partnership will collaborate with the DOI CSC scientists who are responsible for developing and delivering this information to the GCP LCC.

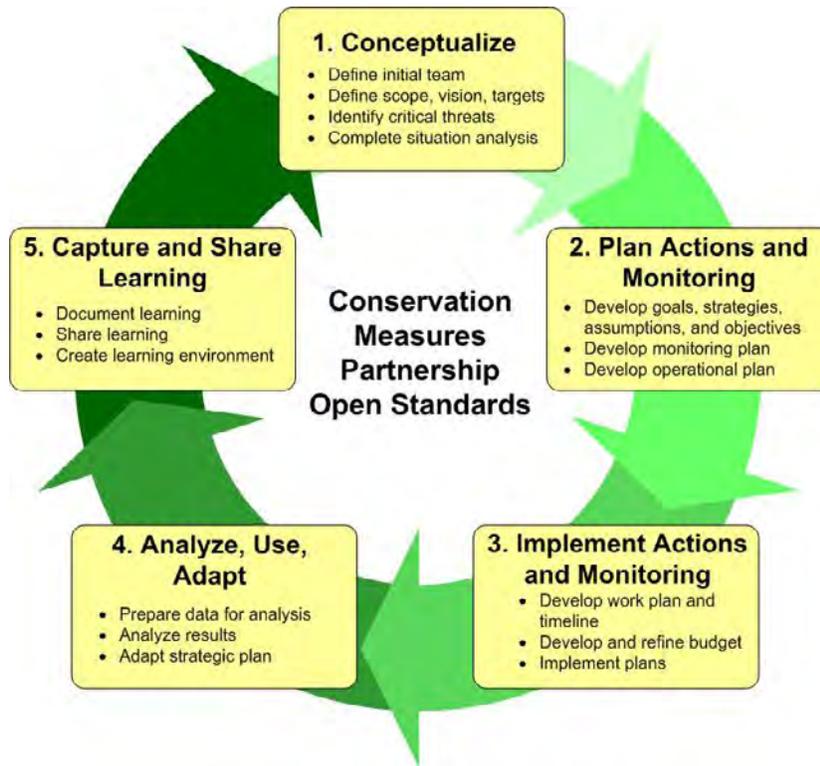
I. Adaptive Management

Adaptive management is a structured, iterative process of decisionmaking in the face of uncertainty with an aim to reduce uncertainty over time through monitoring and evaluation. In this way, decisionmaking simultaneously maximizes one or more resource objectives and, either passively or actively, accrues information needed to improve future management. Because adaptive management is based on a learning process, it provides sustainable long-term management outcomes. It is not a “trial and error” process, but rather it emphasizes learning while implementing. The challenge in using an adaptive management approach lies in finding the correct balance between gaining knowledge to improve management in the future and achieving the best short-term outcome based on current knowledge.

Some components of adaptive management are as follows:

- Management is linked to appropriate temporal and spatial scales.
- Management retains a focus on statistical power, effective sample size, and controls.
- Management recognizes the importance of natural variability in contributing to ecological resilience and productivity.
- Computer models are used to build synthesis and an embodied ecological consensus.
- Embodied ecological consensus is used to evaluate strategic alternatives.
- Communication of alternatives to political arena for negotiation of a selection.

The achievement of these objectives requires an open management process that seeks to include past, present, and future partners. Adaptive management needs to maintain political openness, though in many cases the process itself actually initiates and creates an open process. As such, adaptive management blends the science within a social context. Conceptually, the following diagram describes an adaptive management process.

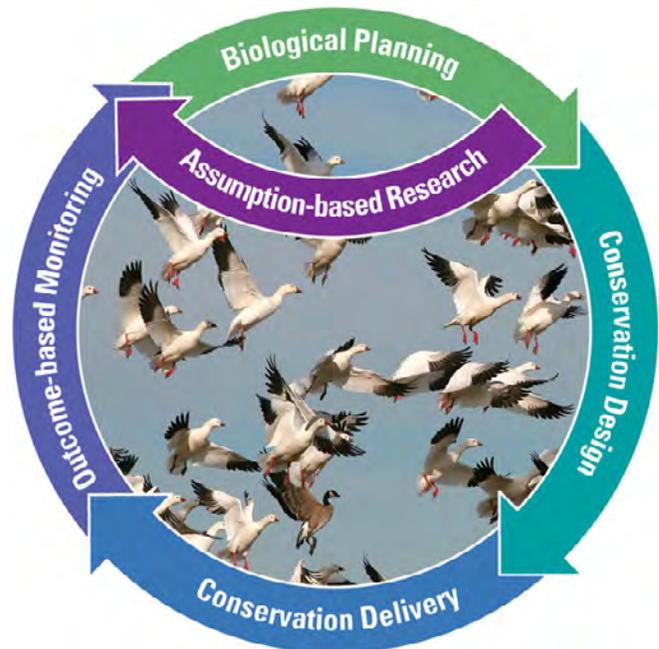


II. Strategic Habitat Conservation Process

Like the adaptive management model previously described, Strategic Habitat Conservation (SHC) is a science-based framework for making management decisions about where and how to efficiently deliver conservation to achieve specific biological outcomes. Originally focused on habitat conservation, this strategic approach will address both habitat and nonhabitat factors that limit fish and wildlife populations (<http://www.fws.gov/science/shc/>).

SHC is a way of reasoning and implementing strategies that requires setting up specific biological goals. SHC allows for strategic decisions about the action and encourages constant reassessment for improvement. SHC incorporates five key principles in an ongoing process that changes and evolves:

1. Biological Planning (setting targets)
2. Conservation Design (developing a plan to meet the goals)
3. Conservation Delivery (implementing the plan)
4. Monitoring and Adaptive Management (measuring success and improving results)
5. Research (increasing our understanding)



III. Science Team Process

The CHARTER for the Science Team describes its form and function. This portion of Appendix B proposes that the Science Team forwards to the Steering Committee a recommended process, with key checkpoints and meetings, in evaluating and recommending science priorities based on the Strategic Habitat Conservation (SHC) and/or adaptive management model. Simply stated, the process is a continuous cycle of the adaptive management, or SHC, in order to

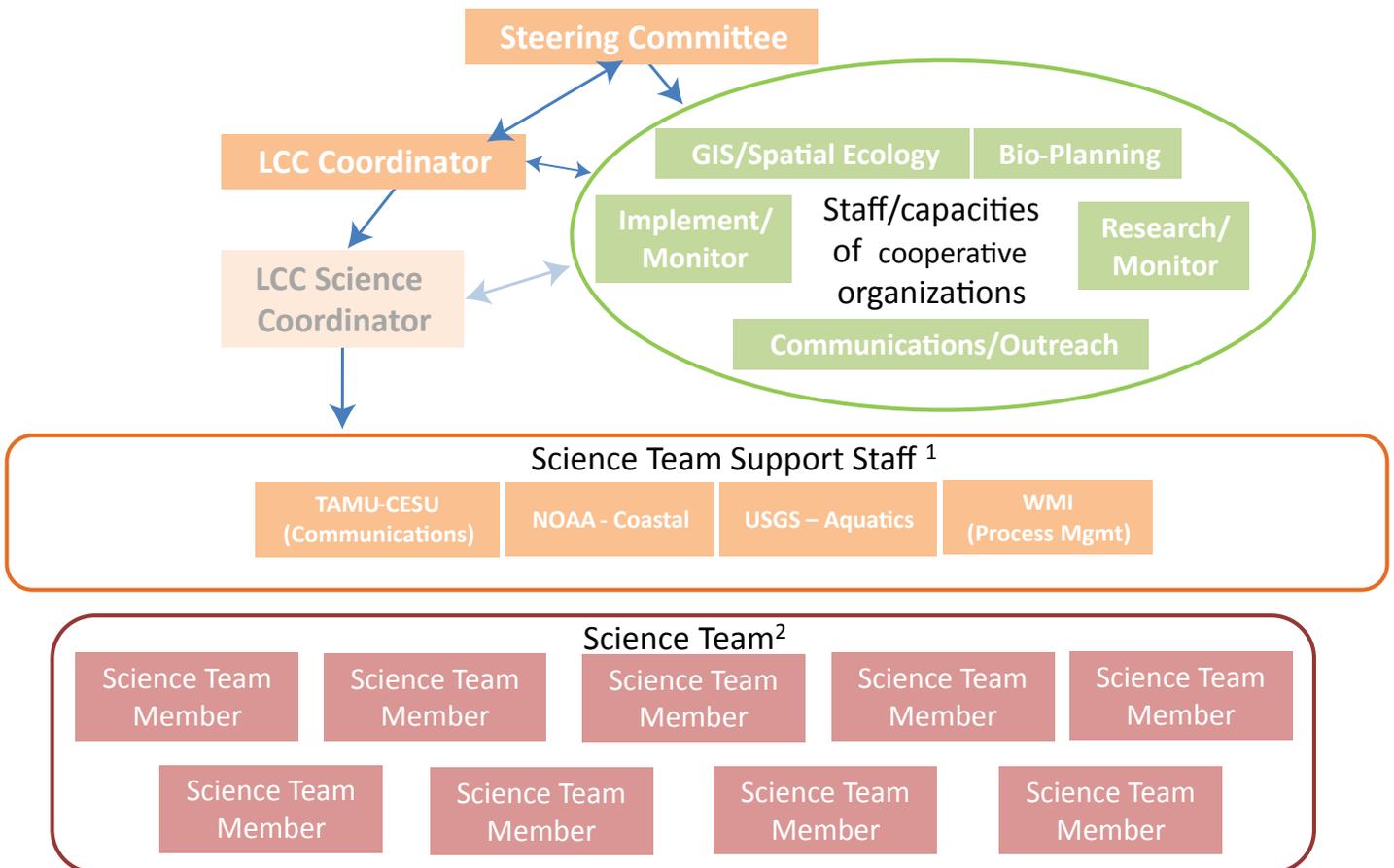
- Coordinate with Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) cooperators to advance identification of a suite of science needs (projects) to develop for submission to the Steering Committee of the GCP LCC.
- Facilitate, refine, and coordinate with the GCP LCC cooperators. This is an iterative long-term process to compile priority science needs that include priority species and habitat projects designed to meet GCP LCC needs.
- Utilize the GCP LCC network (Gulf Coast Cooperative Environmental Studies Unit, GCP LCC committees, partners, and staff) to identify, solicit, and select, as grant recipients, the best institutions to lead projects that address both short- and long-term science needs.
- Disseminate results and products of GCP LCC-funded projects through the LCC Websites and translate these results into reports and tools in the formats and scales needed by conservation partners when making strategic decisions.
- Develop tools that foster collaboration and disseminate information to partners, enhance communication among partners, attract new partners to the GCP LCC, and raise awareness of GCP LCC priorities.
- Develop extension and outreach programs designed to reach target land management clientele for translation of science project results into on-the-ground conservation efforts.

SHC Matrix Used To Determine Science Needs for GCP LCC Priority Species

ELEMENT	SUB-ELEMENTS				
Biological Planning	Planning Unit	Priority Species	Population Objectives	Limiting Factors	Species and Habitat Models
Conservation Design	Landscape and Habitat Assessment	Assessment of Conservation Estate	Decision Support Tools	Conservation Objectives	Integrate Multiple Species Objectives
Conservation Delivery	Program Objectives	Conservation Delivery Mechanisms	Communication and Education		
Outcome-based Monitoring	Conservation Tracking System	Habitat Inventory and Monitoring Program	Population Monitoring Program		
Assumption-driven Research	Species and Habitat Model	Conservation Treatment Assumptions	Sensitivity Analyses	Spatial Data Analyses	

Sample Priorities

- Climate change impacts on groundwater and surface water dynamics
 - Implications for priority species in major river systems
- Expanding integrated coastal assessment of the SE pilot to Oklahoma and Texas
- Expanding the Coastal Wetlands PRIORITIZATION TOOL to Texas
- Refinement of SLAMM models
- Predicting the effects of land use and climate change on wildlife communities and habitats; predicting the effects of land use key cultural aspects impacted by climate change
- An integrated “grassland and savanna” management database
- Expanding and updating land cover classifications for priority habitats
 - Use data to develop a Treasured Landscape Decision Support Tool
- Conservation strategies for dynamic landscapes impacted by wildfire and weather
- Assess the impact of human development on high-priority species



¹ Support via agency (USGS or NOAA) and/or taxa or physiography; assist/coordinate sub-teams or facilitate a sub-team leader.

² Nominated by Strike Team and/or Steering Committee, possibly organized into sub-teams aligned with support staff.

Enclosure B1

Gulf Coast Prairie Landscape Conservation Cooperative Charter for Science Strike Team

Charter Purpose: The Science Rapid Assessment Charter establishes the authority assigned to the **Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC)** Coordinator, by the Steering Committee, to establish a Science Strike Team and to lead and manage the Science Strike Team to meet objectives. The charter defines and directs the Science Strike Team and includes purpose, timeline, and rules of engagement—Who, What, Where, How.

Team Objective: Establish an efficient process to guide allocation of FY11 GCP LCC science funds for near-term science needs. These funds are currently obligated within broad agreements in the Southeast Cooperative Environmental Studies Unit (CESU) hosted at Texas A&M University Institute for Renewable Natural Resources (IRNR) and Wildlife Management Institute (WMI); determination of funding will be directed by the GCP LCC Steering Committee. This process will occur via the following team actions:

Develop criteria, timeline, and methodology to identify near-term science priorities;

Initiate the process (or processes) to identify possible funding deliverables;

Recommend a suite of science needs and estimated costs to GCP LCC Steering Committee;

Obligate FY11 funds for priority science needs before October 1, 2011; and

Recommend steps for developing future long-term priority science needs.

Team Membership: Bill Bartush, GCP LCC Coordinator – leader; Mike Brasher, DU/GCJV; Jim Giocomo, OPJV; Mary Gustafson, RGJV; Scott Robinson, SARP; Tim Andersen, FWS; Todd Snelgrove, TX A&M; Chris Smith, WMI; and Jeff Boxrucker, RFHP.

Timeline: The lifespan of this team is expected to extend through spring 2012 to enable a rapid response capability for the GCP LCC; however, the primary actions will occur prior

to October 1, 2011. Upon establishment, the Strike Team will develop a short list of science needs by July 15, 2011; this list will be evaluated and a priority with estimated costs will be established by August 5, 2011. The Strike Team will draft a proposal for immediate science needs and submit this proposal to the Steering Committee by August 18, 2011. Based on Steering Committee recommendations, future refinement may be directed by September 15, 2011.

Tasks & Benchmarks: Science Strike Team will convene and establish HIGH PRIORITY science needs; tasks specifically include the following:

- (a) Assemble Strike Team, review and accept the charter;
- (b) Involve and integrate WMI and CESU members into the Strike Team;
- (c) Confirm individual responsibilities;
- (d) Assess and assemble plans for priority species/habitats and landscape science needs;
- (e) Submit Strike Team responses by July 15, 2011;
- (f) Convene Strike Team to discuss and recommend science needs by July 25, 2011;
- (g) GCP LCC Coordinator will compile responses, list, and costs by August 5, 2011;
- (h) Submit priority list of science needs to GCP LCC Steering Committee August 18, 2011;
- (i) An after-action report and a process for continued refinement of long-term science needs;
- (j) Other duties as assigned by the GCP LCC Steering Committee.

Enclosure B2

Science Team CHARTER

Gulf Coast Prairie Landscape Conservation Cooperative

1. STATEMENT

The Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) is committed to using adaptive management and strategic habitat conservation, with actions rooted in sound scientific principles. The Science Team is charged with proactively engaging regional, national, and international experts to consider environmental issues across the GCP LCC landscape, using a coordinated approach to focus on continual provision of the best available science and factual information to the GCP LCC partnership. The effectiveness of the Science Team in supporting the mission of the GCP LCC partnership is dependent on the active contribution and commitment of GCP LCC partners and the individuals that compose the partnership, other LCCs, and the Science Team.

2. SCOPE

The Science Team will meet to review and discuss priority science needs within the GCP LCC, evaluate progress, and communicate issues and recommendations to the Steering Committee. As needed, the Science Team may promote a Science Forum, organized by the leadership of the Science Team and including partners, contractors, and others from governmental and nongovernmental sectors. The Science Forum will be a primary mechanism used by the Science Team to identify science priorities to carry forward to the GCP LCC Steering Committee and GCP LCC partners for consideration.

3. PURPOSE

To implement and conduct the priority science needs of the GCP LCC, the Science Team is charged by the GCP LCC Steering Committee to maintain and continually provide the best available science and factual information for the GCP LCC partnership. The Science Team is composed of members who lend their perspectives, experiences, knowledge, and qualifications to the GCP LCC and the Science Team.

4. STRUCTURE AND RESPONSIBILITIES

The Science Team is responsible for coordinating GCP LCC science efforts, communicating with the Steering Committee and GCP LCC staff, and ensuring that actions and recommendations coming to the Steering Committee or developed and disseminated by the GCP LCC are founded on sound scientific principles. The Science Team will consist of representatives recommended by the GCP LCC Science Coordinator and as approved by the Steering Committee. The Science Team will consist of at least nine (9) and up to fifteen (15) members who will represent significant programs, issues, and disciplines within the GCP LCC.

4.1 Science Team Structure

The Science Team will be chaired by the GCP LCC Science Coordinator. In the absence of a Science Coordinator, the Science Team will be led by a “Team-appointed” Chair. The Science Team will be supported by the GCP LCC staff and cooperators (Cooperative Environmental Studies Unit [CESU], Wildlife Management Institute [WMI], National Oceanic and Atmospheric Administration [NOAA], and U.S. Geological Survey [USGS]) to assist process management, information technology, and communications. The composition of the Science Team may include representatives from broad conservation and scientific disciplines, for example:

- Cultural and social resources to include private lands
- Terrestrial: vegetation and wildlife
- Aquatic: watershed and fisheries
- Coastal: marine and estuarine
- Conservation design and spatial planning (SE CAS and WGA)
- At-large representatives (Federal, State, and nongovernmental) to provide support on key issues such as energy, climate, taxa, data management, etc.

4.2 Science Team Responsibilities

The responsibility of the Science Team is to monitor and provide regular guidance to GCP LCC Steering Committee actions to ensure that sound science information is a primary component in deliberations. The Science Team should seek continual improvement and serve as an advisory body to the Steering Committee. In meeting this responsibility, the Science Team shall do the following:

1. Provide guidance on projects, products, and initiatives.
2. Document efforts and maintain documentation.
3. Establish regular meetings (teleconferences and/or onsite meetings) for the Science Team.
4. Maintain records of Science Team meeting minutes.
5. Communicate important matters to GCP LCC Steering Committee and other personnel.
6. Evaluate science needs: concepts, activities, and services brought to the GCP LCC.
7. Clearly define project goals, objectives, and outcomes to ensure project efficiency.
8. Represent their scientific discipline and communicate conservation interests on issues through consultation with their organization's leadership, management, and staff.

5. DECISIONMAKING

The Science Team is charged with making recommendations to the Steering Committee. Any and all recommendations put forth will be made by consensus, and all Science Team members will have equal status during deliberations. When consensus cannot be reached, a vote may be taken; a quorum will exist when a simple majority (minimum of 51 percent) is present. Without a quorum, meetings may be convened to discuss issues, but no decisions or Science Team recommendations can be made. Subject-matter experts and other visitors to Science Team meetings may participate in deliberations, but may not "vote" on recommendations.

6. MEETING SCHEDULE

The Science Team will conduct regularly scheduled meetings, at least twice annually. Additional meetings and Science Forums may be scheduled as needed.

7. MODIFICATIONS AND EFFECTIVE DATE

This CHARTER becomes effective as of the date approved by the Steering Committee. This CHARTER may be subsequently amended or supplemented as directed by the Steering Committee at any time. The Science Team, through a process of petition for change, and with the GCP LCC Science Coordinator, may request modifications by the Steering Committee.

