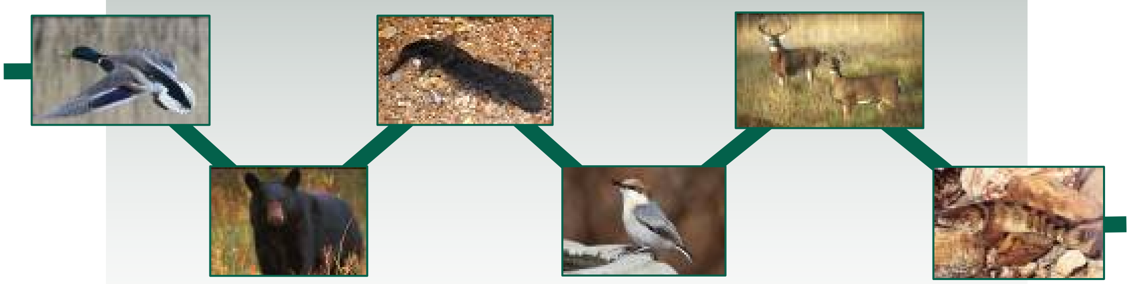
Gulf Coastal Plains and Ozarks
Landscape Conservation Cooperative

Development and Operations Plan



Sustaining the Nation's Treasured Natural Resources

December 2009

Table of Contents

List of Tables

List of Figures

Figure 15. The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative will potentially organize within each of the subunits with three general organizational components: a Leadership Community, a dedicated Conservation Science capacity, and Process Networks.

List of Appendices

Appendix A: Letter from Lower Mississippi Valley Joint Venture Management Board to Secretary of Interior Salazar

Appendix B: Letter from East Gulf Coastal Plain Joint Venture Management Board to Secretary of Interior Salazar

Appendix C: Priority Habitats and Species of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Appendix D: Preliminary species in need of priority conservation action within broadly-defined ecological communities of the Southeast

Appendix E: Preliminary list of potential federal and state agencies, colleges and universities, and non-governmental organization partners within the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

Appendix F: Select priority science projects targeting needs of Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, December 2009.

Appendix G: Draft Operational Compass for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Appendix H: Detailed Descriptions of Select High Priority Science Project Needs

Appendix I: A subset of science capacity needs identified by a cross-section of the private, state, federal conservation community in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (LCC), December 2009.

Appendix J: Announcement for Gulf Coastal Plains and Ozarks LCC Leadership Summit

Appendix K: Charter for the Lower Mississippi Valley Joint Venture Forest Resource Conservation Working Group

Appendix L: Lower Mississippi Valley Joint Venture Conservation Delivery Network Concept Overview

Appendix M: The Need for Landscape Conservation Cooperatives – A Back Story

Appendix N: The Interior Low Plateaus

Proviso:

This *Development and Operations Plan* for the Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) acknowledges that:

(a) The LCC will be established under the leadership of the Lower Mississippi Valley, East Gulf Coastal Plain, and Central Hardwoods Joint Venture Partnerships. These three large-scale partnerships have a combined membership comprised of ten state agencies, three federal agencies, and nine non-governmental organizations that individually and collectively have a demonstrated history of success in conservation;

(b) While a number of individuals within these agencies and organizations were involved in developing this plan, the plan does not have the benefit of the multitude of individuals whose contributions will be instrumental to the success of the LCC. Thus, this plan is expected to undergo substantial improvements as the larger community engages in the cooperative;

(c) The GCPO LCC was not originally targeted to be funded in FY2010. However, numerous states, federal, and private agencies and organizations were eager to unite and lead the development of an LCC in this geography. Thus, the Southeast Region of the U.S. Fish and Wildlife Service and other potential partners will provide existing funds as venture capital to finance the start-up and initial development of the GCPO LCC. The GCPO partnership will invest resources to hire a Science and Technology Coordinator and initiate key science projects.

(d) Familiarity and understanding of the concept and expectations behind a national network of Landscape Conservation Cooperatives varies greatly among individuals. Thus, we provide a back story in Appendix M to ensure readers have a common understanding of the changes in conservation that have led to the genesis of LCCs.

Introduction

The American public has a rich and storied history in its commitment to maintaining wild and scenic landscapes and its tireless endeavor to conserve endemic fish and wildlife resources for future generations. Indeed, one of the grandest achievements of this society has been the recognition that Man's well-being is dependent on Nature and he has a responsibility to properly steward it. Evidence of this philosophy is manifest in public policies and treasured landscapes that provide citizens the near limitless experience of natural wonder and the opportunity to freely share in the excitement offered by consumptive and non-consumptive uses of fish and wildlife resources. Paradoxically, our society is placing increasing pressures on the very resources it depends on and desires to conserve. The American public faces unprecedented issues of scale, pace, and complexity in sustaining our Nation's fish and wildlife resources. Global population is expected to reach 9 billion by 2042. As the number of people increases, resource management challenges such as habitat degradation, conversion, and fragmentation; contamination and pollution; invasive species, disease and threats to water quality and quantity grow as well. All of these threats are compounded by a changing climate that is itself accelerated by demands for energy (including the development of alternative energy sources). Thus, despite the tremendous success our nation has enjoyed in maintaining wild places and sustaining fish and wildlife resources, the conservation challenges of the 21st Century represent a force of change more far-reaching and consequential than any previously encountered.

Many organizations and agencies across America in both the public and private sectors are taking bold steps to address these complex challenges. In 2009 the United States Department of Interior demonstrated its commitment to serving the Public's interest in our Nation's treasured landscapes by issuing Secretarial Order 3289 titled: Addressing the Impacts of Climate Change on American's Water, Land, and Other Natural and Cultural Resources. Among the actions in that order, the Department of Interior committed to helping the conservation community develop a collaborative response to climate change. In FY2010, Congress appropriated funds to support DOI's vision of establishing a national network of Landscape Conservation Cooperatives (LCCs). LCCs are envisioned as conservation science alliances where the private, state, federal community operates as a networked, leveraged system in a non-regulatory forum to effectively pursue socio-viable solutions in support of the Nation's interest in sustaining endemic fish and wildlife populations and the ecological functions and processes on which they depend.

The Gulf Coastal Plains and Ozarks (GCPO) LCC, located in the south-central US (Figure 1), is one of 22 LCCs identified by the Department of Interior. On November 1st 2009, agencies and organizations of the Lower Mississippi Valley (LMV) Joint Venture partnership, whose geography overlaps 50% of the GCPO LCC, voted unanimously to assume the responsibility of providing leadership in the establishment of the Cooperative (Appendix A). The LMV Joint Venture is a 21-year-old conservation partnership recognized internationally for its cohesive leadership, innovative approach to landscape-scale conservation, and effective integration of science and management – all targeting

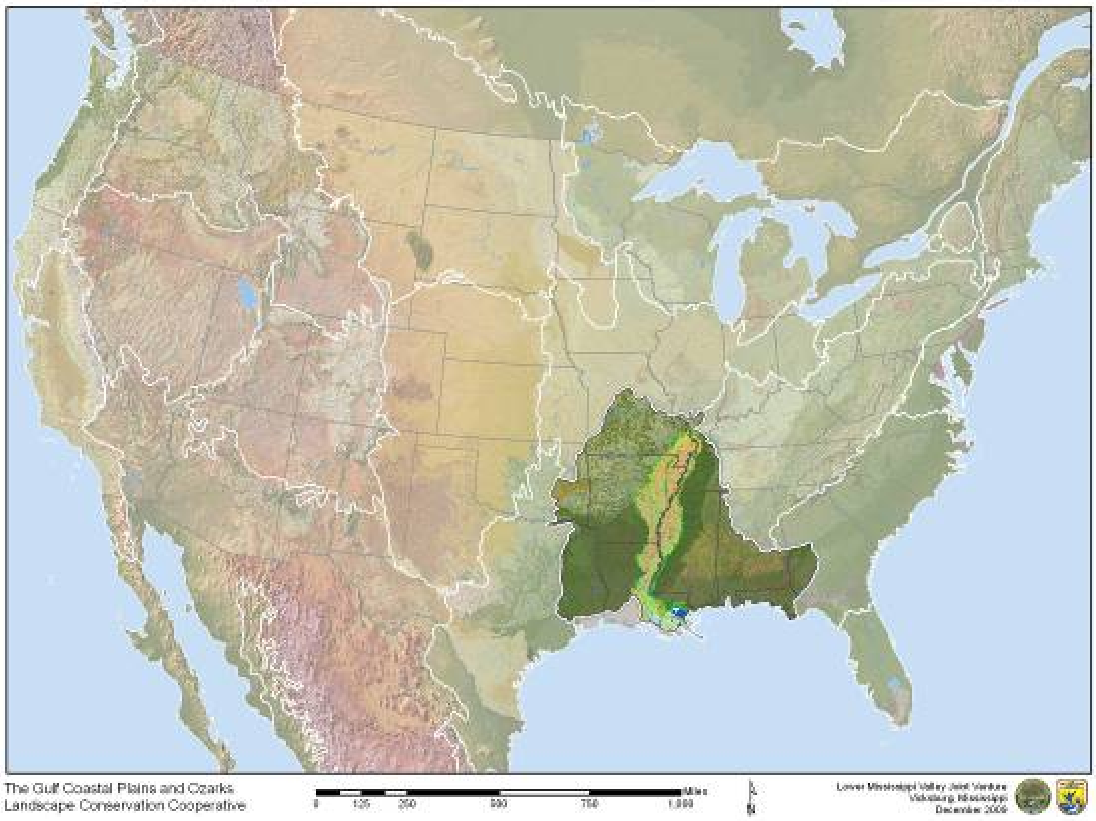


Figure 1. The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative in the context of the national framework of Landscape Conservation Cooperatives.

the long-term sustainability of regional and North American bird populations. On November 18th 2009, agencies and organizations of the East Gulf Coastal Plain (EGCP) Joint Venture partnership, whose geography overlaps 35% of the GCPO LCC, voted to share the lead role with the LMV Joint Venture in the establishment of the GCPO LCC (Appendix B). The EGCP Joint Venture is a young partnership, but has made substantial progress in defining landscape sustainability and strategically advancing bird conservation consistent with that vision. On November 18th 2009, partners of Central Hardwood (CH) Joint Venture also agreed to assist in the establishment of the GCPO LCC. However, the geographic area of responsibility for the CH Joint Venture is bisected by the boundaries delineating the GCPO LCC and the Appalachian LCC (Appendix N). The CH Joint Venture partnership is exploring options for engaging in the establishment of LCCs. While the reach of the three Joint Venture partnerships touches many organizations, agencies, and individuals across the public and private sectors, the long-standing members responsible for their success include ten state agencies, three federal agencies, and nine non-governmental organizations (Table 1).

Joint Venture partnerships originated as a strategy of the 1986 North American Waterfowl Management Plan to address unprecedented declines in waterfowl populations. The theory behind their development was that regional self-directed non-regulatory partnerships could become so well-coordinated in leveraging their assets and so well-coordinated in targeting their conservation programs that the collective contributions of each individual Joint Venture's actions nation-wide would have a direct and positive effect in supporting and sustaining desired levels of waterfowl populations regionally and continentally. In the late 1990s Joint Venture partnerships were challenged to integrate all bird conservation into their strategies. While many Joint Venture partnerships have integrated other priority species into conservation actions, no Joint Venture has a mission that extends beyond birds. In recognition of individual and organizational concerns that may exist regarding the role three avian-focused Joint Venture partnerships have assumed to establish a GCPO LCC with a broader biological scope, the individual partner agencies and organizations note:

- >90% of the member organizations of these Joint Venture partnerships have responsibilities that go beyond birds

- Underlying the commitment of these member organizations to landscapes that can sustain birds is the commitment to landscapes capable of sustaining all fish and wildlife species. The emergence of an all taxa LCC is seen as a necessary step to achieve this larger goal

- This plan reflects input from a large and diverse conservation community, including: aquatic resource partnerships, state fish and wildlife agencies, federal resource management organizations, science organizations, and programs within individual agencies and organizations. Nevertheless, as stated in the proviso, the plan requires additional input from many more individuals whose contributions will be instrumental to the success of the LCC

- Each member agency and organization of the three Joint Venture partnerships is committed to the success of the GCPO LCC and is resolved to engage and enlist the larger conservation community to develop a shared vision of conservation, cooperate in its implementation, and collaborate in its refinement

- This plan is expected to undergo substantial improvements as the larger community engages in the Cooperative

Table 1. Current collective members of the Central Hardwoods Joint Venture, East Gulf Coastal Plain Joint Venture, and Lower Mississippi Valley Joint Venture, 2009.

Jurisdiction	Name
Federal	U.S. Fish and Wildlife Service
	U.S. Forest Service
	U.S. Geological Survey
State	Alabama Wildlife and Freshwater Fisheries
	Arkansas Game and Fish Commission
	Florida Fish and Wildlife Conservation Commission
	Kentucky Department of Fish and Wildlife Resources
	Louisiana Department of Wildlife and Fisheries
	Mississippi Department of Wildlife, Fisheries and Parks
	Missouri Department of Conservation
	Oklahoma Department of Wildlife Conservation
	Tennessee Wildlife Resources Agency
	Texas Parks and Wildlife Department
Non-governmental organizations	American Bird Conservancy
	Auburn University
	Ducks Unlimited
	National Audubon Society
	National Wild Turkey Federation
	Northern Bobwhite Conservation Initiative
	The Conservation Fund
	The Nature Conservancy
	Wildlife Management Institute

Gulf Coastal Plains and Ozarks LCC: Ecological Context

The Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) is a ~180 million acre region in the south-central United States (Figure 1). The region spans 12 states and ranges from Oklahoma and Texas on the west to Alabama, Georgia, and Florida on the east; the states of Arkansas and Mississippi are completely contained within this geography (Figure 2). The GCPO LCC is comprised of four distinct sub-regions: the East Gulf Coastal Plain (EGCP), Interior Highlands, Mississippi Alluvial Valley (MAV), and the West Gulf Coastal Plain (WGCP) (Figure 3). Although these sub-regions share many characteristics that warrant their inclusion in a single LCC, significant differences exist among them with regards to history, culture, ecology, and economics. Thus, understanding the geographic setting, priority species and habitats, and conservation challenges and opportunities of the GCPO LCC as a whole demands examination of the unique attributes for the component sub-units of the LCC individually. The following sections are devoted to this review.

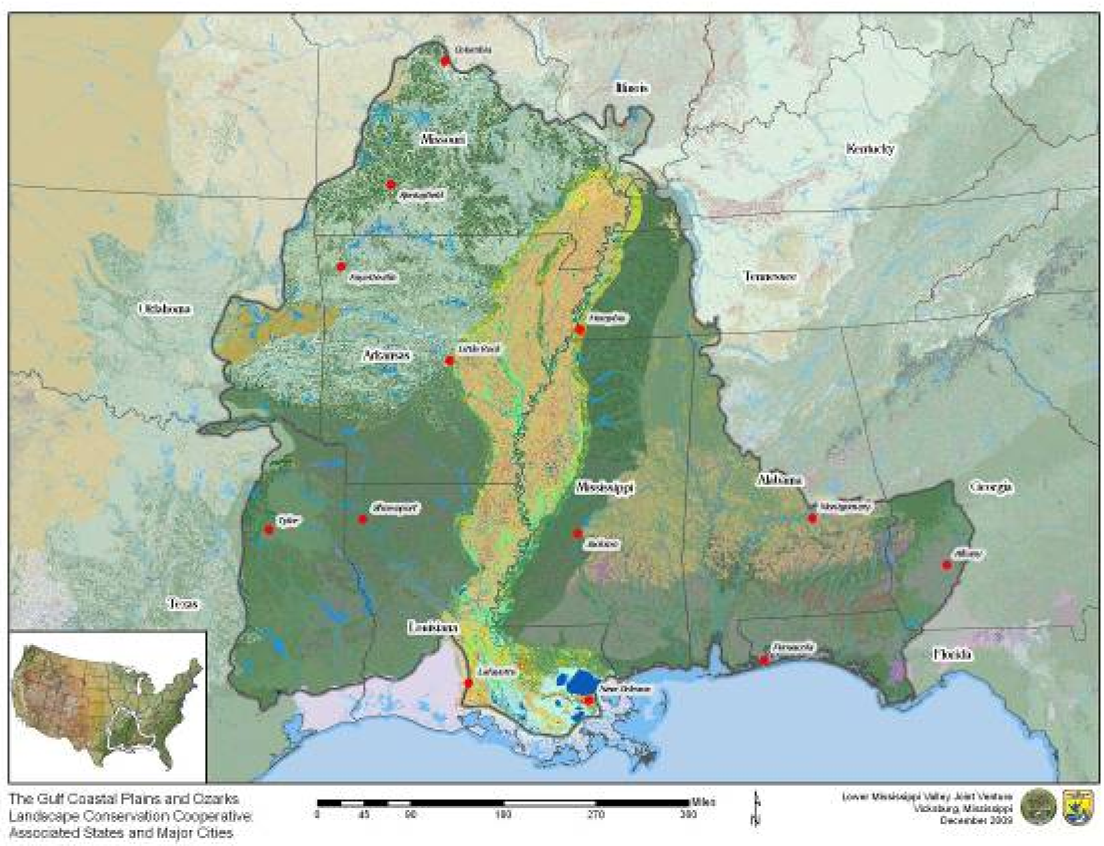


Figure 2. The states and select cities within the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

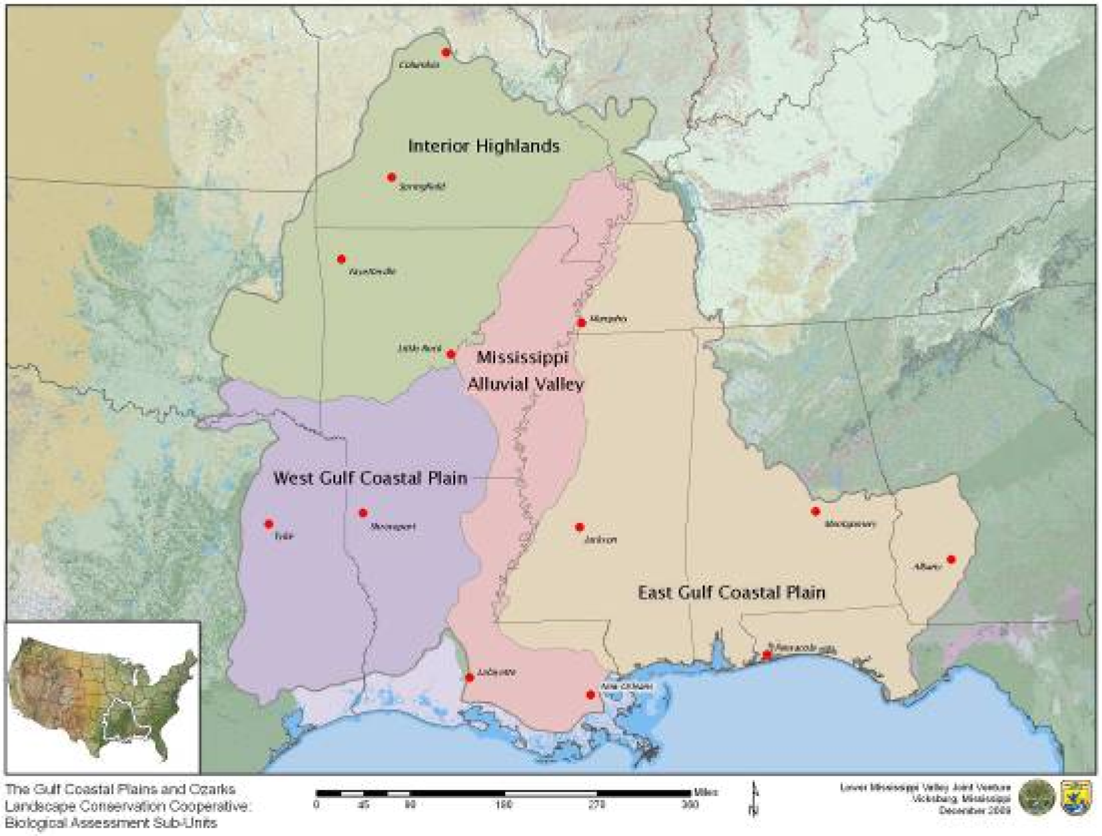


Figure 3. The four sub-units of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

East Gulf Coastal Plain (EGCP)

Geographic setting. At 65.5 million acres, the EGCP is the largest sub-unit of the GCPO LCC (Table 2). Occupying most of the LCC area east of the Mississippi River, the EGCP touches 7 states: Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, and Tennessee (Figure 3). The region is predominantly forested (~68%); however, nearly 15% of this is in shrub-scrub (i.e., clearcuts); developed lands account for another 6% of the landscape (Table 3). More than 14,500 miles of river course across this region, accounting for more than a third of all river miles within the entire GCPO LCC (Table 4).

Priority species and habitats. The EGCP is home to a number of high profile priority species that reflect the diversity of the habitats that occur within this geography (Appendices C and D). Restricted to <3% of their former range, longleaf and shortleaf pine ecological communities within this region provide critical habitat for numerous high priority bird (e.g., red-cockaded woodpecker, Mississippi sandhill crane, Bachman's sparrow, and Henslow's sparrow) and herptile (e.g., Flatwoods salamander, gopher frog, gopher tortoise, and pine snake) species. Vast acreages of bottomland hardwoods (more than any other subunit; Table 4) occur along the floodplains of large rivers (e.g., Pascagoula River; Figure 4) and also support many high priority birds (e.g., Swainson's warbler and swallow-tailed kite) and plants (e.g., Alabama leather flower). The diversity in forestlands is equaled by the diversity in other habitats: coastal dunes and marshes provide habitat for priority mammals (e.g., Alabama and southeastern beach mouse), birds (e.g., saltmarsh sparrow, reddish egret, and Wilson's plover) and fish (e.g., saltmarsh topminnow); native grasslands and prairies support priority plants (e.g., pitcher plants) and herptiles (e.g., mimic glass lizard); and a wide range of wetland and aquatic habitats are home to numerous freshwater mussel (e.g., black clubshell and flat pigtoe), fish (e.g., Conasauga logperch and Okaloosa darter), bird (e.g., mottled duck, wood stork, and American bittern), and herptile (e.g., American alligator) species.

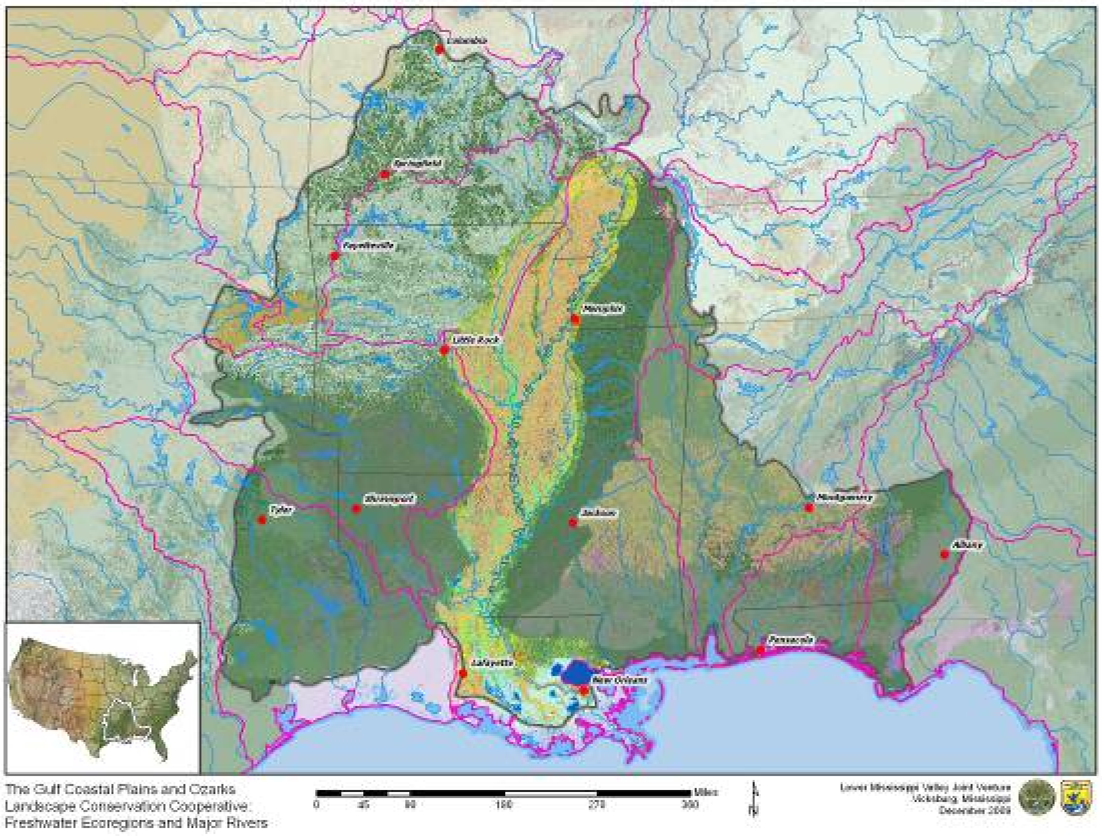


Figure 4. Primary watersheds and major rivers of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

Conservation challenges. The need for swift, yet strategic conservation action in the EGCP is clear. Among the most prominent conservation threats in the region, projected population growth (and the urban and suburban development that follow) ranks highest. The bulk of the EGCP landscape is in private ownership, and more than half the landowners own <500 acres. The increasing divestiture of corporate-owned timberland will only increase the challenge of coordinating conservation among numerous

Table 2. Landcover characterization (acres; miles) of individual subunits of Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative based on 2001 National Landcover Dataset and National Hydrology Dataset.

	Subunits				
Landcover Class (acres)	East Gulf Coastal Plain	Interior Highlands	Mississippi Alluvial Valley	West Gulf Coastal Plain	Total
Aquatic					
Open water	1,045,133	989,657	1,854,152	1,093,836	4,982,778
Rivers (miles)	14,631	9,330	7,518	10,980	42,459
Terrestrial					
Developed – open space	3,032,474	1,919,947	1,073,015	1,379,290	7,404,726
Developed – low intensity	790,886	554,259	462,869	1,133,146	2,941,160
Developed – medium intensity	246,391	128,967	121,958	170,278	667,594
Developed – high intensity	83,946	47,484	52,085	62,885	246,400
Barren land	125,467	58,820	50,401	53,390	288,078
Deciduous forest	10,890,804	21,602,318	611,733	3,283,230	36,388,085
Evergreen forest	13,691,721	3,842,557	247,868	11,551,339	29,333,485
Mixed forest	5,398,635	2,175,478	232,143	2,659,898	10,466,154
Shrub-scrub	6,738,799	283,555	161,430	4,109,759	11,293,564
Herbaceous grassland	1,029,677	1,432,332	86,300	1,394,449	3,942,758
Hay-pasture	7,026,333	12,211,209	783,341	5,018,597	25,039,480
Cultivated crops	7,046,247	1,526,974	15,431,758	921,167	24,926,146
Woody wetlands	7,987,079	409,351	6,280,995	6,279,499	20,956,924
Emergent herbaceous wetland	436,670	42,321	699,989	167,624	1,346,604
Total	65,587,262	47,225,227	28,150,036	39,278,386	180,240,911

Table 3. Landcover characterization (%) of individual subunits as a total of each subunit within the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative geography based on 2001 National Landcover Dataset and National Hydrology Dataset.

	Subunits				
Landcover Class (acres)	East Gulf Coastal Plain	Interior Highlands	Mississippi Alluvial Valley	West Gulf Coastal Plain	Total
Aquatic					
Open water	1.59	2.10	6.59	2.78	2.76
Rivers (miles)	-	-	-	-	-
Terrestrial					
Developed – open space	4.62	4.07	3.81	3.51	4.11
Developed – low intensity	1.21	1.17	1.64	2.88	1.63
Developed – medium intensity	0.38	0.27	0.43	0.43	0.37
Developed – high intensity	0.13	0.10	0.19	0.16	0.14
Barren land	0.19	0.12	0.18	0.14	0.16
Deciduous forest	16.61	45.74	2.17	8.36	20.19
Evergreen forest	20.88	8.14	0.88	29.41	16.27
Mixed forest	8.23	4.61	0.82	6.77	5.81
Shrub-scrub	10.27	0.60	0.57	10.46	6.27
Herbaceous grassland	1.57	3.03	0.31	3.55	2.19
Hay-pasture	10.71	25.86	2.78	12.78	13.89
Cultivated crops	10.74	3.23	54.82	2.35	13.83
Woody wetlands	12.18	0.87	22.31	15.99	11.63
Emergent herbaceous wetland	0.67	0.09	2.49	0.43	0.75
Total	100.00	100.00	100.00	100.00	100.00

Table 4. Landcover characterization (%) of individual subunits as a total of entire Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative geography based on 2001 National Landcover Dataset and National Hydrology Dataset.

	Subunits				
Landcover Class (acres)	East Gulf Coastal Plain	Interior Highlands	Mississippi Alluvial Valley	West Gulf Coastal Plain	Total
Aquatic					
Open water	20.97	19.86	37.21	21.95	100.00
Rivers (miles)	34.46	21.97	17.71	25.86	100.00
Terrestrial					
Developed – open space	40.95	25.93	14.49	18.63	100.00
Developed – low intensity	26.89	18.84	15.74	38.53	100.00
Developed – medium intensity	36.91	19.32	18.27	25.51	100.00
Developed – high intensity	34.07	19.27	21.14	25.52	100.00
Barren land	43.55	20.42	17.50	18.53	100.00
Deciduous forest	29.93	59.37	1.68	9.02	100.00
Evergreen forest	46.68	13.10	0.85	39.38	100.00
Mixed forest	51.58	20.79	2.22	25.41	100.00
Shrub-scrub	59.67	2.51	1.43	36.39	100.00
Herbaceous grassland	26.12	36.33	2.19	35.37	100.00
Hay-pasture	28.06	48.77	3.13	20.04	100.00
Cultivated crops	28.27	6.13	61.91	3.70	100.00
Woody wetlands	38.11	1.95	29.97	29.96	100.00
Emergent herbaceous wetland	32.43	3.14	51.98	12.45	100.00
Total	36.39	26.20	15.62	21.79	100.00

landowners that have smaller landholdings. Furthermore, many of these divestitures are coupled with changes in management strategies or land use that negatively (and often permanently) affect the suitability of these lands for priority species. Therefore, effective conservation in this region must recognize the primary role private lands play in this effort, emphasize their management, and expand their participation in conservation programs. Anthropogenic effects also extend to existing habitats as well. Altered fire regimes, conversion to off-site pine, and unsustainable forestry practices threaten upland and open pine habitats, including longleaf pine stands. Freshwater habitats are negatively impacted by hydrologic alteration, fragmentation, non-point source pollution, and sedimentation. Incompatible land use that significantly alters the composition and structure of forests is also a major threat, and habitat loss to agricultural development has contributed to major losses of grassland habitats in the EGCP.

Global changes in climate represent an overarching threat that will have profound and cascading impacts on the natural communities of the EGCP. The potential implications of climate change must be acknowledged and factored into any long□term conservation strategy. Sea level rise, shifts in the distributions and migration patterns of wildlife, and increasing frequency and intensity of Gulf hurricanes are several of the more widely recognized implications of a rapidly shifting climate. In addition, climate change will undoubtedly result in dramatic alterations in land use as humans respond to changing resource availability, rising sea levels, and increased societal pressures to develop alternative energy. Such land use changes threaten priority species and the natural communities they depend on and will require cutting edge science to predict, assess, and address their impacts.

Conservation opportunities. Despite these threats, much of the EGCP remains undeveloped (Table 2) and ample opportunity exists for strategic planning to effectively influence management and restoration of the remaining habitats. As an example of this potential, the EGCP Joint Venture partnership has recently developed an open pine Decision Support Tool to determine where conservation activities should be directed to maximize conservation benefit with the minimum amount of effort (Figure 5). Although this tool currently reflects only the ecological requirements of birds, the habitat associations of additional open pine species (e.g., gopher tortoise) are being integrated into this tool to provide a model for guiding conservation activities for the benefit of multiple taxonomic groups. Application of this tool to prioritize locations for conservation actions exemplifies how partners in the EGCP are aligning their activities to address their mutual conservation priorities and produce success at the landscape scale that results in diverse, healthy, and sustainable populations of fish and wildlife.

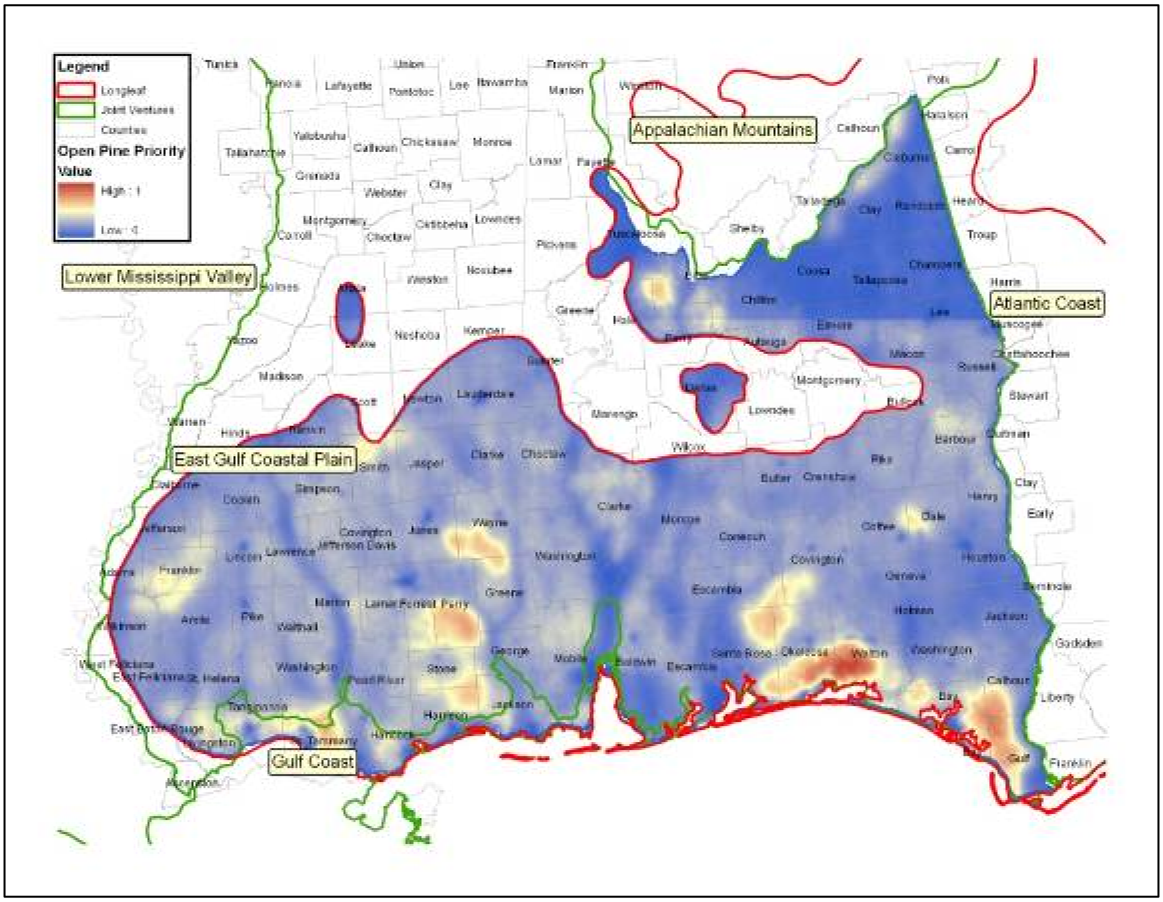


Figure 5. Open pine Decision Support Tool used to identify top priorities for conservation activities (e.g., restoration or management) that benefit open pine species.

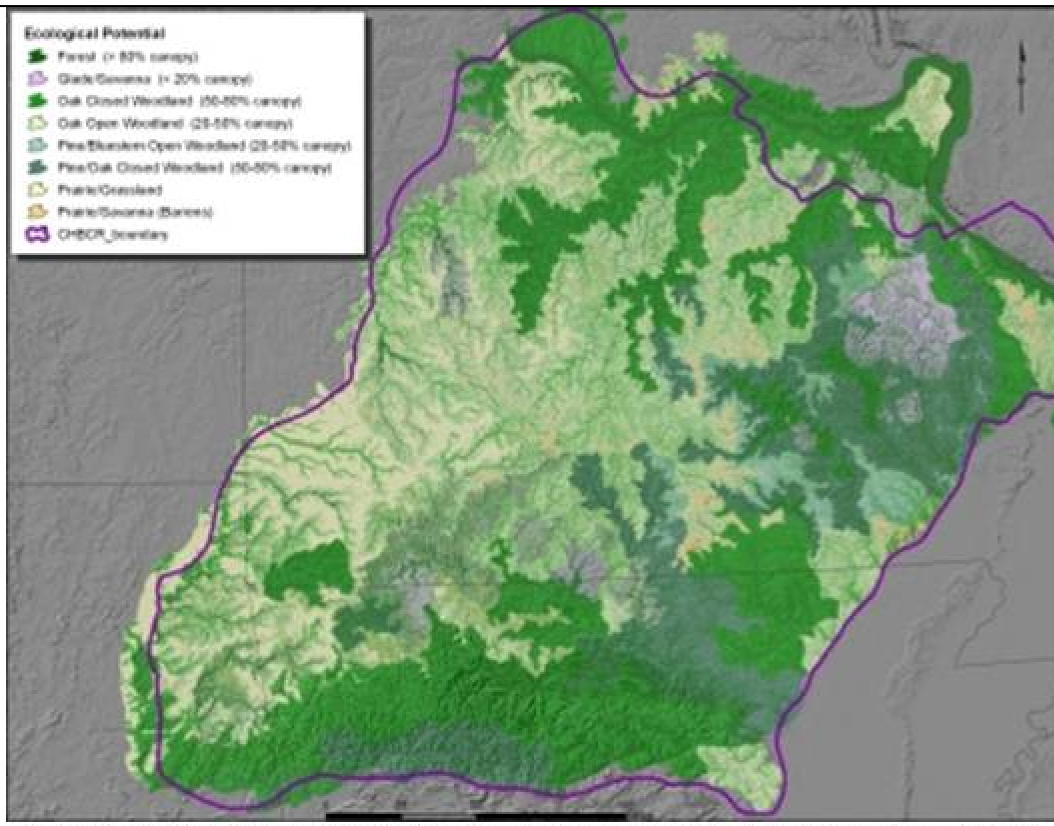
Interior Highlands

Geographic setting. The Interior Highlands include much of southern Missouri and northern Arkansas, and small portions of Illinois, Kansas, and Oklahoma (Figure 3). This sub-unit is itself comprised of 4 distinct ecological units: the Ozark Highlands, the Boston Mountains, the Arkansas Valley, and the Ouachita Mountains. This region is the only highland in mid-continent North America and the only notable topographic relief between the Appalachian and the Rocky Mountains. Altitudes range from 200 to 2,700 feet above mean sea level. The hills and valleys of this region are dominated by forest, which comprises nearly 60% of the landcover (Table 3). Additionally, more than a quarter of the Interior Highlands is grassland habitat (Table 3). The sedimentary rocks that form these highlands are highly erodible carbonates and sandstones, which have combined with the abundant water in the Ozark Highlands and Boston Mountains (as indicated by the numerous lakes and high gradient rivers) to produce a karst topography dotted with cliffs, caves, seeps, and springs within these regions. This Interior Highlands as a whole is part of the larger Central Hardwoods Bird Conservation Region; the other portion, the Interior Low Plateaus, is currently in the proposed Appalachian LCC but is being considered for inclusion in the GCPO LCC. Details on this geography and discussion of its status are in Appendix N.

Priority species and habitats. The Interior Highlands is dominated by large tracts of unbroken deciduous oak-hickory and oak-pine forest that harbor source populations for many priority Neotropical landbird species that experience high predation and parasitism rates (i.e., low reproductive success) in more fragmented landscapes (e.g., cerulean warbler, wood thrush, and worm-eating warbler). Fire, once a common occurrence in the Interior Highlands and now dramatically reduced, historically produced a mosaic of ecological communities within this forest matrix. The glades, prairies, savannas, and woodlands that remain provide key habitats for many high priority species that exist nowhere else in the region (e.g., Bell's vireo, Bewick's wren, collared lizard, scrubland tiger beetle, western diamondback rattlesnake, and ornate box turtle). Other high priority species that were once common in pine (e.g., Bachman's sparrow, brown-headed nuthatch) and oak (e.g., prairie warbler, blue-winged warbler) woodlands in this region are now extirpated, rare, or in decline. The topography and age of the region have also shaped the priority species, as numerous endemics occur here, particularly in geographically isolated montane forests (e.g., Fourche Mountain salamander and Rich Mountain salamander) and caves and springs of karst formations (e.g., Ozark cavefish, Oklahoma cave crayfish, and Ozark big-eared bat; Appendices C and D). Aquatic habitats with isolated watersheds hold a wide diversity of mussels (e.g., Neosho mucket and Ouachita kidneyshell) and fish (e.g., Ozark shiner, redspot chub, and long-nosed darter).

Conservation challenges. Protecting the unfragmented forest landscape of the Interior Highlands represents one of the greatest challenges to the long-term sustainability of the many priority species in this region. Predictive models developed through the work of the Central Hardwoods Joint Venture partnership indicate the Ozark and Ouachita Mountains are likely to lose ~4.0 million acres to development by 2030, a quarter of which currently provide source forest for landbirds. In addition to the ongoing threats that are a direct result of urban sprawl, certain areas of the region also are affected by lead and other heavy metal contamination, as well as inadequate sewage treatment and catchment of runoff from agricultural and urban areas. The impacts of these contaminants on water quality negatively affect both aboveground aquatic ecosystems as well as the organisms that are adapted to life in the underground karst streams and caves. Even where native ecosystems remain (or at least the potential to restore them), they are often highly degraded or sorely needing management attention. The elimination of fire from the landscape has threatened numerous species of plants and animals adapted to the disturbance-dependent habitats that are rare today (i.e., glade, savanna, woodland). Additionally, the even-aged and densely stocked second growth forest (a product of widespread logging and land clearing at the turn of the 20th century) that currently dominates the Interior Highlands is now reaching senescence and is subject to unprecedented levels of wood borer outbreaks and attack by other insects and pathogens that together contribute to widespread "oak dieback".

Conservation opportunities. Ecologists and managers throughout the Interior Highlands are using ecological potential models (Figure 6) to guide thinning of overstocked stands and application of prescribed fire for restoring pine and oak woodlands on ecologically appropriate sites. Grass and forb seeds and root stock for woodland plants persist in the soils of many degraded forests and reappear once fire returns, the canopy is opened, and light reaches the forest floor. Given the current limited acreage of these habitats across the region, woodland restoration efforts are critical for increasing the redundancy of these native ecosystems to ensure adequate resiliency of the species dependent upon them – particularly in light of anticipated impacts from urbanization and climate change. Although the stressors associated with a burgeoning human population in the Interior Highlands are likely to predominantly have negative consequences for most priority species, the need for adequate supplies of clean water offers conservation planners an opportunity to collaborate with urban planners to reach solutions that address the needs of both the priority species of the region and society at large.



Draft Ecological Potential Model for the western part of the Central Hardwoods BCR.

Figure 6. Ecological Potential Model for targeting management activities on ecologically appropriate regions of the Interior Highlands.

Mississippi Alluvial Valley (MAV)

Geographic setting. The Mississippi River holds a special place in American folklore and culture. Mark Twain referred to the Mississippi River Basin as the "Body of the Nation" because of its ecological and economic significance. The 28-million acre MAV extends 600 miles from southern Missouri to coastal Louisiana, varying in width and reaching 100 miles at its widest (Figure 2). It was an ecosystem literally created by the river and its flood pulses, with several hundred thousand acres inundated on an annual basis and, less frequently, several million acres. In its pre-settlement state, the valley contained a 22-million acre expanse of sub-tropical/temperate zone forested wetlands. However, the rich soils and long growing season of "The Delta" led to its agricultural development, and by the late 1950's, agricultural production was well established on the less flood prone, better drained sites across roughly half the region (Figure 7). Nevertheless, much of the floodplain forest remained and the extent of agricultural development was arguably both ecologically and economically sustainable. However, post-War agricultural expansion resulted in nearly 6 million additional acres of forested wetlands being converted to agriculture. The most flood prone and poorly drained portions were cleared – an expansion that would ultimately prove unsustainable both economically and environmentally. Today, the land base of the MAV is >50% agricultural row crops; forested wetlands remain on only 22% of the area (Table 3).

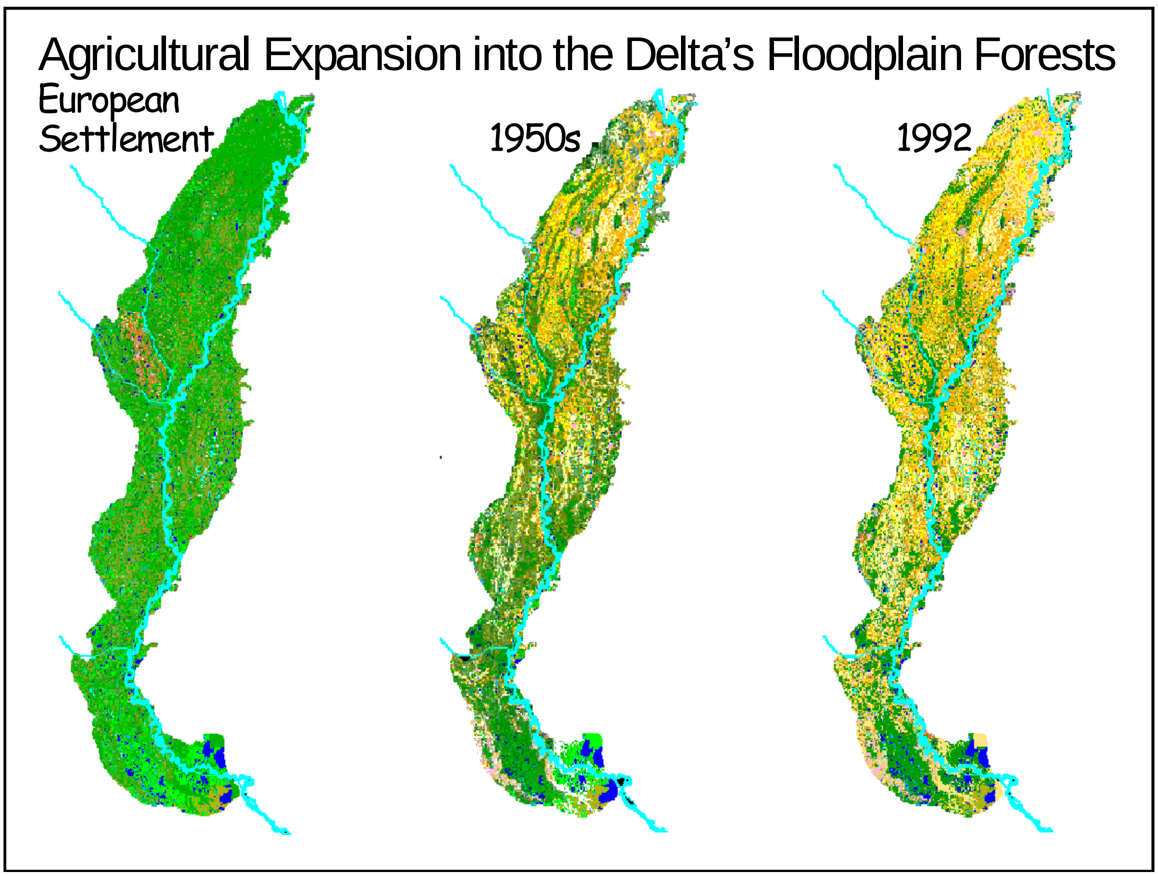


Figure 7. Agricultural expansion and forested wetland loss in the Mississippi Alluvial Valley, European settlement to 1992.

Priority species and habitats. A giant wetland, the MAV is an area incredibly rich in wildlife resources, although some species have been extirpated (e.g., Florida panther and red wolf). Nevertheless, the region continues to be of hemispheric significance to migratory birds both in the summer (e.g., prothonotary warbler, Swainson's warbler, and swallow-tailed kite) and winter (e.g., rusty blackbird and American woodcock). In particular, the MAV is a critical wintering region for many waterfowl (e.g., mallard and wood duck) which often occur in large concentrations. Nevertheless, the dwindling and disconnected forest has had significant impacts on many priority species, particularly those dependent on high connectivity of habitats within a large landscape (e.g., Louisiana black bear and ivory-billed woodpecker) or mature stands of large trees (e.g., Rafinesque's big-eared bat). The Mississippi River also once hosted a diverse riverine and floodplain fishery that was unparalleled in scope and diversity and among the most productive in North America. Changes in hydrology have significantly altered the suitability of spawning habitats for some species, which are now recognized as high priorities within the region (e.g., pallid sturgeon and paddlefish). Bottomland hardwood forests and emergent herbaceous wetlands (with more than half of those found in the GCPO occurring in the MAV; Table 4) remain the highest priority habitats in the region.

Conservation challenges. Impacts to biological systems as a result of the large scale forest loss, fragmentation and hydrologic change that have already occurred in the MAV have been dramatic, particularly with regard to impacts on wildlife populations and their habitats. Economic forces associated with agricultural commodity production are likely to limit the feasibility of restoring portions of the landscape (or its associated hydrology) to an ecologically-sustainable state. Changes in agricultural practices are likely to exacerbate these impacts, not alleviate them. The influence of global climate change and the uncertainty of market forces, particularly on agricultural production in the MAV, emphasize the reality that future partnerships must reflect not simply mutual interest but also acknowledge interdependencies if conservation objectives are to be achieved.

Conservation opportunities. The need to address ecological restoration in the MAV is apparent and opportunities are virtually limitless. Today, the MAV is the focus of efforts by numerous agencies, organizations, private landowners, corporations, and partnerships seeking to reverse the negative environmental impacts to this great region and restore it to a healthy and sustainable condition. The bottomland hardwood forests that originally characterized more than 90% of this landscape have thus far defined much of the targeted restoration effort in the region. A reforestation decision support tool (Figure 8) is being used to target restoration efforts on the most ecologically sensitive portions of the landscape (i.e., those areas that most efficiently restore ecological function of large forest blocks). A recent review of management options in extant bottomland forest has also produced guidelines for silvicultural practices that improve the habitat conditions within bottomland hardwood forests for a wide cross-section of priority wildlife species. Broad-base support for these "Desired Forest Conditions" has led to widespread adoption and implementation of these practices across the region and serves as a model for cooperative landscape conservation.

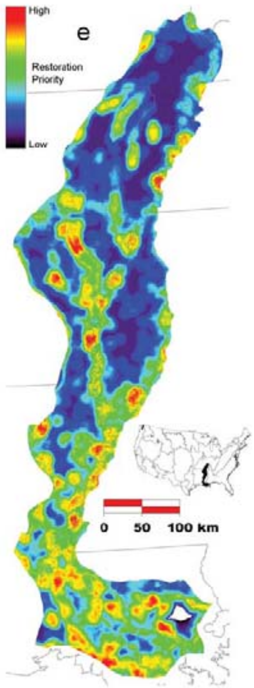


Figure 8. Reforestation Decision Support Tool for the Mississippi Alluvial Valley that prioritizes forest restoration to maximize ecological function of large, connected forest blocks.

West Gulf Coastal Plain (WGCP)

Geographic setting. The WGCP is a 39-million acre region spanning four states (Arkansas, Louisiana, Oklahoma, and Texas) in the southwest portion of the larger GCPO LCC geography (Figure 3). Ecologically similar to the EGCP, the region is predominantly forested (~71%), with nearly 30% of the total geography in evergreen forest (Table 3). The primary difference between the two coastal plains is the increased influence of western fauna (e.g., scissor-tailed flycatcher) and flora on WGCP ecological communities and the absence of Gulf Coast habitats and species (e.g., saltmarshes and dunes). Additionally, the proportion of land dedicated to agricultural production (either cultivated crops or pasture-hay) is lower in the WGCP than any other sub-unit of the LCC. The proportion of developed land is higher (Table 3). Nearly 11,000 miles of rivers course through this region.

Priority species and habitats. Given their similar ecological setting, it is not surprising that the priority species and habitats of the WGCP are very similar to those of the EGCP. In longleaf and shortleaf pine savannas, many of the priorities are identical (e.g., red-cockaded woodpecker, brown-headed nuthatch) or at the very least ecological analogs (e.g., Louisiana pine snake in the WGCP vs. black pine snake in the EGCP). Bottomland hardwoods along the floodplains of major rivers and tributaries also contain similar species in both sub-units. In the WGCP, breeding Swainson's warbler and wintering American woodcock are particularly important. Prairie habitats on the western edge of the region are part of a continental ecotone between forest systems to the east and grasslands to the west. Here, fauna more commonly found (and abundant) to the west occur sporadically (e.g., Texas horned lizard, western slender glass lizard, and lark sparrow). However, their contribution to the regional diversity of the GCPO LCC geography warrants their inclusion as priority species. Aquatic habitats in the WGCP –

like the EGCP – harbor a strikingly rich diversity of freshwater mussels, fish, and crayfish. Many of the high priority species within the WGCP are endemic to the region and found nowhere else (e.g., Texas heelsplitter, Louisiana pigtoe, blackspot shiner, and Neches crayfish).

Conservation challenges. Although the WGCP is predominantly forested, it is highly fragmented and dissected by roads, utility rights-of-way, pastures, cities, and reservoirs. Many of the intact forests suffer reduced productivity and natural diversity due to management regimes that favor wood volume and economic return over forest health. Suppression of natural fires, along with short rotation harvest and introduction of loblolly pine, has drastically altered the character of once-vast shortleaf pine savannas in the northern portion of the region to the detriment of the species dependent on open, prairie-like understory and old-growth trees. In the south, longleaf pine savannas have suffered similar fates. As significant as the past and current human footprint on the landscape of the WGCP is, foreseeable changes in the near future present additional challenges to the ecological sustainability of this region. Growing human populations will undoubtedly place higher demands on natural resources, especially water. This emerging need has already resulted in dozens of proposed reservoirs for the region. These projects will permanently alter the character of many aquatic habitats and terrestrial wetlands, further isolating many populations of priority species. Changes in private ownership patterns also threaten the integrity of forest lands in the WGCP. Large timber companies are divesting their holdings to Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs) whose interest in land and forest health is secondary to return on investment. Further divestiture of these assets is likely to cause increased fragmentation.

Conservation opportunities. Clearly the WGCP is a region rich in ecological diversity and productivity, but with a legacy of significant negative human impact. Nevertheless, a future with certain predictable stressors (e.g., increased population growth and expansion of natural gas extraction) presents the conservation community with an incredible impetus for increasing its communication, coordination, and collaboration in the planning and delivery of conservation actions. Because much of the forest still exists across the WGCP, conservation of sustainable natural landscapes is attainable largely through the combination of improved management, protection of core forest and unique habitats, and restoration of key areas. Partners of the Lower Mississippi Valley Joint Venture and Central Hardwoods Joint Venture collaborated in developing a framework for assessing, monitoring, and predicting how changes in land use and land cover affect the sustainability of priority species populations across these landscapes. Application of habitat suitability models to geospatial datasets depicting key limiting habitat factors provides insight into the distribution of suitable habitat (and individual species) across the region (Figure 9). A working group of collaborating research scientists, field biologists, and planners are utilizing this information to derive population and habitat objectives to guide the location and quantity of conservation effort needed to achieve sustainable priority populations. These tools, made possible by the conservation community working together to share resources, provide a vital example of our ability to effectively utilize limited funds for achieving sustainable landscapes for birds. Through the LCC, this approach can be expanded to facilitate better conservation planning, delivery, and monitoring for all trust species.

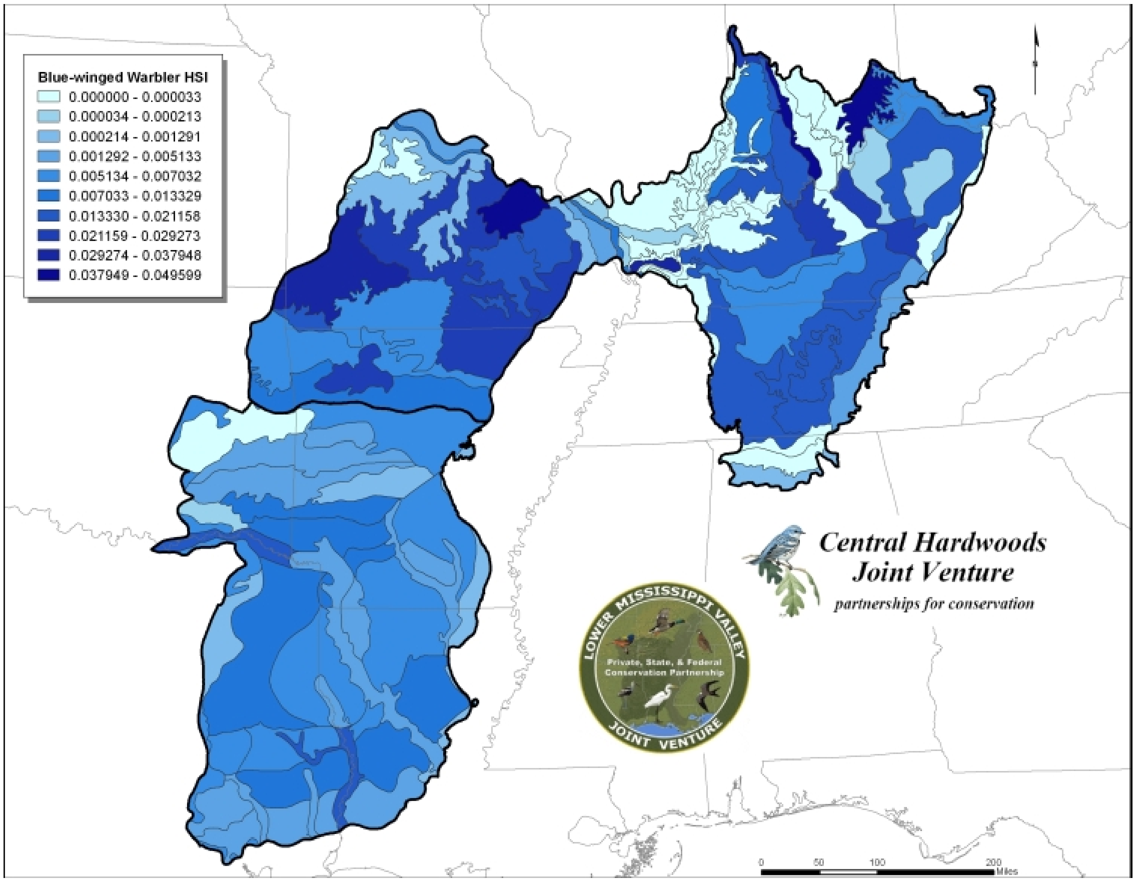


Figure 9. Habitat suitability for blue-winged warbler across the West Gulf Coastal Plain and Interior Highlands (and Interior Low Plateaus) based on geospatial datasets depicting key habitat attributes.

Gulf Coastal Plains and Ozarks LCC: Organizational Context

The Conservation Community

The Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) is being established under the leadership of multiple large-scale successful partnerships (i.e., Central Hardwoods Joint Venture, East Gulf Coastal Plain Joint Venture, and Lower Mississippi Valley Joint Venture) whose combined membership currently includes ten state agencies, three federal agencies, and nine non-governmental organizations (Table 1). These agencies and organizations – by virtue of their authority, mandate, or primary mission have already recognized the need to coalesce as a multi-partner conservation community in developing a shared vision of bird conservation, cooperating in its implementation, and collaborating in its refinement. Partnerships have developed among agencies and organizations that have similar authorities, mandates, and missions with respect to other taxa as well (e.g., Partners in Amphibian and Reptile Conservation and the Southeast Aquatic Resources Partnership). Although the membership of these partnerships overlaps broadly across individual agencies and organizations and the target of all these partnerships is fundamentally the same (i.e., landscapes capable of sustaining priority species at prescribed levels), the conservation planning and delivery mechanisms of each are not often aligned. Development of the GCPO LCC promises to increase the communication, coordination, and collaboration among these individual efforts as the biological scope of its mission encompasses all fish, wildlife, and plant species. Further, the creation of the GCPO LCC provides an opportunity to expand the conservation vision of sustainable populations of priority species in sustainable landscapes to non-traditional partners whose authorities, mandates, or primary missions affect ecological functions and processes that directly or indirectly impact species viability (e.g., Army Corps of Engineers, Department of Transportation). A preliminary review of agencies and organizations operating within the GCPO geography identified 35 federal agencies, 90 state agencies, 39 colleges and universities, and 63 non-governmental organizations that could potentially play a role in the development and operations of this LCC (Appendix E). Clearly, all 227 agencies and organizations will not be directly involved in the LCC, and inclusion on this list does not represent a specific commitment or a willingness to participate (nor does exclusion from this list indicate an unwillingness to participate or a negligible role in conservation of priority species). However, this list does preliminarily identify those agencies and organization with a potential role in the LCC due to direct or indirect effects of individual agencies and organizations on the sustainability of priority species populations by virtue of their authority, mandate, or mission. The ultimate success of the LCC will likely hinge on its ability to elicit participation from as many of these agencies and organizations as possible.

The Conservation Estate

The conservation footprint within the GCPO LCC represents the totality of federal, state, and private lands that provide habitat for sustaining populations of priority species. Although many public and private lands benefit priority species, a thorough landscape and habitat assessment across the entire LCC geography is required to identify and quantify their overall impact. For our purposes here, we restrict our assessment to quantification of the conservation estate (i.e., those areas formally reserved for conservation of priority species or ecosystems) to provide an overview of the magnitude and potential of existing conservation lands that contribute to achieving conservation objectives of the emerging GCPO LCC.

Across the entire 180 million acre GCPO LCC, just <10% (16,146,669 acres) is in the conservation estate (Table 5). National Forest lands administered by the U.S. Forest Service comprise more than 40% (6,845,550 acres) of this estate. Wildlife Management Areas administered by individual state fish and wildlife agencies total more than 4.8 million acres (~30% of the conservation estate). National Wildlife Refuges managed by the U.S. Fish and Wildlife Service add another 1.262 million acres (~8%). National Park Service manages 456,000 acres (~3%). Lands within the conservation estate are well-distributed across the GCPO LCC geography (Figure 10).

Table 5. Conservation estate (acres) of the Gulf Coastal Plains and Ozarks LCC.

Ownership		Acres
Federal Lands		
U.S. Fish & Wildlife Service		1,262,134
National Park Service		456,002
U.S. Forest Service		6,845,550
Military		474,274
U.S. Army Corps of Engineers		572,232
	Federal Subtotal	9,610,192
State Lands		
Wildlife Management Areas		4,800,355
State Parks		377,270
Other		568,444
	State Subtotal	5,746,069
	Public Subtotal	15,356,261
Private Lands		
Non-governmental Organizations		72,739
Wetlands Reserve Project		717,669
	Private Subtotal	790,408
Grand Total		16,146,669

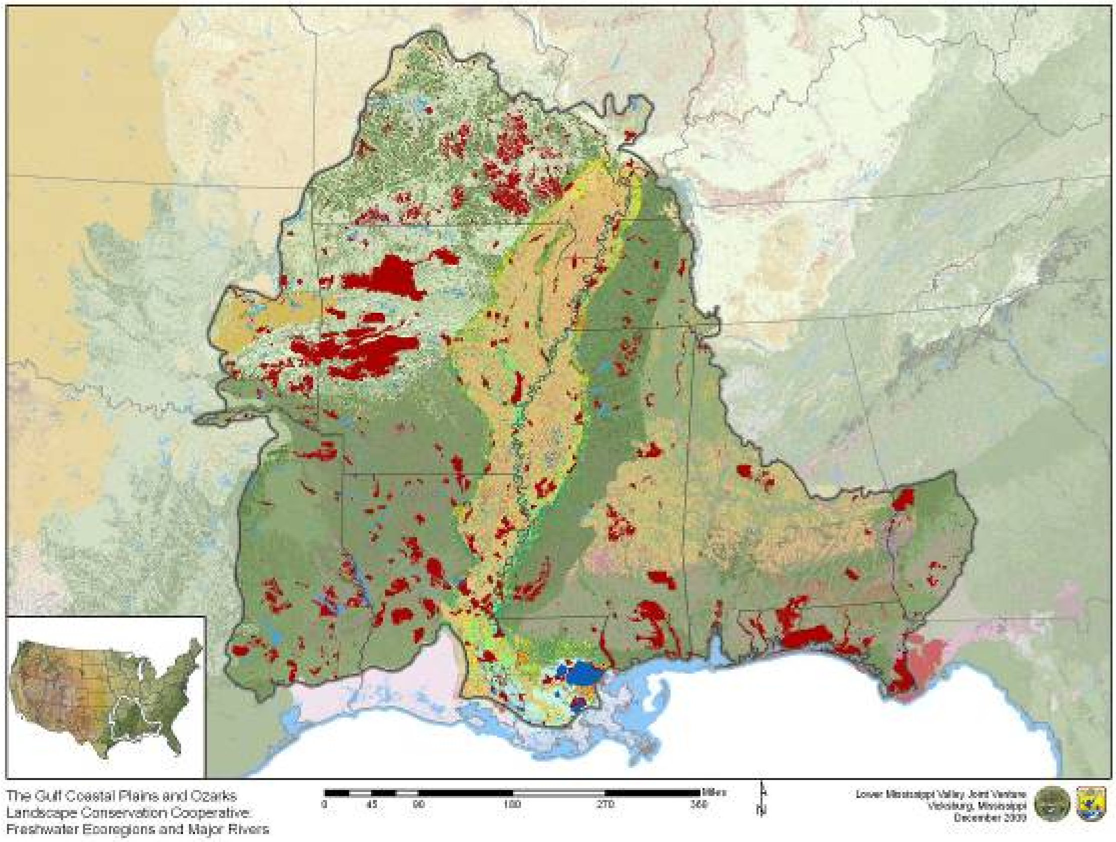


Figure 10. Conservation estate of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

Conservation Delivery and the Magnitude of Potential

Conservation partners within the GCPO LCC area are engaged in a wide array of conservation activities, ranging from technical assistance to private landowners, cost-share for habitat improvements, conservation easements, and land acquisition. These activities are administered and funded by federal, state, and local governments, as well as by non-profit organizations. A broad sampling of these partners and activities (Table 6) reveals numerous active natural resource conservation partners annually expending nearly $330 million on direct conservation programs. Additionally, non-traditional conservation partners are already investing within this geography to address climate change through carbon offsets (~$14 million and 50,000 acres). Given the more than 16 million acres, annual $330 million budget, and the state of fish and wildlife resources that collectively represent the current assets of the conservation community within the GCPO LCC, the potential for achieving long-term sustainability of priority species and habitats is great. However, despite the self-acknowledged need for increased coordination, conservation organizations and agencies often act independently, assuming the sum of their collective efforts will be sufficient to offset the myriad of impacts affecting fish and wildlife. Capitalizing on these assets requires effective and efficient coordination of conservation delivery guided by transparent and defensible science.

Table 6. A sampling of annual conservation partner activities within the Gulf Coast Plain and Ozarks Landscape Conservation Cooperative area.

Partner(s)	Program	$	Acres
Agency- or State-Specific Programs			
USFWS[a]	Partners for Fish & Wildlife (PFW)	$4,111,821	27,460
USFWS[a]	Refuge/Other Habitat Projects	$10,917,736	8,718
USFS[b]	Forest Legacy	$3,260,667	
USDA[a]	Conservation Reserve Program (CRP)	$106,437,000	700,000
USDA[a]	Wetlands Reserve Program (WRP)	$11,470,938	
USDA[a]	Environmental Quality Incentives Program (EQIP)	$129,161,735	
USDA[a]	Wildlife Habitat Incentives Program (WHIP)	$5,593,192	
NWTF/State Wildlife Agencies[d]	Acquisition	$16,497	3,882
NWTF/State Wildlife Agencies[d]	Restoration & Enhancement	$145,939	20,936
State Wildlife Agencies[d]	Sport Fish Restoration	$10,582,439	
State Wildlife Agencies[a]	State Grants	$4,077,177	
State Wildlife Agencies[a]	Landowner Incentive Program (LIP)	$1,964,360	
State Wildlife Agencies[a]	Wildlife Restoration	$30,292,239	
State Wildlife Agencies[e]	Habitat Programs	$3,431,078	1,556
LWCF[f]		$4,288,889	
DU Easements[g]	Perpetual Conservation Easements		11,821
Multi-Agency Private Lands Programs			
DU/AGFC/USFWS/NRCS[a]	Arkansas Partners Project	$206,908	1,503
DU/LDWF/USFWS/NRCS[a]	Louisiana Waterfowl Project (North & South)	$346,939	1,201
DU/USFWS/NRCS[a]	Mississippi Partners Project	$2,836	
DU/TWRA/TDA/UTAES/USFWS/NRCS[a]	Tennessee Partners Project	$534,349	5,079
DU/KDFWR/USFWS/NRCS[a]	Kentucky Partners Project		983
ETWP[a]	East Texas Wetlands Project	$620,650	746
National/Competitive Granting Programs			
USFWS[g]	NAWCA	$2,482,413	15,616
GRAND TOTAL		**$329,945,892**	**799,501**

[a] Data represent a single year, depending on the latest available (typically 2007 or 2008)
[b] Mean of 2007-09 data
[c] Mean of 1985-2009 data
[d] Predominantly 2009 data
[e] Data from AR, TN, and TX only
[f] Mean of 2004 and 2008
[g] Mean over the life of the program

Toward the Potential: Science in Landscape Conservation

The uncertain future of a changing climate in an increasingly globalized and human-impacted world challenges the assurance that our current conservation strategies will be sufficient to sustain our trust resource populations. Science (i.e., the systematic accumulation of knowledge based on objective observation) provides a means to confront these challenges head-on by arming the conservation community with the unbiased information it requires to make sound decisions, increasing the effectiveness of management practices targeting these impacts, and retaining the public faith in the ability of the conservation community to effectively steward trust resources for future generations. To achieve this vision, science must provide the foundation for all aspects of conservation (i.e., biological planning, conservation design, conservation actions, outcome-based monitoring, and assumption-driven research) and serve as the unifying force for the integration of these elements in an adaptive management framework. Science has long played a foundational and critical role in the assessment, planning, and implementation of conservation actions; however, continuing scientific and technological advances and their uniform application places a demand on our current scientific capacity to meet needs that are only now emerging. The development of the Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) is a direct response to these capacity gaps and science needs.

An Adaptive Management Framework

The GCPO LCC has broad responsibilities for ensuring critical science needs are being addressed relative to sustaining fish and wildlife populations within the context of current threats (e.g., climate change, urbanization, etc.). These science needs span the individual elements of the conservation enterprise as well as their assimilation into a unified whole. A brief description of these elements and the science responses they demand follow. Additionally, a compilation of specific science projects that meet these demands is found in Appendix F. The project list in this appendix is a product of a November 2009 survey of potential GCPO LCC partners; it is neither comprehensive nor complete. Additional input from the entire GCPO conservation community is needed to achieve a common vision and broad support for science priorities of the GCPO LCC. Further opportunities and means for soliciting partner perspectives are already planned.

Biological planning entails establishing and refining population objectives for priority species through application of species-habitat models that reflect limiting factors at multiple scales within a specific geography. Although the GCPO LCC will never fully satisfy the requirements of this element (or any other) given the dynamic aspects of conservation, positioning the Partnership for long-term success requires effectively addressing some clear, specific, and immediate needs. First, key priority species for the LCC need to be selected from a comprehensive list reflecting the full spectrum of conservation priorities identified in existing plans (e.g., State Wildlife Action Plans, national and international bird plans, National Fish Habitat Action Plan, etc.). Appendices C and D provide examples of initial attempts to prioritize key species and habitats for this region. Neither list is definitive, but both offer an approach for identifying priorities. Unifying and refining these priorities through a transparent, mutually agreed upon protocol is among the first tasks of the GCPO LCC. Additionally, formal vulnerability assessments need to be conducted across all species to identify those that will likely be most negatively affected by future conditions associated with climate change, urbanization, and changing land uses. Well-documented methods exist for conducting these assessments and selecting umbrella species for focal conservation efforts. All of these approaches assume that the factors that limit (or potentially limit) individual species and populations have been identified. While this is certainly true for some charismatic and well-studied species (e.g., mallard and gopher tortoise), a dearth of information plagues other species (e.g., Arkansas fatmucket, a freshwater mussel). Without basic information on the specific factors limiting a species, the prospects of developing effective conservation strategies are bleak. Nevertheless, conceptual models of species-habitat relationships based on hypothesized limiting factors provide a starting point for entering the adaptive management cycle and assessing vulnerability of a species' sustainability under expected future conditions. Development of species-habitat models that document the current knowledge of a species' limiting factors and the assumptions that compensate for the gaps in that knowledge are needed for all priority species. Critical in the development of these models to ensure their maximum utility is the use of a common framework that establishes standards for scale, scope, uncertainty, and currency (i.e., model outputs) across taxa.

Conservation design centers on characterizing, monitoring, and predicting the amount, condition, configuration, and location of habitats needed to support priority species at prescribed levels. Armed with the products of biological planning, the GCPO LCC will apply species-habitat models to establish habitat objectives for priority species. To accomplish this, the GCPO LCC requires accurate spatial depictions of the attributes that define habitat quantity and quality (i.e., the limiting factors defined in the species-habitat models) across the entire geography. Landcover (e.g., forest, agriculture, and wetland) and hydrology (e.g., depth, duration, and extent of water) are the primary drivers of habitat conditions in the GCPO. However, even the "current" assessment of these key features is woefully outdated (circa 2001), and there is a clear need to develop more up-to-date and consistent geospatial datasets of landcover and hydrology for the entire GCPO region. Intensifying this need, and at least on par with it, is the development of methods that can project, with quantifiable uncertainty, how baseline (i.e., "current") habitat conditions would change under alternative climate, urbanization, and land use scenarios. These data are critical for assessing the ability of existing conservation lands to provide adequate resiliency, redundancy, and representativeness to effectively sustain trust resource species and populations across the GCPO into the future. This assessment forms the basis for devising adaptation strategies that compensate for known shortcomings in the conservation estate and the development of decision support tools that target conservation on the most biologically efficient and ecologically sensitive portions of the landscape. Transparent processes for integrating the planning products for individual species spatially and temporally need to be developed to integrate habitat objectives across taxa. Structured decision making, along with other aspects of decision theory and management science, will be increasingly relied upon to provide appropriate frameworks for merging multiple objectives. Developing or recruiting scientists that can effectively apply these techniques will be critical for coordinating conservation across species and habitats.

Conservation delivery focuses on the development of projects, policies, and programs that target habitat delivery, funding, and restoration and management capability toward achievement of habitat and population objectives for priority species. While science impacts conservation delivery predominantly through its connections to the other elements of the conservation enterprise, science serves two direct roles in conservation delivery as well: developing and adopting technology and addressing the human dimensions of conservation. Technological advances that impact conservation are often a product of applications designed for alternative purposes (e.g., the military origin of GPS). Nevertheless, conservation engineers abound, and there are numerous examples of tools and techniques developed specifically for conservation purposes (e.g., Clemson beaver pond leveler). The ingenuity in the application of new and borrowed technologies is an applied science that must be fostered, for it offers the best hope for the simplest solutions to the novel problems we will face in the future. Effective conservation delivery also demands science that can quantify and integrate the economic and human dimension aspects of conservation into specific programmatic goals and policies. The success of any conservation delivery program to achieve the level of impact required to sustain trust resource species and populations will ultimately hinge on its ability to garner sufficient public interest to support it financially (e.g., by providing capital to conduct management or by ensuring conservation easements or payments have financial incentives commensurate with alternative land uses) and operationally (e.g., by tolerating smoke associated with prescribed burning or by acknowledging long-term benefits of silvicultural prescriptions). Studies that inform development of sound programmatic objectives reflective of economic and sociologic realities are needed to ensure the ultimate success of biologically-driven management strategies.

Outcome-based monitoring involves the development and implementation of statistically-sound protocols that track priority habitats and populations and produce scientifically credible data through timely and statistically-rigorous analysis, ultimately to facilitate biological and fiscal accountability for conservation actions. Science needs within this element reflect the products of highly technical skill sets associated with the ever-evolving fields of quantitative ecology and computer science. Rapid advances in statistical theory (and the associated conservation applications they have heralded) have fundamentally altered the estimation of population parameters (e.g., abundance or density) that form the basis of all inventory and monitoring programs. Complex sampling and analysis techniques that account for uncertainty, occupancy, detectability, and variability necessitate scientists and statisticians are involved at the outset of any monitoring program to ensure proper protocols are developed and useful data are acquired. The goals of all monitoring programs should be focused on specific outcomes with tangible benefits for improved decision-making. Climate change and an uncertain future only put an even higher premium on the need for monitoring programs that serve as early warning systems for priority species and populations by detecting changes in their abundance, range, phenology, or response to management. However, appropriate collection and analysis of habitat and population data is only one aspect of an effective monitoring program. Compiling data from large-scale coordinated monitoring networks and establishing long-term strategies for data storage require development of conservation tracking systems and databases. Biologists trained primarily in ecological theory and wildlife management techniques typically impersonate database developers poorly; computer scientists with dedicated training in systems analysis and programming advanced applications using current technology are integral to the success of any monitoring program.

Assumption-driven research emphasizes scientific investigations that target evaluation and assessment of key assumptions, uncertainties, and data gaps associated with the planning, design, and delivery aspects of the conservation enterprise. This element responds directly to the uncertainties that plague the other elements and provides the raw material that feeds the iterative assessments within the adaptive management cycle. In the context of biological planning, assumption-driven research clarifies currently unknown limiting factors and quantifies or strengthens species-habitat relationships, thereby reducing the structural, ecological, and functional uncertainties found within the species-habitat models that form the foundation of the conservation enterprise. Research evaluating the geospatial data used in conservation design has a valuable role in quantifying the uncertainty (and confidence) underlying the decision support tools used to target conservation efforts. Conservation delivery also benefits from targeted research that tests competing hypotheses about a species' expected response to habitat conditions and the specific management practices to achieve them.

An Adaptive Conservation Enterprise: A Case Study with Landbirds

Development of a science-based conservation enterprise that integrates the individual elements of biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-driven research will benefit by drawing on the successes of the strong partnerships within the GCPO geography that already operate under a collaborative, adaptive conservation business model. Landbird conservation in the West Gulf Coastal Plain/Ouachitas and Central Hardwoods Bird Conservation Regions exemplifies how this model has been successfully applied in an integrated framework of these individual elements. Further, it demonstrates how this model could be adopted by the full complement of partners to benefit the full suite of taxa across the entire GCPO geography.

Landbird conservation in these regions has as its primary goal the creation of landscapes capable of sustaining populations of priority species at prescribed levels. Implicit in this conservation target is the identification of priority species and establishment of population objectives, two critical subelements of biological planning. The North American Landbird Conservation Plan established continental population estimates and objectives for the 448 native species of birds that regularly breed in the continental United States and Canada. Subsequent work by Partners in Flight provided additional guidance on establishing regional population objectives that reflect both continental objectives and regional estimates of abundance. Although the North American Landbird Conservation Plan can be credited with the development of aspirational goals that elucidate the relative magnitude of the conservation challenge before us, it lacks quantitative methods for allocating population targets to finer scales and translating population objectives into explicit habitat objectives that specifically guide conservation action. Managers, called to action by the crisis identified in the North American Landbird Conservation Plan, demanded these capabilities along with the ability to monitor the effects of their conservation actions and predict the effect of alternative management scenarios on priority species to more proactively respond to conservation challenges. This demand was initially met by the development of species-habitat models which describe explicit mathematical relationships that predict habitat suitability for 40 priority landbird species as a function of their limiting factors. Landscape characterization, the first subelement of conservation design, reflects the specific habitat attributes the models require as input variables; these were derived from nationally-consistent, spatially explicit datasets, including the National Land Cover Dataset (MRLC), Forest Inventory and Analysis data (USFS), National Hydrography Dataset (USGS), National Elevation Dataset (USGS), and the U.S. General Soil Map (NRCS). Applying the models to these datasets provides spatially explicit depictions of habitat suitability and abundance for each of these species at an ecological subsection scale (Figure 11). The multi-partner Lower Mississippi Valley Joint Venture West Gulf Coastal Plains/Ouachitas Landbird Working Group is using these model outputs to derive habitat objectives for open pine species (e.g., Bachman's sparrow, brown-headed nuthatch) and develop a decision support tool for targeting open pine conservation in areas within the region that have both the highest current habitat suitability and the greatest potential for long-term management (Figure 12). This decision support tool is adapted from a process initially developed by the East Gulf Coastal Plain Joint Venture for longleaf pine conservation within their boundaries. Exporting existing tools and techniques from individual subunits to the entire GCPO geography represents another critical step in aligning priorities across this broad landscape. In turn, translating the priorities identified by these decision support tools into the priorities of management programs that actually implement the needed conservation practices to achieve objectives requires aligning the population and habitat objectives identified in biological planning and conservation design with the programmatic objectives of our conservation delivery infrastructure. A tangible example of this can be found in the West Gulf Coastal Plain Prescribed Burning Initiative jointly administered by the Louisiana Department of Wildlife & Fisheries and the U.S. Fish and Wildlife Service Partners for Fish and Wildlife. In ranking applications for the monies associated with this program, locations that occur in priority regions are given higher scores (Figure 13). Additional efforts to apply these models at even finer scales exist; however, they are hampered by the ability to supply appropriate habitat inputs and/or to connect to a broader conservation vision (current methods for estimating abundance from HSI scores are restricted to the subsection scale). To remove these barriers, the Central Hardwoods Joint Venture initiated a coordinated outcome-based monitoring program in 2009. State and federal partners are following a common protocol for collecting bird abundance and habitat data to estimate densities of select priority species and link them quantitatively to habitat

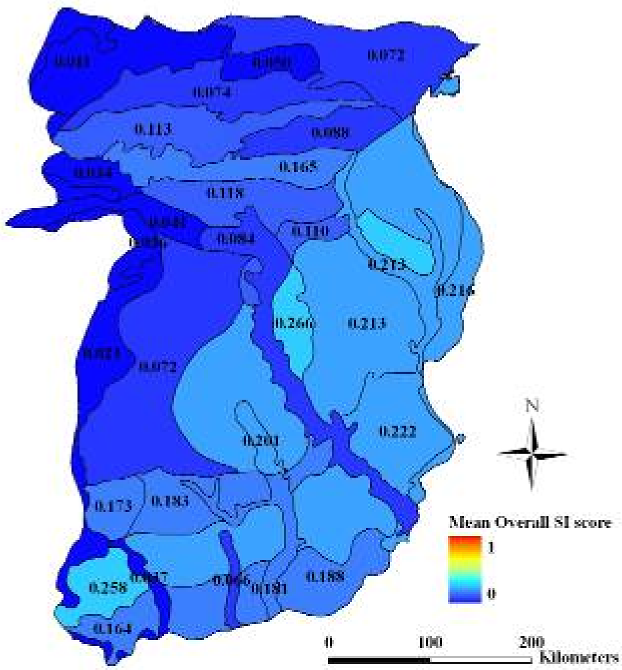


Figure 11. Average habitat suitability of brown-headed nuthatches by ecological subsection in the West Gulf Coastal Plain/Ouachitas Bird Conservation Region, 2001.

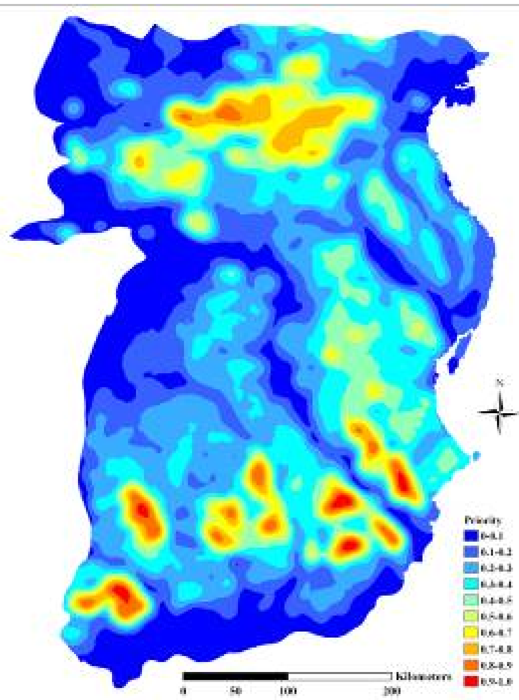


Figure 12. Open pine priorities in the West Gulf Coastal Plain/Ouachitas Bird Conservation Region, based on habitat assessments for Bachman's sparrow and red-cockaded woodpecker, 2001.

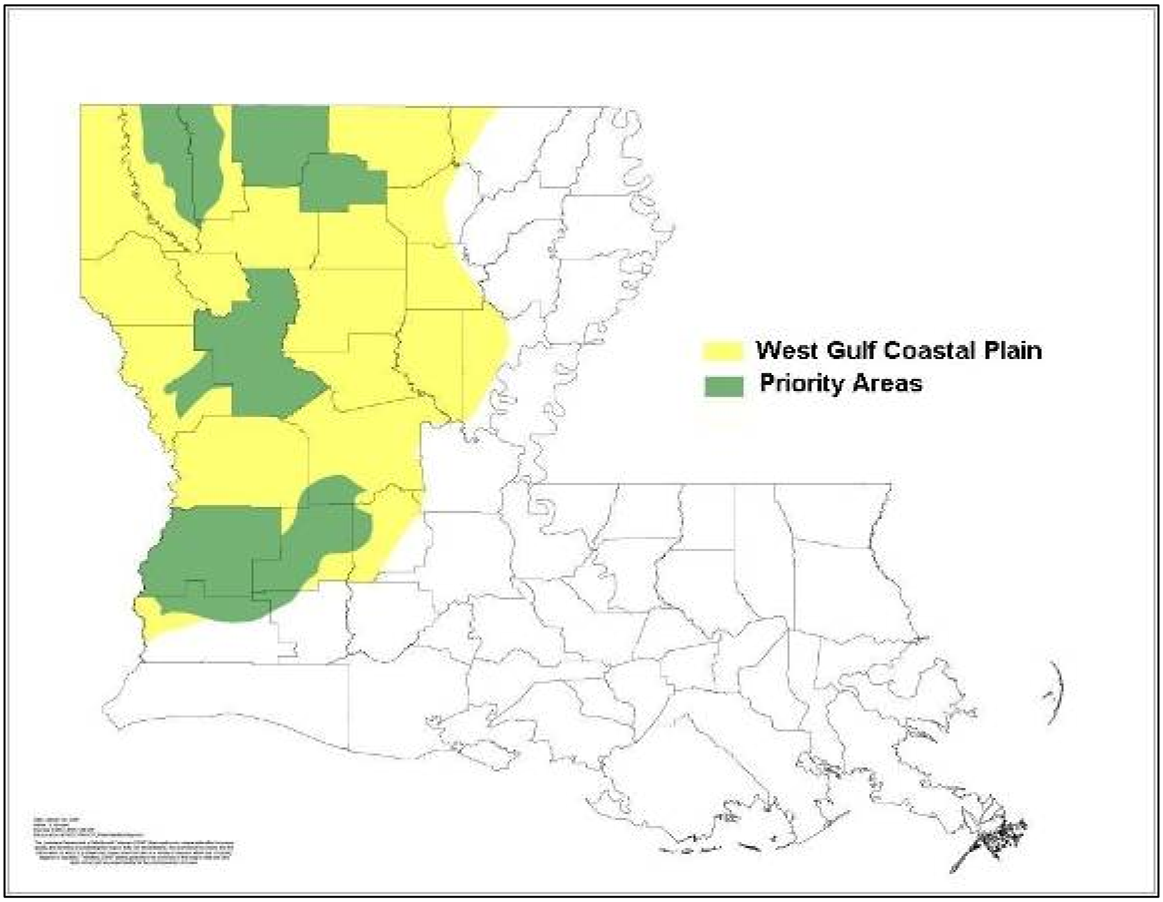


Figure 13. Prioritization map for Louisiana's West Gulf Coastal Plain Prescribed Burning Initiative, 2008.

suitability at fine scales. While these monitoring data are providing insights into site-specific responses of priority species to conservation actions, the data are also fueling assumption-driven research efforts focused on evaluating the models across the Central Hardwoods geography. Initial tests of the models exposed the limitations of Breeding Bird Survey data for conclusively verifying or validating models for some species (e.g., Bewick's wren and red-headed woodpecker).

Additional research comparing species-specific abundance datasets to model predictions is also being conducted to more thoroughly assess model validity. Ongoing studies on Swainson's warbler habitat use and demography by Dr. Jim Bednarz and his students at Arkansas State University are being leveraged to test the model for this species, whose abundance is poorly estimated by Breeding Bird Survey protocols.

By connecting the individual elements in an adaptive framework, changes in any single element have instantly recognizable implications to all aspects of the conservation enterprise. This reality is presently used to incorporate refinements to the biological understanding of species-habitat relationships or updated habitat assessments into our current planning and delivery mechanisms. However, this interconnectedness among elements can also be exploited to quickly identify appropriate strategies for addressing the changes in habitat suitability that are predicted or anticipated to occur across the landscape under alternative land use and climate change scenarios. An example of this latter approach is an ongoing geospatial assessment of the potential impacts of projected housing density on high priority forest birds in the West Gulf Coastal Plain/Ouachitas, Mississippi Alluvial Valley, and the Central Hardwoods Bird Conservation Regions. The products of this assessment – quantification and spatial characterization of population change for 35 bird species – provide a prioritization tool for determining the amount and location of habitat conservation efforts that are needed to sustain priority landbird populations. A similar project is using a generalized productivity function, developed in conjunction with the models previously described, to assist the US Fish and Wildlife Service's Louisiana Ecological Services office in quantifying the impacts of alternative gas pipeline right-of-way routes on landbird reproductive success for permitting and mitigation purposes. Lastly, an interdisciplinary research team being led by Dr. Stephen Faulkner at USGS's National Wetlands Research Center is assessing future climate change impacts on priority species by developing downscaled climate models for select watersheds in the Mississippi Alluvial Valley, using these climate models to project landcover and hydrological changes across the region, and applying species-habitat models for fish, amphibians, and birds (including the Swainson's warbler, prothonotary warbler, and wood duck) to these landcover and hydrology output datasets. The products of this effort – spatial depictions of habitat suitability across taxa and a mechanism for integrating results across species – have immediate value in conducting the needed sensitivity and vulnerability assessments and developing adaptation strategies that target the key habitats needed to ensure sustainable populations of priority species at prescribed levels.

Responding to the Science and Technology Challenges

The previous case study exemplifies the science, technical, and organizational challenges that must be addressed under the auspices of the Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) as the community strives to bring all taxa in all geographies up to a common standard of scientific rigor in an iterative cycle of adaptive conservation planning and delivery. Strategies employed to respond to these challenges must consider the information gaps when defining and prioritizing science capacity projects needing implementation. Likewise, the GCPO LCC will identify the corresponding gaps in science and technical capacity to define and prioritize expertise and resources necessary for success.

Defining and Prioritizing Science Capacity Project Needs

An assessment of our current body of science for priority species measured against the LCC matrix (Table 7) provides the framework on which to identify and prioritize science capacity project needs. Any assessment quickly reveals the paucity of basic life history information that exists for many priority species, gaps that immediately challenge cooperators as they enter the adaptive management cycle. Another fundamental challenge in landscape conservation, and one that transcends taxa, is the ability to "see" the ecological processes acting on the targeted biotic community(ies) at both the landscape and site scales. A cursory assessment of science capacity project needs solicited from a cross-section of conservation practitioners among federal, state, and private organizations revealed a subset of specific projects (Appendix F), which reflect the subelements identified in the LCC matrix (Table 7) and the operational compass (Appendix G). This list is neither comprehensive nor complete, but provides insight into the types of projects that are currently being considered as priorities by multiple partners.

Details on select projects identified in Table 8 are available in Appendix H. A more comprehensive approach to identify and prioritize science capacity needs will be taken by the Cooperative. For example, one strategy will include the GCPO Steering Committee hosting a "Science Summit" (see details in "Optimal Strategies" project in Appendix H) designed to: (1) develop optimal conservation strategies for dynamic landscapes based on alternative scenarios, (2) develop inter-taxa conservation planning and habitat delivery tools, and (3) elucidate and prioritize top science capacity projects and capacity needs of the Cooperative. Downscaled climate models are considered a high priority among partners in the GCPO geography. However, they were omitted from the priority list provided in Appendix F under the acknowledgement that the GCPO Cooperative will collaborate with scientists of the Department of Interior's Climate Change Impact Response Centers responsible for developing and delivering this information to the GCPO Cooperative.

Table 7. Roles and responsibilities shared among organizations and agencies of the Landscape Conservation Cooperative (LCC) and its supporting staff will be aligned along the functional responsibilities and key products of the partnership.

Draft

Landscape Conservation Cooperative Matrix
Sustaining Fish and Wildlife Populations Through Science, Technology and Partnerships.

SHC Element	Sub-element	Functional Responsibilities and Key Products
Biological Planning	Biological Planning Units	Identify and describe any subunits and their biological/ecological relevance. Describe processes for coordinating with other LCCs for priority species that transcend LCC boundary.
	Priority Species	Develop a list of priority species/populations from existing plans (e.g., State Wildlife Action Plans, Recovery Plans) or ongoing/planned assessments (e.g., climate change vulnerability assessment). Select a subset of species/populations to represent the full suite of priority species for which the LCC will engage in biological planning and conservation design. Document process and assumptions in identification of priority species/populations and selection of subsets.
	Population Objectives	Develop explicit population objectives linked across scales (i.e., regional objectives meaningfully tied to national goals). Where appropriate, population objectives should account for environmental variability. Transparent, defensible and replicable process for deriving population objectives well-documented with key uncertainties explicitly identified.
	Limiting Factors	Generate list of factors considered most limiting to specific species and populations. Describe how factors influence demographic parameters (e.g., abundance, survival rate, recruitment rate) and how they inform and target conservation actions (e.g., habitat management).
	Species/Habitat Models	Develop species-habitat models that quantify population response to limiting factors. Document assumptions as testable hypotheses.
Conservation Design	Landscape/Habitat Assessment	Conduct rigorous analyses of current landscape/habitat carrying capacity based on explicit species-habitat models. Where possible, conduct retrospective analysis of carrying capacity during period of desired population levels. Predict impacts of multiple stressors (e.g., urban growth, climate change, public policies) individually and in concert on carrying capacity. Forecast expected carrying capacity with and without the Cooperative's intervention.
	Assessment of Conservation Estate	Conduct comprehensive analysis throughout the biological planning unit of existing habitat under protection, management, enhancement, or restoration that supports priority species. Information appropriately delineated (e.g., by ownership, state, etc.) to inform management. Assessment of net change in the conservation landscape conducted at ~5 year intervals.
	Decision Support Tools	Develop both non-spatial and spatially-explicit decision support tools to guide and target specific management actions for overcoming limiting factors. Document analytical processes and model assumptions. Define strategy for distributing tools and soliciting feedback from appropriate agencies and organizations.
	Habitat Objectives	Develop habitat objectives explicitly linked to population objectives based on population-habitat models, carrying capacity, assessment of conservation estate, and decision support tools, as available. Partition habitat objectives among sources (e.g., ownership, state, habitat types), where appropriate.
	Integrate Multiple Species Objectives	Use Structured Decision Making processes to develop tools and methods for spatially and temporally integrating habitat objectives and management options for all priority species/populations across the biological planning unit. Describe decision-rules for conflict resolution given the extent of spatial/temporal overlap in conservation activities among species.
Conservation Actions	Program Objectives	Translate habitat objectives into spatially-explicit, program-specific objectives (e.g., North American Wetlands Conservation Act, Conservation Reserve Program, Wetland Reserve Program, National Wildlife Refuge System, Wildlife Management Area System, etc.). If appropriate, develop ranking systems to inform prioritization and decision-making.
	Habitat Delivery Mechanisms	Catalog conservation delivery actions, tools, and management treatments applicable to conservation of priority species within biological planning unit, both by members of Cooperative as well as other organizations and programs. Describe how each specific conservation actions is anticipated to affect priority species abundance and/or vital rates.
	Communication and Education Delivery Mechanisms	Develop interactive communications strategy focused on employees, partners, and other audiences as appropriate to raise awareness about these broad-based science partnerships in the context of priorities including our community's response to accelerating climate change, and engage members of the conservation community. Such a strategy would help us bolster our web presence, build broader communications partnerships and aggressively support our priority conservation work in this area relying on limited climate funding available in 2010.
Outcome-based Monitoring	Conservation Tracking System	Ensure conservation tracking and spatial database systems are in place and being used to store and integrate habitat actions occuring on the landscape. Describe how information will be used to inform decisions (e.g., increasing performance for Program X). Clarify linkages between tracking systems and biological models to facilitate assessment and reporting of biological accomplishments.
	Habitat Inventory and Monitoring Program	Identify clear objectives and develop appropriate protocols for habitat monitoring programs that are linked to biological planning and conservation design. Define habitat parameters to be estimated and anticipated duration of monitoring program. Detail procedures (e.g., remote sensing, field biologists) and time interval for data collection and assessments. Characterize how data will inform decisions (e.g., establishing appropriate management intervals). Provide analytical support and develop desktop tools for land managers collecting data.
	Population Monitoring Program	Identify demographic parameters to be monitored based on explicit population objectives. Define expected process (e.g. aerial surveys, nest monitoring), protocols, and time interval for data collection, storage, and management. Describe how information collected from monitoring programs will inform future planning decisions (e.g., refine population objectives).
Assumption-driven Research	Species/Habitat Model Assumptions	Identify and prioritize (based on value of better information) targeted research that addresses key uncertainties within models used in biological planning and conservation design.
	Conservation Treatment Assumptions	Identify and prioritize targeted research that addresses key uncertainties about the response (e.g., changes in demographic parameters) of priority species/populations to specific conservation actions.
	Keyfactor/Sensitivity Analyses	Conduct or facilitate statistical analysis of key parameters to examine their relative influence on population or habitat model predictions based on a range (e.g., confidence intervals) of assumed values (e.g., percent grass on landscape).
	Spatial Data Analyses	Conduct rigorous statistical analyses of key uncertainties (e.g., classification errors) related to the use and application of spatial data used in planning or monitoring. Document errors to facilitate refinement of geospatial datasets, when possible.

Defining and Prioritizing Science Capacity Needs

In addition to top capacity needs identified by partners of the future GCPO LCC, the science capacity projects presented in Appendix F provide significant insight into the capacity and skill sets necessary in the GCPO geography to ensure the goals and objectives of the LCC can be fully realized. Reoccurring themes highlight the need for advanced technical skills in:

- 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)
- Public engagement (e.g., social science, human dimensions, communications)

Although a preliminary set of capacity needs are presented in Appendix I, the GCPO Steering Committee will conduct a more thorough capacity needs assessment to generate a comprehensive list of needed expertise and skills.

Many of the skill sets identified above and in Appendix I already exist within the agencies and organizations operating within the GCPO geography. The GCPO Steering Committee will develop strategies for enlisting and accessing required capacities from willing and interested agencies and organizations. Under development at the USGS's National Wetlands Research Center is a "Conservation Capacity Commitment" web-application that enables agencies and organizations operating within the GCPO LCC to identify their interest in engaging as a cooperator in the Cooperative. The Internet-based application will be designed using the LCC Matrix (Table 7) and will request interested parties to identify their specific expertise as well as the level of time and resources they can contribute in support of the LCC. USGS has agreed to develop this capability and make it available to other interested LCCs as well. Armed with a comprehensive assessment of capacity needs measured against capacity commitments, the GCPO LCC will be in a position to identify and prioritize capacity shortfalls.

Dedicated capacity to the GCPO LCC will be added as funds are secured from the U.S. Fish and Wildlife Service and future partners of the GCPO LCC. In FY2010, limited capacity will be provided by staff of the Lower Mississippi Valley and East Gulf Coastal Plain Joint Venture offices as directed by their respective board members. Additionally, the Southeast Region of the U.S. Fish and Wildlife Service and other potential partners will provide venture capital as a means of financing the start-up and initial development of the GCPO LCC. These funds will be used to meet immediate, high priority capacity and science capacity project needs.

Table 8. Select high priority science project needs of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative that are detailed in Appendix H. . Descriptions of these projects are provided in Appendix H. The order of projects in this table and in the appendix does not reflect any predetermined ranking for anticipated funding.

Project	Complete Budget - All Costs	Existing Partner Contributions	Unmet Funding Needs
Climate Change Impacts on Ground and Surface Water Dynamics of the Mississippi Alluvial Valley: Implications for Priority Species	$1,194,000	$120,500	$1,073,500
Predicting the Effects of Land Use and Climate Change on Wildlife Communities and Habitats in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative	$1,500,000	$751,000	$749,000
An Integrated Forest Management Database for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative	$320,000	$70,000	$250,000
Multi-Resolution Assessment of Potential Climate Change Effects on Priority Aquatic Species – Phase II of the Southeastern Pilot	$1,610,000	$1,410,000	$200,000
Common Ground: Expanding and Updating Land Cover Classifications for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative	$300,000	$100,000	$200,000
Biological Planning, Conservation Design, and Monitoring Longleaf Pine in the Gulf Coastal Plains and Ozarks and South Atlantic Landscape Conservation Cooperatives	$226,750	$76,750	$150,000
Expanding the Integrated Coastal Assessment of the Southeastern Pilot	$415,500	$277,000	$138,500
Monitoring the Effects of Climate Change on Waterfowl Abundance in the Mississippi Alluvial Valley: Tools for Increasing Monitoring Efficiency	$125,000	$40,000	$85,000

Table 8. Continued.

Project	Complete Budget - All Costs	Existing Partner Contributions	Unmet Funding Needs
Assessment of Desired Forest Conditions within the Mississippi Alluvial Valley: Spatial and Temporal Considerations	$136,000	$78,000	$58,000
Development of a Treasured Landscape Decision Support Tool to Safeguard Priority Fish and Wildlife Populations in the Mississippi Alluvial Valley	$75,000	$25,000	$50,000
Optimal Conservation Strategies for Dynamic Landscapes	$782,500	$732,500	$50,000
Assessing the Impact of Human Development on High Priority Species in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative	$50,000	$25,000	$25,000

Responding to the Organizational and Institutional Challenges

“A Way-of-Working Challenge”

“21st Century resource challenges are formidable and complex, yet the most fundamental challenge facing the wildlife community is not a resource challenge at all; it’s A Way-of-Working Challenge” (Charles Baxter 2008). Indeed, the complexity of the conservation and science challenges already indentified are shadowed only by the complexities inherent in pursuing an approach to partnering that enables the diverse cultural and organizational landscape of the Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) to operate as a networked, leveraged system. The geography overlaps 12 states, each with its own unique approach to arraying and organizing its conservation assets, resources, and capacities. Similarly, federal conservation agencies provide an example of administrative heterogeneity in their approach to conservation (Figure 14).

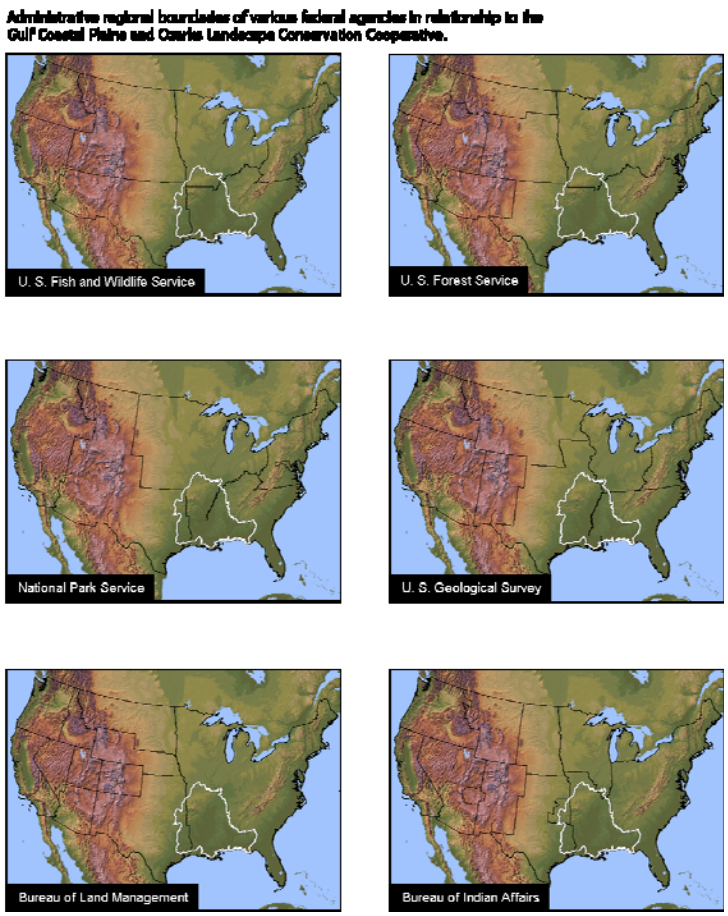


Figure 14. Administrative boundaries of key federal conservation agencies relative to the geography of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

Member agencies and organizations of the GCPO LCC must honor and respect the individualities of each partner, yet an ecological view of their interrelationships would require broader "system recognition"; that is, an explicit recognition that within any given ecological region, those organizations comprising the private, state, and federal conservation infrastructure must interact as a system if they expect to have a system-level impact. There would also be "niche recognition" that acknowledges that the performance and accountability of each partner hinges on their ability to access, use, and leverage assets external to their organization. Organizations and agencies would recognize the need for "functional connectivity" and consciously seek ways to integrate their otherwise independent capacity for biological assessment, conservation design, conservation delivery etc. Partners would explicitly act on the acknowledgement that they are "functionally interdependent" and that goals and objectives expressed at landscape scales exceed the singular grasp of any one organization. Finally, an ecological view of partner relationships would include "system sustainability", where agencies and organizations would aim to leverage assets in ways that sustain the health of the "conservation partner ecosystem."

Developing the Cooperative: Community and Infrastructure

> *A Vision*
>
> *The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative can emerge as a conservation-science alliance in which the private, state, and federal community operates as a networked, leveraged system in a non-regulatory forum and in collaboration with the public to effectively pursue socio-viable solutions to support the Nation's interest in sustaining endemic fish and wildlife populations and the ecological functions and processes on which they depend.*

The member organizations of the Lower Mississippi Valley, East Gulf Coastal Plain, and Central Hardwood Joint Ventures will convene a "Leadership Summit" in FY2010 to facilitate the organizational and operational development of the GCPO LCC (Appendix J). While the outcomes of the Leadership Summit will set the initial course of this partnership, the GCPO LCC is conceptualized to emerge with three general organizational components: a Leadership Community, a dedicated Conservation Science and Coordination Team, and Process Networks (Figure 15). The leadership of the GCPO LCC will guide its organizational evolution to ensure it remains relevant in addressing the public's interest in conservation within this region.

Leadership Community. A Steering Committee will be created and comprised of Executive and Senior-level leaders representing the mission, interest, and investment of their agency or organization in the GCPO LCC. The LCC functions as a formal long-standing community agreeing to work cooperatively in a non-regulatory forum to conserve the Nation's fish and wildlife resources and the ecological processes on which they depend. Each organization that commits to the success of the LCC participates as an

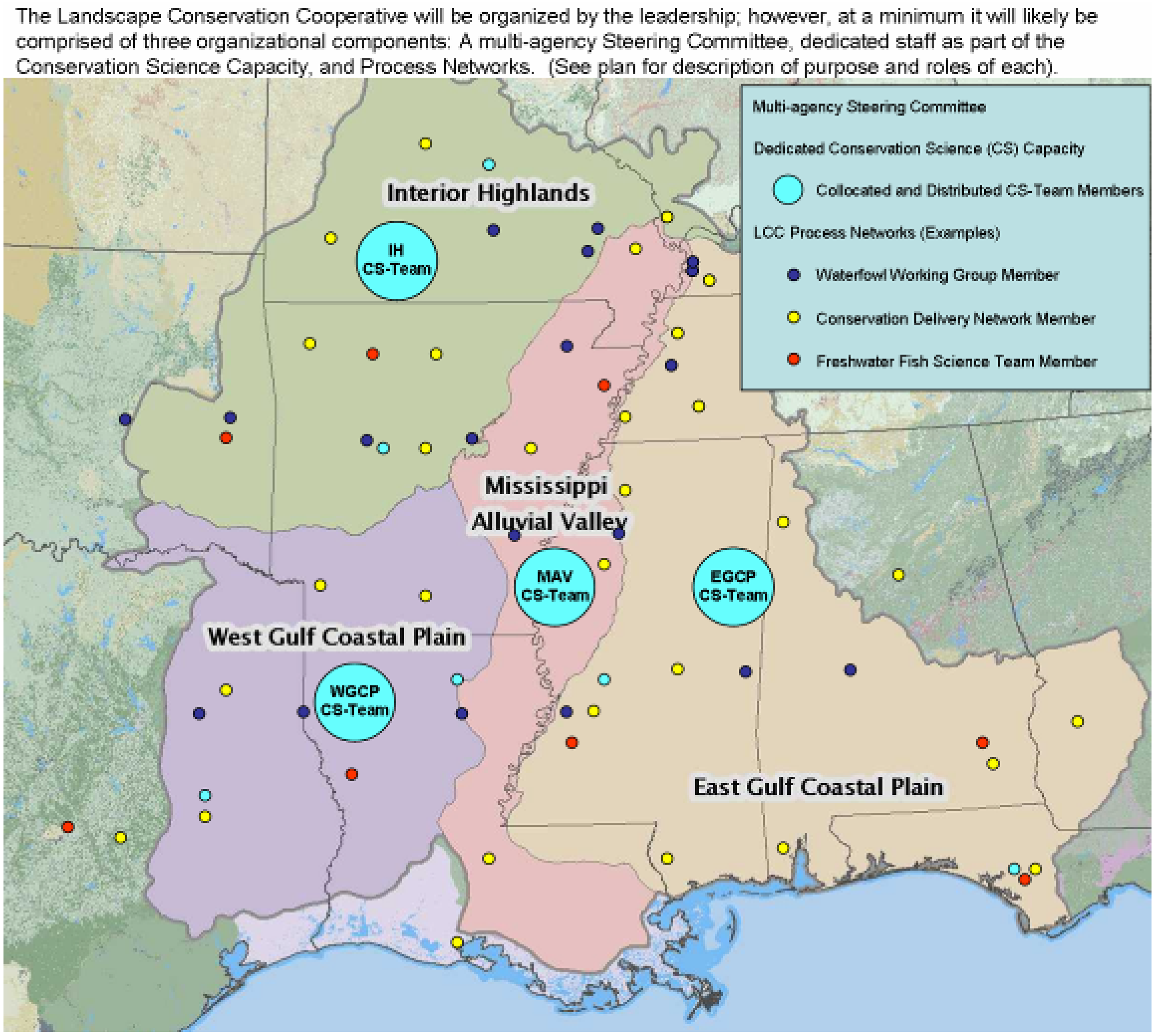


Figure 15. The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative will potentially organize within each of the subunits with three general organizational components: a Leadership Community, a dedicated Conservation Science capacity, and Process Networks.

equal member. The initial Steering Committee of the GCPO LCC will be comprised of leaders within the agencies and organizations of the Lower Mississippi Valley and East Gulf Coastal Plain Joint Venture partnerships (Table 1). The Steering Committee will reach out to the leadership of the broader community that affects the sustainability of fish and wildlife resources to gauge their interest and seek their participation as an active member of the GCPO LCC.

Steering committee members will serve the GCPO LCC by:

- Providing leadership to guide the direction and set the priorities of the GCPO LCC

- Contributing the necessary technical expertise and resources to achieve the goals and objectives of the GCPO LCC

- Accepting the responsibility for the performance and success of the GCPO LCC

Conservation Science and Coordination Team. The U.S. Fish and Wildlife Service will contribute resources to help staff dedicated Conservation Science and Coordination Team (CSCT) that supports the broader GCPO LCC. It is critical to distinguish the CSCT from the LCC. The former serves as staff supporting the latter; the two are not one in the same. The Service anticipates its capacity investment in the CSCT to be networked and linked to capacity and funding support from members of the Cooperative. The CSCT will contain both core-collocated and distributed capacity aligned along the four ecological systems of the GCPO LCC (Figure 3). The distributed capacity team members may work inside agencies and organizations of the GCPO LCC. Dedicated CSCT members may be cost-shared among parties of the GCPO LCC. See Appendix I for preliminary list of existing capacity and staffing needs.

The Purpose of the CSCT will be to:

- Provide science and technology support to the GCPO LCC in each of the functional elements of the adaptive management framework (Table 7)

- Provide partnership development and coordination support by creating, guiding, facilitating, and nurturing a networked partnership infrastructure sufficient to support the iterative, interagency application of the GCPO LCC adaptive management framework. This partnership infrastructure is organized broadly around "Process Networks", the third organizational component of the envisioned GCPO LCC.

Process Networks. The extensive management and science communities of the GCPO LCC are the key sources of technical and resource expertise and creative ingenuity necessary for the LCC to succeed. Further, the interdependency of system sustainability necessitates expertise be well connected with open channels of communication that promote innovative development, robust dialog, and sharing of tasks and project assignments. The GCPO Steering Committee will look to its CSCT to help identify and create such conduits of innovation from existing working groups and technical teams within the region. Where working groups or technical teams do not exist, the GCPO Steering Committee may charter new teams to ensure the GCPO LCC can successfully meet its goals and objectives. In all cases, the Steering Committee will foster increased coordination and collaboration wherever necessary.

The purpose of each network is to engage and link appropriate technical staff among GCPO LCC agencies and organizations in performance of one or more core functions within the adaptive conservation framework (i.e., biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-driven research). Example Process Networks include:

- Biological Planning/Conservation Design Network (e.g., Freshwater Fisheries Science Team, Forest Resource Conservation Working Group [see Appendix K for sample charter])

- Conservation Delivery Network (e.g., Conservation Delivery Network [see Appendix L for concept overview], Communications Network)

- Monitoring, Evaluation, and Research Network (e.g., Coordinated Monitoring Team)

- BioInformatics Network (e.g., Web-based Applications Development Team)

Basic Structure of the Landscape Conservation Cooperative (LCC)			
Steering Committee	**Conservation Science and Coordination Team**	**Process Networks**	**Programs, Projects, and Partnerships**
Upper Level Management/Executives Provides leadership to guide the direction and set the priorities of the Gulf Coastal Plains and Ozarks (GCPO) LCC Contributes the necessary technical expertise and resources to achieve the goals and objectives of the GCPO LCC Accepts the responsibility for the performance and success of the GCPO LCC	Dedicated Staff Supporting the LCC Provides science and technology support to the GCPO LCC in each of the functional elements of the adaptive management framework Provides partnership development and coordination support by creating, guiding, facilitating, and nurturing a networked partnership infrastructure sufficient to support the iterative, interagency application of the GCPO LCC adaptive management framework.	The Extensive Management and Science Communities of the GCPO Geography Appropriate technical staff of the various agencies and organizations within the GCPO LCC networking on issues or species specific tasks associated with one or more core functions of the adaptive conservation framework (i.e., biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-driven research).	Existing and future Programs (e.g., Refuge System, State Agency, University), Projects (habitat delivery, monitoring and research projects) and Partnerships working in the GCPO geography represent the array of assets that directly produce and deliver targeted actions. Program management decisions have a direct impact on each organization's performance in contributing to the goals and objectives of the LCC.

Anticipated 2010 Progress

The vision of the GCPO LCC presented will begin to materialize in FY2010, with capital investments by the U.S. Fish and Wildlife Service and other partners. Concomitant with the funding available, expectations include tangible products and actions in both the leadership and science and technology realms of this Partnership. Specifically, the LCC will:

Leadership

- Form an Inter-agency LCC Steering Committee to provide guidance and direction for GCPO LCC development

- Host a Leadership Summit that includes all potential partner agencies and organizations to garner their interest in actively participating in the development of the LCC. Objectives of the Leadership Summit include:

    1. Explore options for linking actions and activities among the myriad partners and partnerships operating in the GCPO geography

    2. Arrive at a consensus on the GCPO geographic extent (e.g., Will it include the Interior Low Plateaus?)

    3. Arrive at a consensus on the approach to partitioning the 180 million acre GCPO into manageable conservation planning units (e.g., Are the four sub-units logical divisions?)

    4. Identify strategies for linking to neighboring LCCs and operating as one LCC within a network of LCCs

Science and Technology

- Hire an LCC Science and Technology Coordinator

- Begin to coalesce and build a vision for greater integration among the science community in the GCPO geography

- Initiate species sensitivity and vulnerability assessments. Members of the Cooperative will develop transparent, replicable, and defensible processes for identifying priority species and habitats based on their current status and potential vulnerability or sensitivity to climate change and other stressors (e.g., urbanization, invasive species, stream flow, and fragmentation)

- Host a Science Summit/Optimal Conservation Strategy Workshop

- Identify methods and begin to develop tools for integrating aquatic and terrestrial priorities and aligning conservation strategies

- Develop a process for selecting priority science projects and initiate 2-3 high priority science projects based on level of funding secured.

Appendix A: Letter from Lower Mississippi Valley Joint Venture Management Board to Secretary of Interior Salazar

Lower Mississippi Valley Joint Venture
Tennessee Wildlife Resources Agency
PO Box 40747
Nashville, TN 37204

November 23, 2009

Secretary Ken Salazar
Department of Interior
1839 C Street, NW
Washington, DC 20240

Dear Secretary Salazar:

As Chairman of the private, state, and federal Lower Mississippi Valley Joint Venture conservation partnership, I write to you on behalf of its member organizations and agencies to express our unified support for the Department of Interior's actions in developing partnership-based Landscape Conservation Cooperatives (LCCs). We fully share the vision of a national network of LCCs collaboratively developing a comprehensive strategy for sustaining our Nation's fish and wildlife resources. Further, we commend the Department of Interior for demonstrating both bold leadership and a strong commitment to our natural resources at a time when they face unprecedented and unparalleled challenges to their conservation and long-term sustainability. In a response commensurate to these challenges and your dedication, the Lower Mississippi Valley Joint Venture Management Board voted on November 1, 2009 to assume the responsibility of providing leadership in the establishment of the Gulf Coastal Plains and Ozarks LCC.

This is not a responsibility we take lightly. I am confident the Lower Mississippi Valley Joint Venture is well-positioned and uniquely poised to confront the organizational and technical challenges that the development of a successful and effective LCC presents. The Lower Mississippi Valley Joint Venture is a 20-year conservation partnership recognized internationally for its cohesive leadership, innovative approach to landscape-scale conservation, and effective integration of science and management – all targeting the long-term sustainability of regional and North American bird populations. While the reach of the Lower Mississippi Valley Joint Venture partnership touches many organizations, agencies, and individuals across both the public and private sectors, the long-standing members responsible for its success include: Arkansas Game and Fish Commission; Ducks Unlimited, Inc; Kentucky Department of Fish and Wildlife Resources; Louisiana Department of Wildlife and Fisheries; Mississippi Department of Wildlife, Fisheries, and Parks; Missouri Department of Conservation; Oklahoma Department of Wildlife Conservation; Tennessee Wildlife Resources Agency; Texas Parks and Wildlife Department; The Conservation Fund; The Nature Conservancy; US Fish and Wildlife Service; US Forest Service; US Geologic Survey; and the Wildlife Management Institute. Each member agency and organization of the partnership is committed to its success, and the strength of the partnership is reflected in its resolve to develop a shared vision of conservation, cooperate in its implementation, and collaborate in its refinement.

Appendix A: Letter from Lower Mississippi Valley Joint Venture Management Board to Secretary of Interior Salazar

We feel strongly that success in conserving our Nation's natural resources is dependent on the ability of the private, state, federal conservation and science community to work collaboratively toward developing and implementing a common vision of landscape sustainability. We recognize the opportunity that exists to translate that vision to a reality through leading the establishment and nurturing the development of the Gulf Coastal Plains and Ozarks LCC. Among other foreseeable steps, the Lower Mississippi Valley Joint Venture Management Board envisions hosting a Leadership Summit and a Science Summit to actively engage both the upper-level management and technical staff of Department of Interior bureaus, state agencies, other federal agencies, and non-governmental organizations within the Gulf Coastal Plains and Ozarks geography whose mission includes or impacts the conservation of fish and wildlife resources.

In parting, I professionally and personally thank you for your organizational commitment to the model of scientific, partner-based conservation. The Lower Mississippi Valley Joint Venture looks forward to building upon our existing strengths as we engage the conservation community in the expansion of our biological and geographic focus to encompass a broader suite of taxa and partners. Improving our science and working together is the only way I see, that as a broad conservation community, we can ensure the natural resources the public has entrusted to us will be sustained in perpetuity. With the advent of LCCs, I have optimism we can achieve just that.

Yours in conservation,

Greg Wathen

Greg Wathen, Chairman, Lower Mississippi Valley Joint Venture
Chief of Wildlife, Tennessee Wildlife Resources Agency

cc: Sam Hamilton, Director US Fish and Wildlife Service
Benjamin Tuggle, Southwest Regional Director, US Fish and Wildlife Service
Tom Melius, Midwest Regional Director, US Fish and Wildlife Service
Cindy Dohner, Southeast Regional Director, US Fish and Wildlife Service

Appendix B: Letter from East Gulf Coastal Plain Joint Venture Management Board to Secretary of Interior Salazar

East Gulf Coastal Plain
JOINT VENTURE

East Gulf Coastal Plain Joint Venture
Mississippi Department of Wildlife, Fisheries, and Parks
1505 Eastover Dr.
Jackson, MS 39211-6374

November 30, 2009

Secretary Ken Salazar
Department of Interior
1839 C Street, NW
Washington, DC 20240

Dear Secretary Salazar:

As Chairman of the Management Board for the East Gulf Coastal Plain Joint Venture (EGCPJV), I'm writing on behalf of our partnership to express support for the Interior Department's plans to develop a national, partner-based network of Landscape Conservation Cooperatives (LCC). A national network of self-directed partnerships that informs resource management decisions and supports landscape-scale conservation activities will afford technical capacity and collaborative potential that are critical for addressing a host of unprecedented societal conservation challenges, including those related to a rapidly changing climate. We are pleased to see the leadership and initial efforts of the Department in working towards establishment of a functional network of cooperatives that will greatly facilitate the conservation of ecologically and socio-economically sustainable landscapes across the country.

As a newer partnership striving to deliver programs that promote landscape sustainability in support of bird conservation, the EGCPJV and its member organizations have already invested considerable resources in defining "landscape sustainability" within our region, and in strategically advancing the conservation of birds and their habitats consistent with that vision. We recognize the goals of our partnering organizations and hold the conviction that we can achieve greater success by working cooperatively on our mutual conservation objectives than by working as independent entities. The success of our Joint Venture is derived from support provided by our current members: Alabama Department of Conservation and Natural Resources; American Bird Conservancy; Auburn University School of Forestry and Wildlife Sciences; Florida Fish and Wildlife Conservation Commission; Kentucky Department of Fish and Wildlife Resources; Louisiana Department of Wildlife and Fisheries; Mississippi Department of Wildlife, Fisheries, and Parks; National Audubon Society; National Wild Turkey Federation; Northern Bobwhite Conservation Initiative; Tennessee Wildlife Resources Agency; US Fish and Wildlife Service; and the US Forest Service. Each of these organizations is represented on the management board and is committed to actively engage in the development, implementation, and refinement of our conservation strategy.

Nonetheless, we acknowledge and value the need to expand these types of efforts to consider landscape sustainability beyond just birds. It is our hope that, in time, the Gulf Coastal Plains and Ozarks LCC will complement our partnership's efforts and significantly improve the collective conservation community's ability to plan and design conservation programs to sustain functional landscapes for all species in the East Gulf Coastal Plain. Furthermore, it is our conviction that Joint Ventures are the pre-eminent model for successful conservation partnerships, with their success due in part to our deliberate, strategic approaches that hinge on committed engagement from a host of critical partners. Development of LCCs must follow on the successful pathways paved by Joint Ventures.

Consequently, at a recent meeting of our Management Board, the EGCPJV voted to work cooperatively with the neighboring Lower Mississippi Valley Joint Venture to provide leadership in the development of the Gulf Coastal Plains and Ozarks LCC. We intend to lead and participate in discussions and planning regarding strategic, operational, and technical considerations integral to the formation of an effective and functional cooperative. Shared leadership in the development of the Gulf Coastal Plains and Ozarks LCC will serve to enhance an already strong collaborative relationship with the Lower Mississippi Valley Joint Venture, resulting in even greater cooperation and more meaningful results. In short, the collective experience and expertise of our two partnerships will help ensure the best chance of success for the new LCC.

In closing, I thank you for the Department of Interior's innovative vision in sustaining our natural resources by investing in, as well as leveraging, the capacity of many organizations dedicated to wildlife conservation. The East Gulf Coastal Plain Joint Venture looks forward to investing time, energy, and leadership with our partners in the conservation community in developing and implementing successful strategies for sustainable landscapes within the Gulf Coastal Plains and Ozarks LCC.

Sincerely,

Ron Seiss, Chairman, East Gulf Coastal Plain Joint Venture

Assistant Wildlife Resources Director, Mississippi Department of Fisheries, Parks, & Wildlife

cc: Sam Hamilton, Director, US Fish and Wildlife Service

Benjamin Tuggle, Southwest Regional Director, US Fish and Wildlife Service

Tom Melius, Midwest Regional Director, US Fish and Wildlife Service

Cindy Dohner, Southeast Regional Director, US Fish and Wildlife Service

Appendix C: Priority Habitats and Species of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

The following list of priority habitats and species was developed via a cursory review of the highest priorities identified within the State Wildlife Action Plans for the twelve states of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative. This list in not comprehensive or final, and inclusions or omissions do not reflect the judgment of any individual or collective partners as to the current conservation priority status of any habitats or species.

<u>Priority Habitats and Species of the East Gulf Coastal Plains</u>

Forest

- Bottomland/floodplain forest
  - Swainson's warbler
  - Prothonotary warbler
  - Swallow-tailed Kite

Savanna (and Flatwoods)

- Pine savannah/Flatwoods
  - Red-cockaded woodpecker
  - Flatwoods salamander
  - Gopher frog
- Open woods
  - Loggerhead shrike

Prairie

- Mimic glass lizard
- Northern Bobwhite
- Henslow's sparrow
- Florida sandhill crane

Woodland

- Longleaf Pine woodlands
  - Bachman's' sparrow
  - Brown-headed nuthatch
  - Northern bobwhite
  - Black pine snake
  - Gopher tortoise

Caves and Karst

- Dougherty plain cave crayfish
- Georgia blind salamander

Wetland

One-toed amphiuma

River/Stream

Robust redhorse
Alabama shad
Blackbanded sunfish

Altamaha arcmussel
Apalachicola floater
Altamaha spinymussel
Oval pigtoe

Priority Habitats and Species of the Interior Highlands

Forest

- Upland forest
    - Wood Thrush
    - Eastern Wood-Pewee
    - Ovenbird
    - Orchard oriole
- Mesic Hardwood Forest
    - Cerulean Warbler
    - Worm-eating Warbler
    - Kentucky Warbler
    - Ringed Salamander
    - Ozark Salamander
    - Ozark Big-eared Bat
    - Gray Myotis
    - Northern Long-eared Myotis
- Montane Forest
    - Fourche Mountain Salamander
    - Rich Mountain Salamander
- Bottomland forest
    - Pileated woodpecker
    - Acadian flycatcher
    - Prothonotary warbler
    - Cerulean warbler

Savanna

- Pine savanna
    - Red-cockaded woodpecker
    - Brown-headed nuthatch
    - Bachman's sparrow
    - Prairie warbler
    - Northern bobwhite
    - Diana Fritillary

Prairie

- Brown thrasher
- Prairie warbler
- Field sparrow
- Ornate box turtle
- Prairie mole cricket
- Southern prairie skink

Northern crawfish frog

Glade (and Barrens)

Collared lizard
Scrubland tiger beetle
Western diamondback rattlesnake

Priority Habitats and Species of the Interior Highlands, cont'd

Cliffs and Talus

Rich mountain slitmouth
Eastern small-footed bat

Woodland

Oak-hickory woodlands/Oak Woodlands and Savannahs

Prairie warbler
Blue-winged warbler
Bachman's sparrow
Northern bobwhite
Diana Fritillary
Linda's roadside skipper
Byssus skipper
American burying beetle
Three-toed box turtle
Whip-poor-will

Oak-pine woodlands

Scarlet tanager
Northern fence lizard

Pine woodlands

Red-cockaded woodpecker
Brown-headed nuthatch
Bachman's sparrow
Prairie warbler
Northern bobwhite
Diana Fritillary

Caves and Karst

Ozark cavefish
Bristly cave crayfish
Ozark big-eared bat
Gray myotis
Cave salamander
Northern long-eared myotis
Grotto salamander
Oklahoma cave crayfish
Delaware County cave crayfish
Endemic subterranean isopods and amphipods

Wetland

Sinkhole pond

Ringed salamander

River/Stream

Arkansas darter
Stippled darter
Little spectaclecase
Purple lilliput
Butterfly mussel
Midget crayfish
Oklahoma salamander
Wedgespot shiner
Blunt-faced shiner

Redspot chub
Ozark minnow
Cardinal shiner
Plains topminnow
Southern book lamprey
Oklahoma salamander
Louisiana waterthrush
Neosho mucket
Ouachita kidneyshell

Priority Habitats and Species of the Mississippi Alluvial Valley

Forest

Bottomland/floodplain forest

- Swainson's warbler
- Prothonotary warbler
- Cerulean Warbler
- Swallow-tailed kite
- Swamp rabbit
- Mississippi kite
- Bird-voiced treefrog
- Mole salamander
- Western mudsnake

Savanna

Early-successional and shrub/scrub habitats

- Orchard oriole
- White-eyed vireo
- Painted bunting
- Mississippi kite

Prairie

- LeConte's sparrow
- Henslow's sparrow
- Field sparrow
- Grasshopper sparrow
- Loggerhead shrike
- Dickcissel
- Short-eared owl
- Sedge wren

Wetland

- Nonforested wetlands
  - shorebirds
  - long-legged wading birds
  - bitterns
  - rails
  - Western chicken turtle
- Bottomland depression (swamp or slough)
  - Gulf crayfish snake

River/Stream

- Pallid sturgeon
- Alligator gar
- Paddlefish
- Fat pocketbook
- Pink mucket
- Rabbitsfoot

Priority Habitats and Species of the West Gulf Coastal Plains

Forest

- Bottomland forest
  - Swainson's warbler
  - Hooded warbler
  - Wood thrush
  - Prothonotary warbler
  - American woodcock
  - Mole salamander
  - Southeastern myotis
  - Rafinesque's big-eared bat
- Mesic Hardwood Forest
  - Cerulean warbler
  - Hooded warbler
  - Worm-eating warbler
  - Wood thrush
  - Kentucky warbler
  - Ringed salamander
  - Kiamichi slimy salamander
  - Rich Mountain salamander
  - Rich Mountain slitmouth snail
  - Southeastern myotis
  - Northern long-eared myotis
- Pine forest
  - Brown-headed nuthatch
  - Canebrake rattlesnake
  - Louisiana black bear

Savanna

- Longleaf pine savanna
  - Red-cockaded woodpecker
  - Louisiana pine snake
  - Bachman's sparrow

Prairie

- Hurter's spadefoot
- Texas horned lizard
- Western slender glass lizard
- Southern prairie skink
- Northern bobwhite
- Grasshopper sparrow

Short-eared owl
Upland sandpiper
Lark sparrow
Scissor-tailed flycatcher
Eastern kingbird

Priority Habitats and Species of the West Gulf Coastal Plains, cont'd

Woodland

- Shortleaf Pine/Oak Savannahs and Woodlands
  - Bachman's sparrow
  - Brown-headed nuthatch
  - Prairie warbler
  - Red-cockaded woodpecker
  - Red-headed woodpecker
  - Northern bobwhite
  - Diana fritillary

Caves and Karst

Wetland

- Bottomland slough
  - Three-toed amphiuma
  - Lesser siren
  - Bird-voiced treefrog
  - Alligator snapping turtle
  - Western mudsnake
  - Swamp rabbit

River/Stream

- Ouachita rock pocketbook
- Scaleshell
- Winged mapleleaf
- Ouachita kidneyshell
- Rabbitsfoot
- Southern hickorynut
- Kiamichi shiner
- Rocky shiner
- Peppered shiner
- Blackspot shiner
- Taillight shiner
- Blue- headed shiner
- Blue sucker
- Leopard darter
- Crystal darter
- Harlequin darter
- Lesser siren
- Alligator snapping turtle
- Texas pigtoe
- Louisiana pigtoe
- Sandbank pocketbook
- Texas heelsplitter
- Wartyback
- Creeper
- Fawnsfoot
- Texas emerald (dragonfly)
- Western sand darter
- American eel
- Creek chubsucker
- Ironcolor shiner
- Sabine shiner
- Silverband shiner
- Paddlefish

Razor-backed musk turtle
River otter
Big Thicket blind isopod
Texas prairie crayfish
Upshur crayfish
Neches crayfish
Black-girdled crayfish
Kensley's crayfish

Appendix D. Preliminary species in need of priority conservation action within broadly-defined ecological communities of the Southeast. This list of priority species was compiled by biologists of the U.S. Fish and Wildlife Service in Region 4; it is neither comprehensive nor exclusive to the species of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative.

Ecological Community (Habitat)	Taxon	Species
Beaches-Dunes	bird	American oystercatcher
Beaches-Dunes	bird	piping plover
Beaches-Dunes	bird	red knot
Beaches-Dunes	bird	snowy plover
Beaches-Dunes	bird	Wilson's plover
Beaches-Dunes	mammal	Alabama beach mouse
Beaches-Dunes	mammal	southeastern beach mouse
Caves-Karst-Springs	amphibian	Georgia blind salamander
Caves-Karst-Springs	amphibian	Tennessee cave salamander
Caves-Karst-Springs	crayfish	cave crayfish, collectively
Caves-Karst-Springs	fish	Alabama cavefish
Caves-Karst-Springs	fish	other cavefish
Caves-Karst-Springs	fish	Ozark cavefish
Caves-Karst-Springs	fish	pygmy sculpin
Caves-Karst-Springs	fish	spring pygmy sunfish
Caves-Karst-Springs	fish	watercress darter
Caves-Karst-Springs	insect	cave beetles, collectively
Caves-Karst-Springs	mammal	gray bat
Caves-Karst-Springs	mammal	Indiana bat
Caves-Karst-Springs	mammal	Ozark big-eared bat
Caves-Karst-Springs	plant	American Hart's-tongue fern
Caves-Karst-Springs	shrimp	cave shrimp, collectively
Caves-Karst-Springs	snail	royal snail
Estuarine-Marine	bird	black-necked stilt
Estuarine-Marine	bird	clapper rail
Estuarine-Marine	bird	common loon
Estuarine-Marine	bird	lesser scaup
Estuarine-Marine	bird	Nelson's sharp-tailed sparrow
Estuarine-Marine	bird	reddish egret
Estuarine-Marine	bird	redhead
Estuarine-Marine	bird	saltmarsh sparrow
Estuarine-Marine	coral	staghorn coral
Estuarine-Marine	fish	American eel
Estuarine-Marine	fish	Key silverside
Estuarine-Marine	fish	Opossum pipefish
Estuarine-Marine	fish	other groupers and snappers, collectively
Estuarine-Marine	fish	red drum
Estuarine-Marine	fish	saltmarsh topminnow

Appendix D. Continued.

Ecological Community (Habitat)	Taxon	Species
Estuarine-Marine	fish	seahorses, collectively
Estuarine-Marine	fish	snook and tarpon, collectively
Estuarine-Marine	fish	spotted seatrout
Estuarine-Marine	fish	striped bass
Estuarine-Marine	plant	Johnson's seagrass
Estuarine-Marine	plant	other seagrasses, collectively
Estuarine-Marine	reptile	diamond terrapin
Estuarine-Marine	snail	queen conch
Forested Wetlands – Mineral Soil	bird	American woodcock
Forested Wetlands – Mineral Soil	bird	cerulean warbler
Forested Wetlands – Mineral Soil	bird	hooded warbler
Forested Wetlands – Mineral Soil	bird	prothonotary warbler
Forested Wetlands – Mineral Soil	bird	rusty blackbird
Forested Wetlands – Mineral Soil	bird	Swainson's warbler
Forested Wetlands – Mineral Soil	bird	swallow-tailed kite
Forested Wetlands – Mineral Soil	bird	wood duck
Forested Wetlands – Mineral Soil	mammal	golden mouse
Forested Wetlands – Mineral Soil	mammal	Louisiana black bear
Forested Wetlands – Mineral Soil	mammal	other black bear populations
Forested Wetlands – Mineral Soil	mammal	Rafinesque's big-eared bat
Forested Wetlands – Mineral Soil	mammal	southeastern myotis
Forested Wetlands – Mineral Soil	plant	Alabama leather flower
Forested Wetlands – Organic Soil	bird	hooded warbler
Forested Wetlands – Organic Soil	bird	red-cockaded woodpecker
Forested Wetlands – Organic Soil	bird	red-headed woodpecker
Forested Wetlands – Organic Soil	bird	Swainson's warbler
Freshwater Aquatic – East Gulf	fish	gulf populations of Atlantic sturgeon
Freshwater Aquatic – East Gulf	fish	Okaloosa darter
Freshwater Aquatic – East Gulf	mussel	Ochlocknee moccasinshell
Freshwater Aquatic - Mississippi	fish	Alabama shad
Freshwater Aquatic - Mississippi	fish	alligator gar
Freshwater Aquatic - Mississippi	fish	Ozark cavefish
Freshwater Aquatic - Mississippi	fish	paddlefish
Freshwater Aquatic - Mississippi	fish	pallid sturgeon
Freshwater Aquatic - Mississippi	fish	skipjack herring
Freshwater Aquatic - Mississippi	fish	yellowcheek darter
Freshwater Aquatic - Mississippi	mussel	Arkansas fatmucket
Freshwater Aquatic - Mississippi	mussel	fat pocketbook
Freshwater Aquatic - Mississippi	mussel	speckled pocketbook
Freshwater Aquatic - Mobile	fish	Alabama sturgeon
Freshwater Aquatic - Mobile	fish	amber darter
Freshwater Aquatic - Mobile	fish	Conasauga logperch

Appendix D. Continued.

Ecological Community (Habitat)	Taxon	Species
Freshwater Aquatic - Mobile	fish	watercress darter
Freshwater Aquatic - Mobile	mussel	black clubshell
Freshwater Aquatic - Mobile	mussel	Coosa moccasinshell
Freshwater Aquatic - Mobile	mussel	dark pigtoe
Freshwater Aquatic - Mobile	mussel	flat pigtoe
Freshwater Aquatic - Mobile	mussel	heavy pigtoe
Freshwater Aquatic - Mobile	mussel	southern combshell
Freshwater Aquatic - Mobile	mussel	southern pigtoe
Freshwater Aquatic - Mobile	mussel	stirrupshell
Freshwater Aquatic - Mobile	snail	plicate rocksnail
Freshwater Aquatic - Mobile	snail	Tulotoma snail
Freshwater Managed Wetland	amphibian	green treefrog
Freshwater Managed Wetland	bird	American bittern
Freshwater Managed Wetland	bird	bald eagle
Freshwater Managed Wetland	bird	greater yellowlegs (long-legged shorebirds)
Freshwater Managed Wetland	bird	green-winged teal
Freshwater Managed Wetland	bird	king rail
Freshwater Managed Wetland	bird	least sandpiper (short-legged shorebirds)
Freshwater Managed Wetland	bird	little blue heron
Freshwater Managed Wetland	bird	mallard
Freshwater Managed Wetland	bird	mottled duck
Freshwater Managed Wetland	bird	northern harrier
Freshwater Managed Wetland	bird	northern pintail
Freshwater Managed Wetland	bird	purple gallinule
Freshwater Managed Wetland	bird	ring-necked duck
Freshwater Managed Wetland	bird	wood stork
Freshwater Managed Wetland	crayfish	other native crayfish
Freshwater Managed Wetland	mammal	hispid cotton rat
Freshwater Managed Wetland	reptile	sliders and cooters, collectively
Freshwater Managed Wetland	reptile	water snakes, collectively
Freshwater Marsh	amphibian	green treefrog
Freshwater Marsh	amphibian	sirens, amphiumas, waterdogs, collectively
Freshwater Marsh	bird	American bittern
Freshwater Marsh	bird	common yellowthroat
Freshwater Marsh	bird	king rail
Freshwater Marsh	bird	marsh wren
Freshwater Marsh	bird	mottled duck
Freshwater Marsh	bird	purple gallinule
Freshwater Marsh	bird	sora
Freshwater Marsh	bird	wood stork (FL, GA, SC, AL)
Freshwater Marsh	crayfish	other native crayfish
Freshwater Marsh	mammal	roundtail muskrat

Appendix D. Continued.

Ecological Community (Habitat)	Taxon	Species
Freshwater Marsh	reptile	American alligator
Grassland-Prairie-Savanna	amphibian	Mississippi gopher frog
Grassland-Prairie-Savanna	bird	buff-breasted sandpiper
Grassland-Prairie-Savanna	bird	grasshopper sparrow
Grassland-Prairie-Savanna	bird	greater prairie-chicken
Grassland-Prairie-Savanna	bird	Henslow's sparrow
Grassland-Prairie-Savanna	bird	LeConte's sparrow
Grassland-Prairie-Savanna	bird	Mississippi sandhill crane
Grassland-Prairie-Savanna	bird	mottled duck
Grassland-Prairie-Savanna	bird	northern bobwhite
Grassland-Prairie-Savanna	bird	upland sandpiper
Grassland-Prairie-Savanna	plant	coastal plain pitcher plants, collectively
Grassland-Prairie-Savanna	plant	Indian grass
Grassland-Prairie-Savanna	plant	little bluestem
Grassland-Prairie-Savanna	plant	switch grass
Grassland-Prairie-Savanna	plant	wiregrass (*Aristida* sp.)
Grassland-Prairie-Savanna	reptile	eastern indigo snake
Grassland-Prairie-Savanna	reptile	gopher tortoise (east of Mobile Bay)
Grassland-Prairie-Savanna	reptile	gopher tortoise (west of Mobile Bay)
Shrub-Scrub	bird	Bell's vireo
Shrub-Scrub	bird	blue-winged warbler
Shrub-Scrub	bird	eastern Bewick's wren
Shrub-Scrub	bird	golden-winged warbler
Shrub-Scrub	bird	painted bunting
Shrub-Scrub	bird	Swainson's warbler
Shrub-Scrub	insect	southern pearly-eye
Shrub-Scrub	mammal	cotton mouse
Shrub-Scrub	mammal	swamp rabbit
Shrub-Scrub	plant	barren and glade plants, collectively
Shrub-Scrub	plant	cliff face and rockhouse plants, collectively
Shrub-Scrub	plant	coastal plain bog plants, collectively
Shrub-Scrub	plant	*Geocarpon minimum*
Shrub-Scrub	plant	Godfrey's butterwort
Shrub-Scrub	plant	Kentucky gladecress
Shrub-Scrub	plant	mountain bog and fen plants, collectively
Shrub-Scrub	plant	patch ("pocket") prairie plants, collectively
Shrub-Scrub	plant	rock outcrop plants, collectively
Shrub-Scrub	plant	savanna plants, collectively
Shrub-Scrub	plant	Short's goldenrod
Shrub-Scrub	plant	white haired goldenrod
Shrub-Scrub	reptile	Timber (canebrake) rattlesnake
Southern Pine	amphibian	ephemeral pond-breeding amphibians

Appendix D. Continued.

Ecological Community (Habitat)	Taxon	Species
Southern Pine	amphibian	frosted flatwoods salamander
Southern Pine	amphibian	gopher frog
Southern Pine	amphibian	Mississippi gopher frog
Southern Pine	amphibian	reticulated flatwoods salamander
Southern Pine	bird	Bachman's sparrow
Southern Pine	bird	brown-headed nuthatch
Southern Pine	bird	Henslow's sparrow
Southern Pine	bird	red-cockaded woodpecker
Southern Pine	bird	red-headed woodpecker
Southern Pine	crayfish	Panama City crayfish
Southern Pine	plant	*Aster spinulosus*
Southern Pine	plant	coastal plain pitcher plants, collectively
Southern Pine	plant	little bluestem
Southern Pine	plant	telephus spurge
Southern Pine	plant	wiregrass (*Aristida* spp.)
Southern Pine	reptile	eastern indigo snake
Southern Pine	reptile	eastern rattlesnake
Southern Pine	reptile	gopher tortoise (east of Mobile Bay)
Southern Pine	reptile	gopher tortoise (west of Mobile Bay)
Southern Pine	reptile	Louisiana pine snake
Southern Pine	reptile	other pine snakes
Southern Pine	reptile	pygmy rattlesnake
Upland Hardwood	amphibian	red hills salamander
Upland Hardwood	bird	Acadian flycatcher
Upland Hardwood	bird	cerulean warbler
Upland Hardwood	bird	Kentucky warbler
Upland Hardwood	bird	wood thrush
Upland Hardwood	bird	worm-eating warbler
Upland Hardwood	mammal	eastern small-footed myotis
Upland Hardwood	snail	Magazine Mountain shagreen
Xeric Maritime Scrub	amphibian	ephemeral pond-breeding amphibians
Xeric Maritime Scrub	amphibian	gopher frog
Xeric Maritime Scrub	bird	painted bunting
Xeric Maritime Scrub	mammal	Alabama beach mouse
Xeric Maritime Scrub	mammal	southeastern beach mouse
Xeric Maritime Scrub	plant	white sand scrub plants, collectively
Xeric Maritime Scrub	plant	yellow sand scrub plants, collectively
Xeric Maritime Scrub	reptile	eastern indigo snake
Xeric Maritime Scrub	reptile	eastern rattlesnake
Xeric Maritime Scrub	reptile	gopher tortoise (east of Mobile Bay)
Xeric Maritime Scrub	reptile	other pine snakes
Xeric Maritime Scrub	reptile	pygmy rattlesnake

Appendix E. Preliminary list of potential federal and state agencies, colleges and universities, and non-governmental organization partners within the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative. This list does not include the myriad Industrial organizations (e.g., Timber) or corporations that may have a role in the LCC.

Jurisdiction Affiliation	Name
Federal	
Department of Interior	Bureau of Indian Affairs
	Bureau of Reclamation
	Bureau of Land Management
	Fish and Wildlife Service
	U.S. Geological Survey
	Minerals Management Service
	National Park Service
	Office of Surface Mining
Department of Agriculture	Cooperative State Research, Education and Extension Service
	Agricultural Research Service
	Natural Resources Conservation Service
	Farm Services Agency
	Forest Service
	National Agricultural Statistics Service
Department of Commerce	National Marine Fisheries
	National Oceanic & Atmospheric Administration
	National Technical Information Service
	National Weather Service

Appendix E. Continued.

Jurisdiction Affiliation	Name
Federal	
Department of Defense	Air Force
	Army
	Army Corps of Engineers
	Marine Corps
	Navy
Department of Energy	Office of Science
	National Laboratories
	Southeastern Power Administration
Dept. of Health and Human Services	Centers for Disease Control and Prevention
Department of Homeland Security	Coast Guard
	Federal Emergency Management Administration
Department of State	Global Affairs
Department of Transportation	Federal Highway Administration
Non-Cabinet related Agencies	National Aeronautics and Space Administration
	Environmental Protection Agency
	National Science Foundation
	U.S. Global Change Research Program/Climate Change Science

Appendix E. Continued.

Jurisdiction Affiliation	Name
State	
Alabama	Alabama Department of Agriculture and Industries
	Alabama Department of Conservation and Natural Resources
	Alabama Forestry Commission
	Geological Survey of Alabama
	Alabama Soil and Water Commission
	Alabama Transportation Department
	Alabama Wildlife and Freshwater Fisheries
Arkansas	Arkansas Department of Environmental Quality
	Arkansas Forestry Commission
	Arkansas Game and Fish Commission
	Arkansas Geological Survey
	Arkansas Geographic Information Office
	Arkansas Governor's Commission on Global Warming
	Department of Arkansas Heritage
	Arkansas Highway and Transportation Department
	Arkansas Highway Commission
	Arkansas Natural and Cultural Resources Council
	Arkansas Natural Heritage Commission

Appendix E. Continued.

Jurisdiction Affiliation	Name
State	
Arkansas	Arkansas Natural Resources Commission
	Arkansas Oil and Gas Commission
	Arkansas Department of Parks and Tourism
	Arkansas Parks, Recreation, and Travel Commission
	Arkansas Waterways Commission
Florida	Florida Department of Agriculture and Consumer Services
	Florida Department of Environmental Protection
	Florida Department of Transportation
	Florida Fish and Wildlife Conservation Commission
	Florida Geological Survey
Georgia	Georgia Department of Agriculture
	Georgia Forestry Commission
	Georgia Land Conservation Program
	Georgia Department of Natural Resources
	Georgia Spatial Data Infrastructure
	Georgia Department of Transportation
Illinois	Illinois Department of Agriculture
	Illinois Environmental Protection Agency
	Illinois Department of Natural Resources

Appendix E. Continued.

Jurisdiction Affiliation	Name
State	
Illinois	Illinois Department of Transportation
Kentucky	Kentucky Department of Agriculture
	Kentucky Department of Fish and Wildlife Resources
	Kentucky Environmental Quality Commission
	Kentucky Department for Natural Resources
	Kentucky State Nature Preserves Commission
	Kentucky Department of Parks
	Kentucky Division of Forestry
	Kentucky Division of Water
Louisiana	Louisiana Department of Wildlife and Fisheries
	Louisiana Department of Culture, Recreation, and Tourism
	Louisiana Department of Environmental Quality
	Louisiana Department of Natural Resources
	Louisiana Department of Transportation and Development
	Louisiana Department of Agriculture and Forestry
Mississippi	Mississippi Department of Wildlife Fisheries and Parks
	Mississippi Department of Environmental Quality
	Mississippi Forestry Commission

Appendix E. Continued.

Jurisdiction Affiliation	Name
State	
Mississippi	Mississippi Department of Marine Resources
	Mississippi Geospatial Clearinghouse
	Mississippi Museum of Natural Science
	Mississippi Oil & Gas Board
	Mississippi Coordinating Council for Remote Sensing and GIS
	Mississippi Soil and Water Conservation Commission
	Mississippi State Parks
	Mississippi Department of Transportation
Missouri	Missouri Department of Agriculture
	Missouri Depart of Conservation
	Missouri Department of Natural Resources
	Missouri Department of Transportation
Oklahoma	Oklahoma Agriculture, Food & Forestry Department
	Oklahoma Biological Survey
	Oklahoma Department of Wildlife Conservation
	Oklahoma Climatological Survey
	Oklahoma Conservation Commission
	Oklahoma Environmental Quality Department
	Oklahoma Geologic Survey

Appendix E. Continued.

Jurisdiction Affiliation	Name
State	
Oklahoma	Oklahoma Scenic Rivers Commission
	Oklahoma Tourism & Recreation Department
	Oklahoma Transportation Department
	Oklahoma Water Resources Board
Tennessee	Tennessee Wildlife Resources Agency
	Tennessee Department of Agriculture
	Tennessee Department of Environment and Conservation
	Tennessee GIS Services Division
	Tennessee State Parks
	Tennessee Department of Transportation
Texas	Texas Department of Agriculture
	Texas Commission of Environmental Quality
	Texas Forest Service
	Texas State Soil & Water Conservation Board
	Texas Department of Transportation
	Texas Parks and Wildlife Department

Appendix E. Continued.

Jurisdiction Affiliation	Name
Colleges and Universities	Alcorn State University
	Arkansas State University
	Arkansas Tech University
	Auburn University
	College of the Ozarks
	Delta State University
	Jackson State University
	Louisiana State University System
	Louisiana Tech University
	Millsaps College
	Mississippi College
	Mississippi State University
	Mississippi Valley State University
	Missouri State University
	Missouri Valley College
	Nicholls State University
	Oklahoma State University System
	Southeastern Louisiana University
	Southeastern Oklahoma State University
	Southern Illinois University System
	Stephen F. Austin State University

Appendix E. Continued.

Jurisdiction Affiliation	Name
Colleges and Universities	Texas A&M University System
	University of Alabama
	University of Arkansas System
	University of Central Arkansas
	University of Florida
	University System of Georgia
	University of Illinois System
	University of Kentucky
	University of Louisiana System
	University of Louisville
	University of Memphis
	University of Mississippi
	University of Missouri System
	University of Oklahoma
	University of Southern Mississippi
	University of Tennessee System
	University of Texas System
	Vanderbilt University

Appendix E. Continued.

Jurisdiction Affiliation	Name
Non-governmental Organizations	American Bird Conservancy
	American Fisheries Society
	American Rivers
	Amphibian Conservation Alliance
	Association of Fish and Wildlife Agencies
	Audubon
	Bass Anglers Sportsman Society (B.A.S.S.)
	Bat Conservation International, Inc.
	BirdLife International
	Black Bear Conservation Coalition
	Center for North American Herpetology
	Conservation International
	Cornell Laboratory of Ornithology
	Defenders of Wildlife
	Delta Waterfowl
	Delta Wildlife
	Ducks Unlimited
	Earthwatch Institute
	Environmental Defense Fund
	Fish Unlimited
	Forest Stewardship Council

Appendix E. Continued.

Jurisdiction Affiliation	Name
Non-governmental Organizations	Freshwater Mollusk Conservation Society
	International Carnivorous Plant Society
	International Union for the Conservation of Nature
	Izaak Walton League
	Longleaf Alliance
	National Forestry Association
	National Geographic Society
	National Smallmouth Alliance
	National Wildlife Federation
	National Wildlife Refuge Association
	National Wild Turkey Federation
	Native Plant Society
	NatureServe
	North American Native Fishes Association
	Northern Bobwhite Conservation Initiative
	Ozark Partnership
	Partners in Amphibian and Reptile Conservation
	Partners in Flight
	Quail Unlimited
	River Management Society

Appendix E. Continued.

Jurisdiction Affiliation	Name
Non-governmental Organizations	Rivers Without Borders
	Rocky Mountain Elk Foundation
	Ruffed Grouse Society
	Safari Club International
	Sierra Club
	Society of American Foresters
	Southeast Aquatic Resources Partnership
	Sutton Avian Research Center
	Student Conservation Association
	The Conservation Fund
	The National Rivers
	The Nature Conservancy
	The Wilderness Society
	The Wildlife Society
	Trout Unlimited
	Turtle Conservancy
	Turtle Survival Alliance
	Wetlands International
	Whitetails Unlimited
	Wildlife Conservation Society
	Wildlife Management Institute

Appendix F. Select priority science projects targeting needs of Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, December 2009. List compiled by informal solicitation of subset of potential Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative partners; it is neither comprehensive nor complete and will be refined in proposed Science Summit to be held in next 12-18 months.

Category	Description
Biological Planning	Develop species-habitat models that predict occurrence and persistence of aquatic focal species as a function of hydrology and flow regimes
	Develop a working list of priority species for entire Gulf Coastal Plains and Ozarks geography
	Development of species-habitat models for long-legged waders (e.g., little blue heron) and marshbirds (e.g., king rail)
	Identify focal aquatic species for prioritized conservation efforts that reflect ecological, cultural, social, and economic factors
	A transparent, defensible, and replicable process for deriving landbird population objectives linked to the NALCP
	Investigate life histories and habitat requirements of unique species/strains of riverine black bass, including the Guadalupe bass, Neosho smallmouth, and Ouachita smallmouth
	Conduct sensitivity and vulnerability assessments for potential impacts of critical biological stressors (including but not limited to climate change) on priority species
	Revision of shorebird population and habitat objectives for MAV that incorporates newly-available data and information
	Identify remaining barriers to genetic flow of wildlife throughout the LCC by evaluating isolation of populations as indicated by key genetic markers tied to landscape structure

Appendix F. Continued.

Category	Description
Conservation Design	Development of landscape simulation models (e.g., LANDIS) that predict spatial and temporal dynamics of landuse-landcover within the predominantly forested WGCP
	Hydrologic modeling in MAV to predict temporal (e.g., duration) and spatial (e.g., extent) dynamics of surface water
	Mapping of NatureServe ecological communities for entire WGCP (Texas and Arkansas are complete)
	Development of Desired Forest Conditions for ecosystems other than bottomland hardwoods (e.g., pine savanna)
	Ability to characterize conservation value of conservation practices associated with Farm Bill programs (e.g., CRP) from available datasets and decision support tools
	Conduct a regional classification of all aquatic resources (e.g., streams, rivers, lakes, etc.) reflecting standardized categories for biological and physical characteristics
	Conduct a regional evaluation of status and condition of riparian areas associated with aquatic systems
	Assess connectivity of aquatic systems to evaluate dispersal potential of aquatic animal populations
	Develop a decision support tool that prioritizes removal or modification of specific barriers (e.g., bridges, dams, culverts) to aquatic animal passage
	Develop a decision support tool for prioritizing watersheds for conservation based on ecological sensitivity given current and projected future conditions
	Develop and refine seamless geospatial datasets for assessing habitat characteristics critical to trust resource populations and species: National Land Cover Database to the Alliance Level
	Develop and refine seamless geospatial datasets for assessing habitat characteristics critical to trust resource populations and species: Digital Elevation Models to common resolution

Appendix F. Continued.

Category	Description
Conservation Design	Develop and refine seamless geospatial datasets for assessing habitat characteristics critical to trust resource populations and species: National Hydrology Dataset to common resolution and reflecting both surface and groundwater resources
	Develop and refine seamless geospatial datasets for assessing habitat characteristics critical to trust resource populations and species: improve functionality of SSURGO database for soils
	Develop dynamic landscape simulation tool (LANDIS) to link models of bird habitat quality, population size, and population viability to predicted changes in habitat quality and quantity
	Model effects of thermal change on water quality in select river basins
	Develop and refine seamless geospatial datasets for assessing habitat characteristics critical to trust resource populations and species: geomorphological structure and function
	Apply landscape simulation models to assess changes in habitats/landscapes across time and space under alternative landuse and climate scenarios
	Develop a decision support tool to prioritize corridor development that facilitates dispersal and connectivity of priority species populations
	Develop a working list of priority habitats for entire Gulf Coastal Plains and Ozarks geography
	Digitize wetlands from imagery to identify wetlands ≥1 acre

Appendix F. Continued.

Category	Description
Inventory and monitoring	Inventory of karst species endemic to the Ozark Highlands
	Temporal characterization of shorebird abundance, by species
	Conduct surveys of grassland-dependent avifauna to feed population viability models and decision support tools on highest priority habitats in region
	Collect abundance and demographic data on silvicolous landbirds to evaluate existing habitat suitability and generalized productivity models for 40 priority species
	Development and implementation of coordinated monitoring for waterbirds to assess population status, validate species-habitat models, and track effects of conservation treatments
Assumption-driven Research	Effect of sanctuary on ability of wintering waterfowl to acquire "available" energy resources
	Evaluation of HSI models for priority birds at local scales
	Conduct sensitivity analysis on species-habitat models for aquatic animals to identify minimum flow and water management requirements that sustain priority species
	Quantify relationship between the amount of impermeable surface/landuse in a watershed (including effects of management) and the associated stream health and condition
	Assess efficacy of current management (i.e., silvicultural and/or agricultural) practices for achieving desired response in priority species populations
	Model the potential effects of climate change on the karst resources of the Ozark Highlands
	Formally assess ecological issues associated with invasive species, particularly in reference to negative effects on long-term sustainability of priority species populations
	Evaluate assumption that vernal ponds will remain adequate in the absence on management to support breeding amphibians and migrating shorebirds in a climate changed world

Appendix G: Draft Operational Compass for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Draft Operational Compass to help set priorities, assess progress, and identify capacity needs of partner organizations and the conservation science staff supporting the Landscape Conservation Cooperative.

Draft

Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative
Sustaining Fish and Wildlife Populations Through Science, Technology and Partnerships.

SHC Element	Sub-element/Product	Birds	Herps	Mammals	Fishes	Plants	Inverte-brates
Biological Planning	Biological Planning Units						
	Priority Species						
	Population Objectives						
	Limiting Factors						
	Species/Habitat Models						
Conservation Design	Landscape/Habitat Assessment						
	Assessment of Conservation Estate						
	Decision Support Tools						
	Habitat Objectives						
	Integrate Multiple Species Objectives						
Conservation Actions	Program Objectives						
	Habitat Delivery Mechanisms						
	Communication and Education Delivery Mechanisms						
	Law Enforcement Delivery Mechanisms						
	Policy Delivery Mechanisms						
Outcome-based Monitoring	Conservation Tracking System						
	Habitat Inventory and Monitoring Program						
	Population Monitoring Program						
Assumption-driven Research	Species/Habitat Model Assumptions						
	Conservation Treatment Assumptions						
	Keyfactor/Sensitivity Analyses						
	Spatial Data Analyses						

Project Title: Monitoring the Effects of Climate Change on Waterfowl Abundance in the Mississippi Alluvial Valley: Tools for Increasing Monitoring Efficiency

Project Description: Given the potential for dramatic changes to wildlife distribution and abundance under various climate change scenarios, there is a great need to quickly collect and process reliable information on wildlife populations. Wintering waterfowl, in particular, provide an excellent bellwether for the effects of climate change as changes in their abundance and distribution reflect both a direct response to climatic variables (e.g., temperature and precipitation) and an indirect response to climate change mediated through habitat alterations. The mallard is the most abundant (and arguably most popular for sport) duck in North America, and their numbers are often used as a surrogate to gauge the health of other waterfowl populations. In turn, the Mississippi Alluvial Valley (MAV) is a continentally important region for migrating and wintering waterfowl in North America, and the single most important region for wintering mallards. Therefore, MAV-wide monitoring of mallards has the potential to provide some of the earliest indications of climate change impacts on wildlife. Winter waterfowl surveys have been conducted across much of the United States since 1935. However, sampling strategies have generally relied on professional judgment rather than statistical probability to establish "representative" samples, making inferences and comparisons of estimates among years and studies difficult. Surveys in the MAV are typically conducted using aerial fixed width strips, which have the advantages of extensive coverage at relatively low cost, the ability to survey areas difficult to assess by ground, and elimination of double counting by traveling faster than the waterfowl can fly. However, these waterfowl surveys are complicated by the high degree of variability associated with the clumped distribution of birds and the often ephemeral nature of the habitats they use; precipitation and wetland conditions vary within and among years leading to highly dynamic usage of habitat by waterfowl. Additionally, not all birds are detected during aerial surveys and the proportion of birds not seen varies by habitat type and group size.

In response to these challenges, a statistically robust sampling design for aerial surveys of mallards in the Mississippi portion of the MAV has recently been developed. Beginning in 2005, the Mississippi Department of Wildlife, Fisheries and Parks, in cooperation with Mississippi State University, has annually conducted aerial surveys following this protocol and estimated abundance and distribution of mallards four times each winter (see http://home.mdwfp.com/ContentManagement/Html/htmldownload.aspx?id=327). Based on that success, the Arkansas Game and Fish Commission (AGFC) adopted the same protocol for its aerial surveys of the Arkansas portion of the MAV. However, implementation of these protocols in Arkansas has already considerably taxed AGFC staff. Anticipated geospatial processing of the data collected is causing further concern. These issues threaten data integrity, the conclusions and inferences from the coordinated survey efforts, and the long-term viability of this monitoring program. To overcome these issues, we propose the development of a user-friendly, easily modifiable graphical user interface in program R. This interface will rapidly generate and select random transects, stratified by habitat, for aerial surveys. Additionally, this tool will adjust for visibility bias using assumed or calculated rates and spatially interpolate the aerial counts while accounting for habitat heterogeneity. The development of this tool will allow for comparable estimates from multiple agencies, increase the speed of dissemination by increasing efficiency, and allow for faster management responses in the event of rapid population declines or shifts. Furthermore, application of this protocol to waterfowl monitoring in adjacent states (e.g., Louisiana) has heretofore been limited by the scientific support capacity for analysis. This tool would eliminate that constraint and provide incentives for agencies to use a more robust protocol.

Proposed Budget: $125,000 (Includes conducting MAV-wide surveys and development of tools; $40,000 already expended annually on surveys in Arkansas and Mississippi; request $85,000).

Project Title: Common Ground: Expanding and Updating Land Cover Classifications for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Project Description: One of the largest obstacles to coordinated landscape-scale conservation is consistent and contemporary data across the entire region of interest. Relative to land cover characterizations, lack of these data prevents application of uniform approaches for assessing current habitat conditions and developing common management strategies across conservation partners. The challenge then becomes meaningfully integrating incongruent data in a manner that preserves the resolution and accuracy of the more refined data without misrepresenting the resolution or accuracy of the coarser dataset. The emerging Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) is already facing this challenge. The East Gulf Coastal Plain and portions of the Mississippi Alluvial Valley regions of the LCC have land cover data produced by the Southeast Gap Analysis Project (SE-GAP), who distinguished 218 distinct ecological systems in their full dataset. Alternatively, for the remaining portions of the Mississippi Alluvial Valley, Interior Highlands, and West Gulf Coastal Plain, the most contemporary and consistent data comes from the 2001 National Land Cover Dataset (NLCD 2001) and LANDFIRE data. The NLCD 200l Land Cover is a general land cover classification, best suited for broad research applications. The LANDFIRE classification, while representing a finer thematic classification, does not adequately represent the full suite of land cover classes that the Fish and Wildlife Service requires for habitat modeling. To overcome this limitation, we propose to develop a seamless land cover dataset for the entire GCPO LCC geography that is based on the classification protocol developed by SE-GAP. The new land cover map would be created using the most current imagery available (2009-2010). Concurrent with the geographic expansion of the SE-GAP land cover mapping will be a change detection effort that will provide updated land cover for portions of the GCPO geography previously mapped based on 2001 imagery. This new land cover map will permit a more realistic assessment of current conditions, particularly in the West Gulf Coastal Plain where numerous projects associated with natural gas extraction have significantly altered the landscape. A preliminary accuracy assessment will be conducted on the final dataset that will be produced within 18 months of the start date of the project.

Proposed Budget: $300,000 ($100,000 provided as in-kind support; funding request $200,000)

Project Title: Assessment of Desired Forest Conditions: Spatial and Temporal Considerations

Project Description: In a collaborative effort involving 56 scientists and managers from 14 agencies and organizations, the Forest Resource Conservation Working Group outlined forest management recommendations for priority wildlife in bottomland hardwood habitats in its 2007 publication, "Restoration, Management, and Restoration of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat". As part of these recommendations, the Working Group defined desired forest conditions (DFCs) at both the landscape (≥4000 ha) and stand (≤100 ha) scales and recognized the necessity of achieving these desired conditions at both scales to ensure the long-term sustainability of priority wildlife species (including the Swainson's warbler, prothonotary warbler, and Louisiana black bear) across both space and time. Foresters and biologists within the Arkansas Game and Fish Commission, Louisiana Department of Wildlife and Fisheries, Tennessee Wildlife Resources Agency, Mississippi Department of Wildlife, Fisheries and Parks, and the U.S. Fish and Wildlife Service have already begun using these recommendations in their management of forests for wildlife resources. Implementation is occurring without explicit knowledge of the amount, location, or status of forests conforming to the postulated DFCs at either scale (i.e., without the benefit of an informed conservation design strategy). Forest managers need this information to most effectively target management prescriptions on stands that will permit achievement of DFCs at both scales. Additionally, there exists uncertainty around the temporal dynamics of the forest structure response to prescribed silvicultural treatments. This information is needed by forest managers to effectively design management strategies that will sustain desired forest conditions through both space and time.

To address the above needs, we propose to evaluate the achievement of DFCs at the landscape and stand scales within the MAV. Specifically, we will: (1) assess historic and current conformity (or potential for conformity) of landscapes to landscape-scale DFCs advocated by the Working Group, (2) assess the proportion of the landscape that currently conforms to stand-level DFCs , and (3) assess the temporal relationship between forest structure variables and years since silvicultural treatment.

Proposed Budget: $136,000 ($78,000 existing in-kind contributions; funding request $58,000)

Project Title: An Integrated Forest Management Database for the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Project Description: Landscape Conservation Cooperatives (LCCs) are founded on the premise that conservation actions will be most efficient if delivery is grounded on scientifically-sound strategies developed through networked partnerships. Refinement of these strategies in an adaptive resource management framework (a reality required in a world of changing climate) necessitates monitoring the effects of conservation actions on target wildlife resources via changes in habitat condition and population status. A fundamental challenge of monitoring in the context of an LCC is coordinated collection of consistent data across multiple partners. Common databases offer a potential solution to this problem, provided they are simultaneously responsive to the needs of individual partners as well as the partnership as a whole. Partners recently endorsed a product of the Forest Resource Conservation Working Group, "Restoration, Management, and Restoration of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat", which outlines desirable forest structure conditions for wildlife on managed lands. Guidelines in this document pertaining to restoration of bottomland hardwood forest on retired agricultural lands are being followed by most partners; however, the delivery program being utilized differs across partners. While some partners are solely relying on federal Farm Bill programs (e.g., Wetland Reserve Program), others are capitalizing on reforestation dollars available via biological carbon sequestration projects associated with climate change initiatives. While the core information required by the partnership is common across all partners, the disparate nature of the underlying funding sources has created a need to collect additional data by some partners. Because the current databases developed in partnership do not include all the necessary fields to store and manage the data being collected by individual partners, these partners have developed independent databases that they are populating in isolation. This trend has the potential to undermine the ability of the partnership to effectively coordinate their monitoring, refine their concerted conservation strategies, and identify where across the landscape the most appropriate and efficient locations for specific conservation action exist. The purpose of this request is to unify these databases and reinforce this partnership. Specifically, the reforestation tracking system database developed by USGS will be expanded to include the additional data needs of the Gulf Coastal Plains and Ozarks LCC partners, including expansion to other ecological systems (e.g., longleaf pine).

Proposed Budget: $250,000

Project Title: Expanding the Integrated Coastal Assessment of the Southeastern Pilot

Project Description: Sea-level rise is among the most costly and most certain consequences of a warming climate. Even with stringent climate change mitigation (reduced greenhouse gas emissions) mean sea level will continue to rise for centuries due to the thermal inertia of the oceans and ice sheets and their long time scales for adjustments. As sea level rises, coastal shorelines will retreat and low-lying areas will tend to be inundated more frequently, if not permanently, by the advancing sea. If tropical and extra-tropical storms increase in intensity, as projected by many studies, shoreline retreat and wetland loss along low-lying coastal margins will accelerate further. Accelerated coastal retreat has already been observed in many tropical, mid-latitude, and Arctic regions. In addition to the conversion of land to open water, coastal retreat can diminish or eliminate many critical ecosystem services, such as supporting commercially important fisheries, providing wildlife habitat, improving water quality, and protecting human populations from storm surge and chronic tidal flooding.

Improving the ability to predict future sea-level rise effects on coasts is a major challenge for natural resource managers. For example, predicting changes in shoreline position and land loss resulting from erosion is difficult due to the complexity of coastal systems. This complexity arises from the wide range of variables and related feedbacks that influence responses to rising sea level, coupled with the interactive effects of human development activities. In addition to uncertainties in future sea-level rise, there are also large uncertainties in predictions of future climate conditions (e.g., storms) that drive the relevant physical and biological processes. To better support the management of coastal resources, more integrated assessments of sea level rise and climatic change in coastal areas are required, including the significant non-climatic drivers.

There are three primary objectives of the coastal component for years 1 and 2 of the Integrated Coastal Assessment of the Southeastern Pilot:

1) Develop a Bayesian statistical framework for predicting coastal erosion and inundation under a range of sea level rise scenarios and considering the combined effects of geologic constraints and other driving forces,
2) Develop visualization products that will help natural resource managers anticipate sea level rise and adapt to the changes that are projected over the coming decades, and
3) Assess the potential impacts of sea level rise on coastal ecosystems and related wildlife resources.

This work is currently focused (and funded) solely on the Mississippi and Alabama coasts. To ensure seamless coverage of the entire Gulf Coast region, additional funds are being sought to expand this work to include Florida portions as well. Requested funds will fill budgetary deficit associated specifically on expanding this project to include the Gulf Coastal Plains and Ozarks portion of Florida.

Proposed Budget: $415,500 ($277,000 funded 2009-2010; current deficit of $138,500)

Project Title: Multi-Resolution Assessment of Potential Climate Change Effects on Priority Aquatic Species – Phase II of the Southeastern Pilot

Project Description: This component of the Southeastern Integrated Assessment will develop information and modeling approaches to help resource managers assess potential effects of climate change on biological resources. The specific focus of this research is on aquatic biota, especially freshwater fishes and mussels, and on improving our ability to answer questions concerning how species are likely to respond to climate-induced hydrologic change. This research has two, interrelated objectives. Our first objective is to develop modeling approaches to assess climate-change effects on aquatic biota across large regions and at local landscape-scales, each with specific management questions, response units, data requirements, and associated costs. At each level of resolution, we will work with resource managers to identify key management questions and objectives and to conceptualize links between climate change, wildlife resources, and management actions. Our second objective is to evaluate how the choice of model resolution affects assessment of ecological sensitivity to changes in climate, hydrology, land cover dynamics, surface water dynamics and land use. The processes that link climate, land cover and management to wildlife resources frequently occur at finer spatial scales than may be captured by coarse-grain assessments (e.g., hydrologic alteration in specific river reaches that support imperiled species; strategic conservation of population source habitats). Conversely, conditions characterized at larger spatial scales frequently set boundary conditions for local landscapes; for example, isolation of headwater streams by downstream dams. It is thus particularly important for designing future assessment methods, that researchers and managers understand changes in the information content of differing measures of ecological, hydrologic, terrain and geomorphic characteristics in relation to changes in measurement scale. Phase I of the project will develop and demonstrate a multi-resolution approach to assessment in the context of the Apalachicola-Chattahoochee-Flint (ACF) river basin, chosen because the basin supports multiple fish and wildlife species of conservation concern to Federal and State managers, is regionally important for water supply, and has been a recent focus of complementary research, providing an empirical basis for tool development. Using probabilistic projections of climate change developed for this integrated assessment, we will model effects on aquatic biota at coarse (i.e., the entire ACF basin) to fine (i.e., stream networks within the ACF) resolutions, providing estimates of biological responses for alternative climate scenarios and, at finer resolutions, potential management actions. In Phase II, researchers will confer with resource managers to examine usefulness of coarse- and fine-resolution models for supporting biological planning and conservation design and to explore how the appropriate model-resolution may depend on characteristics of species, landscapes and limiting factors.

The ACF basin is shared by the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (LCC) and South Atlantic LCC. Funding is being sought to support development of effective and coordinated adaptation strategies for priority aquatic species that cross these LCC boundaries.

Proposed Budget: $150,000

Project Title: Predicting the Effects of Land Use and Climate Change on Wildlife Communities and Habitats in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Project Description: Species-habitat models and survey protocols provide a foundation for measure priority species population responses to climate change and other environmental or land use changes; however, additional tools and knowledge are needed to effectively manage priority species populations in light of the uncertain future associated with climate change and other novel stressors. Research scientists and modelers with the USDA Forest Service's Northern Research Station have developed dynamic landscape simulation tools (e.g., LANDIS) to can link models of habitat quality, population size, and population viability for a variety of species to predicted changes in habitat quality and quantity such as those that might result from climate change, conservation programs (e.g., habitat management and carbon sequestration efforts), and other land use change scenarios (e.g., urbanization and biofuel production). The Northern Research Station already has been awarded funding to develop and apply LANDIS to the Interior Highlands region over the next two years. Expansion of LANDIS to the other upland regions of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (LCC) will permit a more holistic approaches to conservation planning and design across the entire LCC, allowing potential habitat and land use alterations from climate change and other factors to be readily translated into spatially explicit assessments regarding the future viability of populations of priority bird species. Such assessments can then help LCC partners make strategic decisions regarding the most effective conservation, management and adaptation strategies necessary to offset projected negative population impacts, and how/where to employ such strategies across the landscape.

A similar effort to simulate landscape dynamics in bottomland hardwood systems via LANDIS is being explored in four proposed watersheds of the Mississippi Alluvial Valley (Atchafalaya, Cache/Lower White, Tensas, and Yazoo). A collaborative research team spearheaded by USGS research scientists is linking downscaled Global Circulation Models and outputs from the Precipitation Runoff Modeling System to LANDIS to explore how changes in precipitation, temperature, and surface water may manifest in landscape patterns of vegetation dynamics. In turn, the team will also quantify the impacts of these changes on amphibians, fish, breeding landbirds, wintering waterfowl, and carbon stocks and fluxes.

Together, the outputs of these ecosystem simulation projects provide the foundation for sound adaptation strategies that cross both the terrestrial and aquatic systems of the entire Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative. Already, $725,000 has been awarded to complete this work on a small scale. We seek additional funds to bring this capacity to all sub-units of the LCC.

Proposed Budget: $1,500,000 ($751,000 funded 2009-2010; current deficit of $749,000)

Project Title: Assessing the Impact of Human Development on High Priority Species in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

Project Description: Urban and rural development associated with burgeoning human populations will likely negatively affect bird and other wildlife populations through the loss, degradation, and fragmentation of habitat. The amount and degree of fragmentation that can result from urban sprawl varies depending on the density of housing units or other infrastructure and their interspersion within a landscape. Suburban growth, for example, can have dramatic environmental consequences due to the high concentration of development around and between more major metropolitan areas. Yet rural growth can negatively affect landscapes on an even more extensive scale when developments are dispersed and new roads are extended ever farther from the suburban fringe. In addition, the degree to which development patterns impact bird and other wildlife populations depend upon the habitat value or degree of degradation within the landscape prior to development. If conservation planners are to design landscapes that will sustain populations of high priority species, it is imperative that growth patterns are predicted to the best of our ability and that any potential negative impacts that can result from those patterns be quantified. In addition, it is important to see how the impacts of projected growth compare to best- and worst-case fragmentation scenarios so that efforts can be made to guide urban and rural growth in the least damaging directions.

To address urban and rural development we will use recently developed approaches that quantify spatial and temporal patterns of housing growth (Hammer et al 2004, Radeloff et al. 2005) as well as other census data and changes in landcover (based on NLCD). These data along with other ecological data will be as the basis for predicting habitat suitability and population viability under current habitat conditions as well as to forecast change. Hammer et al (2004) and Radeloff et al. (2005) have forecast future urban and rural growth between 2000 and 2030 for the entire United States. For evaluation of future growth impacts we will assume that, on average, forest condition (age, structure, composition) does not change. We will apply habitat suitability index models and empirical models on the relationship of priority bird species to housing density derived from Breeding Bird Survey data to housing density projections to quantify impacts of urbanization on high priority bird species.

Recent work has estimated the amount of habitat that could be affected by on-going development and the resulting impacts to avian populations for the Interior Highlands, Mississippi Alluvial Valley, and West Gulf Coastal Plain. Additional funds are being sought to expand this work to the East Gulf Coastal Plain and thereby cover the entire Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative geography. Expansion to other forested Landscape Conservation Cooperatives (e.g., Appalachian) is possible as well.

Proposed Budget: $50,000 ($25,000 funded 2009-2010; current deficit of $25,000)

Project Title: Climate Change Impacts on Ground and Surface Water Dynamics of the Mississippi Alluvial Valley: Implications for Priority Species

Project Description: Migratory birds are important trust resources that serve as both economic drivers and ecological indicators of the health of our ecosystems. The Mississippi Alluvial Valley (MAV), at the southern terminus of the Mississippi Flyway, serves as a critical geography for migratory birds. The largest concentration of wintering mallards - the species most sought by hunters - in North America is found in the MAV and substantial populations of breeding prothonotary warblers and Swainson's warblers (two species on the Partners in Flight WatchList) occur here as well. As the Nation's largest floodplain, the MAV hosts some of the largest forested wetland complexes in the country that serve as critical habitats for these species. However, the hydrology of this system has been substantially altered for flood control. The net result has been a loss of habitat for wintering waterfowl and forest-dependent migratory birds and concomitant declines in these species' populations.

To reverse these declines and implement the goals and objectives of national and international bird plans, the Lower Mississippi Valley Joint Venture (LMVJV) – a regional conservation partnership of private, state, and federal conservation agencies and organizations that share the collective responsibility for ensuring the long-term sustainability of migratory bird populations in the MAV – was created. Recognizing the loss of natural (i.e., unmanaged) habitat in the MAV, the LMVJV partners collectively spend millions annually to actively manage the remnant system to ensure and meet the population objectives stepped down from these continental plans. Significant conservation successes have occurred over the last 20 years, with thousands of acres equipped with water control structures to enable active flooding from ground or surface water sources and hundreds of thousands of former agricultural land permanently reforested with trees. Climate change threatens the long-term benefit of these conservation actions by further altering the hydrologic regime to a point that undermines these successes. Increased temperature and reduced precipitation, as predicted by numerous climate change scenarios for the MAV, would likely have negative impacts on both the surface and groundwater systems that sustain the wetlands on which migratory bird populations (and the management for them) depend. Therefore, we propose to evaluate the impact of climate variability on migratory bird habitat by simulating ground and surface water systems under current and forecasted future climatic conditions. Our simulations, run in a Coupled Groundwater and Surface-water FLOW (GSFLOW) model environment, will specifically assess how predicted alterations in precipitation and temperature downscaled from global circulation models will affect ground and surface water systems. In turn, these hydrologic outputs will be used as inputs in existing species-habitat models to assess the effect of these changes on the availability of habitat for wintering waterfowl, breeding prothonotary warblers and Swainson's warblers, and other priority species (e.g., Louisiana black bear, floodplain fishes) in the MAV.

Proposed Budget: $1,194,000

Project Title: Optimal Conservation Strategies for Dynamic Landscapes

Project Description: The US Geological Survey is coordinating the "Integrated Assessment of Climate and Landscape Change in the Southeastern US." This Southeastern Assessment will integrate the work of numerous universities and federal research institutes to provide data on environmental dynamics and to predict responses of aquatic and terrestrial species to these changes at sub-regional and local scales. The numerous individual research projects in the integrated assessment are developing downscaled climate data, urban growth models, and improved sea level rise predictions and evaluating the effects on freshwater aquatic habitats and terrestrial land cover. These data will in turn be used to predict responses of aquatic and terrestrial wildlife to anticipated climate change while quantifying the uncertainty that exists with regard environmental change. One goal of this effort is to use this information to develop specific recommendations and conservation strategies of use to natural resource managers.

Meaningful conservation planning requires the development of a science and management enterprise that integrates the expertise of agency decision makers, resource managers, and researchers. Decision makers and resource managers must frame the goals and objectives and identify the specific conservation actions that could be used to maintain habitat function for wildlife populations, while research scientists develop the data and models to predict wildlife and habitat responses to future environmental conditions and management actions. Workshops that capitalize on existing partnerships and emerging Landscape Conservation Cooperatives are the most effective means of establishing this enterprise.

The workshops will employ the principles of structured decision making and rapid prototyping to develop and refine goals, establish measurable objectives, identify feasible alternatives, and provide an initial assessment of the consequences of management actions. The prototypes will be refined and reviewed by workshop participants and the conservation communities before management recommendations are provided. Because of the uncertainty that is inherent in estimating the behavior of natural systems, and the potential effects of near-term actions on future decisions, adaptive management provides an ideal mechanism for optimal decision making. Strategic Habitat Conservation provides an outline for the application of adaptive management to large-scale conservation planning.

Proposed Budget: $15,000

Project Title: Development of a Treasured Landscape Decision Support Tool to Safeguard Priority Fish and Wildlife Populations in the Mississippi Alluvial Valley

Project Description: The Mississippi Alluvial Valley (MAV) was historically a 28-million acre forested wetland ecosystem. The area and distribution of bottomland hardwoods in the MAV has been greatly reduced. The loss of forest is due, in large part, to agricultural conversion enabled by extensive flood control projects along the Mississippi River and its tributaries. Flood control dramatically altered the hydrology within this floodplain – reducing flooding in many areas but increasing the frequency and extent of flooding in others. Extensive flood control and deforestation has had negative ecological impacts to include systemic water quality degradation and a landscape containing exceedingly fragmented forest blocks. The ecological implication of this highly altered system is a landscape that is no longer sustainable for many high priority fish and wildlife populations. To address this conservation challenge an integrated Treasured Landscape Decision Support Tool will be developed to target restoration to those areas most important to floodplain fisheries, the federally-threatened Louisiana Black Bear, and a suite of priority landbirds.

A diverse cross-section of the conservation community with expertise associated with priority species will parameterize the model based on existing scientific information or their extensive experience and knowledge of population habitat relationships. Key habitat and ecological parameters for the model will be identified from existing datasets, including the Forest Breeding Bird Decision Support Model. Black bear biologists, avian ecologists, and fisheries biologists will consider future scenarios based on potential changes in temperature and hydrology relative to climate change and other anticipated environmental perturbations. Methods will be developed to intersect the resulting highest priority areas with existing private, state, and federal conservation lands. The final product will be a Treasured Landscape Decision Support Tool to guide restoration, management and protection of an MAV that safeguards priority fish and wildlife populations. Conservation biologists will document methods and recommend monitoring strategies to test the assumptions and uncertainties associated with model development.

Proposed Budget: $20,000

Project Title: Biological Planning, Conservation Design, and Monitoring Longleaf Pine in the Gulf Coastal Plains and Ozarks and South Atlantic Landscape Conservation Cooperatives

Project Description: One of the most important habitats in the Gulf Coastal Plains and Ozarks (GCPO) Landscape Conservation Cooperative (LCC) and the neighboring South Atlantic LCC is the longleaf pine ecosystem. Red-cockaded woodpecker, gopher tortoise, indigo snake, and Bachman's sparrow are high priority species typically associated with longleaf pine forest habitats. Partners working across these two LCC will (1) establish population objectives for these species reflective of the best available information and population estimation techniques relevant to the two LCCs by identifying and adopting regional population objectives in line with the continental objectives established in state, national, international, or recovery plans; (2) translate population objectives to habitat objectives using alternative established methods or innovating new methods that are replicable, defensible, and transparent; (3) extend the East Gulf Coastal Plain Open Pine Decision Support Tool range-wide; (4) develop a "Desired Forest Conditions" guidance document for use by foresters and wildlife biologists in longleaf pine management and restoration that can be applied range-wide to ensure sustainable longleaf communities; and (5) inventory and map extant longleaf pine throughout its historic range using remote sensing techniques and field reconnaissance.

Proposed Budget: $150,000

Appendix I. A subset of science capacity needs identified by a cross-section of the private, state, and federal conservation community in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative (LCC), December 2009. This list is not prioritized, comprehensive, nor complete and will be refined over the next 12-18 months by the emerging Cooperative. Multiple capacity needs listed here may be met through a single position. Some capacity needs may be met by cost-sharing positions with other agencies or organizations (see the "Responding to the Organizational and Institutional Challenges" section).

Science Capacity Needs	Description
LCC Coordinator	Supports partnership in the collaboration, development, maintenance, and advancement of a strategic, landscape-oriented, partnership-driven approach to integrated fish and wildlife conservation. Provides guidance to the dedicated science and technical staff of the Conservation Science and Coordination Team supporting the LCC partnership.
Conservation Science and Technology Coordinator	Supports and coordinates the biological underpinning of the conservation partnership's collective efforts – coordinating and facilitating the development and progressive refinement of a strong scientific foundation for fish and wildlife conservation. Skills in the development of population/habitat relationship models and the application of geographic information system and model-based approaches to assessing, predicting, or monitoring the ability of landscapes to support/sustain wildlife populations.
Ecosystem Simulation Modeler	Develops spatially explicit models of vegetation or hydrologic dynamics and land-use change. Simulates alternative futures (e.g., climate change, urban growth) using innovative methods applied at landscape scales. Generates the outputs/products that population-habitat specialists can use to forecast/predict population response to changing climates.
Monitoring Coordinator and Biometrician	Coordinates and develops goals, objectives, protocols, and procedures for monitoring habitat change and population response at multiple spatial scales that are linked to formal decision-making processes. Analyzes and interprets outcomes to inform decision makers (e.g., land managers).

Appendix I. Continued.

Science Capacity Needs	Description
Aquatic Species Hydrologist	Develops hydrologic models to measure and predict priority species response to changes in temporal (e.g., duration) and spatial (e.g., extent) dynamics of aquatic systems. Assesses connectivity of aquatic systems to evaluate dispersal potential of aquatic animal populations.
GIS Applications Specialist Remote Sensing/Spatial Analyst	Creates, compiles, analyzes, and manages geospatial physical, biological, and remotely sensed data as necessary to characterize, assess, and map landscape heterogeneity, and model and predict biophysical relationships at multiple spatial scales. Analyzes and interprets multi-spectral imagery and aerial photography to assess patterns in the extent, distribution, and juxtaposition of land cover, land use, and habitat suitability.
Aquatic System Ecologist	Focuses on the restoration and management of aquatic ecosystems and their connectivity to terrestrial ecosystems. Supports biological planning and conservation design, outcome-based monitoring, and assumption-driven research. Develops species population/habitat relationship models; parameterizes and analyzes decision support models; develops statistical designs for ecoregional scale monitoring programs; translates management assumptions into testable hypotheses; evaluates monitoring results; and interprets research studies and analyses.
Conservation Delivery Coordinator	Serves as the primary conduit between the Cooperative's biological planning and conservation design efforts and the private, state, and federal conservation delivery infrastructure. Works with partnership conservation delivery staff and programs to ensure that biological goals and objectives of the Cooperative are fully integrated into the program objectives of private, state, and federal partners. Coordinates with traditional and non-traditional programs (e.g., ecosystem services, carbon projects) within and among states to maximize leveraging opportunities and to promote cross-organizational interactions to deliver priority habitat conservation throughout the Cooperative's geography.

Appendix I. Continued

Science Capacity Needs	Description
Geodatabase Developer/Manager	Defines, designs, develops, and manages the information technology environment (capability, capacity, and structure) necessary to accommodate conservation planning and assessment, inventory, and monitoring at multiple spatial scales among multiple programs and partners. Reviews and assesses the adequacy of existing geodatabase structures and internet applications in supporting the conservation vision of the Cooperative in developing and implementing conservation plans.
Landscape Ecologist/ Conservation Biologist	Large systems ecologist that utilizes a systems approach to developing species-habitat and biotic/abiotic relationship models that are the foundation of conservation design, adaptive management, and research; develops decision support tools for field use, determining regional and ecoregional habitat objectives. Conducts landscape-level ecological analyses to integrate work of population modelers and GIS specialists.

DRAFT

GULF COASTAL PLAINS AND OZARKS LANDSCAPE CONSERVATION COOPERATIVE

DRAFT

LEADERSHIP SUMMIT

Summer/Early Fall 2010

Guiding the Development and Operations of the LCC

The Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative is envisioned to be a conservation-science alliance where the private, state, federal community operates as a networked leveraged system in a non-regulatory forum and in collaboration with the public to effectively pursue socio-viable solutions to support the nation's interest in sustaining endemic fish and wildlife populations and the ecological functions and processes on which they depend.

WHERE AND WHEN: Location TBD, Summer – Early Fall 2010

HOSTED BY: Agencies and Organizations of the Lower Mississippi Valley, East Gulf Coastal Plains, and Central Hardwoods Joint Venture Partnerships

PURPOSE: To develop strategies that guide the development and operational direction of the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative by engaging the executive and senior level leadership among private, state, federal, and tribal communities operating within the GCPO geography. The Summit is specifically targeted to those agencies and organizations whose mission includes or substantially impacts the conservation of our nation's environmental assets to include fish and wildlife resources.

GEOGRAPHIC FOCUS: Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

PRELIMINARY SUMMIT OBJECTIVES:

- Arrive at a common understanding of vision & expectations of a National Network of Landscape Conservation Cooperatives
- Form a broad alliance among interested parties operating within the GCPO who have a mandate or interest in the sustainability of our nation's fish and wildlife resources and the ecological processes on which they depend
- Frame strategies to guide the development and operations of the GCPO Cooperative

DRAFT DRAFT

Appendix K: Charter for the Lower Mississippi Valley Joint Venture Forest Resource Conservation Working Group

Lower Mississippi Valley Joint Venture Forest Resource Conservation Working Group

Charter

Purpose:

The Lower Mississippi Valley (LMV) Joint Venture Forest Resource Conservation Working Group (hereafter "Working Group") will serve as the technical forum for coordination among Joint Venture partners on reforestation and forest management. The Working Group will strive to ensure that the conservation actions and programs of Joint Venture partners reflect reforestation and forest management prescriptions and practices that sustain populations of priority birds and other forest-dependent wildlife in concert with sustainable forestry.

The Working Group is empowered to:

1) Develop and refine the prescriptions, treatments, and practices for reforestation and forest management expected to achieve forest habitat conditions capable of sustaining populations of priority species. Recognizing the overlap in membership that often occurs between this and other Working Groups, the Management Board assumes and expects close coordination between biologists and foresters in first defining the forest conditions associated with sustainable populations and second, developing the prescriptions and treatments expected to achieve such conditions.

2) Translate prescriptions, treatments, and practices into forest management guidelines that speak to the management goals and objectives of the four broadly recognized categories of forest landowners – public natural resource agencies, non-industrial private forest (NIPF), industrial forest, and timber investment and management organizations (TIMO's).

3) Develop collaborative forest inventory and monitoring protocols and databases as necessary to promote cooperative management between and among Joint Venture partners and their cooperators, and as necessary to support monitoring programs and projects as may be developed to track the biological and carbon sequestration response to forest management.

4) Identify research issues and needs pertinent to refining LMVJV reforestation and forest management practices and prescriptions,

and facilitate the development and implementation of associated research projects.

5) Organize such ad hoc or standing sub-committees or working groups as deemed necessary in accomplishing its purpose.

Membership: Management Board Members will appoint at their discretion one to three Standing Working Group Members. Such members should have a strong background in conservation-based forestry, forestry-based wildlife conservation, and/or have a working knowledge of avian ecology in forested ecosystems. Additionally, the Science Coordinator of the LMV Joint Venture Office will serve as a Standing Member. The Standing Members of the Working Group so appointed are empowered and encouraged to enlist other such members as deemed appropriate to the creation and operation of ad hoc or standing subcommittees.

Process: The Working Group will operate under the broad guidance and direction of the Management Board and with operational oversight provided on behalf of the Board from the Joint Venture Coordinator. The Working Group should operate with an annual work plan that identifies priorities consistent with the purpose of the LMV Joint Venture; the broad goals and objectives of national and international bird conservation plans; and the mission, authorities, and responsibilities of the Joint Venture's member agencies and organizations.

Reporting Responsibilities And Relationships: The Working Group will submit an annual report through the Joint Venture Coordinator to the LMV Joint Venture Management Board at least 15 days prior to the Board's Spring/Summer Meeting. Report topics should include progress and activities associated with the current year's work plan and priorities, issues, findings or recommendations, and a proposed work plan for the ensuing 12 months.

Appendix L: Lower Mississippi Valley Joint Venture Conservation Delivery Network Concept Overview

Lower Mississippi Valley Joint Venture
Conservation Delivery Network

Concept Overview:

Background

The Lower Mississippi Valley (LMV) Joint Venture is a self-directed, non-regulatory partnership of private, state, federal conservation agencies and organizations that by virtue of legislated authority or organizational mission are committed to the implementation of state, national, and international wildlife conservation plans within the Mississippi Alluvial Valley and West Gulf Coastal Plain/Ouachitas Bird Conservation Regions. The strategy of developing Conservation Delivery Networks (CDN) is intended to improve and further augment the JV's "all-bird" mission. It speaks specifically to the need of Joint Venture partners to heighten coordination in leveraging and targeting their individual efforts as necessary to achieve landscape-level goals and objectives.

Purpose and Scope

As proposed, Conservation Delivery Networks (CDN) of the LMV Joint Venture partnership would be chartered by the Management Board to serve as forums whereby member organizations of the Joint Venture and other appropriate conservation organizations coordinate and target on-the-ground delivery of their otherwise independent efforts. CDN members would be guided by the vision that through cooperative coordination, leveraging, and targeting of their actions they may more effectively achieve, at ecoregional scales, the measurable biological outcomes sought by the LMV Joint Venture partnership. The scope of coordination is intended to include not only the implementation of individual projects, but the refinement of programs as partners deal with emerging challenges such as carbon sequestration, climate change, and other issues. It is intended that CDNs provide a functional link for translating biological assessment, databases, and tools (scientific analysis and assessment) to the conservation professionals directly engaged in on-the-ground decisions and actions (conservation delivery), and actively contribute feedback and accomplishments to improve the biological foundation through an iterative adaptive management cycle. Thus CDNs would play a pivotal role in providing input into the development and refinement of biological planning tools developed through the JV partnership, as well as by supporting the monitoring programs used in evaluating biological outcomes (e.g. the "geoRTS", the JVs reforestation tracking system).

Responsibilities and Relationship to the Joint Venture's Partnership Infrastructure

Individually and collectively, the conservation programs of LMV Joint Venture partners form the operational link between the JV ecoregional-scale biological planning and its site-scale and project-scale delivery of conservation. The goals, objectives, and biological outcomes the partnership seeks are expressed at landscape scales; yet, it is at the site-scale that conservation is accomplished. Accordingly, it is intended that CDN participants would establish clear and explicit connections between the activity-based objectives of their programs and the biological objectives developed through the coordinated efforts of the JV partnership. As an example, the JV partnership's spatially-explicit decision support tools depict the sensitivity of the landscape for restoring the ecological systems in support of trust resource populations. Through coordinated efforts the CDN would prioritize opportunities against landscape-scale assessment to help integrate these tools into the on-the-ground decisions and delivery process.

Priorities for Coordination

- The suite of protection, restoration, and management practices offered within the established JV geography so as to maintain and enhance the synergies of partner programs
- The various conservation delivery activities of individual JV partners as deemed necessary and appropriate, to address relevant ecosystem services issues i.e., biological carbon sequestration
- Targeting of programs to the most environmentally sensitive portions of the landscape as identified by biological planning and conservation design. This includes but is not limited to linking/coordinating activities on public and private lands
- Land protection activities of one partner with the restoration and management activities of another so as to leverage the resources available for long term protection with those available for restoration and management
- Development of grant proposals in a manner that recognizes the interdependency of partners in achieving priority conservation goals and objectives and that by virtue of scale, exceed the grasp of any one agency or organization

The Need for Landscape Conservation Cooperatives – A Back Story

Conservation Challenge: The American public has a rich and storied history in its commitment to maintaining wild and scenic landscapes and its tireless endeavor to conserve endemic fish and wildlife resources for future generations. Indeed, one of the grandest achievements of this society has been the recognition that Man's well-being is dependent on Nature and he has a responsibility to properly steward it. Evidence of this philosophy is manifest in public policies and treasured landscapes that provide citizens the near limitless experience of natural wonder and the opportunity to freely share in the excitement offered by consumptive and non-consumptive uses of fish and wildlife resources. Paradoxically, our society is placing increasing pressures on the very resources it depends on and desires to conserve. The American public faces unprecedented issues of scale, pace, and complexity in sustaining our Nation's fish and wildlife resources. Global population is expected to reach 9 billion by 2042. As the number of people increases, resource management challenges such as habitat degradation, conversion, and fragmentation; contamination and pollution; invasive species, disease and threats to water quality and quantity grow as well. All of these threats are compounded by a changing climate that is itself accelerated by demands for energy (including the development of alternative energy sources). Thus, despite the tremendous success our nation has enjoyed in maintaining wild places and sustaining fish and wildlife resources, the conservation challenges of the 21st Century represent a force of change more far-reaching and consequential than any previously encountered.

The Emergence of Conservation Science as the 21st Century Conservation Paradigm: Confronting challenges of climate change and these other growing stressors requires willingness and ability to think about and approach conservation in new ways. The conservation target is changing from the simplistic idea of protecting and managing parts and pieces to the complexities inherent in sustaining systems and functions, species and populations at global scales. Our nation must understand climate change as an overarching challenge that requires us to reconsider every aspect of organizational and program operations and performance. The conservation community understands that it cannot face these challenges by simply repeating the conservation successes of the past. Instead, America is undergoing fundamental shifts in how the nation approaches the conservation of our natural recourses. This change has been evolving over the past couple of decades catalyzed by advancements in conservation and decision theory as well as the new spatial planning capabilities and tools which are outgrowths of the global digital revolution. While the intent here is not to provide a comprehensive overview of the shifting paradigm, we believe it is important to provide a brief overview to properly place LCCs in the context of the changing conservation business model.

Meffe and Carroll (Principles of Conservation Biology 1997) describe three "ethics" or philosophical movements that have defined conservation in America. The Romantic-Transcendental Conservation Ethic was exemplified by the work of early American naturalists, writers, and artists. The man/nature relationship was seen in a spiritual renewal context. The Resource Conservation Ethic is exemplified by the public policies that emanated from the Roosevelt/Pinchot era. The prevailing ethic was that nature existed for the benefit of man, and man's obligation was for stewardship and wise use that specifically considered the needs of future generations. Meffe and Carroll indicated that the Evolutionary-Ecological Land Ethic (referred to here as the Conservation Science Ethic) sprang from the theoretical thinking of the sub-disciplines of Conservation Biology, Landscape Ecology, and Ecosystem Management. A critical point that seems overlooked by most of us that have chosen conservation as our profession is that the Conservation Science Ethic overtly seeks a change, a departure from the resource conservation ethic.

To understand the change the Conservation Science Ethic seeks, we need to take a closer look at the resource conservation era. The Resource Conservation ethic regarded development as an economic imperative and stewardship as a public responsibility. Natural resources were segmented and compartmentalized, i.e. forest, soil, water, wildlife, range, etc. Practitioners (both scientists and managers) were trained in resource-specific disciplines, e.g. forestry, wildlife, range management, soil science. The Nation's private, state, federal conservation infrastructure developed following this compartmentalized approach. The agencies and organizations comprising the Nation's conservation infrastructure operated with hard and fixed boundaries; organizational identity strongly associated with programs. Educational systems focused on increasing the efficiency and effectiveness of our management of individual resource components. Organizational responsibilities were synonymous with program responsibilities. Organizational responsibilities equal the sum of program responsibilities. Planning was viewed as an administrative exercise and was compartmentalized by program and designed to prioritize near term opportunities. Implementation focused on the site/project scale. Monitoring and evaluation were seen as elements of research and from a program standpoint considered an operational luxury detracting from the inherent good of protecting, restoring, and managing. The 20th Century artificial separation between science and management is ameliorated by deriving research priorities from periodic visits to programs and field stations to identify science needs.

The 21st Century conservation issues can not be addressed using the conservation business model of the 20th Century. The issues are inter-disciplinary in nature, they are multi-scaled in scope, they span the jurisdictions of multiple agencies and organizations, and they are intertwined with issues of socio-economic sustainability. The emergence of Conservation Science as the 21st Century conservation paradigm is a direct response to the unprecedented challenges confronting our nation's ability to sustain ecological processes, species, and populations of fish and wildlife.

The Conservation Science era seeks system sustainability necessitating conservation employ both dimensions of science: science as a body of knowledge and science as a method of discovery. Planning becomes outcome oriented requiring model-based and spatially explicit approaches that predicts the biological response at multiple spatial and temporal scales. Implementation targets protection, restoration, and management as means to an end and thereby prioritizing opportunities against landscape scale assessments. Policies, regulations, communication, and education are recognized as significant conservation delivery mechanisms treating them as equally important means to achieving landscapes that can sustain fish and wildlife populations. Monitoring and evaluation are imperative to assessing outcomes and integral to structured adaptive decision making. Research is aimed at testing the underlying assumptions and uncertainties introduced in planning, spatial analyses, as well as implementation strategies and programs.

Resource Conservation and Conservation Science

An Operational Comparison

	Resource Conservation	Conservation Science
Planning	• Activity oriented • Administratively focused • Programmatically explicit • Opportunity based	• Outcome oriented • Predictive • Model based • Spatially explicit • Multi-scaled
Implementation	• Protection, restoration, and management pursued as ends • Opportunities prioritized at the project scale	• Protection, restoration, and management pursued as means • Opportunities prioritized against landscape scale assessments
M&E	• An operational luxury • Appropriate as an element of research	• Essential to assessing outcomes • Integral to structured, adaptive decision making
Research	• Priorities are derived from periodic calls to programs and field stations to identify their needs	• Aimed at testing assumptions and uncertainties of biological planning and assessment

Fostering the Culture and Creating the Conservation Science Capacity: 21st Century conservation community will need a capacity for conservation that extends beyond the operational footprint of its programs, specifically the capacity to characterize, assess, and predict population and habitat sustainability at landscape scales. Such a capacity relies on transparent, model-based, spatially-explicit approaches to conservation planning. Problems endemic to conservation at landscape scales regularly transcend the boundaries of individual programs (and agencies). Goals and objectives expressed as measurable change at landscape scales exceed the operational reach of any one program. Also, the solutions to conservation at landscape scales will invariably extend beyond the operational footprint of the agency as a whole. Thus, developing such a capacity will pose significant operational and cultural challenges to any agency owing to the fact that the capacity will need to transcend programs (and agencies) and not be program (or agency) specific.

Secondly, 21st Century conservation will require new organizational core competencies. While competencies are typically considered at the level of the individual, here competencies are considered at the organizational level (Prahalad and Hamel in 1990). The needed competencies flow from the capacity outlined above: (1) competence in assessing and predicting population and habitat sustainability within ecologically definable units; (2) competence in spatially depicting goals and objectives that reflect measurable biological outcomes; and (3) competence in assessing and characterizing the environmental sensitivity of landscapes to species and populations.

Thirdly, 21st Century conservation seeks an approach to partnering that enables a region's private, state, and federal conservation infrastructure to operate as a networked, leveraged system. An ecological view of partner relationships would seem to involve "system recognition". That is, an explicit recognition that within any given ecological region, those organizations comprising the private, state, and federal conservation infrastructure of the region must interact as a system if they are to expect system-level impact. There would also be "niche recognition" that acknowledges that the performance and accountability of each partner hinges on their ability to access, use, and leverage assets external to their organization. Organizations and agencies would recognize the need for "functional connectivity" and consciously seek ways to integrate their otherwise independent capacity for biological assessment, conservation design, etc. Partners would explicitly act on the acknowledgement that they are "functionally interdependent" that the goals and objectives expressed at landscape scales exceed the singular grasp of any one organization. Finally, an ecological view of partner relationships would include "system sustainability" where agencies and organizations would aim to leverage assets in ways that sustain the health of the "conservation partner ecosystem."

Fourthly, 21st Century conservation will need to assume a role in the Public Square that extends beyond the operational footprint of its programs. A conservation target of sustainable systems, processes, species, and populations requires then that our goals, objectives, and solutions must ultimately be socially viable. We need to pursue conservation at landscape scales as a science-based, socially-driven endeavor. Doing so will require that we lay before the public transparent, science-based assessments of population and habitat sustainability, and having done so engage the public in non-regulatory forums in finding conservation solutions that will lead to socially viable populations of fish and wildlife.

A National Network of Landscape Conservation Cooperatives

Many organizations and agencies across America in both the public and private sectors are taking bold steps to address these complex challenges. In 2009 the United States Department of Interior demonstrated its commitment to serving the Public's interest in our Nation's treasured landscapes by issuing Secretarial Order 3289 titled: Addressing the Impacts of Climate Change on American's Water, Land, and Other Natural and Cultural Resources. Among the actions in that order, the Department of Interior committed to helping the conservation community develop a collaborative response to climate change. In FY2010, Congress appropriated funds to support DOI's vision of establishing a national network of Landscape Conservation Cooperatives (LCCs). LCCs are envisioned as conservation science alliances where the private, state, federal community operates as a networked, leveraged system in a non-regulatory forum to effectively pursue socio-viable solutions in support of the Nation's interest in sustaining endemic fish and wildlife populations and the ecological functions and processes on which they depend.

Landscape: *a specific geographic area and includes the pattern and structure of the geography, the biological components, its physical environment, as well as the social and cultural setting.* Scope and scale of a "landscape" typically varies and is defined by the ecological processes or an environmental issues/challenges being addressed. However, the intense level of coordination necessary to sustain ecological systems, processes, and species requires a common spatial language that allows for seamlessly integration across political and ecological boundaries as well as transcending institutional or organizational boundaries. Thus, a *landscape* in an LCC has a defined and "quasi-fixed" spatial extent to which biological assessment and conservation design will be applied. LCC boundaries are not intended to be barriers to conservation, but should ensure complete spatial coverage while avoiding costly duplications. The LCC also should provide common ground for the intense level of coordination required to sustain ecological systems, processes and species.

Conservation: *defined by a conservation target and an adaptive management framework.*

The Conservation Target: Socio-viable sustainability of systems, processes, species, and endemic populations of fish and wildlife at landscape scales.

The Conservation Framework: The LCC will enable conservation partners to apply the science-based adaptive management process known as Strategic Habitat Conservation. SHC integrates biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-driven research as an iterative whole (Table 7). The framework will continue to be refined and improved upon through the partnerships that comprise the national network of LCCs.

Cooperative: *Coordination can no longer be our goal*. We must recognize the need for working beyond our boundaries and accept interdependency as an organizing principle. We must embrace and lead change, not just within ourselves and our organization, but across the entire conservation community.

The Interior Low Plateaus: A Central Hardwood Perspective

Members of the Central Hardwoods Joint Venture (CHJV) formed a partnership, beginning in 2000, with the primary purpose of elevating emphasis on all-bird conservation within the Central Hardwoods Bird Conservation Region (CHBCR). The partnership embraces the goal of the North American Bird Conservation Initiative "to deliver the full spectrum of bird conservation through regionally based, biologically driven, landscape oriented partnerships." To that end, the partners of the Joint Venture seek to base conservation delivery upon sound science and principles of adaptive management, and to target conservation actions toward landscapes with the greatest ecological and socioeconomic potential to support viable populations of priority birds in four general habitat types: grasslands; grass-shrublands; forest-woodlands; and wetlands. The partnership also seeks to strengthen the biological foundation upon which planning and evaluation are based and to initiate projects and fund-raising for habitat and other work that will further the conservation objectives of the various bird initiatives encompassed by NABCI.

The Central Hardwoods Joint Venture is guided by a Management Board with representatives from the following agencies and organizations:

- American Bird Conservancy
- Arkansas Game and Fish Commission
- Kentucky Department of Fish and Wildlife Resources
- Missouri Department of Conservation
- National Wild Turkey Federation
- Oklahoma Department of Wildlife Conservation
- Tennessee Wildlife Resources Agency
- U. S. Fish and Wildlife Service
- U. S. Forest Service
- The Northern Bobwhite Conservation Initiative

The Central Hardwoods Bird Conservation Region straddles the Mississippi River between Illinois and Missouri; the region to the west is also known as the Ozarks or Interior Highlands, and the region to the east, the Interior Low Plateaus, although a small area of southern Illinois actually is affiliated ecologically with the Ozarks (Figure 1, this Appendix). The BCR occupies a transition zone between what was historically tallgrass prairie and oak savanna and woodlands to its north and west; pine forests and woodlands to the south; and oak and mixed mesophytic forests to the east. Components of each of those ecosystems are interspersed throughout the BCR, with their juxtapositions dependent to a large degree on variation in topography and soils as well as human uses of and alterations to the land (Figure 2). The BCR's priority birds can be grouped into four suites of species based on general habitat affinities: grasslands; grass-shrublands; woodlands-forests; and wetlands.

The Central Hardwoods Joint Venture Board met on 18-19 November 2009 in Decatur, Alabama, where the topic of the potential relationship of the JV to the two proposed Landscape Conservation Cooperatives (LCCs) that the Central Hardwoods BCR overlaps (Fig 3) was discussed for several hours. The CHJV Board expressed strong support for the Department of Interior's development of LCCs and recognized that the Department has shown a great deal of initiative and commitment to natural resources with this vision. The JV partners also clearly noted the importance of collaboration among multiple agencies and organizations in developing effective strategies for natural resource conservation.

However, the geography of LCCs as currently delineated splits the Central Hardwoods BCR into two units, joining the Ozarks, or western side of the BCR with the Gulf Coastal Plains and Ozarks LCC, and the Interior Low Plateaus, or eastern side of the BCR with the Appalachian Mountains LCC. There was concern expressed that if the bird conservation Joint Ventures were to eventually be melded into the LCC framework, the existing CHJV partnership, which already has developed a solid science-based foundation for conservation planning, conservation design, habitat delivery and monitoring and evaluation, would be negatively affected. In addition to the disruption of a functioning partnership that easily could be expanded to deliver the LCC vision of integrated planning and delivery for all taxa of conservation concern, the JV partners noted a number of ecological reasons that seem to support an effort to keep the BCR intact as a planning and delivery unit, rather than dividing it into two LCCs, as follows:

1. A model recently completed by the CHJV's technical staff illustrates the dispersion of barrens and prairie-savanna-woodland complexes; glade-savanna-woodland complexes; open and closed oak woodlands, mixed pine-hardwood woodlands, and other native ecosystems that occurred throughout the BCR prior to widespread European settlement (Figure 2). These are systems that are shared by both the Ozarks and ILP side of the Central Hardwoods, but have much less affinity with the BCRs that border us or LCCs that would overlap us (with the exception of the prairie-savanna that once existed in the Eastern Tallgrass Prairie region to our north and west). Although vast acreages of many of these native communities have been converted to other land uses and/or are in great need of restoration, where these systems occurred historically was largely dependent upon variation in geology, soils and topography. Even in the face of changing climatic conditions as a result of global warming, it's likely that these kinds of edaphic factors will still play a role in shaping the dispersion of the habitat types that might replace them. It seems wise to consider them at the scale of the BCR in its

entirety rather than in the context of planning for regions like the coastal plains and Appalachian Mountains, with which they have less in common ecologically.

2. Figure 4 depicts the dispersion of karst ecosystems in the United States, and shows the large degree of overlap of the CHBCR with karst in the U.S. Karst systems are exemplified by a variety of closed surface depressions, underground drainages, and surface streams. Karst ecosystems are rich in water and mineral resources, and provide habitat for many very specialized often endemic aquatic species that are present in the caves and underground streams that are affiliated with karst geology. Karst ecosystems are very vulnerable to groundwater pollution, due to ease of water flow, lack of natural filtration, and the expansion of land uses that often produce a variety of aquatic contaminants. Again, it seems worthwhile to consider planning for karst organisms throughout the BCR rather than for the Ozarks and Interior Low Plateaus independently.

3. Finally, Figure 5 shows the overlap of the BCR boundary with the freshwater ecosystems of the world, the units used to develop the LCC boundaries from the aquatic perspective. The terrestrial units and the aquatic units don't show great concordance, but those overlaying the Interior Low Plateaus (ILP) side of the BCR do drain systems to their north and east so perhaps do make sense if kept with the Appalachian LCC. However, there appears to be some affinity among the Ozarks and Tennessee and Cumberland aquatic units of the ILP that would support keeping the BCR boundary intact. For example, the Freshwater Ecosystems of the World website says of the fish fauna of the Ozark Highland aquatic region, "The Ozarks are home to a unique assemblage of species, including relict populations of more northerly species, such as the Ozark minnow (*Notropis nubilus*) and silver redhorse (*Moxostoma anisurum*) (Cross et al. 1986). The ecoregion also shares a number of species with the Cumberland [151] and Tennessee [152] drainages, such as the banded sculpin (*Cottus carolinae*)(Starnes & Etnier 1986). These species likely had a continuous distribution prior to the last glaciation, but were disconnected into refugia as glaciers advanced southward (Burr & Page 1986)." See http://www.feow.org/ecoregion_details.php?eco=147

However, despite some reservations about the proposed geography of the LCCs in relation to the Central Hardwoods BCR, the CHJV Management Board is fully supportive of CHJV staff working with the East Gulf Coastal Plain (EGCP) and Lower Mississippi Valley (LMV) Joint Ventures and others to help stand up the Gulf Coastal Plains and Ozarks LCC. The CHJV and LMV have been collaborating for several years to develop bird population and habitat models that can be applied throughout both regions, and have an excellent track record of communication and collaboration. CHJV staff also have worked closely with the EGCP Coordinator and the alliance of the three JVs bodes well for successful formation of a new Landscape Conservation Cooperative.

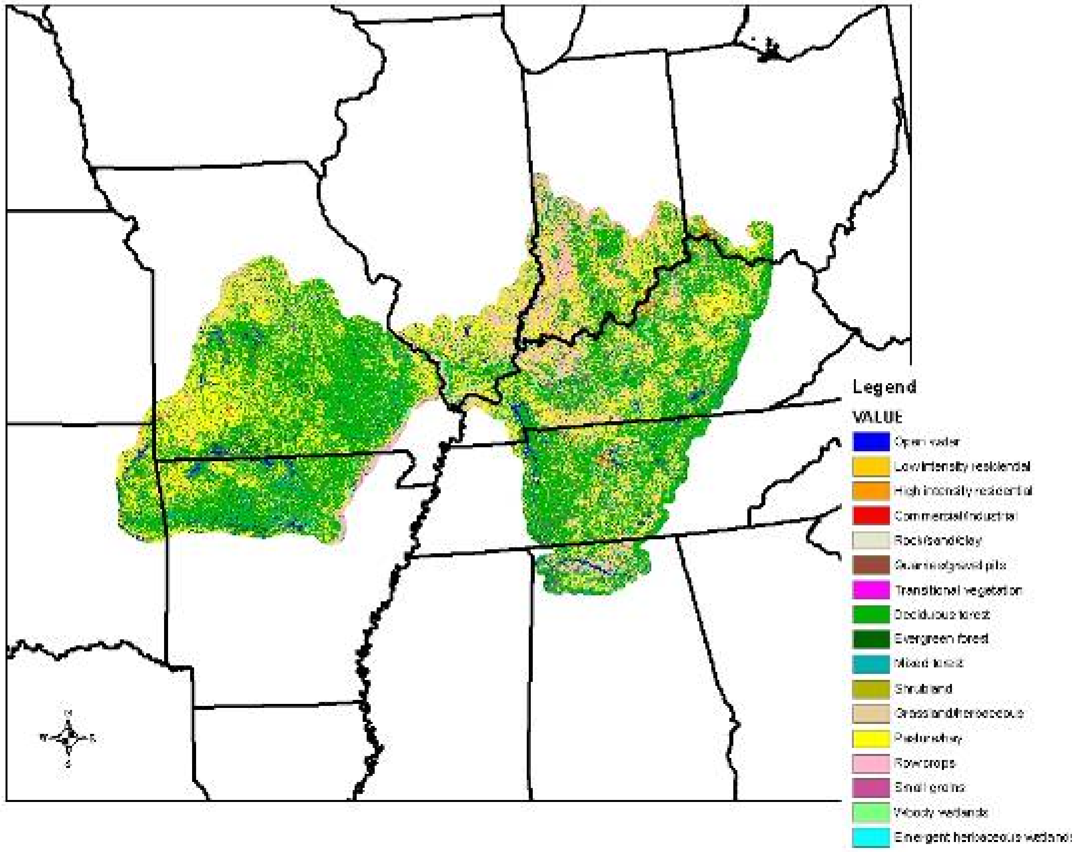


Figure 1. The Central Hardwoods Bird Conservation Region

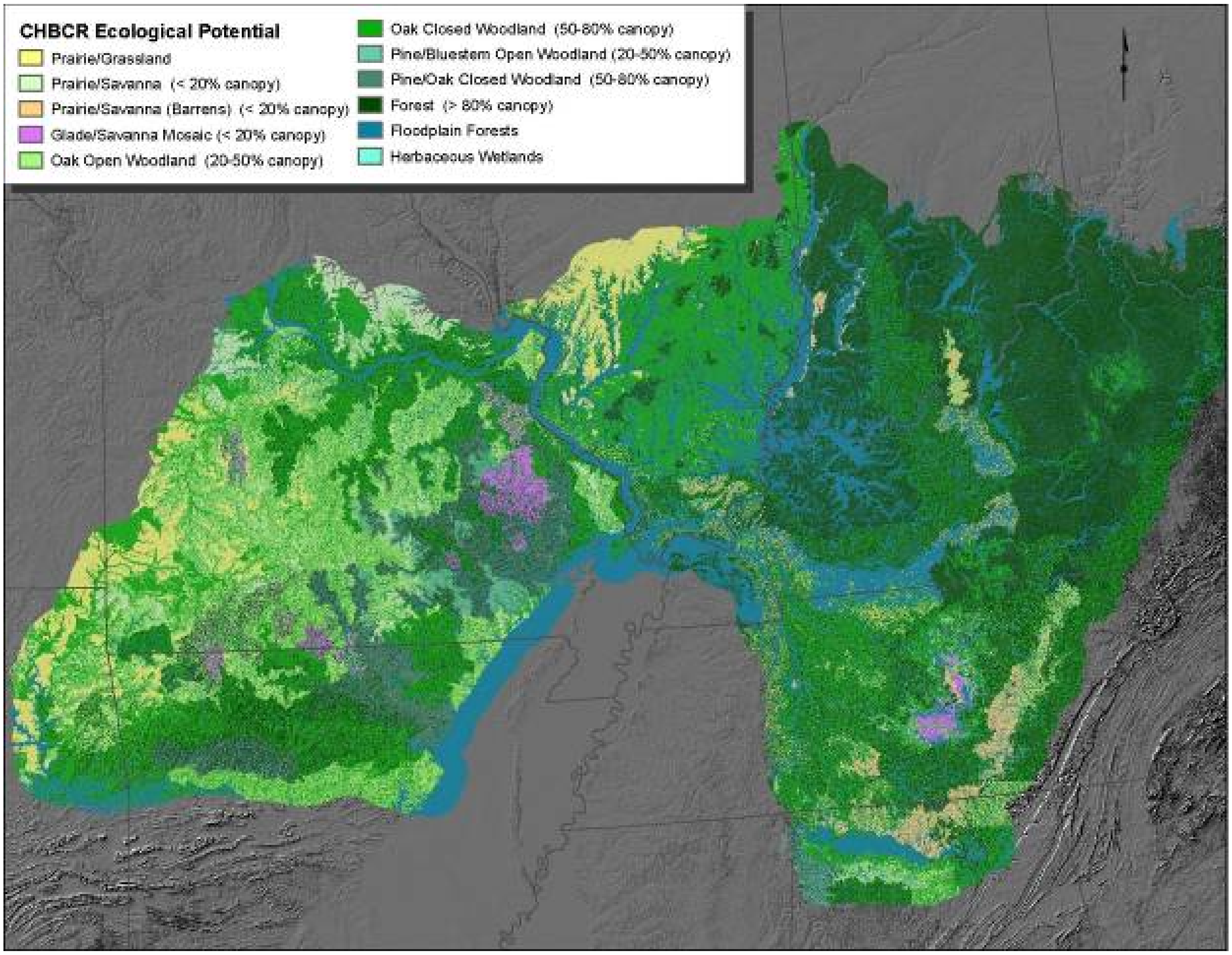


Figure 2. Native ecosystems of the Central Hardwoods Joint Venture.

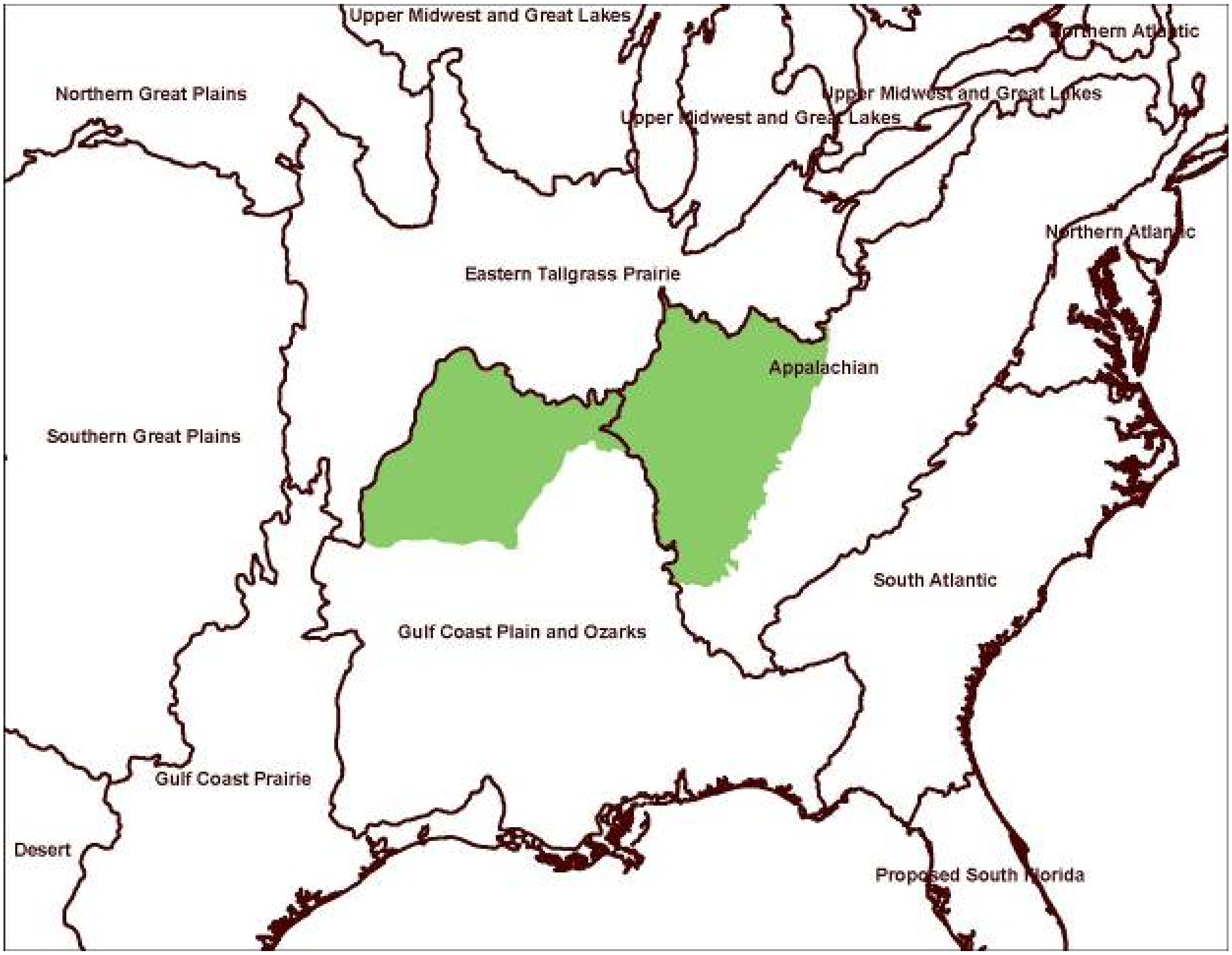


Figure 3. Overlap of the Central Hardwoods BCR with LCC boundaries.

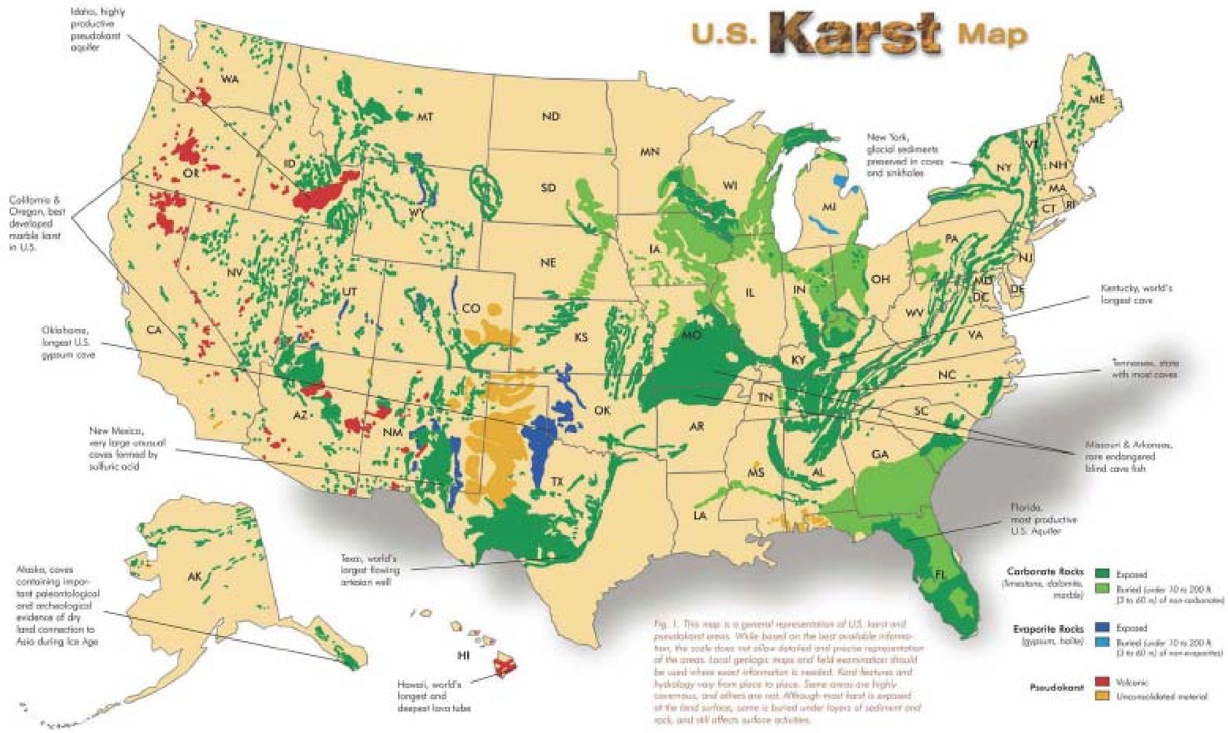


Figure 4. Karst ecosystems of the United States.

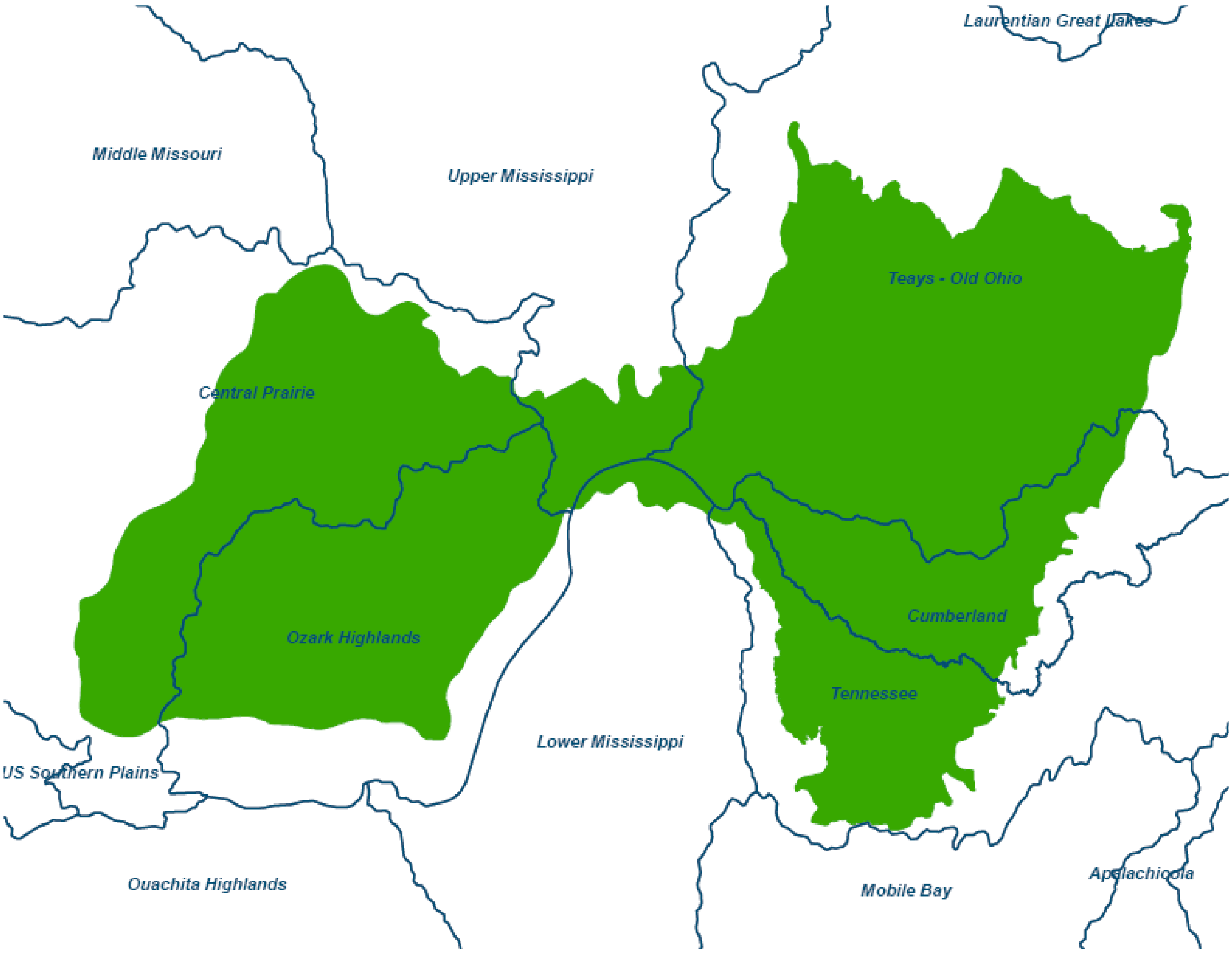


Figure 5. Overlap of the Central Hardwoods BCR and Aquatic Ecosystems.