Conservation Planning in the Mississippi River Alluvial Plain

Photo courtesy of Nancy Webb

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Conservation Planning in the Mississippi River Alluvial Plain
(Ecoregion 42)

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Preface

The information presented herein is the result of four years of conservation planning and represents two iterations of the Mississippi River Alluvial Plain (MSRAP) ecoregional plan as developed by The Nature Conservancy (TNC) and many partners. The bulk of the text describes the process the MSRAP team undertook to:

- identify important biological species, communities, and ecological systems, commonly referred to as "conservation targets," existing in the ecoregion; and
- select priority sites, or conservation areas, for biodiversity conservation based on the perceived viability of those targets.

It should be noted that a considerable amount of time was spent developing data as few Heritage data, the common building blocks of TNC's ecoregional plans, were available for the ecoregion. Much of the emphasis on data collection was focused on terrestrial targets. The dearth of aquatics data required that the team rely heavily on the use of coarse filter, abiotic information to identify aquatic systems warranting further investigation.

To help fill the gap in aquatics data and better inform MSRAP conservation planning, the Charles Stewart Mott Foundation provided funding to TNC's Southeast Conservation Science Center and Freshwater Initiative to assess freshwater biodiversity in several southeast ecoregions including the Mississippi Embayment Basin (MEB), of which MSRAP is a part. **The Addendum (Aquatics Assessment) provided at the end of the MSRAP plan was developed by the Southeast Conservation Science Center, the TNC office responsible for implementation of the Mott grant, and describes the process whereby aquatic targets were identified and sites were delineated based on perceived viability of those targets.** This body of work has greatly supplemented our knowledge of aquatic biodiversity in MSRAP, an ecoregion especially important for these elements.

Though several databases exist for each of these planning initiatives, and are provided on the CDs contained herein, Figure 1 is a composite map of the two assessments, showing the totality of sites important for conservation of biodiversity in MSRAP. Additionally, Appendix 1 lists all targets known to occur within each MSRAP site and notes instances of coincidence with aquatics targets identified through the Aquatics Assessment.

At this time, and until each site (sometimes referred to as "conservation areas") can be analyzed in more detail ("conservation area planning"), the **polygons presented in Figure 1 and in all maps are a general representation of the conservation areas** that should be considered when developing strategies to achieve conservation of the target(s) contained within them. **All of these areas are working landscapes, with humans and nature coexisting. Thus, conservation strategies will not only include conservation and restoration of important tracts within these areas, but will also require that conservation and economic interests work together to develop strategies that are compatible and ensure the long-term viability of identified conservation targets.**

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Conservation Planning in the Mississippi River Alluvial Plain

...We cannot see all that is worth seeing in the bottom lands along the banks of the great river. One must visit the deep, silent bayous, overhung with moss-covered cypress, willows and liveoaks; he must ramble along the clear, quiet lakes whose polished surfaces reflect with perfect fidelity everything above and around them save where float the broad leaves and bright flowers of the graine-a-volee; he must penetrate the tangled swamps with their primeval forests standing as the representatives of past ages, with their dense jungles of luxuriant cane, with their ponds, sloughs and marais where the wild fowl nestles amongst the water lilies, and if he has anything of an artist's eye, he will see new and peculiar beauties everywhere.

- Colonel Samuel H. Lockett, engineer and early explorer of the Mississippi River

1.1 Introduction

Across the globe, modern man has left an imprint on the natural world. Perhaps nowhere has the impact of civilization been experienced so profoundly as in the Mississippi River Alluvial Plain (MSRAP). Once, an impenetrable blanket of forest cover, occasionally interrupted by dense thickets of cane or prairie terrace, stretched across 9.7 million hectares of rich floodplain. The diverse plant species and complex forest structure supported wildlife so exotic in form and habit that many settlers likened this New World environment – the largest forested wetland in North America – to the floodplain forests of the Amazon.

It would be some time before these forests would relent to human settlement. But in this century, a series of socio-political events, technological advances, and environmental disasters made possible, for the first time, widespread drainage and clearing of the Mississippi River Alluvial Plain. In the past century, 4,300 miles of levee have been erected along the river and its tributaries. Hundreds of thousands – perhaps millions – of miles of ditches have been dug. And, nearly eight million acres of forests, roughly 80%, have been cleared for agricultural production (Creasman et al., 1992).

In the past decade, conservation organizations and agencies from throughout MSRAP have focused tremendous attention and allocated substantial resources to address the ecological consequences of widespread clearing and hydrologic alteration. In 1992, The Nature Conservancy designated MSRAP a bioreserve and one of its "Last Great Places." Along with conservation partners such as the U.S. Fish and Wildlife Service, the Natural Resources Conservation Service, the U.S. Army Corps of Engineers, the Environmental Protection Agency and state Heritage, water quality and wildlife agencies, The Nature Conservancy has engaged in the strategic protection and restoration of hundreds of thousands of acres in landscapes of known importance for aquatic, migratory, and threatened species.

This plan proposes to fine-tune conservation plans that have helped guide conservation activities in MSRAP over the past decade, in order to ensure that all elements of biodiversity are protected or restored. In its 1996 vision document, Conservation by Design: A Framework for Mission Success, The Nature Conservancy dedicated itself to the "long-term survival of all viable native species and community types through the design and conservation of portfolios of sites within ecoregions." To accomplish this goal, TNC staff are charged with identifying the species, communities, and ecological systems that will serve as targets for conservation action in each ecoregion in the United States (Figure 2), Latin America and the Caribbean. Once identified, a suite of sites – or portfolio – is developed that will collectively conserve these targets. Long-term viability is considered by protecting "multiple, viable or recoverable occurrences" of these targets and conserving or restoring the ecological processes needed to ensure their long-term persistence.

The MSRAP Ecoregional Planning Team initiated the ecoregional planning process in early summer of 1997. Over the course of 2 ½ years, experts from The Nature Conservancy, state Heritage programs, state wildlife and forestry programs, federal agencies, and academia, participated in field surveys and expert interviews in an attempt to help the team quickly obtain new ecological information on the ecoregion and to help refine and determine how to best utilize existing data. Computer modeling through a Geographic Information System (GIS) was also employed to help characterize ecological patterns and processes in the ecoregion.

Beyond providing new ecological information and insights about MSRAP, this report provides three things:

1. An identification and discussion of sites that will presumably conserve or restore all elements of biodiversity in MSRAP (Chapter 2). In addition, this plan identifies "action sites," or those sites that are of highest immediate priority given their high biodiversity value, degree of threat and the opportunity they present for leveraging limited conservation dollars. Chapter 3 provides a detailed discussion of how the portfolio was developed.
2. Guidance on implementation of the plan. Chapter 4 provides a discussion of the major threats facing the selected sites and suggests strategies – most cross-cutting to many sites – that must be implemented with partners to abate these threats.
3. A discussion on data gaps and information management (Chapter 5). Because new information on biodiversity patterns and ecological processes in MSRAP is constantly coming on-line, the MSRAP team anticipates future revisions of this plan and suggests topics for ecological research, inventory, and monitoring that can help improve the quality and comprehensiveness of this plan in the future.

1.2 A Description of MSRAP

The Mississippi River Alluvial Plain is a 9.7 million ha ecoregion that includes several uplands (e.g., Macon Ridge, Grand Prairie and Crowley's Ridge) and most of the Atchafalaya Basin but excludes the Red and Ouachita River Alluvial Plains and coastal areas south of the forested portions of the Atchafalaya Basin (Figure 3). Its most defining feature is the Mississippi River which flows south over the Mississippi Embayment, a structural trough in the earth's crust that, over the past one- to two-hundred million years, has thrust alternately upward and downward relative to the sea. MSRAP is a geologically complex area, with Coastal Plain sediments having been deposited by a retreating Gulf of Mexico during the Tertiary Period of the Cenozoic Era. The melting of the glaciers during the Pleistocene forced the upper Midwest and the current Ohio River Basin to drain southward and, over time, form the modern-day Mississippi River. Retreating glaciers left behind glacial outwash that, through time, was reworked by the energy of the river and overlaid by deep alluvium deposited through annual overbank flooding. Several distinct landforms in MSRAP (e.g., Grand Prairie, Macon Ridge) represent an accumulation of coarse, glacial sediments that have not been fully subjected to the erosional forces of big river systems, and thus remain tens of feet above floodplain elevations. Crowley's Ridge in Arkansas is hundreds of feet above the floodplain and is comprised of Tertiary deposits. Well-drained, highly-erodable, wind-blown deposits (loess) originating from glacial outwash are characteristic of these landforms (Saucier, 1994). Upland pine hardwood plant communities and, in areas of clay-pan formation, prairie communities, characterize these upland areas.

The bottomland hardwood forest is by far the dominant natural plant component of MSRAP. It is maintained by regular back- and headwater flood events and localized ponding on poorly drained soils. Headwater or mainstem flooding results from rainstorms over the watersheds of the Mississippi's tributaries, and produces the great spring floods characteristic of MSRAP. Backwater flooding is a phenomenon in which high water stages on the Mississippi River create a damming effect, preventing tributary drainage into the mainstem and at times reversing tributary flow upstream. As a result, long-duration flooding accompanied by sediment and nutrient deposition occurs throughout the associated tributary watersheds.

Concomitant to these flooding mechanisms are the hydrogeomorphic processes associated with meandering river systems. The high energy inherent in the Mississippi River and its tributaries once sculpted the landscape, producing a surface geomorphology comprised of natural levees, meander scar (oxbow) lakes, point bars, and ridge and swale topography. Site conditions within MSRAP range from permanently flooded areas supporting only emergent or floating aquatic vegetation to high elevation sites that support climax hardwood forests. The distribution of bottomland hardwood communities within the floodplains of the Mississippi River and its tributaries is determined by the timing, frequency, and duration of flooding. Elevational differences of only a few inches result in great differences in soil saturation characteristics and thus the species of plants that grow there. As a result, much variability exists within a bottomland hardwood ecosystem, ranging from the bald cypress/tupelo swamp community that develops on frequently inundated sites with permanently saturated soils, to the cherrybark oak/pecan community found on sites subjected to temporary flooding. Between these rather distinct community types are the more transitional, less distinguishable overcup oak/water hickory, elm/ash/hackberry, and sweetgum/red oak communities.

In time, and in response to sediment texture, deposition rates and quantities, plant communities characteristic of MSRAP undergo ecological succession from pioneer communities dominated by black willow or cottonwood (depending on soil drainage characteristics) to a red oak and finally white oak dominated climax community (Hodges, 1994). But other disturbances also influence plant community distribution. Both human- and naturally-induced disturbances, such as ice storms, hurricanes, beaver activity, hydrologic alteration and silvicultural practices, greatly influence the rate and direction of succession. There is emerging thought that the dynamic nature of this water- and sediment-driven system, coupled with frequent disturbance, historically precluded, in most cases, the development or long-term viability of a closed canopy of senescent trees, or a community commonly thought of as old-growth (Meadows, 1994). The pre-settlement forests of MSRAP were likely a shifting mosaic of even-aged small patches of all ages, further defined by minute differences in elevation and tolerances among a large number of woody plant species.

The diversity of forests and other habits characterizing the historic landscape provided extraordinary habitat for a range of species utilizing MSRAP. River floodplain systems are highly productive and provide exceptional habitat for a variety of vertebrates including foraging and spawning fish, amphibians, and reptiles. Over 240 fish species, 45 species of reptiles and amphibians, and 37 species of mussels depend on the river and floodplain system of MSRAP. In addition, 50 species of mammals and approximately 60 percent of all bird species in the contiguous United States currently utilize the Mississippi River and its tributaries and/or their associated floodplains (Fremling et al. 1989; Sparks 1992, USACE 1988 *in Robinson and Marks, 1994*). A number of species inhabiting MSRAP are threatened or endangered including the interior least tern, the fat pocketbook pearly mussel, the pallid sturgeon, the ring pink mussel, the orangefoot pimpleback mussel, the pink mucket, pondberry, and the Louisiana black bear.

1.3 Ecosystem Alteration

The last two centuries have witnessed dramatic changes in the ecoregion. A concerted flood control effort began in 1879 with the establishment of the Mississippi River Commission. Its flood control functions were assumed by the U.S. Corps of Engineers after the great flood of 1927 and the passage of the 1928 Flood Control Act (MacDonald et al. 1979). Since that time, one of the world's most comprehensive flood control systems has been developed along the Mississippi River and its tributaries, consisting of some 4,300 miles of levees. As a result, mainstem flooding has been virtually eliminated, and tributary flooding has been reduced by approximately 90% (Galloway, 1980). In addition, channels have been cut and rivers straightened in order to improve drainage of the hydric soils that are characteristic of the vast majority of the landscape, thus greatly reducing localized ponding due to rain events.

By the late 1930's the elaborate system of levees and drainage projects was completed, creating increased opportunities for agricultural production. As a result, the bottomland hardwood forest has been reduced to only 1.8 million ha, or about 20% of its historic extent. The remaining forest exists as fragmented patches of varying size and habitat quality. Recent satellite data indicate that this remaining habitat is broken into more than 35,000 discrete forest blocks of 1 hectare in size or larger (Mueller et al., 1999). Much of this remaining habitat is found in the wettest backswamp systems of the Yazoo River in Mississippi, the Tensas River in Louisiana, and the Cache/Bayou DeView/White River in Arkansas and in the Atchafalaya River system. Forests on drier ridges and higher terraces were cleared early in the history of human settlement in MSRAP as these better drained soils provided optimal conditions for growing commodity crops.

While this ecoregion has experienced extensive alteration, hundreds of thousands of acres of public land have been purchased as state wildlife management areas and federal wildlife refuges. And, the potential for significant restoration is very high. In fact, since 1994, approximately a half million acres of marginal agricultural land in MSRAP have been planted to bottomland hardwood forests through such programs as the Wetlands Reserve Program, the Conservation Reserve Program, Partners for Wildlife, and many private initiatives. Conservation planning, such as that described in this document, provides guidance to conservation practitioners on how to most efficiently and strategically target implementation of these programs – given the need to consider the full range of biodiversity values in MSRAP – and to assist in the management of these tracts given the need to restore or maintain ecological processes.

Chapter 2
The MSRAP Portfolio – an overview

2.1 Sites and Statistics

The MSRAP ecoregional planning team identified 123 conservation targets of concern within MSRAP ranging from plant and animal aquatic and terrestrial species at a local scale to ecological systems covering hundreds of thousands of acres. Chapter 3 provides a detailed discussion of how target occurrences were identified and how sites were determined. In all, 54 sites were delineated throughout the ecoregion to protect or restore almost 900 occurrences of these targets (Figure 4). Appendix 1 provides a list of all conservation target occurrences contained within each site. Appendix 2 contains general information on ownership, threats to conservation targets, future action, and inventory needs. Appendix 3 provides a list of all site names and codes to identify sites on maps. There are a number of other sites, termed provisional sites, that are of conservation interest but not currently in the portfolio. For example, several areas have been identified as having unique soils or surface geology that may contain underrepresented targets.

The MSRAP portfolio of sites comprise some 3.6 million hectares, or 37 % of the ecoregion. Of the 54 sites, roughly half (24) are considered to be "action sites," requiring immediate attention over the next ten years. A relatively large percentage of the portfolio (18%) is in some type of conservation designation since the importance of MSRAP as a flyway has led to the establishment of a large number of refuges and wildlife management areas. Owing to the emphasis in MSRAP on ecological systems (e.g., migratory birds, matrix forests) versus a finer level of ecological organization (i.e. species), many of the 54 sites are large and contain the ecoregion's best remaining blocks of forest. Although many sites are large, only 11 are considered landscape-scale sites, which are designed to protect or restore many conservation targets at coarse, intermediate, and local scales and contain both aquatic and terrestrial targets. Landscape-scale sites include (those in bold are also action sites):

Black River Megasite
Brandywine
Chickasaw-Lower Hatchie River
Donaldson Point-Reelfoot Lake
Lower Yazoo River Megasite
Horseshoe Lake
Sunken Lands
Tensas River Megasite
Three Rivers
Main Atchafalaya
White River Megasite

Thirteen sites contain known, relatively intact river or lake (oxbow) systems that serve as surrogates, or coarse-filter targets, for the elements of aquatic biodiversity they presumably contain. While we have element data from some of these sites, which presumably provides evidence of a high quality aquatic system, many sites do not as yet have detailed aquatic inventories. In addition, sites located within high quality watersheds (USGS 8th field Hydrologic Unit Code-HUC 8) that collectively contain the spectrum of surface geology types present in MSRAP, were identified as potentially containing high quality aquatic systems. Discrete systems will be identified as site conservation plans are developed for these sites.

The majority of portfolio sites contain multiple occurrences of many targets; however, a few sites contain only one or a few occurrences. Because of a general lack of inventory in this ecoregion to date, it is anticipated that future inventory of portfolio sites will reveal the presence of important species, plant communities, and ecological systems not yet documented.

2.2 Action Sites Overview

Action sites are defined as those sites in the portfolio where the Conservancy is committed to working over the next 10 years. Where not already developed, the Conservancy will do detailed planning – site conservation planning – on each of the sites to determine data gaps and specific strategies. In determining which sites should be designated as action sites, the team applied a consistent set of criteria as developed by Greg Lowe, The Nature Conservancy. These criteria include:

- Complementarity – Is the coarse-scale target at a site currently conserved at other portfolio sites?
- Leverage – Does the site offer clear opportunities for pursuing conservation activities at other portfolio sites?
- Number and diversity of targets – Are there many aquatic and terrestrial targets relative to other sites in the portfolio existing at a variety of spatial scales?
- Health of targets – Are the targets at the site in overall good health based on size, condition and their landscape context?
- Urgency and degree of threat – Are there any threats likely to seriously degrade the health of targets at the site?
- Feasibility – What is the probability of implementing strategies to abate threats at the site, what is the probable outcome, and what is the cost?

In total, 24 sites were identified as action sites. These include:

Scatter Creek
Rainey Brake
Village Creek
Second Creek
Black River Megasite
Union Pacific Railroad
Prairie Co. south
St. Francis River
Cat Island
Tensas River Megasite
Cypress Island
Bayou Bartholomew
Main Atchafalaya
Horseshoe Lake
Lower Yazoo River Megasite
Rodney

White River Megasite	Dahomey
Pine City	Otter Slough
Chickasaw-Lower Hatchie River	Sand Ridge Lands
Donaldson Point-Reelfoot Lake	Mingo

Figure 4 shows the distribution of these sites. Action sites cover approximately 2.4 million ha in the ecoregion.

2.3 Meeting Conservation Goals

For each of the 123 targets identified as having conservation importance in MSRAP, the team set a numeric goal that should ideally be captured in the suite of sites in the portfolio to ensure the long-term sustainability of the target. In selecting occurrences, viability was considered (See Chapter 3). Also, because this ecoregion has experienced extensive alteration, and because there is currently tremendous emphasis by conservation partners on restoring landscapes, target occurrences were sometimes selected if it was felt they could be reasonably restored. In order for a site to be included in the portfolio, viability (or restorability) of at least the coarsest-scale target at that site had to be reasonably certain.

Because few endemics or rare elements occur in this ecoregion relative to many other southern ecoregions, few Heritage data were available to guide the selection process. Occurrence data on plant communities were especially sparse. In order to quickly fill this data gap, rapid ecological assessments were performed in an attempt to 1) locate high quality natural plant communities; and 2) establish relationships between plant communities and easily mapped abiotic information. Despite the tremendous amount of information gathered through this process, the plan falls far short in meeting goals for intermediate- (plant communities) and local-scale (plant and animal species) targets.

Of the 123 targets only 27, or 22%, met their goal. Nine of the 10 terrestrial systems (matrix-forming communities) of sufficient total acreage, and including feasibly restorable acreage, were captured within sites. All migratory bird guilds met the stated goal as did wide-ranging mammals. Only one of the aquatic targets – large disconnected oxbows – met its goal. Ten of the 63 plant communities met their stated goals, and four of 43 species met their stated goal. Two highly-ranked (G1/G2) communities met the stated goal. Only one highly-ranked species (G1) of 15 G1/G2 species met its goal. Three of eight federally-listed species (pondberry, interior least tern, and Louisiana black bear) met their stated goal. Appendix 4 provides a detailed breakdown of occurrences for all targets 1) captured in Phase I sites, (preselected as “no-regret” sites), 2) tagged as irreplaceable (fewer total occurrences than goal), or 3) selected based on co-occurrence with other target occurrences and viability. Chapter 3, sections 3.2 and 3.3, provides a thorough description of how occurrences were selected and sites delineated.

Also, many occurrences of unknown viability, though not included in the goal tally, were incidentally captured in sites, as were occurrences that met goals at other sites. Thus, some redundancy is built into the portfolio and these incidental occurrences with unknown viability will be assessed during detailed site planning. Also, because many sites consist of large blocks of existing or restorable matrix-forming communities, it is quite reasonable to expect that many common communities, though not discretely delineated or recognized in this plan, are embedded in these sites. Thus, detailed site planning should include further inventory of these sites in order to confirm or reject this assumption.

Table 2.1
Summary of MSRAP goals

Target Group	**Number of targets in group**	**Number of targets meeting goal**
Coarse Scale Targets		
Matrix-forming communities	10	9
Migratory bird guilds	3	3
Wide-ranging mammals	1	1
Aquatic systems	5	1
Intermediate Scale Targets		
Communities	63	10
G1/G2 communities	10	2
Local Scale Targets		
All species	43	4
G1/G2 animal species	12	0
G1/G2 plant species	3	1
Federally-listed species	8	3

Chapter 3
Designing the MSRAP Portfolio

3.1 Team structure, Project elements, Timeline, and Budget

The MSRAP ecoregional planning process officially began in Summer of 1997. At that time, participants decided that the optimal strategy for developing the ecoregional plan was to create four teams: a core team, a community ecology team, a botany team, and a zoology team. Appendix 5 provides information on team roles and members. Though not adhered to linearly, the general steps required for developing an ecoregional portfolio for the Mississippi River Alluvial Plain included:

- Refining the National Vegetation Classification (NVC) – the vast majority of plant communities in MSRAP are bottomland hardwood types which had not been well described at the time;
- Developing conservation targets and goals for the ecoregion – determining which elements of biodiversity should be conserved or restored in the ecoregion and define the number/acreage and distribution of each;
- Data collection and populating the Biological Conservation Database (BCD) – very little State Heritage data (EOs) on community and rare species' occurrences exist for this ecoregion given its relative lack of rare and/or endemic elements. Rapid ecological assessments (REAs) and expert interviews were used to create "proto-EOs" for communities;
- Revisions and updates to the BCD – this included updating viability ranks, using the most updated viability definitions available, and standardizing nomenclature (crosswalking);
- GIS data analyses – using information provided through GIS modeling to characterize coarse scale patterns of biodiversity and to analyze presumed changes in ecological processes given human influence;
- Portfolio design and conservation action – identifying sites that are critical for conserving or restoring conservation targets in the ecoregion as well as assessing threats to those sites and developing ecoregional strategies to abate those threats.

Throughout the process, several ad-hoc working groups, essentially comprised of representatives from the four teams, were formed to accomplish a variety of tasks. For example, the community ecology team quickly realized that very few data on plant community occurrences existed in most states in the ecoregion. Thus, representatives of that team from the lower four states in the ecoregion (comprising roughly 90% of the ecoregion) developed a strategy to gather information on plant community distribution and occurrences in MSRAP. Also, given the MSRAP team's long-term investment in GIS technology, a small working group continually explored ways that this technology could be used to provide insights about coarse scale targets and ecological processes.

Approximately three years were required to develop the ecoregional plan. The majority of this time involved refining the tools (e.g., the community classification) and developing the data needed (e.g., Rapid Ecological Assessments) to complete the plan. Designing the portfolio and identifying threats and strategies was accomplished in roughly nine months.

The MSRAP ecoregional planning process was managed from the Louisiana Field Office of The Nature Conservancy (LAFO). LAFO also assumed responsibility for all data management, GIS analyses, and map and document production. This work was done in conjunction with migratory bird conservation planning for the ecoregion through a grant provided to LAFO by the Joe W. and Dorothy Dorsett Brown Foundation, the National Fish and Wildlife Foundation, and the Salisbury Community Foundation. Throughout the process, individual state Heritage and TNC programs as well as the Southern Conservation Science Center funded their staff expenses for time and travel. Many other state and federal partners also generously contributed time and resources to the development of this portfolio.

3.2 Tools and Products

3.2.1 Conservation Targets

An essential first step in developing the MSRAP portfolio was to identify biodiversity targets – the building blocks of the portfolio. These targets – ecological systems, ecological communities, and species – occur at multiple spatial scales including regional, coarse, intermediate, and local. Once targets were determined, the teams gathered information on occurrences of these targets, and on the viability and/or restorability of the occurrences.

Coarse and Regional Scale Targets

In considering coarse and regional scale targets, emphasis was placed on identifying those targets that occur in the context of intact or restorable landscapes and across multiple physical gradients. Such a strategy helps ensure that the range of genetic and environmental variability is considered and ultimately conserved. The team also explicitly addressed issues of connectivity. Ecological systems included as coarse scale targets were terrestrial systems (referred herein as matrix-forming communities) and aquatic systems. Migratory birds and wide-ranging mammals are also considered in this discussion given their occurrence, like terrestrial and aquatic systems, at coarse and regional scales.

Migratory Birds

MSRAP has experienced extreme habitat reduction and fragmentation. The bottomland hardwood forest has been reduced to only 1.8 million hectares, or about 20% of its historic extent. A GIS fragmentation analysis was performed in the MSRAP ecoregion in order to identify large, roadless blocks of forest. MSRAP forests exist as more than 35,000 discrete forest blocks (forested pixels separated by greater than 30 meters), one hectare in size or larger and of varying quality and composition (Mueller et al. 1999). This decline has been mirrored by a decline in many species of forest breeding birds, a species group of major importance in MSRAP. Of the 24 physiographic areas of the southeastern United States, MSRAP leads in the percent decline of all high priority species (as determined through the Partners in Flight prioritization scheme) and is second in the percent decline of all species (Hunter 1993). Two hundred of the 236 landbirds in eastern North America (85%) can be found in MSRAP during some portion of their life cycle (Smith et al. 1993).

Three guilds of forest birds requiring different habitat size needs – 4,000ha, 8,000ha and 40,000ha – and as represented by Swainson's Warbler, Cerulean Warbler, and Swallow-tail Kite, respectively, were chosen as targets. Appendix 6 provides a history of bird conservation planning in MSRAP and a complete description of the methodology used in the identification of guilds and umbrella species as developed by the Lower Mississippi Valley Joint Venture, Partners in Flight and many collaborating organizations. Figure 5 displays the Migratory Bird Areas (MBAs) identified by this collaboration as important for the conservation of forest birds in MSRAP.

Wide-ranging Mammals

Three large mammal species in the Order Carnivora historically occurred throughout MSRAP: the cougar, the red wolf, and the black bear. The first two species have presumably been extirpated, while bear populations persist at perilously low numbers in a few scattered places. Black bear were targeted as a wide-ranging species for this ecoregion and presumably serve as a good umbrella species should other large, wide-ranging mammals be reintroduced to this ecoregion.

Two subspecies of black bear occur in MSRAP. The northern part of the ecoregion is occupied by the American black bear (*Ursus americanus americanus*). The southern part of the ecoregion is occupied by the Louisiana black bear (*U.a. luteolus*), a subspecies whose range extends from east Texas across Louisiana and the southern half of Mississippi, but whose distribution occurs in two pockets. One of these occurs in northeast Louisiana and the other occurs near the mouth of the Atchafalaya River. *U.a. luteolus* is a federally listed subspecies. None of the Louisiana populations are considered to be minimally viable, which is not surprising given the extreme fragmentation of this ecoregion. Large forest blocks are needed by the black bear to support denning and home-range requirements. Also important is the surrounding "ecological backdrop" – the landscape within which large forest blocks are imbedded, and that is critical for supplying forage, cover, and dispersal opportunities across the landscape.

Terrestrial Systems – Matrix-forming Communities

The distribution of bottomland hardwood communities within the MSRAP is determined by the interrelated parameters of soil type, flooding frequency and duration, and landform. Fine-grained, clayey sediments characterize the low bottoms, backswamps, and abandoned river courses and channels of the ecoregion. As a consequence, drainage in these areas is poor to very poor. Coarser-textured sediments are characteristic of point bars and natural levees and result in improved drainage. Elevational differences of only a few inches result in great differences in soil characteristics and, therefore, on plant community distribution.

As a result of these complex hydrologic and edaphic factors, much variability exists within the fluvial landforms and associated habitat types that comprise the palustrine portion of the ecoregion. Bald Cypress-Water Tupelo communities occur in the lowest portions of the floodplains in backswamps and in abandoned channels and courses. These same habitats, with a somewhat decreased flooding duration, may support communities dominated by Overcup Oak and Bitter Pecan (as in the Tensas Basin of northeast Louisiana; Barrow 1990). Intermediate terraces may support any of several communities represented by a variety of dominant and characteristic species including Sweetgum, Water Oak, Willow Oak, Nuttall Oak, Cedar Elm, American Elm, Slippery Elm, Hackberry, Sugarberry, and others. Higher terraces, those which flood most years but for a relatively short time, support communities dominated by Cherrybark Oak, Swamp Chestnut Oak, Sweetgum, and others. While forested wetlands are the predominant vegetation type of the MSRAP, prairies, upland forests, and emergent wetland communities also can be found.

For the purposes of this ecoregional plan, matrix-forming communities are defined as those communities that occurred historically in very large (greater than 4,000ha to approximately 40,000ha) patches. These communities responded primarily to a flooding gradient and soil type. They are less specific in their requirements generally than the large patch and small patch communities embedded within them and, at least as currently described in the National Vegetation Classification (NVC), have more variability in species composition. Especially within the large floodplains of MSRAP and its tributaries, several matrix-forming communities intertwined to form a very large, primarily forested landscape.

The MSRAP team relied on the assumption that the unique hydroedaphic conditions represented by each surface geology type in MSRAP (e.g., backswamp, meander belt, etc.; Saucier, 1994) support unique vegetative assemblages, or “matrix-forming communities.” Though scarce data exist to confirm these relationships across the ecoregion, one such test of this hypothesis (Tingle et al. 1995) suggests some positive correlation between vegetative type and surface geology. Appendix 7 provides a thorough description of the geologic landforms of MSRAP. A GIS analysis was performed to determine the current representation of these communities, as identified through the intersection of present-day forest and surface geology, compared to their historic abundance and distribution (as represented by surface geology; Figure 6). This was done in order to establish a goal for each of the matrix-forming communities. Each goal was defined as the historic relative percentage of that community. As anticipated, valley train terrace communities are underrepresented due to widespread clearing for agricultural production.

Soils in MSRAP are also useful predictors of vegetation types in some cases and are well mapped since this is now an agricultural landscape (Foti, 1995). Given the history of land clearing and restoration trends in MSRAP – less hydric soils are most productive, were the first cleared for agricultural production, and are the least likely to be restored – it was assumed that certain matrix communities are currently underrepresented in MSRAP relative to their historic distribution, and are not widely targeted for restoration. Thus, information on soils and surface geology was used to identify these underrepresented communities and to define provisional sites for further inventory and potential restoration (Figure 7). Table 3.1 provides a description of the surface geology and soils surrogate analyses.

It should be noted that the GIS-based forest fragmentation analysis, used to locate critical restoration and protection zones for migratory birds and wide-ranging mammals, identified zones containing the largest remaining unfragmented forests. We assume that these patches would, to a large extent, be composed of matrix communities. In essence, we used these patches as a coarse filter for matrix communities. In fact, goals for all but one matrix community (CEGL2424) were met with the identified suite of sites (see Appendix 4). In this instance, our reliance on forest blocks as a filter for "capturing" matrix communities was generally successful. However, many large and small patch community targets were not well represented within the forest blocks. The reasons for this are unknown at this time though the MSRAP team feels confident that further field inventory of these forest blocks will uncover to-date-unknown occurrences of these targets. More detailed information on the composition (and viability, see discussion below) of these forest blocks was largely derived through REAs and interviews with land managers and other experts.

Table 3.1
Using Soils and Surface Geology as Surrogates in MSRAP Ecoregional Planning

When surveying for plants and animals, biologists regularly use maps of proxies or surrogates of the organisms they seek. Quoting from a TNC document (Designing a Geography of Hope, 1997), "Surrogates are members of any land and/or water classification selected for conservation planning and action to stand in for or be representative of unknown elements or unknown occurrences of elements." Widely used surrogates includes streams, topography, geology, and soils. Here we introduce our systematic assessment of surrogates that may represent flora and fauna not well known or widely represented on public lands, which are very representative of their associated site in the portfolio. Soils and their underlying geology affect flora so profoundly that to ignore them could seriously discredit the site selection and ranking process. Fortunately, there are sufficient digital information on soils and geology for MSRAP to warrant serious consideration of them in site planning.

Soils data were developed by the Natural Resources Conservation Service or NRCS (formerly Soil Conservation Service or SCS) and are available at three scales – country, state, and county. Few county soil books had been digitized for MSRAP, but state-level data known as STATSGO (State Soil Geographic Data Base) provided much insight despite the generalization of their spatial distribution to soil associations. We approached this data with caution because, according to NRCS, "STATSGO was designed to be used primarily for regional, multistate, river basin, State, and multicounty resource planning, management, and monitoring. STATSGO data are not detailed enough to make interpretations at a county level."

Each set of polygons that represent a particular soil association is attributed with several soil series. A particular soil series can be a part of several different associations. STATSGO data includes estimates of the percentage of soil series that comprise the soil association polygons. We used these percentages to create "probability" maps of each soil series in MSRAP, giving us an understanding of how each soil series type was distributed and concentrated.

Table 3.1
Cont'd

The percentage of each soil series in a given soil association is listed in the COMPPCT field in the COMP table of STATSGO for each state. We used 50 classes to indicate probability in 2% intervals, presented in raster form. We created the datasets using MicroImages Inc. TNTmips v. 6.2 software and tested them on ESRI ArcView 3.2 software. We created raster maps (geoTIF format) of soil series in part because STATSGO vector data display and model quite slowly on today's computers,especially when showing all 7 states comprising MSRAP. We created a geoTIF file for each soil series at the low resolution of 237meters (3 times poorer in the X or Y direction than MSS Imagery) to facilitate modeling and for quick viewing of each soil series. We avoided mapping the percentages of the first record of a suite of records attached to individual polygons (many- to-one) by using a programming script to select the correct records pertaining specifically to a given series. We mapped percentages of the area of every detailed soil type (419 soil series) in every state soil unit (soil association) occurring near or within MSRAP in seven states. Approximately 125 soils effectively characterize MSRAP. Boundaries of national wildlife refuges, wildlife management areas, and national forests were overlaid on each of the 125 MSRAP soils to assess its representation within public lands. A total of 45 MSRAP soils were found to be poorly or not represented on MSRAP public lands. These 45 were analyzed in three ways. First, the percentages of their land surface were summed to obtain a total percent, accurate at the scale of soil associations. Second, the number of soil types of the 45 soils in any association was counted. Finally, the 45 soils were organized into groups of soils that share soil associations of similar distribution, enabling one to see, in a single map, the generalized locations of all 45 soils. The apparent concentrations of these 45 soils may justify floristic and faunal surveys of those areas.

As could be expected, we learned that several MSRAP soils and soil associations are poorly or not represented on public lands in MSRAP. Missouri has a disproportionately high number, 57% of such MSRAP soils, and was followed in order of percentage by Arkansas (39%), Mississippi (37%), Tennessee (25%), and Louisiana (25%). Illinois and Kentucky each have one MSRAP soil not found on public lands. Element Occurrence Records (EORs) tracked by Natural Heritage Programs are not strongly related to the soil regions highlighted in this analysis, lending support for the use of soils to supplement EORs for conservation planning or, alternatively, supporting the arguable contention that such areas should be ignored altogether. The former argument is bolstered by coincidence of the range of one of MSRAP's target species, the Illinois chorus frog, that occurs on land in Missouri highlighted by our analysis.

GEOLOGY
Geology data encompassing the entirety of MSRAP were available to us in GIS-compatible form at a scale rather similar to that of STATSGO data. The data were assembled by Roger Saucier of the U.S. Army Corps of Engineers (USACE) at Vicksburg, MS. (Geomorphology and Quaternary Geologic History of the Lower Mississippi Valley," Vol I and II. Report prepared 1994 for the Mississippi River Commission, Vicksburg, MS, by the U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS.) These GIS data are intended as the first comprehensive overview and synthesis of the geomorphology and geology of the Lower Mississippi Valley, both the alluvial valley and the deltaic plain, since 1944. The digital data were digitized from the 1:250,000 scale sheets in Volume II of the report.

We aggregated the USACE geology classes from the original DESCRIPT field of the GIS database into 11 classes that we propose as being useful in supporting and distinguishing MSRAP's matrix-forming communities, namely backswamp, abandoned channels and courses, Crowley's ridge, other alluvium, meander belts, valley train terraces, prairie alluvium, lacustrine, deltaic levees, and saltmarsh deposits.

We computed the acreage of each aggregate class to the total area of MSRAP (excluding water) and compared this value to the relative acreage comprising our sites. As expected, valley train terrace communities are not well represented in portfolio sites.

Aquatic Systems

MSRAP is a very important ecoregion for aquatic species and serves as an important conduit for fish dispersal and adaptive radiation (Hoover and Killgore, 1998). Over 240 species of fish and 37 known freshwater mussel species are found in the ecoregion (Robinson, 1994). Fourteen of the 37 mussel species are recognized as being of concern for this planning effort (Appendix 12).

Southeastern forested wetlands are highly productive and provide important habitat for larval fish. Fish species richness is two to five times higher in bottomlands of MSRAP as compared to other southeastern bottomland hardwood forests (Hoover and Killgore, 1998). Over half of MSRAP fish species (68%; Guillory, 1979) are dependent on healthy, connected floodplain systems where rivers overflow their banks and then recede; adequate transport and deposit of woody debris and sediments is accomplished; and streamside habitats are sufficiently large and unfragmented. In The Nature Conservancy report, Rivers of Life (1998), three MSRAP watersheds – Bayou Bartholomew, Cache River, Bayou Teche – were recognized as critical watersheds to conserve at-risk fish and mussel species.

While significant hydrologic alteration has occurred throughout most of MSRAP, hydrologic function remains relatively intact in a few select places due to the scarcity of levees, minimal channelization, and the presence of relatively intact riparian forests and floodplains. Because resources prohibited the development of a full-blown aquatic community characterization, we instead assumed that identification of coarse scale targets (i.e., aquatic ecological systems including headwater, small-, medium-, and large-order streams), in higher quality watersheds stratified latitudinally and by substrate (surface geology), would adequately represent the diversity of aquatic systems in MSRAP. (See Appendix 8 for a full description of the aquatics approach). Higher quality watersheds include the more intact drainage units of the White River/Cache River/Bayou DeView system, the Atchafalaya River system, and the Yazoo River system. These watersheds have more intact floodplain systems and less channelization relative to other watersheds. In addition, restoration efforts are greater in these watersheds (see GIS watershed analysis discussion, Section 3.2.2). Stream segments corresponding to each of these targets (i.e., headwater, small-, medium-, and large-order streams) will be identified through Site Conservation Planning at each of these hydrologic sites. In addition, the team solicited input from experts with knowledge of the aquatic system to identify known high-quality stream segments. Large oxbow lakes with no direct connection to the stream targets were also identified as an aquatic systems target in MSRAP (Figure 8).

Ecological Communities

All naturally occurring communities in MSRAP, as represented by 63 plant associations, were determined to be conservation targets by the community ecology team. From the beginning, issues of classification consistencies and data gaps were addressed. State Heritage Program ecologists, in concert with ecologists from the Southern Conservation Science Center, spent considerable effort refining the MSRAP portion of the NVC and updating state BCD records.

This process required:

- refining descriptions of previously defined plant communities and developing descriptions for new types;
- reconciling state classification units with national taxonomy and crosswalking state units to these national types;
- refining Global Ranks for plant associations (the finest level in the NVC hierarchy);
- updating or assigning EORanks for community element occurrences (EORs) based on assessments that integrated the criteria of size, condition, and landscape context.

Heritage staff, TNC staff, and other outside experts were consulted during this phase of the process. The edited and revised records were compiled into a central database and required the collaboration of the LAFO information manager, the TNC regional information manager, and state Heritage data managers.

Because few Biological Conservation Database (BCD) data exist on MSRAP communities, the community ecology team developed a method for quickly populating the database with field-assessed, high quality occurrences, or "proto-EOs." Data collected through a Rapid Ecological Assessment (REA) included such information as vegetation descriptions, association(s) type, ranks based on size, condition, and landscape context, management comments, stress, etc. (Table 3.2; Appendix 9). In some cases, sites identified in ecological reports, theses or published papers were also considered proto-EOs if enough information was available and sources were considered reliable. These point-based occurrences will be entered into state Heritage databases.

While conducting REAs, ecologists also attempted to better establish the correlations between vegetation type (community associations) and surface geology and/or soils. We hoped that, if these relationships could be confidently established and repeated across the ecoregion, it might be possible to comprehensively model plant community distributions across MSRAP to an accurate and usable level of detail. Ultimately, we determined that a much larger sample size than that which we collected would be needed to develop these relationships with an acceptable degree of confidence.

In addition to conducting REAs, considerable time was spent interviewing land managers, state foresters, ecologists, and other experts to summarize information on large blocks of forests which, in MSRAP, often correspond to matrix forests on public lands. These nonpoint-based descriptions include information on forest types/approximate acreages/age/conditions, management regimes, desired future condition, hydrologic impacts, natural area designation, presence of exotics, etc. and are documented in the “subunit database” (Appendix 10). These interviews were not conducted on public lands in Missouri, Kentucky, and Illinois. While not technically considered in our assessment of goals for specific community targets (see goal discussion below), the more general descriptions of forest types collected through this effort provided further insights into the distribution and condition of plant communities within these large blocks of matrix forests. This information will help focus future inventory efforts.

Table 3.3 provides an overview of the types of data used to develop a community database for use in MSRAP ecoregional planning. Appendix 11 provides an overview of all community targets in MSRAP.

<u>Local Scale Targets</u>

Species

Plant and animal targets were determined by the Botany and Zoology teams through an iterative process that considered:

- all G1 – G2 and T1-T2 taxa
- G3 taxa if 1) declining throughout range, 2) highly disjunct from other portions of range (distinct evolutionary unit), 3) endemic to MSRAP, and 4) could potentially be missed during the site selection process due to unique habitat requirements, unusual life history attributes, or patchy distributions
- G4 and G5 taxa if those elements of biodiversity are not likely to be captured during the site selection process due to 1) unique habitat requirements or special management needs, 2) unusual life history attributes, 3) highly irregular distribution within the ecoregion, or 4) endemism within the ecoregion

For each target, the teams evaluated the overall viability of the species by reviewing all known element occurrence records and ranks and by consulting knowledgeable experts. There were many occurrences ranked as not viable (i.e., not A-,B-, or C-rank) or deemed not to be restorable in the ecoregion at this time and were dropped from consideration. Once species targets were determined, experts from the MSRAP states reviewed BCD records to update viability (EORANKs), often based on best professional judgement and a consideration of size, condition, and landscape context. In addition, multiple occurrences that appeared to be part of the same population, were combined into a "principle EO." Appendices 12 and 13 list all plant and animal targets for MSRAP.

Table 3.2
Rapid Ecological Assessment

Because few data existed on ecological communities, the MSRAP team developed a strategy for quickly gathering field-derived information on high-quality plant communities. Ecologists field-assessed the occurrences of these communities through REAs to determine their potential for inclusion in the MSRAP plan. The areas to be assessed were suggested by:

1) Expert interviews with public land managers
2) State Heritage BCD occurrences, not explicitly classified by vegetation type or quality-ranked
3) Information provided by other ecologists or scientific studies (e.g. Heritage scientists, academic theses)
4) Thematic Mapper data indicating large undisturbed blocks of forest

Unfortunately, time was limited and not every site was evaluated. The majority of field time was spent assessing potential natural areas as identified by public land managers. These sites were generally easier to access and, in MSRAP, typically represent some of the higher quality areas in the ecoregion. Examples of information gathered include vegetation type, size, condition, quality, stress, and management comments. Appendix 9, the "Single Vegetative Community Form," provides a complete list of all factors evaluated through the Rapid Ecological Assessment at each site. This information is georeferenced to a "proto-EO" datum for the purposes of this study and will eventually be converted to an Element Occurrence Record as part of the State Heritage Biological Conservation Database system.

Table 3.3
Definitions of data types utilized in building plant community database

Element Occurrence Record (EOR): a point based datum that contains a high quality (based on community quality, size, and landscape context) association or group of associations. EOR information has been reviewed and quality controlled by the state Heritage program and is in its Biological Conservation Database. EOR's have quality, size and landscape context ranks that have been assigned by field observers and Heritage. EOR's that are not point-based, and describe large forested tracts are tagged as "subunits" for the purposes of eco-regional planning.

Proto Element Occurrences (Proto-EO): a point based datum that contains an association or group of associations that has been documented and ranked by field ecologists, but has not been entered into the Heritage Biological Conservation Database. Ranks are assigned to these data using the same criteria as for EORs. These have had standard EOR type information collected by qualified individuals through the Rapid Ecological Assessment (REA) process. Areas identified in ecological reports, theses or published papers may also be considered proto-EO's if enough EO-type information is available. Proto-EO's were documented by "single vegetative community" forms and generally are only documented if they receive an overall rank of "B" or better.

Non-point information (NP): This category includes information about quantity and quality of associations (or other classification unit, i.e., SAF type or alliance, see Appendix 15) that is not tied to a specific geographic point. Examples of this type of data include: percentages of managed areas occupied by a specific association, presence of an association within a specified subunit, low-precision EOR's that described a general area rather than a specific site, general landscape information tied to any larger unit of land (soils-vegetation and geounit-vegetation relationships). There are no ranks assigned to information in this category and occurrences of non-point data are not counted toward the target goal.

Subunit: Any large area represented by a polygon that has been delineated for the purposes of ecoregional planning. This includes forested public and private land areas. This category will also contain "old" EOR's in BCD that document to large, "low-precision" areas rather than sites. Proto-EOs are linked to subunits via a unique subunit code.

Managed Area: Any subunit that is managed by federal or state land management agencies, or by private conservation organizations (i.e., TNC). The managed area evaluation was used in many cases to determine viability ranks for EOs and Proto-Eos.

Potential Natural Areas (PNA): a site that has defined boundaries, potentially contains high quality associations, and is one of the following: a) a designated Natural Area within a public land holding, b) an informal natural area recognized by land managers or local "experts", c) a site on private land that has been identified by an expert, d) a site documented in reports, theses or published literature as potentially containing exemplary associations. PNA's were documented by "single vegetative community" forms and/or by "expert forms for natural communities", but they do not receive quality or size ranks and are not counted toward target goal unless indicated by REA site visit.

Migratory Bird Area (MBA): a large unit of land in the MSRAP defined by Migratory Bird Planning Initiative as important habitat for migratory bird species. These tracts were delineated by a team consisting of local land managers and based on habitat consideration as well as the feasibility of restoration. These sites were evaluated prior to this round of ecoregional planning.

Watershed Integrity: an index developed for each HUC8 in MSRAP based on sinuosity of streams, reforestation potential, and percent forest cover.

3.2.2 Viability and restoration of targets

The viability of our target occurrences was addressed at multiple scales, depending on the scale of the target and of the processes influencing the viability of that target. For example, viability assessments for community association occurrences (EOs and ProtoEOs) drew heavily from Heritage methodologies and considered such factors as size of the occurrence, condition of the occurrence, and landscape context. An analysis of viability (given habitat restoration) for migratory birds and black bears required a consideration of processes occurring at a much coarser scale (e.g., dispersal across the ecoregion). Because occurrences were selected in a nested fashion, progressing from coarse to local scale targets (see Assembling the Portfolio, Section 3.3), there is some redundancy built into the assessment of viability, especially for those targets occurring at a local scale.

<u>Element Occurrence Ranks</u>

Communities

Element occurrence ranks (EORANKs) indicate the predicted viability of an element based on the integration of three rank factors: size, condition, and landscape context. Because no national standard yet exists for ranking community element occurrences, ecologists at the Southern Conservation Science Center have developed a generic set of standards for each of the above-listed rank factors. These are presented in Appendix 14.

Size is simply defined as the area of the occurrence in acres. The MSRAP ecology team determined the size range for an A-ranked occurrence of each of the community targets (based largely on historical estimates). Each EO was then ranked based on its size with a decreased rank based on decreasing size.

Condition was an integrated measure of the quality of biotic and abiotic factors, structures, and processes *within* the occurrence, and the degree to which they affected the continued existence of the occurrence. Components included composition, presence of indicator species, structure, presence of exotics, presence of natural processes including disturbance, and presence of human impacts.

Landscape context was an integrated measure of the quality of biotic and abiotic factors, structures, and processes *surrounding* the occurrence. Components of this factor included landscape structure and extent, functional connectivity to other communities, buffering from harmful edge effects, and intact ecotones and condition (naturalness) of the surrounding landscape. These three rank factors are combined into an overall EORANK. We weighted each of the factors equally. (See Appendix 14 for a full description of this ranking process for plant communities).

In some instances, community element occurrence records did not contain an EORANK. In those instances, technical team members evaluated viability on a case-by-case basis, relying heavily on expert knowledge, managed areas evaluation (if applicable, see below), and using such tools as TM satellite imagery. In addition, a confidence rank reflecting the degree of classification certainty was assigned. We assume that EORANKs of A, B, C, AB, BC, or AC are potentially viable into the foreseeable future.

Species

EO ranks for species provide an estimate of viability of an occurrence. They are based on the current status of an EO but the criteria used to determine the rank (EORANKSPECS) integrate both current status and historical evidence. As with community ranking, species EORANKS are based on size, condition and landscape context. Among the specific criteria evaluated are: population abundance, population density, population fluctuation, reproduction and health, and abiotic physical and chemical factors.

Managed Area Evaluation

In addition to collecting data on community occurrences, interviews with land managers, foresters, and local ecologists resulted in information used by the evaluator to subjectively assign an overall rank to each managed area or other large block of forest (both defined as subunits) in Louisiana, Mississippi, Arkansas, and Tennessee (Appendix 10). Figure 9 shows the relationship of managed areas with forest cover. This information was considered when assessing the restorability of Migratory Bird Areas (i.e., higher quality forest blocks provide a more favorable "nucleus" for the restoration of the surrounding landscapes) and to aid in the evaluation of viability for point-based occurrences of conservation targets. Specifically, these ranks considered:

- Size: total area of the subunit
- Percent forest: amount of forested area relative to total area
- Landscape context: position of subunit relative to other forested blocks and condition of surrounding land
- Located within Phase I site (sites selected earlier by TNC as areas of high priority for conservation, see Assembling the Portfolio, below): (Y/N)
- Existing condition: general condition of vegetation with regard to past and present management
- Predicted future management: assessment of quality impacts of future management based on knowledge of local conditions and agency policies
- Hydrological context: degree of hydrological alteration effects on vegetation and ecological processes

MSRAP Restoration Model

Acting on the knowledge that migratory birds have experienced precipitous declines in MSRAP in large part due to widespread forest fragmentation, conservation partners throughout MSRAP participated in the development of the Mississippi Alluvial Valley Bird Conservation Plan, spearheaded by Partners in Flight, the Lower Mississippi Valley Joint Venture, and the Western Hemisphere Shorebird Reserve Network. One objective of the plan was to define breeding habitat needs for sustained, source populations of three guilds of high priority forest bird species requiring 4,000, 8,000, and 40,000 ha (See Appendix 6 for methodology). The plan identifies 101 MBAs targeted for restoration and protection. MBAs are generally characterized by a nucleus of relatively large, contiguous habitat and by high potential for restoration based on flooding regimes and knowledge of landowner intent. To further define restoration priorities based on landscape criteria, Twedt and Uihlein (in press) used GIS technology to incorporate landscape features thought to influence avian population viability in MSRAP (see Table 3.4 and Figure 10). Landscape features considered were 1) distance from existing forest; 2) distance from forest core habitat; 3) proportion of landscape occupied by forest cover; and 4) mean forest patch size within the landscape. Raster-based digital data were used to assess the reforestation priority of each hectare within the MSRAP. Five theme rasters, based on 11 information layers were created that established the relative suitability of non-forested lands for reforestation based on their contribution to the hypothesized needs of forest breeding birds. These data were then amalgamated into a single raster which was further modified by present and historical conditions to yield reforestation priorities targeted to enhance breeding conditions for forest breeding birds. Of course, this analysis only provides restoration priorities based on the existence and juxtaposition of forest patches. It is widely recognized by the conservation team that issues of habitat quality are important to consider when establishing objectives for bird conservation.

Not only are data provided by the MSRAP restoration model critical for identifying existing and restorable habitat blocks for forest breeding birds, but they also identify areas of critical importance for *Ursus americanus.* The U.S. Fish and Wildlife Service Recovery Plan for *U. a. luteolus* suggests that large contiguous blocks of habitat of at least 40,000 ha are thought to be important for denning and establishment of a home range. Also important to black bear are opportunities for dispersal and foraging. Forested landscapes represent a more “permeable” matrix (compared to those dominated by agriculture) where these processes are supported. Adherence to restoration guidelines described by the MSRAP restoration model will help ensure that this permeable matrix is strategically restored, thus facilitating the restoration of black bear populations.

In addition to meeting minimal habitat requirements for migratory birds and black bear, the forests occurring in the restoration/protection zones identified through these analyses will presumably withstand typical disturbance events such as tornadoes or wind storms in the northern reaches of the ecoregion and hurricanes in the south. They are also large enough to presumably maintain the internal ecological processes of these systems (e.g., tree fall gap dynamics). While no good data exist to scientifically validate these size thresholds, it is generally agreed that forested landscapes, 4,000ha in size or greater, and stratified throughout the ecoregion, are adequate for mitigating and supporting both internal and external disturbance events.

Watershed Analysis

Forest fragmentation and hydrologic alteration are extensive in MSRAP. In 1879, a concerted flood control effort began in MSRAP with the establishment of the Mississippi River Commission. The Commission's flood control functions were assumed by the U.S. Army Corps of Engineers after the great flood of 1927 and the passage of the 1928 Flood Control Act (MacDonald et al. 1979). Since that time, one of the world's most comprehensive flood control systems has been developed along the Mississippi River and its tributaries, consisting of some 4,300 miles of levees. As a result, mainstem flooding of the ecoregion has been virtually eliminated, and tributary flooding has been reduced by approximately 90% (Galloway, 1980). In addition, channels have been cut and rivers straightened in order to improve drainage of the hydric soils that are characteristic of the vast majority of the landscape, thus reducing localized ponding due to rain events by some 90% (pers. comm., Charles Baxter, US Fish and Wildlife Service). MSRAP’s elaborate system of levees and drainage projects has created increased

Table 3.4
MSRAP Restoration Model

- From Twedt and Uihlein, in press

Using data on current forest cover, the first theme raster depicted linear distance from existing forest habitat, with restoration values declining as distance from forest cover increased. However, because contiguous forest of a minimum area is required to support breeding bird populations, reforestation adjacent to small, isolated forest fragments is of lesser "value" than reforestation next to larger forest fragments. On the other hand, reforestation that enlarges forest patches beyond the maximum forest habitat objective (i.e., >40,000 ha) may be superfluous. Thus, the second theme depicted the distance from forest fragments that were >1,012 ha but <40,000 ha.

Although bird conservation goals are often stated as area of contiguous forest, in reality, forest interior, or core, is often the limiting factor. After delineating forest core habitat (defined as forested habitat >1km from agricultural, urban, or pastoral habitats), the distance from forest core habitat was determined as the third theme. Again, reforestation nearer to forest cores was given precedence.

Theme four reflected the proportion of the landscape occupied by forest cover when considered at four different scales (50,000, 100,000, 150,000, and 200,000 ha). Because Robinson et al. (1995) found increasing nest success within landscapes as the proportion of forest in the landscape increased to circa 65%, reforestation was assumed to have increasingly greater conservation value as forest cover increased from 0% to $\leq$65% but decreasing thereafter up to 100%.

Mean forest patch size within the landscape is also important to forest breeding birds because of its relationship with nestling mortality. Therefore, the mean size of contiguous forest patches was determined, again at four different landscape scales. The mean forest patch size over all landscape scales was depicted in theme five. Reforestation within landscapes containing larger forest patches was given greater priority.

These five themes were combined using a weighting system that gave highest priority to existing forest cores, larger forest patches, and moderately forested landscapes:
RV=[(Forest)+(2*Patch)+(3*Core)+(2*Percent)+(Area)]/9
RV = reforestation value,
Forest = distance from all existing forest (Theme 1),
Patch = distance from forest patches between 1,012 and 40,000 ha (Theme 2),
Core = distance from forest cores <5,200 ha (Theme 3),
Percent = "adjusted" percent forest cover in landscape (Theme 4), and
Area = mean forest patch size in landscape (Theme 5).

Existing forest, open water, and urban areas were removed before determining the distribution of reforestation priorities (Fig 10). Finally, reforestation priorities were adjusted by giving increased priority to more recently cleared lands and to lands under public ownership.

Rationale for restoration analysis

- From Brown and Twedt, in press

Loss and fragmentation of North American breeding habitat are thought to be the primary reasons for population declines in bird species (Faaborg et al. 1995). The results of landscape fragmentation are well documented. Not only is overall habitat acreage reduced, but so too are mean forest tract size and the amount of associated interior, or core, habitat. These changes are often accompanied by an increase in habitat isolation and an increase in edge and edge effects (Saunders et al. 1991). The demographic effects of fragmentation (e.g., reduced nesting success due to increased crowding or increased mortality due to increased nest predation) are often cited as the primary causes of density declines in forest fragments (Holmes et al. 1996; Van Horn et al. 1995; Hagan et al.1996). However, these localized effects are strongly influenced by characteristics of the associated landscape such as the history of fragmentation and the distance and degree of connectivity among forest tracts (Hagan et al. 1996; Saunders et al. 1991; Robinson et al. 1995). Thus, although forest breeding bird responses to habitat fragmentation are species-specific and related to such factors as physiology, habitat selection, dispersal capabilities, predation, parasitism, and competition, they are influenced by factors at multiple scales. Recognizing these underpinning influences on breeding forest bird populations is critical to restoring and managing fragmented landscapes. Increasingly, researchers are understanding the scale-dependency of bird responses, recognizing that sub-populations of some species may collectively function as metapopulations across landscapes (Trine 1998; Robinson et al. 1995; Brawn & Robinson 1996; Roth & Johnson 1993; Gale et al. 1997). That is, local population extinctions may occur in fragments below some size threshold (population sinks). Recolonization of these fragments may depend on their proximity and connectedness to other fragments where survival exceeds mortality (population sources). These factors were all taken into consideration in the development of the MSRAP Restoration Model (Twedt and Uhlein, in press).

In the last decade there has been a concerted effort by landowners and conservation agencies and organizations to restore this landscape. Incentive-based federal programs like the Wetlands Reserve Program (WRP), Conservation Reserve Program (CRP), and Partners for Wildlife have, since 1992, facilitated the restoration of approximately 500,000 acres in the three-state area of Louisiana, Mississippi, and Arkansas. Hydrologic restoration and reforestation are typical activities carried out on tracts within these programs. These efforts will no doubt result in improved water quality, increased habitat availability, and more stable hydrologic regimes.

The watershed analysis essentially considers historic alterations and presumed future conditions simultaneously. Three factors were analyzed through GIS for each HUC in the ecoregion (Figure 11):

- percentage forest cover;
- restoration opportunity (percentage restored through federal programs and HUCs with high potential for restoration given restoration model results); and
- degree of channelization as determined through sinuosity of HUC streams (ratio of straight distance between endpoints to length of actual segment).

These factors were assigned equal weights and integrated into an overall score of watershed integrity for each HUC in the ecoregion (Figure 11). This information aided in the identification of relatively intact watersheds, within which aquatic systems targets are potentially located.

Table 3.5
Summary of Targets, Data Sources, Viability Considerations

Coarse Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
Migratory Birds	4,000ha Migratory Bird Area (MBA) 8,000ha MBA 40,000ha MBA - I.D. through TM landcover	MSRAP Restoration Model
Terrestrial system (Matrix-forming Communities)	4,000ha MBA 8,000ha MBA 40,000ha MBA - I.D. through TM landcover Surface geology (surrogate)	MSRAP Restoration Model
Aquatic system (stream segments within "intact" HUCs w/ varying substratum)	USGS 8-digit HUCs Hydrography TM landcover Surface geology	Watershed Integrity Index
Wide ranging mammals	40,000ha MBA Element Occurrence Records	MSRAP Restoration Model
Intermediate Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
Plant Associations	Biological Conservation Database Rapid Ecological Assessment	Element Occurrence Ranks Managed Area Assessment(where applicable)
Local Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
G1-G3 plant and animal spp and those of special concern	Biological Conservation Database	Element Occurrence Ranks

3.2.3 Establishing Conservation Goals – rationale for number and distribution

After determining the targets that should be considered in the ecoregional plan, technical teams determined goals, or the number and distribution of occurrences that are presumably needed to ensure representation and persistence of each element over the foreseeable future (100 years). Due to the relative homogeneity of this ecoregion, a latitudinal stratification of the ecoregion into a north, central, and southern zone was thought to be adequate in addressing the full range of variability for most targets over their range (Figure 12).

<u>Coarse Scale Targets</u>

Migratory Birds

For a complete discussion of how goals were established for migratory birds see Appendix 6. In summary, a six-step process was utilized by the Mississippi Alluvial Valley Bird Conservation Plan team that included:

- establishing species priorities
- establishing habitat priorities
- identifying habitat requirements of species groups in priority habitat(s)
- determining the extent and location of existing habitat
- setting site specific habitat objectives (including restoration goals)
- setting population goals

While 101 MBAs (i.e., potentially restorable metapopulations) are identified in this plan, the MSRAP ecoregional planning team established a more conservative goal of 73 MBAs stratified across the ecoregion: 10, 4,000ha tracts in north, central and south zones; 10, 8,000ha tracts in north, central and south zones; all existing 40,000ha tracts.

Large Wide-ranging Mammals

A USFWS recovery plan for *Ursus americanus luteolus* has been developed which addresses restoration goals for this species. Four populations within this ecoregion have been targeted for restoration – one in the Tensas River Basin in north Louisiana, two in the Atchafalaya in south Louisiana, and one in the Yazoo Basin of Mississippi. One additional population of *Ursus americanus* (*americanus*) is located in the White River system in Arkansas. The taxonomic status of the Arkansas population has not been sufficiently resolved. A minimally viable population has been defined as consisting of between 120-150 individuals with evidence of dispersal (one male per generation). None of the *U.a. luteolus* populations is currently considered minimally viable but they are the focus of ongoing restoration and, in the case of the Yazoo population, repatriation. Five sites of at least 40,000 ha (considering restoration) have been identified for this target. These tracts coincide with MBAs and lie within optimal landscapes, suitable for facilitating dispersal and foraging needs for this species.

Terrestrial Systems – Matrix-forming Communities

In addition to expressing goals for individual matrix communities as a number, the team also established goals for each terrestrial system (i.e., assemblage of matrix-forming communities) based on a consideration of the historic distribution and extent of the system. For each system type, the percentage of its historic extent was calculated as a measure of surface geology and then compared to its current extent within sites selected for other targets (see Figure 6 and Table 3.1 for a further description of this analysis). As is true for the other coarse/regional scale targets, it should be emphasized that, in order to meet goals, a significant restoration effort will be required within sites.

Aquatic Systems

Although the majority of the MSRAP zoological targets are aquatic, and most sites based on other coarse/regional scale targets will no doubt capture multiple imbedded aquatic systems, the zoology team felt that the plan might miss a significant component of aquatic biodiversity unless coarse scale aquatic targets were explicitly addressed. MSRAP is primarily an alluvial landscape that is relatively homogeneous. Thus, the limited list of aquatic targets included headwater streams, small order streams and bayous, mid-sized streams and bayous, large rivers, and large ox-bows that receive periodic recharge via sheet flow or channel.

The first step in identifying aquatic targets involved expert input on known, high-quality stream segments – analogous to "no regret" Phase I terrestrial sites. In total, eight mid-sized streams were identified, primarily in the northern and central strata. Many of these streams originate in the adjacent uplands and traverse through MSRAP before joining alluvial tributaries.

To help further guide the identification of potential aquatic systems, a watershed integrity analysis was performed (see viability discussion above) to identify HUCs with the least amount of disturbance and, therefore, the best hope for locating high quality or feasibly restorable targets. Underlying geology and latitudinal stratification were also integrated into the selection process to include variable substrates in these provisional aquatic sites. In total, three provisional aquatic sites were identified as delineated by high quality HUCs. These are characterized by the spectrum of surface geology classes present within the ecoregion and are stratified latitudinally across the ecoregion. Identification of the actual stream segments for each target will be determined during the site conservation planning process.

Proposed goals for each aquatic target within each HUC-defined system are:

- Headwater streams – ten in each identified HUC-defined system
- Small streams – five in each identified HUC-defined system
- Mid-size streams and bayous – three in each identified HUC-defined system
- Large rivers – one in each identified HUC-defined system
- Large oxbows – three in each stratification zone

Appendix 8 provides a more complete explanation for the rationale behind assigning goals. Figure 8 shows all aquatic targets and provisional sites for identify aquatic targets.

Table 3.5
Coarse Scale Targets and Goals
for the Mississippi River Alluvial Plain

I. MIGRATORY FOREST BIRDS		
10,000-acre bird guild	10 populations per subregion as represented by MBAs	Migratory bird areas (MBAs) determined with conservation partners and represent protection/restoration zones to achieve three acreage goals.
20,000-acre bird guild	10 populations per subregion as represented by MBAs	
100,000-acre bird guild	all	
II. TERRESTRIAL SYSTEM*		
Meander belt	33% of total area contained within site boundaries	
Backswamp	20% of total area contained within site boundaries	
Valley train terrace	28% of total area contained within site boundaries	
Stream course/abandoned channels	7% of total area contained within site boundaries	
Crowley's ridge	2% of total area contained within site boundaries	
Deltaic plain levee	2% of total area contained within site boundaries	
Lacustrine	1% of total area contained within site boundaries	
Sand dune field	1% of total area contained within site boundaries	
Prairie alluvium	4% of total area contained within site boundaries	
Salt marsh	1% of total area contained within site boundaries	
III. AQUATIC SYSTEM		
1. Expert-identified high quality stream segments	avo	
2. HUCs with high watershed integrity score		
HUCs characterized by spectrum of surface geology classes		
Within HUC boundaries, the following will potentially be identified:		
Headwater streams	10	
High-order streams	5	
Medium order streams	3	
Large order stream	1	
3. Disconnected, large oxbows per stratum	3	
IV. LARGE WIDE RANGING MAMMALS		
Ursus americanus luteolus	4 populations	
Ursus americanus americanus	1 populations	

*Goal was determined by calculating historic proportion of surface geology across the ecoregion and using this figure as a benchmark for desired future condition within site boundaries. As with all coarse scale targets, significant restoration will be required to achieve goals.

Intermediate Scale Targets

The community ecology team set goals for all community targets based on :

- GRANK. All G1 – G5 communities occurring in MSRAP were considered.
- Overall distribution (Endemic/Limited, Widespread, Peripheral) of the target within MSRAP relative to total distribution.
- Pattern of landscape occurrence (matrix/ large patch/small patch).

In general, a greater number of occurrences was deemed necessary for less common communities (high ranked; G1-G2) and for communities that are endemic or limited in distribution. More common communities (lower ranked; G3-G5) and those with a more widespread or peripheral distribution were generally assigned a lower goal number. Goals were stratified across the ecoregion (north, central, and south strata) as appropriate given the distribution of a particular community target. The following guidelines provided a starting point for discussion. However, goals were shifted upward or downward based on the team's judgement of what is needed in this ecoregion given a variety of unique issues such as restoration potential, historic abundance, and potential threat given cultural influences (e.g., riparian communities).

- G1 and G2 communities: all viable (EORANK of A,B,C,AB,BC,AC) occurrences. Consider restoration potential.
- G3: 30 viable if endemic or limited; 15 viable if widespread; 5-10 if peripheral or disjunct, depending on its occurrence in other adjacent ecoregions.
- G4 – G5: 30 viable if endemic or limited; 15 viable if widespread; 5-10 if peripheral or disjunct, depending on its occurrence in other adjacent ecoregions.

Appendix 11 provides a complete list of all community targets and their rank, spatial pattern, size type, and goal.

Local Scale Targets

The team adopted recommended criteria from work done by the East Gulf Coastal Plain ecoregional planning team. Goals ranged from all viable occurrences for G1 and T1 taxa to lesser numbers for more common or wide ranging species, assuming that more common elements with distributions across multiple ecoregions will be captured in other ecoregional portfolios. The goals were determined through best professional judgement in most cases and will likely be revised in the future as population viability analyses for a target species provide more concrete guidelines on minimum numbers needed to ensure long-term viability. Conservation goals for plant and animal species included a consideration of global rank, viability, and the proportion of the taxon's range (areal extent and abundance) falling within MSRAP:

- G1 and T1 taxa – conserve all viable populations (EORANK of A,B,C,AB,BC,AC) with a goal of obtaining at least five via restoration, reintroduction, etc. if five viable populations do not currently occur and the goal of five is deemed obtainable given the current situation, historic distribution, etc.

- G2 and T2 taxa – conserve all viable populations (EORANK of A,B,C,AB,BC,AC) if species is endemic to MSRAP. Conserve 12 viable populations if it is estimated that < 90% but >75% of a target's range (i.e., limited distribution) is within MSRAP. Conserve eight viable occurrences if <75% of a target's range is estimated to be within MSRAP. If those goals cannot be achieved using currently viable populations, consider restoration, reintroduction, etc. to eventually conserve a minimum of five viable populations.
- G3 and T3 taxa – conserve 10 viable populations (EORANK of A,B,C,AB,BC,AC) if the species is endemic to MSRAP or if it is estimated that >75% of its range (i.e., limited distribution) is within MSRAP. Conserve five viable occurrences if <75% of its range is estimated to be within MSRAP.
- G4/G5 and T4/T5 taxa – conserve 5 viable populations (EORANK of A,B,C,AB,BC,AC) if the species is endemic to MSRAP or if >75% of distribution is within ecoregion (i.e., limited distribution). Conserve up to 5 A-ranked occurrences if <75%of distribution is within ecoregion.

In addition, the teams considered how goals should be stratified across the ecoregion (north, central, and south strata) considering the rangewide distribution of the target in question. Appendices 12 and 13 provide a complete listing of all species targets and goals.

3.3 Selecting occurrences and assembling the portfolio of sites

3.3.1 The Assembly Framework

Through ecoregional planning, The Nature Conservancy is attempting to identify the sum of conservation sites (the portfolio) that will, through protection or restoration activities, collectively conserve an ecoregion's biodiversity (systems, communities, and species). As outlined in the previous sections, this requires not only a look at patterns of biodiversity but also a consideration of viability given the presence or restorability of sustaining ecological processes. Thus, the portfolio should incorporate the following factors:

1. Functionality: Sites must maintain the size, condition, and landscape context of the target(s) under consideration.
2. Coarse scale targets: First capture all coarse scale targets (including ecological systems, ecological communities, and coarse scale species) in the ecoregion, including those that are feasibly restorable.
3. Environmental gradients: Capture examples of the coarse scale targets across the diversity of environmental gradients inherent in the ecoregion (in MSRAP, latitudinal stratification into north, central, south).
4. High quality occurrence: Give priority to high quality occurrences of targets in building a portfolio. Where no or too few high quality occurrences exist, select feasibly restorable occurrences.
5. Efficiency: Give priority to occurrences of coarse scale ecological systems with multiple embedded targets and co-occurrences of intermediate and local scale targets.
6. Integration: Give priority to co-occurrences of high quality coarse scale terrestrial and coarse scale aquatic targets for inclusion in the portfolio.

7. Completeness: Capture all other intermediate and local scale targets where functional sites exist or are feasibly restorable.

Building on these guidelines, the MSRAP team developed assembly rules which emphasized two fundamental principles: 1) building in viability/restorability at every step with an emphasis on landscape context, and 2) selecting occurrences in a step-wise, nested fashion so that selected finer scale targets are imbedded within more intact landscapes identified through the assessment of coarse scale targets and processes.

3.3.2 Assembly Sequence and Rationale

In building the portfolio, emphasis was first placed on coarse scale targets. In MSRAP, these are identified as matrix-forming communities (thought to be contained in large forest blocks), intact aquatic systems, migratory birds, and wide-ranging mammals. Migratory Bird Areas (MBAs) were first identified in the portfolio design process. MBAs represent large (4,000 ha or greater) landscapes that are considered viable or potentially restorable. Again, not only do MBAs represent required habitat for migratory birds and black bear, but they are also assumed to serve as a coarse filter for matrix communities.

In addition, Phase I sites, or “no regret” sites given their relatively high degree of functionality or restorability, were mapped (Figure 13). Early in the ecoregional planning process, eight sites were identified as Phase I sites. These are considered to be “no regret” sites as they have high biodiversity value and a high probability of long-term viability given their landscape context. These sites are: Cypress Island, LA, Atchafalaya Basin, LA, Tensas Basin, LA, Big Woods, AR, Pondberry sites, AR, Hatchie River, TN, West Tennessee Migratory Bird Focus Area, TN, and Lower Yazoo Basin, MS. Not surprising, all occurred within the boundaries of MBAs. These large functional landscapes provided the backdrop within which point based occurrences (i.e., plant associations and plant and animal species) and the aquatic targets (e.g., large oxbows and stream systems) would ideally be selected.

Our point-based analyses began with the selection of expert identified (i.e. EOs or ProtoEOs) viable matrix communities, then large patch communities, small patch communities, and finally, species and aquatic target occurrences. This approach allowed us to identify and protect target occurrences that are in a clustered configuration and embedded within functional landscapes. The viability of more isolated occurrences was considered on a case-by-case basis. The following outlines the steps followed in the portfolio assembly process.

Step 1: Identify intact forest blocks (habitat required for migratory birds, black bear; coarse filter for matrix communities; contain Phase I sites)
Step 2: Analyze EOs and Proto-EOs At Phase I Sites. In this phase of the analysis, all viable occurrences for community and species targets within Phase I were selected and defined as “Phase I” occurrences.
Step 3: Analyze all irreplaceable occurrences. If the goal for a particular target was not met in Step 2, the Phase I analysis, other occurrences were then reviewed to determine their potential for inclusion in the portfolio. Occurrences within MBAs were given priority. In those instances where the number of occurrences throughout the ecoregion was insufficient to meet the goal for

that target, *any* viable occurrence of that target was tagged for inclusion in the portfolio – even if it did not occur within a larger landscape – and was defined as "Irreplaceable." Optimally, these occurrences *do* coincide with sites defined by coarse scale targets (i.e., birds, aquatics) as it is assumed that this helps assure a greater likelihood of long-term viability. Viability of more isolated occurrences was considered on a case-by-case basis.
Step 4: Analyze remaining EOs and proto-EOs for inclusion in the portfolio. Viability, as predicted through EORANK, was the primary consideration when selecting occurrences. However, other factors that influenced the ultimate selection included an assessment of whether or not the occurrence was within an MBA or other high quality subunit. Occurrences identified in this step were defined as "Selected" occurrences.
Step 5: Using expert input, identify high quality stream segments and oxbow lakes. These were ideally located within Phase I sites or MBAs.

After target occurrences were identified, site boundaries were delineated. It was often the case that, given the assembly sequence, large functional/restorable sites or landscapes were delineated. However, there are several smaller sites identified as well, based on the occurrence of intermediate or local scale targets and only a few occurrences. In these cases, simple buffers or, in the case of aquatic elements and high-quality stream systems, buffered stream segments, were drawn around the targets to define site boundaries. In all, 54 sites were identified through the assembly process (Figure 3).

Because of the general lack of data across the ecoregion, some attempt was made, through GIS analysis, to identify sites requiring further consideration. These were termed "provisional sites." As noted earlier, an assessment of underrepresented and/or unique soil/surface geology relationships was performed. Additionally, higher quality HUCs were identified based on the assumption that these hold the greatest promise for identifying viable examples of aquatics targets.

Appendix 1 lists all selected occurrences within each of the 54 portfolio sites.

Chapter 4
Conserving Biodiversity in MSRAP

In order to ensure biodiversity conservation across the ecoregion, it is necessary to recognize the stresses and sources of stresses (collectively referred to as threats) that could impact the long-term viability of the conservation target(s) at portfolio sites. Many threats to targets in MSRAP result from past disturbances (e.g., hydrologic alteration, deforestation). In some cases, the effects of these stresses may be within a normal range of variability for the given target and presumably pose no threat. However, in some cases, key ecological processes have been so severely altered that they require restorative action. Only sites containing targets that are thought to be feasibly restorable are included in this portfolio. Some potential threats – including major water projects – that could be very devastating to targets, require pre-emptive action. Whatever the type of threat, it is clear that the conservation of biodiversity in MSRAP requires a coordinated approach and an enormous commitment of resources by conservation partners throughout the ecoregion.

4.1 Major Threats

Each portfolio site will undergo a detailed threats assessment as part of a site conservation planning process. However, five major threats were identified as having the potential to impact the long-term viability of target occurrences across many sites in the ecoregion:

- altered flow regimes
- habitat loss and fragmentation
- habitat alteration
- decreased water quality (nutrient enrichment, sedimentation and toxic runoff)
- direct take

<u>Altered Flow Regimes</u>

The original forested wetland ecosystem of the Mississippi River was a product of the hydrologic regime of the river and its tributaries. Storage volumes, flood frequency, duration, depth and timing, flow velocities, soil saturation and infiltration rates all strongly influence the biogeochemical processes of the system. Because one of the world's most comprehensive flood control systems has been developed in MSRAP, these natural processes have been extensively altered. The cumulative affects of ecoregion-wide *channelization, levee construction, dam building, irrigation and navigational projects* have led to major changes in the hydrologic regime over much of the system. These are manifested in a variety of ways.

For example, the batture (i.e., land between levees) is subject to increased flooding depths, duration and velocity as seasonally high flows are confined within levees instead of spreading across the floodplain. Outside of the batture, extreme flood flows have been virtually eliminated, as have the associated processes of nutrient enrichment of high terraces and the constant reworking of the floodplain topography. Levees constructed on smaller bayous and streams have likewise restricted floodwaters to natural channels.

In turn, these bayous are often dredged and channelized to speed flow downstream. While many drainage projects are maintenance-related and implemented by drainage districts, some new agriculture-related projects are being constructed by private landowners, often times without permits or under the blanket, Nationwide 26 permit. In any case, cumulative impacts of such activities are often not considered by permitting agencies.

Upstream impoundments, or dams, are typically built on large rivers and are designed to provide hydropower and flood control. Dams have altered the timing and quantity of flow in some of the ecoregion's downstream tributaries. In the White River, for example, the operation of seven upstream reservoirs has required the late release of winter and spring floodwaters. Consequently, flood stages downstream extend into late spring and early summer, with reduced amplitudes during peak flow and heightened amplitudes during low flow events. Smaller dams (e.g., PL566 projects) are few, and impacts from these structures are highly localized.

Proposed navigational projects on the White and Ouachita Rivers pose a big threat to the integrity of these rivers, their associated bottomland hardwood forests, and other elements of conservation concern (e.g., interior least tern). Bend cuts, lock and dam systems, channel deepening, and bank stabilization all contribute to altered river flood stages and discharge volumes and, thus, flooding regimes in the associated floodplain. In addition, in-stream habitat (e.g., sandbars) is often lost to higher river stages.

Finally, irrigation for agricultural production is common throughout the ecoregion. Water is commonly diverted from bayous to farm fields or pumped from groundwater reserves, which are especially limited away from big rivers. Bayous are often pumped dry and there are some areas where reliance on groundwater is especially high (e.g., rice farming on the Grand Prairie). There is currently a proposed irrigation project that will divert water from the White River for rice production on the Grand Prairie. There are no laws to regulate pumping by farmers although, in some places, authority has been established to set up an allocation system in the event of an emergency. Where water conservation plans are in place, they rely heavily on the development of reservoir systems. Recycled water is, in these cases, high in sediments and chemicals.

<u>Habitat loss and fragmentation</u>

Habitat conversion and fragmentation, while no longer happening at the rate or magnitude that it once did, still pose a considerable lingering threat to biodiversity in MSRAP, a threat that is being aggressively addressed through a variety of restoration programs. However, some current activities – *land clearing for urban development, gravel mining, beaver dams, road building, establishment of food plots, and ditch construction* – also contribute somewhat to the loss and/or fragmentation of habitat for some species of concern.

Perhaps the most widespread activity that contributes directly to habitat loss is the clearing of streamside and in-stream vegetation for channel maintenance. Continued ditching contributes to the direct loss of in-stream habitat.

In some areas (e.g., Crowley's Ridge and the Hatchie River), there is increased pressure for urban development, and in the case of Crowley's Ridge, gravel mining. Because Crowley's Ridge has not been subject to the erosional forces of big river systems, deep gravel beds can be found here.

Beavers have also profoundly affected habitat availability for many targets in MSRAP. They are ubiquitous throughout the ecoregion and because so much of their habitat has been lost, populations are more concentrated than they were historically. Also, because some of their natural predators have been lost from the system, populations are not in balance. Because beavers impound water, there are many places in MSRAP where managers are having a difficult time achieving habitat and management goals.

Many of the roads that are under construction are small access roads. For the time being, the major road construction projects (e.g., Highway 69) appear to pose little threat to portfolio sites as conservation interests have worked diligently for rerouting (e.g., avoiding Big Island). While larger roads contribute more substantially to habitat fragmentation, noise, and the spread of exotics, the cumulative effect of smaller roads can also be negative.

Clearing forests to plant food plots is a common practice for attracting deer and providing a supplemental food source. Because food plots can approach several acres in size, the problems typically associated with increased edge habitat – increased parasitism and predation – are prevalent with this management practice.

<u>Habitat alteration</u>

While outright habitat loss is less prevalent than it once was, the remaining forest and other habitat types in MSRAP are subject to changes in structure and composition through such things as *silvicultural practices (historic and current), the lack of fire, water temperature changes from dams, salinization, impounded water and exotics*.

Through the years, awareness about the need for environmentally sustainable silvicultural practices has increased among foresters and wildlife managers in the ecoregion. In fact, many of the present day forests that are in public ownership reflect past management (e.g., highgrading and diameter limit cuts) practiced by large timber companies that have since left the valley. Across the ecoregion, young forests with very little vertical structure and a bias toward mast-producing (oak) species are prevalent. Many practitioners are attempting to remediate the effects of past management. However, some ongoing practices continue to place pressure on existing forests and compromise their ability to provide quality habitat for many species of concern. Clearcutting, highgrading, shorter rotations, intensive site preparation, and extensive roads can still be found in many places, both public and private. In general, industrial lands are turning to shorter rotations and more intensive cutting. Non-industrial privately-owned timberlands are sometime subject to clearcutting. Cypress mulching is increasing in some places and, while the effects on harvest intensity are unclear, chip mills are more common.

Another common practice in MSRAP is the impoundment of water for the establishment of green tree reservoirs (GTRs). GTRs provide considerable habitat for waterfowl and are ubiquitous in the ecoregion, given its importance as a flyway. While GTRs can be managed to lessen the impacts of impounded water on vegetation, it is sometimes the case that water is not removed efficiently or requires pumping. As a result, regeneration of overstory species is reduced or, in extreme cases, vegetation will die completely. In addition, GTRs are known to attract beaver problems.

Exotic plant species can be aggressive invaders in alluvial forests, particularly on sites that have undergone various types of disturbance. The most troublesome are trees and shrubs (e.g., Chinese tallow tree) that replace native vegetation. Japanese honeysuckle is a vine that can dominate the understory even in relatively mature forests and kudzu can be locally abundant on edges and uplands. Loblolly pine is an offsite native strongly favored for silvicultural purposes on sites that have been effectively drained and are the species of choice for many landowners enrolled in the Conservation Reserve Program. It is now possible to see loblolly invading and altering the composition of nearby hardwood forests. While not currently considered to be a threat, some aquatic exotics including zebra mussels and bighead carp have been recently introduced in the ecoregion. Also, water hyacinth and hydrilla are major nuisance species in aquatic systems in the southern portion of the ecoregion.

Though not common across the ecoregion, habitat alteration resulting from fire suppression, water temperature changes, and salinization is a noteworthy threat in some areas. Fires were not common in the bottomlands of MSRAP, however, fire was an important ecological process on upland sites. As in many places, prescribed burning has been difficult to accomplish, especially on those sites juxtaposed to human populations. The construction of dams for hydroelectric power and flood control has resulted in water temperature changes in some river stretches, thus affecting some aquatic species. Also, water level changes have occurred in the Mississippi and other big rivers in the ecoregion (e.g., Arkansas), limiting the availability of sand bars for nesting species (e.g., interior least tern). And, in some places, soil salinization has resulted from application of irrigation water to farm fields.

Decreased Water Quality

The most significant impacts to water quality in MSRAP result from nonpoint source pollution associated with runoff from *farming* operations. Additional sources of water quality problems include sedimentation from *gravel mining* and *sand dredging* and to a limited extent, *run-off* from industrial operations.

The last decade has witnessed a noticeable increase of environmentally-friendly farming practices in MSRAP. Dire economic conditions and an increasing sensitivity to the environmental benefits of conservation farming practices have encouraged farmers to employ low- and no-till farming methods and precision application of chemicals, for example. Improved drainage structures on many farm fields have reduced the delivery of sediments to drainage ditches, however, many fields lack such structures. Unfortunately, in some places, fertilizer and pesticide use is rising. So, while improvements in methods and materials have been made in some places, water quality problems are still widespread and pose a serious threat to many of the species of conservation concern to MSRAP.

<u>Direct take</u>

Human-induced mortality can be particularly damaging to threatened populations of long-lived species that have low reproductive rates. Direct human take was probably more responsible than loss of habitat in the eradication or reduction of large carnivorous mammals like the black bear, red wolf, and Florida panther. The only remaining large mammal, the black bear, continues to suffer from poaching, roadkill, and other negative bear/human interactions. Several other species, including many mussels and the alligator snapping turtle, are also potentially threatened due to poaching and collection by humans.

4.2 Multi-site Strategies and the Role of Partners

Table 4.1 provides a detailed summary of strategies that can help abate existing and potential threats to portfolio sites. Currently, there is a tremendous emphasis on accomplishing conservation through partnerships in MSRAP. The Natural Resources Conservation Service, through its agricultural incentive programs, has restored hundreds of thousands of acres of marginal agricultural lands in this ag-dominated landscape, typically working with private and other public partners to leverage limited resources. The U.S. Fish and Wildlife Service, with partners such as the Conservancy, has acquired hundreds of thousands of acres and the Service's Partners for Wildlife program has successfully restored thousands of acres. The Lower Mississippi Valley Joint Venture has provided tremendous leadership in building public and private support for conservation efforts in MSRAP. And, there are multiple other examples across the ecoregion where private and public agencies including state water quality and wildlife agencies, USEPA, the Corps of Engineers, and USGS are providing resources and expertise to implement protection and restoration strategies on key tracts. Partners have worked hand-in-hand to develop conservation blueprints, including this ecoregional plan, to guide these activities and have influenced public programs to consider guidance provided by these plans when allocating resources. For example, agricultural fields located within priority restoration zones (i.e., MBAs, black bear occupied habitat) currently receive greater points in the weighting scheme for the Wetlands Reserve Program in Louisiana and Arkansas. Priority watersheds for EQIP and WRP have, in part, been designated based on habitat needs for species of concern.

While past and ongoing efforts have accomplished a great deal in MSRAP, partners must continue to explore new opportunities for implementing conservation strategies since an enormous amount of work remains to be done. The strategies listed in Table 4.1 suggest working with partners to:

- implement on-the-ground strategies (e.g., restoration, Best Management Practices (BMP) implementation, acquisition of fee or easements);
- influence national and regional policies that favor protection and restoration of resources;
- collect and disseminate data that provide ecological and economic insights, and;

- integrate planning efforts of all conservation agencies and organizations.

4.3 The Role of Community Based Conservation

While suggested strategies require working through various venues at a variety of scales (nationally, regionally, and locally), the Conservancy has become firmly convinced that long-term conservation of sites often requires a constant local presence. For this reason, The Nature Conservancy has established several positions throughout the ecoregion, from southern Illinois to southern Louisiana, with personnel living and working in local MSRAP communities. At these key places, staff are actively engaged with resource stakeholders, community leaders, and local conservation interests to implement site-based strategies that will ensure the long-term protection of conservation targets at those sites while integrating local needs and concerns.

Table 4.1
Multi-sites threats and strategies in MSRAP

Stress	Source of Stress	Strategies
I. Altered flow regime	1. Channelization (ongoing and potential)	1. Prioritize efforts based on ecoregional sites. 2. Find other economic alternatives (e.g., WRP, CRP) to row crop agriculture 3. Encourage BMP implementation to help with sedimentation problem. 4. Investigate Forest Legacy program (federal program, state-administered). State develops a plan for management of forest lands and acquires easements.
	2. Dams	1. Develop comprehensive plan for White River that addresses all hydrologic issues; look at alternatives and various management scenarios with goal being to move toward more natural hydrograph. Increase funding for study. 2.Explore possibility of FERC relicensing to address problem. 3. Work w/ groups/licensing agencies to prevent new dams. 4. Support completion of Corps of Engineers Mississippi River Watershed study. 5. Explore national initiatives looking at related problems (e.g., Hypoxia).
	3. Levees - flood control	1.Investigate use of floodplain easements from NRCS (25% of emergency flood$ set aside for flood control easements) through Emergency Watershed Protection (EWP)..has easier enrollment criteria 2. Smaller scale…work with FWS (Partners) and NRCS (WRP, CRP) to strategically breech levees at sites. 3. Explore potential to use Total Maximum Daily Load initiative as opportunity to breech levees for water quality improvements 4. Explore opportunities to earmark federal dollars for direct funding for particular stream..to address TMDL, e.g.
	4. Navigation	1. Explore potential to mitigate influences through WRDA 2. Educate authorization committees, boards, Congress/President about impacts of existing and proposed projects
	5. Irrigation (surface and groundwater removal)	1. Proactive development of allocation scheme in critical watersheds. 2. Utilize NRCS EQIP, EPA programs to fund water conservation programs on farmland. 3. Become more involved in state technical committees. 4. Encourage removing land from production in critical watersheds. Encourage other economic uses like reforestation and forest management. 5. Work with national stewardship staff to develop strategies to abate threat...hire ecoregional hydrologist if warranted 6. Engage partners interested in water resource issues in our site based planning/strategies

II. Habitat loss and fragmentation	1. Land clearing	1. Investigate utilization of Conservation Reserve Enhancement Program (for riparian restoration) in places not currently utilized (e.g., 2-state initiative on Bayou Bartholomew), minimizing CRP replication (buffer restoration). 2. Investigate purchase of residual value of CRP easements with state/private funds when contract expires. 3. Investigate possibility of changing federal statute that restricts acreage eligible for CRP enrollment. 4. Utilize CRP priority areas designation to restore important areas. 5. Work with national staff to ensure reauthorization and more funding for the Wetlands Reserve Program. Compile data to justify raising acreage caps. 6. Stay involved with State Technical Advisory Committees to develop criteria for WRP based on biodiversity needs. 7. Prioritize restoration efforts based on fragmentation models developed by partners. 8. Pursue state policies that provide tax incentives for doing conservation easements on important riparian areas and wetlands. 9. Explore efficacy of Forest Legacy program. 10. Identify and pursue sources of private money for restoration since many areas that are important for restoration aren't eligible for government programs. (e.g., carbon sequestration) 11.Continue cooperative acquisition projects with government partners to acquire important tracts.
	2. Gravel mining	1. Explore possibility of using zoning to direct activities elsewhere. 2. Buy mineral rights, explore possibility of trade options (for minerals) 3. Work with counties (often buyers of gravel) to identify least fragile sites to mine.
	3. Beavers	1. Work with landowners (public and private) to control the management of beavers on priority areas through the control of water (i.e., dams).
	4. Roads	1. Work through environmental/public review processes to mitigate affects of road building 2. Implementation of BMPs on public lands and industrial lands.
	5. Food plots	1. Explore alternatives (e.g., timed feeder) with hunt clubs and public land agencies on significant tracts
	6. Ditching	See I. 1.
III. Habitat alteration	1. Incompatible silvicultural practices	1. Work with state and federal partners through their planning processes (e.g., ecosystem plans, Comprehensive Conservation Plans, forest management planning) to establish regimes that support more favorable forest structure and species composition 2. Hold old-growth conference for private and public land managers to discuss strategies for managing toward older seral stages 3. Secure easements and/or cooperative management agreements on industrial private lands. 4. Purchase significant natural areas. 5. Provide education/economic incentives for small private landowners to develop forest management plans. 6. Pursue promotion of green marketing with timber companies.
	2. Lack of fire(uplands)	1. Adhere to prescribed burn plans 2. Work with local communities to accept need to burn. 3. Supplement prescribed fire with haying
	3. Dams	See I. 2.
	4. Salinization	See I. 5.
	5. Impoundments	1. Work through regulatory process to require water management plans that involve flooding after growing season, removing water before growing season, and leaving dry occasionally (one year in five). 2. Work with public agencies to hold workshops that provide information on sound GTR management. 3. Work with permit agencies to ensure proper design and siting of GTRs to facilitate efficient draining
	6. Exotics	1. Work with public agencies to investigate ways to harvest loblolly before reproductive age (before age 20). 2. Develop tallow eradication program on key tracts.

IV. Reduced Water Quality	1. Incompatible agricultural practices	1. Work with NRCS and state water quality agencies to promote precision application of chemicals. 2. Working w/ extension service, NRCS, designate high priority watersheds for EQIP, WRP, CRP 3. Explore opportunity to encourage BMP implementation through TMDL initiative 4. Support farm field days 5. Reforest marginal agricultural lands 6. Raise private money to invest in needed equipment for conservation farming practices (e.g., precision application, drill-planting) 7. Work with NRCS, extension to encourage strategic installation of water control structures on agricultural fields.
	2. Gravel mining and sand dredging	1. Engage in regulatory process to ensure permit compliance 2. Do Site Conservation Plan quickly to determine ownership, options, etc.
	3. Run-off	1. Investigate options with National Wildlife Refuge and other partners 2. Engage appropriate partners to ensure better monitoring and enforcement 3. Explore potential for engaging local citizens' group. 4. Explore possibility of structural measures to help mitigate effects
V. Direct take	1. Poaching	1. Continue involvement with Black Bear Conservation Committee to support education, enforcement, habitat restoration and outreach activities.
		2. Continue to work with state fish and wildlife agencies to regulate harvest of mussels

Chapter 5
Conclusions and Next Steps

5.1 Summary of Results

In total, 54 sites were identified for conservation action in this ecoregion. Sites are generally large, and capture biodiversity targets at multiple scales. The vast size of many of these sites indicate that implementation of conservation strategies will require the commitment of a variety of partners employing a variety of approaches. And, even though a number of publicly owned lands constitute these sites, the vast majority (82%) of the area contained within these sites is in private ownership – both industrial and non-industrial. Twenty-six sites were recognized as high priority "action sites," using the criteria of complementarity, biodiversity value, threats, feasibility, and potential for leverage. By definition, these sites will require ongoing conservation action, at least over the next ten years. In some places (e.g., upland sites), targets are threatened by potential human activities such as residential development. In most of the bottomland hardwood sites, many threats are more a result of past activities (e.g., conversion to agriculture, hydrologic alteration), though some ongoing and proposed activities (e.g., dredging, navigation) also pose a threat to the long-term viability of some targets. Much of the conservation focus in this ecoregion is on restoration of biodiversity patterns and processes. Each site in the portfolio was assessed for restoration feasibility and only those sites thought to be restorable were included. While team members used all best available information and, in some cases, best professional judgement to determine the viability of all selected targets, there are some that require a more detailed assessment like that provided through site conservation planning. For example, the long-term consequences of hydrologic change on plant community composition, while known in some cases, is more subtle and less detectable at other sites. Finally, because little inventory data exist for this ecoregion, it is highly likely that many target occurrences, unaccounted for through this process (i.e., assessing goal based largely on element-based data), are contained within the suite of sites delineated in this portfolio. The use of coarse-scale targets (e.g., matrix-forming communities), as represented through such surrogate data like soils and surface geology and stratified across the ecoregion, improves the likelihood that this is indeed the case.

5.2 Addressing Assumptions and Data Gaps

In designing the portfolio of conservation sites for MSRAP, the team was faced with several challenges, some stemming from incomplete or lacking data on both biological patterns and processes. Appendix 2 provides information on site-specific data gaps. But other ecoregion-wide data gaps are also apparent. For example, occurrence information about finer-scaled targets (i.e., plant communities and species) is lacking in general. The team opted for two approaches to address the dearth of plant community occurrences. A small ad-hoc team was created to perform rapid ecological field assessments and expert interviews. In addition, the coarse-filter approach was utilized whereby matrix forests of sufficient size were identified. The assumption is that these systems will encompass the assemblage of communities for which there are few or no Heritage data. This assumption needs testing and presumably will be during site conservation planning and associated inventory efforts. Similarly, occurrences for other system targets, including migratory birds, were selected based on the existence or feasibility of restoring large tracts (4,000, 8,000, and 40,000 ha) of matrix forests. Although these block sizes were developed based on a consideration of minimum habitat requirements for sustained, source populations of forest interior birds, rigorous monitoring and evaluation will be required to verify this assumption. A cadre of ornithologists from throughout the ecoregion are currently implementing research to address these outstanding issues.

While much of the ecoregion has not been inventoried in depth, the following areas of MSRAP are particularly noteworthy:

Macon Ridge, LA
Atchafalaya Basin, LA
Batture Lands, LA and MS

It is the hope of the MSRAP team that academicians and others will partner with TNC and Heritage to address these inventory needs. In fact, the Louisiana Heritage program has initiated a contract to identify high quality natural communities on Macon Ridge. Also, the Louisiana and Arkansas field offices of TNC have a contract with a local university to complete an in-depth inventory of Bayou Bartholomew, one of the most intact and species-rich streams in the ecoregion. In addition to basic inventory, some team members are involved in the creation of GAP products for the ecoregion to assist in the remote identification of vegetative patterns. There is a need to ground-truth GAP-based information. In future iterations of this ecoregional plan, we anticipate the ability to provide comprehensive, point-based information on portfolio sites across the ecoregion, thus helping to facilitate the creation of robust and useful GAP maps.

Aside from the lack of basic inventory, there is also the need to better understand basic life history characteristics of many of the species of interest as well as natural disturbance processes in many of the systems targeted for protection and restoration. Viability in general – be it what constitutes a minimally viable population of the Illinois chorus frog or the effects of hydrologic change on plant communities at Tensas Refuge – must be better understood. The long-term impacts of altered hydrologic regimes on bottomland species composition and health are unknown in many places. And, while many outstanding questions will be answered during the site conservation planning process, the team recommends that an ecoregional ecologist and/or hydrologist, devoted solely to addressing inventory and ecological process issues, be hired for the ecoregion.

Like many other southern ecoregions, MSRAP has historically been an area of high aquatic species richness, especially for mussels and fishes. As a group, aquatic invertebrates comprise the majority of many state Heritage data records though, in some places, data are conspicuously lacking. Given the alterations – and, in some places, impending threats – to this ecoregion, it is imperative that future inventory efforts key in on high quality, representative stream systems to better assess the current condition of the aquatic resource. It should be determined whether the development of a coarse-filter aquatic community classification – analogous to the terrestrial classification – would help facilitate the identification of these systems.

Finally, restoration of ecological systems in MSRAP, while better understood now than ten years ago, is still in need of further insights and improved techniques. Appropriate project design, including a better consideration of species/site relationships and hydrologic restoration, is still wanting in some places. The restoration of less-common community types such as switchcane is only now gaining attention. In all cases, a better understanding of historic conditions, and how modifications to the landscape (e.g., silvicultural practices, hydrologic impacts) have altered patterns and processes, is needed. Some insights have been gained through research into "witness tree" data, collected by early land surveyors in the 19th century (Ouchley, 2000). The Louisiana field office of TNC is currently seeking funding to pursue these data so that the historic distribution of plant communities in the ecoregion can be better understood.

5.3 Multi-state Implementation Teams

To ensure the continued coordination of conservation actions, research, and communications in MSRAP, three teams have been created. These include 1) Research and Inventory; 2) Communications and Outreach; and 3) Restoration and Management. These teams will pursue identified data gaps and inventory needs, share information and lessons learned with partners and with each other, and provide partners with a consistent message about ecoregional objectives and priorities. The intent is to meet on a regular (quarterly) basis to pursue the objectives below and then yearly, with the entire team, to provide annual progress reports.

The objectives of the Research and Inventory team are to:

- Develop and prioritize a list of research questions and inventory needs that have come out of plan.
- Identify and engage research partners (academia, government partners)
- Determine how data clearinghouse should work and how information generated through ecoregional planning should be managed
- Identify ongoing research and review relevant literature
- Investigate in-house resources to assist in developing water allocation plans
- If need be, work with states to raise money to hire ecoregional hydrologist
- Report progress to other MSRAP implementation teams

The objectives of the Communication and Outreach are to:

- Determine audiences for MSRAP information
- Determine message per audience, data availability (especially as related to ecoregional plan and contents)
- Develop distribution system for information

- Develop educational/outreach materials
- Pursue fundraising for educational/informational materials
- Report progress to other MSRAP implementation teams

The objectives of the Restoration and Management team are to:

- Explore the relevance of other less-used programs (e.g., CRP) for habitat restoration and BMP implementation in MSRAP
- Continue to investigate and pursue potential use of ag-incentive programs to address restoration and BMPs
- Investigate and pursue sources of private funding for restoration and fee/easement purchase
- Work with public land managers to implement strategies at portfolio sites
- Work with private lands managers to implement strategies at portfolio sites
- Share experiences and lessons learned with MSRAP staff
- Report progress to other MSRAP implementation teams

5.4 Information Management

Throughout the ecoregional planning process, the MSRAP team compiled a large amount of data (e.g., roads, satellite imagery, hydrology, DEMs) and created new information to guide conservation in the ecoregion. In considering long-term management of this information, we consulted the Ecoregional Information Management Team's recommendations (dated 13 April 2000). Data management, data licensing issues, and data distribution will primarily be the responsibility of the GIS analyst/database manager in the Louisiana Field Office (LAFO) of The Nature Conservancy. This individual is also responsible for updating databases as future iterations of the plan are completed and more data are compiled.

Information and data derived through the development of this plan will be archived at LAFO but will also be provided to the Ecoregional Conservation Planning Office. A copy of the final plan will be available on the Conservation Process intranet site of The Nature Conservancy. LAFO recently established a Clearinghouse Node of the National Spatial Data Infrastructure (NSDI) for MSRAP data (www.mapthedelta.org); data layers from the ecoregional planning effort will be made available on this external Web site for distribution as well. Also, a huge amount of Heritage-quality data (i.e., proto-EOs) were generated through this planning process. These data will be transferred to state Heritage programs for eventual entry into the Biological Conservation Database. Other partners (e.g., state wildlife programs) that were instrumental in creating the managed areas database, will also receive copies of the databases for their respective jurisdictions.

A variety of systems will be used to manage the data and information, including:

- Microsoft Excel for transferring tabular information
- ArcView or ArcInfo for visualization of geospatial information
- BCD or Biological Conservation Data System (source of Heritage Programs' Element Occurrence Data)

- MicroImages TNTmips for geospatial raster processing and raster/vector analyses
- Filemaker Pro for tabular information, including relational tables and summaries
- Adobe Photoshop for image enhancement (e.g., of satellite imagery used for viability questions)
- Deneba Canvas for map layout

Only non-proprietary information will be archived and distributed and logs will be kept of all significant database updates and revisions to archived information. Data generated by future iterations will also be archived. The kinds of data and information archived include geospatial information, tabular information, and text documentation. During the process of data collection and plan development, the Federal Geographic Data Committee metadata standards were adhered to and great effort was made to ensure that various datasets were compatible. For example, it was important that geospatial and tabular databases had common field definitions. This standard will be adhered in developing future datasets.

Addendum

Identification of Freshwater Biodiversity Conservation Areas in the Mississippi River Alluvial Plain Ecoregion

The freshwater portion of the Mississippi River Alluvial Plain (MSRAP) ecoregional plan was developed as part of a larger body of work conducted by the Southeast Conservation Science Center (SCSC) and Freshwater Initiative (FWI). The Charles Stewart Mott Foundation has funded the SCSC/FWI to identify important areas for aquatic biodiversity conservation in the Southeast. The Mott Foundation's interest is focused on four river basins, the Tennessee and Cumberland River Basins, Mississippi Embayment Basin, South Atlantic Basin, and Mobile Bay Basin. This work is being conducted for two purposes; 1) to help prioritize subsequent Mott Foundation funding to TNC and other organizations for freshwater conservation; and, 2) to improve integration of freshwater conservation targets and conservation areas into TNC ecoregional plans.

The MSRAP work was done as part of the Mississippi Embayment Basin (MEB), which encompasses the lower portions of the Mississippi River drainage, and other Gulf drainages (Pearl, Pascagoula, Pontchartain, Mermentau, and Vermilion). The SCSC/FWI team identified aquatic species and aquatic systems conservation targets and delineated areas of importance to aquatic conservation (hereafter "aquatic conservation areas" or "conservation areas") for the MEB as a unit and the MSRAP portion was clipped out for inclusion in this ecoregional plan.

I. Aquatic Conservation Targets

Conservation by Design identifies all viable native species and communities as the elements to be represented in ecoregional portfolios of conservation areas (TNC 2000a; 2000b). This represents the coarse filter/fine filter approach to biodiversity conservation developed by The Nature Conservancy (Noss 1987). The coarse filter is a community-level conservation strategy whereby natural community types are used as conservation targets to represent 85-90% of species and many ecological processes, without having to inventory and manage each species individually. In this prioritization work, we utilized both aquatic species targets and a physically-based classification to represent aquatic community targets as a coarse-filter.

A. Aquatic Species Targets

In this analysis we considered fishes, mussels, aquatic snails, crayfishes, and obligate aquatic amphibians and reptiles as aquatic species targets. We did not consider aquatic plants or amphibians and reptiles which live out the adult phases of their life cycle primarily on land. We developed a preliminary species target list for these taxa by requesting queries of Natural Heritage Programs (NHP) databases for all states occurring in the four basins. The preliminary lists were then reviewed by regional experts who added any species not tracked by NHP's or any newly described species and removed any species that do not occur in the four basins. In "active" ecoregions, targets were delineated in conjunction with zoology and aquatic technical teams. Where the first iteration of ecoregional plans was completed, as in MSRAP, zoology target lists were used as a starting point for development of a target list.

Target species in these taxa groups were evaluated and identified by consideration of three criteria: level of imperilment, distribution, and viability (population trends). All viable, globally rare species and subspecies (with global ranks of G1 and G2) were included as targets. In addition, many species endemic to one of the four basins or species with disjunct populations occurring in the basins were considered as targets. Regional experts also identified several declining species, which were considered as targets as well.

Overall, there were 31 aquatic species targets considered in the MSRAP portion of the MEB. These were comprised of 10 fishes, 20 mussels, and 1 crayfish (see the MS Access database on the Aquatics Assessment CD for a list of species targets). 11 of these were incorporated as targets in the delineation of the MSRAP portfolio. The additional 20 targets were added by regional experts. Several of the added species were species not tracked by Heritage programs or additional species that were known to be in decline.

B. Aquatic Coarse Filter Targets

To identify aquatic system targets, we employed an approach similar to that developed by the Freshwater Initiative (Higgins et al. 1998) that uses a physically-based classification applied in a Geographic Information System (GIS) to represent aquatic communities. The methodology was developed for areas with limited or currently unavailable spatially-referenced information about the distribution of aquatic species and lacking data on natural aquatic assemblages. We used it in the MEB as a coarse-filter complement to the fine-filter species targets.

The community targets themselves are referred to as Aquatic Ecological Systems. Aquatic Ecological Systems (hereafter “aquatic systems”) are dynamic spatial assemblages of multiple ecological communities that: 1) occur together in an aquatic landscape with similar geomorphological patterns; 2) are tied together by similar ecological processes (e.g., hydrologic and nutrient regimes, access to floodplains and other lateral environments) or environmental gradients (e.g., temperature, chemical and habitat volume); and 3) form a robust, cohesive and distinguishable unit on a hydrography map. Each system type represents a different pattern of physical settings thought to contain a distinct set of biological communities and is therefore a distinct conservation target.

We developed the classification model by consulting literature and regional experts to determine the most important physical variables that distinguish natural aquatic communities in freshwater ecosystems. In the MEB we identified stream size, gradient, hydrologic regime, water chemistry, and downstream connectivity.

To construct systems based on these factors, we used digital coverages of surficial geology, hydrography (streams layer), and elevation in a GIS. We calculated stream size using a visual basic program that first determines the flow sequence then calculates a set of attributes for each reach in the streams layer. We then used stream link (number of first order streams upstream of a reach) as a measure of stream size. Gradient of all stream reaches was calculated using the streams layer and a digital elevation model. Bedrock and surficial geology type was used as a mapped variable because it relates to water chemistry, hydrologic regime, and substrate (Table 1). For example, flow in streams draining calcareous, impervious surface materials such as chalk or marl is likely to be alkaline, be dominated by surface run-off, have little groundwater connection, and be seasonally ephemeral.

Aquatic systems were mapped in a GIS by assigning each stream reach in the hydrography layer a class of each variable and identifying the unique combinations of these variables. Five stream size classes were delineated to distinguish headwater communities from larger creek and river communities (Table 2). Three gradient classes were delineated to allow differentiation of moderate to high gradient headwaters and creeks of the ecoregional margins from lower gradient creeks in the Alluvial Plain (Table 2). Four downstream connectivity classes were utilized to differentiate between streams that allow direct access from anadromous fishes or other taxa that migrate among water bodies (Table 2).

We mapped aquatic systems encompassing small streams and creeks at the scale of Natural Resource Conservation Service 14-digit watershed units. Each watershed unit was classified into a stream aquatic system class based on its geology characteristics, topography, and elevation. Larger stream and rivers aquatic systems were classified according to the characteristics of larger watershed units, usually 8- or 6-digit USGS hydrologic units. Systems maps were constructed from EPA reach file 1 by assigning the aquatic systems code from the watershed in which it falls. Aquatic system occurrences were then tracked by reach file 1 code in all analyses.

Using these methods, we identified 49 aquatic systems targets, 33 of which occur primarily in the MSRAP. The remaining 16 aquatic systems are targets that are either transitional from Coastal Plain to Alluvial plain or that occur peripheral to MSRAP in the Coastal Plain and coastal prairies, but were included in analyses. See the MS Access database on the Aquatics Assessment CD for a list and descriptions of all aquatic systems targets.

II. Stratification Units

We also developed stratification units to account for inclusion of aquatic targets (species and aquatic systems) in conservation areas across their environmental range. These stratification units are known as Ecological Drainage Units (EDU's). EDU's are aggregations of broad-scale watersheds that occur in similar zoogeographic, climatic, and physiographic settings. EDU's are mapped in a GIS by aggregating the USGS 8^{th} field Hydrologic Unit Code (HUC8) according to similarities in the patterns of these features.

The use of EDU's as stratification units serves two purposes. First, the use of EDU's for stratification of aquatic systems goals ensures consideration of regional-scale differences in aquatic species pools that are not accounted for in the classification of aquatic system targets (which are essentially stream, river, and lake types). For example, by selecting examples of a particular stream type in each EDU, we ensure inclusion of all suites of species that may occur in that stream type in different major river drainages. Second, the use of EDU's for stratification of aquatic species goals facilitates inclusion of species targets across their environmental range and in all evolutionary pathways.

We identified 14 EDU's that occur in the MSRAP (Figure 14, Table 3). Four of these are primarily in the Upper East Gulf Coastal Plain and East Gulf Coastal Plain, two are primarily in the Gulf Coastal Prairies and Marshes, and two are primarily in the Upper West Gulf Coastal Plain and West Gulf Coastal Plain.

III. Conservation Goals
To design a portfolio of aquatic conservation areas that includes multiple viable examples of all aquatic species and aquatic systems targets in the ecoregion (TNC 1997), the planning team developed conservation goals for the representation of each target in the portfolio. Goals for representation of both aquatic systems and aquatic species targets in the portfolio were stratified across EDU's. Goals were assigned based on target size, distribution, and global rarity and were expressed both as a number of examples required for each EDU in which the target naturally occurs and as a overall total goal for the ecoregion (Tables 4-5).

Determining the distribution and number of occurrences to be represented in the portfolio was an informed opinion of the planning team. There is no scientific consensus on how much habitat or how many populations are necessary to conserve coarse and fine filter targets. Our goals are based on a number of factors, including threats to the element, life history of the element, stability of the occurrences, key ecological processes and disturbance regimes, and known genetic or environmental variability of the element. In almost all cases, however, little target-specific information exists and our short timeline precluded intensive research of those factors that affect long-term viability. Therefore, our representation goals are considered initial objectives and must be tested and refined through time by monitoring and re-evaluating the status and trends of individual targets.

Goals for aquatic species targets were stratified by EDUs and were based upon the species' global rarity (G-rank), distribution in relation to the ecoregion, and preferred habitat type (Table 4). Species with global ranks of G1 or G2 and species endemic to the ecoregion (those targets with > 90% of their range in the ecoregion) had the highest overall goals. We also set goals for large river species targets lower than those inhabiting streams because their habitat is less prevalent across the ecoregion (i.e., there may only be one or two large rivers in an EDU affording sufficient habitat for one population of a large river target, but a single river system may support sufficient habitat for several populations of targets inhabiting small streams).

The goal for aquatic systems targets was to identify one viable example of each medium and large river sized system in each EDU, two examples of each small river system, and three examples of each creek/headwater system (Table 5). Systems peripheral to MSRAP (i.e., systems occurring primarily in the Coastal Plain) had goals of one occurrence per EDU for all sizes (Table 5). There was a minimum stream/river length required for inclusion of lotic aquatic system targets. This requirement was based on the assumed requirements of the biotic components of the communities contained in the system. Thus, the minimum length is greater for large rivers than for creeks and small rivers (Table 5).

IV. Aquatic Portfolio Assembly Methods
Aquatic conservation areas were identified at an experts meeting held 21-22 August 2000 in Jackson, MS (See the MS Access database on the Aquatics Assessment CD for a list of participants). At this meeting experts provided input on selection of aquatic conservation species

targets, classification of aquatic systems targets, development of conservation goals, and delineation of aquatic conservation areas.

Aquatic conservation areas were delineated in two steps. First, experts identified areas supporting viable populations of species targets. These conservation areas were then delineated in a GIS by digitizing polygons or selecting associated stream reaches (EPA reach file 1 and EPA reach file 3). Conservation areas were delineated as polygons (vs. stream reaches) where target species occur in lakes or ponds or where a species inhabits swamps and marshes and is thus not limited to stream channels. Conservation areas were identified for each target species until all viable populations were represented or until the goal was reached. See the MS Access database on the Aquatics Assessment CD for a list of species targets occurring in each conservation area.

Second, after identifying conservation areas that capture aquatic species targets, the experts identified high quality reaches to represent aquatic systems that were not captured by the conservation areas. By using conservation areas delineated by species' occurrences to track aquatic systems targets, we assumed viable examples of these systems. This assumption was not independently evaluated (e.g., by GIS viability analysis). However, the same length criteria for inclusion of aquatic system targets were applied. As a result, there were several examples of aquatic systems captured by conservation areas delineated on species' occurrences, that were not counted toward goals because they did not meet the minimum length requirement. See the MS Access database on the Aquatics Assessment CD for a list of aquatic system targets occurring in each conservation areas

Experts identified 35 conservation areas in MSRAP to represent viable occurrences of species targets (Figure 1, 14). Thirteen are entirely within the Mississippi River Alluvial Plain, 13 are transitional from Upper East or East Gulf Coastal Plain to Alluvial Plain, 7 are transitional from Upper West or West Gulf Coastal Plain to Alluvial Plain, and 2 are transitional to Gulf Coast Prairies and Marshes.

V. Achievement of Conservation Goals

Goals were met in all EDU's for 15 of 31 species targets (See the MS Access database on the Aquatics Assessment CD for a list of species targets and progress toward their conservation goals). Many of the targets for which goals were not met were endemic to the ecoregion or were targets for which a limited number of extant populations could be identified.

The Ecoregional representation goal was met in all EDUs for only one of the 48 aquatic systems targets (See the MS Access database on the Aquatics Assessment CD for a list of aquatic system targets and progress toward their conservation goals). An additional 26 system targets were represented in the portfolio, and 11 of these had goals met in at least one EDU. As a result, 11 system targets were not represented in the portfolio. Representation of systems targets was poor for two reasons: 1) there are not enough mapped examples to meet the goal, or 2) experts were not able to identify a sufficient number of viable examples.

Few conservation goals were met in the MSRAP, even for areas that experts know well, because of the intense alteration of the regional landscape. Experts could identify few sections of high quality, medium or large rivers in the region with high levels of ecological integrity since most of the main channel rivers have been dammed, leveed and have regulated flows. Even most of the few river ecosystem targets that were included are subject to intense dredging, channel maintenance, and alteration of flow regime. However, these large river sections still support diadromous species that have access to many tributary drainages, and still serve as important migratory corridors. We also did not meet goals for most alluvial plain stream systems or coastal brackish marsh and tidal systems because these regions have been heavily altered for agriculture and flood control.

Representation of many aquatic systems is poor because we directed experts only to identify areas that they knew to be high quality, viable examples of these system types. Thus, many of the under-represented systems represent gaps in our ability to identify or verify aquatic system condition and viability. This emphasizes the need for more survey work and viability assessments. It also points out the need in further planning efforts to identify the most restorable examples of these poorly represented system types, which we did not attempt in our workshop.

VI. Literature Consulted

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Noss, R.F. 1987. From plant communities to landscapes in conservation inventories: a look at the Nature Conservancy (USA). Biological Conservation 41:11-37.

The Nature Conservancy. 2000a. Conservation By Design: a framework for mission success. The Nature Conservancy, Arlington, VA.

The Nature Conservancy. 2000b. Designing a Geography of Hope: guidelines for ecoregional-based conservation in The Nature Conservancy. Second Edition. The Nature Conservancy, Arlington, VA.

Appendices

Appendix 1.
Occurrence of Conservation Targets in Mississippi River Alluvial Plain Portfolio Sites

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

(ar01) Black River LANDSCAPE-SCALE ACTION SITE (AR MO)

59,001 Ha 145,791 Acres PUBLIC LAND: 20.9 % 12,526 Ha 30,951 Acres

QUATERNARY GEOLOGY GROUPS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Meander belt	28,613	70,702			
			Other Alluvium	5,756	14,224			
			Sand dune field	7,077	17,487			
			Valley train terrace	16,761	41,417			

MIGRATORY BIRD ZONES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			20,000-acre (Cerulean Warbler)			N	AR MO	
			20,000-acre (Cerulean Warbler)			N	AR	

PUBLIC LANDS and TNC PRESERVES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Allred Lake DNA	82	203		MO	
			Big Cane CA	841	2,078		MO	
			Carmichael (Mac & Zelma) SF	16	40		MO	
			Chilton Creek NA	62	153		MO	
			Coon Island CA	1,293	3,195		MO	
			Corkwood CA	177	437		MO	
			Dave Donaldson / Black River WMA	9,834	24,299		MO	
			NA in AR	61	150		AR	
			Pondberry Preserve NA	33	82		AR	
			Sand Ponds DNA	129	319		AR	

AQUATIC SURROGATES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			RIVER			N	AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CTFEB11730*025*MO	B/C	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			N	MO	
CTFEB11730*038*MO	C/C-		2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			N	MO	
CTWHZ15310*001*MO	A		2420 Taxodium distichum / Lemna minor Forest			N	MO	
CTFWB11740*003*MO	B		2420 Taxodium distichum / Lemna minor Forest			N	MO	
CTFWB11740*013*MO	B/C	S	2422 Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda Forest			N	MO	
CTFEB11730*039*MO	C	S	2422 Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda Forest			N	MO	
CTFEB11730*003*MO	A	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			N	MO	
CTFWB11740*017*MO	B/C	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			N	MO	
CTFEB11730*026*MO	C/C-	S	2432 Quercus palustris - Quercus bicolor - (Liquidambar styraciflua) Mixed Hardwood Forest			N	MO	

PLANT OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PMCYP03CK0*001*AR			CAREX SOCIALIS			N	AR	SOCIAL SEDGE
PMCYP03CK0*003*MO	C		CAREX SOCIALIS			N	MO	SOCIAL SEDGE
PDLEI01010*022*MO	A	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*007*MO	A	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*019*MO	A-B	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*039*AR	B	S	LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*008*MO	B	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*002*MO	B	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*004*MO	B	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*034*AR	C		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*035*AR	C		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*025*MO	C	S	LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*031*MO	C		LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*034*MO	C		LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLEI01010*056*AR	E	S	LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*059*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*060*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*055*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*058*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*053*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*057*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*026*MO	O		LEITNERIA FLORIDANA			N	MO	CORKWOOD
PDLAU07020*007*AR	A	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*003*MO	A	S	LINDERA MELISSIFOLIA			N	MO	PONDBERRY
PDLAU07020*001*AR	B	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*004*MO	B	S	LINDERA MELISSIFOLIA			N	MO	PONDBERRY
PDLAU07020*001*MO	C	S	LINDERA MELISSIFOLIA			N	MO	PONDBERRY
PDLAU07020*002*MO	C	S	LINDERA MELISSIFOLIA			N	MO	PONDBERRY
PDLAU07020*016*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY

ANIMAL OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
ARAAD03012*006*MO	A	S	DEIROCHELYS RETICULARIA MIARIA			N	MO	WESTERN CHICKEN TURTLE
IMBIV21110*018*AR		S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
AFCJB28830*006*AR			NOTROPIS SABINAE			N	AR	SHINER (SABINAE)
IMBIV39041*013*AR			QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
VEGETATION ALLIANCES in WMAs and REFUGES								
A.346	88		AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.328	50		AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			N		
A.331	74		AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.295	37		AGFC/MSRAP 12 - Nuttall Oak-Ash-Sugarberry			N		
A.330	62		AGFC/MSRAP 13 - Willow Oak-Overcup Oak			N		
A.291	23		AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak			N		

(ar02) Big Lake SITE (AR MO)

33,238 Ha 82,131 Acres PUBLIC LAND: 31.8 % 10,445 Ha 25,809 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS								
			meb-067 Little River (St. Francis)					
QUATERNARY GEOLOGY GROUPS								
			Meander belt	2,810	6,945			
			Valley train terrace	30,441	75,220			
MIGRATORY BIRD ZONES								
			20,000-acre (Cerulean Warbler)			N	AR MO	
PUBLIC LANDS and TNC PRESERVES								
			Big Lake NWR	4,393	10,855		AR	
			Big Lake WMA	4,782	11,816		AR	
			Hornersville Swamp CA	1,118	2,761		MO	
			Little River Lake CA	120	297		MO	
			Warbler Woods CA	31	77		MO	
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
XXNCPS.S1-*002*AR	BC		2420 Taxodium distichum / Lemna minor Forest			N	AR	
XXNCPS.S1-*004*AR	BC		2420 Taxodium distichum / Lemna minor Forest			N	AR	
ANIMAL OCCURRENCES								
IMBIV06010*026*MO	E	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*028*MO	E	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*023*MO	E	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*027*MO	E	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*029*MO	E	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*024*MO	U	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IMBIV06010*025*MO	U		ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
IIEPH05010*002*MO	U	S	BAETISCA OBESA			N	MO	(BAETISCA OBESA)
ARAAB02010*034*MO	U		MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
IMBIV37030*007*MO	A	S	POTAMILUS CAPAX			N	MO	FAT POCKETBOOK
IMBIV37030*002*AR	E	S	POTAMILUS CAPAX			N	AR	FAT POCKETBOOK
IMBIV37030*009*MO	E	S	POTAMILUS CAPAX			N	MO	FAT POCKETBOOK
IMBIV37030*008*MO	E	S	POTAMILUS CAPAX			N	MO	FAT POCKETBOOK
VEGETATION ALLIANCES in WMAs and REFUGES								
A.346	86		AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.331	72		AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.286	16		AGFC/MSRAP 9 - Elm-Ash-Sugarberry			N		

(ar03) Current River SITE (AR)

1,230 Ha 3,039 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
QUATERNARY GEOLOGY GROUPS								
			Meander belt	406	1,004			
			Valley train terrace	271	669			
AQUATIC SURROGATES								
			RIVER			N	AR	
ANIMAL OCCURRENCES								
IMBIV10010*004*AR			CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
IMBIV21110*003*AR		S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET

(ar04) Arkansas Frog SITE (AR)

3,248 Ha 8,026 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
QUATERNARY GEOLOGY GROUPS								
			Valley train terrace	3,183	7,865			
ANIMAL OCCURRENCES								
AAABC05061*012*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*014*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
AAABC05061*013*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*001*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*011*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*015*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*009*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*010*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*008*AR		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	AR	ILLINOIS (STRECKER'S) CHORUS FROG

(ar05) Sunken Lands LANDSCAPE-SCALE SITE (AR MO)

43,171 Ha 106,676 Acres PUBLIC LAND: 9.4 % 4,424 Ha 10,933 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			meb-076 St. Francis River					

QUATERNARY GEOLOGY GROUPS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Meander belt	7,720	19,077			
			Valley train terrace	35,995	88,943			

MIGRATORY BIRD ZONES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			20,000-acre (Cerulean Warbler)			N	AR	

PUBLIC LANDS and TNC PRESERVES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Ben Cash Memorial CA	400	987		MO	
			Ben Cash Memorial CA - Largent (S&L) Annex	66	162		MO	
			Cash Swamp DNA	154	381		MO	
			NA in AR	191	471		AR	
			St. Francis Sunken Lands WMA	3,614	8,931		AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CTFEB11730*023*MO	B	S	2101 Populus deltoides - Salix nigra Forest			N	MO	
CTWHZ15310*009*MO	B		2420 Taxodium distichum / Lemna minor Forest			N	MO	
CTFWB11740*012*MO	C	S	2586 Acer saccharinum - Ulmus americana - (Populus deltoides) Forest			N	MO	

PLANT OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PDLEI01010*006*AR			LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*023*MO	C		LEITNERIA FLORIDANA			N	MO	CORKWOOD

ANIMAL OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
IMBIV06010*030*MO	U	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
AMACC08020*004*AR		S	CORYNORHINUS RAFINESQUII			N	AR	BAT (CORYNORHINUS RAFINESQUII)
ARAAB02010*035*MO	U	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
ARAAB02010*021*MO	U	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
IMBIV35250*004*AR	E	S	PLEUROBEMA RUBRUM			N	AR	PYRAMID PIGTOE

VEGETATION ALLIANCES in WMAs and REFUGES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
A.346 92			AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.328 53			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			N		
A.331 77			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.295 40			AGFC/MSRAP 12 - Nuttall-Ash-Sugarberry			N		
A.330 66			AGFC/MSRAP 13 - Willow Oak-Overcup			N		
A.292 31			AGFC/MSRAP 14 - Willow Oak-Water Oak			N		
A.291 26			AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak-Willow Oak			N		
A.297 45			AGFC/MSRAP 6 - Willow-Cottonwood			N		
A.282 11			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			N		
A.316 48			AGFC/MSRAP 8 - Ash-Maple			N		

(ar06) Scatter Creek ACTION SITE (AR)

20,561 Ha 50,806 Acres PUBLIC LAND: 5.1 % 1,115 Ha 2,756 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			meb-070 Cache River / Bayou de View					

QUATERNARY GEOLOGY GROUPS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Crowleys ridge	19,809	48,948			
			Other Alluvium	339	837			
			Valley train terrace	610	1,506			

PUBLIC LANDS and TNC PRESERVES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			NA in AR	106	261		AR	
			Scatter Creek WMA	1,010	2,495		AR	

AQUATIC SURROGATES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			HUC			N	AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PROTO-EOR	B	S	7919 Pinus echinata Crowley's Ridge Forest			N	AR	
XXNCPS.X1-*001*AR	B?	S	8887 UNDESCRIBED			N	AR	
XXNCPS.X1-*002*AR	B?	S	8887 UNDESCRIBED			N	AR	

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
XXNCPS.X1-*003*AR	B?	S	8887 UNDESCRIBED			N	AR	

(ar07) Black Rock SITE (AR)

3,626 Ha 8,960 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

QUATERNARY GEOLOGY GROUPS

			Meander belt	2,370	5,857			
			Sand dune field	102	251			
			Valley train terrace	135	335			

ANIMAL OCCURRENCES

IMBIV16190*007*AR		S	EPIOBLASMA TRIQUETRA			N	AR	SNUFBOX
IMBIV21110*001*AR		S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
IMBIV41010*004*AR		S	SIMPSONAIAS AMBIGUA			N	AR	SALAMANDER MUSSEL

(ar08) Rainey Brake ACTION SITE (AR)

23,493 Ha 58,051 Acres PUBLIC LAND: 20.4 % 4,468 Ha 11,040 Acres

QUATERNARY GEOLOGY GROUPS

			Meander belt	3,691	9,120			
			Sand dune field	2,099	5,188			
			Valley train terrace	15,441	38,154			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			N	AR	

PUBLIC LANDS and TNC PRESERVES

			NA in AR	4,463	11,029		AR	
			Shirey Bay / Rainey Brake WMA	4	11		AR	

AQUATIC SURROGATES

			HUC			N	AR	
			RIVER			N	AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

XXNCTS.F3-*005*AR	?		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	AR	

PLANT OCCURRENCES

PDLAU07020*011*AR	B	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*009*AR	C	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*013*AR	C	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*012*AR	C	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*024*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*043*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*040*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*023*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*026*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*022*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*025*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY

VEGETATION ALLIANCES in WMAs and REFUGES

A.346	87		AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.331	73		AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.330	65		AGFC/MSRAP 13 - Willow Oak-Overcup			N		
A.292	30		AGFC/MSRAP 14 - Willow Oak-Water Oak			N		
A.291	25		AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak-Willow Oak			N		
A.282	7		AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			N		

(ar09) White River LANDSCAPE-SCALE ACTION SITE (AR MS)

708,017 Ha 1,749,510 Acres PUBLIC LAND: 16.6 % 123,396 Ha 304,910 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

			meb-069 White River					
			meb-070 Cache River / Bayou de View					

QUATERNARY GEOLOGY GROUPS

			Backswamp	43,275	106,932			
			Course or Channel	20,181	49,868			
			Meander belt	304,244	751,786			
			Other Alluvium	33,997	84,006			
			Prairie alluvium	86,448	213,613			
			Sand dune field	9,684	23,930			
			Valley train terrace	180,955	447,139			

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
MIGRATORY BIRD ZONES								
			10,000-acre (Swainson's Warbler)			N	AR	
			100,000-acre (Swallow-tailed Kite)			NC	AR	
			100,000-acre (Swallow-tailed Kite)			NC	AR	
			20,000-acre (Cerulean Warbler)			C	AR	
			20,000-acre (Cerulean Warbler)			C	AR	
			20,000-acre (Cerulean Warbler)			C	AR	
			20,000-acre (Cerulean Warbler)			C	AR	
PUBLIC LANDS and TNC PRESERVES								
			Bald Knob NWR	6,035	14,912		AR	
			Bayou Meto WMA	13,025	32,185		AR	
			Cache River NWR	16,105	39,795		AR	
			Dagmar WMA	3,533	8,729		AR	
			Earl Buss / Bayou DeView WMA	396	977		AR	
			Great River Road NA	264	652		AR	
			Henry Gray / Hurricane Lake WMA	7,151	17,670		AR	
			NA in AR	5,902	14,583		AR	
			Rex Hancock / Black Swamp WMA	1,076	2,658		AR	
			Trusten Holder WMA	1,883	4,653		AR	
			Wattensaw WMA	7,240	17,890		AR	
			White River NWR	60,788	150,208		AR	
AQUATIC SURROGATES								
			HUC			NC	AR	
			OXBOW			C	AR	
			RIVER			NC	AR	
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
XXNCTS.F14*001*AR	B	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	AR	
XXNCTS.F14*005*AR	B	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			N	AR	
PROTO-EOR	C	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			N	AR	
PROTO-EOR	C	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			N	AR	
PROTO-EOR	AB	S	2419 Nyssa aquatica Forest			N	AR	
PROTO-EOR	AB	S	2419 Nyssa aquatica Forest			N	AR	
PROTO-EOR	A	S	2420 Taxodium distichum / Lemna minor Forest			C	AR	
PROTO-EOR	A	S	2420 Taxodium distichum / Lemna minor Forest			C	AR	
PROTO-EOR	AB	S	2420 Taxodium distichum / Lemna minor Forest			C	AR	
PROTO-EOR	B	S	2420 Taxodium distichum / Lemna minor Forest			C	AR	
PROTO-EOR	C	S	2420 Taxodium distichum / Lemna minor Forest			N	AR	
XXNCPS.S2-*002*AR	B	S	2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	AR	
CCAJ020000*004*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ020000*001*MS			2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ020000*002*MS			2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ020000*003*MS			2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	A	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	AR	
PROTO-EOR	AB	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	AR	
PROTO-EOR	B	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	AR	
PROTO-EOR	AB	S	3836 Arundinaria gigantea ssp. gigantea Shrubland			C	AR	
XXNCTS.T1-*002*AR	B	S	3836 Arundinaria gigantea ssp. gigantea Shrubland			C	AR	
XXNCTS.T1-*002*AR	B	S	3836 Arundinaria gigantea ssp. gigantea Shrubland			C	AR	
XXNCTS.T1-*003*AR	C	S	3836 Arundinaria gigantea ssp. gigantea Shrubland			C	AR	
PROTO-EOR	B	S	7224 Quercus alba - Carya alba / Vaccinium elliottii Forest			C	AR	
XXNCTS.F8-*003*AR	AB	S	7397 Quercus lyrata - Carya aquatica Forest			C	AR	
XXNCTS.F8-*005*AR	B?	S	7397 Quercus lyrata - Carya aquatica Forest			C	AR	
XXNCTS.F8-*007*AR	B	S	7397 Quercus lyrata - Carya aquatica Forest			C	AR	
PROTO-EOR	AB	S	7407 Quercus texana - Quercus lyrata Forest			N	AR	
XXNCTS.F14*001*AR	AB	S	7407 Quercus texana - Quercus lyrata Forest			C	AR	
CCAJ011000*001*MS			7410 Salix nigra Seasonally Flooded Forest			C	MS	
XXNCPS.S2-*004*AR	B	S	7422 Taxodium distichum - Nyssa aquatica - Acer rubrum var. drummondii / Itea virginica Fores			N	AR	
CCAJ010000*001*MS		S	7908 Salix nigra Mississippi River Alluvial Plain Forest			C	MS	
XXNCTS.P4-*032*AR	CD	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	
PLANT OCCURRENCES								
PMCYP033K0*006*MS	?		CAREX DECOMPOSITA			C	MS	CYPRESS-KNEE SEDGE
PDLEI01010*025*AR		S	LEITNERIA FLORIDANA			C	AR	CORKWOOD
PDLEI01010*021*AR		S	LEITNERIA FLORIDANA			C	AR	CORKWOOD
PDLEI01010*004*AR		S	LEITNERIA FLORIDANA			C	AR	CORKWOOD
PDLEI01010*061*AR			LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*010*AR	B	S	LEITNERIA FLORIDANA			C	AR	CORKWOOD
PDLEI01010*024*AR	BC	S	LEITNERIA FLORIDANA			C	AR	CORKWOOD
PDLEI01010*026*AR	BC		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLEI01010*048*AR	E		LEITNERIA FLORIDANA			N	AR	CORKWOOD
PDLAU07020*008*AR	B	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*037*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*038*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*034*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*028*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
PDLAU07020*044*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*027*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*039*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*033*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*029*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*030*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*036*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*032*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*035*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDLAU07020*031*AR	E	S	LINDERA MELISSIFOLIA			N	AR	PONDBERRY
PDONA0C112*002*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE
PDONA0C112*001*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE
PDONA0C112*003*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE

ANIMAL OCCURRENCES

AFCAA01020*003*AR		S	ACIPENSER FULVESCENS			C	AR	LAKE STURGEON
AFCAA01020*004*AR		S	ACIPENSER FULVESCENS			C	AR	LAKE STURGEON
ICMAL01070*001*AR		S	CAECIDOTEA DIMORPHA			N	AR	(CAECIDOTEA DIMORPHA)
AMACC08020*005*AR			CORYNORHINUS RAFINESQUII			N	AR	BAT (CORYNORHINUS RAFINESQUII)
IMBIV10010*013*AR		S	CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
IMBIV10010*014*AR		S	CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
IMBIV10010*012*AR		S	CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
ARAAD03012*005*AR		S	DEIROCHELYS RETICULARIA MIARIA			C	AR	WESTERN CHICKEN TURTLE
ARAAD03012*007*AR			DEIROCHELYS RETICULARIA MIARIA			N	AR	WESTERN CHICKEN TURTLE
IMBIV16190*005*AR		S	EPIOBLASMA TRIQUETRA			N	AR	SNUFBOX
IIORT17010*020*AR	B	S	GRYLLOTALPA MAJOR			C	AR	PRAIRIE MOLE CRICKET
IMBIV21110*005*AR		S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
IMBIV21110*007*AR	E	S	LAMPSILIS ABRUPTA			C	AR	PINK MUCKET
IMBIV21110*012*AR	E	S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
IMBIV21110*014*AR	E	S	LAMPSILIS ABRUPTA			C	AR	PINK MUCKET
IMBIV21110*016*AR	E	S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
IMBIV21110*017*AR	E	S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
IMBIV21110*015*AR	E	S	LAMPSILIS ABRUPTA			N	AR	PINK MUCKET
AFCJB28830*002*AR		S	NOTROPIS SABINAE			C	AR	SHINER (SABINAE)
AFCJB28830*001*AR			NOTROPIS SABINAE			N	AR	SHINER (SABINAE)
AFCJB28830*012*AR			NOTROPIS SABINAE			N	AR	SHINER (SABINAE)
AFCJB28830*010*AR			NOTROPIS SABINAE			N	AR	SHINER (SABINAE)
IMBIV39041*021*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*014*AR		S	QUADRULA CYLINDRICA CYLINDRICA			C	AR	RABBITSFOOT
IMBIV39041*020*AR		S	QUADRULA CYLINDRICA CYLINDRICA			C	AR	RABBITSFOOT
IMBIV39041*022*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*024*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*017*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*023*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*016*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*015*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*018*AR		S	QUADRULA CYLINDRICA CYLINDRICA			N	AR	RABBITSFOOT
IMBIV39041*019*AR	E	S	QUADRULA CYLINDRICA CYLINDRICA			C	AR	RABBITSFOOT
ABNNM08102*080*AR			STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*017*AR	E	S	STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*014*AR	E	S	STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*013*AR	E	S	STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*016*AR	E	S	STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*015*AR	E?	S	STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*019*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*009*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*008*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*018*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
PROTO-EOR		S	URSUS AMERICANUS			C	AR	LOUISIANA BLACK BEAR

VEGETATION ALLIANCES in WMAs and REFUGES

A.295 43			AGFC 12 - Nuttall Oak-Ash-Sugarberry			N		
A.345 85			AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.346 89			AGFC/MSRAP 1 - Cypress-Tupelo			C		
A.346 90			AGFC/MSRAP 1 - Cypress-Tupelo			C		
A.346 91			AGFC/MSRAP 1 - Cypress-Tupelo			N		
A.346 94			AGFC/MSRAP 1 Cypress-Tupelo			N		
A.328 49			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			C		
A.328 51			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			C		
A.328 52			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			N		
A.328 55			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			C		
A.328 57			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			N		
A.328 58			AGFC/MSRAP 10 - Overcup Oak-Bitter Pecan			N		
A.331 71			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			C		
A.331 75			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			C		
A.331 76			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.331 78			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.331 81			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			C		

EOCODE or ALLIANCE CODES		EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
A.331	83			AGFC/MSRAP 11 - Nuttall Oak-Overcup Oak			N		
A.295	38			AGFC/MSRAP 12 - Nuttall-Ash-Sugarberry			C		
A.295	39			AGFC/MSRAP 12 - Nuttall-Ash-Sugarberry			N		
A.330	67			AGFC/MSRAP 13 - Willow Oak- Overcup Oak			N		
A.330	61			AGFC/MSRAP 13 - Willow Oak-Overcup			C		
A.330	63			AGFC/MSRAP 13 - Willow Oak-Overcup			N		
A.330	70			AGFC/MSRAP 13 - Willow Oak-Overcup Oak			N		
A330	95			AGFC/MSRAP 13 - Willow Oak-Overcup Oak			C		
A.292	33			AGFC/MSRAP 14 - Willow Oak-Water Oak			C		
A.292	35			AGFC/MSRAP 14 - Willow Oak-Water Oak			N		
A.292	36			AGFC/MSRAP 14 - Willow Oak-Water Oak			C		
A.291	27			AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak			N		
A.291	28			AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak			C		
A.291	22			AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak-Willow Oak			C		
A.291	24			AGFC/MSRAP 15 - Cherrybark Oak-Swamp Chestnut Oak-Willow Oak			N		
A.330	64			AGFC/MSRAP 19 - Sweetgum-Willow Oak-Overcup Oak			N		
A.330	68			AGFC/MSRAP 19 - Sweetgum-Willow Oak-Overcup Oak			N		
A.331	80			AGFC/MSRAP 20 - Holly-Ash-Soft Elm			N		
A.331	79			AGFC/MSRAP 20 - Nuttall Oak-Sweetgum-Bitter Pecan			N		
A.241	5			AGFC/MSRAP 21- White Oak-Post Oak-Southern Red Oak			C		
A.241	4			AGFC/MSRAP 21 - White Oak-Southern Red Oak-Mockernut Hickory			N		
A.283	14			AGFC/MSRAP 22 - Ash-Hackberry-Soft Elm			N		
A.290	20			AGFC/MSRAP 5 - Cottonwood			C		
A.290	21			AGFC/MSRAP 5 - Cottonwood			N		
A.297	44			AGFC/MSRAP 6 - Willow-Cottonwood			N		
A.282	8			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			C		
A.282	9			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			C		
A.282	10			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			N		
A.282	12			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			C		
A.282	13			AGFC/MSRAP 7 - Ash-Sugarberry-Pecan			N		
A.316	46			AGFC/MSRAP 8 - Ash-Maple			C		
A.316	47			AGFC/MSRAP 8 - Ash-Maple			N		
A.286	15			AGFC/MSRAP 9 - Elm-Ash-Sugarberry			C		
A.286	17			AGFC/MSRAP 9 - Elm-Ash-Sugarberry			C		
A.286	18			AGFC/MSRAP 9 - Elm-Ash-Sugarberry			N		
A.329	59			AGFC/MSRAP - Pin Oak-Misc. Oaks			N		
A.1011	3			buttonbush			N		
A.1011	2			Not in AGFC/MSRAP classification			N		
A.295	42			Nuttall Oak-Willow Oak-Red Gum			C		
A.337	84			WRR - Cypress			C		
A.286	19			WRR - Hackberry-Elm ASH			C		
A.295	41			WRR - Oak-Elm-Ash			C		
A.328	54			WRR - Overcup Oak-Bitter Pecan			C		
	1			WRR - Pine Plantation			C		
A.241	6			WRR - White Oak-Red oak-Hickory			C		
A.292	32			WRR - Willow Oak			C		

(ar10) Big Bay Ditch SITE (AR)

3,595 Ha **8,883 Acres** **PUBLIC LAND:** **0 %** **0 Ha** **0 Acres**

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

meb-068 Whiteness Creek

QUATERNARY GEOLOGY GROUPS

Valley train terrace	3,623	8,953			

ANIMAL OCCURRENCES

IMBIV37030*901*AR	S	POTAMILUS CAPAX	N	AR	FAT POCKETBOOK
IMBIV37030*003*AR	S	POTAMILUS CAPAX	N	AR	FAT POCKETBOOK

(ar11) Village Creek ACTION SITE (AR)

54,271 Ha **134,104 Acres** **PUBLIC LAND:** **0 %** **2,907 Ha** **7,184 Acres**

QUATERNARY GEOLOGY GROUPS

Backswamp	1,354	3,347
Course or Channel	3,115	7,698
Crowleys ridge	19,369	47,860
Meander belt	28,206	69,698
Other Alluvium	102	251
Valley train terrace	2,133	5,271

PUBLIC LANDS and TNC PRESERVES

NA in AR	2,907	7,184	AR

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
AQUATIC SURROGATES								
			RIVER			N	AR	
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
PROTO-EOR	AB	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
PROTO-EOR	AB	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
PROTO-EOR	BC	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
PROTO-EOR	BC	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
PLANT OCCURRENCES								
PDSCH01020*004*AR			SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*002*AR	AB		SCHISANDRA GLABRA			N	AR	BAY STARVINE
ANIMAL OCCURRENCES								
IMBIV10010*010*AR	E		CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
IMBIV10010*001*AR	E		CYPROGENIA ABERTI			N	AR	WESTERN FANSHELL
IMBIV24020*004*AR	E	S	LEPTODEA LEPTODON			N	AR	SCALESHELL
IMBIV35250*001*AR	E	S	PLEUROBEMA RUBRUM			N	AR	PYRAMID PIGTOE
IMBIV35250*002*AR	E	S	PLEUROBEMA RUBRUM			N	AR	PYRAMID PIGTOE
IMBIV37030*001*AR	BC	S	POTAMILUS CAPAX			N	AR	FAT POCKETBOOK
AFCAA02010*001*AR		S	SCAPHIRHYNCHUS ALBUS			N	AR	PALLID STURGEON

(ar12) Second Creek ACTION SITE (AR)

8,577 Ha 21,194 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
QUATERNARY GEOLOGY GROUPS								
			Valley train terrace	8,533	21,085			
AQUATIC SURROGATES								
			RIVER			N	AR	
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
XXNCTS.F3-*001*AR	BC	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	AR	
XXNCTS.F3-*002*AR	BC	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	AR	
XXNCTS.W5-*001*AR	A	S	8889 UNDESRIBED			N	AR	
XXNCTS.W5-*003*AR	A	S	8889 UNDESRIBED			N	AR	

(ar13) St. Francis Co. Southwest SITE (AR)

1,230 Ha 3,039 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
QUATERNARY GEOLOGY GROUPS								
			Valley train terrace	1,185	2,928			
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
XXNCTS.P4-*031*AR	CD	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			N	AR	
PLANT OCCURRENCES								
PDONA0C112*019*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			N	AR	PRAIRIE EVENING PRIMROSE
PDONA0C112*018*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			N	AR	PRAIRIE EVENING PRIMROSE

(ar14) St. Francis National Forest ACTION SITE (AR)

26,458 Ha 65,378 Acres PUBLIC LAND: 33.1 % 8,841 Ha 21,846 Acres

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
QUATERNARY GEOLOGY GROUPS								
			Backswamp	271	669			
			Course or Channel	2,472	6,108			
			Crowleys ridge	11,750	29,034			
			Meander belt	10,294	25,436			
			Prairie alluvium	169	418			
			Valley train terrace	102	251			
MIGRATORY BIRD ZONES								
			20,000-acre (Cerulean Warbler)			N	AR	
PUBLIC LANDS and TNC PRESERVES								
			NA in AR	239	589		AR	
			St. Francis NF	8,602	21,257		AR	
AQUATIC SURROGATES								
			RIVER			NC	AR	
COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)								
XXNCTS.F6-*001*AR	A	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
PROTO-EOR	BC	S	4663 Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra			N	AR	
XXNCTS.F10*002*AR	BC	S	7913 Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua)			C	AR	

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

PLANT OCCURRENCES

PDSCH01020*009*AR			SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*001*AR			SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*003*AR			SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*007*AR			SCHISANDRA GLABRA			C	AR	BAY STARVINE
PDSCH01020*006*AR	A		SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*005*AR	A		SCHISANDRA GLABRA			N	AR	BAY STARVINE
PDSCH01020*011*AR	E		SCHISANDRA GLABRA			N	AR	BAY STARVINE

ANIMAL OCCURRENCES

ABNNM08102*034*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*032*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN

(ar15) Pine City ACTION SITE (AR)

7,127 Ha 17,611 Acres PUBLIC LAND: .4 % 67 Ha 166 Acres

QUATERNARY GEOLOGY GROUPS

			Sand dune field	406	1,004			
	B		Valley train terrace	6,806	16,818			

PUBLIC LANDS and TNC PRESERVES

			NA in AR	67	166		AR	

AQUATIC SURROGATES

			HUC			N	AR	

VEGETATION ALLIANCES in WMAs and REFUGES

			7985			N		

(ar16) Union Pacific Railroad Prairie ACTION SITE (AR)

6,748 Ha 16,674 Acres PUBLIC LAND: 1.3 % 124 Ha 306 Acres

QUATERNARY GEOLOGY GROUPS

			Prairie alluvium	6,637	16,400			

PUBLIC LANDS and TNC PRESERVES

			NA in AR	124	306		AR	

AQUATIC SURROGATES

			HUC			C	AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

XXNCTS.P4-*030*AR	C	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	
XXNCTS.P4-*025*AR	CD	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	
XXNCTS.P4-*029*AR	CD	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	

PLANT OCCURRENCES

PDONA0C112*008*AR			OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE
PDONA0C112*006*AR	B	S	OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE

ANIMAL OCCURRENCES

IIORT17010*016*AR	B	S	GRYLLOTALPA MAJOR			C	AR	PRAIRIE MOLE CRICKET
IIORT17010*014*AR	BC	S	GRYLLOTALPA MAJOR			C	AR	PRAIRIE MOLE CRICKET
IIORT17010*017*AR	CD		GRYLLOTALPA MAJOR			C	AR	PRAIRIE MOLE CRICKET

(ar17) Prairie Co. South ACTION SITE (AR)

8,104 Ha 20,025 Acres PUBLIC LAND: .3 % 24 Ha 60 Acres

QUATERNARY GEOLOGY GROUPS

			Meander belt	135	335			
			Prairie alluvium	7,856	19,412			

PUBLIC LANDS and TNC PRESERVES

			NA in AR	24	60		AR	

AQUATIC SURROGATES

			HUC			C	AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

PROTO-EOR	C	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	
XXNCTS.P4-*005*AR	C	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	
XXNCTS.P4-*028*AR	C	S	7911 Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation			C	AR	

PLANT OCCURRENCES

PDROS26010*001*AR	A	S	MESPILUS CANESCENS			C	AR	(MESPILUS CANESCENS)
PDONA0C112*012*AR		S	OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
PDONA0C112*013*AR			OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE
PDONA0C112*004*AR	O		OENOTHERA PILOSELLA SSP SESSILIS			C	AR	PRAIRIE EVENING PRIMROSE

ANIMAL OCCURRENCES

IIORT17010*019*AR		S	GRYLLOTALPA MAJOR			C	AR	PRAIRIE MOLE CRICKET

(ar18) Big Ditch SITE (AR)

11,037 Ha 27,272 Acres PUBLIC LAND: .9 % 185 Ha 457 Acres

QUATERNARY GEOLOGY GROUPS

			Backswamp	2,066	5,104			
			Course or Channel	1,185	2,928			
			Meander belt	6,942	17,153			
			Other Alluvium	372	920			
			Prairie alluvium	576	1,422			

MIGRATORY BIRD ZONES

			10,000-acre (Swainson's Warbler)			C	AR	

PUBLIC LANDS and TNC PRESERVES

			NA in AR	185	457		AR	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

XXNCPS.S6-*001*AR	B	S	2419 Nyssa aquatica Forest			C	AR	

(il01) Horseshoe Lake LANDSCAPE-SCALE ACTION SITE (IL)

5,140 Ha 12,701 Acres PUBLIC LAND: 61.3 % 3,267 Ha 8,074 Acres

QUATERNARY GEOLOGY GROUPS

			Course or Channel	1,287	3,180			
			Meander belt	1,964	4,853			
			Meander belt	643	1,590			
			Other Alluvium	68	167			
			Valley train terrace	1,050	2,594			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			N	IL	

PUBLIC LANDS and TNC PRESERVES

			Cypress Creek NWR	7	17		IL	
			Horseshoe Lake SCA	3,260	8,056		IL	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

CPFBA00000*003*IL	ABC		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	IL	
CPFBA00000*004*IL	ABC		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	IL	
CPFBC00000*013*IL	AC		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	IL	
CPWF000000*008*IL	AB		2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	IL	
CPWF000000*009*IL	AC		2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	IL	
CPFBC00000*012*IL	BC	S	2432 Quercus palustris - Quercus bicolor - (Liquidambar styraciflua) Mixed Hardwood Forest			N	IL	

ANIMAL OCCURRENCES

AMACC08020*005*IL		S	CORYNORHINUS RAFINESQUII			N	IL	BAT (CORYNORHINUS RAFINESQUII)
AAABC05061*026*IL		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	IL	ILLINOIS (STRECKER'S) CHORUS FROG

(il02) Mississippi River of Illinois SITE (IL MO KY)

7,978 Ha 19,714 Acres PUBLIC LAND: 0 % 2 Ha 4 Acres

QUATERNARY GEOLOGY GROUPS

			Course or Channel	68	167			
			Meander belt	2,980	7,363			

PUBLIC LANDS and TNC PRESERVES

			Fort Defiance SHP	2	4		IL	

AQUATIC SURROGATES

			OXBOW			N	IL	

ANIMAL OCCURRENCES

AFCJB53020*030*MO	E	S	MACRHYBOPSIS GELDA			N	MO	STURGEON CHUB
ARAAB02010*005*KY	E		MACROCLEMYS TEMMINCKII			N	KY	ALLIGATOR SNAPPING TURTLE
IMBIV39041*035*KY	O	S	QUADRULA CYLINDRICA CYLINDRICA			N	KY	RABBITSFOOT
AFCAA02010*002*KY	C	S	SCAPHIRHYNCHUS ALBUS			N	KY	PALLID STURGEON

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEG	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

(ky01) Ballard SITE (KY)

13,749 Ha 33,974 Acres PUBLIC LAND: 35.1 % 4,895 Ha 12,095 Acres

QUATERNARY GEOLOGY GROUPS

			Meander belt	6,501	16,065			
			Other Alluvium	102	251			
			Valley train terrace	6,434	15,898			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			N	KY	

PUBLIC LANDS and TNC PRESERVES

			Ballard WMA	3,199	7,905		KY	
			Peal Land WMA	61	151		KY	
			Peal WMA	611	1,509		KY	
			Swan Lake WMA	1,024	2,529		KY	

ANIMAL OCCURRENCES

AMACC08020*117*KY	E	S	CORYNORHINUS RAFINESQUII			N	KY	BAT (CORYNORHINUS RAFINESQUII)

(ky02) Kentucky Creeks SITE (KY)

28,381 Ha 70,129 Acres PUBLIC LAND: .1 % 69 Ha 171 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

			meb-019 Obion Creek					
			meb-020 Bayou de Chien					

QUATERNARY GEOLOGY GROUPS

			Course or Channel	1,050	2,594			
			Meander belt	5,892	14,559			
			Other Alluvium	1,659	4,100			
			Valley train terrace	169	418			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			N	KY	

PUBLIC LANDS and TNC PRESERVES

			Westvaco WMA	69	171		KY	

ANIMAL OCCURRENCES

IMBIV37030*027*KY	C	S	POTAMILUS CAPAX			N	KY	FAT POCKETBOOK
AFCAA02010*009*MO	A	S	SCAPHIRHYNCHUS ALBUS			N	MO	PALLID STURGEON
AFCAA02010*001*KY	C	S	SCAPHIRHYNCHUS ALBUS			N	KY	PALLID STURGEON
ABNNM08102*006*MO	A/B	S	STERNA ANTILLARUM ATHALASSOS			N	MO	INTERIOR LEAST TERN
ABNNM08102*006*KY	B	S	STERNA ANTILLARUM ATHALASSOS			N	KY	INTERIOR LEAST TERN
ABNNM08102*005*KY	B	S	STERNA ANTILLARUM ATHALASSOS			N	KY	INTERIOR LEAST TERN
ABNNM08102*004*MO	B	S	STERNA ANTILLARUM ATHALASSOS			N	MO	INTERIOR LEAST TERN
IMGASA1250*001*KY	B	S	TRIODOPSIS MULTILINEATA			N	KY	STRIPED WHITELIP

(la01) Bayou Bartholomew ACTION SITE (LA AR)

116,205 Ha 287,143 Acres PUBLIC LAND: 13.8 % 16,081 Ha 39,736 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

			meb-044 Lower Ouachita River					
			meb-071 Bayou Bartholomew					

QUATERNARY GEOLOGY GROUPS

			Backswamp	46,729	115,466			
			Lacustrine	5,993	14,810			
			Meander belt	37,654	93,042			
			Other Alluvium	9,549	23,595			
			Prairie alluvium	13,680	33,803			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			C	LA	
			20,000-acre (Cerulean Warbler)			C	LA	
			20,000-acre (Cerulean Warbler)			C	LA	

PUBLIC LANDS and TNC PRESERVES

			Chemin A Haut SP	81	199		LA	
			Cut-Off Creek WMA	3,660	9,044		AR	
			D'Arbonne NWR	7,190	17,765		LA	
			Felsenthal/Overflow Overflow Unit NWR	4,896	12,099		AR	
			Seven Devils Swamp WMA	254	628		AR	

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
III.A.2.N.g.1 251			Arundinaria gigantea temporarily flooded shrubland alliance			C		
III.B.2.N.f.1 254			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 262			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 263			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
I.B.2.N.d.11 100			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 104			Fraxinus pennsylvanica - Ulmus americana - Celtis(occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 106			Fraxinus pennsylvanica - Ulmus americana - Celtis(occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 109			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.a.22 98			Liquidambar styraciflua forest alliance			C		
I.B.2.N.a.22 99			Liquidambar styraciflua forest alliance			C		
I.B.2.N.e.13 175			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 183			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 190			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 194			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 195			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 196			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.16 122			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.17 131			Quercus (phellos, nigra, laurifolia) tempararily flooded forest alliance			C		
I.B.2.N.d.17 128			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 133			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 134			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 135			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.20 140			Quercus texana - Celtis laevigata - Ulmus(americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.b.2.N.d.20 144			Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.b.2.N.d.20 147			Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.B.2.N.d.20 149			Quercus texana - Celtis laevigata - Ulmus(americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.B.2.N.d.20 150			Quercus texana - Celtis laevigata - Ulmus(americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.B.2.N.d.20 151			Quercus texana - Celtis laevigata - Ulmus(americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.B.2.N.e.16 207			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 215			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 217			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 218			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.f.3 239			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 242			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 247			Taxodium distichum semipermanently flooded forest alliance			C		
none 292			Willow oak-cedar elm			C		
none 283			Willow oak-cedar elm alliance			C		
none 287			Willow oak-cedar elm alliance			C		

(la03) Saline SITE (LA)

53,861 Ha 133,091 Acres PUBLIC LAND: 50.9 % 28,238 Ha 69,777 Acres

QUATERNARY GEOLOGY GROUPS

			Backswamp	17,472	43,174			
			Course or Channel	1,219	3,012			
			Meander belt	3,589	8,869			
			Other Alluvium	102	251			
			Prairie alluvium	2,201	5,439			
			Valley train terrace	27,902	68,945			

MIGRATORY BIRD ZONES

			100,000-acre (Swallow-tailed Kite)			C	LA	

PUBLIC LANDS and TNC PRESERVES

			Catahoula NWR	2,432	6,009		LA	
			Dewey W. Wills WMA	25,030	61,849		LA	
			SCA in LA	777	1,919		LA	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

PROTO-EOR	AB		2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	LA	
PROTO-EOR	AB		2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	LA	
PROTO-EOR	B		2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	LA	
PROTO-EOR	B		2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	LA	
PROTO-EOR	BC		2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	LA	
PROTO-EOR	AB	S	7407 Quercus texana - Quercus lyrata Forest			C	LA	
PROTO-EOR	BC	S	7719 Taxodium distichum - Fraxinus pennsylvanica - Quercus laurifolia / Acer rubrum / Saururus			C	LA	
PROTO-EOR	B	S	7909 Taxodium distichum / Planera aquatica - Forestiera acuminata Lakeshore Woodland			C	LA	
PROTO-EOR	BC		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	LA	
PROTO-EOR	C		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	LA	
PROTO-EOR	A	S	7921 Quercus phellos - Ulmus crassifolia Forest			C	LA	
PROTO-EOR	B	S	7921 Quercus phellos - Ulmus crassifolia Forest			C	LA	
PROTO-EOR	B	S	7921 Quercus phellos - Ulmus crassifolia Forest			C	LA	

ANIMAL OCCURRENCES

AFCJB28540*009*LA	E	S	PTERONOTROPSIS HUBBSI			C	LA	BLUEHEAD SHINER

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

VEGETATION ALLIANCES in WMAs and REFUGES

none 276			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 289			Alliance with L. styraciflua, Q. phellos as dominants			C		
III.B.2.N.f.1 252			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 257			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 260			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
none 285			Crataegus spp. temporarily flooded shrubland alliance			C		
III.B.2.N.f.2 268			Foresteria acuminata semipermanently flooded forest alliance			C		
III.B.2.N.f.2 273			Foresteria acuminata semipermanently flooded forest alliance			C		
III.B.2.N.f.2 264			Foresteria acuminata semipermanently flooded shrubland alliance			C		
? 96			Pinus taeda - Quercus (marilandica, falcata, stellata) forest alliance			C		
V.B.2.N.h.100 295			Polygonum spp. seasonally flooded herbaceous alliance			C		
I.B.2.N.d.15 117			Populus deltoides temporarily flooded forest alliance			C		
I.B.2.N.e.13 171			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 184			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 191			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 192			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.17 125			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.e.15 201			Quercus phellos seasonally flooded forest alliance			C		
I.B.2.N.e.15 202			Quercus phellos seasonally flooded forest alliance			C		
I.B.2.N.e.15 203			Quercus phellos seasonally flooded forest alliance			C		
I.B.2.N.e.16 211			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 216			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.d.22 158			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.e.22 225			Taxodium distichum - Nyssa (aquatica, biflora, ogeche) seasonally flooded forest alliance			C		
I.B.2.N.e.22 228			Taxodium distichum - Nyssa (aquatica, biflora, ogeche) seasonally flooded forest alliance			C		
I.B.2.N.f.3 236			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 243			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 245			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.e.22 220			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
none 284			Willow oak-cedar elm alliance			C		
none 288			Willow oak-cedar elm alliance			C		

(la04) Bayou Cocodrie SITE (LA)

24,471 Ha 60,468 Acres PUBLIC LAND: 20.9 % 5,099 Ha 12,599 Acres

QUATERNARY GEOLOGY GROUPS

			Backswamp	14,154	34,975			
			Course or Channel	1,591	3,933			
			Meander belt	8,296	20,499			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			C	LA	
			20,000-acre (Cerulean Warbler)			C	LA	

PUBLIC LANDS and TNC PRESERVES

			Bayou Cocodrie NWR	5,099	12,599		LA	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

PROTO-EOR	A	S	2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			C	LA	
PROTO-EOR	A		2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	LA	
PROTO-EOR	A		7397 Quercus lyrata - Carya aquatica Forest			C	LA	
PROTO-EOR	A		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	LA	

VEGETATION ALLIANCES in WMAs and REFUGES

none 280			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 282			Alliance with L. styraciflua, Q. phellos as dominants			C		
III.B.2.N.f.1 255			Cephalanthus Occidentalis Semipermanently Flooded Shrubland			C		
I.B.2.N.d.11 101			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 102			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
none 281			Planara aquatica Semipermanently Flooded Shrubland			C		
I.B.2.N.d.15 116			Populus deltoides temporarily flooded forest alliance			C		
I.B.2.N.e.13 176			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 177			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.17 129			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 130			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.e.16 208			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.d.20 141			Quercus texana-Celtis Laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 142			Quercus texana-Celtis Laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.e.22 222			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 223			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 224			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CTPDA13410*002*MO	C		2397 Schizachyrium scoparium - Sorghastrum nutans - Aristida lanosa - Polypremum procumbens			N	MO	
CTFDA11420*003*MO	C	S	2417 Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand			N	MO	
CTSZA12400*002*MO	C+/C	S	2417 Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand			N	MO	

ANIMAL OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
AAABC05061*018*MO		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	MO	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*042*MO	A	S	PSEUDACRIS STRECKERI ILLINOENSIS			N	MO	ILLINOIS (STRECKER'S) CHORUS FROG
AAABC05061*045*MO	U	S	PSEUDACRIS STRECKERI ILLINOENSIS			N	MO	ILLINOIS (STRECKER'S) CHORUS FROG

(mo03) Mingo ACTION SITE (MO)

13,434 Ha 33,195 Acres PUBLIC LAND: 83.3 % 11,193 Ha 27,657 Acres

QUATERNARY GEOLOGY GROUPS

PRIMARY IDENTIFIER	HA	ACRES
Crowleys ridge	474	1,171
Meander belt	102	251
Other Alluvium	610	1,506
Valley train terrace	11,242	27,779

MIGRATORY BIRD ZONES

PRIMARY IDENTIFIER	GEOG ZONE	STATE
20,000-acre (Cerulean Warbler)	N	MO

PUBLIC LANDS and TNC PRESERVES

PRIMARY IDENTIFIER	HA	ACRES	STATE
Duck Creek CA	2,580	6,374	MO
Mingo NWR	8,613	21,282	MO

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CTFMB11720*003*MO	B-C		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	MO	
CTFEB11730*005*MO	C		2101 Populus deltoides - Salix nigra Forest			N	MO	
CTFWB11740*002*MO	C		2422 Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda Forest			N	MO	
CTFEB11730*037*MO	C		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	
CTFEB11730*028*MO	C		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	

(mo04) Missouri Crowleys Ridge SITE (MO)

4,163 Ha 10,287 Acres PUBLIC LAND: 12.9 % 416 Ha 1,027 Acres

QUATERNARY GEOLOGY GROUPS

PRIMARY IDENTIFIER	HA	ACRES
Crowleys ridge	2,878	7,112
Other Alluvium	135	335
Valley train terrace	1,117	2,761

PUBLIC LANDS and TNC PRESERVES

PRIMARY IDENTIFIER	HA	ACRES	STATE
Beech Springs DNA	14	35	MO
Holly Ridge CA	364	898	MO
Holly Ridge DNA	38	94	MO

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CTFRA11430*001*MO	B	S	2396 Quercus stellata - Quercus velutina - Quercus alba - (Quercus falcata) / Croton michauxii			N	MO	
CTWWZ15270*005*MO	B		2406 Quercus palustris - (Quercus bicolor) / Carex crinita / Sphagnum spp. Forest			N	MO	
CTFDA11420*002*MO	B	S	2417 Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand			N	MO	

(mo05) Donaldson Point - Reelfoot Lake LANDSCAPE-SCALE ACTION SITE (MO TN KY)

110,592 Ha 273,273 Acres PUBLIC LAND: 12.9 % 13,970 Ha 34,521 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

meb-021 Reelfoot Lake and watershed

QUATERNARY GEOLOGY GROUPS

PRIMARY IDENTIFIER	HA	ACRES
Course or Channel	16,998	42,003
Meander belt	49,099	121,323
Meander belt	372	920
Other Alluvium	68	167
Sand dune field	948	2,343
Valley train terrace	13,138	32,464

MIGRATORY BIRD ZONES

PRIMARY IDENTIFIER	GEOG ZONE	STATE
10,000-acre (Swainson's Warbler)	N	MO
10,000-acre (Swainson's Warbler)	N	MO
10,000-acre (Swainson's Warbler)	N	MO
10,000-acre (Swainson's Warbler)	N	KY
20,000-acre (Cerulean Warbler)	N	TN KY

PUBLIC LANDS and TNC PRESERVES

PRIMARY IDENTIFIER	HA	ACRES	STATE
Big Oak Tree DNA	384	950	MO
Big Oak Tree SP	17	41	MO

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
			Donaldson Point CA	2,352	5,811		MO	
			Lake Isom NWR	728	1,798		TN	
			Reelfoot Lake NWR	4,161	10,282		TN	
			Reelfoot WMA	3,720	9,191		TN	
			Seven Island CA	972	2,402		MO	
			Ten Mile Pond CA	1,525	3,767		MO	
			Ten Mile Pond WMA	113	279		MO	

AQUATIC SURROGATES

			OXBOW			N	MO	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

CTFEB11730*001*MO	A-B+	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	MO	
PROTO-EOR	b		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	TN	
PROTO-EOR	a		2420 Taxodium distichum / Lemna minor Forest			N	TN	
CTWHZ15310*005*MO	B		2420 Taxodium distichum / Lemna minor Forest			N	MO	
CTWHZ15310*008*MO	B+	S	2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	MO	
CTFWB11740*015*MO	B-		2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	MO	
CTFWB11740*008*MO	B	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			N	MO	
CTFEB11730*033*MO	B-		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	
CTFEB11730*032*MO	C-		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	
CTFEB11730*031*MO	C-		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	
CTFEB11730*029*MO	C/C-		2424 Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest			N	MO	
PROTO-EOR	a		2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			N	TN	
CEGL002427*001*TN	AB		2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			N	TN	
CTFEB11730*020*MO	B-C		2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			N	MO	
CTFWB11740*019*MO	B/C-		2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			N	MO	
CTFWB11740*007*MO	A/B	S	2586 Acer saccharinum - Ulmus americana - (Populus deltoides) Forest			N	MO	
CTFWB11740*005*MO	B/C	S	2586 Acer saccharinum - Ulmus americana - (Populus deltoides) Forest			N	MO	

PLANT OCCURRENCES

PMCYP033K0*___*TN	ab	S	CAREX DECOMPOSITA			N	TN	CYPRESS-KNEE SEDGE
PMCYP03CK0*___*TN	ab	S	CAREX SOCIALIS			N	TN	SOCIAL SEDGE
PMCYP03CK0*002*MO	B	S	CAREX SOCIALIS			N	MO	SOCIAL SEDGE

ANIMAL OCCURRENCES

IMBIV06010*001*MO	U	S	ARCIDENS CONFRAGOSUS			N	MO	ROCK POCKETBOOK
AMACC08020*016*TN	?	S	CORYNORHINUS RAFINESQUII			N	TN	BAT (CORYNORHINUS RAFINESQUII)
AAABC05061*012*MO		S	PSEUDACRIS STRECKERI ILLINOENSIS			N	MO	ILLINOIS (STRECKER'S) CHORUS FROG
ABNNM08102*003*MO	A	S	STERNA ANTILLARUM ATHALASSOS			N	MO	INTERIOR LEAST TERN
ABNNM08102*002*KY	B		STERNA ANTILLARUM ATHALASSOS			N	KY	INTERIOR LEAST TERN
ABNNM08102*008*KY	B		STERNA ANTILLARUM ATHALASSOS			N	KY	INTERIOR LEAST TERN
ABNNM08102*007*KY	C		STERNA ANTILLARUM ATHALASSOS			N	KY	INTERIOR LEAST TERN
ABNNM08102*011*MO	E		STERNA ANTILLARUM ATHALASSOS			N	MO	INTERIOR LEAST TERN
ABNNM08102*013*TN	E		STERNA ANTILLARUM ATHALASSOS			N	TN	INTERIOR LEAST TERN
ABNNM08102*030*TN	E		STERNA ANTILLARUM ATHALASSOS			N	TN	INTERIOR LEAST TERN
IMGASA1250*001*TN	B	S	TRIODOPSIS MULTILINEATA			N	TN	STRIPED WHITELIP
IMGASA1250*002*TN	B	S	TRIODOPSIS MULTILINEATA			N	TN	STRIPED WHITELIP
IMGASA1250*004*KY	C		TRIODOPSIS MULTILINEATA			N	KY	STRIPED WHITELIP

VEGETATION ALLIANCES in WMAs and REFUGES

I.B.2.N.d.27 442			Acer saccharinum - Carya cordiformis temp. flooded forest.			N	TN	
I.B.2.N.d.16 436			Sweetgum - mixed oak - SAF			N	TN	
I.B.2.N.f.3 446			Taxodium distichum semipermanently flooded forest.			N	TN	
I.B.2.N.f.3 447			Taxodium distichum semipermanently flooded forest - no Water tupelo at Reelfoot Lake			N	TN	

(mo06) Otter Slough ACTION SITE (MO)

4,825 Ha 11,923 Acres PUBLIC LAND: 39.9 % 1,986 Ha 4,908 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

meb-076 St. Francis River

QUATERNARY GEOLOGY GROUPS

			Meander belt	1,321	3,263			
			Valley train terrace	3,352	8,283			

PUBLIC LANDS and TNC PRESERVES

			Bradyville DNA	61	150		MO	
			Otter Slough CA	1,912	4,725		MO	
			Otter Slough DNA	14	35		MO	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

CTFZH11800*012*MO	C	S	2101 Populus deltoides - Salix nigra Forest			N	MO	
CTFZH11800*013*MO	C	S	2101 Populus deltoides - Salix nigra Forest			N	MO	
CTFZH11800*014*MO	C	S	2101 Populus deltoides - Salix nigra Forest			N	MO	
CTFEB11730*009*MO	C	S	2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			N	MO	
CTWHZ15310*006*MO	B	S	2422 Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda Forest			N	MO	

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

ANIMAL OCCURRENCES

IMBIV10010*002*MO	U	S	CYPROGENIA ABERTI			N	MO	WESTERN FANSHELL
IMBIV10010*001*MO	U	S	CYPROGENIA ABERTI			N	MO	WESTERN FANSHELL
IMBIV39041*001*MO	U	S	QUADRULA CYLINDRICA CYLINDRICA			N	MO	RABBITSFOOT

(mo07) Wilhelmina State Forest SITE (MO)

7,631 Ha 18,856 Acres PUBLIC LAND: 8.3 % 574 Ha 1,417 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

			meb-076 St. Francis River					

QUATERNARY GEOLOGY GROUPS

			Crowleys ridge	68	167			
			Meander belt	1,998	4,937			
			Valley train terrace	5,316	13,136			

MIGRATORY BIRD ZONES

			10,000-acre (Swainson's Warbler)			N	MO	

PUBLIC LANDS and TNC PRESERVES

			Wilhelmina CA	574	1,417		MO	

AQUATIC SURROGATES

			HUC			N	MO	

PLANT OCCURRENCES

PMCYP03CK0*005*MO	C		CAREX SOCIALIS			N	MO	SOCIAL SEDGE

ANIMAL OCCURRENCES

ARAAB02010*046*MO	E	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
ARAAB02010*040*MO	E	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
ARAAB02010*039*MO	E	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE
ARAAB02010*037*MO	E	S	MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE

(mo08) Ripley Co. SITE (MO)

1,198 Ha 2,960 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

QUATERNARY GEOLOGY GROUPS

			Meander belt	203	502			
			Sand dune field	203	502			
			Valley train terrace	745	1,841			

AQUATIC SURROGATES

			RIVER			N	MO	

ANIMAL OCCURRENCES

IMBIV21110*036*MO	U	S	LAMPSILIS ABRUPTA			N	MO	PINK MUCKET
ARAAB02010*014*MO	A		MACROCLEMYS TEMMINCKII			N	MO	ALLIGATOR SNAPPING TURTLE

(ms01) Tunica SITE (MS AR)

37,715 Ha 93,194 Acres PUBLIC LAND: 0 % 0 Ha 0 Acres

QUATERNARY GEOLOGY GROUPS

			Course or Channel	7,009	17,320			
			Meander belt	25,531	63,088			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			C	MS	
			20,000-acre (Cerulean Warbler)			C	MS	

AQUATIC SURROGATES

			OXBOW			S	MS	

ANIMAL OCCURRENCES

ABNNM08102*035*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*036*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*033*AR	E		STERNA ANTILLARUM ATHALASSOS			C	AR	INTERIOR LEAST TERN
ABNNM08102*037*AR	E		STERNA ANTILLARUM ATHALASSOS			N	AR	INTERIOR LEAST TERN

VEGETATION ALLIANCES in WMAs and REFUGES

I.B.2.N.f.2	390		Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.e.13	353		Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.16	315		Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.17	319		Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.e.16	370		Quercus texana - (Q. lyrata) seasonally flooded forest alliance			C		

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES

(ms02) O'Keefe SITE (MS)

33,269 Ha 82,208 Acres PUBLIC LAND: 9.5 % 3,292 Ha 8,134 Acres

QUATERNARY GEOLOGY GROUPS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Course or Channel	3,386	8,367			
			Meander belt	9,143	22,591			
			Valley train terrace	20,757	51,290			

MIGRATORY BIRD ZONES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			20,000-acre (Cerulean Warbler)			C	MS	

PUBLIC LANDS and TNC PRESERVES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			O'Keefe WMA	2,392	5,911		MS	
			Tallahatchie NWR	900	2,223		MS	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PROTO-EOR	B		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
CCAJ000000*008*MS			2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*008*MS			2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	BC		7397 Quercus lyrata - Carya aquatica Forest			C	MS	
CCAJ000000*008*MS			7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	B		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	

ANIMAL OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
ARAAB02010*013*MS			MACROCLEMYS TEMMINCKII			C	MS	ALLIGATOR SNAPPING TURTLE

VEGETATION ALLIANCES in WMAs and REFUGES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
none 421			Alliance with L. styraciflua, Q. phellos as dominants			C		
I.B.2.N.e.13 350			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.16 313			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.22 340			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 343			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 344			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.f.3 403			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.e.22 384			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		

(ms03) Malmaison SITE (MS)

36,202 Ha 89,455 Acres PUBLIC LAND: 15.6 % 5,743 Ha 14,190 Acres

QUATERNARY GEOLOGY GROUPS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Course or Channel	4,876	12,049			
			Meander belt	8,398	20,750			
			Other Alluvium	339	837			
			Prairie alluvium	508	1,255			
			Valley train terrace	18,996	46,940			

MIGRATORY BIRD ZONES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			20,000-acre (Cerulean Warbler)			C	MS	

PUBLIC LANDS and TNC PRESERVES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			Malmaison WMA	3,775	9,328		MS	
			Tallahatchie NWR	1,668	4,122		MS	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
CCAJ050000*001*MS			2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
PROTO-EOR	AB		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
PROTO-EOR	AB		2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	MS	
PROTO-EOR	BC		2419 Nyssa aquatica Forest			C	MS	
PROTO-EOR	B		2420 Taxodium distichum / Lemna minor Forest			C	MS	
PROTO-EOR	BC	S	2421 Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest			C	MS	
PROTO-EOR	BC	S	7913 Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua)			C	MS	
PROTO-EOR	AB		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	B		7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	

PLANT OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PDSCH01020*032*MS	AB	S	SCHISANDRA GLABRA			C	MS	BAY STARVINE
PDSCH01020*033*MS	C		SCHISANDRA GLABRA			C	MS	BAY STARVINE

VEGETATION ALLIANCES in WMAs and REFUGES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
none 422			Alliance with L. styraciflua, Q. phellos, and Q. nigra as dominants			C		
none 431			Alliance with L. styraciflua, Q. phellos, and Q. nigra as dominants			C		
none 432			Alliance with L. styraciflua, Q. phellos, as dominants			C		
III.B.2.N.f.2 413			Foresteria acuminata semipermanently flooded shrubland alliance			C		
I.B.2.N.f.2 389			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.d.15 308			Populus deltoides temporarily flooded forest alliance			C		
I.B.2.N.e.13 352			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		

EOCODE or ALLIANCE CODES		EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
I.B.2.N.e.13	367			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.16	314			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.e.15	368			Quercus phellos seasonally flooded forest alliance			C		
I.B.2.N.f.3	397			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.e.22	379			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		

(ms04) Dahomey ACTION SITE (MS)

8,041 Ha 19,869 Acres PUBLIC LAND: 49.4 % 3,970 Ha 9,810 Acres

OVERLAPPING SITES IDENTIFIED BY TNC FRESHWATER INITIATIVE AQUATICS ANALYSIS

meb-030 Big Sunflower River

QUATERNARY GEOLOGY GROUPS

Primary Identifier	HA	ACRES
Course or Channel	1,016	2,510
Meander belt	1,862	4,602
Valley train terrace	5,350	13,220

MIGRATORY BIRD ZONES

Primary Identifier	GEOG ZONE	STATE
10,000-acre (Swainson's Warbler)	C	MS

PUBLIC LANDS and TNC PRESERVES

Primary Identifier	HA	ACRES	STATE
Dahomey NWR	3,970	9,810	MS

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE	EORANK	SELECT		Primary Identifier	GEOG ZONE	STATE
PROTO-EOR	AB	S	2099	Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F	C	MS
PROTO-EOR	BC	S	2099	Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F	C	MS
CCAE000000*002*MS	C		2191	UNDESRIBED	C	MS
PROTO-EOR	B		2427	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	C	MS
PROTO-EOR	AB		4619	Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)	C	MS
PROTO-EOR	B		4619	Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)	C	MS
PROTO-EOR	BC		4619	Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)	C	MS
PROTO-EOR	BC		7397	Quercus lyrata - Carya aquatica Forest	C	MS
PROTO-EOR	BC		7915	Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest	C	MS

VEGETATION ALLIANCES in WMAs and REFUGES

Alliance Code		Primary Identifier	GEOG ZONE
none	415	Codominants: Q. nigra, Q. phellos, L. styraciflua	C
I.B.2.N.d.11	298	Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest	C
I.B.2.N.d.11	304	Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest	C
I.B.2.N.e.13	345	Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance	C
I.B.2.N.d.16	310	Quercus (michauxii, pagoda, shumardii)-Liquidambar styraciflua temporarily flooded forest alliar	C
I.B.2.N.d.20	326	Quercus texana-Celtis laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest	C
I.B.2.N.e.19	374	Salix nigra seasonally flooded forest alliance	C
I.B.2.N.f.3	395	Taxodium distichum semipermanently flooded forest alliance	C
I.B.2.N.f.3	402	Taxodium distichum semipermanently flooded forest alliance	C
I.B.2.N.e.22	378	Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest	C

(ms05) Lower Yazoo LANDSCAPE-SCALE ACTION SITE (MS)

459,271 Ha 1,134,859 Acres PUBLIC LAND: 14.2 % 65,363 Ha 161,512 Acres

QUATERNARY GEOLOGY GROUPS

Primary Identifier	HA	ACRES
Backswamp	102,464	253,189
Course or Channel	80,793	199,640
Meander belt	246,612	609,378
Other Alluvium	779	1,924
Prairie alluvium	169	418
Valley train terrace	5,553	13,722

MIGRATORY BIRD ZONES

Primary Identifier	GEOG ZONE	STATE
100,000-acre (Swallow-tailed Kite)	C	MS
100,000-acre (Swallow-tailed Kite)	C	MS
20,000-acre (Cerulean Warbler)	C	MS
20,000-acre (Cerulean Warbler)	C	MS
20,000-acre (Cerulean Warbler)	C	MS
20,000-acre (Cerulean Warbler)	C	MS
20,000-acre (Cerulean Warbler)	C	MS

PUBLIC LANDS and TNC PRESERVES

Primary Identifier	HA	ACRES	STATE
Anderson Tully WMA	1,842	4,552	MS
Delta NF	24,624	60,846	MS
Hillside NWR	7,502	18,537	MS
Lake George WMA	3,421	8,454	MS
Mahannah WMA	5,237	12,940	MS
Mathews Brake NWR	971	2,400	MS
Morgan Brake NWR	2,978	7,358	MS
Panther Swamp NWR	14,394	35,567	MS
Shipland WMA	2,055	5,078	MS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
			Twin Oaks WMA	2,340	5,781		MS	

AQUATIC SURROGATES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
			HUC			C	MS	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PROTO-EOR	A	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
PROTO-EOR	B	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
PROTO-EOR	C	S	2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			C	MS	
PROTO-EOR	A	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	MS	
PROTO-EOR	B	S	2102 Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest			C	MS	
PROTO-EOR	B	S	2419 Nyssa aquatica Forest			C	MS	
PROTO-EOR	BC	S	2420 Taxodium distichum / Lemna minor Forest			C	MS	
CCAJ000000*003*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*004*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*005*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*006*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ041000*001*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ041000*002*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*001*MS		S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
PROTO-EOR	Ab	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
PROTO-EOR	B	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
PROTO-EOR	B	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
PROTO-EOR	B	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
PROTO-EOR	B	S	2423 Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest			C	MS	
CCAJ000000*001*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ000000*009*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ040000*001*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ000000*003*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ000000*004*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ000000*005*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
CCAJ000000*006*MS		S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	AB	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	AB	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	B	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	B	S	2427 Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest			C	MS	
PROTO-EOR	AB	S	4619 Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)			C	MS	
PROTO-EOR	AB	S	4619 Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)			C	MS	
PROTO-EOR	AB	S	4619 Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)			C	MS	
PROTO-EOR	B	S	7394 Planera aquatica Forest			C	MS	
PROTO-EOR	Ab	S	7397 Quercus lyrata - Carya aquatica Forest			C	MS	
PROTO-EOR	Ab	S	7397 Quercus lyrata - Carya aquatica Forest			C	MS	
PROTO-EOR	B	S	7397 Quercus lyrata - Carya aquatica Forest			C	MS	
PROTO-EOR	B	S	7397 Quercus lyrata - Carya aquatica Forest			C	MS	
PROTO-EOR	AB	S	7407 Quercus texana - Quercus lyrata Forest			C	MS	
PROTO-EOR	BC	S	7407 Quercus texana - Quercus lyrata Forest			C	MS	
CCAJ000000*009*MS		S	7410 Salix nigra Seasonally Flooded Forest			C	MS	
PROTO-EOR	AB	S	7410 Salix nigra Seasonally Flooded Forest			C	MS	
PROTO-EOR	BC	S	7410 Salix nigra Seasonally Flooded Forest			C	MS	
PROTO-EOR	B	S	7908 Salix nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	BC	S	7912 Carya illinoinensis - Celtis laevigata - Ulmus (americana, crassifolia) Mississippi River Alluvial			C	MS	
PROTO-EOR	B	S	7913 Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua)			C	MS	
PROTO-EOR	B	S	7913 Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua)			C	MS	
CCAJ030000*002*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*001*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*003*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*004*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*005*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*006*MS		S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	A	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	AB	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	AB	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	AB	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	AB	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	B	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	BC	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	BC	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	C	S	7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
PROTO-EOR	A	S	7921 Quercus phellos - Ulmus crassifolia Forest			C	MS	

PLANT OCCURRENCES

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER
PMCYP033K0*005*MS	AB	S	CAREX DECOMPOSITA			C	MS	CYPRESS-KNEE SEDGE
PMCYP03CK0*001*MS	E	S	CAREX SOCIALIS			C	MS	SOCIAL SEDGE
PDLAU07020*008*MS	?	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*001*MS	A	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*018*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*013*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*022*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*016*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
PDLAU07020*007*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*011*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*024*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*014*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*019*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*020*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*021*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*023*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*015*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*009*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*010*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*017*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*025*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*006*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDLAU07020*012*MS	E	S	LINDERA MELISSIFOLIA			C	MS	PONDBERRY
PDSCH01020*037*MS		S	SCHISANDRA GLABRA			C	MS	BAY STARVINE
PDSCH01020*043*MS	E	S	SCHISANDRA GLABRA			C	MS	BAY STARVINE

ANIMAL OCCURRENCES

IMBIV06010*011*MS	C		ARCIDENS CONFRAGOSUS			C	MS	ROCK POCKETBOOK
ARAAB02010*006*MS		S	MACROCLEMYS TEMMINCKII			C	MS	ALLIGATOR SNAPPING TURTLE
ARAAB02010*005*MS		S	MACROCLEMYS TEMMINCKII			C	MS	ALLIGATOR SNAPPING TURTLE
AFCAA02010*003*MS	E	S	SCAPHIRHYNCHUS ALBUS			C	MS	PALLID STURGEON
ABNNM08102*003*LA			STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*010*LA	A	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*011*LA	B	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*013*LA	B-C	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*012*LA	C	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*002*LA	E	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN

VEGETATION ALLIANCES in WMAs and REFUGES

none 416			Alliance with L. styraciflua, Q. nigra, Q. phellos as dominants			C		
none 420			Alliance with L. styraciflua, Q. nigra, Q. phellos as dominants			C		
none 417			Alliance with L. styraciflua, Q. nigra, Q. phellos as dominants			C		
I.B.2.N.d.17 318			Alliance with L. styraciflua, Q. phellos as dominants			C		
I.B.2.N.d.17 325			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 423			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 424			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 425			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 426			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 427			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 430			Alliance with L. styraciflua, Q. phellos as dominants			C		
none 419			Alliance with Q. phellos, L. stryraciflua, and Q. texana			C		
none 429			Alliance with Q. phellos, L. stryraciflua, and Q. texana			C		
III.B.2.N.f.1 408			Cephalanthus Occidentalis Semipermanently Flooded Shrubland			C		
III.B.2.N.f.1 409			Cephalanthus Occidentalis Semipermanently Flooded Shrubland			C		
III.B.2.N.f.1 410			Cephalanthus Occidentalis Semipermanently Flooded Shrubland			C		
III.B.2.N.f.1 405			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 406			Cephalanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 404			Cephanlanthus occidentalis semipermanently flooded shrubland alliance			C		
III.B.2.N.f.1 411			Cephanlanthus occidentalis semipermanently flooded shrubland alliance			C		
I.B.2.N.f.2 391			Foresteria acuminata semipermanently flooded shrubland alliance			C		
III.B.2.N.f.2 414			Foresteria acuminata semipermanently flooded shrubland alliance			C		
III.B.2.N.f.2 412			Foresteria acuminata semipermanently flooded shrubland alliance			C		
I.B.2.N.d.11 297			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 299			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 300			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 301			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 302			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.d.11 303			Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata) temporarily flooded forest			C		
I.B.2.N.f.2 385			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 386			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 387			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 388			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 392			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 393			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.f.2 394			Nyssa aquatica -(Taxodium distichum) semipermanently flooded forest alliance			C		
I.B.2.N.d.13 305			Platanus occidentalis - (Fraxinus pensylvania, Celtis laevigata, Acer saccharinum) Temporarily flooded			C		
I.B.2.N.d.13 307			Platanus occidentalis - (Fraxinus pensylvania, Celtis laevigata, Acer saccharinum) Temporarily flooded			C		
none 418			Q. phellos - Ulmus crassifolia			C		
none 428			Q. phellos - Ulmus crassifolia			C		
I.B.2.N.e.13 346			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 348			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 349			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 351			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 354			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 355			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 356			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGI	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
I.B.2.N.e.13 357			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 358			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 359			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 360			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 361			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 362			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 363			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 364			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 365			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 347			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.e.13 366			Quercus lyrata - (Carya aquatica) seasonally flooded forest alliance			C		
I.B.2.N.d.16 312			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.16 316			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.16 311			Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua temporarily flooded forest allia			C		
I.B.2.N.d.17 321			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 322			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 323			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.17 317			Quercus (phellos, nigra, laurifolia) temporarily flooded forest alliance			C		
I.B.2.N.d.20 328			Quercus texana - Celtis laevigata - Ulmus(americana, crassifolia) - (Gleditsia triacanthos) temporarily			C		
I.B.2.N.e.16 371			Quercus texana - Quercus lyrata /Campsis radicans forest			C		
I.B.2.N.e.16 372			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 373			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.e.16 369			Quercus texana - (Quercus lyrata) seasonally flooded forest alliance			C		
I.B.2.N.d.20 327			Quercus texana-Celtis Laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 329			Quercus texana-Celtis laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 330			Quercus texana-Celtis laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 331			Quercus texana-Celtis laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 332			Quercus texana-Celtis laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 333			Quercus texana-Celtis Laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
I.B.2.N.d.20 334			Quercus texana-Celtis Laevigata-Ulmus americana - (Gleditsia triacanthos) temporarily flooded forest			C		
none 433			Red oak, white oak, sweetgum upland slope forest			C		
I.B.2.N.d.22 337			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 338			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 339			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 342			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 336			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.d.22 335			Salix nigra temporarily flooded forest alliance			C		
I.B.2.N.f.3 398			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 399			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 400			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 401			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.f.3 396			Taxodium distichum semipermanently flooded forest alliance			C		
I.B.2.N.e.22 375			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 376			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 377			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 381			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 382			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
I.B.2.N.e.22 383			Taxodium distichum-Nyssa (aquatica, biflora, ogeche) seasonally flooded forest			C		
? 296			undefined			C		

(ms06) LeRoy Percy SITE (MS)

10,564 Ha 26,104 Acres PUBLIC LAND: 57.6 % 6,263 Ha 15,475 Acres

QUATERNARY GEOLOGY GROUPS

		HA	ACRES	GEOG ZONE	STATE
	Backswamp	1,422	3,514		
	Course or Channel	2,743	6,777		
	Meander belt	4,808	11,881		
	Valley train terrace	1,727	4,267		

MIGRATORY BIRD ZONES

		HA	ACRES	GEOG ZONE	STATE
	20,000-acre (Cerulean Warbler)			C	MS

PUBLIC LANDS and TNC PRESERVES

		HA	ACRES	GEOG ZONE	STATE
	Leroy Percy WMA	987	2,438		MS
	Yazoo NWR	5,276	13,036		MS

AQUATIC SURROGATES

		HA	ACRES	GEOG ZONE	STATE
	HUC			C	MS

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

			GEOG ZONE	STATE
CCAJ000000*002*MS	2423	Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest	C	MS
CCAJ011000*002*MS	2427	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	C	MS
CCAJ000000*002*MS	2427	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	C	MS
CCAJ000000*007*MS	2427	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	C	MS
PROTO-EOR	7407	Quercus texana - Quercus lyrata Forest	C	MS
CCAJ011000*002*MS	7410	Salix nigra Seasonally Flooded Forest	C	MS
CCAJ000000*007*MS	7410	Salix nigra Seasonally Flooded Forest	C	MS

EOCODE or ALLIANCE CODES	EORANK	SELECT	PRIMARY IDENTIFIER (other than codes to left) GEOLOGY or RESERVES or BIRD ZONE or AQUATIC or GNAME or TNC CEGL	HA	ACRES	GEOG ZONE	STATE	SECONDARY IDENTIFIER GCOMNAME or ATCHAFALAYA HABITAT TYPES
CCAJ000000*002*MS			7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	
CCAJ000000*007*MS			7915 Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest			C	MS	

PLANT OCCURRENCES

PMCYP033K0*008*MS	?		CAREX DECOMPOSITA			C	MS	CYPRESS-KNEE SEDGE

ANIMAL OCCURRENCES

IMBIV06010*006*MS	?	S	ARCIDENS CONFRAGOSUS			C	MS	ROCK POCKETBOOK

(ms07) Rodney ACTION SITE (MS)

5,865 Ha   14,492 Acres   PUBLIC LAND: 0 %   0 Ha   0 Acres

QUATERNARY GEOLOGY GROUPS

			Backswamp	271	669			
			Course or Channel	1,287	3,180			
			Meander belt	4,199	10,375			

AQUATIC SURROGATES

			OXBOW			C	MS	

ANIMAL OCCURRENCES

IMBIV37030*001*MS	BC	S	POTAMILUS CAPAX			C	MS	FAT POCKETBOOK
IMBIV37030*002*MS	E	S	POTAMILUS CAPAX			C	MS	FAT POCKETBOOK
ABNNM08102*006*LA	A	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN

(ms08) St. Catherines Creek SITE (MS)

37,999 Ha   93,896 Acres   PUBLIC LAND: 27.2 %   10,107 Ha   24,974 Acres

QUATERNARY GEOLOGY GROUPS

			Backswamp	17,405	43,007			
			Course or Channel	2,675	6,610			
			Meander belt	13,646	33,720			
			Other Alluvium	847	2,092			

MIGRATORY BIRD ZONES

			20,000-acre (Cerulean Warbler)			C	MS	
			20,000-acre (Cerulean Warbler)			C	MS	

PUBLIC LANDS and TNC PRESERVES

			St. Catherines Creek NWR	10,107	24,974		MS	

AQUATIC SURROGATES

			OXBOW			C	MS	

ANIMAL OCCURRENCES

IMBIV37030*003*MS	C		POTAMILUS CONFRAGOSUS			CD	MS	FAT POCKETBOOK
ABNNM08102*004*LA	A	S	STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN
ABNNM08102*005*LA	B		STERNA ANTILLARUM ATHALASSOS			C	LA	INTERIOR LEAST TERN

(tn01) Ernest Rice SITE (TN)

2,964 Ha   7,324 Acres   PUBLIC LAND: 31.9 %   875 Ha   2,161 Acres

QUATERNARY GEOLOGY GROUPS

			Course or Channel	948	2,343			
			Meander belt	1,727	4,267			
			Valley train terrace	203	502			

PUBLIC LANDS and TNC PRESERVES

			Ernest Rice Sr. WMA	875	2,161		TN	

COMMUNITY OCCURRENCES (PLANT ASSOCIATIONS)

PROTO-EOR	c		2099 Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea F			N	TN	
PROTO-EOR	c	S	7346 Populus deltoides - Salix nigra / Mikania scandens Forest			N	TN	

ANIMAL OCCURRENCES

IMGASA1250*005*TN	C		TRIODOPSIS MULTILINEATA			N	TN	STRIPED WHITELIP

VEGETATION ALLIANCES in WMAs and REFUGES

I.B.2.N.d.16 437			Quercus spp - Liquidamber styraciflua			N	TN	

(tn02) Chickasaw - Lower Hatchie LANDSCAPE-SCALE ACTION SITE (TN AR)

101,258 Ha   250,209 Acres   PUBLIC LAND: 20.9 %   21,150 Ha   52,263 Acres

Appendix 2
Characteristics of MSRAP Portfolio Sites

Arkansas Frog Site	
State:	AR
Ownership:	Private non-industrial
Biodiversity issues	Potentially water quality
Urgency:	
Current role:	
Anticipated role:	
Data Gaps:	Know little about this site; need to check on viability, however MANY occurrences so likely viable
Comments:	Not on radar screen before now. Promising site.
Bayou Bartholomew	
State:	LA
Ownership:	Private non-industrial; USFWS; private industrial; state
Biodiversity issues	Incompatible land use due to past conversion of forest to ag land-H, incompatible forest practices-M, incompatible home development-M, incompatible current ag practices-H, USACE project impacts altering tractive sediment transport by low flow weirs.
Urgency:	Medium-High
Current role:	Inventory for Bayou Bartholomew; site conservation planning
Anticipated role:	Community Based Conservation (CBC) working with landowners on best management practices (BMPs); protection work
Data Gaps:	Aquatic inventory and monitoring
Comments:	Bayou Bart most diverse freshwater body in state
Bayou Cocodrie	
State:	LA
Ownership:	USFW; private non-industrial
Biodiversity issues	land conversion-M
Urgency:	Medium
Current role:	Input into mgt. via refuge planning process
Anticipated role:	Continued input to planning and possible land acquisition via land coop
Data Gaps:	Effect of altered hydrology on matrix community
Comments:	Contains app. 1000 ac. of best remaining higher old growth blh
Big Bay Ditch	
State:	AR
Ownership:	Private non-industrial
Biodiversity issues	Pesticide-H; ditching-H; sediment-H
Urgency:	
Current role:	None
Anticipated role:	Don't know
Data Gaps:	Confidence on viability rank
Comments:	Tributary of St. Francis River for mussels
Big Ditch	
State:	AR
Ownership:	Private non-industrial; state(minimal)
Biodiversity issues	Water level manipulation (green tree reservoir-gtr) for duck hunting - H
Urgency:	High
Current role:	State owns natural area; working with COE on irrigation/drainage project
Anticipated role:	
Data Gaps:	Lack of inventory…inaccessible private land
Comments:	

Big Lake	
State:	AR/MO
Ownership:	Federal; state; MDC owns some; private non-industrial
Biodiversity issues	Water quality(sedimentation)-H; water quantity manipulation-H
Urgency:	Threat has been somewhat mitigated. Medium
Current role:	AR-none except environmental review MO-none
Anticipated role:	
Data Gaps:	Viability of all elements needs scrutiny
Comments:	Initially ditched around Big Lake NWR to improve water quality in lake; concrete dam to maintain historic condition…ie significant hydrologic change. Big Lake Wilderness Area (2500 acre Natural Area) Hornersville swamp is a large block of timber adjoining Big Lake in AR. Cost to improve system would be very high, effort very difficult.
Black River/Sand Ponds Megasite	
State:	AR/MO
Ownership:	State; private nonindustrial; TNC
Biodiversity issues	Upstream dam changed hydroperiod-H, ditches-H, levees (esp. for pondberry)-H, groundwater hydrology altered-H, clearing-H, pesticides &biocides directly applied as well as runoff-M
Urgency:	High
Current role:	Ownership, management
Anticipated role:	Connect corridors, purchase land, reforestation
Data Gaps:	
Comments:	One of two sites with significant sand
Blackrock	
State:	AR
Ownership:	State (i.e. navigable waters)
Biodiversity issues	Hydrology(upstream dams)-M, low water temperature-M; sediment-M;
Urgency:	Medium
Current role:	Environmental review
Anticipated role:	Restoration and review
Data Gaps:	Probably have good data on aquatics
Comments:	Good habitat for mussels
Brandywine	
State:	TN
Ownership:	State wildlife management area (wma); state park
Biodiversity issues	Minimal but some exotics on bluff, beaver but better than in most places
Urgency:	Low
Current role:	No
Anticipated role:	Data collection
Data Gaps:	Unknown; bird work complete (Cooper, Hamel)
Comments:	Streams in bluffs have interesting fish communities; no levee on river; exotics not too bad though some, several bird studies
Cat Island	
State:	LA
Ownership:	USFWS; private non-industrial; TNC
Biodiversity issues	Incompatible forest practices-H, incompatible land use due to past conversion of forest to ag land-L, incompatible use of drainage structures-L
Urgency:	Medium
Current role:	TNC acquisition
Anticipated role:	Future protection action-stewardship
Data Gaps:	Effect of altered hydrology on matrix community, effect of past silviculture
Comments:	Highest density of old growth tupelo and cypress in MSRAP

Chickasaw-Lower Hatchie	
State:	TN
Ownership:	Federal; State Park; Tennessee Department of Environment and Conservation (natural area is Sunk Lake); state prison; private industrial; private non-industrial; large farming operations; TNC
Biodiversity issues	Hatchie: sedimentation, other contaminants (ag runoff), industrial wastes, historic negative silvicultural practices and sedimentation/hydrology effects on structure, composition; fragmentation; Chickasaw experiencing same threats; also, large dump for liquid wastes from meat(hog) slaughter houses (manure, etc), urban development on bluffs
Urgency:	High
Current role:	Land coops with state and federal government, active planning, technical assist (reforestation, silviculture, shorebird/waterfowl management), Forest Legacy, conservation easements, workshops, working with TDEC to monitor water quality
Anticipated role:	Continued activities plus increased encouragement of best management practices north of Hatchie
Data Gaps:	Lack of inventory on aquatic communities; contaminant issues..lack understanding of pesticide effects on aquatic communities; many questions about reforestation
Comments:	Huge initiative to reconnect forest patches, some talk about restoration of black bear…soon to be moving on a public relations strategy
Current River	
State:	AR
Ownership:	Private non-industrial
Biodiversity issues	Streamside clearing-L
Urgency:	
Current role:	Environmental review
Anticipated role:	Continued environmental review of project
Data Gaps:	
Comments:	Investigate reach as aquatic community target
Cutoff Creek	
State:	AR
Ownership:	State; private industrial (mostly Georgia Pacific); private non-industrial
Biodiversity issues	Bottomland hardwood…agriculture, sedimentation, hydrologic change, biocides, food plots on state land - M; upland…silvicultural practices (clearcutting, intensive site prep, shorter rotations) - H
Urgency:	Medium
Current role:	Heritage has 300a Natural Area on state wma. Site includes Seven Devils Swamp-1500 acre easement on that site
Anticipated role:	Continue acquisition in coop with Arkansas Game and Fish and acquisition of fee or easement on industrial forests
Data Gaps:	More extensive inventory
Comments:	State wma had big ice storm a couple of years back; site includes upper west gulf coastal plain; may be potential to work with GP on this tract
Cypress Island	
State:	LA
Ownership:	TNC; private non-industrial
Biodiversity issues	Creation of drainage structures-H, incompatible forest practices-M, incompatible land use due to past conversion of forest to ag land-L, incompatible recreation-H
Urgency:	Medium-High
Current role:	Coordinating conservation/recreation plan; protection
Anticipated role:	CBC; protection activity; education

Data Gaps:	Forest inventory; effects of land conversion on hydrology at preserve
Comments:	One of the largest wading bird rookerys in U.S. and forest blocks in Bayou Tech/Vermilion
Dahomey	
State:	MS
Ownership:	USFWS
Biodiversity issues	Interstate 69/bridge-m, Area surrounding farmed for rice and cotton; groundwater withdrawal in surrounding landscape-m
Urgency:	Medium
Current role:	Partnering with USFWS on land acquisition;
Anticipated role:	Protect/restore as part of large landscape
Data Gaps:	Pondberry site even though not in state Heritage database; effects of hydrology on communities
Comments:	400 acres considered for Research Natural Area; bird, terrestrial communities significant
Des Allemands	
State:	LA
Ownership:	LADWF; private industrial; private
Biodiversity issues	Saltwater intrusion-M, urban/residential development-M, altered hydrology-M
Urgency:	Medium
Current role:	Pending
Anticipated role:	Pending
Data Gaps:	Inventory work needed
Comments:	Eagles and small water bird colonies
Dewey Wills	
State:	LA
Ownership:	State wma; USFWS; private
Biodiversity issues	Incompatible forest practices-L
Urgency:	Low
Current role:	None
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	100,000 contiguous acres
Donaldson Point – Reelfoot Lake	
State:	TN,KY,Mo
Ownership:	TN: State wma/natural area; State park; National Wildlife Refuge MO: Westvaco; state
Biodiversity issues	Reelfoot: Exotics-H, sedimentation (and related hydrology)-H Missouri portion: there is a current effort well underway by COE and local parties (Emerson Electric, etc.) to drain the area. Already far into the review process.
Urgency:	High
Current role:	Reelfoot: working with partners on water mm for shorebirds, waterfowl, monitoring bird populations
Anticipated role:	TN: some inventory work on bluffs, need to work with state and feds to learn how to control sedimentation
Data Gaps:	Reelfoot: well inventoried; COE and TWRA doing sedimentation/hydrologic studies; landscape connectivity issues
Comments:	Multiple blocks of bottomland forest/swamp. Among the least altered hydrologically – it is outside the levee, so subject to Mississippi flooding, very low so never been able to drain

East Atchafalaya	
State:	LA
Ownership:	Private industrial; private; state
Biodiversity issues	Altered hydrology-L, incompatible forest practices-L,
Urgency:	Low
Current role:	Working on master plan
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	The largest forested blocks in MAV
Ernest-Rice	
State:	TN
Ownership:	State; private
Biodiversity issues	Pesticides and mussel - H; communities well protect
Urgency:	High to mussels, low elsewhere
Current role:	Acquisition
Anticipated role:	Continue with coops; Csequestration opportunities?
Data Gaps:	Mussel occurrence viability needs to be explored
Comments:	This site tied with White Lake to north; lots of flooding east of site..good restoration potential
Lower Castor	
State:	MO
Ownership:	State; private
Biodiversity issues	Water quality
Urgency:	Low
Current role:	State working with private landowners on water quality issues
Anticipated role:	
Data Gaps:	
Comments:	Watershed quality could deteriorate and threaten mussel and fish species. Site includes good community diversity & integrity
Lower Yazoo Megasite	
State:	MS
Ownership:	USFSW; USFWS; State; Anderson-Tully; Tara
Biodiversity issues	Dredging Sunflower (not leveed);cutoff through Delta speeds drainage; bank clearing on Sunflower; Pumps project; silvicultural practices
Urgency:	High for dredging; Pumps medium
Current role:	Coops, supplying data
Anticipated role:	Connect Panther Swamp and Delta
Data Gaps:	Effects of hydrologic change on communities; COE have done good inventory; lots of research being initiated on Delta
Comments:	Look at Phase I site report for info on site. DU doing lots of WRP/CRP
Leroy Percy	
State:	MS
Ownership:	State; USFWS
Biodiversity issues	Fragmentation (prime cotton land); hydrologic on Yazoo communities; channelization through Black Bayou (enters Steel Bayou); pumps (Steel Bayou) and effects on mussel populations; silvicultural practices
Urgency:	medium
Current role:	no current role
Anticipated role:	explore easements on ownerships adjacent to Leroy Percy
Data Gaps:	hydrology effects on plant communities unknown; mussel inventory needed
Comments:	dechannelization (restoration of sinuousity) may present good restoration opportunities for COE and for mussel beds

Malmaison	
State:	MS
Ownership:	State; USFWS; hunt clubs
Biodiversity issues	Dams upstream; levees; water control structure; exotics
Urgency:	Medium
Current role:	No real role
Anticipated role:	Land acquisition
Data Gaps:	Site basic record missing
Comments:	Much water management for waterfowl
Maurepas	
State:	LA
Ownership:	Private industrial; state; private
Biodiversity issues	Altered hydrology-L, saltwater intrusion-L, incompatible forest practices-L
Urgency:	Low
Current role:	None
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	Bald eagles
Mingo	
State:	MO
Ownership:	Public, private
Biodiversity issues	Exotics, Mingo landscape is threatened long-term by changes in hydrology and overflooding due to the runoff from surrounding irrigated cropfields.
Urgency:	Low
Current role:	
Anticipated role:	Working with landowners, and with water control technology something could be done here to counteract hydrology threat.
Data Gaps:	
Comments:	The largest remaining bottomland forest/swamp in Missouri, never been drained & least altered of the Bootheel land, good old growth. Highest quality of natural lowland systems in Bootheel. Lots of it is in public ownership, lots of possibilities for conservation
Missouri Crowley's Ridge	
State:	MO
Ownership:	Unknown
Biodiversity issues	Seem to be few
Urgency:	Low
Current role:	
Anticipated role:	
Data Gaps:	
Comments:	Unique communities
O' Keefe	
State:	MS
Ownership:	State (DOC); private estate
Biodiversity issues	GTR, few exotics, silvicultural practices, fragmentation, channelization
Urgency:	Medium
Current role:	No current role
Anticipated role:	Contact with private estate; explore getting protection on high quality communities in DOC tract
Data Gaps:	Forest age and condition (a lot of cut-over); potential rare element occurrences (aquatics)
Comments:	Transient bears, birds, rare levee ridge/bottom habitats are high quality, potential for hydrologic restoration on Tallahatchie?(restore meanders), unique opportunities for conservation in upper Delta

Otter Slough	
State:	MO
Ownership:	State; private
Biodiversity issues	Water levels, hydrology, headcutting of ditches
Urgency:	Medium
Current role:	
Anticipated role:	
Data Gaps:	
Comments:	Nice bottomland hardwood/swamp. Good communities, though altered hydrology.
Pine City	
State:	AR
Ownership:	Private non-industrial; state
Biodiversity issues	Clearing-H; habitat change, silviculture(losing structure) - H; beaver - M;
Urgency:	H
Current role:	Own and manage two sites to maintain community and red cockaded woodpecker (RCW) habitat
Anticipated role:	Acquire fee and easements; provide incentives to landowners to manage forestland; involve CRP in forest restoration
Data Gaps:	No extensive inventory of existing habitat or potential habitat restoration areas
Comments:	Only area in MSRAP with loblolly pine, RCWs, developing a RCW habitat mitigation area on site.
Rainey Brake	
State:	AR
Ownership:	State; private non-industrial
Biodiversity issues	Pondberry is private…land clearing/drainage-M; hydrology(upstream dams)-M; low water temperature-M; sediment-M
Urgency:	High because of pondberry
Current role:	Not much; some inventory; all landowners contacted but none interested in partnership at this time
Anticipated role:	Acquisition from willing sellers
Data Gaps:	Need more inventory on communities (probably enough on pondberry)
Comments:	Exploring landscape scale site on valley train sand dunes with partners.
Ripley Co. (Little Black)	
State:	MO
Ownership:	
Biodiversity issues	Ongoing hydrologic impacts
Urgency:	
Current role:	
Anticipated role:	
Data Gaps:	
Comments:	Viability of elements still questionable
Rodney	
State:	MS
Ownership:	private (unknown)
Biodiversity issues	Hydrologic alteration on river; mining of gravel; oil drilling; cottonwood plantations; agricul south of chute
Urgency:	Medium
Current role:	Inventory
Anticipated role:	Acquisition/easements? WRP opportunities?
Data Gaps:	Birds, fish haven't been looked at, forest communities
Comments:	High quality, 15,000 acres, good shorebird, waders; not easy to get into; mussels including P.Capax inventoried fairly well (diversity

	good..recruitment across taxa), but more to look at; huge unique gravel bar; information (Don Lewis, Mike Peazo. MS state); very few high quality sites like this in MS river
Sand Ridge	
State:	MO
Ownership:	Private
Biodiversity issues	Sites are so few and development is so rapid, that remaining sites and Illinois Chorus Frog populations are critically threatened. Uncertain capacity to implement strategies, cost is high, probability of success is medium
Urgency:	High
Current role:	None
Anticipated role:	MO Dept hopes to buy but limited on funds and availability of land.
Data Gaps:	
Comments:	The only cluster of intact sand prairie savanna. Also the only cluster of Illinois Chorus Frog sites included in MO.
Scatter Creek	
State:	AR
Ownership:	Private non-industrial; state
Biodiversity issues	Logging-M; conversion to pasture/clearing-M; dams -M; residential subdivisions-M; gravel mining-H
Urgency:	High
Current role:	Working cooperatively with Ark Game and Fish and their acquisition
Anticipated role:	Acquire fee and easements
Data Gaps:	Relatively little data; better describe communities and more detailed inventory
Comments:	Groundwater seepage communities that are very vulnerable; only record for Big Leaf Magnolia is from there (now extirpated); more inventory would likely reveal other unique spp..e.g. maybe some good aquatics just below seepage areas; unique geology on north part of site
Second Creek	
State:	AR
Ownership:	State; private non-industrial
Biodiversity issues	Clearing-H, ditching-H, beaver-H, groundwater withdrawal for rice (potential for saltwater intrusion)-H
Urgency:	High
Current role:	Management agreement with University of Arkansas (Ag Exper Station); working with Corps on restoration project
Anticipated role:	Ownership and management agreements and cooperation with Corps(TMDL);
Data Gaps:	Very limited data
Comments:	Likely many other elements that are under pressure…we have management agreement on targets we know of
Spanish Lake	
State:	LA
Ownership:	Private industrial; private; state
Biodiversity issues	Altered hydrology-H
Urgency:	
Current role:	None
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	Mitigation bank covers much of site

St. Catherines Creek	
State:	MS
Ownership:	Federal, private
Biodiversity issues	Exotics, fragmentation
Urgency:	Low
Current role:	Some coop
Anticipated role:	More coop work
Data Gaps:	Some mussel and bat survey work ongoing
Comments:	Good connection to upland; good mussels, Rufenesque bat, bear, bird zone
St. Francis Co. Southwest	
State:	AR
Ownership:	Private Industrial(railroad)
Biodiversity issues	Plowing it up – H
Urgency:	High
Current role:	None
Anticipated role:	Easement acquisition
Data Gaps:	Limited inventory of area
Comments:	Railroad own other prairies? On their right of ways near Stuttgart
Prairie Co. South	
State:	AR
Ownership:	State; private non-industrial
Biodiversity issues	Plowing-M, lack of fire-M, fragmentation (loss of spp)-M
Urgency:	Medium
Current role:	Ownership/easement/management agreement with landowner
Anticipated role:	Continued role, pursue restoration
Data Gaps:	Current status of elements
Comments:	
St. Francis River	
State:	AR
Ownership:	Federal(national forest); private non-industrial
Biodiversity issues	Bottoms..water quality, ditching, clearing, sedimentation – M
Urgency:	Medium
Current role:	Working cooperatively with Forest Service (planning and inventory)
Anticipated role:	Land acquisition; cooperative work with other agencies in restoration
Data Gaps:	Good for communities and aquatic; good for spp on National Forest; perhaps more needed in bottoms.
Comments:	Expand ownership in bottoms to the east and up L'Anguille; nice old growth upland and bottomland community in NF
Sunken Lands	
State:	AR/MO
Ownership:	Federal; private non-industrial; state; drainage district
Biodiversity issues	Sediment-H, water manipulation-H, threat of channelization on northern stretch on North-M
Urgency:	Medium
Current role:	Environmental review
Anticipated role:	Acquisition, cooperative management with AGF, water management with COE and the drainage district (has ongoing authority)
Data Gaps:	Very little community inventory; good aquatics data; do have non-point data from state forestry…good diversity in forest communities
Comments:	Wildlife association requested assistance; two states have successfully stopped channelization by COE; Subject to St. Francis hydrology. A complex of blh forest/swamp. Low, wet, undrained. Substantial portion (1/10) is public ownership. Largest pop pond berry in AR found (2001)

Tensas Megasite	
State:	LA
Ownership:	USFWS; state; private non-industrial
Biodiversity issues	Past conversion of forest to agricultural land-H, forestry practices-H, altered hydrology-M, poaching-L
Urgency:	High
Current role:	Community Based Conservation; protection
Anticipated role:	Same
Data Gaps:	Few
Comments:	Bear population high, diverse topography/forest communities
Thistlethwaite	
State:	LA
Ownership:	State; private non-industrial
Biodiversity issues	Land use changes
Urgency:	Medium
Current role:	None
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	Good higher bottomland site
Three Rivers	
State:	LA
Ownership:	State; private industrial; private
Biodiversity issues	Land use changes-L, incompatible forest practices-M
Urgency:	Low
Current role:	None
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	Large complex of forest blocks, black bear reintroduction
Tunica	
State:	MS
Ownership:	Private (unknown)
Biodiversity issues	Altered flow in MS (water levels for tern); casinos?(development); monoculture timber
Urgency:	Unknown but is a potential
Current role:	No current role
Anticipated role:	Work with partners on potential easements
Data Gaps:	Much inventory required
Comments:	Aquatic site, interior least tern, migratory birds
Union Pacific Railroad Prairie	
State:	AR
Ownership:	State; private non-industrial; TNC
Biodiversity issues	Plowing-M, lack of fire-M, fragmentation (loss of spp)-M
Overall urgency:	Medium
Current role:	TNC owns 1/2 mile of prairie(~6 acres); trying to acquire more from willing sellers
Anticipated role:	Increased ownership; working with landowner on restoration
Data Gaps:	Current status of elements
Comments:	May need boundary change; partnership w/ COE on irrigation project (goes through this area)
Village Creek	
State:	AR
Ownership:	private non-industrial; state
Biodiversity issues	Uplands: logging-M, gravel mining-M, subdivisions-M, dams-M Bottomlands: ditching, water quality

Urgency:	Medium
Current role:	Heritage owns land; inventory
Anticipated role:	Land acquisition; cooperative work with Corps, NRCS, AGF, state parks
Data Gaps:	Need detailed inventory data
Comments:	One of largest heavily forested areas on Crowley's ridge with a good core of quality forests within matrix; good opportunities to do restoration in bottomlands…desire by NRCS to get restoration done…Special Project?
West Atchafalaya	
State:	LA
Ownership:	Private industrial; private; state
Biodiversity issues	Altered hydrology-L, incompatible forest practices-L
Urgency:	Low
Current role:	Working on master plan
Anticipated role:	Pending
Data Gaps:	Inventory
Comments:	With E. Atchafalaya, the largest forested block in MSRAP
White River Megasite	
State:	AR
Ownership:	Federal; state; private industrial; private nonindustrial
Biodiversity issues	Migrating headcuts from the MS River up through the lower reaches of the White River and WR NWR - VH ; intensification of forest management on public and private lands - H; hydrology from upstream dams -H; proposed navigation, irrigation projects -H; existing navigation H; fragmentation-M; water manipulation for ducks(GTR) – H
Urgency:	High / Headcuts = Very High
Current role:	Acquisition; easements; flexible wetland easements…trying to protect entire blh (vs. unique natural areas) through riparian easement program; policy; tourism development; influencing mm on public lands; economic alternatives
Anticipated role:	More of the same; comprehensive study on watershed with academic community, Corps of Engineers, FWS; navigation and drainage project in Bayou Meto watershed could improve hydrology in Bayou Meto WMA
Data Gaps:	So large, still a lot needed…hydrologic relationships; economics of ecotourism; effects of proposed wingdams and other current control devices on hydrology of system; also, effects of dredging of existing navigation projects on bottom fauna of White River
Comments:	TNC/Heritage currently involved in management discussions with NWR; second largest contiguous tract in MSRAP
Wilhelmina	
State:	MO
Ownership:	state
Biodiversity issues	Hydrologic change?
Urgency:	Low
Current role:	
Anticipated role:	
Data Gaps:	
Comments:	Complex of significant bottomland forest/swamp – very different than Big Oak Tree.

Appendix 3
MSRAP Portfolio Sites

SITE NAME	CODE	STATES	SCALE	PRIORITY	TOTAL HECTARES	PUBLIC LAND (HA)	% PUBLIC
Arkansas Frog	ar04	AR			3,248	0	0.0
Ballard	ky01	KY			13,749	4,895	35.6
Bayou Bartholomew	la01	LA AR		Action site	116,205	16,081	13.8
Bayou Cocodrie	la04	LA			24,471	5,099	20.8
Big Bay Ditch	ar10	AR			3,595	0	0.0
Big Ditch	ar18	AR			11,037	185	1.7
Big Lake	ar02	AR MO			33,238	10,445	31.4
Black River	ar01	AR MO	landscape	Action site	59,001	12,526	21.2
Black Rock	ar07	AR			3,626	0	0.0
Brandywine	tn03	TN AR	landscape		34,846	7,863	22.6
Cat Island	la07	LA		Action site	15,011	0	0.0
Chickasaw - Lower Hatchie	tn02	TN AR	landscape	Action site	101,258	21,150	20.9
Current River	ar03	AR			1,230	0	0.0
Cypress Island	la12	LA		Action site	18,259	1,054	5.8
Dahomey	ms04	MS		Action site	8,041	3,970	49.4
Des Allemands	la13	LA			212,260	21,240	10.0
Donaldson Point - Reelfoot Lake	mo05	MO TN KY	landscape	Action site	110,592	13,970	12.6
East Atchafalaya Basin	la09	LA			247,484	2,965	1.2
Ernest Rice	tn01	TN			2,964	875	29.5
Horseshoe Lake	il01	IL	landscape	Action site	5,140	3,267	63.6
Kentucky Creeks	ky02	KY			28,381	69	0.2
LeRoy Percy	ms06	MS			10,564	6,263	59.3
Lower Castor River	mo01	MO			8,735	246	2.8
Lower Yazoo	ms05	MS	landscape	Action site	459,271	65,363	14.2
Main Atchafalaya	la06	LA	landscape	Action site	375,168	36,821	9.8
Malmaison	ms03	MS			36,202	5,743	15.9
Maurepas	la10	LA			195,704	10,134	5.2
Mingo	mo03	MO		Action site	13,434	11,193	83.3

SITE NAME	CODE	STATES	SCALE	PRIORITY	TOTAL HECTARES	PUBLIC LAND (HA)	% PUBLIC
Mississippi River of Illinois	il02	IL MO KY			7,978	2	0.0
Missouri Crowleys Ridge	mo04	MO			4,163	416	10.0
O'Keefe	ms02	MS			33,269	3,292	9.9
Otter Slough	mo06	MO		Action site	4,825	1,986	41.2
Pine City	ar15	AR		Action site	7,127	67	0.9
Prairie Co. South	ar17	AR		Action site	8,104	24	0.3
Rainey Brake	ar08	AR		Action site	23,493	4,468	19.0
Ripley Co.	mo08	MO			1,198	0	0.0
Rodney	ms07	MS		Action site	5,865	0	0.0
Saline	la03	LA			53,861	28,238	52.4
Sand Ridge Lands	mo02	MO		Action site	8,861	0	0.0
Scatter Creek	ar06	AR		Action site	20,561	1,115	5.4
Second Creek	ar12	AR		Action site	8,577	0	0.0
Spanish Lake	la11	LA			8,073	100	1.2
St. Catherines Creek	ms08	MS			37,999	10,107	26.6
St. Francis Co. Southwest	ar13	AR			1,230	0	0.0
St. Francis National Forest	ar14	AR		Action site	26,458	8,841	33.4
Sunken Lands	ar05	AR MO	landscape		43,171	4,424	10.2
Tensas	la02	LA MS	landscape	Action site	205,133	37,722	18.4
Thistlethwaite	la08	LA			28,854	4,816	16.7
Three Rivers	la05	LA	landscape		116,237	45,638	39.3
Tunica	ms01	MS AR			37,715	0	0.0
Union Pacific Railroad Prairie	ar16	AR		Action site	6,748	124	1.8
Village Creek	ar11	AR		Action site	54,271	2,907	5.4
White River	ar09	AR MS	landscape	Action site	708,017	123,396	17.4
Wilhelmina State Forest	mo07	MO			7,631	574	7.5

Appendix 4
Tally of MSRAP target occurrences

Target	Starting goals			Phase I occurrences			New Goal			Irreplaceable occurrences			Working Goal			Selected occurrences			Remaining Goal			Goal met?
	North (N)	Central (C)	South (S)	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	
COMMUNITIES																						
CEGL 2018	5	0	0	1	0	0	4	0	0	0	0	0	4	0	0	0	0	0	4	0	0	
CEGL 2086	6	0	0	0	0	0	6	0	0	0	0	0	6	0	0	0	0	0	6	0	0	
CEGL 2099	5	4	4	2	2	2	3	2	2	0	0	0	3	2	2	3	2	2	0	0	0	yes
CEGL 2101	6	0	0	0	0	0	6	0	0	1	0	0	5	0	0	4	0	0	1	0	0	
CEGL 2102	4	4	4	4	3	0	0	1	3	0	1	0	0	0	3	0	0	0	0	0	3	
CEGL 2386	2	2	2	0	0	1	2	2	1	0	0	0	2	2	1	0	0	0	2	2	1	
CEGL 2396	25	0	0	0	0	0	25	0	0	1	0	0	24	0	0	0	0	0	24	0	0	
CEGL 2397	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	1	0	0	2	3	0	
CEGL 2405	3	2	0	0	0	0	3	2	0	0	0	0	3	2	0	0	0	0	3	2	0	
CEGL 2406	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	
CEGL 2411	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	
CEGL 2417	13	12	0	0	0	0	13	12	0	3	0	0	10	12	0	0	0	0	10	12	0	
CEGL 2419	1	2	2	2	0	0	0	2	2	0	0	1	0	2	1	0	2	1	0	0	0	yes
CEGL 2420	1	1	1	3	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	yes
CEGL 2421	3	3	3	1	0	5	2	3	0	0	2	0	2	1	0	2	0	0	0	1	0	
CEGL 2422	3	3	0	1	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	0	0	yes
CEGL 2423	3	3	4	0	7	0	3	0	4	3	0	0	0	0	4	0	0	4	0	0	0	yes
CEGL 2424	3	3	3	4	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	
CEGL 2427	3	3	2	4	8	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	yes
CEGL 2431	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	
CEGL 2432	3	0	0	0	0	0	3	0	0	1	0	0	2	0	0	1	0	0	1	0	0	
CEGL 2586	6	0	0	1	0	0	5	0	0	3	0	0	2	0	0	0	0	0	2	0	0	
CEGL 3836	4	5	4	0	2	0	4	3	4	0	2	0	4	1	4	0	0	0	4	1	4	
CEGL 4323	2	2	2	0	0	1	2	2	1	0	0	0	2	2	1	0	0	0	2	2	1	
CEGL 4414	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	
CEGL 4619	1	4	4	1	6	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	yes
CEGL 4624	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	
CEGL 4642	13	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0	0	0	13	0	0	
CEGL 4663	25	0	0	0	0	0	25	0	0	6	0	0	19	0	0	0	0	0	19	0	0	

Target	Starting goals			Phase I occurrences			New Goal			Irreplaceable occurrences			Working Goal			Selected occurrences			Remaining Goal			Goal met?
	North (N)	Central (C)	South (S)	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	
CEGL 4694	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	
CEGL 4773	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	
CEGL 4778	25	0	0	0	0	0	25	0	0	0	0	0	25	0	0	0	0	0	25	0	0	
CEGL 4782	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	
CEGL 5033	3	3	3	0	0	0	3	3	3	0	0	0	3	3	3	0	0	0	3	3	3	
CEGL 5035	13	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0	0	0	13	0	0	
CEGL 7039	0	0	6	0	0	1	0	0	5	0	0	2	0	0	3	0	0	0	0	0	3	
CEGL 7209	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	0	0	0	0	3	3	
CEGL 7224	0	5	0	0	1	0	0	4	0	0	0	0	0	4	0	0	0	0	0	4	0	
CEGL 7346	7	7	6	2	0	0	5	7	6	2	0	6	3	7	0	0	0	0	3	7	0	
CEGL 7389	0	2	3	0	0	0	0	2	3	0	0	0	0	2	3	0	0	0	0	2	3	
CEGL 7394	0	3	2	0	1	0	0	2	2	0	0	0	0	2	2	0	0	0	0	2	2	
CEGL 7397	0	2	1	0	7	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	yes
CEGL 7407	0	4	5	1	3	2	0	1	3	0	0	0	0	1	3	0	1	3	0	0	0	yes
CEGL 7410	3	3	2	0	3	1	3	0	1	0	0	0	3	0	1	0	0	1	3	0	0	
CEGL 7422	3	3	3	1	0	9	2	3	0	1	0	0	1	3	0	0	0	0	1	3	0	
CEGL 7426	0	7	6	0	0	0	0	7	6	0	0	0	0	7	6	0	0	0	0	7	6	
CEGL 7429	0	2	3	0	0	1	0	2	2	0	0	1	0	2	1	0	0	0	0	2	1	
CEGL 7436	0	0	3	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	3	
CEGL 7719	0	3	3	0	0	2	0	3	1	0	1	0	0	2	1	0	0	1	0	2	0	
CEGL 7908	6	6	6	1	1	0	5	5	6	0	1	0	5	4	6	0	0	0	5	4	6	
CEGL 7909	0	5	4	0	0	0	0	5	4	0	1	0	0	4	4	0	0	0	0	4	4	
CEGL 7910	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	
CEGL 7911	5	20	0	0	0	0	5	20	0	0	11	0	5	9	0	0	0	0	5	9	0	
CEGL 7912	2	8	8	0	2	0	2	6	8	0	0	0	2	6	8	0	0	0	2	6	8	
CEGL 7913	0	5	3	0	2	2	0	3	1	0	2	1	0	1	0	0	0	0	0	1	0	
CEGL 7914	0	18	0	0	0	0	0	18	0	0	2	0	0	16	0	0	0	0	0	16	0	
CEGL 7915	3	3	3	4	19	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	yes
CEGL 7916	0	6	7	0	0	0	0	6	7	0	0	0	0	6	7	0	0	0	0	6	7	
CEGL 7919	9	0	0	0	0	0	9	0	0	1	0	0	8	0	0	0	0	0	8	0	0	
CEGL 7921	3	3	3	0	1	0	3	2	3	0	0	0	3	2	3	0	2	0	3	0	3	
CEGL 8887	?	?	?	0	0	0				3									?	?	?	
CEGL 8888	?	?	?	0	1	0													?	?	?	
CEGL 8889	?	?	?	0	0	0				2									?	?	?	

Target	Starting goals			Phase I occurrences			New Goal			Irreplaceable occurrences			Working Goal			Selected occurrences			Remaining Goal			Goal met?
	North (N)	Central (C)	South (S)	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	
SPECIES																						
A. fulvescens	3	2	0	0	2	0	3	0	0	0	0	0	3	0	0	0	0	0	3	0	0	
A. confragosus	3	2	0	0	0	0	3	2	0	0	0	0	3	2	0	3	0	0	0	2	0	
B. obesa	avo	avo	avo	0	0	0	avo	avo	avo	1	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
C. dimorpha	avo	avo	avo	0	0	0	avo	avo	avo	1	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
C. decomposita	2	2	1	0	0	0	2	2	1	1	1	0	1	1	1	0	0	0	1	1	1	
C. socialis	2	3	0	0	0	0	2	3	0	2	1	0	0	2	0	0	0	0	0	2	0	
C. rafinesquii	3	3	3	0	0	0	3	3	3	0	0	0	3	3	3	3	0	0	0	3	3	
C. aberti	4	4	0	0	0	0	4	4	0	2	0	0	2	4	0	2	0	0	0	4	0	
D. reticularia miaria	1	1	1	0	0	0	1	1	1	1	0	0	0	1	1	0	1	0	0	0	1	
D. sexnotatus	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
E. triquetra	3	2	0	0	0	0	3	2	0	3	0	0	0	2	0	0	0	0	0	2	0	
G. major	2	3	0	0	0	0	2	3	0	0	1	0	2	2	0	0	2	0	2	0	0	
I. taxodii	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
L. abrupta	3	3	2	1	2	0	2	1	2	0	1	0	2	0	2	2	0	0	0	0	2	
L. floridana	5	5	0	1	3	0	4	2	0	4	0	0	0	2	0	0	2	0	0	0	0	yes
L. leptodon	4	4	0	0	0	0	4	4	0	1	0	0	3	4	0	0	0	0	3	4	0	
L. melissifolia	4	4	0	1	4	0	3	0	0	0	1	0	3	0	0	3	0	0	0	0	0	yes
M. gelda	2	3	3	0	0	0	2	3	3	1	0	0	1	3	3	0	0	0	1	3	3	
M. temminckii	2	2	6	0	2	0	2	0	6	0	0	0	2	0	6	2	0	4	0	0	2	
M. canescens	0	3	0	0	0	0	0	3	0	0	1	0	0	2	0	0	0	0	0	2	0	
N. aquatica	1	2	0	0	0	0	1	2	0	0	0	0	1	2	0	0	0	0	1	2	0	
N. sabinae	0	5	0	0	1	0	0	4	0	0	0	0	0	4	0	0	0	0	0	4	0	
N. hubbsi	3	3	4	0	0	0	3	3	4	0	1	0	3	2	4	0	1	0	3	1	4	
N. stigmosus	1	2	2	0	0	0	1	2	2	0	0	0	1	2	2	0	0	0	1	2	2	
O. jacksoniana	avo	avo	avo	1	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
O. retusa	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
O. pilosella ssp. Sessille	4	4	0	0	0	0	4	4	0	2	0	0	2	4	0	0	4	0	2	0	0	
P. hoosieri	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
P. correlli	0	0	3	0	0	0	0	0	3	0	0	0	0	0	3	0	0	1	0	0	2	
P. cooperianus	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
P. cyphyus	3	2	0	0	0	0	3	2	0	0	0	0	3	2	0	0	0	0	3	2	0	
P. rubrum	4	4	0	0	5	0	4	0	0	0	1	0	4	0	0	3	0	0	1	0	0	

Target	Starting goals			Phase I occurrences			New Goal			Irreplaceable occurrences			Working Goal			Selected occurrences			Remaining Goal			Goal met?
	North (N)	**Central (C)**	**South (S)**	**N**	**C**	**S**	**N**	**C**	**S**	**N**	**C**	**S**	**N**	**C**	**S**	**N**	**C**	**S**	**N**	**C**	**S**	
P. canaliculata	1	2	2	0	2	0	1	0	2	0	0	0	1	0	2	0	0	0	1	0	2	
P. capax	avo	avo	avo	0	0	0	avo	avo	avo	8	2	0	avo	avo	avo	0	0	0	avo	avo	avo	
P. ferrugineus	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	0	0	0	avo	avo	avo	
P. streckeri illinoensis	5	0	0	0	0	0	5	0	0	1	0	0	4	0	0	4	0	0	0	0	0	yes
Q. cylindrica cylindrica	4	4	0	1	3	0	3	1	0	0	0	0	3	1	0	3	0	0	0	1	0	
S. albus	avo	avo	avo	0	1?	1	avo	avo	avo	0	0	1?	avo	avo	avo	1?	0	0	avo	avo	avo	
S. glabra	2	3	2	2	0	0	0	3	2	0	0	0	0	3	2	0	3	0	0	0	2	
S. ambigua	4	4	0	0	0	0	4	4	0	1	0	0	3	4	4	0	0	0	3	4	0	
S. antillarum athalassos	4	4	0	1	1	0	3	3	0	0	0	0	3	3	0	3	3	0	0	0	0	
T. multilneata	3	2	0	1	0	0	2	2	0	0	0	0	2	2	0	6	0	0	0	2	0	
SYSTEMS																						
Wide-ranging mammals (U. americanus)	0	3	2	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	yes
10K acre birds	10	10	10													6	2	0	0	0	0	yes
20K acre birds	10	10	10													13	24	4	0	0	0	yes
100K acre birds	all	all	all													3	5	5	0	0	0	yes
TERRESTRIAL SYSTEMS (matrix-forming communities)	Goal stated as percent of historic landscape																					
Meander belt	33%															32%						yes
Backswamp	20%															31%						yes
Valley train terrace	28%															13%						
Stream course, abandoned channels	7%															7%						yes
Crowley’s ridge	2%															2%						yes
Deltaic plain levee	2%															2%						yes
Lacustrine	1%															3%						yes
Sand dune field	1%															1%						yes
Prairie alluvium	4%															4%						yes
Salt marsh	1%															3%						yes

Target	Starting goals			Phase I occurrences			New Goal			Irreplaceable occurrences			Working Goal			Selected occurrences			Remaining Goal			Goal met?
	North (N)	Central (C)	South (S)	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	N	C	S	
AQUATICS SYSTEMS																						
Headwater	10	10	10																?	?	?	
Small order streams	5	5	5																?	?	?	
Med order streams	3	3	3																?	?	?	
Large order streams	1	1	1																?	?	?	
Large oxbows	3	3	3													3	3	3	0	0	0	yes

Appendix 5
MSRAP Team Members and Roles

Core Team

Core team members were ultimately responsible for developing the ecoregional plan and implementing conservation strategies and included all TNC state directors and other staff and 2 state Heritage staff (AR, MS). State representatives served as liaisons to their respective programs.

Cindy Brown – TNC Louisiana; Ecoregional Planning Team Leader, lead author of MSRAP plan
Mark Swan – TNC Louisiana; GIS analyst/Data manager
Lisa Creasman – TNC Louisiana; Lead State Director
Richard Martin – TNC Louisiana
Nancy DeLamar – TNC Arkansas
Leslee Spraggin – TNC Arkansas
Lance Peacock – TNC Arkansas
Tom Foti – Arkansas Heritage
Robbie Fisher – TNC Mississippi
Ron Wieland – Mississippi Heritage
Andy Walker – TNC Tennessee
Bob Ford – TNC Tennessee
Beth Churchwell – TNC Missouri
Jim Aldrich – TNC Kentucky
Matt Nelson – TNC Illinois
Sally Landaal – Southeast Conservation Science Center

Community Ecology Team

The Community Ecology team was responsible for:

- Fine-tuning community classification
- Target list development and review
- Goal setting
- Surrogate development/assisting in formulating GIS analyses
- Assessing viability of and crosswalking existing community occurrences
- Defining Rapid Ecological Assessment methods

Tom Foti – Arkansas Heritage; Team Leader
Sally Landaal – Southeast Conservation Science Center
*Alan Weakley – ABI
Ron Weiland – Mississippi Heritage
Max Hutchinson – TNC Illinois
Susan Carr – TNC Louisiana
Keith Ouchley – TNC Louisiana
Smoot Major – Tennessee Heritage
Bob Ford – TNC Tennessee
Latimore Smith – Louisiana Heritage

*Tim Nigh – Missouri Department of Conservation
*Bryce Fields – Kentucky Heritage
*Kenny Ribbeck – Louisiana Department of Wildlife and Fisheries

Rapid Ecological Assessment

This team performed expert interviews with ecologists, foresters, and land managers. In addition, this team developed proto-EO information on high-quality community occurrences.

Mark Swan – TNC Louisiana
Susan Carr – TNC Louisiana
Tom Foti – Arkansas Heritage; Team Leader
Ron Wieland – Mississippi Heritage
Bob Ford – TNC Tennessee

Botany Team
This team defined plant targets and goals for MSRAP and reviewed state records to assess viability of existing occurrences.

Lance Peacock – TNC Arkansas; Team Leader
Ron Weiland – Mississippi Heritage
*John Logan – Arkansas Heritage
*David Brunet – Louisiana Heritage
*Deb White – Kentucky Heritage
*Carl Nordman – Tennessee Heritage
*Tim Smith – Missouri Department of Conservation
Milo Pyne – Southeast Conservation Science Center
*Scott Simon – TNC Arkansas
Doug Zollner – TNC Arkansas
*Bill Carr – Texas CDC
Beth Churchwell – TNC Missouri
*Phil Hyatt – U.S. Forest Service
Julian Campbell – TNC Kentucky

Zoology Team
This team defined animal targets and goals for MSRAP and reviewed state records to assess viability of existing occurrences.

Richard Martin – TNC Louisiana; Team Leader
Keith Ouchley – TNC Louisiana
Doug Zollner – TNC Arkansas
Lance Peacock – TNC Arkansas
*Cindy Osborne – Arkansas Heritage
Bob Ford – TNC Tennessee
Alex Wyss – TNC Tennessee
David Campbell – TNC Tennessee
Smoot Major – Tennessee Heritage
Beth Churchwell – TNC Missouri
*Thomas Johnson – Missouri Department of Conservation
Ronald Cicerello – Kentucky Heritage
*Steve Shively – Louisiana Heritage
*Tom Mann – Mississippi Heritage
*Kathy Shropshire – Mississippi Heritage
*David Pashley – American Bird Conservancy(bird patch goal setting only)
*Chuck Hunter – U.S. Fish and Wildlife Service (bird patch goal setting only)

* reviewers

Appendix 6

Development of Management Objectives for Breeding Birds in the Mississippi Alluvial Valley

Allan J. Mueller1, Daniel J. Twedt2, and Charles R. Loesch3

ABSTRACT—We used a six-step process to set habitat objectives and population goals for breeding birds in the Mississippi Alluvial Valley. Specifically, we used existing empirical studies and mathematically derived viable population estimates to define habitat objectives and population goals for bottomland hardwood forest, the most important habitat type in this physiographic area. Although habitat objectives must address both quality and quantity, we concentrate here on the size and number of forest patches in this highly fragmented landscape. To support source populations of all forest breeding birds we recommend the protection/restoration of 52 forest patches that are 4,000-8,000 ha in size, 36 patches of 8,000-40,000 ha, and 13 patches greater than 40,000 ha. Although every physiographic area is unique, the methodology applied here should be applicable in other situations.

INTRODUCTION

Bird Conservation Plans (BCPs) for each physiographic area will make critical contributions to the national Partners In Flight (PIF) conservation plan. To be most useful, these regional BCPs should promote on-the-ground conservation actions by developing quantified, site-specific habitat and population objectives. As a model for the PIF planning process, the North American Waterfowl Management Plan has had great success in putting conservation on the ground through the preparation of detailed regional plans with objectives that focus conservation efforts, provide funding justifications, and provide perspective on the "big picture."

Frequently we do not have firm scientific information to quantify conservation issues. However, if we wait for all of the information that we think we require, the time for effective conservation action may pass. We therefore must move forward and make conservation recommendations as soon as possible, based on the best information currently available. As new information becomes known, recommendations can be modified. This iterative method of operation, called adaptive management, is becoming widely accepted in the conservation/scientific community (Franklin 1995, Kirchhoff et al. 1995, Meffe and Viederman 1995, Petit et al. 1995). This paper presents a general model for setting detailed, regional bird conservation objectives, and describes the application of this model, using the best available information in the Mississippi Alluvial Valley (MAV).

THE MODEL

Our generalized model for setting regional bird habitat and population objectives consists of a six-step process (Table 1). The issues addressed in this model should be covered in all bird conservation planning efforts, although the sequence of steps and the emphasis on each one will vary among local situations.

Table 1. A model process for setting bird conservation goals
Step 1. Establish species priorities
Step 2. Establish habitat priorities
Step 3. Identify habitat requirements to maintain individual populations of priority species groups in priority habitat(s)
Step 4. Determine the extent and location of existing habitat suitable for meeting the habitat requirements of individual populations of priority species groups
Step 5. Set site-specific habitat objectives
Step 6. Set meta-population goals

This model shares the philosophy of and is compatible with the processes described by Petit et al. 1995

Step 1. Establish species priorities

In an ecosystem or landscape approach to planning we often are confronted with trying to meet the conservation needs of many bird (and other) species with widely varying ecological requirements. The conservation needs of some species, however, will be greater than others. The PIF prioritization process (Hunter et al. 1993, Carter et al. this volume) can be modified to fit any situation, and will help focus the jumble of apparently conflicting conservation needs.

Step 2. Establish habitat priorities

Species priorities should help to establish habitat priorities. Depending on the location and prioritization scheme, habitat priorities can emphasize breeding, wintering, or migration stopover habitat.

Step 3. Identify habitat requirements to maintain individual populations of priority species groups in priority habitat(s)

Habitat requirements of priority species must be identified explicitly to effectively direct the implementation of conservation actions. (This is the first point at which we face the inadequacy of our information base.) First, the habitat needs of each high-priority species should be defined and quantified. That is, the habitat area sufficient to support and maintain a "population," however it is defined—viable, source, etc.—of a species must be quantified. Then, the needs of all priority species occurring in a habitat type can be considered collectively. Species requiring similar conditions can be grouped into suites; habitat requirements for each suite should be based on the needs of the single most demanding species in the suite.

Step 4. Determine the location and extent of existing habitat suitable for meeting the habitat requirements of individual populations of priority species groups

Knowledge of the current distribution, configuration, condition, and extent of key habitat types is required to set realistic habitat objectives. A Geographic Information System (GIS) or some comparable database is essential in this assessment. Although the expense of assembling a GIS specifically dedicated to PIF planning may be prohibitive, GIS is a widely used tool. For example, most states and major universities operate a GIS and probably have land use/cover data for at least part of any given planning area. If GIS is unavailable, other databases that are less site specific, such as river basin studies and forest inventories, can provide much useful information on the habitat composition of a given physiographic area. However, even when sophisticated spatial imagery is used, assessing the many habitat characteristics that determine the quality of an area for priority species usually requires on-the-ground bird inventory work to verify estimates of habitat extent and condition.

Step 5. Set site-specific habitat objectives

Having defined habitat requirements for priority species, and having identified the location and extent of existing habitat that is suitable for meeting those requirements, the next step is to determine whether the existing habitat is adequate to provide long-term support for secure bird populations. If the current situation is satisfactory, then habitat objectives should be framed in terms of maintaining existing conditions. If the situation is unsatisfactory, then objectives should recommend acquisition or restoration of habitat or changes in management of existing, non-suitable habitat. These recommendations can, at least at first, be opportunistic. That is, they can build on existing efforts that may not specifically be dedicated to birds, or they can build on cooperative arrangements that benefit birds but are not prohibitively expensive to partners. Objectives should be ambitious, but realistic. Site-specific objectives have a much better chance of being implemented than general recommendations for a region. Local knowledge of conservation opportunities should be used to help set site-specific objectives.

Step 6. Set Meta-population Goals

Ideally we would set overall population goals before we establish habitat objectives. We would know how many individuals (i.e., populations) of a species are needed for a secure population (i.e., meta-population) to assure the long-term stability of the species. Unfortunately, this information does not exist for most species addressed here. In addition, unlike conservation models that start with defined population goals (e.g., waterfowl), this model is being applied to bird species that do not have adequate population estimates. Consequently, meta-population goals should be set based on a pragmatic evaluation of what is possible, tempered by the best available scientific evaluation of what is needed for long-term species stability. Population goals may be established in terms of the total number or overall density of birds, the number or distribution of populations constituting the meta-population, source-sink or meta-population dynamics, population trends, or security of existing habitat.

THE MISSISSIPPI ALLUVIAL VALLEY EXAMPLE

Despite the radical habitat changes that have occurred in the past two centuries in the 9.7 million ha MAV (Brown et al. this volume), this physiographic area still retains significant habitat values for wintering waterfowl, breeding forest birds, and other transient and resident wildlife. This example focuses on retaining, restoring, and enhancing those values specifically for forest breeding birds. Our long-term, overall goal is to establish and maintain source populations of all breeding bird species in the MAV.

Step 1. Establish species priorities

We used the PIF prioritization process (Hunter et al. 1993, Carter et al. this volume) to set breeding bird species priorities in the MAV (Table 2). Although we focused on breeding birds, we recognize that the MAV is important winter habitat for vast numbers of temperate migrants as well as in-transit habitat for long distance migrants. We tentatively assume that conditions sufficient for breeding birds also will be sufficient for these other species; this assumption needs to be tested rigorously. Additionally, some areas not suitable to high-priority breeding birds can be very important for wintering and transient birds. Ultimately, these factors need to be incorporated into the overall BCP for the MAV but are beyond the scope of this paper.

Table 2. Breeding bird species priorities in the Mississippi Alluvial Valley

Species	Score
Bachman's Warbler (Vermivora bachmanii)	35 - BLH (Breeds in or requires bottomland hardwood)
Ivory-billed Woodpecker (Campephilus principalis)	35 - BLH
Swainson's Warbler (Limnothlypis swainsonii)	29 - BLH
Cerulean Warbler (Dendroica cerulea)	28 - BLH
Swallow-tailed Kite (Elanoides forficatus)	26 - BLH
Prothonotary Warbler (Protonotaria citrea)	24 - BLH
Painted Bunting (Passerina ciris)	24
Bell's Vireo (Vireo bellii)	23
Worm-eating Warbler (Helmitheros vermivorus)	23
Northern Parula (Parula americana)	23 - BLH
Kentucky Warbler (Oporornis formosus)	23 - BLH
Orchard Oriole (Icterus spurius)	23 - BLH
White-eyed Vireo (Vireo griseus)	23 - BLH
Yellow-billed Cuckoo (Coccyzus americanus)	22 - BLH
Wood Thrush (Hylocichla mustelina)	22 - BLH
Red-headed Woodpecker (Melanerpes erythrocephalus)	21 - BLH
Dickcissel (Spiza americana)	21
Prairie Warbler (Dendroica discolor)	21
Yellow-breasted Chat (Icteria virens)	21 - BLH
Chuck-will's-widow (Caprimulgus carolinensis)	21
Hooded Warbler (Wilsonia citrina)	21 - BLH
Hooded Merganser (Lophodytes cucullatus)	21 - BLH
Louisiana Waterthrush (Seiurus motacilla)	21 - BLH
Scissor-tailed Flycatcher (Tyrannus forficatus)	21
Mississippi Kite (Ictinia mississippiensis)	21 - BLH
White Ibis (Eudocimus albus)	21 - BLH
Acadian Flycatcher (Empidonax virescens)	20 - BLH
Eastern Wood-Pewee (Contopus virens)	20 - BLH
Northern Bobwhite (Colinus virginianus)	20
Yellow-throated Vireo (Vireo flavifrons)	20 - BLH
Yellow-throated Warbler (Dendroica dominica)	20 - BLH
Baltimore Oriole (Icterus galbula)	20 - BLH
Carolina Chickadee (Poecile carolinensis)	20 - BLH
Loggerhead Shrike (Lanius ludovicianus)	20
Field Sparrow (Spizella pusilla)	20
86 additional species have priority scores of 19 or less	

Step 2. Establish habitat priorities

Six of the seven MAV species that have breeding season prioritization scores of 24 or more nest in bottomland hardwood forest (Table 2). Based on this and the historical ecosystem structure of the MAV, we selected bottomland hardwood forest as the highest-priority habitat type for breeding bird conservation in this region.

Step 3. Identify habitat requirements to maintain individual populations of priority species groups in priority habitat

Habitat requirements conceptually can be separated into issues of quality and quantity. Qualitative factors such as vegetative structure, plant species composition, successional stage, flood regime, and other microhabitat features affect the ability of bottomland hardwood habitat to support a diversity of breeding bird species (Pashley and Barrow 1992). Given time and even a marginally natural flood regime, we assume that most sites of sufficient size will achieve the internal diversity to support the needs of most birds in this system.

Much of the topography of the lower Mississippi Valley floodplain consists of ridges and swales, with high, dry sites interwoven with low, wet sites. Over recent history, however, agriculture has claimed almost all of the high sites, leaving only the wettest places for forest and wildlife. These wet sites, regardless of the time that has passed since major disturbance, may not provide conditions necessary for some of the highest priority birds in this system, such as Cerulean Warbler and Swainson's Warbler. Therefore, we must ensure that a sufficient number of forest patches are of average wetness or drier. Habitat quantity must be considered with an awareness that the current landscape of the MAV is at least 75 percent deforested (MacDonald et al. 1979), and most remaining forested patches are small and isolated (Rudis 1995). Because the vast majority of this system is unlikely to be reforested, planners must determine the necessary size, configuration, number, distribution, and interconnectivity of remaining forest patches.

To maintain bird populations, a forest patch should be of sufficient size to support source populations of all priority bird species, with little likelihood of extirpation or genetic degradation. Smaller patches will provide adequate habitat for only a subset of priority species. To determine necessary patch sizes, we used two sources of information: (1) empirical studies and (2) mathematically derived theoretical genetically viable populations.

Empirical studies were used primarily for Swallow-tailed Kite (Cely and Sorrow 1990, Meyer and Collopy 1990) and Cerulean Warbler (Hamel 1992a).

To determine forest patch-size requirements for theoretical genetically viable populations of other species we used the formula:

$$\mathbf{A = (N \bullet D) + B}, \textbf{ where}$$

A = area of forest patch required to support a source population, N = number of reproductive units (usually breeding pairs) required for a source population, D = breeding density (usually expressed as ha/breeding pair), and B = the area of a 1 km forested buffer around the forest core (forest core = N • D).

To determine N, we first considered the work of Soule (1987), who guessed that a population size "in the low thousands" should represent an adequate minimum viable population for vertebrates, although he strongly cautioned that the size should be independently calculated for each species. Thomas (1990) generally concurred with this estimate. We assumed that individuals of a species in one block of habitat in the MAV are not genetically isolated from individuals in other patches. Furthermore, with the exception of the Ivory-billed Woodpecker (which undoubtedly is extinct in the United States), virtually all of the high-priority birds in this system are Neotropical migrants, which show very low natal site fidelity (Sherry and Holmes 1989, Roth and Johnson 1993). This suggests a high likelihood of gene flow among patches. Therefore, retaining populations above the "low thousands" in the entire physiographic area should ensure viability from a genetic perspective. But even though genetic deterioration within blocks does not seem to be a threat if populations in the physiographic area (or whatever planning area is under consideration) are high enough, a target number of birds for each patch is required to ensure a source population. A proposed minimum effective population of 500 breeding adults (Franklin 1980) was adopted by the U. S. Fish and Wildlife Service (1985) as the minimum size for each of several populations in the recovery plan for the Red-cockaded Woodpecker (Picoides borealis). For monogamous species this N constitutes 250 breeding pairs. However, establishing conservation goals at the minimum threshold, based upon a series of unverified assumptions, seems fraught with peril. Therefore, to provide adequate population levels in the face of these uncertainties, we set N at 500 breeding pairs per forest patch.

For the value of D, we used average breeding densities from Breeding Bird Censuses, as summarized for the southeastern United States by Hamel (1992b). We realize, however, that because of differences in habitat quality, birds might not occur in the MAV at densities as high as those reported in the literature. Even under optimal conditions, bird density in bottomland hardwoods is determined by the frequency of occurrence of necessary patchily distributed microhabitat features, e.g., thickets for Swainson's Warblers, cypress brakes for Yellow-throated

Warblers (Dendroica dominica), etc. This is another reason for adopting a target of 500 breeding pairs per forest patch; this number both increases the number above a theoretically determined minimum and reflects our assumption that birds may occur at only one-half the densities reported in ideal conditions.

Finally, because the agricultural matrix that dominates the MAV generally is considered hostile to birds breeding within forest patches, we used an adjustment factor (B) to account for this degradation in suitability. Robinson et al. (1995) found that nest predation and parasitism were high even in large forest patches (2,200 ha) in landscapes with a low percentage of forest cover. Working in Illinois and Missouri, Thompson (1994) found that female Brown-headed Cowbirds (Molothrus ater) traveled an average of 1.2 km between feeding and breeding sites. Undesirable edge effects also can extend to mating patterns. Van Horn et al. (1995) found that male Ovenbirds (Seiurus aurocapillus) singing on territories less than 300 meters from the edge of the forest were much more likely to be unpaired than males from the interior of the forest. For planning purposes, we assumed that a 1.0 km forest buffer surrounding an interior forest core will reduce these negative impacts. Only those pairs within the forest core (N • D) are assumed to reproduce at a rate sufficient to serve as a source population.

Large forest patches also are required to maintain the density of breeding individuals that facilitates extra-pair mating systems found in many Neotropical migrants (Morton 1989, Wagner 1993, Stutchbury and Morton 1995). We assumed that patches designed to include a core large enough to support a source population within a 1 km buffer also will mitigate for these other issues of area sensitivity. Clearly, all of the assumptions in this process need to be tested. Because the area of a 1 km buffer will vary with the geometric configuration of each forest patch, the area requirements of each forest patch will differ. For planning purposes, until the actual areas of interior forest within each forest patch are determined, doubling the core forest area [(N • D) • 2] generally will result in forest patch requirements that approximate or exceed a 1 km buffer around the desired interior forest area.

As an example of the completed calculation for one species, breeding Swainson's Warblers occur at a density of one pair per 4.7 ha (Hamel 1992b). If Swainson's Warblers occur over a large area at this density, then 500 pairs would require 2,350 ha. Applying the doubling factor as a surrogate for the 1 km buffer produces a desired forest patch size of 4,700 ha for one source population of this species.

To determine the minimum forest patch size required to support 500 breeding pairs for all MAV forest breeding species, we performed the above calculations for each species (Table 3). Next, we grouped the species into species suites based on their minimum area requirements. We used three forest patch sizes designed to meet the area requirements of three area-sensitive species groups: 4,000 to <8,000 ha, 8,000 to 40,000 ha, and >40,000 ha. A similar technique was used to determine the areal habitat needs of raptors in French Guiana (Thiollay 1989), Golden-cheeked Warblers (Dendroica chrysoparia) in Texas (Pease and Gingerich nd), and grizzly bears (Ursus arctos) in the Yellowstone ecosystem (Shaffer and Samson 1985). Wenny et al. (1993) discussed this process as one technique for determining areal habitat needs. A good deal of uncertainty is inherent in these assumptions and extrapolations. However, Robinson (this volume), working in the hardwood forests of Illinois, recommended greater-than 8,000 ha "macrosites" to maintain regional metapopulations, and Hamel (1992a) recommended 8,000 ha mature forest patches to secure Cerulean Warbler populations. The agreement of these independently derived figures adds confidence to our forest patch objectives.

Table 3. Forest patch size requirements to support 500 breeding pairs within the Mississippi Alluvial Valley.

4,000 to <8,000 ha species group	Score	Forest Patch Size Requirement (ha)
Swainson's Warbler	29	4700
Prothonotary Warbler	24	2700
Northern Parula	23	3000
Wood Thrush	22	2800
Hooded Warbler	21	2500
Acadian Flycatcher	20	2800
Blue-gray Gnatcatcher	19	4000
Red-eyed Vireo	16	1800
American Redstart	16	4600
8,000 to 40,000 ha species group		
Cerulean Warbler	28	8000
Kentucky Warbler	23	8300
Yellow-billed Cuckoo	22	6600
Louisiana Waterthrush	21	7200
Yellow-throated Vireo	20	7800
Yellow-throated Warbler	20	7800

Eastern Wood-Pewee	20	5400
Summer Tanager	18	6600
Great Crested Flycatcher	17	7200
Scarlet Tanager	17	4900
White-breasted Nuthatch	14	8500
>40,000 ha species group		
Swallow-tailed Kite[a]	26	40000
Red-shouldered Hawk	17	57000
Broad-winged Hawk	15	100000
Pileated Woodpecker	15	19000
Cooper's Hawk	15	44000

a Based on Cely and Sorrow's (1990) work, a 40,000 hectare patch of bottomland

hardwood forest would support only about 80 pairs of Swallow-tailed Kites. A secure (source) population would realistically have to be based on a regional (southeast US) population.

Step 4. Determine the extent and location of existing habitat suitable for meeting the requirements of individual populations of priority species groups

A GIS allowed an analysis of the current status of forested habitat in the MAV. Using 1992 Landsat thematic mapper images, we located and measured more than 35,000 forest patches 1 ha or larger. The average patch size is less than 40 ha. Fewer than one percent of the forest patches are larger than 4,000 ha, but they account for more than 52% of the total forest area. The GIS helped to identify opportunities in which relatively minor improvements of size or configuration through reforestation could create patches at or above threshold sizes. Maps produced through this process have been invaluable tools in all subsequent phases of bird conservation planning in the MAV.

Step 5. Set site-specific habitat objectives

Having determined the areal habitat requirements for source populations of the high-priority species and having measured the amount of existing habitat that can support these populations, we had enough information to identify the specific locations desired for habitat protection/restoration. In addition to habitat requirements and existing forest locations, several other factors, such as flooding frequency and current land use, were used to identify proposed habitat protection/restoration sites. Where possible, restoration sites were centered on existing public land. Where linkages could logically be created, existing forest patches were combined to reach target sizes. For this reason, several existing 4,000 or 8,000 ha patches sometimes were combined into a proposed 40,000 ha patch.

Land use adjacent to existing or proposed forest patches was an important consideration in identifying and locating conservation areas. Adjacent land use can be beneficial, neutral, or hostile to bird survival and reproduction in forest patches. The Mississippi River and other large bodies of water are considered neutral, and the forested uplands on the periphery of the MAV are considered neutral or beneficial. Land uses that support large numbers of Brown-headed Cowbirds and predators are clearly hostile. Grazed levees, which support large populations of cowbirds, are one of the most hostile land uses. Crop lands are generally hostile, but this likely varies with the type of crop.

We identified 101 target forest patches (Table 4), but the number of these sites and their location is not final, and probably never will be. A massive reforestation effort will be necessary to create these patches, and developing them will be opportunity driven. As new opportunities arise and old patch objectives become unattainable, locations of target patches will change.

The current distribution of target patches within the MAV is not even, largely reflecting existing opportunities. For example, more and larger patches exist in southern Louisiana than in northern Mississippi. As a result, the planning team tended to include marginal patches in northern Mississippi more frequently than in areas with adequate numbers of apparently higher quality sites. The most disturbing bias in patch distribution is that a majority of patches are in wetter parts of the MAV, either within the mainline levee systems, or in other areas where permanent or frequent flooding precludes consistent agricultural productivity. A concerted effort is needed to ensure that the range of conditions within the forest patches adequately represents the range of naturally occurring soil and community conditions in the MAV. This ultimately may require more or different forest restoration efforts than currently are contemplated.

Table 4. Distribution of 101 target forest patches in the Mississippi Alluvial Valley.

State	4,000 - 8,000 ha	8,000 - 40,000 ha	>40,000 ha
Arkansas	9	11	3

Illinois	0	1	0
Kentucky	3	1	0
Louisiana	19	15	7
Mississippi	14	6	2
Missouri	6	1	0
Tennessee	1	1	1
MAV Total	52	36	13

Step 6. Set meta-population goals

Assuming that each target patch truly will support a source population of the target species, does the number of patches in the three size classes represent an acceptable meta-population goal for the high-priority species? We feel cautiously optimistic that it does, with the possible exception of the Swallow-tailed Kite. Eventually a population and habitat viability analysis on the range of this species throughout the Southeast may be necessary to generate more reliable conservation goals. For all other species, we feel that the patch goals we have recommended in the MAV, if achieved, should preclude any local extinctions, and should allow population trends to stabilize (inasmuch as breeding ground conditions affect the survival and success of long distance migrants).

In some ways, however, the issue of sufficiency of population goals at the physiographic area level is not biological in nature, but instead depends upon the future demands of society for populations of birds and other elements of biological diversity. From this perspective, evaluating the sufficiency of these ambitious but realistic goals is difficult. The next phase of planning will involve establishing specific objectives for each of these target forest patches. These objectives will be based upon current size and configuration of forested habitat, ownership, intent of the landowners, flood regimes, and the avifauna. In general, forest habitat on public land, private industrial forests, and in limited partnership hunting clubs is considered secure. However, private landowner involvement also will be essential to achieve conservation objectives, because land acquisition by public and private conservation agencies never will be adequate. Indeed, this planning process is not intended to result in a land acquisition plan, but to serve as a guide to focus reforestation efforts of all kinds.

CONCLUSION

The model planning process for the MAV provides site-specific habitat objectives within the context of landscape level conservation needs. The process also gives land managers a perspective on how their management decisions blend with the overall conservation needs of the MAV, at least with regard to forest breeding birds. The process should aid local planning and help to direct, justify, and fund conservation projects. Many assumptions were made in setting these objectives, often based on little existing information. Research to test these assumptions is critical. Monitoring and evaluating the implementation of these recommendations also is essential (Twedt et al. this volume). Through adaptive management, objectives will change as research refines our assumptions, or if monitoring indicates that the intended results are not being achieved.

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Appendix 7
Overview of surface geology in MSRAP

Saucier (1994) provides an excellent overview of geologic aspects of the alluvial valley (plain) of the Mississippi River. In his introduction, Saucier advises: In a dynamic environment such as the Lower Mississippi Valley, a knowledge of natural process and resulting landforms is an essential starting point in understanding man/land relationships. One cannot successfully accomplish environmental management, resource stewardship, or infrastructure development without understanding and appreciating landscape evolution. The following is borrowed heavily (frequently verbatim and without explicit credit hereafter) from Saucier (1994). We are grateful to Roger Saucier for providing a concise, thorough, and enlightening overview of the valley and apologize to those already familiar with the publication.

In this report, we refer frequently to the Mississippi River Alluvial Plain , one of several physiographic regions comprising the United States and the rest of the Western Hemisphere, and three analogous regions often used interchangeably. Saucier (1994) clarified the difference between the Lower Mississippi Valley, Mississippi alluvial valley, and Mississippi alluvial plain, but none of them, as he defined them, correspond to widely accepted nationwide delineations of physiographic regions (e.g., Keys et al. 1995, The Nature Conservancy 1996, Bailey 1995). Examples: The Lower Mississippi Valley includes coastal areas but excludes Tertiary uplands (e.g., Crowley's Ridge). The Mississippi alluvial valley includes the Red and Ouachita river alluvial plains but excludes the Atchafalaya Basin and areas like Arkansas' Grand Prairie that date to early glacial cycles. The Mississippi alluvial plain excludes virtually all uplands (including Macon Ridge). The Mississippi River Alluvial Plain includes several uplands (e.g., Macon Ridge, Grand Prairie and Crowley's Ridge) and most of the Atchafalaya Basin but excludes the Red and Ouachita river alluvial plains and coastal areas south of the forested portions of the Atchafalaya Basin.

REGIONAL OVERVIEW

The Mississippi River flows south over the Mississippi Embayment, a structural trough in the earth's crust that, over the past one to two-hundred million years, has thrust alternately upward and downward relative to the sea. The melting of the glaciers during the Pleistocene forced the upper Midwest and the current Ohio River Basin to drain southward, creating an alluvial plain extending more than 600 miles from Cape Girardeau, Missouri, to the Gulf of Mexico. Historically, the Mississippi River has deposited rich soil throughout its broad alluvial valley during spring floods.

QUATERNARY CHRONOLOGY

Weathering and fluvial erosion produced four primary erosional landscape types in the Lower Mississippi Valley: Paleozoic uplands, Coastal Plain uplands, Upland complex, and Pleistocene terraces. These are definable primarily on the basis of parent material, geologic structure, and the length of time that the area has been subjected to weathering and erosion. On Pleistocene terrace, erosional landscape patterns are more strongly influenced by the age of the deposit rather than the nature of the parent material. Older terraces are more maturely and uniformly dissected, relief is higher, and relatively flat interfluve areas are rare. Drainage on younger terraces is rather poorly developed (inefficient), interfluve areas are flat to undulating with very shallow slopes, soil profiles are relatively weakly developed, and stream valleys are broad and shallow.

During the onset of the first glaciation (the Early Pleistocene), falling sea level caused the entrenchment and deepening of the lower portion of the ancestral Mississippi valley. This downcutting worked headward resulting in steeper stream gradients and formed probably the first manifestations of a hilly topography in this portion of the Coastal Plain. Simultaneously, the advancing ice sheet caused a complete disruption of northward flowing streams in the upper Midwest and diversion of the flow southward in the Mississippi River system. Waning of the first glaciation about 2 million years ago produced significantly increased discharges into the Lower Mississippi Valley area. Glacial meltwater was augmented with runoff from a greatly enlarged drainage network. Waning glaciation was accompanied by major valley widening and deepening and marks the effective beginning of the Mississippi alluvial valley. However, the valley was smaller than the one that exists today. By the first major interglacial stage, the valley for the first time was characterized by an alluvial plain underlain by a thick coarse-grained substratum of glacial outwash deposits. The elevation of the Early Pleistocene alluvial plain was 100 ft or more above the level of the present (Holocene) floodplain.

Between about 2,200,000 and 1,300,000 years B.P., the valley was directly influenced by events of at least two major glacial cycles. During the first, the narrow, incipient valley widened (to several tens of miles) and deepened significantly to accommodate a load of meltwater and outwash. The overall floodplain was significantly higher than at present, and masses of outwash sometimes were deposited stratigraphically adjacent to the Upland Complex. Throughout the period, the Mississippi River flowed through the ancestral Western Lowlands while the Ohio River flow through the Eastern Lowlands. The two streams probably joined somewhere in western Mississippi. Between about 1,300,000 and 800,000 years B.P., a full glacial cycle had taken place. The floodplain level of the Mississippi River, although higher than at present, was well below the average elevation of the Upland Complex. During the waning glaciation phase of the Illinoian glacial cycle of the Middle Pleistocene (about 800,00 to perhaps 150,000 years B.P.) a new wave of outwash entered the area. A date of about 130,000 years B.P. marks the approximate beginning of the Sangamon stage, which was a period of prolonged stability in the uplands and the development of meander belts in the alluvial valley. The Mississippi and Ohio rivers did not merge until south of the latitude of Vicksburg. Waning of the Early Wisconsin glaciation about 70,000 years B.P. resulted in the deposition of large volumes of outwash in the alluvial valley and the formation of extensive valley trains. The two largest surviving remnants constitute most of the present landscape of the Western Lowlands and Macon Ridge. The valley trains are characterized by multiple terrace levels that reflect episodic outwash deposition, and the higher (easernmost) levels are veneered with Peoria loess. Deposition of the Early Wisconsin outwash was so rapid and widespread that the mouths of many alluvial valley tributaries were effectively blocked by alluvial drowning. This led to the formation of extensive lakes, such as Lake Monroe which occupied the Ouachita River valley.

Onset of the Late Wisconsin glaciation (formation of the Laurentide ice sheet) occurred about 30,000 years B.P. Between about 25,000 and 14,000 years B.P., which includes the time of maximum Late Wisconsin glaciation (about 18,000 years B.P.), Mississippi alluvial valley forests featured boreal spruce and fir, owing to the cool, moist climate. Large quantities of silt settled during seasonal loess-forming episodes. Glacial runoff through the area reached its peak about 12,000 years B.P. and abruptly declined thereafter. It was a time of rapid and significant amelioration of climate, an effective end of loess and sand dune formation, and a shift in vegetation to a deciduous hardwood forest. Between 9000 and 9500 years B.P., the Mississippi River shifted to a basically meandering regime throughout most of its valley. For the first time in valley history, archeological evidence directly assists in chronostratigraphic reconstructions. Between 7000 and 6000 years B.P., the Mississippi River followed the modern Tensas meander belt and thence along the western valley wall to the Gulf of Mexico. Previous and since then, the Mississippi had flowed along more eastern routes. By about 2000 years B.P., essentially modern conditions had developed in the alluvial valley, and the river everywhere was occupying a single channel and meander belt. During the past 2500 years archeological evidence is quite definitive and abundant and has allowed on occasion highly detailed reconstructions of channel shifts and their accompanying landscape changes.

GEOMORPHOLOGY

Upland remnants of Tertiary age and terraces and ridges of Wisconsin and pre-Wisconsin age divide the Mississippi alluvial valley (which excludes the Atchafalaya Basin) into six major lowlands or basins, each of which may be further subdivided into smaller units by ridges of Wisconsin and Holocene age. Each of the six major basins is a true topographic depression and definable hydrologic unit with a bounding interfluve. In all cases, drainage is from north to south into a major collecting stream after which the basin is named.

DEPOSITIONAL ENVIRONMENTS

Depositional environments are either fluvial, lacustrine, or eolian. Eolian deposits are loess-based or sand dunes. Fluvial deposits can be classified into alluvial fan / alluvial aprons, valley trains (braided streams), meander belts, and blackswamp / flood basins. Two kinds of valley trains are channels and island/braid bars. Six features are recognized within meander belts, specifically, natural levees, crevasse splays, distributaries, point bars, abandoned channels, and abandoned courses.

Lacustrine deposits

Development of Macon Ridge from glacial outwash impinged outwash against the uplands between Monroe and Sicily Island, creating a large (500- to 700-sq-mi) perennial lake (Lake Monroe) that may have persisted for several millennia. Local runoff from the Ouachita River valley probably combined with floodwaters backing up from the Mississippi alluvial valley to maintain the lake until a more efficient outlet could be developed through a valley train. Saucier (1994) proposed that impounded water created the gap at Harrisonburg, Louisiana, that separates Sicily Island from the uplands to the west. The lake formed relatively early in the period of outwash deposition. Cyclical downcutting or degradation of the valley by the braided river late in the period of outwash deposition likely allowed the eventual draining of the lake.

Fluvial deposits: Valley trains

Autin et al. (1991) recommended adoption of the more generic term valley train over braided-stream surface, braided-stream terrace, or braided-relict alluvial fans, as being more diagnostic of the mode of origin and not simply descriptive of surface features. The Lower Mississippi Valley experienced two discrete episodes of valley train formation, coinciding with the waning of the Early and the Late Wisconsin glaciations.

Valley train surfaces in all parts of the alluvial valley are underlain by massive amounts of course-grained outwash. Significant volumes of outwash have been removed only beneath the Holocene Mississippi River meander belts where the deposits have been reworked to depths averaging about 100 ft (the average depth of channel scouring in the meandering river). Otherwise, outwash underlies all areas mapped as backswamp in Saucier (1994). Throughout most of the alluvial valley area, the backswamp deposits are tens of feet thick.

Valley trains comprising the Macon Ridge stand several tens of feet higher than the adjacent Holocene floodplains (the local base levels of erosion); consequently, local drainage is incised into the deposits. Since nearly all local drainage concentrated in the depressions of the relict braided channels, the present drainage pattern is essentially an underfit system within the confines of the last braided stream pattern that existed on the valley train surface. Macon Ridge survives as a prominent topographic feature in part because the Early Wisconsin outwash accumulated to unusually high elevations in that area. The unusual accumulation may have been a direct consequence of reduced valley gradients that developed upstream from the constriction of the alluvial valley opposite Sicily Island. Because of an apparently greater outwash sediment load in the Mississippi River, the smaller Ohio River maintained a separate valley train at a slightly lower elevation (at any given latitude) until the two were forced to merge near Sicily Island. The lowest valley train levels were along the eastern margin of the alluvial valley in the areas of the present Yazoo and Tensas basins. This presence relatively far south in the alluvial valley area of widespread valley trains is strongly reflected in the distribution of loess deposits of Early Wisconsin age. For the first time during the Quaternary, a loess sheet, designated the Sicily Island loess, formed in the uplands and on terraces on both sides of the alluvial valley south of the latitude of Vicksburg. It thickens appreciably south of Sicily Island and reaches its maximum thickness near the mouth of the Red River. The outwash deposits of the Macon Ridge area probably were the principal source for that loess.

Fluvial deposits: Meander belts

Given a relatively low gradient, a high suspended load / bed-load ratio, cohesive bank materials, and a relatively steady discharge from year to year, a river will develop a meandering regime and a characteristic sinuous pattern. As a meandering river shifts laterally over time, it establishes a complex zone in which sediments are laid down in a series of active and abandoned channel environments and proximal overbank environments. With sedimentation rates highest near the active river channel, the net result is a meander belt, an alluvial ridge that develops to an elevation higher than the more distant floodplain. Once a meander belt ridge forms, most local drainage thereafter is directed away from the river channel into the lowland areas rather than into the channel. The Holocene floodplain of the Mississippi alluvial valley contains the meander belt of the present course of the river and up to five abandoned meander belts that were created at various times in the past because of avulsions (diversions). In the study area, the present meander belt is the largest, having a width up to 20 times that of the river channel itself.

Since attaining a full-flow status between Memphis and the vicinity of Vicksburg about 3000 years ago, the Mississippi River created an exceptionally large number of cutoffs during a short period of time. The relatively great extent to which the river has meandered in that stretch is likely due to the prevalence of coarse-grained glacial outwash deposits in the river's bed and banks, as well as the probability that the river is following the former route of the White River system which carried a considerable volume of sandy deposits. The unusual width of the modern meander belt between Memphis and Vicksburg and the large number of abandoned channels, many of which contain or used to contain oxbow lakes, were important factors in influencing prehistoric settlement patterns. Those abandoned channels are known to contain hundreds of archeological sites, many of which are large Mississippian-period villages or towns with clusters of earth mounds. The broad natural levee ridges of the Mississippi River were favored locations for the practice of maize-based agriculture.

The Arkansas River meander belts in the Tensas-Boeuf are estimated to be 10,000 years B.P. or younger. Poverty Point Period sites and other archaeological sites, several with radiocarbon dates, have been used to affirm and/or refine estimates of the age of specific channels. The modern meander belt of the Arkansas River, as with the Mississippi River, is considerably wider than any of the previous ones. The number of cutoffs is comparable in number to that in several of the older meander belts, but they are noticeably larger and more complex. Variations in width and numbers of cutoffs from one meander belt to another correlate extremely well with the nature of the bed and bank materials. For example, the zone of point bar accretion is noticeably wider and the number of cutoffs greater where the channel flowed through the Early Wisconsin Stage valley train deposits of Macon Ridge than where it flowed through the backswamp deposits of the Boeuf Basin and Ouachita River Lowland.

Fluvial deposits: Natural levees

Natural levees are the most conspicuous landforms of meander belts and the primary reason for their topographic prominence. Further, natural levees are without doubt the most significant landforms of the alluvial valley from both geological and cultural points of view. Natural levees overwhelmingly have been the dominant factors in the patterns of human settlement in both prehistoric and historic times. Their distribution has strongly influenced the locations of settlements, transportation routes, agriculture, and industrial development.

A natural levee is a low, broad ridge a mile to several miles wide, at least several tens of miles long, and 5 to 10 ft. higher than the adjacent floodplain areas. Its ridge slopes gently away from the parent channel to the level of the adjacent floodplain or backswamp. it results from the deposition of the relatively course (silts and sands) fraction of a stream's suspended load as floodwaters overtop the streambanks. Relatively coarser sediments and the largest volumes of sediment are deposited closest to the channel and decrease toward the floodbasin because of a decrease in the velocity and turbulence in the overbank flow. The latter are strongly influenced by the vegetative cover. Overbank flow may be in the form of either sheet flow or locally channelized.

Natural levees develop incrementally, and consequently they increase in both height and width as a function of age. At any given point along a river, the levees are relatively higher on the cutbank (concave) side of a bend where the river is cutting into older deposits. On the point bar (convex) side, pre-existing levees have been recently destroyed by lateral channel migration, and new natural levees are just beginning to develop. The height and width of natural levees are a direct function of the size and volume of the suspended sediment in the parent channel. Where sediments are relatively coarse (silts and sands), the levees tend to be relatively high but narrow (hence steeper). Conversely, where the sediments are primarily silts and clays, the levees are lower and broader. Along the Mississippi River, natural levee crests average about 15 ft above the level of the adjacent floodbasin, and throughout most of the alluvial valley area, they average 2 to 3 mi wide. Along abandoned distributaries, discernible natural levees may only be a few feet high and only several hundred feet wide.

Between Cairo and the head of the Atchafalaya River (the lower limit of the alluvial valley), a typical Mississippi River natural levee consists of medium to stiff, mottled gray, tan, and brown, silty clay, sandy clay, or silty sand. The sediments are highly oxidized with abundant iron and manganese nodules and are moderately to highly affected by bioturbation.

Saucier (1994) did not map natural levees north of the deltaic plain. Meander belts in the alluvial valley northward typically include complex spatial relationships of several generations of abandoned channels, each with their own natural levees. The resultant pattern of levees thus far has not been delineated except in large scale (low-resolution) mapping. In much of the alluvial valley area, natural levees exist more as discontinuous sheet-like deposits of locally highly variable thickness and geometry. Point bar accretion areas normally exhibit some degree of levee development and are entirely absent only over some (but not all) abandoned channels and along fresh point bar accretion along the active river channel.

Fluvial deposits: Point bars

Point bars consist of relatively coarse-grained deposits (mostly silts and sands) that are laid down during higher stream stages in a zone of relatively low turbulence and velocity along the convex side of a migrating stream bend. Bar development is a means by which a meandering stream strives toward equilibrium by compensating for channel widening caused by bank caving. Point bars would not fully develop without appreciable stage variations on the stream (e.g., annual floods) and easily erodible banks. Each major high-stage event is accompanied by a new increment of bar development from the stream's bed load, much of which may have come from material eroded from the cutbank side of the river immediately upstream from the bar. A point bar is a composite of sediments that are transported as underwater dunes in the stream channel. Because of helical flow, the sediments are moved into shallower water and deposited as transverse bars and sand waves. The bars and waves typically begin forming just below reaches (straight channel segments between bends) and progressively develop downstream around a convex bends as arcuate (bow-shaped) ridges. Before a ridge develops completely around a convex bend, one or more new ridges are beginning to form near the head of the band and accrete (amass) in a downstream direction; hence, bar formation is a continual process.

Cumulative point bar development results in the formation of characteristic point bar ridge and swale sequences (meander scrolls or scroll-bar sequences), which record the directions of bend migration along a meandering stream. Once a stream meanders away from a given area, overbank sediments accumulate vertically, eventually obscuring the pattern of point bar ridges and swales. Volumewise, point bar deposits encompass the majority of Holocene alluvial sediments north of the Red River.

Beneath that portion of a point bar sequence that can be most appropriately regarded as natural levee, the topstratum of a point bar ridge consists of a few feet of gray or tan, oxidized, silty or sandy clay or silty sand. Below the topstratum is a thick, coarsening downward sandy substratum that constitutes the typical point bar deposits. Most vertical sequences grade downward from well-sorted, fine and medium sands to medium and coarse sands with gravel. In point bar sequences, fine-grained, cohesive deposits occur mainly in the topstratum and the upper part of the substratum as either very thin clay drapes (generally less than an inch thick) or as swale filling. Small swales may contain only a few feet of silty or sandy clay, clayey sand, or silty sand unconformably overlying clean sands, whereas the larger, deeper swales (a hundred or more feet wide and perhaps thousands of feet long) may contain several tens of feet of soft, gray fat clays, organic clays, or clayey silts. From an engineering viewpoint, the vast majority of coarse-grained point bar deposits are dense to very dense and therefore provide competent foundation conditions.

Fluvial deposits: Abandoned channels

The abandoned channel may be the most significant of all depositional environments in terms of engineering considerations because of the typically soft and compressible soils that are often present. In a meandering river regime, short channel segments may be abandoned as the stream constantly strives to shorten its course. If two bends migrate such that they intersect and create a neck cutoff , sand bars quickly form in the upper and lower arms of the abandoned stream, leading the formation of an oxbow lake. No river through-flow takes place, but the lake is not completely hydraulically isolated from the river. Small channels called batture channels form and maintain themselves through the sediment wedges in the arms and serve to allow overflow from the oxbow lake to enter the river at low stages and floodwaters to back up into the lake during high stages. Because of this hydraulic connection, fine-grained suspended sediment (clays and silts) periodically enters and is deposited in the oxbow lake, causing it to slowly fill. As the lake shallows, the sediment wedges or plugs in the arms also expand at the expense of open water, but from deposition of clays and silts rather than sands. The fine-grained channel-fill deposits constitutes what engineers call clay plugs and are manifest at the surface by a flat, featureless freshwater marsh or swamp.

The sand wedge or plug portion of the channel filling that forms mainly in the arms of a cutoff during early stages consists predominantly of cross-bedded, fine to medium sands and silty sands. The overlying fine-grained or clay plug sediments are what most people regard as abandoned channel deposits. These consist predominantly of very soft to medium, gray, slightly organic, silty clays and clays. Since the sediments are typically laid down in perennial water bodies or deep swamp environments and are rarely exposed to oxidation or desiccation, they lack color mottling and nodules except in the uppermost portions of channels that are essentially filled. Deposits filling abandoned channels along smaller streams such as the Red River are analogous to those of the Mississippi River, only proportionately finer grained. Silt and sand layers are less numerous, and organic contents tend to be significantly higher.

The ultimate fate of an oxbow lake depends primarily on the behavior of the active river channel after cutoff takes place. If the river channel remains relatively nearby and there is an effective connection, the lake may fill completely and be characterized by a dense swamp forest. Conversely, if the river channel meanders well away from the lake or occupies a new meander belt, the lake may persist for a long time as a relatively deep water body. Lasting lakes do not normally form when riverflow cuts across a point bar by occupying a major swale and scouring it into a major channel; such an event characterizes the chute cutoff process of forming an abandoned channel. Since a much smaller segment of a bend is involved and most have a more arcuate (bow-like) than horseshoe shape, sediment filling is much more rapid and proportionately much more occurs as a sand bar or wedge rather than a clay plug.

Fluvial deposits: Abandoned courses

Abandoned courses appear to be similar in origin as abandoned channels in the Tensas-Boeuf Basin, occurring irregularly among abandoned channels up and down meander belts of the Arkansas River. An abandoned course is a lengthy segment of stream channel, more than a single bend and up to hundreds of miles long, that remains after a stream diversion to a new course and meander belt. During abandonment, a sand wedge forms at the point of avulsion and slowly develops and this downstream as flow progressively declines.

All abandoned course sequences appear to have a thin, fine-grained topstratum overlying a much thicker, coarse-grained substratum. The topstratum may be of various origins. Where it represents slack-water sedimentation after complete abandonment of the course by the river, it probably consists of very soft to soft, gray, organic clays and silts. Where it represents point bar accretion by a small stream flowing within the confines of the larger channel, the deposits will be coarser grained with medium, gray, silty, or sandy loams and silty sands being the dominant soil types.

The substratum portion of abandoned course sequences represents channel-fill sediments deposited during the stage of waning discharge when an upstream diversion was taking place. These sediments consist of gray, fine to medium, well-sorted sands that exhibit large-scale, tabular cross-stratification with ripple-drift cross laminations formed by migrating sand waves.

Fluvial deposits: Backswamps

A backswamp is a simple and easily defined depositional environment; in geomorphic terms, it is a flat, shallow, poorly-drained, typically swampy or marshy floodplain depression bounded by natural levees or other uplands. The term flood basin is often used synonymously with backswamp, and the term rim swamp is sometimes used when the area lies between a natural levee of a meander belt and the valley margin (either dissected upland or terrace). The backswamp environment is characterized by the incremental accumulation of fine-grained sediments during periods of overbank flooding. Sedimentation rates are the lowest to occur on the floodplain because backswamps lie beyond the limits of natural levee development. Backswamps typically are poorly drained with small, low gradient streams flowing in chaotic or anastomosing (interwoven) patterns.

Swamp deposits consist of firm to stiff, mostly gray to black clays and silty clays with thin silt laminations and frequent burrows. Organic matter is abundant both as woody fragments and scattered small particles. Bedded organics in the form of peat layers of zones of compacted leaf litter are infrequent even in poorly-drained swamp deposits.

Depending on the degree of ponding of water, backswamp subenvironments can be classified as lakes, poorly-drained swamps, or well-drained swamps. In the Lower Mississippi Valley area, cypress and tupelo typically are the only forest species that can tolerate prolonged flooding and soil saturation. Virtually all backswamps experience significant seasonal water level variations: a swamp that might contain 5 to 10 ft of standing water for several months in the spring of the year may be completely dry and easily negotiated during the late summer and fall. Only relatively small areas of deep or poorly-drained swamp have permanent standing water. As a generalization, the backswamp environment includes areas of thick, massive sequences of fine-grained overbank deposits as opposed to areas of thick, relatively coarse-grained point bar deposits.

Everywhere in the Lower Mississippi Valley area, backswamp deposits directly overlie and typically are abruptly separated from the coarse-grained substratum of glacial outwash deposits. The thickness of the backswamp deposits slowly but progressively increases downvalley from an average of about 40 ft at the latitude of Memphis to about 60 ft at the latitude of Natchez.

Eolian deposits

In the Lower Mississippi Valley, the most obvious indication of climate change is not within the fluvial systems but rather is the extensive blanket of loess. Loess is the direct result of deflation of silt from glacial outwash deposits (valley trains) transported tens to hundreds of miles to the east and south by seasonally strong, primarily northerly and northwesterly, late glacial-stage winds. The greatest amount of material and relatively coarsest materials were deposited closest to the source areas of recently deposited, unvegetated masses of glacial outwash. Loess of the Lower Mississippi Valley area is contiguous with an extensive blanket in the central United States and together form one of the largest blankets in the world. Loess exists as a thin (10 ft or less) veneer on Macon Ridge. Loess is a mealy, calcium-based material that was ground from rock by the glaciers and carried by wind from the floodplain of the Mississippi River when the river was draining actively glaciated areas. During dry periods, winds eroded the alluvium and deposited it over adjacent areas. Loess is a relatively homogeneous, seemingly nonstratified, unconsolidated deposit consisting primarily of well-sorted silt. It occurs as a blanket, composed of several discrete sheets, that drapes upland formations of Quaternary and Tertiary age. It is conspicuous because of its unusually massive nature, typical uniformly tan to brown color, and its extraordinary ability to form and maintain vertical slopes or cliffs. Unweathered loess has the ability to maintain vertical slopes if protected from surface runoff: this characteristic is attributable to its high vertical permeability (which reduces or eliminates water saturation), binding of silt- and larger-sized particles by thin clay and carbonate films, and hollow, vertically-oriented, calcareous root tubules.

Appendix 8
Conservation of Aquatic Targets in MSRAP

The development of a credible portfolio that adequately addresses the conservation needs of the full complement of species within MSRAP requires additional attention to aquatic targets. Although the majority of the current animal targets are aquatics and most of our sites based upon natural communities and bird patches are sufficiently large in area as to capture multiple imbedded aquatic systems, a significant component of aquatic biodiversity might be omitted unless aquatic targets are explicitly identified. Because of limited resources, the development of a full-blown aquatic community characterization was not possible. Instead, it was felt that an identification of coarse scale targets (i.e. aquatic ecological systems including headwater, small-, medium-, and large-order streams), stratified latitudinally and by substrate (surface geology), would adequately characterize the diversity of the aquatic system in MSRAP. Due to extreme hydrologic alteration throughout the ecoregion, viable occurrences of these targets are thought to be restricted to the more intact drainage units of the White River/Cache/Bayou DeView system, the Atchafalaya River System, and the Yazoo River system. The targets were thus nested within these large, HUC-delineated systems. Stream segments corresponding to each of these targets (i.e. headwater, small-, medium-, and large-order streams) will be identified through Site Conservation Planning at each of these hydrologic sites. Large, disconnected oxbow lakes were also included as an aquatic systems target in MSRAP.

The following list of aquatic targets has been developed:

Headwater streams (e.g., spring or stream initiation and immediate downstream stretches)
Small order streams and bayous
Mid-sized streams and bayous
Large rivers
Large, active ox-bows that receive periodic recharge via sheet flow or channel

Proposed goals and rationale for each aquatic target within each sub-region are:

<u>Headwater streams</u>

Description: Smallest stream subdivision. Typically includes spring source or apex of watershed. Streams generally narrow, shallow, and may fluctuate greatly in depth and flow rate but significant changes in amplitude of relatively short duration. Adjacent slopes relatively steep with narrow riparian zone. Lower limit generally defined by confluence with another similar stream.

Goal: 10 in each identified aquatic site, 30 total.

Rationale: These targets tend to be small and isolated, thus providing relatively high potential for genetic isolation and speciation (especially significant for organisms like caddis flies). Additionally, this target will likely encompass a fairly diverse assemblage of aquatic systems and a relatively large goal will be necessary to capture a significant portion of the variation.

<u>Small streams</u>

Description: Typically capture multiple headwater streams. Fluctuation in water level and flow rate often significant and of moderate duration. Adjacent slopes gradual with expanded floodplain and riparian zone. Lower reaches identified by confluence with streams that have created expanded alluvial floodplains. Historically may have had complete canopy cover over much of reach.

Goal: 5 each, 15 total.

Rationale: Typically supports species less constrained by dispersal barriers than headwater streams. Often significant differences in substrate composition among small streams (effects of unique near-surface geology especially pronounced).

Mid-size streams and bayous

Description: Relatively stable over short-term although significant variation in depth and flow rate occur periodically. Adjacent floodplain relatively expansive, alluvial. Adjacent overflow forest often extensive and may be inundated for prolonged periods. Historically, canopy coverage minimal over stream. Sand bars relatively common.

Goal: 3 each, 9 total.

Rationale: Moderate variability in water regime, substrate composition relatively uniform, few barriers to dispersal for aquatics.

Large rivers

Description: Largest river systems in valley. Includes the main stem of the Mississippi and the largest tributaries (e.g. White, Atchafalaya, Yazoo Rivers). Fluctuations in water flow typically seasonal rather than affected by individual weather systems. Adjacent floodplain expansive, alluvial. Adjacent overflow forest often extensive and typically inundated for prolonged periods. Sand bars, islands, etc., common. No canopy coverage over main channel.

Goal: 1 each, 3 total.

Rationale: Inter-river variation relatively low in terms of structure, dynamics and species assemblages. Target rivers will typically support large populations (multiple metapopulation units) of focal species. Few, if any, barriers to dispersal by focal species (large river fishes)

Large oxbows

Description: Oxbows created by channel changes in large rivers. Receive annual recharge from backwater / overbank flooding or connected directly to large river and receive significant flow during high water.

Goal: 3 per strata (North, Central, South), 9 total.

Rationale: May not support species assemblages that differ significantly from large or mid-size rivers but dynamics clearly unique. Recent oxbows that are directly connected with river may be important for mussels.

Appendix 9

SINGLE VEGETATIVE COMMUNITY DATAFORM

Header

STATE

SUBUNIT_code SUBUNIT_code

Percent_of_Subunit Perce

VISITED ○ yes ○ no

STATE

SAF Number SAF I

SAF Name SAF Name

Alliance TNC Code Alliance TNC Code

Alliance_Description Alliance_Description

Association Code ASSOCIATION COD

Association Association

ASSOCIATION TYPE ASSOCIATION TYP

ASSOCIATON TARGET ASSOCIATON TARG

ASSOCIATON DIST ASSOCIATON DIS

ASSOCIATION SIZE ASSOCIATIO

Soil Series Name Soil Series Name

Soil Series Book Code Soil Series Book Code

Saucier_Geo_Code Saucier_Geo_Code

Regeneration ○ great ○ good ○ fair ○ poor

SiteQuality ○ great ○ good ○ fair ○ poor

Stand_Age_Years Stand_Age_Year

Old_Growth_Comments Old_Growth_Comments

Management_Comments Management_Comments

Primary_Stress_Factors Primary_Stress_Factors

Stress_Affect_Percent Stress_Affect

Other_Stress_Factors Other_Stress_Factors

HYACINTH	○ NONE	○ LOW	○ MEDIUM	○ HIGH
PRIVET	○ NONE	○ LOW	○ MEDIUM	○ HIGH
JOHNSON GRASS	○ NONE	○ LOW	○ MEDIUM	○ HIGH
TALLOW	○ NONE	○ LOW	○ MEDIUM	○ HIGH
HONEYSUCKLE	○ NONE	○ LOW	○ MEDIUM	○ HIGH
CHINABERRY	○ NONE	○ LOW	○ MEDIUM	○ HIGH

Comments Comments

Body

Appendix 10

PUBLIC LAND SUBUNIT DATAFORM **PAGE 1**

THE NATURE CONSERVANCY
225-338-1040

STATE	MS	MBA NAME	St. Catherines Creek (if any)
COUNTY	Adams		
OWNER	St. Catherines Creek ("gov" for government)	LATITUDE	3477 (3000-4000, e.g., 3259)
TYPE	○ WMA ○ NF ◉ NWR ○ NP ○ SP ○ PP	LONGITUDE	(9000-9300, e.g., 9105)
SUBUNIT	A (A,B,etc.)	ACRES	24125
subunitCODE	STCATHERINEA (First 2 letters above 5 fields)	Forest acres	7300
INTERVIEWED	Jim Hall, Refuge Manager	HRS INTERVIEW	4
		HRS INFIELD	0

BY: Susan Carr YEAR: 1999 MO: 6 DATE: 8 CONFIDENCE LEVEL: high

SUBUNIT GEOSOILS RELATIONSHIP

none noted - most of refuge is not forested - did not visit mature bottomland areas

EXISTING EOS

Interior least tern, Balk eagle, Burrowing owl

POTENTIAL NA

none designated or observed

CLEARCUTsince20yr_ACRES	14000
SELECTIONsince20yr_ACRES	2200
PLANTEDsince20yr_ACRES	3000
AGEfrom20to70yr_ACRES	7300
AGEplus70yr_ACRES	

MANAGEMENT DESIRED VEG

Reforest cleared areas
increase regeneration of heavy seed species: i.e. c
species. Focus reforestation in upper 2 units.

AGE CLASS COMMENTS (CUTTING HISTORY)

Most of refuge has been cleared in past for farming. About 1/3 of bottomland area has been selectively cut w/in past 20 yrs. Sibly unit: cleared in 60's and 70's, was historically mainly cypress forest.

NATURAL REGENERATION COMMENTS

Lots of Salix nigra regeneration in disturbed and riverfront areas. Regeneration of light seeded species OK on south part refuge; poor regenerati of all overstory spp. on North portion.

MANAGEMENT COMMENTS

About 10% refuge is forested upland; about 30% is mature bottomland forest.
3000 ac. reforested by FWS since 1990. About 11-14,000 acres need reforestation.

No timber harvest since FWS acquisition: future plans for small "liberation" cuts to release Q. lyrata regeneration.

6200 acres moist soil units and future GTR's

Exotics: Kudzu in uplands; Sesbania is a problem in fields and reforested areas; swamp privot is a minor problem. Beaver a intermittent problem (trap and remove when problem occurs)

THE NATURE CONSERVANCY
225-338-1040

WILDLIFE MANAGEMENT

Hog hunting (to reduce hog population).

UNDERSTORY CONDITION (SUBUNIT LEVEL)

Poor regeneration of most species due to: extended flooding from MS river, black willow competition

PRESENCE OF GAPS, STRUCTURAL DIVERSITY (SUBUNIT)

no

HYDRO TREND ☒ towardWET ☐ towardDRY ☐ constant

HYDRO STRESS

☐ intDITCH ☒ intLEVEE ☒ intBEAVER ☐ intDAM ☐ intDREDGE
☐ extDITCH ☒ extLEVEE ☐ extBEAVER ☐ extDAM ☒ extDREDGE

RUNOFF STRESS

☐ AGRICULTURE ☐ MANUFACT ☐ FEEDLOT
☐ CLEARCUT ☐ SUBURBAN ☐ Other...

VEG STRESS

☒ higraded ☐ eroded ☐ burned ☒ flooded
☐ diseased ☐ cattle ☒ hogs ☐ greentree

HYDROLOGY COMMENTS

Miss. River is not leveed - refuge receives longer and more severe headwater flooding, well into the growing season. Levee separating Cloverdale unit from rest of refuge - has been breeched. Levee along Homochito River (Washout Bayou) to

RARE SPECIES/HABITAT KNOWN

Good muscle habitat on Old St. Catherine Creek inside refuge: including fat pocketbook muscle.
Rafenesque big-eared bat - present in abandoned houses.
2 active bald eagle nests

SOURCES OTHER
Potential sources of information

Bottomland Forest Re-establishment Coop Studies, Sharkey County MS May 1999.
FWS Summary Report

KNOWN SITES
Sites having documented ecology data (not FIA)

no

SURROUNDING LAND INFO

SURROUNDING FORESTED LAND? ☐ NO ☒ YES

South of refuge: Beck's Bay, owned by DU with a permanent conservation easement.
East of Butler Lake: Laural Hill Plantation (1300 ac) - conservation easement with State
Rest is agriculture and forested private land.

Four potential inholding acquisitions pending (including James tract, waiting for closing)

PUBLIC LAND SUBUNIT DATAFORM **PAGE 1**

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225-338-1040

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OWNER: St. Catherines Creek ("gov" for government)
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SUBUNIT: A (A,B,etc.)
subunitCODE: STCATHERINEA (First 2 letters above 5 fields)
LATITUDE: 3477 (3000-4000, e.g., 3259)
LONGITUDE: (9000-9300, e.g., 9105)
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Forest acres: 7300

INTERVIEWED: Jim Hall, Refuge Manager
HRS INTERVIEW: 4
HRS INFIELD: 0

BY: Susan Carr
YEAR: 1999
MO: 6
DATE: 8
CONFIDENCE LEVEL: high

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SELECTIONsince20yr_ACRES: 2200
PLANTEDsince20yr_ACRES: 3000
AGEfrom20to70yr_ACRES: 7300
AGEplus70yr_ACRES:

MANAGEMENT DESIRED VEG

Reforest cleared areas
increase regeneration of heavy seed species: i.e. c
species. Focus reforestation in upper 2 units.

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PUBLIC LAND SUBUNIT DATAFORM PAGE 2

THE NATURE CONSERVANCY
225-338-1040

WILDLIFE MANAGEMENT

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UNDERSTORY CONDITION (SUBUNIT LEVEL)

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PRESENCE OF GAPS, STRUCTURAL DIVERSITY (SUBUNIT)

no

HYDRO TREND ☒ towardWET ☐ towardDRY ☐ constant

HYDRO STRESS ☐ intDITCH ☒ intLEVEE ☒ intBEAVER ☐ intDAM ☐ intDREDGE
☐ extDITCH ☒ extLEVEE ☐ extBEAVER ☐ extDAM ☒ extDREDGE

RUNOFF STRESS ☐ AGRICULTURE ☐ MANUFACT ☐ FEEDLOT
☐ CLEARCUT ☐ SUBURBAN ☐ Other...

VEG STRESS ☒ higraded ☐ eroded ☐ burned ☒ flooded
☐ diseased ☐ cattle ☒ hogs ☐ greentree

HYDROLOGY COMMENTS

Miss. River is not leveed - refuge receives longer and more severe headwater flooding, well into the growing season. Levee separating Cloverdale unit from rest of refuge - has been breeched. Levee along Homochito River (Washout Bayou) to

RARE SPECIES/HABITAT KNOWN

Good muscle habitat on Old St. Catherine Creek inside refuge: including fat pocketbook muscle.
Rafenesque big-eared bat - present in abandoned houses.
2 active bald eagle nests

SOURCES OTHER Potential sources of information

Bottomland Forest Re-establishment Coop Studies, Sharkey County MS May 1999.
FWS Summary Report

KNOWN SITES Sites having documented ecology data (not FIA)

no

SURROUNDING LAND INFO

SURROUNDING FORESTED LAND? ☐ NO ☒ YES

South of refuge: Beck's Bay, owned by DU with a permanent conservation easement.
East of Butler Lake: Laural Hill Plantation (1300 ac) - conservation easement with State
Rest is agriculture and forested private land.

Four potential inholding acquisitions pending (including James tract, waiting for closing)

Appendix 11
MSRAP Community Targets and Goals

Global Name	Elcode	Rank	Spatial Pattern	Element Distribution	Size Type	Goals
Quercus virginiana - (Pinus taeda) / (Sabal minor, Serenoa repens) Forest	CEGL007039	G3G4	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6
Pinus echinata Crowley's Ridge Forest	CEGL007919	G3G4	LARGE PATCH	LIMITED	SIZE TYPE 4	9
Quercus muehlenbergii - Quercus shumardii - Carya myristiciformis Forest	CEGL004414	G2G3				?
Fagus grandifolia - Acer saccharum - Liriodendron tulipifera Unglaciated Forest	CEGL002411	G4?	SMALL PATCH	PERIPHERAL	SIZE TYPE 7	6
Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra glabra Forest	CEGL004663	G3?	SMALL PATCH	ENDEMIC	SIZE TYPE 7	25
Fagus grandifolia - Quercus alba - Liquidambar styraciflua - (Liriodendron tulipifera) / Mixed Herbs Forest	CEGL007209	G4?				6
Quercus alba - Carya alba / Vaccinium elliottii Forest	CEGL007224	G5?	LARGE PATCH	WIDESPREAD	SIZE TYPE 5	5
Quercus alba Macon Ridge Forest	CEGL007914	G2G3	LARGE PATCH	ENDEMIC	SIZE TYPE 4	18
Quercus stellata / Cinna arundinacea Flatwoods Forest	CEGL002405	G2G3	LARGE PATCH	WIDESPREAD	SIZE TYPE 6	5
Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos) Forest	CEGL004619	G4G5	LARGE PATCH	LIMITED	SIZE TYPE 5	9

Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	CEGL002427	G4G5	MATRIX	LIMITED	SIZE TYPE 3	8
Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua) Forest	CEGL007913	G5	LARGE PATCH	LIMITED	SIZE TYPE 6	9
Populus deltoides - Salix nigra Forest	CEGL002018	G3G4	LARGE PATCH	WIDESPREAD	distribution is not certain	5
Populus deltoides - Salix nigra / Mikania scandens Forest	CEGL007346	G4G5	SMALL PATCH	LIMITED	SIZE TYPE 7	20
Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea Forest	CEGL002099	G3G4	SMALL PATCH	LIMITED	SIZE TYPE 7	13
Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest	CEGL007915	G4G5	LARGE PATCH	LIMITED	SIZE TYPE 4	9
Quercus laurifolia - Quercus nigra Mississippi River Alluvial Plain Forest	CEGL007916	G?	SMALL PATCH	LIMITED	SIZE TYPE 7	13
Quercus phellos - Ulmus crassifolia Forest	CEGL007921	G?	LARGE PATCH	LIMITED	SIZE TYPE 5	9
Salix nigra Mississippi River Alluvial Plain Forest	CEGL007908	G?	LARGE PATCH	ENDEMIC	SIZE TYPE 4	18
Acer saccharum - Carya cordiformis / Asimina triloba Floodplain Forest	CEGL005035	G2Q	SMALL PATCH	LIMITED	SIZE TYPE 7	13
Acer negundo Forest	CEGL005033	G4G5	LARGE PATCH	WIDESPREAD	SIZE TYPE 5	9
Acer saccharinum - Celtis laevigata - Carya illinoinensis Forest	CEGL002431	G2G4	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6
Acer saccharinum - Ulmus americana - (Populus deltoides) Forest	CEGL002586	G4?	SMALL PATCH	WIDESPREAD		6
Betula nigra - Platanus occidentalis Forest	CEGL002086	G5	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6

Carya illinoinensis - Celtis laevigata - Ulmus (americana, crassifolia) Mississippi River Alluvial Plain Forest	CEGL007912	G2G3	LARGE PATCH	ENDEMIC	SIZE TYPE 4	18
Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda Forest	CEGL002422	G3G5	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6
Fraxinus pennsylvanica - Populus heterophylla - Ulmus americana - (Quercus texana) Forest	CEGL004694	G2?				?
Planera aquatica Forest	CEGL007394	G4?	LARGE PATCH	WIDESPREAD	SIZE TYPE 6	5
Quercus lyrata Pond Forest	CEGL004642	G1G3	SMALL PATCH			13
Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest	CEGL002423	G2Q	MATRIX	ENDEMIC	SIZE TYPE 3	10
Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest	CEGL002424	G4G5	MATRIX	LIMITED	SIZE TYPE 3	9
Quercus lyrata - Quercus palustris / Acer rubrum var. drummondii / Itea virginica - Cornus foemina - (Lindera melissifolia) Forest	CEGL004778	G2?	SMALL PATCH	ENDEMIC	SIZE TYPE 8	25
Quercus lyrata - Carya aquatica Forest	CEGL007397	G4G5	MATRIX	WIDESPREAD	SIZE TYPE 3	3
Gleditsia aquatica - Carya aquatica Forest	CEGL007426	G3?	SMALL PATCH	LIMITED	SIZE TYPE 7	13
Quercus palustris - (Quercus stellata) - Quercus pagoda / Isoetes spp. Forest	CEGL002101	G1G2	LARGE PATCH	PERIPHERAL	SIZE TYPE 6	?
Quercus palustris - Quercus bicolor - (Liquidambar styraciflua) Mixed Hardwood Forest	CEGL002432	G3G5				6
Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest	CEGL002102	G3G4Q	LARGE PATCH	LIMITED	SIZE TYPE 5	12

Quercus texana - Quercus lyrata Forest	CEGL007407	G3G4	LARGE PATCH	LIMITED	SIZE TYPE 4	9
Salix nigra / Cephalanthus occidentalis Forest	CEGL004773	G4	SMALL PATCH	WIDESPREAD	SIZE TYPE 8	6
Salix nigra Seasonally Flooded Forest	CEGL007410	G3G5	LARGE PATCH	WIDESPREAD	SIZE TYPE 5	8
Salix nigra / Sagittaria lancifolia Forest	CEGL007436	G4?				3
Taxodium distichum - Nyssa aquatica - Acer rubrum var. drummondii / Itea virginica Forest	CEGL007422	G4?	LARGE PATCH	LIMITED	SIZE TYPE 4	9
Taxodium distichum - Fraxinus pennsylvanica - Quercus laurifolia / Acer rubrum / Saururus cernuus Forest	CEGL007719	G3G4	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6
Nyssa aquatica Floodplain Forest	CEGL007389	G?	LARGE PATCH	WIDESPREAD	SIZE TYPE 5	5
Nyssa aquatica Forest	CEGL002419	G5?	LARGE PATCH	WIDESPREAD	SIZE TYPE 4	5
Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest	CEGL002421	G?	LARGE PATCH	LIMITED	SIZE TYPE 4	9
Nyssa aquatica - Nyssa biflora Forest	CEGL007429	G4G5	SMALL PATCH	PERIPHERAL	SIZE TYPE 7	5
Taxodium distichum / Lemna minor Forest	CEGL002420	G5	MATRIX	WIDESPREAD	SIZE TYPE 3	3
Pinus taeda - Quercus phellos - Quercus nigra Forest	CEGL007910	G4	LARGE PATCH	PERIPHERAL	SIZE TYPE 6	3
Quercus stellata - Quercus velutina - Quercus alba - (Quercus falcata) / Croton michauxii Sand Woodland	CEGL002396	G2Q	SMALL PATCH	ENDEMIC	SIZE TYPE 8	25
Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand Woodland	CEGL002417	G2Q	SMALL PATCH	ENDEMIC	SIZE TYPE 8	25

Taxodium distichum / Planera aquatica - Forestiera acuminata Lakeshore Woodland	CEGL007909	G?	LARGE PATCH	LIMITED	SIZE TYPE 6	9
Arundinaria gigantea ssp. gigantea Shrubland	CEGL003836	G2?	SMALL PATCH	LIMITED	SIZE TYPE 7	13
Panicum virgatum - Andropogon gerardii Grand Prairie Herbaceous Vegetation	CEGL007911	G1		ENDEMIC		25
Panicum virgatum - Tripsacum dactyloides Herbaceous Vegetation [Provisional]	CEGL004624	G?				6
Schizachyrium scoparium - Sorghastrum nutans - Aristida lanosa - Polypremum procumbens Herbaceous Vegetation	CEGL002397	G1Q				6
Juncus (acuminatus, brachycarpus) - Panicum virgatum - Bidens aristosa - Hibiscus moscheutos ssp. lasiocarpos Herbaceous Vegetation	CEGL004782	G2G3				6
Nelumbo lutea Herbaceous Vegetation	CEGL004323	G3G4	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6
Nuphar lutea ssp. advena - Nymphaea odorata Herbaceous Vegetation	CEGL002386	G4G5	SMALL PATCH	WIDESPREAD	SIZE TYPE 7	6

Appendix 12
MSRAP Animal Targets and Goals

Scientific Name	Common Name	G Rank	Distribution (other than ecoregion 42)	Goal	Conservation Issues
INVERTEBRATES					
Caecidotea dimorpha	an isopod	G1?	?	> 5 (avo)	AR and MO endemic
Procambarus ferrugineus	crayfish	G1		> 5 (avo)	AR endemic; Grand Prairie
Obovaria retusa	ring pink	G1	44	> 5 (avo)	
Plethobasus cooperianus	orangefoot pimpleback	G1	44	> 5 (avo)	
Potamilus capax	fat pocketbook	G1	38,44	> 5 (avo)	
Obovaria jacksoniana	southern hickorynut	G1G2	38,39,40,41,53	> 5 (avo)	
Cyprogenia aberti	western fanshell	G2	32,38,39	8(4,4,0)	
Lampsilis abrupta	pink mucket	G2	38,44	8(3,3,2)	
Simpsonaias ambigua	salamandermussel	G2	36,38,44,46	8(4,4,0)	
Pleurobema rubrum	pyramid pigtoe	G2	36,38,44,46	8(4,4,0)	
Leptodea leptodon	scaleshell	G2G3	36,38,44	8(4,4,0)	
Quadrula cylindrica cylindrica	rabbitsfoot	G4T2T3	36,44	8(4,4,0)	
Arcidens confragosus	rock pocketbook	G3	38,40,41,44	5(3,2,0)	
Epioblasma triquetra	snufbox	G3	36,38,44,46	5(3,2,0)	
Plethobasus cyphyus	sheepnose	G3	36,38,44,46	5(3,2,0)	
Inscudderia taxodii	bald cypress katydid	G?	?	> 5 (avo)	ecoregion endemic ?; MS, IL, MO
Dryobius sexnotatus	six-banded longhorn beetle	G?	?	> 5 (avo)	LA endemic?
Baetisca obesa	a mayfly	G?	?	> 5 (avo)	MO endemic? S3?
Triodopsis multilineata	striped whitelip	G?	?	5(3,2,0)	
Pleurocera canaliculata	silty hornsnail	G?	?	5(1,2,2)	widespread in eastern U.S.
Paroxya hoosieri	Hoosier grasshopper	G?	?	> 5 (avo)	ecoregion endemic ?; LA, MO
Gryllotalpa major	prairie mole cricket	G3	32,36,37,38	5(2,3,0)	Grand Prairie only ecoregion occurrence

Scientific Name	Common Name	G Rank	Distribution (other than ecoregion 42)	Goal	Conservation Issues
FISH					
Scaphirhynchus albus	pallid sturgeon	G1G2	26,34,35,36,38,	≥ 5 (avo)	Reproducing metapopulation unit in Atchafalaya River (LA)
Macrhybopsis gelda	sturgeon chub	G2	26,34,35,36,38	8(2,3,3)	
Acipenser fulvescens	lake sturgeon	G3	35,36,38,43,44,45, 46,47,48,49,50	5(3,2,0)	
Pteronotropis hubbsi	bluehead shiner	G3	40	10(3,3,4)	
Noturus stigmosus	northern madtom	G3	44,45,48,49	5(1,2,2)	
Notropis sabinae	Sabine Shiner	G3	40,41	5(0,5,0)	NE AR / SE MO population highly disjunct from primary range
AMPHIBIANS					
Pseudacris streckeri illinoensis	Illinois chorus frog	G5T3	36, 38, 44	5(5,5,0)	highly disjunct subspecies
REPTILES					
Macroclemys temminckii	alligator snapping turtle	G3G4	31, 32, 36, 37, 38, 39, 40, 41, 43, 44, 52, 53, 56,	10(2,2,6)	MSRAP center of abundance; declining significantly in periphery of range; S3 or rarer in all states
Deirochelys reticularia miaria	western chicken turtle	G5T5	31, 32, 39, 40, 41,	3(1,1,1)	Apparently declining in MO, AR, MS; mostly peripheral in ecoregion
BIRDS					
Sterna antillarum athalassos	interior least tern	G4T2Q	34,35,36,38,40,41, 44	8(4,4,0)	river stretches with suitable nesting areas
MAMMALS					
Corynorhinus rafinesquii	Rafinesque's big-eared bat	G4	38,39,43,44,50,515 2,53,54,55,57,59	9 (3,3,3)	Rangewide decline; proposed for listing; may key on larger blocks of forested wetland with numerous relict hollow trees for denning; occurs in low density

Ursus americanus	black bear	G5	many	4 for U. a. luteolus, 1 other	Includes U. a. luteolus T2; surrogate for many forest-dwelling animals

NOTES: 1. Conservation goals were based upon work done by the East Gulf Coastal Plain ecoregional planning team and include consideration of both global rank and the proportion of the taxa's range (areal extent and abundance) falling within MSRAP:

- 5 viable populations of all G1/T1 taxa or all viable extant populations, whichever is greater
- 12 viable populations of each G2/T2 target if MSRAP comprises over 75% of the taxa's range; 8 if MSRAP comprises < 75%
- 10 viable populations of each G3/T3 taxa if MSRAP comprises over 75% of the taxa's range; 5 if MSRAP comprises <75%
- 5 viable populations of each G4/T4 and G5/T5 taxa if MSRAP comprises over 75% of the taxa's range; 3 if MSRAP comprises <75%

2. Goals per strata appear in parenthesis (North, Central, South) following ecoregion goal

TAXA OR OTHER ELEMENTS CONSIDERED FOR INCLUSION IN TARGET LIST

Scientific Name	Common Name	G Rank	COMMENTS
Sylvilagus aquaticus	Swamp Rabbit	G5	apparently declining in periphery of range, may be extirpated in AR, considered common in LA, MS, TN; will be captured in bird patches and larger community target sites
Polyodon spathula	Paddlefish	G4	general decline; harvested commercially in some states for roe (LA temporary ban); still common in LA; will be captured in multiple sites and with aquatic targets
Anguilla rostrata	American Eel	G5	rangewide decline; catadromous so faced with multiple threats; still common in LA and other coastal states; will be captured via large river aquatic targets
Hybognathus hayi	Cypress Minnow	G5	declining in northern portion of range; still common in LA and MS; likely to capture multiple populations along with bird and community targets (inhabits cypress swamp, bayous, oxbows)
Noturus phaeus	Brown Madtom	G4	not in biologically-based boundaries for ecoregion
Crystallaria asprella	Crystal Darter	G3	not likely in biologically-based boundaries for ecoregion
Scientific Name	**Common Name**	**G Rank**	**COMMENTS**
Ammocrypta clara	Western Sand Darter	G3	not in ecoregion
Ammocrypta vivax	Scaly Sand Darter	G5	not in ecoregion; abundant in adjacent ecoregions
Alligator mississippiensis	American Alligator	G5	abundant in ecoregion and adjacent ecoregions; will capture multiple populations during selection of sites for other targets
Coluber constrictor	Blackmask Racer	G5T5	considered abundant in LA and MS; will capture multiple populations during selection of

latrunculus			sites for other targets.
	Waterbird Nesting Colonies		numerous colonies will be captured in bird patches and community target sites.
	Migratory Shorebird Sites		will capture numerous shorebird sites within bird patches; moist soil units on wildlife refuges and wildlife management areas.

Appendix 13
MSRAP Plant Targets and Goals

Scientific Name	Common Name	G Rank	Distribution (other than ecoregion 42)	Goal	Conservation Issues
DICOTS					
Mespilus canescens	Stern's Medlar	G1	?	3(0,3,0)	Only NA member of Genus; 25 plants in one AR site; ARNHC has easement; goal to include restoration
Lindera melissifolia	Pondberry	G2	43, 52, 53, 54, 57	8(4,4,0)	36 known US locations
Physostegia correllii	Correll's False Dragon-head	G2	31, 53	3(0,0,3)	Only one known ecoregional occurrence; goal of 3 via restoration
Leitneria floridana	Corkwood	G3	53	10(5,5,0)	Only member of Genus
Schisandra glabra	Bay Starvine	G3		7(2,3,2)	May not be in southern strata of ecoregion
Neobeckia aquatica	Lakecress	G4		3(1,2,0)	Declining throughout range; few recent collections; found throughout eastern US/Canada
Oenothera pilosella ssp. sessilis	Prairie Evening Primrose	G5T2Q	36,38,39,40	8(4,4,0)	Taxonomy in question; not recognized in Louisiana
MONOCOTS					
Carex socialis	Social Sedge	G3G4	43,44,45	5(2,3,0)	
Carex decomposita	Cypress-knee Sedge	G3		5(2,2,1)	One significant KY site in ecoregion; widespread in east US

NOTES: 1. Conservation goals were based upon work done by the East Gulf Coastal Plain ecoregional planning team and include consideration of both global rank and the proportion of the taxa's range (areal extent and abundance) falling within MSRAP:

- 5 viable populations of all G1/T1 taxa or all viable extant populations, whichever is greater
- 12 viable populations of each G2/T2 target if MSRAP comprises over 75% of the taxa's range; 8 if MSRAP comprises < 75%
- 10 viable populations of each G3/T3 taxa if MSRAP comprises over 75% of the taxa's range; 5 if MSRAP comprises <75%
- 5 viable populations of each G4/T4 and G5/T5 taxa if MSRAP comprises over 75% of the taxa's range; 3 if MSRAP comprises <75%

2. Goals per strata appear in parenthesis (North, Central, South) following ecoregion goal

3. Mespilus and Physostegia are exceptions to the above rules as it is not likely that the stated minimum goals could ever be achieved even with restoration.

ADDITIONAL PLANT TAXA CONSIDERED FOR INCLUSION IN TARGET LIST

Scientific Name	Common Name	G Rank	Distribution (other than ecoregion 42)	Goal	Conservation Issues
Helianthus silphioides	Silphium Sunflower	G3G4			Not likely in ecoregion; common in AR Ozarks; remove from MSRAP list
Hypericum adpressum	Creeping St. John's wort	G2G3			Not likely in ecoregion; SH in KY one location in MO
Polymnia laevigata	Tennessee Leafcup	G3			Peripheral to ecoregion; mostly in Coastal Plain
Carex hyalina	A sedge	?			
Carex bicknellii var. opaca	A sedge	G5T2T3			Widespread in MO; some question about taxonomic status; ecoregional endemic?
Cyperus grayioides	Mohlenbrock's Umbrella sedge	G3	38,39,40,41		Target in other (TX) ecoregions; peripheral, at best, in ecoregion

Appendix 14
Generic community EO ranking guidelines

EOSPECS

General EOSPECS guidelines
The very general guidelines offered below may be used as a starting point for EOSPECS:

Minimum critera: (default= Matrix Type = 5 ac. Large Patch Type = 2 ac. Small Patch Type = none.)
Separation Distances: EOs are separated by either:

- a barrier between patches (e.g., a two-lane paved highway, urban development, open body of water); or,
- an area of cultural vegetation (including ruderal vegetation, such as old-fields) greater than 0.5 km; or,
- a different intervening natural or semi-natural community greater than 1 km.

Justification:
Comments:

EORANK.PROCEDURE
Rank factors: Size + Condition + Landscape context ⇒ predicted viability ≈ EORANK
A general guideline is that all three factors be weighted equally, with matrix types perhaps being weighted more by size and landscape context, and small patch types being weighted more by condition and landscape context. If Size, Condition, or Landscape context is ranked as unknown (U), include a ? on the overall EORANK. The overall EO rank of E (extant) should be used if you cannot meaningfully assign an EO rank based on available information, but you know the EO does exist.
EORANKSPECS
General EO ranking guidelines
The general EORANK specifications, described below, may be used as a starting point for EORANKSPECS.

Factor 1 : SIZE
Two scales may be used. One is simply based on the community pattern, whether matrix, large patch or small patch. The other is a more refined scale that may be used more specifically for certain associations or groups of associations.

Pattern	**A Size**	**B Size**	**C Size**	**D Size**
MX	> 5,000	500 - 5,000	50 - 500	5 - 50
LP	> 500	50 - 500	5 - 50	2 - 5
SP	> 50	5 - 500.5 - 5	<0.5	

Pattern	A SIZE	B SIZE	C SIZE	D SIZE
MX -Size type 1	>10,000 acres	>5,000 acres	>2,000 acres	<2,000
MX -Size type 2	>5,000	>2,000	>1,000	< 1,000
MX - Size type 3	>1000	>500	>200	< 200
LP - Size type 4	>500	>200	>100	< 100
LP - Size type 5	>200	>100	>50	<50
LP - Size type 6	>100	>50	>20	< 20
SP - Size type 7	>50	>20	>10	< 10
SP - Size type 8	>10	>5	>2	< 2
SP - Size type 9	>2	>1	<1	
SP - Size type 10	size irrelevant (all examples are small and size is not meaningful)			

Factor 2: CONDITION
an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the EO. The overall condition rank is a subjective integration of a variety condition factors. Some representative condition factors are included in the grades below, but additional factors may be considered when developing the overall condition rank. For a given EO, different factors may "rate out" to different grades, but the final condition rank is a subjective integration of all factors present.

A -- Typical composition, with indicator species
Typical structure, especially of mature or old growth features where appropriate
Few or no exotics
Presence of natural processes, including disturbances
Lack of negative human impacts

B -- Lack of some typical indicators due to alteration or disturbance
Structure may be somewhat immature, or lacking old growth features, if expected
Some exotics, but not dominant
Some natural processes lacking
Some negative human impacts

C -- Many typical indicators missing because of alteration or disturbance; "weedy" dominants
Structure immature, or lacking features present under natural disturbance processes
Exotics may be extensive, but rarely dominant over native component.
Natural processes largely changed
Some extensive negative human impacts

D -- Most typical indicators missing; "weedy" dominants
Structure immature or lacking features present under natural disturbances
Exotics may dominate over native components
Natural processes highly altered
Extensive negative human impacts

U -- Unknown (if using secondary sources or ranking existing, unranked EOs)

*** **C/D** distinction needs to emphasize minimum viability in a 25-100 year time frame

Factor 3: LANDSCAPE CONTEXT
an integrated measure of the quality of biotic and abiotic factors, structures, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the EO. The values that landscape context has for a given community include functional connectivity to other communities, buffering from harmful edge effects from adjacent unnatural areas, and intact ecotone zones and processes.

A -- Highly connected to functioning natural landscapes
EO is surrounded by largely intact natural vegetation, with species interactions and natural processes occurring across communities
Area surrounding EO is 2500-10,000 acres with 80% natural vegetation

B -- Moderately connected to functioning natural landscapes
EO is surrounded by moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality, due to overgrazing or recent logging.
Area surrounding EO is 2500-10,000 acres with 50-80% natural vegetation.

C -- Moderately isolated from functioning natural landscapes

EO is surrounded by a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots.

Area around EO is 20-50% natural vegetation.

D -- Highly isolated from functioning natural landscapes
EO is entirely or almost entirely surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

Area around EO is 0-20% natural vegetation.

U -- Unknown (if using secondary sources or ranking existing, unranked EOs).

The Spatial Pattern Of Communities

Natural terrestrial communities may be categorized into three functional groups on the basis of their current or historical patterns of occurrence, as correlated with the distribution and extent of landscape features and ecological processes. These groups are identified as matrix communities, large patch communities, and small patch communities. Community pattern may vary by ecological region, requiring that a type be categorized several ways.

C1 Matrix Communities
Communities that form extensive and often contiguous cover may be categorized as matrix (or matrix-forming) community types. Matrix communities occur on the most extensive landforms and typically have wide ecological tolerances. Individual Element occurrences of the matrix type typically range in size from 5000 to 1,000,000 acres. In a typical ecoregion, the aggregate of all matrix communities covers, or historically covered, as much as 75-80% of the natural vegetation of the ecoregion. Matrix community types are often influenced by large-scale processes (e.g., climate, fire), and are important habitat for wide-ranging or large area-dependent fauna, such as large herbivores or birds (e.g., bison, prairie chickens).

C2 Large Patch Communities
Communities that form large areas of interrupted cover may be categorized as large patch community types. Individual EOs of this community type typically range in size from 50 to 5,000 acres. Large patch communities are associated with environmental conditions that are more specific than those of matrix communities, and that are less common or less extensive in the landscape. In a typical ecoregion, the aggregate of all large patch communities covers, or historically covered, as much as 20% of the natural vegetation of the ecoregion. Like matrix communities, large patch community types are also influenced by large-scale processes, but these tend to be modified by specific site features that influence the community.

C3 Small Patch Communities
Communities that form small, discrete areas of cover may be categorized as small patch community types. Individual EOs of this community type typically range in size from 1 to 50 acres. Small patch communities occur in very specific ecological settings, such as on specialized landform types or in unusual microhabitats. In a typical ecoregion, the aggregate of all small patch communities covers, or historically covered, only as much as 5% of the natural vegetation of the ecoregion. Small patch community types are characterized by localized, small-scale ecological processes that can be quite different from the large-scale processes operating in the overall landscape. The specialized conditions of small patch communities, however, are often dependent on the maintenance of ecological processes in the surrounding matrix and large patch communities. In many ecoregions, small patch communities contain a disproportionately large percentage of the total flora, and also support a specific and restricted set of associated fauna (e.g., invertebrates or herpetofauna) dependent on specialized conditions.

Appendix 15
Relationship of Community Alliances to SAF forest types

Elcode	Alliance code	Gname	SAF type	Notes
CEGL007919	I.A.8.N.b.5	Pinus echinata Crowley's Ridge Forest	Shortleaf Pine: 75	in part
CEGL004414	I.B.2.N.a.101	Quercus muehlenbergii – Quercus shumardii - Carya myristiciformis Forest	Sugar Maple: 27	in part
CEGL002411	I.B.2.N.a.15	Fagus grandifolia - Acer saccharum - Liriodendron tulipifera Unglaciated Forest	Beech - Sugar Maple: 60	in part
CEGL007224	I.B.2.N.a.26	Quercus alba - Carya alba / Vaccinium elliottii Forest	White Oak: 53	
CEGL007914	I.B.2.N.a.26	Quercus alba Macon Ridge Forest	White Oak: 53	
CEGL007900	I.B.2.N.a.41	Quercus stellata - Quercus marilandica - Pinus taeda Jackson Acidic Clay Forest	Post Oak - Blackjack Oak: 40	in part
CEGL002405	I.B.2.N.a.49	Quercus stellata / Cinna arundinacea Flatwoods Forest	Post Oak - Blackjack Oak: 40 (clayey, heavy soil variant)	
CEGL002431	I.B.2.N.d.4	Acer saccharinum - Celtis laevigata - Carya illinoinensis Forest	Silver Maple - American Elm: 62	in part
CEGL002586	I.B.2.N.d.4	Acer saccharinum - Ulmus americana - (Populus deltoides) Forest	Silver Maple - American Elm: 62	in part
CEGL002431	I.B.2.N.d.4	Acer saccharinum - Celtis laevigata - Carya illinoinensis Forest	Cottonwood: 63	in part
CEGL002586	I.B.2.N.d.4	Acer saccharinum - Ulmus americana - (Populus deltoides) Forest	Cottonwood: 63	in part
CEGL002086	I.B.2.N.d.5	Betula nigra - Platanus occidentalis Forest	River Birch - Sycamore: 61	in part
CEGL002427	I.B.2.N.d.11	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	Sugarberry - American Elm - Green Ash: 93	in part
CEGL004619	I.B.2.N.d.11	Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos) Forest	Sugarberry - American Elm - Green Ash: 93	in part
CEGL002427	I.B.2.N.d.11	Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest	Silver Maple - American Elm: 62	in part
CEGL004619	I.B.2.N.d.11	Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos) Forest	Silver Maple - American Elm: 62	in part

CEGL007913	I.B.2.N.d.13	Platanus occidentalis - Fraxinus pennsylvanica - Celtis laevigata - (Liquidambar styraciflua) Forest	Sycamore - Sweetgum - American Elm Riverfront Forest: 94	in part
CEGL002018	I.B.2.N.d.15	Populus deltoides - Salix nigra Forest	Cottonwood: 63	in part
CEGL007346	I.B.2.N.d.15	Populus deltoides - Salix nigra / Mikania scandens Forest	Cottonwood: 63	in part
CEGL002099	I.B.2.N.d.16	Quercus michauxii - Quercus shumardii - Liquidambar styraciflua / Arundinaria gigantea Forest	Swamp Chestnut Oak - Cherrybark Oak: 91	in part
CEGL007915	I.B.2.N.d.17	Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest	Willow Oak - Water Oak - Diamondleaf (Laurel) Oak: 88	in part
CEGL007916	I.B.2.N.d.17	Quercus laurifolia - Quercus nigra Mississippi River Alluvial Plain Forest	Willow Oak - Water Oak - Diamondleaf (Laurel) Oak: 88	in part
CEGL007915	I.B.2.N.d.17	Quercus phellos - Quercus nigra Mississippi River Alluvial Plain Forest	Sweetgum - Willow Oak	in part
CEGL007916	I.B.2.N.d.17	Quercus laurifolia - Quercus nigra Mississippi River Alluvial Plain Forest	Sweetgum - Willow Oak	in part
CEGL007921	I.B.2.N.d.19	Quercus phellos - Ulmus crassifolia Forest	Sweetgum - Willow Oak	in part
CEGL002103	I.B.2.N.d.22	Salix nigra Successional Forest	Black Willow: 95	in part
CEGL007908	I.B.2.N.d.22	Salix nigra Mississippi River Alluvial Plain Forest	Black Willow: 95	in part
CEGL005035	I.B.2.N.d.27	Acer saccharum - Carya cordiformis / Asimina triloba Floodplain Forest	Sugar Maple: 27	in part
CEGL007389	I.B.2.N.e.8	Nyssa aquatica Floodplain Forest	Water Tupelo - Swamp Tupelo: 103	in part
CEGL002423	I.B.2.N.e.13	Quercus lyrata - Carya aquatica - Quercus texana / Forestiera acuminata Forest	Overcup Oak - Water Hickory: 96	in part
CEGL002424	I.B.2.N.e.13	Quercus lyrata - Liquidambar styraciflua / Forestiera acuminata Forest	Overcup Oak - Water Hickory: 96	in part
CEGL004642	I.B.2.N.e.13	Quercus lyrata Pond Forest	Overcup Oak - Water Hickory: 96	in part
CEGL004778	I.B.2.N.e.13	Quercus lyrata - Quercus palustris / Acer rubrum var. drummondii / Itea virginica - Cornus foemina - (Lindera melissifolia) Forest	Overcup Oak - Water Hickory: 96	in part
CEGL007397	I.B.2.N.e.13	Quercus lyrata - Carya aquatica Forest	Overcup Oak - Water Hickory: 96	in part

CEGL007426	I.B.2.N.e.13	Gleditsia aquatica - Carya aquatica Forest	Overcup Oak - Water Hickory: 96	in part
CEGL002101	I.B.2.N.e.14	Quercus palustris - (Quercus stellata) - Quercus pagoda / Isoetes spp. Forest	Pin Oak - Sweetgum: 65	in part
CEGL002406	I.B.2.N.e.14	Quercus palustris - (Quercus bicolor) / Carex crinita / Sphagnum spp. Forest	Pin Oak - Sweetgum: 65	in part
CEGL002432	I.B.2.N.e.14	Quercus palustris - Quercus bicolor - (Liquidambar styraciflua) Mixed Hardwood Forest	Pin Oak - Sweetgum: 65	in part
CEGL002102	I.B.2.N.e.15	Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest	Willow Oak - Water Oak - Diamondleaf (Laurel) Oak: 88	in part
CEGL002102	I.B.2.N.e.15	Quercus phellos - (Quercus lyrata) / Carex spp. - Leersia spp. Flatwoods Forest	Sweetgum - Willow Oak: 93	
CEGL007407	I.B.2.N.e.16	Quercus texana - Quercus lyrata Forest	Overcup Oak - Water Hickory: 96	in part
CEGL004773	I.B.2.N.e.19	Salix nigra / Cephalanthus occidentalis Forest	Black Willow: 95	in part
CEGL007410	I.B.2.N.e.19	Salix nigra Seasonally Flooded Forest	Black Willow: 95	in part
CEGL007436	I.B.2.N.e.19	Salix nigra / Sagittaria lancifolia Forest	Black Willow: 95	in part
CEGL007422	I.B.2.N.e.22	Taxodium distichum - Nyssa aquatica - Acer rubrum var. drummondii / Itea virginica Forest	Baldcypress - Tupelo: 102	in part
CEGL007719	I.B.2.N.e.22	Taxodium distichum - Fraxinus pennsylvanica - Quercus laurifolia / Acer rubrum / Saururus cernuus Forest	Baldcypress - Tupelo: 102	in part
CEGL002419	I.B.2.N.f.2	Nyssa aquatica Forest	Baldcypress - Tupelo: 102	in part
CEGL002421	I.B.2.N.f.2	Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest	Baldcypress - Tupelo: 102	in part
CEGL007429	I.B.2.N.f.2	Nyssa aquatica - Nyssa biflora Forest	Baldcypress - Tupelo: 102	in part
CEGL002419	I.B.2.N.f.2	Nyssa aquatica Forest	Water Tupelo - Swamp Tupelo: 103	in part
CEGL002421	I.B.2.N.f.2	Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata Forest	Water Tupelo - Swamp Tupelo: 103	in part
CEGL007429	I.B.2.N.f.2	Nyssa aquatica - Nyssa biflora Forest	Water Tupelo - Swamp Tupelo: 103	in part
CEGL002420	I.B.2.N.f.3	Taxodium distichum / Lemna minor Forest	Baldcypress: 101	in part

CEGL007910	I.C.3.N.b.8	Pinus taeda - Quercus phellos - Quercus nigra Forest	Loblolly Pine - Hardwood: 82	in part
CEGL007039	I.A.4.N.e.1	Quercus virginiana - (Pinus taeda) / (Sabal minor, Serenoa repens) Forest	Live Oak: 89	in part
CEGL002396	II.B.2.N.a.13	Quercus stellata - Quercus velutina - Quercus alba - (Quercus falcata) / Croton michauxii Sand Woodland	White Oak - Black Oak - Northern Red Oak	in part
CEGL002417	II.B.2.N.a.25	Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand Woodland	Post Oak - Blackjack Oak: 40	in part
CEGL002417	II.B.2.N.a.25	Quercus stellata - Quercus marilandica - Quercus falcata / Schizachyrium scoparium Sand Woodland	Eastern Redcedar: 46	in part
CEGL007909	II.B.2.N.c.5	Taxodium distichum / Planera aquatica - Forestiera acuminata Lakeshore Woodland	Baldcypress: 101	in part

Mississippi River Alluvial Plain Ecoregiona

Southern U.S. and Central U.S. Regions

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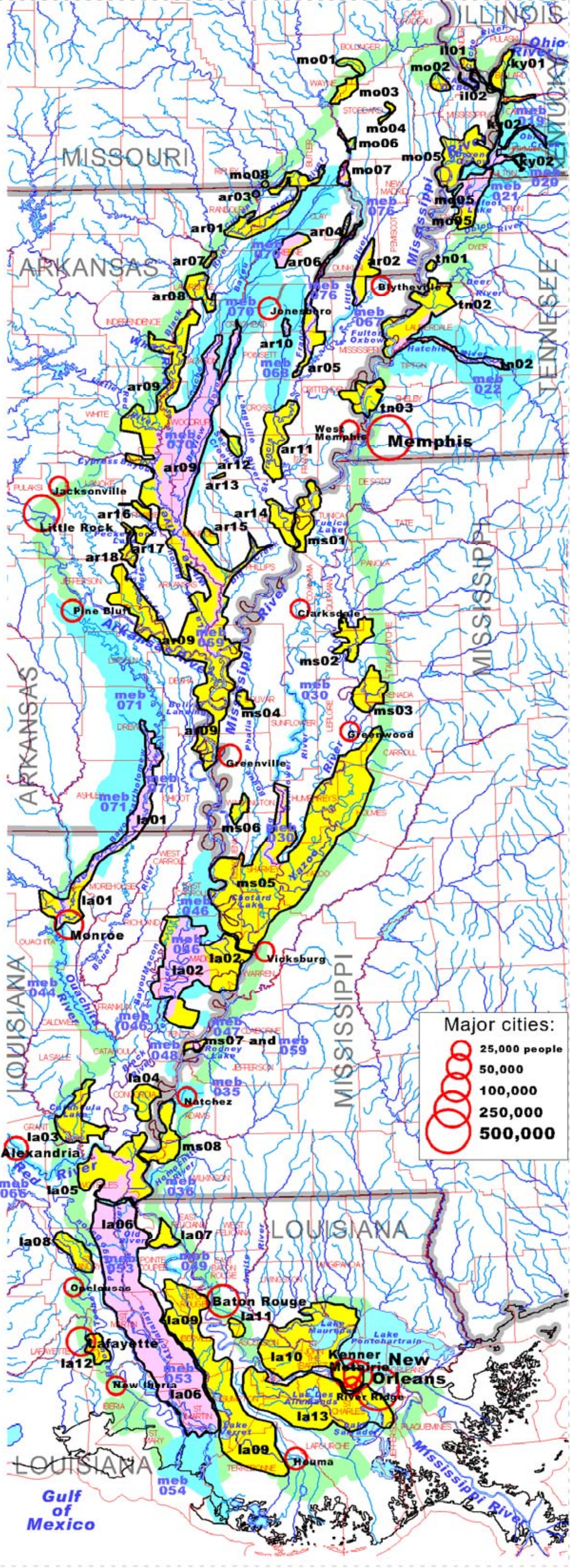
Figure 1.

Mississippi River Alluvial Plain

PORTFOLIO OF STRATEGIC AREAS FOR BIODIVERSITY CONSERVATION



mo05	Ecoregional Planning Sites
	Overlap (both)
meb 05	Aquatic Assessment Sites
	Ecoregion Boundary

Aquatic Assessment by
The Nature Conservancy Freshwater Initiative and
the Southeast Conservation Science Center

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N

scale approximately 1:2,000,000
1 inch equals approximately 35 miles
when "――――――" is reproduced 1 inch long
Map projection UTM 15, NAD 83
(conformal but not equal area)

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miles

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kilometers

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GIS data prepared with software donated by ESRI.
GIS Cartography by Mark Swan, Louisiana TNC
First Printing: May 2002

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- National Fish and Wildlife Foundation
- Salisbury Community Foundation

Figure 2.

Mississippi River Alluvial Plain

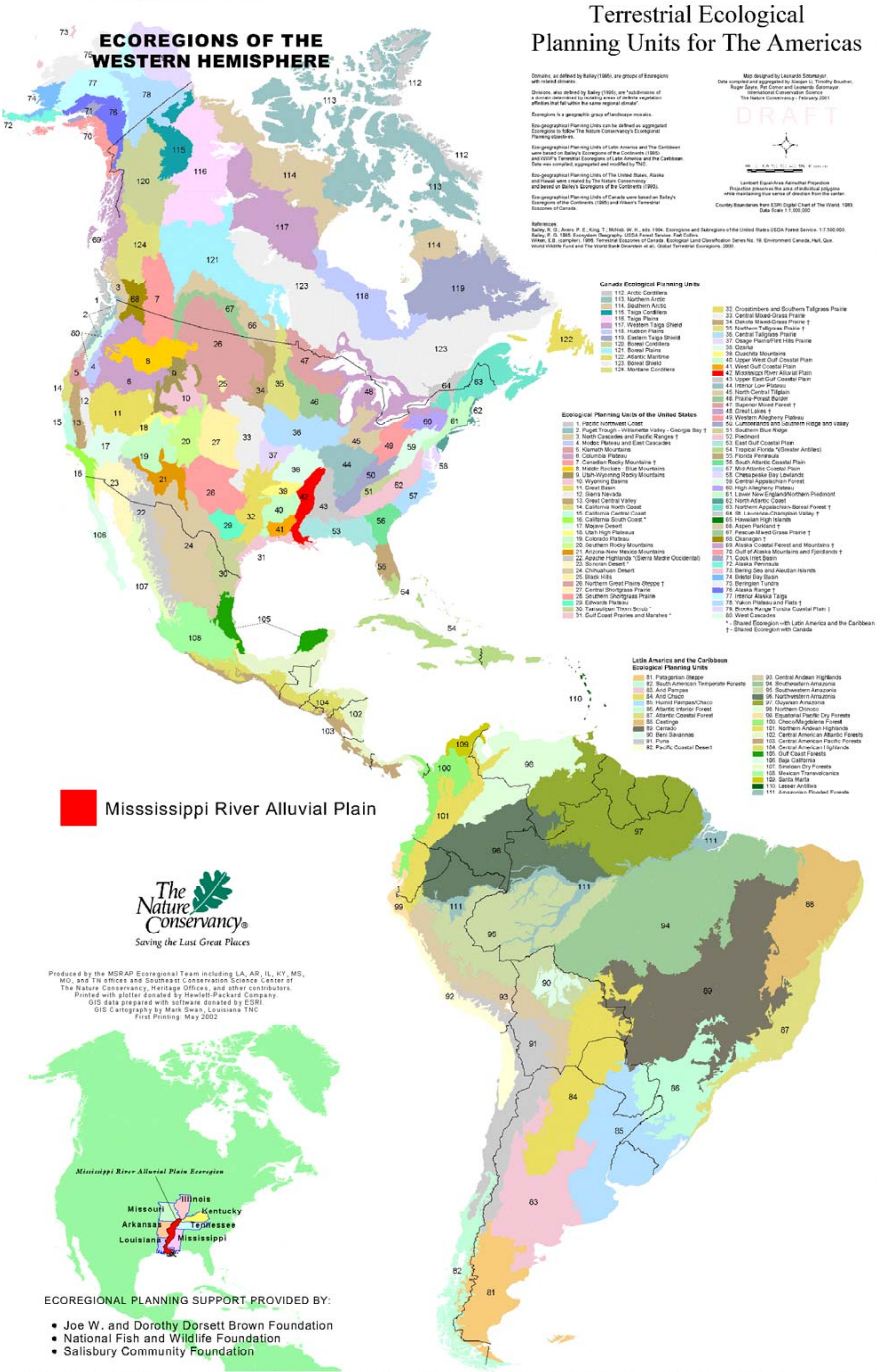

Figure 3.

Mississippi River Alluvial Plain

ROADS, CITIES, RIVERS, LAKES, AND BOUNDARIES

- Counties and Parishes
- States
- Major Water Features
- Major Roads

Major Cities (legend at lower right)

Mississippi River Alluvial Plain Ecoregion

Ecoregion Boundary

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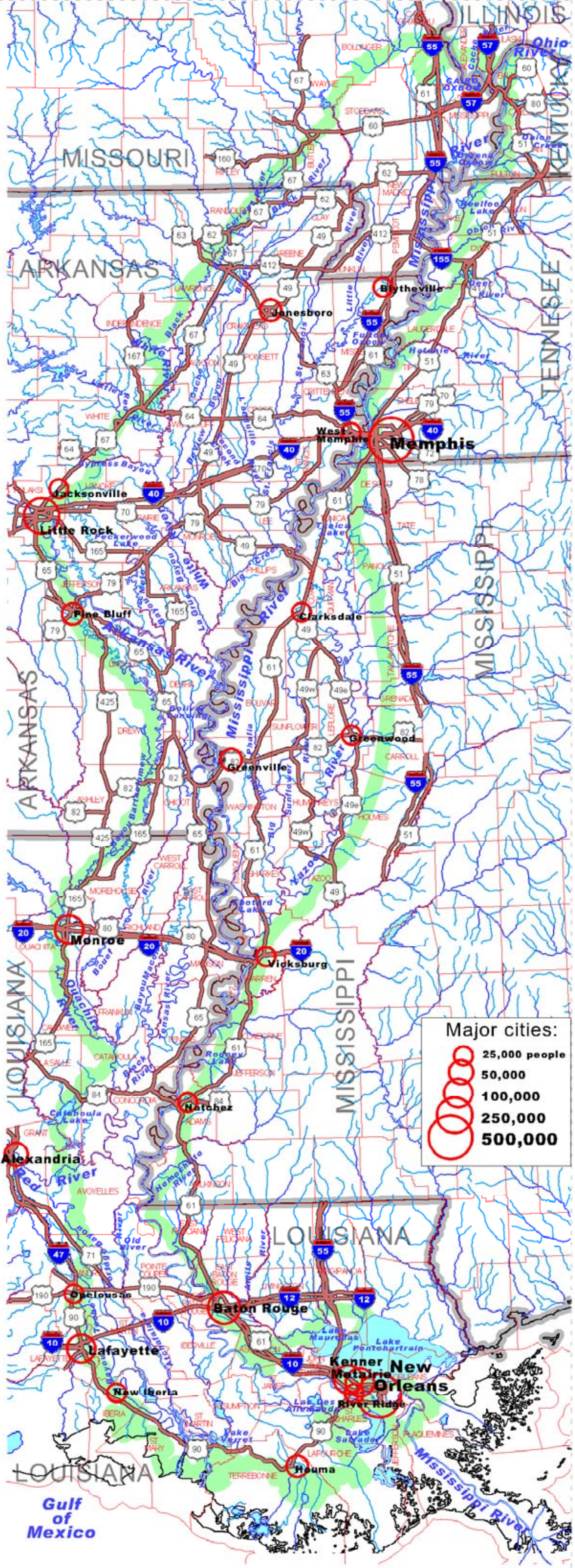


Figure 4.

Mississippi River Alluvial Plain

CLASSIFICATION OF PORTFOLIO SITES

Excluding Aquatic Assessment Sites and Provisional Sites

mo05 Code for Ecoregional Planning Sites

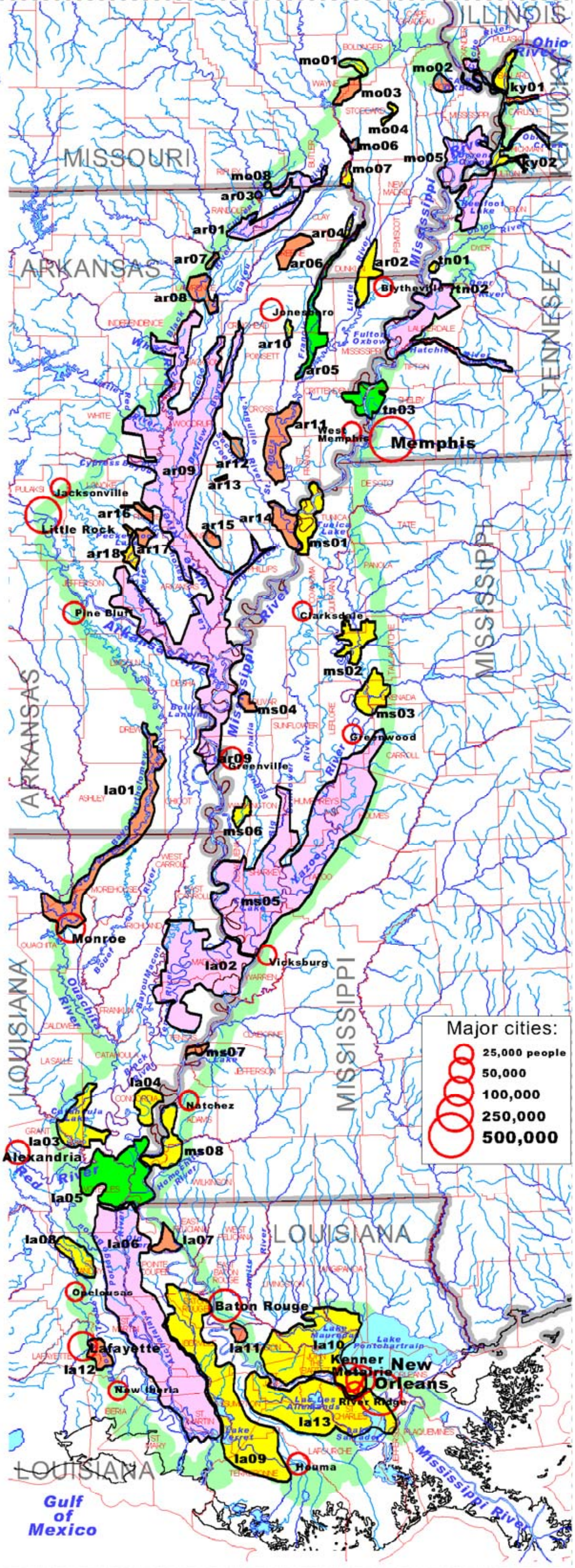
Landscape-Scale Action Sites

Action Sites

Landscape Sites

Other Ecoregional Planning Sites

Ecoregion Boundary



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miles

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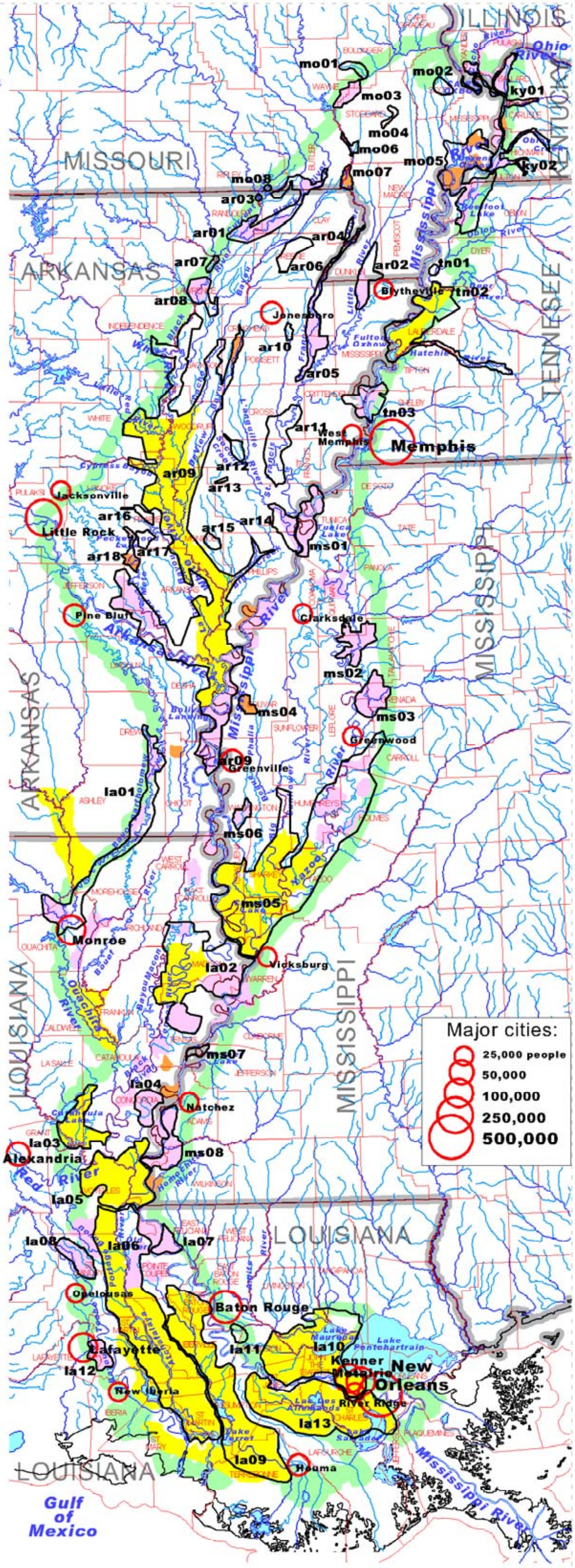
Figure 5.

Mississippi River Alluvial Plain

MIGRATORY BIRD AREAS (MBA)



MBA 40,000-ha Goal (Swallow-tailed Kite umbrella species)

MBA 8,000-ha Goal (Cerulean Warbler umbrella species)

MBA 4,000-ha Goal (Swainson's Warbler umbrella species)

Portfolio Sites and Codes

mo05 Code for Ecoregional Planning Sites

Ecoregion Boundary

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scale approximately 1:2,000,000
1 inch equals approximately 35 miles
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Map projection UTM 15, NAD 83
(conformal but not equal area)

20 10 0 20 40 60 80 100 miles

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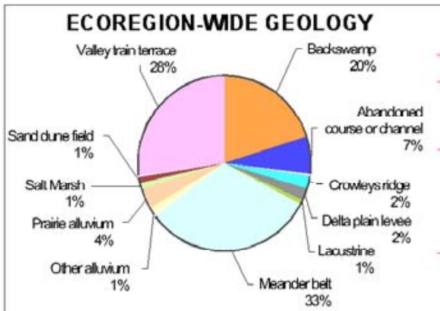
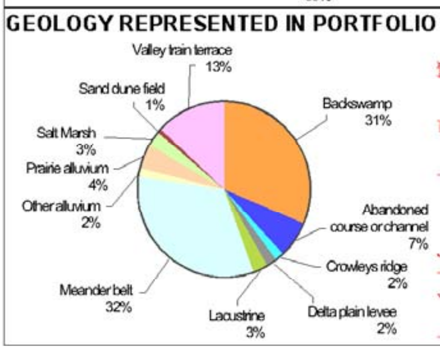
Figure 6.

Mississippi River Alluvial Plain

QUATERNARY GEOLOGY REPRESENTATION IN PORTFOLIO SITES





Portfolio Sites and Codes
mo05 Code for Ecoregional Planning Sites

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scale approximately 1:2,000,000
1 inch equals approximately 35 miles
when "——————" is reproduced 1 inch long
Map projection UTM 15, NAD 83
(conformal but not equal area)

20 10 0 20 40 60 80 100
miles

20 10 0 20 40 60 80 100
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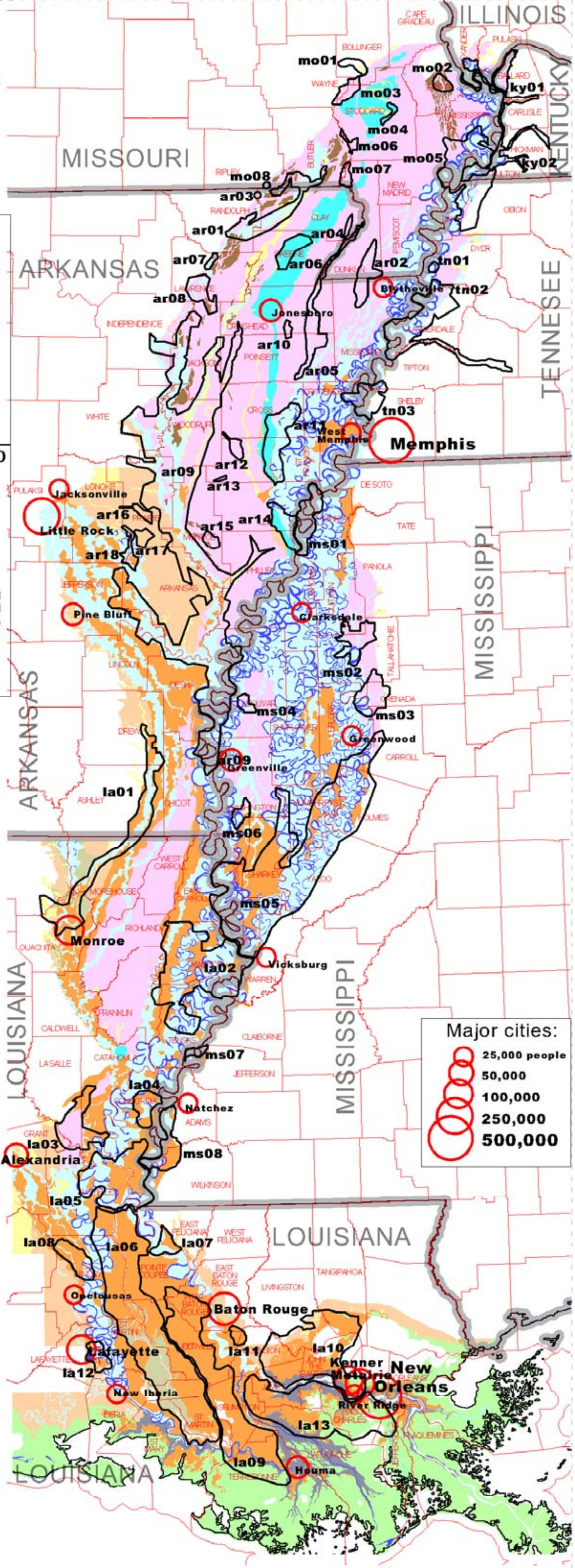


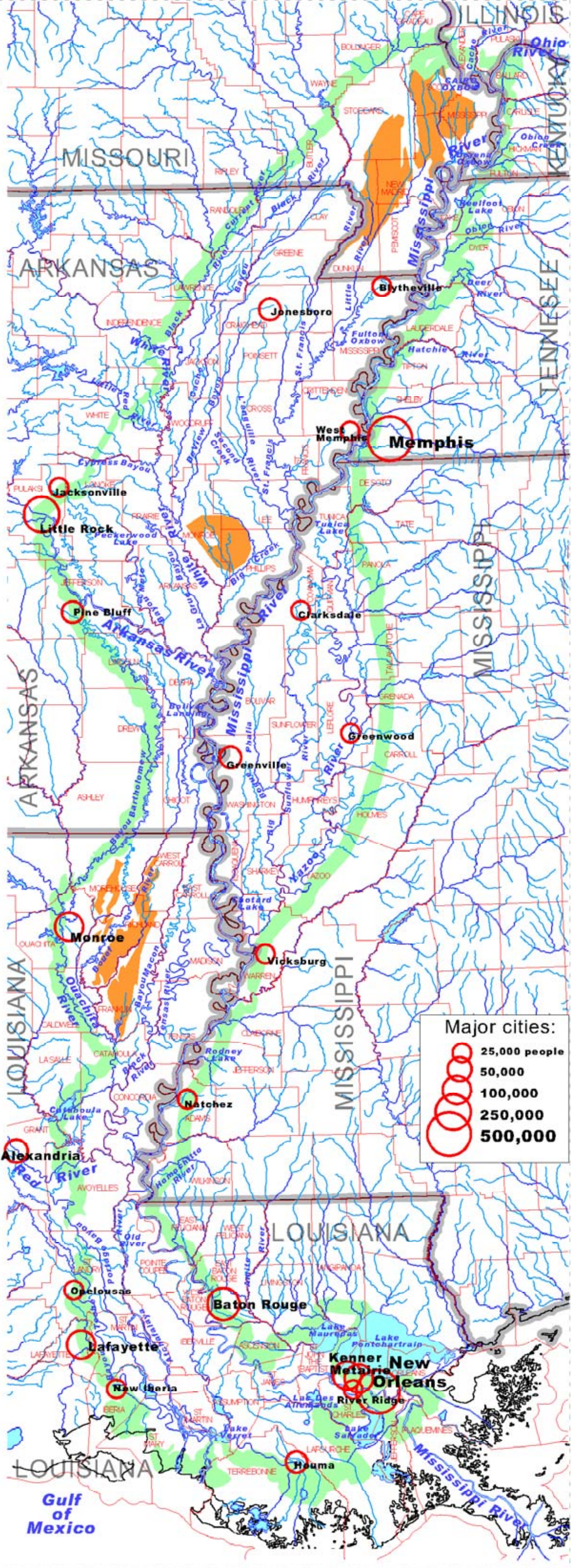
Figure 7.

Mississippi River Alluvial Plain

PROVISIONAL SITES BASED ON ABIOTIC FACTORS

Soil and Geology Sites
(under-represented matrix communities based on soils and geology for further inventory and potential restoration)

Ecoregion Boundary



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1 inch equals approximately 35 miles
when "————————" is reproduced 1 inch long
Map projection UTM 15, NAD 83
(conformal but not equal area)

20 10 0 20 40 60 80 100
miles

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kilometers

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Figure 8.

Mississippi River Alluvial Plain

PROVISIONAL AQUATIC SITES

- High Quality 8-digit Hydrologic Units
- High Quality Oxbows
- High Quality Streams
- Ecoregion Boundary

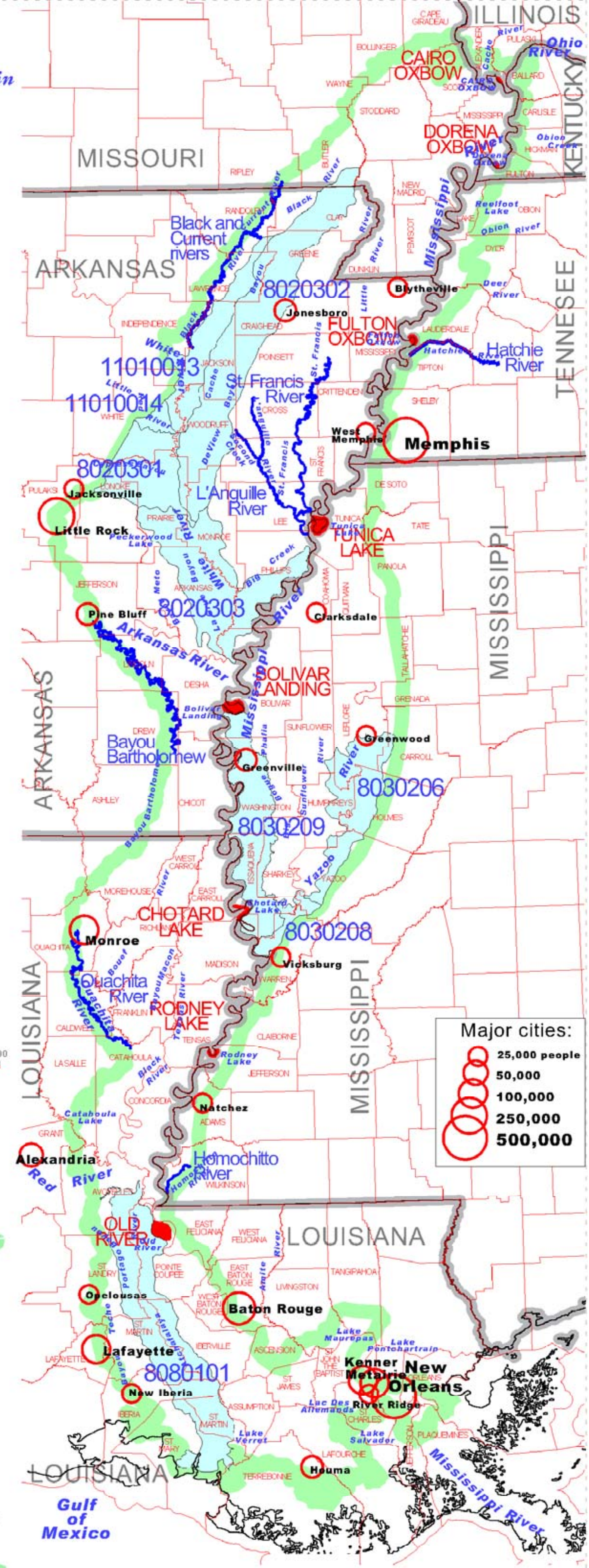

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Figure 9.

Mississippi River Alluvial Plain

PUBLIC LANDS AND FOREST COVER

Public Lands
(also TNC Preserves)

Forest Cover (1992)

Ecoregion
(brighter within Ecoregional Planning Sites)

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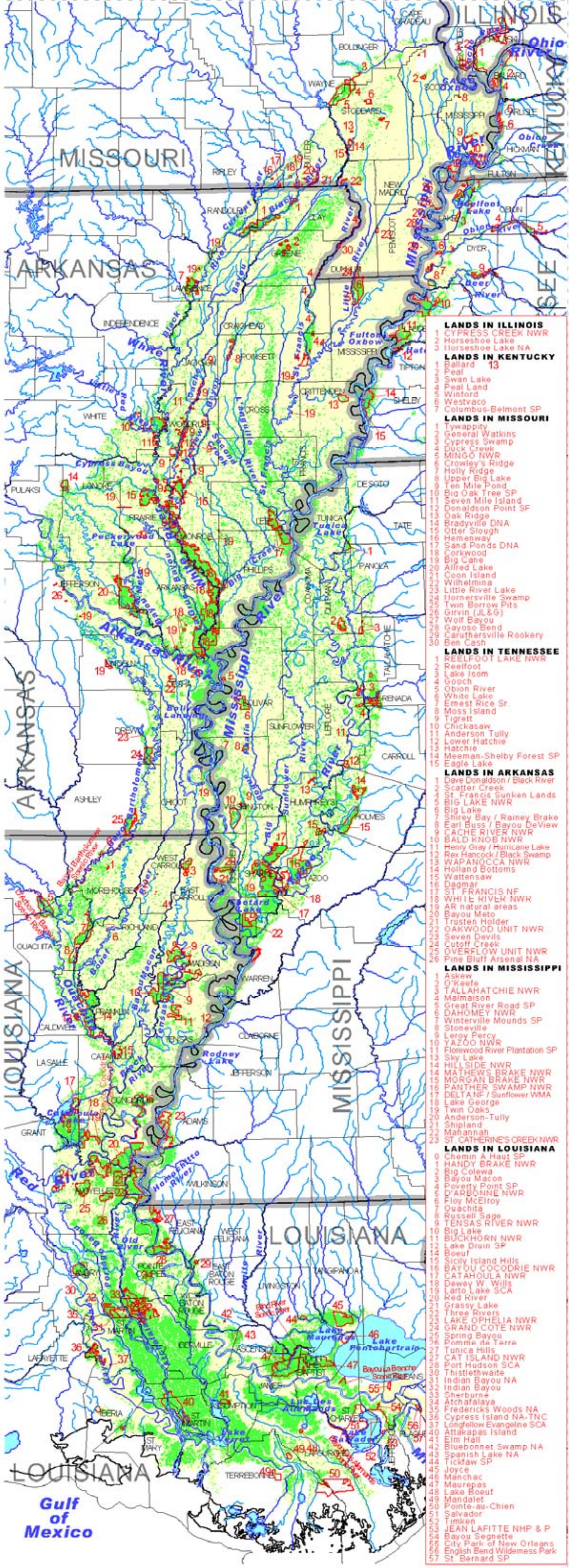

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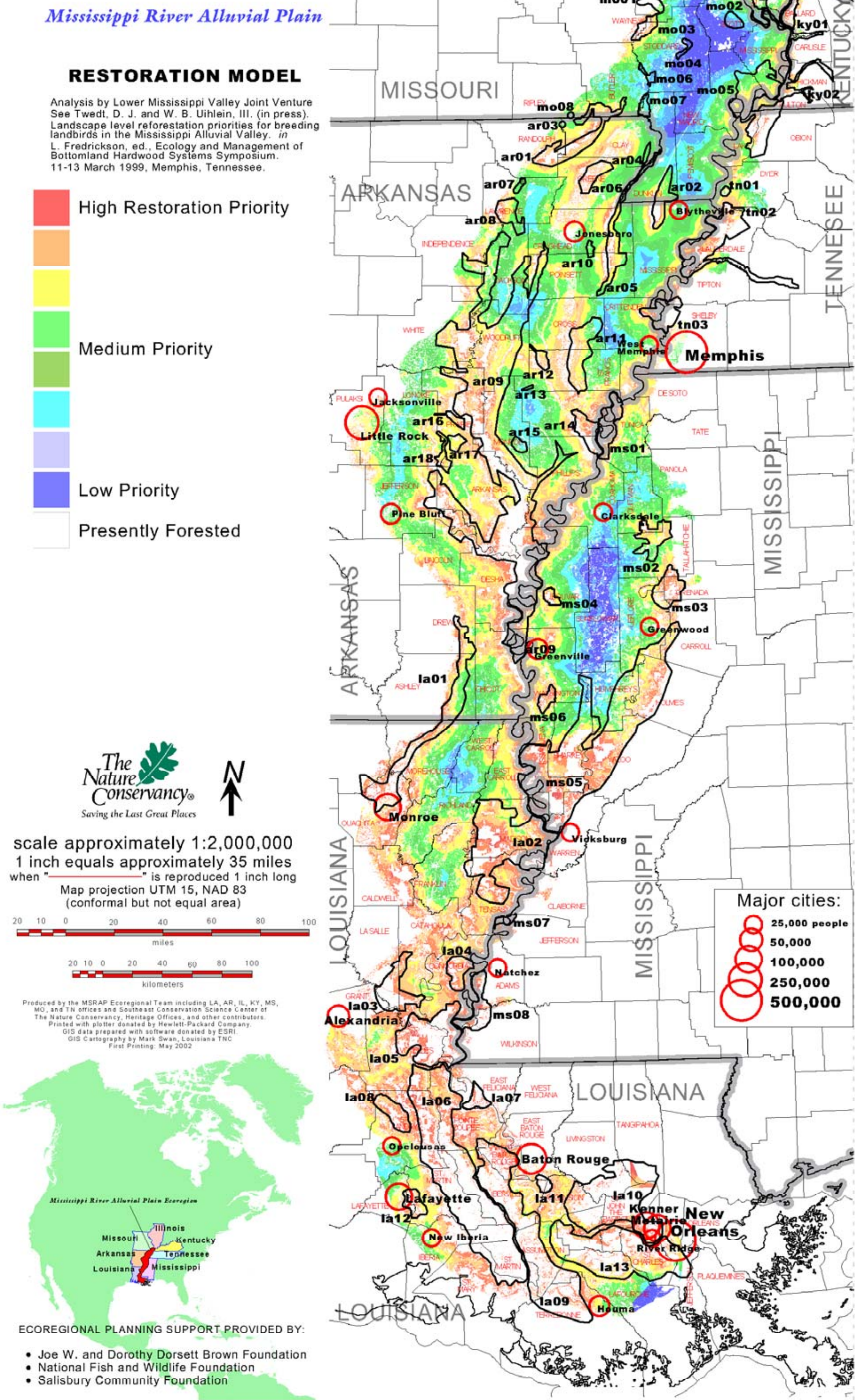
Figure 10.


Mississippi River Alluvial Plain
RESTORATION MODEL
Analysis by Lower Mississippi Valley Joint Venture
See Twedt, D. J. and W. B. Uihlein, III. (in press).
Landscape level reforestation priorities for breeding landbirds in the Mississippi Alluvial Valley. in
L. Fredrickson, ed., Ecology and Management of Bottomland Hardwood Systems Symposium.
11-13 March 1999, Memphis, Tennessee.
High Restoration Priority
Medium Priority
Low Priority
Presently Forested
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Mississippi River Alluvial Plain Ecoregion
Illinois
Missouri
Kentucky
Arkansas
Tennessee
Louisiana
Mississippi
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ILLINOIS
KENTUCKY
MISSOURI
ARKANSAS
TENNESSEE
MISSISSIPPI
LOUISIANA
Major cities:
25,000 people
50,000
100,000
250,000
500,000
Blytheville
Jonesboro
West Memphis
Memphis
Jacksonville
Little Rock
Pine Bluff
Clarksdale
Greenwood
Greenville
Monroe
Vicksburg
Natchez
Alexandria
Opelousas
Baton Rouge
Lafayette
New Iberia
Kenner
Metairie
New Orleans
River Ridge
Houma
mo01
mo02
mo03
mo04
mo05
mo06
mo07
mo08
ky01
ky02
tn01
tn02
tn03
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la01
la02
la03
la04
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la07
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la10
la11
la12
la13

Figure 11.

Mississippi River Alluvial Plain

WATERSHED INTEGRITY

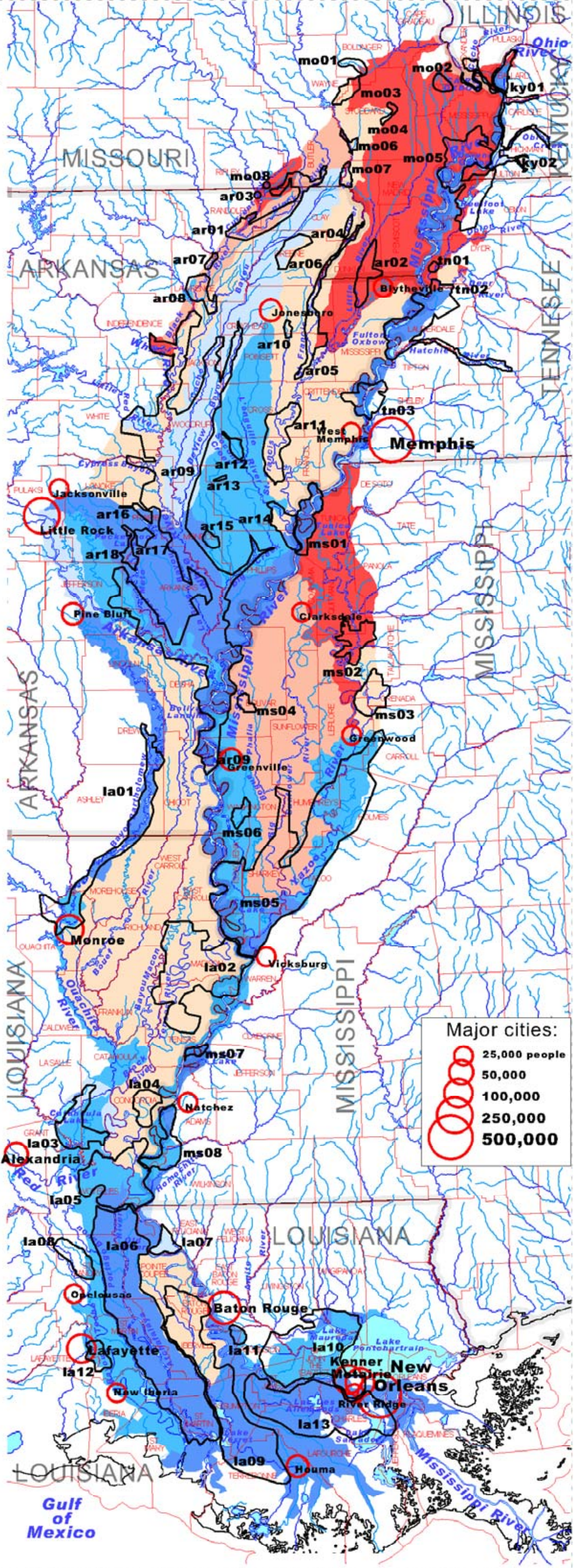
Watershed Integrity based on Forest Cover, Stream Sinuosity, and Forest Loss 1950-70

Most Degraded

Least Degraded

Portfolio Sites and Codes

mo05 Code for Ecoregional Planning Sites



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20 10 0 20 40 60 80 100 miles

20 10 0 20 40 60 80 100 kilometers

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Figure 12.

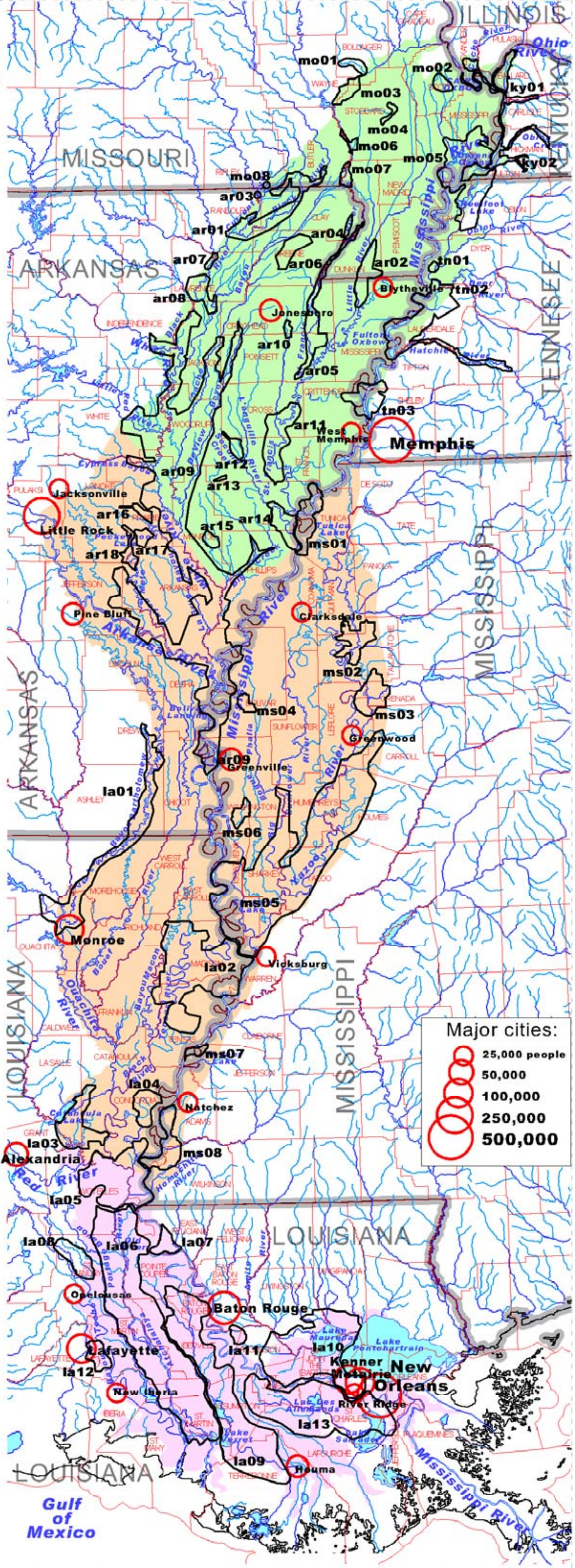
Mississippi River Alluvial Plain

STRATIFICATION ZONES FOR ECOREGIONAL PLANNING

North Zone

Central Zone

South Zone



Portfolio Sites and Codes

mo05 Code for Ecoregional Planning Sites

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Figure 13.

Mississippi River Alluvial Plain

ORIGINAL PHASE 1 SITES

Phase 1 Sites
(Precussors of the Portfolio Sites)

Ecoregion Boundary

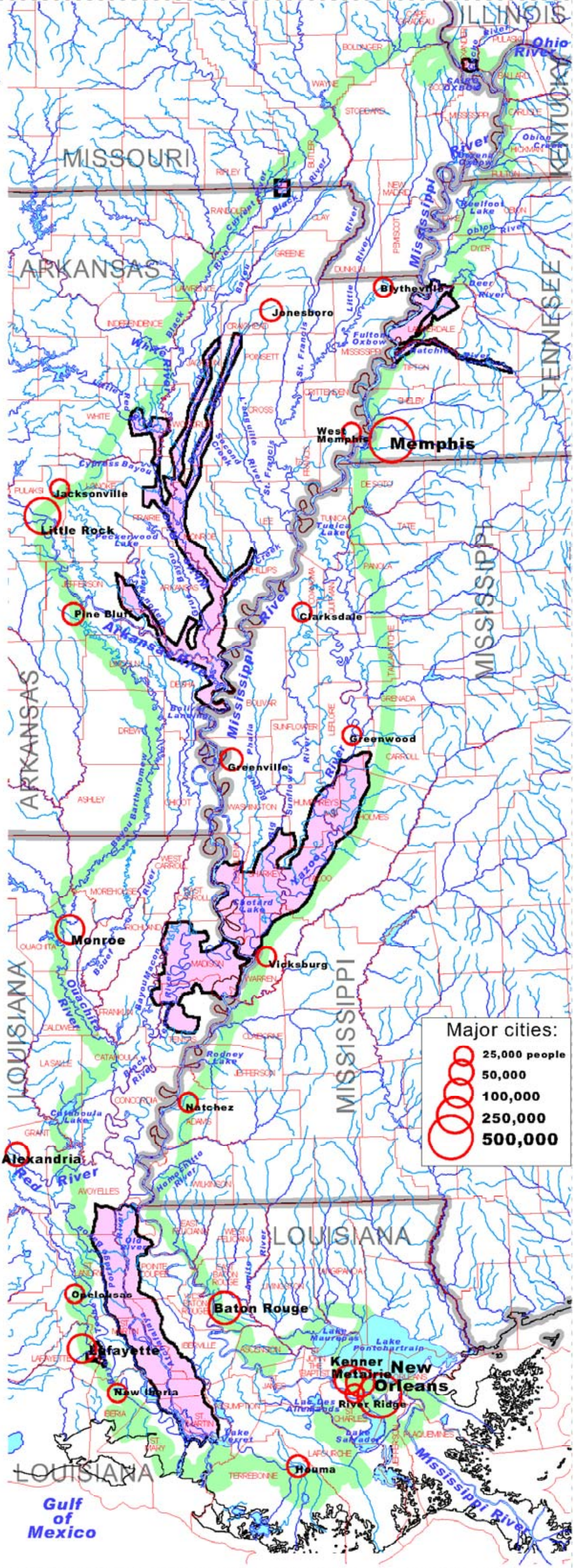

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Figure 14.

Mississippi River Alluvial Plain

ECOLOGICAL DRAINAGE UNITS

Ecological Drainage Units

- A 2.10 Lower St. Francis River
- B 2.06 Coastal Plain - TN
- C 2.11 Lower White River
- D 2.12 Lower Arkansas River
- E 2.07 Yazoo River - Coastal Plain
- F 2.14 Ouachita River - MSRAP
- G 2.08 Yazoo River - MSRAP
- H 2.09 Lower Coastal Plain - MS
- I 2.13 Ouachita River - Coastal Plain
- J 2.15 Lower Red River
- K 2.18 Mermentau / Vermilion rivers
- L 2.16 Atchafalaya River
- M 2.05 Lake Pontchartrain
- N 2.17 Mississippi River Delta

Source:
The Nature Conservancy Freshwater Initiative and the Southeast Conservation Science Center

Ecoregion Boundary

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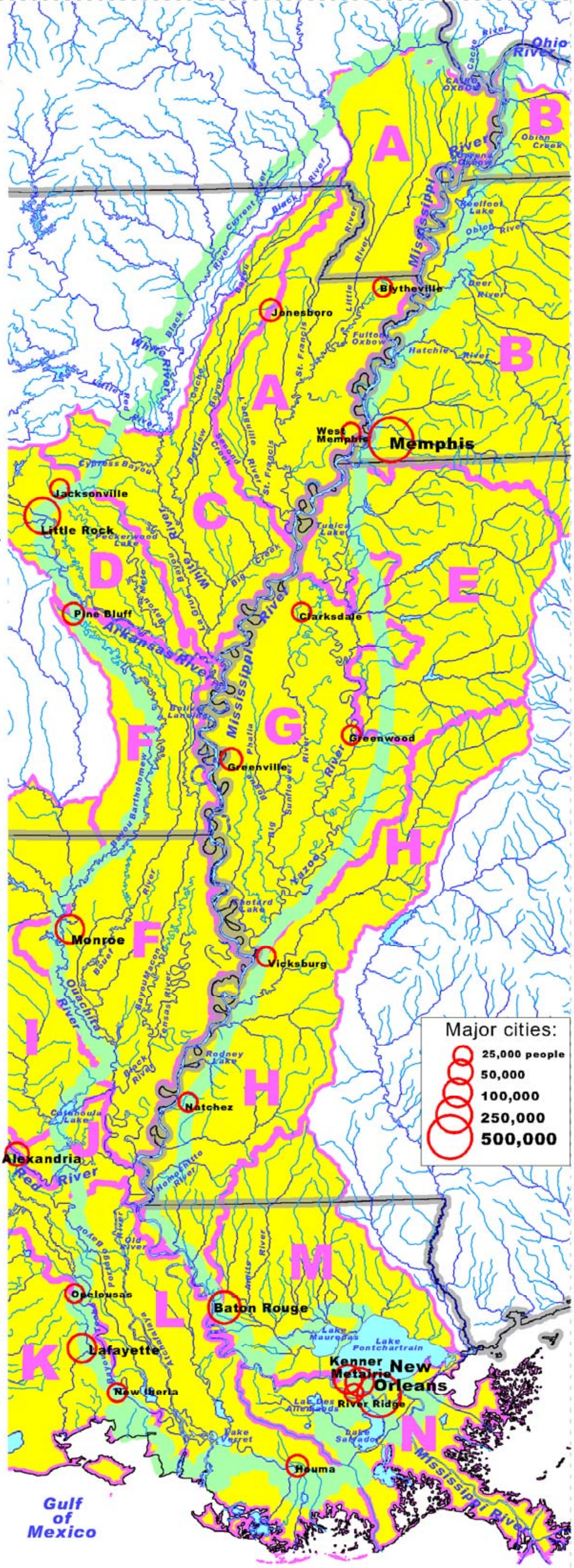

Table 3.5
Summary of Targets, Data Sources, Viability Considerations

Coarse Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
Migratory Birds	4,000ha Migratory Bird Area (MBA) 8,000ha MBA 40,000ha MBA - I.D. through TM landcover	MSRAP Restoration Model
Terrestrial system (Matrix-forming Communities)	4,000ha MBA 8,000ha MBA 40,000ha MBA - I.D. through TM landcover Surface geology (surrogate)	MSRAP Restoration Model
Aquatic system (stream segments within "intact" HUCs w/ varying substratum)	USGS 8-digit HUCs Hydrography TM landcover Surface geology	Watershed Integrity Index
Wide ranging mammals	40,000ha MBA Element Occurrence Records	MSRAP Restoration Model
Intermediate Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
Plant Associations	Biological Conservation Database Rapid Ecological Assessment	Element Occurrence Ranks Managed Area Assessment (where applicab
Local Scale Targets	**Data Sources or Surrogates**	**Viability/Restorability Consideration**
G1-G3 plant and animal spp and those of special concern	Biological Conservation Database	Element Occurrence Ranks