Mississippi's Comprehensive Wildlife Conservation Strategy

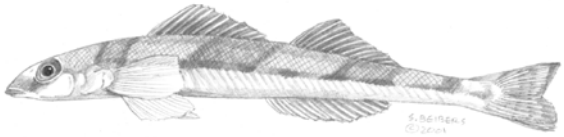
2005 - 2015

Version 1

Coordinated by the Mississippi Department of Wildlife, Fisheries and Parks on behalf of the State of Mississippi

October, 2005

Mississippi's Comprehensive Wildlife Conservation Strategy



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Version 1.1

Coordinated by the Mississippi Department of Wildlife, Fisheries and Parks
On behalf of the State of Mississippi

November, 2005

Our Mission:

It is the mission of the Mississippi Department of Wildlife, Fisheries, and Parks to conserve and enhance Mississippi's natural resources, to provide continuing outdoor recreational opportunities, to maintain the ecological integrity and aesthetic quality of the resources and to ensure socioeconomic and educational opportunities for present and future generations.

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Credits:

Charles Knight and Elizabeth Barber, CWCS Coordinators
Photos by the Mississippi Museum of Natural Science, except where noted.
Illustrations by Sam Beibers from ***Endangered Species of Mississippi***.
Maps by Nick Winstead, MMNS

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FOREWORD

The Mississippi Department of Wildlife Fisheries and Parks was created in 1932. Since its inception, our state has seen its wild turkey and white-tailed deer populations restored, the return of the American alligator and bald eagles, and 800,000 acres of wildlife habitat have been conserved and protected through our 38 wildlife management areas. Opportunities to hunt, fish, canoe, wildlife watch and camp have expanded greatly thanks to the collective efforts of our agency staff, partners, other agencies and organizations and our congressional, state and legislative leadership. Funding for traditional programs is provided by hunting and fishing licenses and through federal aid provided by the Pittman-Robertson Act, the Dingell-Johnson Act and Wallop-Breaux Amendment.

Where we have devoted our attention, resources and applied our knowledge of wildlife and fisheries management, many game species and their habitats have thrived. Yet the vast majority of our wildlife species have not received sufficient management attention, and many have fallen through the cracks. Today we spend most of our budget on 14 percent of the wildlife and fisheries species in our state, while the other 86 percent receive almost no attention until they are in danger of extinction. Like all states, we face widespread declines and losses across all species groups and ecosystems. In the U.S. over 1,200 animals and plants have been federally listed as threatened or endangered. Over 90 more are proposed for listing and another 250 are candidates. In Mississippi, 86 species are listed.

To prevent more species from becoming threatened or endangered, and to keep the common species common, we as an agency, a state and a country must broaden our attention to the great diversity of wildlife and natural communities as a whole. It is time for MDWFP to extend its efforts to truly be an "all wildlife agency".

The good news is that we are receiving help and encouragement. Congress recognized that despite our best efforts, many wildlife populations continue to decline, and that a new approach is needed. I am pleased to introduce MDWFP's new effort to serve as steward of ALL of our state's wildlife resources: the *Mississippi Comprehensive Wildlife Conservation Strategy (CWCS)*. This CWCS has been developed in compliance with a congressional mandate and will serve as Mississippi's blueprint for fish and wildlife conservation statewide for the next half century. This is not a plan for our agency, but rather a broad set of conservation strategies for wildlife and fish species and their key habitats in greatest need of conservation. It was developed by a broad team of wildlife and fisheries professionals in the state in partnership with conservation organizations, agencies, individuals, academics and industries and with public input. It is a comprehensive, cost-effective, pro-active and non-regulatory approach to conserving entire communities, and we hope that it will be widely used by all Mississippians interested in protecting and restoring biodiversity in Mississippi. I want to thank all those that worked over the past three years to develop this important and dynamic strategy. It is my hope that this effort's success will be measured by the cultivation of lasting conservation partnerships and the promise of fish and wildlife resources for future Mississippians.

Sam Polles, Ph.D.
Executive Director
Mississippi Department of Wildlife, Fisheries and Parks

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EXECUTIVE SUMMARY

Introduction

Mississippi's *Comprehensive Wildlife Conservation Strategy (CWCS)* is part of a national collaborative effort among natural resource agencies, conservation organizations, corporations and private landowners to address habitat needs of declining wildlife species. These strategies mark the first time in U.S. history that state wildlife agencies and the broader conservation community have cooperated to design a conservation blueprint for all wildlife species.

Since the early 1990s, the 3,000-member nationwide Teaming with Wildlife Coalition has worked to secure funding for state fish and wildlife agencies to take preventative actions, keeping rare species from becoming endangered and common species abundant. In 2001, Congress responded to this need by creating the State Wildlife Grants (SWG) program and from 2001 - 2005, over $300 million has been allocated to state wildlife agencies.

In order to make the best use of the State Wildlife Grants (SWG) program, Congress charged each state and territory with developing a CWCS. Over the past three years, the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) has coordinated this effort on behalf of the state of Mississippi to meet congressional requirements and to provide a "conservation blueprint" for agencies, organizations, industries, private landowners and academics across the state to advance sound management of all of our fish and wildlife resources in the future. **The overarching goal of this planning effort is to provide a guide to effective and efficient long-term conservation of Mississippi's biological diversity**.

This document represents the summary of a conservation planning effort that officially began in response to the congressional mandate, but which actually builds upon many years of research and data accumulated by the MDWFP staff through the Mississippi Museum of Natural Science (MMNS) and many other organizations, agencies and individuals. To meet our overarching goal and to fulfill congressional requirements, we enlisted the help of several individuals, organizations, agencies and academia. Two **CWCS Coordinators**, Charles Knight and Elizabeth Barber, organized all aspects of the development of this strategy in conjunction with a **Technical Committee** composed of MDWFP

wildlife, fisheries and museum biologists, an **Expert Team** of 46 biologists from around the state and region, a **Steering Committee** of MDWFP management and a large working stakeholder group called the **Advisory Committee** which included 179 active members. This document was strengthened greatly by the input, participation and feedback of stakeholders across the state.

1) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife.

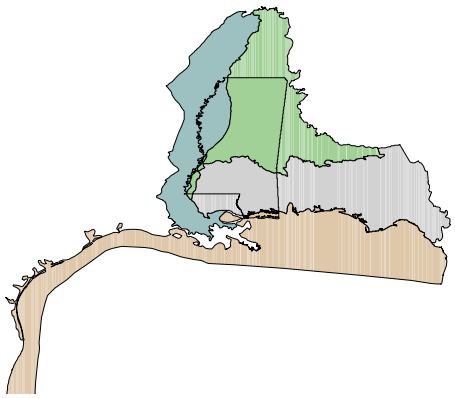
Mississippi's Natural Heritage Program (NHP) at the MMNS is one of the oldest in the country. They maintain a database of approximately 1,500 species of animals and house a significant amount of long-term data on many tracked species. NHP's list of *Animals of Special Concern* was used as the foundation for developing the Species of Greatest Conservation Need (SGCN) for Mississippi's CWCS which includes 18 amphibians, 70 birds, 34 crustaceans, 74 fish, 17 mammals, 49 mussels and 35 reptiles for a total of 297 SGCN. The Expert Team of scientists with knowledge of these declining species were also enlisted via an evaluation survey to help identify these species, their habitat preferences, the greatest problems facing these species and potential conservation actions needed to abate those problems or "threats." SGCN were also assigned a Tier ranking (I - IV) based on their degree of imperilment. Some animal groups were not included in this first CWCS version such as gastropods, insects, marine fish and marine invertebrates which were deemed insufficiently well-known to warrant a status evaluation comparable to that of the other species groups. But their exclusion does not indicate the absence of conservation concern, and plans have been made to identify species of concern from these groups and to include them in future iterations. Further survey work will be needed to accomplish this.

2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of SGCN.

The Expert Team, the Technical and Advisory Committees also identified and prioritized the habitats and ecological communities for SGCN using a survey instrument. Associating SGCN to their habitats and communities guided the process of prioritizing conservation actions to be taken on a landscape level for an assemblage of species versus single species. The NHP's *Ecological Community List* was simplified and used to expedite the process of associating SGCN with their habitats and communities. For the purposes of this CWCS, the current list of 159 ecological communities was combined into 17 broad habitat types and 64 subtypes generally organized on the basis of land type, vegetation and the availability of moisture. Within the 17 habitat types, 64 subtypes were further defined by factors

affecting natural communities such as: soil type, water availability, vegetation, water chemistry, region and stream size. General range maps and relative condition of each habitat subtype were developed from the NHP data, the survey instrument and literature.

Due to general acceptance among ecology professionals, Bailey/US Forest Service Ecological Units as modified in 1998 by The Nature Conservancy were adopted as ecoregions for this strategy. TNC's four *Ecoregional Plans* that cover Mississippi are major planning documents from which much of the information and recommendations in this strategy were drawn.



Using TNC's ecoregions will also allow Mississippi's strategy to be "rolled-up" with surrounding states into a national synopsis that will allow Congress and the public to see a coordinated, scientifically rigid account of the nation's "at risk" wildlife and their habitat.

The ecoregions that encompass the state are the **East Gulf Coastal Plain (EGCP)**, the **Mississippi River Alluvial Plain (MSRAP)**, the **Northern Gulf of Mexico (NGM)** and the **Upper East Gulf Coastal Plain (UEGCP)**. All habitat types and subtypes as well as SGCN have been associated with the appropriate ecoregions.

Each subtype received a score called a Value to SGCN. These Values were derived from the number and Tier level of SGCN associated with each subtype. These values indicate the relative importance of various habitat subtypes to SGCN and provided guidance in predicting where actions would benefit more and/or higher tier SGCN. Values are most useful when comparing related habitat subtypes. Three major complexes of related habitat subtypes have been identified for comparing their value to SGCN. **These complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe.** The following is a summary of the highest ranking habitat subtypes by complex in Mississippi based on their Value to SGCN.

A. Inland Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic)

1. Small Stream Swamp Forests
2. Dry Longleaf Pine Forests
3. Bottomland Hardwood Forests
4. Hardwood Seeps
5. Lower Slope/High Terrace Hardwood Forests

B. Lotic and Lentic Systems

1. Tombigbee Drainage
2. Northeast Hills, Tennessee River Drainage
3. Ephemeral Ponds
4. Pascagoula Drainage
5. Lower Coastal Plain, Pearl Drainage

C. Marine and Estuarine

1. Estuarine Marshes
2. Barrier Island Wetlands
3. Estuarine Bays, Lakes and Tidal Streams
4. Barrier Island Uplands
5. Mainland (Natural) Beaches

Because marine fish and invertebrates were not included in the SGCN, the Value or Rank of some marine and estuarine subtypes may be lower than expected. To ensure proper attention will be applied to these important habitats, we included a discussion about the rarity ranking and are developing plans to assess and begin incorporating these missing species groups into the NHP database and next iteration of the CWCS where possible.

3) Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.

To develop a list of potential problems which we refer to as threats to wildlife and wildlife habitats in Mississippi, we adapted the *Proposed Taxonomy of Direct Threats* developed by the Conservation Measures Partnership for describing categories of threats. These threat categories were used in the survey to aid in identifying major problems affecting SGCN. The results of the survey were compiled and presented to the Advisory Committee, who reviewed and revised the threats list by habitat subtype. Other conservation plans where threats, stressors or problems had been identified such as TNC's *Conservation Area Plans* were also consulted and used to identify threats as well as potential conservation strategies for habitat types. The threats identified for each subtype were assigned a high, medium or low rank to aid in determining the most critical problems for each identified habitat subtype and to facilitate identifying priority conservation actions.

Mississippi's landscape has changed dramatically since European settlement. There are almost no places left that have not been affected by man. Urbanization, agriculture, fencing, dams and stream channelization, commercial forestry and many other actions have modified wildlife and fisheries habitat and many of these land use changes have come at a great cost to wildlife. It is not our intent to debate the benefits and detriments of land use changes and historical activities on Mississippi's landscape, but

rather to take a meaningful look at the landscapes and habitats as they exist today and to develop plans on how best to make improvements that benefit fish and wildlife, particularly the SGCN. MDWFP recognizes that many problems or threats defined herein are based on legal and accepted practices. Thus, the 23 threats identified are meant to include those practices harmful to wildlife, and it should be understood that the manner in which a human activity or practice is conducted determines if it has a negative, neutral or positive effect on wildlife populations. The threats may be historic, current or potential.

Survey and research needs were developed from the survey as well and include recommendations focused on both individual species, groups and habitats.

4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.

For each threat identified as important to habitat types and subtypes for SGCN, we developed a comprehensive list of conservation actions that would reduce the effect of the threat. A master list of 30 recommended conservation actions was divided into four categories that were adapted from the Conservation Measures Partnership *Proposed Taxonomy of Conservation Actions*. Those categories are:

- Education and Awareness
- Habitat and Species Management
- Planning and Policy
- Research and Survey

As additional planning and analysis of priority conservation areas are developed for the state of Mississippi in the future, a more detailed list of conservation actions is needed that also defines potential partners for implementation and allows for quantitative measurement of results. This detail will be developed with the assistance of our stakeholder group over the next three to five years.

5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions.

Evaluating the effectiveness of the CWCS will be accomplished through an approach which incorporates short-term performance measures of actions implemented, progress toward goals and additional planning, and long-term monitoring status of SGCN populations, their habitats and key biological communities. The extent to which the strategy is implemented and actions performed should provide initial indications of effectiveness of the CWCS. Examples of initial indicators may include acres or stream miles enhanced or protected, conservation plans completed and basic research and survey

projects initiated or completed. Due to limited baseline information and the strategic scope of this document, performance measures are necessarily broad and must realistically remain adaptive as new information becomes available and methods improve. Over the next ten years as data become more available and the CWCS is "stepped down" into more detailed species, habitat or community specific conservation plans, target performance benchmarks should be developed and pursued.

Significant changes in status of SGCN, habitat and biological communities are generally evident only through long-term monitoring. However, baseline information must be established to most effectively assess changes over time. Substantial baseline information is currently available for some SGCN and key communities through the NHP. Information available for others is limited and must be acquired before changes may be adequately tracked. This need for additional baseline information must be addressed early in the implementation of the CWCS.

Numerous programs, projects and plans to monitor species, habitat, communities and conservation actions currently exist and will be used as a foundation for monitoring the CWCS. Although MDWFP through MMNS regularly performs these activities, many others are carried out through other international, national, regional, state and local programs. To effectively monitor the success of Mississippi's CWCS implementation, it is essential that the efforts of all stakeholders be identified, coordinated and included.

6) Descriptions of procedures to review the strategy at intervals not to exceed ten years.

We propose to complete a comprehensive revision of the CWCS by 2015 with an interim five-year review for certain species and habitats. In addition, we recognize that for this CWCS to meet its intended goal to improve biodiversity in Mississippi, we must consider the CWCS a living document and process, and we must continually update, refine and revise the data and recommendations herein. Thus, it is our intention to review, evaluate and update sections annually where possible. To accomplish this, MDWFP further proposes to enlist the assistance of our stakeholder group, the CWCS Advisory Committee, in the annual, five and ten-year review process by making this Committee a long-term standing committee along with the Technical and Steering Committees originally established for this process. The continued involvement of the Advisory Committee will allow MDWFP to collaborate with its many existing and potential conservation partners and interested stakeholders in the future development and implementation of the CWCS and to further refine and improve this CWCS with their assistance and guidance.

This review process will be synchronized with MDWFP's annual budget planning cycle. MDWFP will also use its existing annual performance reports for Federal Aid projects and SWG funds to document progress on CWCS-related activities.

MDWFP will incorporate the data compiled for this effort into Mississippi's new NHP (Biotics 4) database, and any changes in status of species and their habitats will be entered annually in this database and spatially. The SWG Coordinator and Technical Committee will be responsible for implementing the annual review and evaluation of the CWCS and will report annually to the Executive Director and the Advisory Committee. They will conduct annual, five and ten year assessments using the original eight elements, along with other guidance and criteria as they become available. The Steering Committee will oversee the review and revision process and will ensure that the CWCS continues to follow the eight elements.

7) **Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.**

Development of this CWCS was accomplished in coordination with a variety of public wildlife agencies, universities, conservation organizations and land managers in Mississippi. This coordination was ensured by inclusion of representatives of these agencies and organizations on the Advisory Committee, through individual and organization briefings and presentations and through contact with the Expert Team and Technical Committee. Conservation planning documents and tools provided by other agencies were gathered and incorporated into this CWCS where possible. Other interested parties also contributed to the process through comments via the MDWFP CWCS website. It is critical, as we further develop and refine the priority conservation areas and actions in this strategy, to continue working with other agencies through our Advisory Committee and existing partnerships.

There is one native American tribe listed on the federal register in Mississippi — the Mississippi Band of Choctaw Indians who own approximately 29,000 acres of tribal lands in across several Mississippi counties primarily in east-central Mississippi. While invited to participate in our CWCS Advisory Committee and/or review and comment on documents, we did not receive a response. However, we will continue to invite them to aid in the further planning and implementation of the CWCS in Mississippi.

8) **Congress also affirmed through this legislation that broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation (SGCN) that Congress has indicated such programs and projects are intended to emphasize.**

Our stakeholder and public outreach efforts included many approaches. In 2004, we invited by personal invitation, e-mail, web announcements and mail, representatives from over 290 natural resources agencies, conservation organizations, agriculture and forest products industries, technical experts, conservation educators and academics as well as individuals and additional MDWFP district and other staff to participate on the Advisory Committee. This group, which included 179 active members, met quarterly beginning in the summer of 2004 in open meetings at the MMNS, and corresponded between working meetings to review and develop sections of the strategy. Their role was to provide input and advice during the development of the strategy, to recommend existing plans or strategies for incorporation and to review and comment on drafts of the strategy prior to submission. All meetings were also posted on the MDWFP website, and the public was invited to participate as well. In addition to the assistance solicited from members of the Advisory Committee, Expert Team and Technical and Steering Committees, public input has been sought in many capacities.

We provided individual briefings and group presentations throughout the development of the CWCS upon request to any interested individual, organization, company or agency. A promotional brochure was completed in early 2004 and used for presentations, and was distributed through the MDWFP's offices to the potential stakeholders and the public. The brochure was also posted on the agency website and provided to all Advisory Committee and Steering Committee members to use in communication with their staff, volunteers and others. A CWCS website was also developed in early 2004 (www.mdwfp.com/cwcs) and has been used to post all plan elements after review by the Advisory, Technical and/or Steering Committee. The website was the primary method of providing material to the public and stakeholders for additional review and comments and included a page for feedback. The site will remain active as this strategy is implemented and additional iterations are developed. Articles about the CWCS development have been included in several internal and external publications and the development of the CWCS has been reported by news media across the state.

While this CWCS represents the first time in our state's history that we have compiled significant information, analyses and recommendations in one document on all habitat types and the critical species that use them, we have taken a broad and relatively coarse scale approach to this effort. It is important to note that this CWCS is a work in progress and in order for it to meet its intended purpose, much more must be done to further refine the recommendations herein and to fully develop conservation priority areas for our state in conjunction with our stakeholders. The CWCS was never intended to be a plan for our agency, but rather a comprehensive strategy for the entire state. It is critical that we continue to work

with stakeholders to identify partnerships for implementing conservation actions and to ensure this entire process of conservation planning continues on a statewide basis.

Summary

In order for this "conservation blueprint" to truly serve as a long-term guide improving Mississippi's biological diversity, our agency must ensure the following:

1. A full-time conservation planner/State Wildlife Grants Coordinator is hired to lead the further development and implementation of this CWCS.
2. The CWCS Advisory Committee becomes a permanent, standing committee that will continue to aid in the development, partnership and implementation of the CWCS along with the Technical and Steering Committees.
3. The CWCS be further refined with the help of stakeholders and the public to allow for "on the ground" implementation and monitoring of conservation actions on the most critical landscapes.

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HURRICANE KATRINA'S IMPACT

On August 29, 2005 hurricane Katrina made landfall in Mississippi and Louisiana. This category five hurricane was 150 miles wide as it approached the northern Gulf of Mexico and covered an area from west of New Orleans, Louisiana to Mobile Bay in Alabama. In Mississippi the devastation along the Gulf Coast was most severe because of the storm surge and wind accompanied by major flooding; however significant damage occurred far inland from high winds and affected much of the state.

The full extent of environmental impacts resulting from the storm is unknown at this time and may take several years to be assessed. Some waste treatment facilities in the state were apparently forced to release raw sewage directly into our waters. Toxins have likely escaped from numerous damaged facilities, homes, holding tanks, equipment and debris. Significant fish kills have been documented in the Pascagoula River system and have likely occurred in other streams throughout the state. While many forests in the southern half of the state were severely damaged, moderate effects were observed even further inland. Saltwater intrusion resulting from the storm surge may have affected habitats at least as far inland as Interstate 10. Invasive species may have been further dispersed and damaged areas may provide a greater opportunity for their establishment.

As Mississippians rebuild, the cumulative effects of reconstruction taking place in a relatively short period of time and the desire to build in new locations to avoid future losses may further compromise conservation efforts in certain areas. Though this CWCS was developed prior to the storm it may be an important resource for environmental considerations through efforts to rebuild. In addition, some priorities outlined in this strategy may need to be reassessed and adapted in response to the new challenges facing the state of Mississippi.

We will adapt this CWCS to the ecological changes resulting from the storm as we work toward refinement and implementation of this CWCS with our Advisory Committee, staff and many other conservation partners around the state and region.

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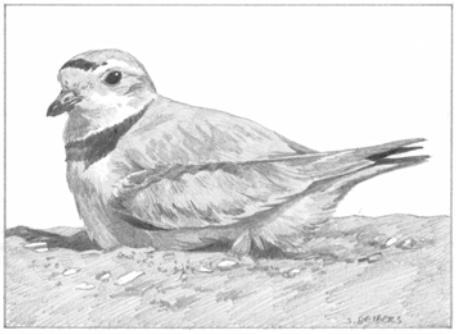
CHAPTER I:
INTRODUCTION & PURPOSE



Mississippi's *Comprehensive Wildlife Conservation Strategy* (CWCS) is part of a nationwide collaboration of state and federal agencies, non-profit organizations and individuals to address the habitat needs of declining wildlife. These state strategies mark the first time in U.S. history that state wildlife agencies and the broader conservation community have cooperated to design a conservation blueprint for all wildlife species.

This national planning effort is an outgrowth of the efforts led by the Teaming with Wildlife Coalition. Since the early 1990s, the 3,000-member nationwide Teaming with Wildlife Coalition has worked to secure funding for state fish and wildlife agencies to take preventative actions keeping rare species from becoming endangered and common species abundant. In 2001, Congress responded to this need by creating the State Wildlife Grants (SWG) program and the related Wildlife Conservation and Restoration Program (WCRP). From 2001 - 2005, over $300 million has been allocated to state wildlife agencies using a formula based on population and land area.

In order to make the best use of the State Wildlife Grants (SWG) program, Congress charged each state and territory with developing a CWCS. The Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) is coordinating this effort on behalf of the State of Mississippi. These strategies will provide an essential foundation for the future of wildlife conservation and a stimulus to engage states, federal agencies and other conservation partners to strategically think about their individual and coordinated

roles in prioritizing conservation efforts in each state and territory.

Congress identified the required elements of this conservation strategy in the WCRP legislation and the U.S. Fish and Wildlife Service adopted those same elements to also apply to SWG required conservation plans, so that one document will satisfy both needs. Each state's strategy must identify and focus on "species in greatest need of conservation", yet address the "full array of wildlife" and wildlife-related issues.

The strategies must provide and make use of the following elements:

1. Information **on the distribution and abundance of species of wildlife, including low and declining populations** as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,
2. Descriptions of **locations and relative condition of key habitats** and community types essential to conservation of species identified in (1); and,
3. Descriptions of **problems** which may adversely affect species identified in (1) or their habitats, and **priority research and survey efforts** needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and,
4. Descriptions of **conservation actions** proposed to conserve the identified species and habitats and priorities for implementing such actions; and,
5. Proposed **plans for monitoring species identified in (1) and their habitats**, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,
6. Descriptions of **procedures to review** the strategy at intervals not to exceed ten years; and,
7. Plans for **coordinating** the development, implementation, review, and revision of the plan with **Federal, State, and local agencies and Indian tribes** that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.
8. Congress also affirmed through this legislation that **broad public participation** is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation (SGCN) that Congress has indicated such programs and projects are intended to emphasize.

In addition to these required elements, the International Association of Fish and Wildlife Agencies (IAFWA) provided a set of *Guiding Principles* for states to consider as they develop and implement their strategies (Appendix I). The MDWFP has tried to apply these principles in the construction of our CWCS and will continue to use these *Guiding Principles* as the CWCS evolves over the next decade.

Mississippi's share of SWG funding since 2001 has been more than $3.5 million, which has been used to help develop this strategy and to fund conservation efforts focused on black bear restoration, walleye research and restoration, Partners in Flight coordination, fish and mussel inventories and many other conservation and restoration efforts. This document represents the summary of a conservation planning effort that officially began in 2003 in response to the congressional mandate, but which builds upon many years of research and data accumulation by the staff of the MDWFP through the Mississippi Museum of Natural Science (MMNS) and the conservation planning efforts of many other organizations and agencies.

Mississippi's CWCS is a blueprint aimed at conserving wild species and their habitat. The overarching goal of this planning effort is to provide a guide to effective and efficient long-term conservation of Mississippi's biological diversity.

In order to achieve this long-term goal, we embarked on this multi-year, dynamic process to develop a conservation strategy as directed by Congress. Our objectives were to base the CWCS on the best currently available data on the distribution and abundance of wildlife species in the state, particularly rare and declining species which are defined as Mississippi's SGCN. The strategy assesses the extent and condition of habitats required by these species, as well as existing and potential threats and conservation opportunities for these habitats. Further, this strategy addresses research and survey needs as well as monitoring needs, and provides a plan for MDWFP and its partners to review and revise the CWCS every ten years. While it builds on the work of previous planning efforts, it attempts to define a set of **broad conservation strategies** that may be applied locally and statewide to achieve the ultimate goal of protecting and improving Mississippi's diversity of native species and habitats. It indicates areas in which resources should be concentrated and emphasis placed. Where data are currently lacking to provide a clear picture of conservation objectives, research priorities are indicated. Where the data are sufficient to provide direction for species and habitat protection, restoration or management, these recommendations are stated.

Coordination with agencies, organization and corporations that manage land or administer wildlife conservation programs in Mississippi was a key component of this effort. Because this strategy is not an agency plan, but rather a guide for the entire state, MDWFP invited a broad cross section of representatives to serve on its Advisory Committee to help develop and review this document. A **Technical Committee** of MDWFP wildlife, fisheries and museum biologists worked with an **Expert Team** of biologists with expertise on SGCN and their habitats to compile and synthesize the data for review and input and coordinated their efforts with the **Advisory Committee** made up of a stakeholders. An internal **Steering Committee** of agency managers ensured the process followed congressional guidelines and met the eight elements required by law.

This document is not intended to be an outline for land use ordinances or for a statewide land use plan, nor is it an evaluation or indictment of land use practices by an entity. Every activity by humans on the Mississippi landscape has positive or negative impacts on wildlife and their habitats. The idea behind this strategy is to provide information and guidance that may help minimize negative impacts and maximize positive impacts. The emphasis of this effort is not on developing new regulations, but on more effective implementation of existing regulations and on development of new partnerships for conservation in the future.

This CWCS represents a foundation on which our agency and many other partners hope to build a more detailed conservation action plan for our state that further defines priority conservation areas and combines the efforts and resources of many partners to achieve the overall goal of improving biodiversity in Mississippi.

CHAPTER II:
APPROACH AND METHOD

Part 1. Organizational Structure

The primary responsibility for developing the CWCS was given to the Mississippi MMNS which functions as MDWFP's non-game wildlife program and includes the Natural Heritage Program (NHP). Over the past two years the MDWFP Conservation Resources Director, Charles Knight, managed all aspects of the CWCS development in concert with a contract CWCS Coordinator, Elizabeth Rooks-Barber. Early in the process, three committees (Technical, Steering and Advisory Committees) and a group of wildlife experts (Expert Team) were established to guide this effort and develop the first version of this CWCS for the State of Mississippi. For a list of committee members, see Appendix II. Each committee is described below.

The **Technical Committee** was composed of wildlife, fisheries and museum biologists. They gathered and analyzed information needed to identify Mississippi's species and habitats of greatest conservation need, threats/limiting factors and potential conservation actions. They met every three to four weeks over a period of two years, and significant correspondence and work occurred between meetings. They also coordinated their efforts with an Expert Team composed of 46 biologists in the state and region with expertise on the SGCN who provided additional input on species, habitats, threats and conservation actions via an extensive survey distributed in late 2003 (see Appendix III for a copy of the survey *Evaluation of SGCN in Mississippi*). These experts also gave feedback individually to members of the

Technical Committee on an as needed basis and many members of this Team served on the Advisory Committee.

A **Steering Committee** composed of MDWFP management (wildlife, fisheries and museum administrators) and the CWCS coordinators worked to ensure overall coordination of plan development and incorporation of the eight required elements. They approved plan formatting, plans for stakeholder and public involvement, plan review and revision and the agency approval process. They met on as needed basis, usually every quarter. During the development of the CWCS, MDWFP was also in the early stages of revising its agency strategic plan. Three of the five strategic plan committee members served on the CWCS Steering Committee.

An **Advisory Committee** composed of representatives from stakeholder organizations and agencies served to aid in the development, review and revision of the CWCS. This committee is described further in Part 2 below.

Part 2. Stakeholder and Public Input

In 2004, MDWFP invited by personal invitation, e-mail, web announcements and mail, representatives from over 290 natural resources agencies, conservation organizations, agriculture and forest products industries, technical experts, conservation educators and academics as well as individuals and additional MDWFP district and other staff to participate in a large working stakeholder group called the **Advisory Committee**. This Advisory Committee met quarterly beginning in the summer of 2004, and corresponded in between working meetings to review and develop sections of the strategy. Their role was to provide input and advice during the development of the strategy: to recommend existing plans or strategies for incorporation; and to review and comment on drafts of the strategy prior to submission. All Advisory Committee meetings were also posted on the MDWFP website and the public was invited to participate as well. Meetings were held in August 2004, November 2004, March 2005 and June 2005. During these meetings, state CWCS Coordinators shared information on designation of SGCN and habitats, identification of threats to SGCN and their habitats, potential conservation actions and opportunities for collaboration with other agencies and organizations. Committee members provided feedback on all aspects of the plan and many participated in working groups.

A list of 179 active participants in the CWCS Advisory Committee can be found in Appendix II. "Active" members of the Advisory Committee were individuals who attended meetings and/or reviewed parts of the CWCS draft and submitted comments via mail or e-mail if they could not attend meetings. The Advisory Committee was divided into working groups to develop lists of threats and conservation actions by broad ecological systems type. Those working groups were: terrestrial, marine and aquatic. These committees met during Advisory Committee meetings, and the marine committee also met on two additional occasions in February 2005 and May 2005 to review species and habitats and to develop conservation strategies for marine and estuarine habitats.

In addition to the assistance solicited from members of the Advisory Committee, Expert Team and Technical and Steering Committees, public input has been sought in many capacities since the beginning of Mississippi's planning process and included:

A. **Individual briefings and group meetings.** These occurred throughout the development of the CWCS. Presentations were provided upon request to any individual, organization, company or agency. A list of presentations made is included in Appendix IV. CWCS Coordinators and Technical Committee members made presentations to organizations such as the Mississippi Forestry Association, the USDA Natural Resources Conservation Service State Technical Committee, the All Bird Conservation Workshop, the Mississippi Department of Transportation staff members, U.S. Forest Service staff working on the revision of the state forest m,anagement plan, the Mississippi Wildlife Federation Board of Directors and affiliate representatives, the Mississippi Department of Marine Resources staff, American Fisheries Society, Mississippi Chapter members, the Mississippi Bat Working Group and the Mississippi Forest Legacy Program development committee. Briefings were provided at the beginning of the planning process to representatives from statewide conservation organizations such as the Audubon Society, the Mississippi Wildlife Federation, The Nature Conservancy and the Mississippi Fish and Wildlife Foundation. All organizations assigned representatives to participate in the Advisory Committee.

B. **A promotional brochure** was completed in early 2004 and used for presentations, and was distributed through MDWFP's offices to the potential stakeholders and the public to provide information and solicit input. The brochure was also on posted on the agency website and provided to all Advisory Committee and Steering Committee members to use in communication with their staff, volunteers and others. A copy of the brochure can be found in Appendix V.

C. A CWCS **website** was developed in early 2004 (www.mdwfp.com/cwcs) and has been used to post all plan elements after review by Advisory, Technical and/or Steering Committee. The website was the primary method of providing material to the public and stakeholders for additional review and comments and included a page for feedback. The site will remain active as this strategy is implemented and additional planning iterations are developed.

D. A **technical survey** entitled *Evaluation of Species of Greatest Conservation Need in Mississippi* was distributed in late 2003 to 81 biologists in the state and region with expertise on potential species of concern to seek their input and evaluation of the status of species and to recommend additional species for listing as a SGCN. Forty-six experts responded to the survey and provided information on the distribution and abundance of species, priority habitats, research, survey and monitoring recommendations and other information critical to the development of this CWCS. They also evaluated the state heritage ranks for these species and made recommendations on any needed

changes in SRANKS (see Part 4 in this Chapter for a description of state and global ranks used in the NHP). A copy of the survey can be found in Appendix III and a list of experts who responded to the survey is in Appendix II. A total of 1004 surveys were returned.

E. **Articles** about the CWCS development have been included in several internal and external publications such as: the Mississippi Museum of Natural Science newsletter; the Mississippi Wildlife Federation magazine — *Mississippi Wildlife*; several issues of MDWFP's electronic newsletter – *Wildlife Notes*; local newspapers such as the *Bolivar Commercial* (August 24, 2005), *Spirit of Morton* (August 24, 2005), *Deer Creek Pilot* (August 25, 2005), *Port Gibson Reveille* (August 25, 2005), *Picayune Item* (August 28, 2005), *Leader Call* (August 28, 2005), *Simpson County News* (August 25, 2005) and *Jasper County News* (August 19, 2005), and MDWFP's external magazine — *Mississippi Outdoors*. A press release inviting additional public review and comment was issued statewide in August, 2005 (see Appendix VI for samples of articles).

F. **Collaboration with bordering states and other CWCS planners** occurred primarily during national and regional meetings hosted by the International Association of Fish and Wildlife Agencies (IAFWA). National CWCS meetings were in Texas in January 2004 and in Nebraska August 2004. Mississippi CWCS coordinators actively participated in all national meetings and collaborated with other southeastern states through the Southeastern Association of Fish and Wildlife Agencies (SEAFWA) Ad Hoc Working Group for CWCS which met in Montgomery, Alabama in September 2003, in Atlanta, Georgia in July 2004, and in Ridgeland, South Carolina in January 2005. Also, planners from states bordering Mississippi met in September 2004 in Vicksburg, Mississippi to compare species lists and approaches. Mississippi CWCS coordinators corresponded with other state coordinators between meetings via mail, e-mail and telephone. Within the SEAFWA Ad Hoc committee meetings, efforts were made to share information and approaches in an effort to improve consistency in the plans of these states. Representatives of these southeastern state agencies are continuing discussion in this area after submission of the first CWCS in order to eventually develop regional conservation strategies for SGCN and habitats.

G. The CWCS Coordinators and Technical Committee members made **presentations to internal MDWFP groups** such as district staff, other museum staff, district managers and wildlife and fisheries staff throughout the process. They included updates in internal staff publications as well.

Part 3. Coordination with Other Agencies

Development of this CWCS was accomplished in coordination with a variety of public wildlife agencies, universities, conservation organizations and land managers in Mississippi. This coordination was ensured by inclusion of representatives of these agencies and organizations on the Advisory Committee, through individual and organization briefings and presentations and through contact with the Expert Team and Technical Committee. Conservation planning documents and tools provided by other agencies

were gathered and incorporated into this CWCS where possible. Other interested parties also contributed to the process through comments via the MDWFP CWCS website.

One of the eight elements required by Congress in the development of this strategy was to coordinate with "Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats." There is on native American tribe listed on the federal register in Mississippi — the Mississippi Band of Choctaw Indians. They own almost 29,000 acres in several counties primarily in east-central Mississippi. We invited the Chief to send a representative to participate in our Advisory Committee via phone, mail and e-mail. While we did not receive a response, we will continue to invite their participation and assistance in the further planning and implementation of the CWCS in our state.

A list of agencies and organizations that provided input in the development of the CWCS is listed in Appendix II.

Part 4. Criteria for Selecting and Prioritizing Mississippi's Species of Greatest Conservation Need

The Mississippi NHP, under the auspices of the MDWFP through its MMNS, maintains a database on approximately 1,500 species of animals in Mississippi. This includes all vertebrates and a large number of invertebrates native to the state. To develop conservation priorities, each of these species is ranked according to the number of occurrences, population trends, and threats (a complete list of rank definitions follows). The NHP formally tracks populations of the rarer species (S1 through S3 including the borderline ranking of S3S4). There are 336 such species on this Mississippi *Track List*, and these are designated as *Animals of Special Concern*. The location of each population of each of these species is mapped by the NHP, and population status is monitored within the database.

In late 2003 and early 2004, the *Special Animals* list was evaluated by the CWCS Technical Committee and our Expert Team consisting of other biologists with expertise relative to those species. These biologists assessed the ranks and provided extensive input via a survey regarding those ranks and the population status, species distribution and habitat status (see survey in Appendix III). This survey was sent to 81 individuals around the state and region and 46 responded by completing 1,004 surveys.

The list that was evaluated did not include tracked gastropods and insects, marine fish and marine invertebrates which were deemed insufficiently well-known to warrant status evaluation comparable to that possible for the vertebrates, mussels and crayfish. Their exclusion from the first round of prioritization is not an indication of the absence of conservation concerns within these groups, but thorough basic survey work is needed first and is recommended in this document.

From that survey and review process, the SGCN list was developed for the purposes of Mississippi's *CWCS.* The SGCN list, which can be found at the end of this section, includes:

1. Those species listed by state or federal statute as threatened or endangered.
2. Species tracked by the Mississippi Natural Heritage Program, which includes species ranked as S1 (critically imperiled), S2 (imperiled) or (S3) vulnerable.
3. Those species with low population density, low reproductive potential and narrow geographic distributions that may not be included in endangered, threatened, imperiled or at-risk classifications (or are thought to be declining rapidly).

Additionally, species that have been identified as a conservation priority under national plans and peer reviewed publications were considered for inclusion on the SGCN list. Examples of peer-reviewed publications which identify species as conservation priorities are: *Partners In Flight North American Landbird Conservation Plan*, *U.S. Shorebird Conservation Plan, North American Waterfowl Management Plan* and the *North American Waterbird Conservation Plan*. Fish species identified as threatened or vulnerable by the American Fisheries Society and freshwater mussel species identified as endangered, threatened or special concern by the American Fisheries Society were also considered.

As noted above, some species on the NHP's list of *Special Animals* were excluded from the selection of *Species of Greatest Conservation Need*. However, these animals will continue to be tracked by the NHP and may appear on future iterations of the SGCN.

When reviewing the scored data, some species at the extreme periphery of their range in Mississippi, accidentals and/or sporadic migrants were not considered priority species for the SGCN list. While not included on Mississippi SGCN list as individuals, we elected to include, as groups, lists of pelagic birds and migratory songbirds and shorebirds associated with important habitat types (see Chapter IV). These birds species (listed in Appendix IX) migrate through or are rare visitors to Mississippi. Also, individual migratory songbirds that breed in Mississippi, but weren't considered high enough in conservation need to be considered separately were captured in that list. They are included as groups in an effort to acknowledge the importance of Mississippi's habitats to their conservation and survival.

SPECIAL ANIMALS DEFINITION OF RANKS (USED TO DEVELOP THE SGCN LIST)

HERITAGE RANKS: The Mississippi NHP uses the Heritage ranking system developed by The Nature Conservancy. Each species is assigned two ranks: one representing its range wide or global status **(GRANK)** and one representing its status in the state **(SRANK)**. A guide to ranking criteria and symbols follows:

S1 Critically imperiled in Mississippi because of extreme rarity or because of some factor(s) making it vulnerable to extirpation.

S2 Imperiled in Mississippi because of rarity or because of some factor(s) making it vulnerable to extirpation.

S3 Rare or uncommon in Mississippi.

S4 Widespread, abundant, and apparently secure in the state, but with cause for long-term concern.

S5 Demonstrably widespread, abundant, and secure in the state.

SH Of historical occurrence in Mississippi, perhaps not verified in the past 20 years and suspected to be extant. An element would also be ranked SH if the only known occurrence(s) were destroyed, or if it had been sought extensively and unsuccessfully looked for. Upon verification of an extant occurrence, SH-ranked elements would typically receive an S1 rank.

SU Possibly in peril in Mississippi but status uncertain; need more information. May also be represented by S?.

S? Unranked: Element is not yet ranked in the state.

SX Element is believed to be extirpated from the state.

SE Exotic: An exotic established in the state; may be native in nearby regions (e.g. pecans along the eastern seaboard of the U.S.)

SA Accidental: accidental or casual in the state (i.e. in frequent and far outside usual range).

SZ Not of practical conservation concern in the state, because there are no established populations, although the taxon is native.

SP Potential: Element potentially occurs in the state but no occurrences reported.

SR Reported: Element reported in the state but without persuasive demonstration which would provide a basis for either accepting or rejecting (e.g. misidentified specimen) the report.

SRF Reported falsely: Element erroneously reported in the state and the error has persisted in the literature.

HYB: Hybrid: Element represents hybrid of species.

SSYN Synonym

Breeding Status: (Applicable to migratory species, mainly birds, but also includes sea turtles, some fish and some insects).

B = Breeding Status
N = Non-breeding Status

Qualifiers:
? = Inexact
C = Captive or Cultivated only

GRANK: Criteria follow those of SRANK except for species having several subspecies. In these cases, a subrank, made up of the letter "T" plus a number or letter (1,2,3,4,5,H,U, X,?), is added to the GRANK.

STATE STATUS: Seventy-six animals have been designated as state endangered through the Mississippi State Law, the Nongame and Endangered Species Conservation Act of 1974. Plants receive no formal legal protection by state law in Mississippi other than that provided for in the trespass laws.

FEDERAL STATUS: The following is a guide to acronyms taken from the *Federal Register*.

LE ENDANGERED. A species which is in danger of extinction throughout all or a significant portion of its range.

LT THREATENED. A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

C CANDIDATE SPECIES. Species for which the U.S. Fish and Wildlife Service (USFWS) currently has substantial information supporting the biological appropriateness of proposing to list as endangered or threatened. Proposed rules have not yet been issued because they have been precluded at present by other listing activity. Development and publication of proposed rules is anticipated, however, and the

USFWS encourages federal agencies and other appropriate parties to give considerations to such taxa in environmental planning.

C2 CANDIDATE CATEGORY 2. The USFWS identified Category 2 candidates as taxa for which information in the possession of the Service indicated that proposing to list as endangered or threatened was possibly appropriate, but for which sufficient data on biological vulnerability and threat were not currently available to support proposed rules. The quality of information varied greatly among the former Category 2 species, but they all shared one trait — sufficient information to justify issuance of a proposed rule was lacking. **The designation of Category 2 species as candidates resulted in confusion about the conservation status of these taxa. To reduce that confusion, and to clarify that the USFWS does not regard these species as candidates for listing, the Service has discontinued the designation of Category 2 species as candidates.** The USFWS remains concerned about these species, but further biological research and field study are needed to resolve the conservation status of these taxa. The Service encourages other Federal agencies to give consideration to these taxa in environmental planning.

The designation of Category 3 is discontinued, but the Service has retained all Category 3 information in case future reviews are conducted on these taxa.

3A SUBCATEGORY 3A. Species for which the USFWS has persuasive evidence of extinction. If rediscovered, however, such taxa warrant high priority for addition to the List of Endangered and Threatened Wildlife.

3C SUBCATEGORY 3C. Species that are now considered to be more abundant and/or widespread than previously thought. Should new information suggest that such taxon is experiencing a numerical or distributional decline, or is under a substantial threat, it may be considered for transfer to Category 1 or 2.

PRIORITIZATION OF MISSISSIPPI'S SPECIES OF GREATEST CONSERVATION NEED

A four-tiered **prioritization** of species was developed by the CWCS Technical Committee to determine where Mississippi's SGCN rank within the list and aid in evaluating the relative conservation priority of each species at the current time. This prioritization was also designed to aid in determining the most critical habitats in Mississippi and to assist in prioritizing conservation approaches in the future. Because there is no nationally standardized method for states to follow in ranking the conservation need of species, the Technical Committee developed a system of criteria that can be applied objectively across the entire range of animal taxa included in this report (mammals, birds, reptiles, amphibians, fish, crustaceans and mussels).

Many criteria used by other states, agencies and conservation organizations were considered; however, scarcity of data on the status of many species, difficulty in applying criteria to all taxonomic groups, and the subjective nature of some criteria would have made them difficult to use for the purposes of MCWCS. Thus, the Technical Committee elected to evaluate species based on seven relatively objective criteria that can be broadly applied. The ranking system described below is a matrix of seven evaluation criteria under which each species would receive a score between one (1) and three (3) for the all criteria except the third and fifth, and a score of one (1) to four (4) for the third and zero (0) or one (1) for the fifth criterion. The advantage of scoring variables on a three or four point spread is that it lessens the degree of subjectivity.

DESCRIPTION OF EACH EVALUATION CRITERION USED TO PRIORITIZE SGCN

A) Nationwide Conservation Priority Rank (www.natureserve.org) 1 – 3 points

The network of State Natural Heritage Inventory Programs ranks all species on a scale of G1 through G5 with G1 species being the most imperiled and G5 species being the most secure. The Heritage Ranking incorporates several aspects of a species' status including the number of known populations, the degree of threats to the species, the species' population trend and the degree of uncertainty regarding the species' status. Each species' NHP Global Rank (GRANK) is identical across its range in the United States and can be obtained from the NatureServe Website - *http://www.natureserve.org*.

3 points - Species has a Global Heritage Rank of G1 or G2
2 points - Species has a Global Heritage Rank of G3 or G4
1 point - Species has a Global Heritage Rank of G5

B) Eligibility of Species to Receive Other Sources of Federal Aid Funding 1 – 3 points

One of the selling points used to develop support for the State Wildlife Grants (SWG) program in

Congress has been that it meets unfunded wildlife conservation needs. As such, state wildlife agencies have been cautioned against using these funds to supplement traditional management programs such as endangered and threatened species recovery, sport fish management or game management. The CWCS Technical Committee chose to follow an evaluation method that several states are using which incorporates a consideration of alternative funding availability as an evaluation criterion. Incorporating this criterion does not eliminate endangered, threatened, game and sport fish species from the list of species of greatest conservation need; however, it does lower their ranking relative to other species. A sport fish, game mammal or game bird species which is eligible for funding under the existing Dingell Johnson (DJ)/Wallop-Breaux (WB) or Pittman-Robertson (PR) federal aid programs or a federally listed or candidate species (Endangered Species Act or ESA) receives fewer points because there is an existing funding avenue to meet their needs. Game and sport fish species receive one (1) point. (Note that there are approximately 100 species sharing nearly $600 million annually nationwide). Federally endangered or threatened species receive two (2) points This is one point higher because there are more species (about 500) competing for fewer dollars (less than $200 million) nationwide.

3 points - Species not targeted for management funding under ESA, P-R or D-J Programs
2 points - Species is listed as federally endangered or threatened and is eligible for management funding under the ESA.
1 point - Species is eligible for management funding as a sport fish, game bird or game mammal

C) Percent of Population Size or Geographic Range within Mississippi 1 – 4 points

This criterion evaluates how important the state of Mississippi is to the conservation of the species. A species receives a higher score if it is found only in Mississippi (endemic) and/or a few surrounding states and a lower score if Mississippi is on the periphery of its range. This takes into consideration the national intent to place funding where it can be most effective — usually within the heart of a specie's geographic range. Because population size is unknown for most species, the geographic range can be used as a surrogate for population size.

4 points - Species endemic to Mississippi
3 points - Mississippi encompasses >25% of the species' range
2 points - Mississippi encompasses 5-25% of the species' range
1 point - Mississippi encompasses < 5% of the species' range

D) Trend in Population Size 1 – 3 points

For this criterion, population size refers to the total theoretical number of individuals of the species that reside in or migrate through the state. Scientists, through the survey included in Appendix III, were asked to subjectively evaluate whether the populations numbers for each species are increasing, stable, or declining. These evaluations were based on the knowledge of the scientists

and data presently available to them. The answers were later converted to numerical values that were consistent with the conservation priority ranks, with one (1) indicating declining; two (2), stable; and, three (3), increasing populations. Since other attributes of the scoring system indicated greatest need using higher numerical values, it was necessary to invert these scores to make them compatible with the scoring of other attributes. Those that were not scored on the survey sheets were logically given the average score to prevent them from being disproportionately penalized for lacking information.

3 points - Declining population
2 points - Stable population
1 point - Increasing population

E) Degree of Existing Data Available to Support Designation as a SGCN 0 - 1 point

A species may receive a maximum of one (1) point. Federal and state listed species and candidate species have been identified as those species at greatest risk of endangerment through a public process. The rationale for this criterion is to separate those species which have been previously identified as a conservation concern through other established processes from those species which are regionally endemic, but appear to have stable or secure populations.

1 point - Species has been listed as federally or state endangered, threatened or identified as a candidate.

F) Summary of Knowledge Level of Species 1- 3 points

Through the survey instrument, species were categorized by estimated knowledge level within the scientific community. Scientists, who completed approximately three surveys per species, were asked to specify the degree of knowledge of the scientific community relating to species population status, distribution and habitat type designation and threats/limiting factors/problems affecting the species. They were asked to consider the most appropriate level of knowledge (high, medium, low) of the scientific community for each species for each of the three criteria listed. The answers were later converted to numerical values that were consistent with the conservation priority ranks, with one (1) indicating low; two (2), medium; and three (3), high. Since other attributes of the scoring system indicated greatest need using higher numerical values, it was necessary to invert these scores to make them compatible with the scoring of other attributes. Those that were not scored on the survey sheets were logically given the average score to prevent them from being disproportionately penalized for lacking information.

1 point – High level of knowledge
2 points – Moderate level of knowledge
3 points – Low level of knowledge

G) Statewide Conservation Priority Rank (NHP) 1 – 3 points

Mississippi's NHP ranks state status (SRANK) of all species on a scale of S1 through S5 with S1 species being the most imperiled and S5 species being the most secure. Similar to global ranks or GRANKS (see A above).

3 points - Species has a State Heritage Rank of S1 or S2
2 points - Species has a State Heritage Rank of S3 or S4
1 point - Species has a State Heritage Rank of S5

The maximum possible points that could be assigned were 20 and the minimum were 6.

Mississippi's SGCN was divided into four tiers based upon their evaluation score. The scores and tiers are described below.

DESCRIPTION OF TIERS FOR SGCN

Tier 1 Score of 14.52 or greater - Species that are in need of immediate conservation action and/or research because of extreme rarity, restricted distribution, unknown or decreasing population trends, specialized habitat needs and/or habitat vulnerability. Some species may be considered critically imperiled and at risk of extinction/extirpation.

Tier 2 Score of 11.27 – 14.51- Species that are in need of timely conservation action and/or research because of rarity, restricted distribution, unknown or decreasing population trend, specialized habitat needs or habitat vulnerability or significant threats.

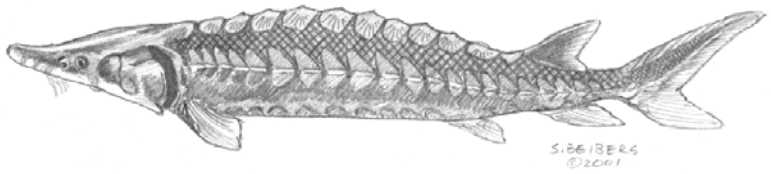
Tier 3 Score less than 11.26 - Species that are of less immediate conservation concern, but are in need of planning and effective management due to unknown or decreasing population trends, specialized habitat needs or habitat vulnerability.

Tier 4 - Species listed as extirpated from Mississippi, of historical occurrence only, or accidental. **While no conservation action or research is recommended at this time, these species remain a SGCN in the event that taxa may be rediscovered or reintroduced from populations existing outside the state.**

Part 5. Mississippi's Species of Greatest Conservation Need

The 297 species identified for this iteration of Mississippi's SGCN can be found on the following pages by taxonomic group and Tier level. The list includes 18 amphibians, 70 birds, 34 crustaceans, 74 fish, 17 mammals, 49 mussels and 35 reptiles. The Federal and State protection status and NHP global and state rank are also listed for each applicable species.

Please note that gastropods, insects, marine fish and invertebrates were not evaluated for inclusion in the development of this SGCN because of the lack of data available to sufficiently evaluate their status. This is not an indication of lack of conservation concern for species within these groups, but rather an acknowledgement that thorough basic survey work must be accomplished first.



TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
1	**Amphibians**	*AMPHIUMA PHOLETER*	ONE-TOED AMPHIUMA	G3	S1		LE
1	Amphibians	*CRYPTOBRANCHUS ALLEGANIENSIS*	HELLBENDER	G3G4	S1	(PS)	
1	Amphibians	*RANA HECKSCHERI*	RIVER FROG	G5	S1		
1	Amphibians	*RANA SEVOSA*	MISSISSIPPI GOPHER FROG	G1	S1	LE	LE
2	Amphibians	*ANEIDES AENEUS*	GREEN SALAMANDER	G3G4	S1		LE
2	Amphibians	*EURYCEA LUCIFUGA*	CAVE SALAMANDER	G5	S1		LE
2	Amphibians	*GYRINOPHILUS PORPHYRITICUS*	SPRING SALAMANDER	G5	S1		LE
2	Amphibians	*HEMIDACTYLIUM SCUTATUM*	FOUR-TOED SALAMANDER	G5	S1S2		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Amphibians	*PLETHODON VENTRALIS*	SOUTHERN ZIGZAG SALAMANDER	G4	S2		
2	Amphibians	*PLETHODON WEBSTERI*	WEBSTER'S SALAMANDER	G3	S3		
2	Amphibians	*PSEUDACRIS ORNATA*	ORNATE CHORUS FROG	G5	S1S2		
2	Amphibians	*PSEUDOTRITON MONTANUS*	MUD SALAMANDER	G5	S2S3		
2	Amphibians	*RANA AREOLATA*	CRAWFISH FROG	G4	S3		
3	Amphibians	*BUFO NEBULIFER*	GULF COAST TOAD	G5	S3		
3	Amphibians	*PSEUDACRIS BRACHYPHONA*	MOUNTAIN CHORUS FROG	G5	S3		
3	Amphibians	*PSEUDOTRITON RUBER*	RED SALAMANDER	G5	S3		
4	Amphibians	*AMBYSTOMA TIGRINUM*	TIGER SALAMANDER	G5	SH	(PS)	
4	Amphibians	*PLETHODON AINSWORTHI*	BAYSPRINGS SALAMANDER	GH	SX		
1	**Birds**	*CHARADRIUS ALEXANDRINUS TENUIROSTRIS*	SOUTHEASTERN SNOWY PLOVER	G4T3Q	S2		LE
1	Birds	*CHARADRIUS WILSONIA*	WILSON'S PLOVER	G5	S1		
1	Birds	*COTURNICOPS NOVEBORACENSIS*	YELLOW RAIL	G4	S2N		
1	Birds	*FALCO SPARVERIUS PAULUS*	SOUTHEASTERN AMERICAN KESTREL	G5T4	S3B, SZN		
1	Birds	*GRUS CANADENSIS PULLA*	MISSISSIPPI SANDHILL CRANE	G5T1	S1	LE	LE
1	Birds	*HAEMATOPUS PALLIATUS*	AMERICAN OYSTERCATCHER	G5	S1		
1	Birds	*LATERALLUS JAMAICENSIS*	BLACK RAIL	G4	S2N		
1	Birds	*THRYOMANES BEWICKII*	BEWICK'S WREN	G5	S2B, S3N		LE
2	Birds	*AIMOPHILA AESTIVALIS*	BACHMAN'S SPARROW	G3	S3B, S3S4N		
2	Birds	*AMMODRAMUS HENSLOWII*	HENSLOW'S SPARROW	G4	S3N		
2	Birds	*AMMODRAMUS LECONTEII*	LE CONTE'S SPARROW	G4	S3N		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Birds	*AMMODRAMUS MARITIMUS*	SEASIDE SPARROW	G4	S3	(PS)	
2	Birds	*AMMODRAMUS NELSONI*	NELSON'S SHARP-TAILED SPARROW	G5	S3N		
2	Birds	*AMMODRAMUS SAVANNARUM*	GRASSHOPPER SPARROW	G5	S3B,S3N	(PS)	
2	Birds	*ANAS FULVIGULA*	MOTTLED DUCK	G4	S2B,S4N		
2	Birds	*ASIO FLAMMEUS*	SHORT-EARED OWL	G5	S3N		
2	Birds	*CALIDRIS CANUTUS*	RED KNOT	G5	S2N		
2	Birds	*CHARADRIUS MELODUS*	PIPING PLOVER	G3	S2N	LE,LT	LE
2	Birds	*COLUMBINA PASSERINA*	COMMON GROUND-DOVE	G5	S1S2		
2	Birds	*DENDROICA CERULEA*	CERULEAN WARBLER	G4	S2B,SZN		
2	Birds	*EGRETTA CAERULEA*	LITTLE BLUE HERON	G5	S2B,SZN		
2	Birds	*EGRETTA RUFESCENS*	REDDISH EGRET	G4	S2N		
2	Birds	*ELANOIDES FORFICATUS*	SWALLOW-TAILED KITE	G5	S2B		
2	Birds	*EUDOCIMUS ALBUS*	WHITE IBIS	G5	S2B,S3N		
2	Birds	*EUPHAGUS CAROLINUS*	RUSTY BLACKBIRD	G5	S2		
2	Birds	*HALIAEETUS LEUCOCEPHALUS*	BALD EAGLE	G4	S2B,S2N	PS:LT	LE
2	Birds	*LIMNOTHLYPIS SWAINSONII*	SWAINSON'S WARBLER	G4	S3S4N,SZB		
2	Birds	*LIMOSA FEDOA*	MARBLED GODWIT	G5	S2N		
2	Birds	*MYCTERIA AMERICANA*	WOOD STORK	G4	S2N	PS:LE	LE
2	Birds	*PASSERINA CIRIS*	PAINTED BUNTING	G5	S3S4B,SZN		
2	Birds	*PELECANUS OCCIDENTALIS*	BROWN PELICAN	G4	S1N	PS:LE	LE
2	Birds	*PICOIDES BOREALIS*	RED-COCKADED WOOD-PECKER	G3	S1	LE	LE
2	Birds	*RALLUS ELEGANS*	KING RAIL	G4G5	S3		
2	Birds	*RYNCHOPS NIGER*	BLACK SKIMMER	G5	S2B,S3N		
2	Birds	*STERNA ANTILLARUM*	LEAST TERN	G4	S3B,S3N	PS:LE	

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Birds	*STERNA ANTILLARUM ATHALASSOS*	INTERIOR LEAST TERN	G4T2Q	S2B	PS:LE	LE
2	Birds	*STERNA MAXIMA*	ROYAL TERN	G5	S1B,S4N		
2	Birds	*STERNA NILOTICA*	GULL-BILLED TERN	G5	S1B,S3S4N		
2	Birds	*STERNA SANDVICENSIS*	SANDWICH TERN	G5	S1B, S4N		
3	Birds	*ANAS ACUTA*	NORTHERN PINTAIL	G5	S4N		
3	Birds	*ANAS RUBRIPES*	AMERICAN BLACK DUCK	G5	S2N		
3	Birds	*ANHINGA ANHINGA*	ANHINGA	G5	S3B,S1N		
3	Birds	*AYTHYA AFFINIS*	LESSER SCAUP	G5	S4N		
3	Birds	*BOTAURUS LENTIGINOSUS*	AMERICAN BITTERN	G4	S3N		
3	Birds	*CALIDRIS ALPINA*	DUNLIN	G5	S4N		
3	Birds	*CALIDRIS MAURI*	WESTERN SANDPIPER	G5	S4N		
3	Birds	*CAPRIMULGUS CAROLINENSIS*	CHUCK-WILL'S-WIDOW	G5	S4B		
3	Birds	*COLINUS VIRGINIANUS*	NORTHERN BOBWHITE	G5	S3S4	(PS)	
3	Birds	*DENDROICA DISCOLOR*	PRAIRIE WARBLER	G5	S5B,SZN		
3	Birds	*EGRETTA THULA*	SNOWY EGRET	G5	S4B,S1N		
3	Birds	*EGRETTA TRICOLOR*	TRICOLORED HERON	G5	S2B,S1N		
3	Birds	*HELMITHEROS VERMIVORUS*	WORM-EATING WARBLER	G5	S3B,SZN		
3	Birds	*HYLOCICHLA MUSTELINA*	WOOD THRUSH	G5	S5B,SZN		
3	Birds	*IXOBRYCHUS EXILIS*	LEAST BITTERN	G5	S3B		
3	Birds	*LANIUS LUDOVICIANUS*	LOGGERHEAD SHRIKE	G4	S4		
3	Birds	*MELANERPES ERYTHROCEPHALUS*	RED-HEADED WOODPECKER	G5	S4S5		
3	Birds	*NYCTICORAX NYCTICORAX*	BLACK-CROWNED NIGHT-HERON	G5	S3B,S4N		
3	Birds	*NYCTICORAX VIOLACEUS*	YELLOW-CROWNED NIGHT-HERON	G5	S3B,S1N		
3	Birds	*OPORORNIS FORMOSUS*	KENTUCKY WARBLER	G5	S5B,SZN		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
3	Birds	*PANDION HALIAETUS*	OSPREY	G5	S3B, S1S2N		
3	Birds	*PELECANUS ERYTHRORHYNCHOS*	AMERICAN WHITE PELICAN	G3	S3N		
3	Birds	*PIRANGA OLIVACEA*	SCARLET TANAGER	G5	S2?B,SZN		
3	Birds	*PORPHYRULA MARTINICA*	PURPLE GALLINULE	G5	S3B		
3	Birds	*PROTONOTARIA CITREA*	PROTHONOTARY WARBLER	G5	S5B,SZN		
3	Birds	*SCOLOPAX MINOR*	AMERICAN WOODCOCK	G5	S?		
3	Birds	*SEIURUS MOTACILLA*	LOUISIANA WATERTHRUSH	G5	S3B,SZN		
3	Birds	*SITTA PUSILLA*	BROWN-HEADED NUTHATCH	G5	S4B		
3	Birds	*TYTO ALBA*	COMMON BARN-OWL	G5	S3		
4	Birds	*CAMPEPHILUS PRINCIPALIS*	IVORY-BILLED WOODPECKER	GH	SX	LE	LE
4	Birds	*VERMIVORA BACHMANII*	BACHMAN'S WARBLER	GH	SXB	LE	LE
1	**Crustaceans**	*FALLICAMBARUS BURRISI*	BURRIS' BURROWING CRAW-FISH	G3	S2		
1	Crustaceans	*FALLICAMBARUS DANIELAE*	SPECKLED BURROWING CRAYFISH	G2	S2		
1	Crustaceans	*FALLICAMBARUS GORDONI*	CAMP SHELBY BURROWING CRAWFISH	G1	S1	C	LE
1	Crustaceans	*HOBBSEUS ATTENUATUS*	PEARL RIVULET CRAYFISH	G2	S2		
1	Crustaceans	*HOBBSEUS CRISTATUS*	A CRAYFISH	G3	S2?		
1	Crustaceans	*HOBBSEUS ORCONECTOIDES*	OKTIBBEHA RIVULET CRAY-FISH	G3	S1		
1	Crustaceans	*HOBBSEUS PETILUS*	TOMBIGBEE RIVULET CRAY-FISH	G2	S2		
1	Crustaceans	*HOBBSEUS VALLECULUS*	CHOCTAW RIVULET CRAYFISH	G1	S1		
1	Crustaceans	*HOBBSEUS YALOBUSHENSIS*	A CRAYFISH	G3	S2		
1	Crustaceans	*ORCONECTES HARTFIELDI*	A CRAYFISH	G2	S2		
1	Crustaceans	*ORCONECTES MISSISSIPPIENSIS*	A CRAYFISH	G2G3	S2S3		
1	Crustaceans	*PROCAMBARUS BARBIGER*	JACKSON PRAIRIE CRAYFISH	G2	S2		
1	Crustaceans	*PROCAMBARUS COMETES*	MISSISSIPPI FLATWOODS CRAYFISH	G1	S1		
1	Crustaceans	*PROCAMBARUS CONNUS*	CARROLLTON CRAYFISH	GH	S1		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
1	Crustaceans	*PROCAMBARUS FITZPATRICKI*	SPINY-TAILED CRAYFISH	G2	S2		
1	Crustaceans	*PROCAMBARUS LAGNIAPPE*	LAGNIAPPE CRAYFISH	G2	S1		
1	Crustaceans	*PROCAMBARUS LYLEI*	SHUTISPEAR CRAYFISH	G2	S2		
1	Crustaceans	*PROCAMBARUS POGUM*	BEARDED RED CRAYFISH	G1	S1		
2	Crustaceans	*CAMBARELLUS DIMINUTUS*	LEAST CRAYFISH	G3	S2		
2	Crustaceans	*CAMBARELLUS LESLIEI*	A CRAYFISH	G3	S2		
2	Crustaceans	*CAMBARUS LATIMANUS*	A CRAYFISH	G5	S1?		
2	Crustaceans	*FALLICAMBARUS BYERSI*	LAVENDER BURROWING CRAYFISH	G4	S3		
2	Crustaceans	*HOBBSEUS PROMINENS*	A CRAYFISH	G4G5	S2?		
2	Crustaceans	*ORCONECTES ETNIERI*	A CRAYFISH	G4G5	S3?		
2	Crustaceans	*ORCONECTES JONESI*	A CRAYFISH	G3	S3		
2	Crustaceans	*PROCAMBARUS ABLUSUS*	A CRAYFISH	G4	S3		
2	Crustaceans	*PROCAMBARUS BIVITTATUS*	RIBBON CRAYFISH	G4	S3		
2	Crustaceans	*PROCAMBARUS ELEGANS*	A CRAYFISH	G4	S3?		
2	Crustaceans	*PROCAMBARUS HAGENIANUS VESTICEPS*	A CRAYFISH	G4G5T3	S3S4		
2	Crustaceans	*PROCAMBARUS LECONTEI*	MOBILE CRAYFISH	G3G4	S2		
2	Crustaceans	*PROCAMBARUS PENNI*	PEARL BLACKWATER CRAYFISH	G3	S3		
3	Crustaceans	*CAMBARUS GIRARDIANUS*	A CRAYFISH	G5	S2		
3	Crustaceans	*ORCONECTES VALIDUS*	A CRAYFISH	G5	S1		
3	Crustaceans	*PROCAMBARUS SHERMANI*	A CRAYFISH	G4	S?		
1	**Fishes**	*ACIPENSER OXYRINCHUS DESOTOI*	GULF STURGEON	G3T2	S1	LT	LE
1	Fish	*ALOSA ALABAMAE*	ALABAMA SHAD	G3	S1	C	
1	Fish	*CRYSTALLARIA ASPRELLA*	CRYSTAL DARTER	G3	S1		LE
1	Fish	*ETHEOSTOMA RANEYI*	YAZOO DARTER	G2	S2		
1	Fish	*ETHEOSTOMA RUBRUM*	BAYOU DARTER	G1	S1	LT	LE

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
1	Fish	*ETHEOSTOMA ZONIFER*	BACKWATER DARTER	G3G4	S1		
1	Fish	*NOTROPIS CHALYBAEUS*	IRONCOLOR SHINER	G4	S1		LE
1	Fish	*NOTROPIS MELANOSTOMUS*	BLACKMOUTH SHINER	G2	S1S2		
1	Fish	*NOTURUS MUNITUS*	FRECKLEBELLY MADTOM	G3	S2		LE
1	Fish	*NOTURUS GLADIATOR*	PIEBALD MADTOM	G3	S1		LE
1	Fish	*PERCINA AURORA*	PEARL DARTER	G1	S1	C	LE
1	Fish	*PERCINA LENTICULA*	FRECKLED DARTER	G2	S2		
1	Fish	*SCAPHIRHYNCHUS ALBUS*	PALLID STURGEON	G1	S1	LE	LE
1	Fish	*SCAPHIRHYNCHUS SUTTKUSI*	ALABAMA STURGEON	G1	S1	LE	LE
2	Fish	*AMMOCRYPTA MERIDIANA*	SOUTHERN SAND DARTER	G4	S3		
2	Fish	*COTTUS CAROLINAE*	BANDED SCULPIN	G5	S1		
2	Fish	*CYCLEPTUS ELONGATUS*	BLUE SUCKER	G3G4	S3		
2	Fish	*CYCLEPTUS MERIDIONALIS*	SOUTHEASTERN BLUE SUCKER	G3G4	S3		
2	Fish	*CYPRINELLA CALLISTIA*	ALABAMA SHINER	G5	S2		
2	Fish	*CYPRINELLA GALACTURA*	WHITETAIL SHINER	G5	S1		
2	Fish	*CYPRINELLA WHIPPLEI*	STEELCOLOR SHINER	G5	S3		
2	Fish	*ETHEOSTOMA BLENNIOIDES*	GREENSIDE DARTER	G5	S1		LE
2	Fish	*ETHEOSTOMA DURYI*	BLACK DARTER	G4	S1		
2	Fish	*ETHEOSTOMA KENNICOTTI*	STRIPETAIL DARTER	G4G5	S2		
2	Fish	*ETHEOSTOMA LACHNERI*	TOMBIGBEE DARTER	G4	S3		
2	Fish	*ETHEOSTOMA NIGRIPINNE*	BLACKFIN DARTER	G4	S2		
2	Fish	*ETHEOSTOMA ZONISTIUM*	BANDFIN DARTER	G4G5	S2		
2	Fish	*FUNDULUS DISPAR*	NORTHERN STARHEAD TOP MINNOW	G4	S3		
2	Fish	*FUNDULUS EURYZONUS*	BROADSTRIPE TOPMINNOW	G2	S2		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Fish	*FUNDULUS JENKINSI*	SALTMARSH TOPMINNOW	G2	S3	C	
2	Fish	*ICHTHYOMYZON CASTANEUS*	CHESTNUT LAMPREY	G4	S2S3		
2	Fish	*MORONE SAXATILIS*	STRIPED BASS	G5	S1		
2	Fish	*MOXOSTOMA ANISURUM*	SILVER REDHORSE	G5	S1		
2	Fish	*MOXOSTOMA CARINATUM*	RIVER REDHORSE	G4	S3		
2	Fish	*MOXOSTOMA DUQUESNEI*	BLACK REDHORSE	G5	S1		
2	Fish	*MOXOSTOMA MACROLEPIDOTUM*	SHORTHEAD REDHORSE	G5	S1		
2	Fish	*NOTROPIS AMNIS*	PALLID SHINER	G4	S3		
2	Fish	*NOTROPIS BOOPS*	BIGEYE SHINER	G5	S1		LE
2	Fish	*NOTROPIS CANDIDUS*	SILVERSIDE SHINER	G4	S2		
2	Fish	*NOTROPIS EDWARDRANEYI*	FLUVIAL SHINER	G4	S1		
2	Fish	*NOTROPIS MICROPTERYX*	ROSYFACE SHINER	G5	S1		
2	Fish	*NOTURUS FLAVUS*	STONECAT	G5	S1		
2	Fish	*PERCINA EVIDES*	GILT DARTER	G4	S1		
2	Fish	*PERCINA PHOXOCEPHALA*	SLENDERHEAD DARTER	G5	S1		LE
2	Fish	*PHENACOBIUS MIRABILIS*	SUCKERMOUTH MINNOW	G5	S1		LE
2	Fish	*PHOXINUS ERYTHROGASTER*	SOUTHERN REDBELLY DACE	G5	S2		LE
2	Fish	*PTERONOTROPIS WELAKA*	BLUENOSE SHINER	G3G4	S3		
2	Fish	*RHINICHTHYS ATRATULUS*	BLACKNOSE DACE	G5	S1		
2	Fish	*STIZOSTEDION SP 1*	SOUTHERN WALLEYE	G3	S1S2		
3	Fish	*ATRACTOSTEUS SPATULA*	ALLIGATOR GAR	G3G4	S2		
3	Fish	*CLINOSTOMUS FUNDULOIDES*	ROSYSIDE DACE	G5	S2		
3	Fish	*CYPRINELLA SPILOPTERA*	SPOTFIN SHINER	G5	S2		
3	Fish	*ENNEACANTHUS GLORIOSUS*	BLUESPOTTED SUNFISH	G5	S3		
3	Fish	*ETHEOSTOMA ASPRIGENE*	MUD DARTER	G4G5	S3		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS	
3	Fish	*ETHEOSTOMA FLABELLARE*	FANTAIL DARTER		G5	S2		
3	Fish	*ETHEOSTOMA RUFILINEATUM*	REDLINE DARTER		G5	S2		
3	Fish	*ETHEOSTOMA RUPESTRE*	ROCK DARTER		G4	S3		
3	Fish	*HETERANDRIA FORMOSA*	LEAST KILLIFISH		G5	S3		
3	Fish	*HYPENTELIUM ETOWANUM*	ALABAMA HOG SUCKER		G5	S3		
3	Fish	*ICTIOBUS NIGER*	BLACK BUFFALO		G5	S3		
3	Fish	*LYTHRURUS FASCIOLARIS*	ROSEFIN SHINER		G5	S2S3		
3	Fish	*MOXOSTOMA ERYTHRURUM*	GOLDEN REDHORSE		G5	S3		
3	Fish	*NOTROPIS SABINAE*	SABINE SHINER		G3	S3		
3	Fish	*PERCINA KATHAE*	MOBILE LOGPERCH		G4	S3		
3	Fish	*POLYODON SPATHULA*	PADDLEFISH		G4	S3		
3	Fish	*STIZOSTEDION CANADENSE*	SAUGER		G5	S3		
3	Fish	*STIZOSTEDION VITREUM*	WALLEYE		G5	S2?		
4	Fish	*AMBLOPLITES RUPESTRIS*	ROCK BASS		G5	SH		
4	Fish	*AMMOCRYPTA CLARA*	WESTERN SAND DARTER		G3	SH		
4	Fish	*LEPTOLUCANIA OMMATA*	PYGMY KILLIFISH		G5	SH		
4	Fish	*MACRHYBOPSIS GELIDA*	STURGEON CHUB		G3	SH		
4	Fish	*MACRHYBOPSIS MEEKI*	SICKLEFIN CHUB		G3	SH		
4	Fish	*NOTURUS EXILIS*	SLENDER MADTOM		G5	SH		LE
4	Fish	*PLATYGOBIO GRACILIS*	FLATHEAD CHUB		G5	SH		
1	**Mammals**	*MYOTIS AUSTRORIPARIUS*	SOUTHEASTERN MYOTIS		G3G4	S1S2		
1	Mammals	*URSUS AMERICANUS LUTEOLUS*	LOUISIANA BLACK BEAR		G5T2	S1	LT	LE
2	Mammals	*CORYNORHINUS RAFINESQUII*	RAFINESQUE'S BIG-EARED BAT		G3G4	S3		
2	Mammals	*LASIURUS CINEREUS*	HOARY BAT		G5	S3	(PS)	

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Mammals	*LASIURUS INTERMEDIUS*	NORTHERN YELLOW BAT	G4G5	S2?		
2	Mammals	*MYOTIS GRISESCENS*	GRAY MYOTIS	G3	S1	LE	LE
2	Mammals	*MYOTIS LUCIFUGUS*	LITTLE BROWN MYOTIS	G5	S3		
2	Mammals	*MYOTIS SEPTENTRIONALIS*	NORTHERN MYOTIS	G4	S2?		
2	Mammals	*PEROMYSCUS POLIONOTUS*	OLDFIELD MOUSE	G5	S2S3	(PS)	
2	Mammals	*SPILOGALE PUTORIUS*	EASTERN SPOTTED SKUNK	G5	S2?		
2	Mammals	*TRICHECHUS MANATUS*	MANATEE	G2	SZ	LE	LE
2	Mammals	*URSUS AMERICANUS*	BLACK BEAR	G5	S1	(PS)	LE
2	Mammals	*ZAPUS HUDSONIUS*	MEADOW JUMPING MOUSE	G5	S1	(PS)	
3	Mammals	*MUSTELA FRENATA*	LONG-TAILED WEASEL	G5	S?		
4	Mammals	*LASIONYCTERIS NOCTIVAGANS*	SILVER-HAIRED BAT	G5	SA?		
4	Mammals	*MYOTIS SODALIS*	INDIANA OR SOCIAL MYOTIS	G2	SAN	LE	LE
4	Mammals	*PUMA CONCOLOR CORYI*	FLORIDA PANTHER	G5T1	SX	LE	LE
1	**Mussels**	*ACTINONAIAS LIGAMENTINA*	MUCKET	G5	S1		LE
1	Mussels	*CYCLONAIAS TUBERCULATA*	PURPLE WARTYBACK	G5	S1		LE
1	Mussels	*ELLIPTIO ARCA*	ALABAMA SPIKE	G3Q	S1S2		
1	Mussels	*ELLIPTIO ARCTATA*	DELICATE SPIKE	G3G4	S1		LE
1	Mussels	*ELLIPTIO DILATATA*	SPIKE	G5	S1		LE
1	Mussels	*EPIOBLASMA BREVIDENS*	CUMBERLANDIAN COMBSHELL	G1	S1	LE,XN	LE
1	Mussels	*EPIOBLASMA PENITA*	SOUTHERN COMBSHELL	G1	S1	LE	LE
1	Mussels	*EPIOBLASMA TRIQUETRA*	SNUFFBOX	G3	S1		LE
1	Mussels	*FUSCONAIA BARNESIANA*	TENNESSEE PIGTOE	G2G3	S1		
1	Mussels	*LAMPSILIS HYDIANA*	LOUISIANA FATMUCKET	G4	S2?		
1	Mussels	*LAMPSILIS PEROVALIS*	ORANGE-NACRE MUCKET	G2	S1	LT	LE

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
1	Mussels	*LASMIGONA COMPLANATA ALABAMENSIS*	ALABAMA HEELSPLITTER	G5T2T3	S2		
1	Mussels	*LEXINGTONIA DOLABELLOIDES*	SLABSIDE PEARLYMUSSEL	G2	S1	C	LE
1	Mussels	*LIGUMIA RECTA*	BLACK SANDSHELL	G5	S1		
1	Mussels	*MEDIONIDUS ACUTISSIMUS*	ALABAMA MOCCASINSHELL	G1	S1	LT	LE
1	Mussels	*OBOVARIA JACKSONIANA*	SOUTHERN HICKORYNUT	G1G2	S1		
1	Mussels	*OBOVARIA UNICOLOR*	ALABAMA HICKORYNUT	G3	S1S2		
1	Mussels	*PLETHOBASUS CYPHYUS*	SHEEPNOSE	G3	S1		LE
1	Mussels	*PLEUROBEMA DECISUM*	SOUTHERN CLUBSHELL	G1G2	S1	LE	LE
1	Mussels	*PLEUROBEMA PEROVATUM*	OVATE CLUBSHELL	G1	S1	LE	LE
1	Mussels	*PLEUROBEMA RUBRUM*	PYRAMID PIGTOE	G2	S1		LE
1	Mussels	*POTAMILUS CAPAX*	FAT POCKETBOOK	G1	S1	LE	LE
1	Mussels	*QUADRULA CYLINDRICA CYLINDRICA*	RABBITSFOOT	G3T3	S1		LE
1	Mussels	*STROPHITUS CONNASAUGAENSIS*	ALABAMA CREEKMUSSEL	G3	S1		
2	Mussels	*ANODONTOIDES RADIATUS*	RAYED CREEKSHELL	G3	S2		
2	Mussels	*ARCIDENS CONFRAGOSUS*	ROCK POCKETBOOK	G4	S2S3		
2	Mussels	*ELLIPSARIA LINEOLATA*	BUTTERFLY	G4	S2S3		
2	Mussels	*LAMPSILIS CARDIUM*	PLAIN POCKETBOOK	G5	S3		
2	Mussels	*LAMPSILIS STRAMINEA STRAMINEA*	ROUGH FATMUCKET	G5T3	S2		
2	Mussels	*PLEUROBEMA BEADLEIANUM*	MISSISSIPPI PIGTOE	G2G3	S3?		
2	Mussels	*QUADRULA NODULATA*	WARTYBACK	G4	S3		
2	Mussels	*QUADRULA RUMPHIANA*	RIDGED MAPLELEAF	G3	S2		
2	Mussels	*STROPHITUS SUBVEXUS*	SOUTHERN CREEKMUSSEL	G3	S2		
2	Mussels	*STROPHITUS UNDULATUS*	SQUAWFOOT	G5	S1		

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Mussels	*UNIOMERUS CAROLINIANA*	FLORIDA PONDHORN	G4	S2		
2	Mussels	*UNIOMERUS DECLIVIS*	TAPERED PONDHORN	G5	S2S3		
3	Mussels	*LAMPSILIS SILIQUOIDEA*	FATMUCKET	G5	S3		
3	Mussels	*LASMIGONA COMPLANATA COMPLANATA*	WHITE HEELSPLITTER	G5T5	S3		
3	Mussels	*POTAMILUS ALATUS*	PINK HEELSPLITTER	G5	S2		
3	Mussels	*PTYCHOBRANCHUS FASCIOLARIS*	KIDNEYSHELL	G4G5	S1		LE
3	Mussels	*TRUNCILLA TRUNCATA*	DEERTOE	G5	S3		
4	Mussels	*CYPROGENIA ABERTI*	WESTERN FANSHELL	G2	SH		
4	Mussels	*MEDIONIDUS MCGLAMERIAE*	TOMBIGBEE MOCCASINSHELL	GXQ	SX		
4	Mussels	*PLEUROBEMA CURTUM*	BLACK CLUBSHELL	G1	SX	LE	LE
4	Mussels	*PLEUROBEMA MARSHALLI*	FLAT PIGTOE	GH	SX	LE	LE
4	Mussels	*PLEUROBEMA TAITIANUM*	HEAVY PIGTOE	G1	SX	LE	LE
4	Mussels	*POTAMILUS INFLATUS*	INFLATED HEELSPLITTER	G1	SH	LT	LE
4	Mussels	*QUADRULA METANEVRA*	MONKEYFACE	G4	SH		LE
4	Mussels	*QUADRULA STAPES*	STIRRUPSHELL	GH	SX	LE	LE
1	**Reptiles**	*LEPIDOCHELYS KEMPII*	KEMP'S OR ATLANTIC RIDLEY	G1	S1N	LE	LE
1	Reptiles	*OPHISAURUS MIMICUS*	MIMIC GLASS LIZARD	G3	S1?		
1	Reptiles	*PITUOPHIS MELANOLEUCUS LODINGI*	BLACK PINE SNAKE	G4T3	S2	C	LE
1	Reptiles	*PSEUDEMYS ALABAMENSIS*	ALABAMA REDBELLY TURTLE	G1	S1	LE	LE
1	Reptiles	*RHADINAEA FLAVILATA*	PINE WOODS SNAKE	G4	S2S3		
2	Reptiles	*CARETTA CARETTA*	LOGGERHEAD; CABEZON	G3	S1B,SZN	LT	LE
2	Reptiles	*CROTALUS ADAMANTEUS*	EASTERN DIAMONDBACK RATTLESNAKE	G4	S3S4		
2	Reptiles	*EUMECES ANTHRACINUS PLUVIALIS*	SOUTHERN COAL SKINK	G5T5	S2S3		
2	Reptiles	*FARANCIA ERYTROGRAMMA*	RAINBOW SNAKE	G5	S2		LE

TIER*	GROUP NAME	*SCIENTIFIC NAME*	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
2	Reptiles	*GOPHERUS POLYPHEMUS*	GOPHER TORTOISE	G3	S2	PS:LT	LE
2	Reptiles	*GRAPTEMYS FLAVIMACULATA*	YELLOW-BLOTCHED MAP TURTLE	G2	S2	LT	LE
2	Reptiles	*GRAPTEMYS GIBBONSI*	PASCAGOULA MAP TURTLE	G3G4	S3		
2	Reptiles	*GRAPTEMYS NIGRINODA*	BLACK-KNOBBED MAP TURTLE	G3	S2		LE
2	Reptiles	*GRAPTEMYS OCULIFERA*	RINGED MAP TURTLE	G2	S2	LT	LE
2	Reptiles	*GRAPTEMYS PULCHRA*	ALABAMA MAP TURTLE	G4	S2S3		
2	Reptiles	*LAMPROPELTIS CALLIGASTER CALLIGASTER*	PRAIRIE KINGSNAKE	G5T5	S3S4		
2	Reptiles	*LAMPROPELTIS CALLIGASTER RHOMBOMACULATA*	MOLE KINGSNAKE	G5T5	S2		
2	Reptiles	*LAMPROPELTIS TRIANGULUM SYSPILA*	RED MILK SNAKE	G5T5	S3		
2	Reptiles	*MACROCHELYS TEMMINCKII*	ALLIGATOR SNAPPING TURTLE	G3G4	S3		
2	Reptiles	*MALACLEMYS TERRAPIN PILEATA*	MISSISSIPPI DIAMONDBACK TERRAPIN	G4T3	S2		
2	Reptiles	*MICRURUS FULVIUS*	EASTERN CORAL SNAKE	G5	S3S4		
2	Reptiles	*NERODIA CLARKII CLARKII*	GULF SALT MARSH SNAKE	G4T3	S2		
2	Reptiles	*OPHISAURUS ATTENUATUS*	SLENDER GLASS LIZARD	G5	S2S3		
2	Reptiles	*REGINA RIGIDA DELTAE*	DELTA CRAYFISH SNAKE	G5T3T4Q	S2		
2	Reptiles	*REGINA SEPTEMVITTATA*	QUEEN SNAKE	G5	S2S3		
3	Reptiles	*CHELONIA MYDAS*	GREEN TURTLE	G3	SZN	LE,LT	LE
3	Reptiles	*DEIROCHELYS RETICULARIA MIARIA*	WESTERN CHICKEN TURTLE	G5T5	SU		
3	Reptiles	*DERMOCHELYS CORIACEA*	LEATHERBACK; TINGLAR	G2	SZN	LE	LE
3	Reptiles	*LAMPROPELTIS GETULA NIGRA*	BLACK KINGSNAKE	G5T5	S3		
3	Reptiles	*MASTICOPHIS FLAGELLUM*	EASTERN COACHWHIP	G5	S3S4		
3	Reptiles	*PITUOPHIS MELANOLEUCUS MELANOLEUCUS*	NORTHERN PINE SNAKE	G4T4	SR		
3	Reptiles	*REGINA RIGIDA SINICOLA*	GULF CRAYFISH SNAKE	G5T5	S3		
4	Reptiles	*DRYMARCHON COUPERI*	EASTERN INDIGO SNAKE	G3	SH	LT	LE
4	Reptiles	*ERETMOCHELYS IMBRICATA*	HAWKSBILL; CAREY	G3	SZN	LE	LE
4	Reptiles	*HETERODON SIMUS*	SOUTHERN HOGNOSE SNAKE	G2	SX		LE

Part 6. Classifying and Ranking Wildlife Habitats in Mississippi

A required element of the CWCS process was to produce "descriptions of locations and relative condition of key habitats and ecological community types essential to conservation of species identified" as SGCN. To address this element, experts identified and prioritized the habitats and ecological communities for potential SGCN through the survey instrument found in Appendix III. Associating SGCN to their habitats and communities guided the process of prioritizing conservation actions to be taken. Targeting key habitats for conservation actions is often an effective way to ensure long-term survival of many SGCN. Prioritizing and implementing actions that protect, conserve or enhance habitats or communities shared by multiple SGCN should increase return on investments.

Habitat is defined as *the specific place(s) where a particular plant or animal lives.* It is usually used in a much more restricted sense than environment and refers to a smaller area; e.g. "spring brook, tree top, weedy pond and sandy beach." Habitat types, as defined by physical parameters, encapsulate unique environments that generally support particular biotic associations, also referred to as **ecological communities**. Organisms that survive in these groups are those that are most "fit" to live within the constraints of the environmental factors at hand. Competitive exclusion may occur within the suite of habitat occupants. The biotic association is the composite of species that have adapted to the habitat type and thus are considered to be associated to a particular set of environmental parameters. However, the spatial boundaries between ecological communities are often difficult to establish due to the gradual changes in environmental characteristics and species composition and the imperfect correlation of species to these environmental parameters.

A **community** is *collectively, all of the organisms inhabiting a common environment and interacting with each other* and is used with a wide variety of implications by different ecologists; some include only the living organisms within the concept; others maintain that the living organisms cannot be separated from their inanimate surroundings and must include both of these major aspects. This term is also variously used with reference to very small to very large units.

The terms habitat and ecological community have different, but overlapping meanings. Guidelines for this CWCS require a focus on wildlife (animal) conservation. We proposed the list of habitat types and subtypes listed within their respective ecoregions (see Chapter III for ecoregion descriptions) as units to

consider for wildlife conservation. These units are based primarily on physical features and/or plant assemblages and are considered communities when animal assemblages are attributed to them. We have attempted to use recognizable, "standard" terms when referring to these habitats to be consistent with other planning efforts.

Environmental attributes such as water, soil type and the structure and composition of vegetation not only help define habitat types and their importance and usage by species, but also strongly influence community structure. Typically the change from one ecological community type to another occurs as environmental characteristics change to the extent that a large number of species drop out of an assemblage. Species composition is associated with environmental attributes of a community. Community composition may also change due to management treatments unrelated to habitat that favor some species over others.

HABITAT CONDITION

Management practices and the history of disturbance are important factors that affect the types and conditions of wildlife habitats. Returning Mississippi to conditions occurring prior to European settlement is not a goal of this strategy, nor is it possible. Little has been written about conditions of the Central Gulf Coastal Plain prior to European settlement. We do not know, with any real confidence what those conditions were and human activity over the past 200 years has dramatically altered the natural landscape. However, understanding the conditions for which wildlife species are adapted and changes that have occurred to the landscape allow us to better understand why some species have declined. This is useful when planning and implementing habitat-based actions to alleviate problems. Often one must approximate historical conditions to help understand species composition today.

Evidence suggests that the state was once covered with mostly unbroken stands of deciduous, mixed pine-hardwood and evergreen forests. As a result of naturally occurring fires and fires used by Native Americans as a management tool, these forests were composed of large well-spaced trees and supported an ample ground cover of herbs and shrubs.

Centuries of land clearing and development have changed Mississippi's natural landscape. Forests are now more fragmented and dense, with reduced tree diversity, age, species composition and size. Consequent to the changes in forest density and age, diversity and productivity of understory vegetation has likely been significantly reduced. In addition, numerous exotic species (terrestrial and aquatic), some of which are especially aggressive and detrimental to native species, have been introduced and some now thrive.

Pre-settlement aquatic systems were likely cooler, clearer and contained less nutrients and toxins than today. Stream channels were generally narrower, stable and meandering, with lower gradients and water velocities. Urbanization and modern agricultural practices have increased levels of nutrients and toxins,

and fewer high-quality wetlands are available to filter impurities, reduce runoff and recharge ground water supplies. Marsh and mud beach communities were once common along the coastline and submergent vegetation was a prominent feature of the Mississippi Sound.

Aquatic habitats have been greatly impacted by modern land use changes and channel modifications. Land clearing has resulted in increased rates of runoff, erosion, sedimentation and elevated water temperatures. Many stream channels have been dammed, dredged, desnagged or flanked with levees, all of which greatly alter stream habitats and reduce the frequency and duration of floodplain interaction with the stream. Channel modifications have caused headcutting (upstream migration of bed and bank erosion) resulting in wider and shallower streams. A significant portion of Mississippi's coastline has been converted to artificial sand beach and portions of the Mississippi Sound, river mouths and bays have been dredged for navigation channels.

Detailed descriptions of conditions are included in the description of habitat type and subtypes in Chapter IV, Part 3.

EFFECTS OF HABITAT CONDITION ON WILDLIFE

Habitat changes generally benefit some species while harming others. Habitat generalists are better able to tolerate changes than habitat specialists. Land use practices, such as conversion of mature forests to row crops or plantations, fire suppression, use of pesticides and herbicides, livestock grazing and stream channel modification have significant effects on terrestrial communities. Following disturbances, vegetation goes through phases of succession as plant species respond differently to changes in light exposure. Opportunistic, shade intolerant plants and plants with small or wind distributed seeds are more likely to colonize cleared areas. Shade tolerant species are more likely to reproduce and dominate more established stands. Birds and mammals aid in the distribution of seeds also. Animal species composition will not only be influenced by the disturbance event, but also by the phases of plant community succession. Effective management of disturbed and successional habitats is necessary to minimize effects on less tolerate species while providing more benefits to those that may take advantage of these conditions.

Many factors impact freshwater and marine communities. Changes in water chemistry, nutrient levels, sediment load, channel shape or bank vegetation all contribute to species diversity and composition. Changes and their effects on species may be direct, localized and apparent. However any alteration within a watershed may have far-reaching impacts downstream, or even upstream in the case of headcutting. Duration and extent of alterations are also important factors in determining effects. Impacts of indirect or short-term events can be significant but sometimes may be difficult to link to the sources.

In spite of environmental changes that have occurred and their effects on species assemblages, many communities remain relatively intact and functional or have the potential for recovery or increased functionality. A positive result can occur by implementing actions to more effectively manage, protect and conserve habitats while promoting compatible human use of lands.

CLASSIFYING AND RANKING WILDLIFE HABITATS IN MISSISSIPPI

The state's NHP *Ecological Community List* was simplified and used in the CWCS to expedite the process of associating SGCN with their habitats and communities. The NHP list is holistic and ecologically based. Terrestrial habitats are typically classified by a combination of the dominant vegetation cover and moisture availability. Aquatic habitats are primarily classified by ecoregion, stream size and/or drainage, differences in soil type and topography. The National Wetlands Inventory (NWI) provides a basic classification technique for all types of wetlands found throughout the United States. Later modifications to the NWI System were designed to make the levels of the classification hierarchy more consistent and applicable to marine environments. The major categories of this classification are system (marine and estuarine types), subsystem (intertidal and subtidal), class (substrate type), subclass (exposure/energy levels), and modifiers (i.e. water depth, salinity, etc.). The NHP list includes 159 natural, semi-natural, managed, weedy and probable subtypes which have been assigned conservation priority ranks indicating their relative endangerment or abundance (See Appendix XII for information on interpreting those ranks).

The primary factors the NHP uses for assessing community status are the total number of occurrences (e.g., forest stands) and the total acreage occupied by the community. Secondary factors include the geographic range over which the community occurs, threats and the integrity of the occurrences. Because detailed information on these factors may not be available, especially for poorly understood communities, preliminary assessments are often based on the following: geographic range over which the community occurs; long-term trends across this range; short-term trends (i.e., threats); degree of site/ environmental specificity exhibited by the community; and imperilment or rarity across the range.

For the purposes of this CWCS, the 159 ecological community types used in the NHP were combined into 17 broad habitat types and 64 subtypes. The table on the next page lists the CWCS habitats which are generally organized on the basis of land type, vegetation and the availability of moisture. Within the 17 habitat types, 64 subtypes were further defined by factors affecting natural communities such as: soil type, water availability, vegetation, water chemistry, region and stream size. The ecoregions in which these types and subtypes are located are also listed in the following table.

To aid the reader a table providing a crosswalk of the NHP ecological community types with the CWCS habitat types and subtypes is included in Appendix XI.

WILDLIFE HABITAT TYPES AND SUBTYPES OF MISSISSIPPI

Ecoregions* ■ **NGM** - Northern Gulf of Mexico ■ **UEGCP** - Upper East Gulf Coastal Plain
■ **EGCP** - East Gulf Coastal Plain ■ **MSRAP** - Mississippi River Alluvial Plain

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS			
		NGM*	EGCP*	UEGCP*	MSRAP*
1	**Dry-Mesic Upland Forests/Woodlands**		▲	▲	
1.1	Dry Hardwood Forests		▲	▲	
1.2	Dry Longleaf Pine Forests		▲	▲	
1.3	Dry-Mesic Hardwood Forests		▲	▲	
1.4	Dry-Mesic Shortleaf/Loblolly Pine Forests		▲	▲	
2	**Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations**		▲	▲	▲
2.1	Northeast Prairie/Cedar Glades			▲	
2.2	Jackson Prairie		▲	▲	
2.3	Hay and Pasture Lands		▲	▲	▲
2.4	Pine Plantations		▲	▲	
2.5	Old Fields and Young Hardwoods (Shrublands)		▲	▲	▲
2.6	Agriculture Fields (Row Crops, etc.)		▲	▲	▲
3	**Mesic Upland Forests**		▲	▲	
3.1	Beech/Magnolia Forests		▲	▲	
3.2	Mesic Longleaf Pine Savanna/Forests		▲	▲	
3.3	Loess Hardwood Forests		▲	▲	
3.4	Lower Slope/High Terrace Hardwood Forests		▲	▲	
4	**Bottomland Hardwood Forests**		▲	▲	▲
4.1	Bottomland Hardwood Forests		▲	▲	▲
5	**Riverfront Forests/Herblands/Sandbars**		▲	▲	▲
5.1	Cottonwood/Black Willow/River Birch Woodlands		▲	▲	▲
5.2	Sandbars		▲	▲	▲
6	**Wet Pine Savannas/Flatwoods**		▲		
6.1	Wet Pine Savannas		▲		
6.2	Slash Pine Flatwoods		▲		
7	**Spring Seeps**		▲	▲	
7.1	Hardwood Seeps		▲	▲	
7.2	Pine Seeps		▲	▲	
8	**Bogs**		▲	▲	
8.1	Pitcherplant Flat/Bogs		▲	▲	
9	**Inland Freshwater Marshes**		▲	▲	▲
9.1	Freshwater Marshes		▲	▲	▲
10	**Swamp Forests**		▲	▲	▲
10.1	Bald Cypress/Gum Swamp Forests		▲	▲	▲
10.2	Small Stream Swamp Forests		▲	▲	

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS			
11	**Lacustrine (Lentic) Communities**	**NGM***	**EGCP***	**UEGCP***	**MSRAP***
11.1	Oxbow Lakes		▲	▲	▲
11.2	Reservoirs		▲	▲	▲
11.3	Artificial Ponds		▲	▲	▲
11.4	Ephemeral (Temporary) Ponds		▲	▲	▲
11.5	Beaver Ponds		▲	▲	▲
12	**Streams (Lotic Communities)**	▲	▲	▲	▲
12.1	**Mississippi River**				▲
12.2	**Northeast Hills, Tennessee River Drainage**			▲	
12.2.a	Northeast Hills Small Streams			▲	
12.2.b	Northeast Hills Medium Streams			▲	
12.3	**Tombigbee Drainage**			▲	
12.3.a	Tombigbee Small Streams			▲	
12.3.b	Tombigbee Medium Streams			▲	
12.3.c	Tombigbee Large Streams			▲	
12.4	**Lower Mississippi North Drainage (LMND) Hatchie and Wolf Systems**			▲	
12.4.a	LMND Small Streams			▲	
12.4.b	LMND Medium Streams			▲	
12.5	**Upper Coastal Plain, Yazoo Drainage**			▲	
12.5.a	Yazoo Small Streams			▲	
12.5.b	Yazoo Loess Hills Streams			▲	
12.5.c	Yazoo Medium Streams			▲	
12.5.d	Yazoo Large Streams			▲	
12.6	**Big Black River Drainage**			▲	
12.6.a	Big Black Small Streams			▲	
12.6.b	Big Black Loess Hills Streams			▲	
12.6.c	Big Black Medium Streams			▲	
12.6.d	Big Black Large Streams			▲	
12.7	**Upper Coastal Plain, Pearl River Drainage**			▲	
12.7.a	Pearl River Small Streams			▲	
12.7.b	Pearl River Medium Streams			▲	
12.7.c	Pearl River Large Streams			▲	
12.8	**Mississippi Alluvial Plain (MAP)**				▲
12.8.a	MAP Small Streams				▲
12.8.b	MAP Medium Streams				▲
12.8.c	MAP Large Streams				▲
12.9	**Lower Coastal Plain, Pearl Drainage**	▲	▲		
12.9.a	Pearl Small Streams		▲		
12.9.b	Pearl Small Blackwater Streams		▲		
12.9.c	Pearl Medium Streams		▲		
12.9.d	Pearl Medium Blackwater Streams		▲		
12.9.e	Pearl Large Streams	▲	▲		
12.10	**Pascagoula Drainage**		▲	▲	
12.10.a	Pascagoula Small Streams		▲	▲	

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS			
		NGM*	EGCP*	UEGCP*	MSRAP*
12.10.b	Pascagoula Small Blackwater Streams		▲		
12.10.c	Pascagoula Medium Streams		▲	▲	
12.10.d	Pascagoula Medium Blackwater Streams		▲		
12.10.e	Pascagoula Large Streams	▲	▲	▲	
12.11	**Coastal Rivers Drainage**	▲	▲		
12.11.a	Coastal Small Blackwater Streams		▲		
12.11.b	Coastal Medium Blackwater Streams	▲	▲		
12.12	**Lake Ponchartrain Drainage**		▲		
12.12.a	Lake Ponchartrain Small Streams		▲		
12.12.b	Lake Ponchartrain Small Blackwater Streams		▲		
12.12.c	Lake Ponchartrain Medium Streams		▲		
12.12.d	Lake Ponchartrain Medium Blackwater Streams		▲		
12.12.e	Lake Ponchartrain Large Streams		▲		
12.13	**Lower Mississippi South Drainage**		▲	▲	
12.13.a	Lower Mississippi South Drainage Small Streams		▲	▲	
12.13.b	Lower Mississippi South Drainage Medium Streams		▲	▲	
12.13.c	Lower Mississippi South Drainage Large Streams		▲	▲	
13	**Upland Maritime and Estuarine Fringe Habitats**	▲			
13.1	Barrier Island Uplands	▲			
13.2	Man-Made Beaches	▲			
13.3	Barrier Island Wetlands	▲			
13.4	Mainland Beaches	▲			
13.5	Barrier Island Beaches	▲			
13.6	Shell Middens and Estuarine Shrublands	▲			
13.7	Maritime Woodlands	▲			
14	**Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)**	▲			
14.1	Estuarine Bays, Lakes and Tidal Streams	▲			
14.2	Mississippi Sound	▲			
14.3	Estuarine Marshes	▲			
14.4	Barrier Island Passes	▲			
14.5	Salt Pannes	▲			
14.6	Seagrass Beds	▲			
14.7	Mollusk Reefs	▲			
15	**Marine Habitats (Outside Barrier Islands)**	▲			
15.1	Marine Habitats (Smooth Bottoms)	▲			
15.2	Hard Bottoms and Oceanic Reefs	▲			
15.3	Artificial Reefs	▲			
16	**Urban and Suburban Lands**	▲	▲	▲	▲
16.1	Urban and Suburban Lands	▲	▲	▲	▲
16.2	Buildings, Bridges, Overpasses, etc.	▲	▲	▲	▲
17	**Miscellaneous (Rock Outcrops, Caves)**		▲	▲	
17.1	Rock Outcrops		▲	▲	
17.2	Caves		▲	▲	

RANKING HABITATS

Each subtype received a score called a **Value to SGCN.** These Values were derived from the number and Tier level of SGCN associated with each subtype (see description of Tiers in *Criteria for Selecting and Prioritizing SGCN* in Chapter II). They indicate the relative importance of various habitat subtypes to SGCN and provide guidance in predicting where actions will benefit more and/or higher tier SGCN. Values are most useful when comparing related habitat subtypes. Three major complexes of related habitat subtypes have been identified for value comparisons. **These complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe**. Values for subtypes within each complex are provided in Appendix X and again in each subtype's description in Chapter IV.

Gastropods, insects and marine fishes were deemed insufficiently known to warrant status evaluations comparable to evaluations of vertebrates, mussels and crayfish and did not contribute to the subtype value determinations. Therefore the Values to SGCN attributed to some subtypes are lower than expected. Lower than expected Values related to lack of information are most apparent in some marine habitat subtypes. Additional work must be performed to include species from underrepresented groups in future iterations of this strategy.

Since Value to SGCN is derived from the number and Tier level of the species attributed to a habitat subtype, it does not in all instances indicate rarity or level of threat to a subtype. It may be important to consider rarity ranks assigned by NHP or other indications of value when assessing conservation need and implementing actions. Thus, a discussion of the rarity rank, called Conservation Status from NatureServe, is included in the description of each subtype in Chapter IV. Some SGCN are restricted to subtypes with relatively low values that may not benefit or could be negatively affected by conflicting actions performed in subtypes with higher values. Values are not an indication of the type of actions recommended. Recommended conservation actions will vary for each habitat subtype.

The Value was determined by taking list of species for each subtype and their Tier and assigning a weighted value to the Tier Level. Thus, species in Tier 1 received a Value of 4 (the inverse of the Tier); Tier 2 species received a Value of 3, and so on.

EXAMPLE OF HOW VALUE TO SGCN WAS DETERMINED FOR 1.1 DRY HARDWOOD FORESTS

SCIENTIFIC & COMMON NAME	VALUE TO SGCN	TIER
THRYOMANES BEWICKII (BEWICK'S WREN)	4	1
DENDROICA CERULEA (CERULEAN WARBLER)	3	2
CAPRIMULGUS CAROLINENSIS (CHUCK-WILL'S-WIDOW)	2	3
DENDROICA DISCOLOR (PRAIRIE WARBLER)	2	3
HELMITHEROS VERMIVORUS (WORM-EATING WARBLER)	2	3
HYLOCICHLA MUSTELINA (WOOD THRUSH)	2	3
PIRANGA OLIVACEA (SCARLET TANAGER)	2	3
URSUS AMERICANUS LUTEOLUS (LOUISIANA BLACK BEAR)	4	1
LASIURUS CINEREUS (HOARY BAT)	3	2
LASIURUS INTERMEDIUS (NORTHERN YELLOW BAT)	3	2
MYOTIS LUCIFUGUS (LITTLE BROWN MYOTIS)	3	2
MYOTIS SEPTENTRIONALIS (NORTHERN MYOTIS)	3	2
PEROMYSCUS POLIONOTUS (OLDFIELD MOUSE)	3	2
SPILOGALE PUTORIUS (EASTERN SPOTTED SKUNK)	3	2
URSUS AMERICANUS (BLACK BEAR)	3	2
LASIONYCTERIS NOCTIVAGANS (SILVER-HAIRED BAT)	1	4
MYOTIS SODALIS (INDIANA OR SOCIAL MYOTIS)	1	4
PITUOPHIS MELANOLEUCUS LODINGI (BLACK PINE SNAKE)	4	1
CROTALUS ADAMANTEUS (EASTERN DIAMONDBACK RATTLESNAKE)	3	2
GOPHERUS POLYPHEMUS (GOPHER TORTOISE)	3	2
LAMPROPELTIS CALLIGASTER CALLIGASTER (PRAIRIE KINGSNAKE)	3	2
LAMPROPELTIS CALLIGASTER RHOMBOMACULATA (MOLE KINGSNAKE)	3	2
MICRURUS FULVIUS (EASTERN CORAL SNAKE)	3	2
OPHISAURUS ATTENUATUS (SLENDER GLASS LIZARD)	3	2
MASTICOPHIS FLAGELLUM (EASTERN COACHWHIP)	2	3
PITUOPHIS MELANOLEUCUS MELANOLEUCUS (NORTHERN PINE SNAKE)	2	3
TOTAL VALUE OF DRY HARDWOOD FORESTS TO SGCN	**70**	

7. Identifying Threats and Conservation Actions for Species and their Habitats

7A. IDENTIFYING THREATS

The third element required by Congress in the development of this strategy involves the description of problems which may adversely affect SGCN or their habitats. There are several different approaches noted in the literature, but most rely on identification of "stresses" or "threats" and/or "sources of stress" in the environment. To develop a list of potential problems or threats to wildlife and wildlife habitats in Mississippi, the Technical Committee adapted the *Proposed Taxonomy of Direct Threats* developed by the Conservation Measures Partnership in 2004 for describing categories of threats. These threat categories were used in the survey, *Evaluation of Species of Greatest Conservation Need in Mississippi* (Appendix III), to aid in identifying major problems affecting SGCN. The results of the survey were compiled and presented to the members of the Advisory Committee, who reviewed and revised the threats list by habitat subtype during working group meetings in March through May 2005 and were posted for public review and comment in June 2005. Other conservation plans such as TNC's *Conservation Area Plans* for the Pascagoula River and the Pearl River were also consulted and used to identify threats and potential conservation strategies.

The Technical Committee also assigned a high, medium or low rank to the identified threats to aid in determining the most critical problems for each identified habitat subtype and to facilitate identifying priority conservation actions. The assignment of ranks to these threats, while subjective, is a first attempt to identify the magnitude of the threat. As additional planning and analysis of priority conservation areas is developed in the future, a more detailed threats analysis using national conventions for measuring threats is recommended.

Mississippi's landscape has changed dramatically since European settlement. There are almost no places left that have not been affected by man. Urbanization, agriculture, fencing, dams and stream channelization, commercial forestry and many other actions have modified wildlife and fisheries habitat and many of these land use changes have come at a great cost to wildlife. It is not our intent to debate the benefits and detriments of land use changes and historical activities on Mississippi's landscape. We must rather take a meaningful look at the landscapes and habitats as they exist today and to develop plans on how best to make improvements that benefit fish and wildlife, particularly those SGCN. MDWFP recognizes that many problems or threats defined herein are based on legal and accepted practices. Thus, the threats identified are meant to include those practices harmful to wildlife and it should be understood that the manner in which a human activity or practice is conducted determines if it has a negative, neutral or positive effect on wildlife populations.

The threats may be historic, current or potential. For example, conversion of natural forest stands to agricultural uses in Mississippi represents an impact that is mostly historic. Little conversion occurs today, but it is important to demonstrate that wildlife populations have been affected by these past land uses when trying to develop a long-range conservation strategy that considers potential recovery for species using those forests habitats.

The following is a list and description of the 23 general threat categories used for Mississippi's CWCS. A list of ranked threats for each habitat subtype can be found in Chapter IV.

A. Agricultural Conversion

Includes conversion of natural habitats to anthropogenic habitats managed for crops or horticulture, where land has lost its ability to support species which were original inhabitants. Involves removal of native vegetation, site preparation and planting of non-native vegetation. Results in habitat destruction and may impact water quality.

B. Air-borne Pollutants

Includes acid deposition from the atmosphere (wet and dry) and other air-borne pollutants or nutrients. Acidified rainfall generally has a pH lower than 5.5. It is typically, but not exclusively, related to aerosols, volatile compounds and semi-liquid pollutants. Impacts include acidifying aquatic systems, impairing plants' ability to evaporate water and exchange gases, nutrient leaching and toxic accumulation in soil.

C. Altered Fire Regime

Includes fire exclusion, fire suppression, alteration of habitats through unnatural timing, frequency or intensity of prescribed burns and other incompatible fire management practices. Fire regimes are affected by altered community composition (e.g. increase of non-pyric species such as oak) and habitat fragmentation. Fire is an important ecological process that drives many of the terrestrial habitats in Mississippi.

D. Channel Modification

Includes construction and use of ditches, levees, dikes and drainage tiles, flow diversion, dredging, channelization, filling of wetlands and headwater streams, destabilization of streambanks or channels, head-cutting, and other alterations to stream morphology. Results in degradation or destruction of aquatic and wetland habitat. Also called altered hydrology.

E. Conversion to Pasture

Includes conversion of natural habitats such as prairies or forested habitats to anthropogenic habitats managed for hay and pasture by removing the native vegetation, site preparation, planting and maintaining non-native species. Results in habitat destruction or fragmentation and may impact water quality.

F. Forestry Conversion

Includes conversion of natural forest habitats to anthropogenic habits managed for silviculture. Native vegetation is removed, the site is prepared and replanted with off-site or non-native species, often in a row-crop monoculture-type method primarily for commercial timber. Results in habitat destruction and/ or fragmentation.

G. Ground Water and Surface Water Withdrawal

Includes excessive direct groundwater and surface water withdrawals for agriculture, industrial and municipal water supplies. Excessive withdrawal can result in lowered water tables, diminished aquifer discharges and reductions in water available to sustain stream base flows, spring discharges, isolated wetlands, karst environments and seepage communities.

H. Incompatible Agricultural Practices

Includes agricultural practices that do not meet Best Management Practices (BMP) standards. These practices impact the environment well outside the actual agricultural operation through releases of excess nutrients, toxins or sediments. Includes practices that degrade stream or wetland habitat quality.

I. Incompatible Forestry Practices

Involves poor forestry BMP implementation and site management activities that result in altered structure and composition of adjacent natural habitats or degraded stream or wetland habitats. Examples include excessive chemical use, effects of harvesting equipment, bedding and excessively high stocking densities.

J. Incompatible Grazing Practices

Involves high, generally unsustainable rates of herbivory that intensively affect a species or entire natural communities. Usually attributed to domesticated herbivore management (cattle).

K. Over Exploitation/Incidental Capture

Includes commercial exploitation, poaching, by-catch and unscrupulous or excessive collecting of animals or plants by individual or corporate operators. Impacts may include mortality of individuals, population declines and changes in community composition.

L. Incompatible Resource Extraction Practices

Includes extraction of minerals, oil or gas or similar activities that result in the disturbance or destruction of natural habitats as well as secondary impacts such as sedimentation or releases of toxins. Includes surface, subsurface and instream activities. Impacts from construction and actual production may include increased sediment loads, contamination from leaks and spills, downstream scouring, habitat destruction and disturbance, fragmentation and creation of migration routes for invasive exotic species.

M. Incompatible Water Quality

Includes various forms of point and non-point source pollution, such as herbicides, pesticides, sediments, nutrient loading and thermal modifications that directly impact water quality. Sources are quite varied and include wastewater discharges, excessive soil disturbance near streams, increased permeable surface area resulting from development and loss of vegetation in riparian buffers.

N. Industrial Development

Includes development of structures and infrastructure (buildings and utilities) for commercial or industrial purposes, usually in an urban setting. Impacts include direct habitat destruction, fragmentation, altered thermal regimes and indirect pollution sources that alter water or air quality.

O. Invasive Species

Includes exotic species as well as native species that have become invasive due to past habitat alterations (e.g. hardwood encroachment of longleaf pine habitats following fire suppression). Can also refer to spread of native plant or animal species due to certain types of development, management or construction practices. Impacts include competition, hybridization and predation as well as long-term alteration of ecological systems and processes.

P. Livestock Feedlots/Operations

Includes all effects from the commercial raising of cattle, hogs, sheep, etc. Of primary concern are water quality issues resulting from runoff.

Q. Operation of Dams/Impoundments

Includes effects from the actual construction which increases sediment load and destroys terrestrial and stream habitat and the operation of dams and impoundments (agricultural ponds to large reservoirs) that directly affect stream flows and fragment aquatic habitat. Results in impacts to the impounded portion of the stream as well as habitats above and below the dam. Can reduce aquatic species ability to migrate or intermingle which may lead to loss of genetic diversity.

R. Recreation Activities

Includes unmanaged recreation such as recreational overuse, particularly by ATVs (all terrain vehicles), but also motorcycles, trucks, hiking, biking, caving, horseback riding, relic hunting, rock climbing and boating (including the use of personal watercraft such as jet skis) in sensitive areas or at rates considered unsustainable in the environments where they occur. Impacts may include habitat destruction and disturbance as well as impaired water quality and improper trash disposal.

S. Second Home/Vacation Home Development

Includes secondary home construction including resort homes in ecologically sensitive areas such as along streams and estuarine marshes, beaches and forests. Impacts may include habitat destruction, disturbance, fragmentation and introduction of invasive species.

T. Urban/Suburban Development
Includes primary home construction as well as development of associated infrastructure (e.g. subdivision roads and driveways, sewer and stormwater utilities). Impacts may include habitat destruction, disturbance, fragmentation and introduction of invasive species.

U. Road Construction
Includes development and management of roads and associated utility corridors that result in excessive releases of sediment and chemicals, or provide a vector for non-native species, as well as vegetation management practices that are environmentally "unfriendly" such as indiscriminant use of herbicides. Also can cause habitat fragmentation.

V. Head-cutting
A process caused by stream channel alteration that results in long stretches of stream erosion and bank destabilization which move progressively upstream. Most of these streams ultimately become broad, with shallow channels, unstable substrate and little or no canopy cover.

W. Miscellaneous Threats
Additional problems identified by the CWCS Expert Team, Advisory and/or Technical Committee that may be specific to certain habitat types. Examples are marine debris and excessive predation.

7B. IDENTIFYING CONSERVATION ACTIONS

For each threat identified as important to priority habitat types and subtypes for SGCN, the Expert Team, via the survey instrument, and Technical Committee developed a comprehensive list of conservation actions that would reduce the effect of the threat. The Advisory Committee members further refined the list of appropriate actions and added others. A list of priority conservation actions recommended for each habitat subtype and associated species of greatest conservation need is included in Chapter IV.

The following is the master list of 30 recommended conservation actions divided into four categories that were adapted from the Conservation Measures Partnership *Proposed Taxonomy of Conservation Actions.* Those categories are:

Education and Awareness
Habitat and Species Management
Planning and Policy
Research and Survey

As additional planning and analysis of priority conservation areas is developed for the state of Mississippi in the future, a more detailed list of conservation actions is needed that also defines potential partners for implementation and allows for quantitative measurement of results. Additional information about monitoring actions and research and survey needs which were identified by the Expert Team and Technical Committee are listed and discussed in Chapter V.

CODE	PRIORITY CONSERVATION ACTIONS	Education /Outreach	Habitat/Species Management	Planning/ Policy	Research/ Survey
A1	Plan and conduct additional **research** (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.				X
A2	Encourage and improve management of habitat by **controlled burning** at necessary frequencies and seasons.	X	X		
A3	Discourage/**limit human access** in highly critical areas and special habitats, when possible.	X	X		
A9	Develop/implement/continue **recovery plans** for individual SGCN.		X	X	
A10	Encourage **restoration and improved management of altered/degraded habitat** when possible.	X	X		
A12	Encourage and improve agricultural/forestry/watershed **land-use planning and BMPs** to address **nonpoint pollution, erosion and water quality issues.**			X	
A13	**Monitor/address SGCN harvest/over harvest issues** (including by catch or incidental take).			X	X
A15	Maintain/improve/restore **hydrologic** (depth, hydroperiod, flow) and **geomorphic** (channel sinuosity, floodplain, microtopography) integrity.		X		
A17	Discourage **incompatible forestry practices** such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X		
A20	Encourage buffers and improve land use practices adjacent to streams (**Streamside Management Zones**) and other aquatic/wetland habitats.	X	X		
A21	**Limit bulk-heading** along coastal drainages.			X	
A22	Encourage retention, preservation, and conservation of remaining natural habitat through **purchase, easements or MOAs.**		X		
A23	Initiate **propagation program or establish nest box program** for selected SGCN.		X		
A24	**Monitor/limit** commercial/residential/industrial **point source erosion and sedimentation or pollution** into streams/atmosphere.			X	
A28	Develop/improve urban/suburban/infrastructure **land use development planning/zoning** to address SGCN habitats.			X	
A29	**Prohibit gravel mining in stream channels, discourage gravel mining in floodplains** and improve oversight and planning for such mines on upland sites.			X	
A30	Improve **environmental review and permit process** and oversight and **enforcement of existing regulations** in important habitats/populations.			X	

A32	**Limit/discourage surface and ground water withdrawals** that are not sustainable and significantly alter flow, depth or salt intrusion.			X	
A36	Control exotic and invasive species (plant and animal).		X		
A37	Enhance viability of SGCN by **providing habitat corridors between disjunct populations or subpopulations**.		X		
A42	**Provide public education about conservation of SGCN** and/or their habitats.	X			
A44	Discourage **incompatible recreational uses**.	X			
A45	**Improve enforcement of existing species protection regulations**.			X	
A47	Continue to **restrict/monitor scientific collection** of SGCN.				X
A50	**Control/exclude predators** of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.		X		
A54	Promote and develop **landowner incentive and assistance programs** for conservation of SGCN and their habitats.	X		X	
A56	Encourage appreciation of SGCN and their habitats by providing **public access and compatible recreational activities.**	X			
A57	Encourage proper disposal and cleanup of **waste and litter.**	X			
A58	Miscellaneous conservation actions as described	X	X	X	X

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CHAPTER III:

MISSISSIPPI'S ECOLOGICAL FRAMEWORK - ECOREGIONS OF MISSISSIPPI

Bailey/US Forest Service Ecological Units as modified in 1998 by The Nature Conservancy were adopted by the CWCS Technical Committee as ecoregions for this strategy, because of their wide acceptance within the ecological community and their close association to the Partners in Flight regional plans. **TNC's four Ecoregional Plans** that cover Mississippi are major planning documents from which much of the information and recommendations in this strategy were drawn.

TNC operates on the principle of protecting biological diversity and functional landscapes through land conservation. Their planning process relies heavily on the NHP data and expert feedback. In Mississippi, they have identified at total of 64 terrestrial and freshwater biodiversity sites that, if protected, would likely ensure the survival of the four ecoregions' native plants, animals, natural community types and critical ecological processes. Using TNC's ecoregions will also allow Mississippi's strategy to be "rolled-up" with surrounding states into a national synopsis that will allow Congress and the public to see a coordinated, scientifically rigid account of the nation's "at risk" wildlife and their habitat.

What is an ecoregion?

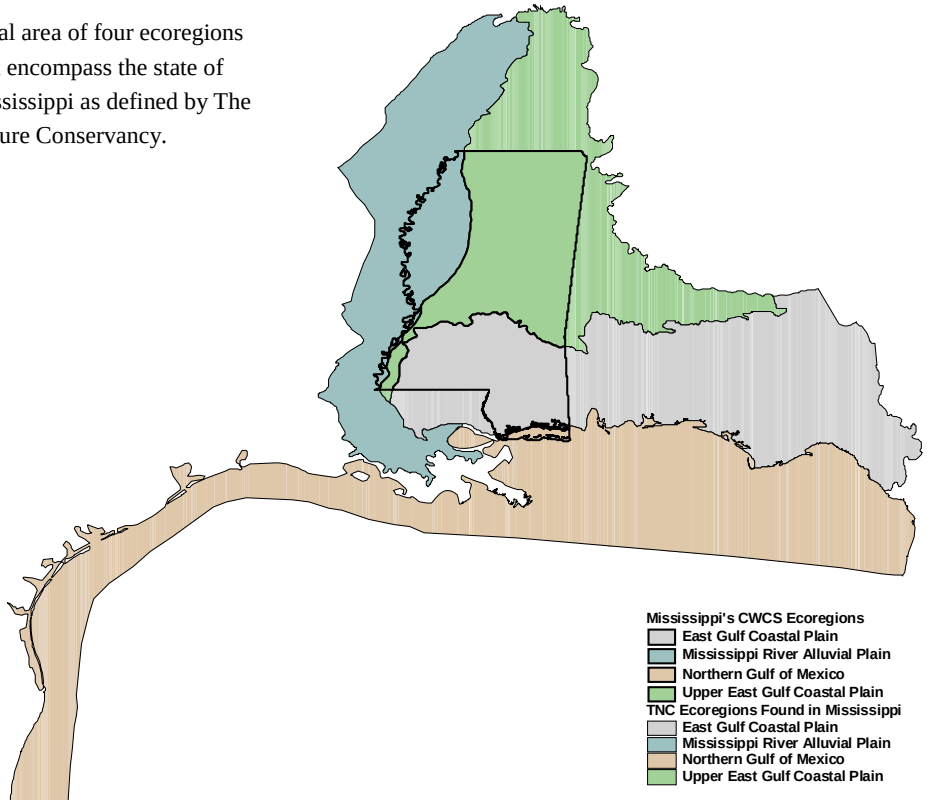
Ecoregions have been defined and mapped by many entities. They are commonly considered to be large areas distinguished from surrounding regions by differing biotic and environmental factors and/or ecological processes. Factors that are generally used to distinguish these large regions from one another include differences in climate, physical geography, soils, species or communities. Using similar criteria,

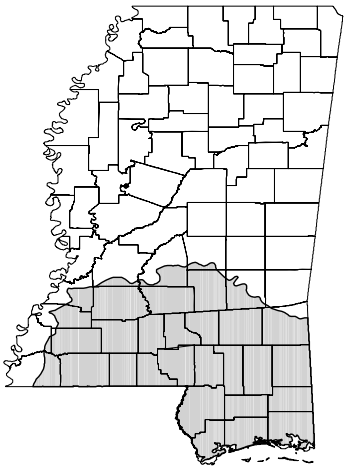
TNC delineated ecoregions across the United States and were the first to use ecoregions as a basis for comprehensive conservation planning on a national scale. They define ecoregions as:

> *...relatively large units of land delineated by large-scale abiotic and biotic factors that broadly shape the structure and function of biological communities within them.*

The following are descriptions of the four ecoregions that encompass Mississippi, as directly excerpted from TNC's respective Ecoregional Plans. They are the **East Gulf Coastal Plain (EGCP), the Mississippi River Alluvial Plain (MSRAP), the Northern Gulf of Mexico (NGM) and the Upper East Gulf Coastal Plain (UEGCP)**. This ecoregional classification will be used throughout this CWCS. All habitat types and subtypes as well as Mississippi SGCN have been identified by ecoregion for planning purposes (see Appendices VII and VIII for these respective lists).

Total area of four ecoregions that encompass the state of Mississippi as defined by The Nature Conservancy.





Part 1. East Gulf Coastal Plain Ecoregion

The East Gulf Coastal Plain (EGCP) ecoregion includes portions of five states (Georgia, Florida, Alabama, Mississippi and Louisiana) and over 42 million acres. It stretches from southwest Georgia across the Florida panhandle and west to southeastern Louisiana. The ecoregion has a diversity of ecological systems, ranging from sandhills and rolling longleaf pine-dominated uplands to pine flatwoods and savannas, seepage bogs and bottomland hardwood forests. The meager topographic and soil diversity of the EGCP suggests an area of low biodiversity and endemism, yet the ecoregion is one of the biologically richest in North America. Many species, particularly vascular plants, reptiles, amphibians and fishes occur only in this ecoregion and many of those are even more narrowly limited within the ecoregion.

This ecoregion is physically characterized by subtle topography, a warm to hot, humid maritime climate, and soils derived primarily from unconsolidated sands, silts and clays transported to the ecoregion by the weathering of the Appalachian Mountains. Other features include a high percentage of land area in wetlands, a dominant role of frequent fire over the majority of the landscape, a diversity of river and stream systems, limited but important karst areas, and significant large scale disturbance events such as hurricanes.

This ecoregion experiences high species richness, species endemism and community diversity in terrestrial, freshwater and aquatic systems. Part of the reason for this is that the ecoregion has never been glaciated, and has been continuously occupied by plants and animals since the Cretaceous period, giving ample time for the evolution of narrow endemic species.

The dominant ecological drivers of the terrestrial systems are soils (texture and chemistry), fire frequency and hydrology. While habitats in the EGCP include barrier island systems with annual-dominated beaches, maritime grasslands and scrub, maritime shrub hammocks, and evergreen forests (both broadleaf and needleleaf) these habitats have been classified as part of the Northern Gulf of Mexico Ecoregion (NGM) for the purpose of this CWCS. Inland, longleaf pine woodlands are dominant over most of the landscape, on upland and wetland sites and a wide variety of soils. These pinelands (sandhills, clayhills, flatwoods and savannas) support a tremendous diversity of plant and animal species: most of them unique to these systems. Embedded in these pinelands, specialized patch communities such as seepage bogs, treeless "savannas" and "prairies", and seasonally flooded depression ponds provide rich habitat for plants, amphibians, and invertebrates. Imperiled plant species are concentrated in fire-maintained pinelands (wetland and upland) and associated seepage bogs. While many imperiled animal species also occur in these communities, there are also significant concentrations in aquatic and bottomland systems.

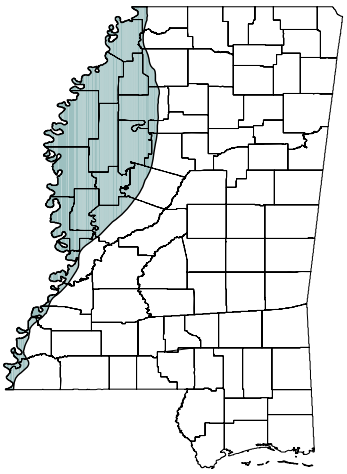
The freshwater aquatic systems of the EGCP are among the most significant and at-risk aquatic biodiversity resources in North America, particularly for fish and mussel species. Each of these groups has unique biodiversity resources. Many aquatic animals are endemic to the ecoregion, and many are restricted to a single river system and its tributaries. Thus, conservation of aquatic biodiversity in the EGCP requires conservation of most of the river systems. In addition, the EGCP supports a range of bottomland hardwood forests and cypress-gum swamps, as well as many lakes and natural ponds.

What is the current status of EGCP biodiversity? The pineland ecosystem (consisting of fire-maintained longleaf pine and slash pine woodlands and their associated seepage bogs and depression wetlands) once dominated a string of ecoregions from southeastern Virginia to eastern Texas. This system has now been reduced to less than five percent of its former range, making it one of the most endangered landscapes in North America. Not only have these pineland ecosystems been directly reduced in extent, but remaining areas are also fragmented and many suffer from the exclusion of fire, a critical ecological process for their maintenance and health. Aquatic systems have been severely affected by hydrologic alterations, pollution and introduction of non-native species. Most of the hundreds of species endemic to the ecoregion, many of which were never common, have been further imperiled by these changes.

The following habitat types described in Chapter IV of this CWCS can be found in the EGCP ecoregion:

- Dry- Mesic Upland Forests/Woodlands
- Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations
- Wet Pine Savannas/Flatwoods
- Mesic Upland Forests
- Bottomland Hardwood Forests
- Riverfront Forest/Herblands/Sandbars

- Spring Seeps
- Bogs
- Inland Freshwater Marshes
- Swamp Forests
- Lacustrine Communities
- Streams
- Urban and Suburban Lands
- Rock Outcrops and Caves



Part 2: Mississippi River Alluvial Plain Ecoregion

The Mississippi River Alluvial Plain (MSRAP) is a 23,968,700 acre ecoregion that includes several uplands 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. 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 100 to 200 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 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. 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 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 the 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.

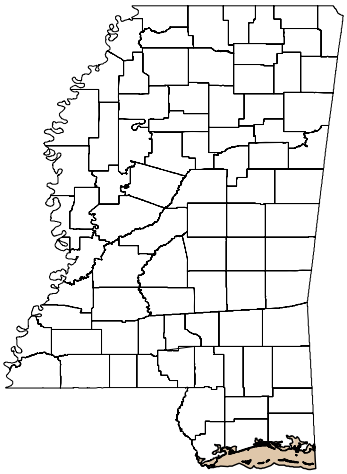
In time, and in response to sediment texture, deposition rates and quantities, plant communities characteristic of MSRAP undergo ecological succession from pioneer communities dominated by black willow or cottonwood (depending on soil drainage characteristics) to red oak and finally white oak dominated climax community. 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. 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 plants.

The diversity of forests and other habitat characterizing the historic landscape provided an 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.

The following habitat types described in Chapter IV of this CWCS can be found in the MSRAP ecoregion:

- Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations
- Bottomland Hardwood Forests
- Riverfront Forests/Herblands/Sandbars
- Inland Freshwater Marshes
- Swamp Forests
- Lacustrine Communities
- Streams
- Urban and Suburban Lands



Part 3: Northern Gulf of Mexico Ecoregion

The Northern Gulf of Mexico (NGM) ecoregion extends from Anclote Keys, Florida to the southern extent of the Laguna Madre de Temaulipas in Mexico. It is a rich and productive subtropical system that supports some of the most extensive wetland and seagrass habitats in the world. Much of the nearshore waters of the Gulf are divided into bay and estuarine systems behind barrier islands, which form a ring of sites around the NGM. For the purposes of this CWCS habitats including barrier island systems with annual-dominated beaches, maritime grasslands and scrub, maritime forests have been classified as part of the NGM ecoregion. These grade through salt marshes to productive estuaries.

In Mississippi, the NGN borders the EGCP and is completely coincident with it. TNC has divided the ecoregion into three broad subregions for planning purposes. Mississippi falls within the Central Gulf of Mexico region which runs from Galveston Bay, Texas to Mobile Bay, Alabama. This region is characterized by extremely high levels of riverine input. Freshwater and sediments from the Mississippi River and to a lesser extent freshwater entering through Mobile Bay determine the characteristics of nearshore waters in this region. Coastal waters are generally variable in salinity, and water clarity is low because of the sediment load. Bottom sediments tend to be fine clays and muds. These conditions are ideal for the growth of marshes and oyster reefs.

The drainage basin for the Gulf extends from the Appalachians to the Rockies. It contains nearly 60 percent of the land area of the continental United States, including some the most fertile lands in the world. This productive drainage makes the Gulf one of the primary producers of finfish and shellfish in the United States. However, because much of this land is in agricultural use, fertilizers, herbicides and pesticides threaten the productivity of the Gulf.

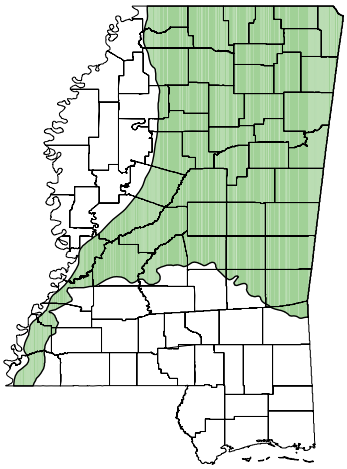
The NGM is a productive environment. In 1997, the estimated commercial value of the finfish and shellfish harvest was $823 million.

The Gulf is ranked as the top region in the country for seafood harvest in both poundage and monetary value. Much of the productivity of this region is believed to have its origins in the productivity of the nearshore marshes and seagrasses, because these habitats serve as nurseries for juveniles, and/or simply because they are the source of vast amounts of carbon and nutrients.

Estuarine, seagrass and marsh environments, which are in abundance in the NGM, are estimated to be ten times more valuable to humans than any terrestrial habitat for ecosystem services like food production, recreation and nutrient cycling.

The following habitat types described in Chapter IV of this CWCS can be found in the NGM ecoregion:

- Streams
- Upland Maritime and Estuarine Fringe Habitats
- Estuary and Mississippi Sound (Inside or Associated with the Barrier Islands)
- Marine Habitats
- Urban and Suburban Lands



Part 4: Upper East Gulf Plain Ecoregion

The Upper East Gulf Coastal Plain (UEGCP) ecoregion encompasses 33,861,051 acres. This large ecoregion ranges from southern Illinois, western Kentucky and Tennessee, throughout much of Mississippi, east to Alabama and a limited area of Georgia and southeastern Louisiana. The region is bounded on the west by the MSRAP and on the north by the Ohio River, and Tennessee River. The eastern margin occurs at the contact point with older rocks of the Piedmont and Southern Ridge and Valley. This region has rugged terrain and hilly topography In addition, the southern boundary approximates the range limits of major potential natural vegetation types oak-hickory-pine to the north, and southern mixed hardwood forests to the south.

Coastal and fluvial processes have considerably reworked the land surface of the region. Approximately 70 million years ago, the area would have been around 4,000 foot elevation. However, the earth's crust sagged forming the Mississippi Embayment. During the Tertiary and Cretaceous periods the Embayment trough was repeatedly invaded by shallow seas leaving behind hundreds of meters of sediments that occupy broad bands approximately paralleling the Gulf of Mexico. The result is a region of belted character, in the form of inner lowlands and cuestas and other low-ridge landforms.

The upper Mississippi Embayment is underlain by an ancient, buried rift zone. This buried rift has acted as a "zone of weakness" in the continental crust and serves to localize earthquake activity in the central United States. There have been many large magnitude earthquakes and abundant seismic activity in the region. The New Madrid earthquake (1811-1812) was among the strongest earthquakes in recorded United States history, resulting in up to nine feet of land subsidence in the upper part of the region. Further south, the geologic structure of the region has been affected by the presence of underground salt

in the form of salt plugs, domes, and basins. The Mississippi Interior Salt Basin, which extends into this region, has extensive hydrocarbon reserves that are still largely undeveloped.

Throughout the region, soils are generally acidic with appreciable amounts of clay present. Ultisols, deeply leached and low in nutrients, are the dominant soil order. Alfisols, less weathered and greater in fertility, are present in more limited areas, especially associated with loess deposits (a unique type of windblown silt). Large quantities of loess were probably carried by wind from exposed sediments of the Mississippi River floodplain and deposited on adjacent uplands during the late Pleistocene and early Holocene. Loess eventually covered much of the underlying topography under a thick blanket deepest along the western edge and thinning abruptly eastward. Vertisols (soils with shrink-swell properties due, in part, to especially high clay content) are uncommon in the southeastern coastal plain but are present in limited areas of the Black Belt where they were derived from marl and chalk residues.

The UEGCP overlaps several distinctive aquatic ecoregions. The majority of this region has been considered a priority for freshwater species conservation due to the richness of the fauna present. For example, rivers in this region provide habitat for over 206 native fish species.

The region also supports relatively large numbers of crayfish and mussel species despite heavily disturbed conditions in many areas that have likely reduced faunal diversity. The bulk of the regions' rivers, especially the Mississippi tributaries, have been channelized and/or subjected to headcutting and heavy sedimentation.

The region includes a diverse assemblage of streams that vary in size, origin, and geology. Particularly noteworthy rivers of this region include the Hatchie, the longest free flowing tributary in the lower Mississippi River valley and tributaries of the Pascagoula, America's longest unencumbered river. The potential natural vegetation of the UEGCP may be characterized as broad bands of different composition that roughly parallel the coast. From south to north these include southern mixed forests, oak-hickory-pine forests, and oak-hickory forests, interrupted by occasional southern floodplain forests and black belt prairies.

Southern mixed forests and oak-hickory-pine forests, the two predominant types in terms of area occupied, are recognized by the presence of longleaf pine and shortleaf pine. Although longleaf forests and woodlands were the dominant vegetation type of the southeastern United States coastal plain, they occur in only limited areas of this region, extending landward into the UEGCP by only about 50 miles. Northward, longleaf pine is replaced by shortleaf pine.

Bluffs along the eastern edge of the Mississippi River, such as those around Vicksburg, are covered with up to 200 feet of loess. A number of factors account for the development and maintenance of precipitous cliffs and ravines where loess is deepest. The vegetation of these loess bluffs is often richer than

surrounding areas due to the fertile topsoil and abundant moisture. In many cases, the bluffs provide habitat for plant species that are rare or absent from other parts of the Coastal Plain. In addition, the bluffs constituted a major refugium for mesophytic plant species, now generally more common to the north, during the last glaciation.

Blackland Prairies occur in two discrete areas of the ecoregion: the Jackson Prairie and the Black Belt (see Northeast Prairie subtype in this CWCS). These areas are among the distinct topographic regions in the state of Mississippi. At their closest point, 65 miles separate the formations supporting the two prairie types. The Black Belt is the larger of the two regions, stretching approximately 300 miles across Mississippi and into adjacent parts of central Alabama. This region, generally 25-30 miles wide, derives its name from the nearly black, rich topsoil that developed over Selma Chalk. Both areas have typically calcareous soils and were formerly occupied by natural grasslands and associated vegetation.

The broad forest cover composition also differs between parts of the region. While the percentage of total area occupied by deciduous forests is relatively evenly distributed across the region, mixed and evergreen forests (each generally including a component of pine species) are much less common overall in both the Black Belt and the North Unit (North of the Mississippi-Tennessee state line). The reasons for this pattern are most obvious in the case of the North Unit, most of which lies outside the natural range of the southern pine species (loblolly, shortleaf, longleaf) commonly encountered this ecoregion. The lack of evergreen forests in the Black Belt is more complex, but is likely due to the poor suitability of the predominantly calcareous soils for pine growth.

The composition of the ecoregion's forests is also changing. Vast acreages of the region are being converted to pine plantations, in many cases at the expense of either existing deciduous or mixed forests, constituting one of the most consequential forestry developments in the region in the last four decades.

The following habitat types described in Chapter IV of this CWCS can be found in the UEGCP ecoregion:

- Dry-Mesic Upland Forests/Woodlands
- Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations
- Mesic Upland Forests
- Bottomland Hardwood Forests
- Riverfront Forests/Herblands/Sandbars
- Inland Freshwater Marshes
- Swamp Forests
- Lacustrine Communities
- Streams

- Urban and Suburban Lands
- Rock Outcrops and Caves

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CHAPTER IV:

WILDLIFE HABITATS FOR MISSISSIPPI'S SGCN, THREATS AND CONSERVATION ACTIONS

Part 1. Introduction

This chapter includes, for the first time in our agency's history, a comprehensive description of all major wildlife habitat types and subtypes in Mississippi that are important to identified SGCN. As part of these comprehensive descriptions, we have included a discussion of the location, condition and where possible the conservation status and size of the community in Mississippi. The assemblages of SGCN associated with each subtype are included as well as a list of threats prioritized (high, medium, low) and a general set of priority conservation actions. The methods we used to develop this information are described in Chapter II – *Approach and Methods*. This information is intended to guide the collective and individual efforts of our agency as well as other resource agencies in the state, conservation organizations, large and small private landowners and others who will ultimately implement recommendations developed from this CWCS.

In Chapter II we also described and presented our method for identifying the most critical habitats for SGCN by using a raw score called Value to SGCN. These Values to SGCN were derived from the number and Tier level of SGCN associated with each subtype. They indicate the relative importance of various habitat subtypes to SGCN and provide guidance in predicting were actions will benefit more and/or higher tier SGCN. Values are most useful when comparing related habitat subtypes and three major complexes of related habitat subtypes have been identified for value comparisons. These

complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe. Values for all subtypes in descending order and within each complex are listed in Appendix X and within each subtype's description in this chapter. The following is a summary of the highest ranking habitat subtypes by complex that are among the most important habitat types for many SGCN. By implementing priority conservation actions described herein for these habitats on both public and private lands with the aid of conservation partners, private landowners, corporations and other resource agencies, Mississippi will be able to abate threats to many of the SGCN and their habitats and ultimately to protect and improve biological diversity in our state.

A. High Priority Inland Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic) Systems

1. Small Stream Swamp Forests
2. Dry Longleaf Pine Forests
3. Bottomland Hardwood Forests
4. Hardwood Seeps
5. Lower Slope/High Terrace Hardwood Forests

B. High Priority Lotic (Streams) and Lentic (Lacustrine) Systems

1. Tombigbee Drainage
2. Northeast Hills, Tennessee River Drainage
3. Ephemeral Ponds
4. Pascagoula Drainage
5. Lower Coastal Plain, Pearl Drainage

C. High Priority Marine and Estuarine Systems (Including Estuarine Fringe)

1. Estuarine Marshes
2. Barrier Island Wetlands
3. Estuarine Bays, Lakes and Tidal Streams
4. Barrier Island Uplands
5. Mainland (Natural) Beaches

While this CWCS represents the first time in our state's history that we have compiled significant information, analyses and recommendations in one document on all the habitat types and SGCN that use them, we have taken a broad and relatively coarse scale approach to this efforts. It is important to note that this CWCS is a "work in progress" and, in order for it to meet its intended purpose, much more work must be done to refine the recommended conservation actions described and to fully develop conservation priority areas for our state in conjunction with our stakeholders. To accomplish this, it is critical that we continue to work with our stakeholders to identify partnerships for implementing

conservation actions and to ensure this entire process of conservation planning continues on a statewide basis.

Thus, in order for this "conservation blueprint" to truly serve as a long-term guide to improving Mississippi's biological diversity, our agency must lead the effort to implement conservation actions recommended for the most critical habitat subtypes and their species, to guide important research and survey efforts described in Chapter V and to ensure the following:

1. A full-time conservation planner/State Wildlife Grants Coordinator is hired to lead the further development and implementation of this CWCS.

2. The CWCS Advisory Committee becomes a permanent, standing committee that will continue to aid in the development, partnership and implementation of the CWCS along with the Technical and Steering Committees.

3. The CWCS be further refined with the help of our stakeholders and public to allow for "on the ground" implementation and monitoring of conservation actions on the most critical landscapes.

Part 2. A Guide to Using this Section

Each of the 17 major wildlife habitat types is coded by number and is described in this chapter. Under each habitat type is a more detailed description of each subtype, its condition, location, the associated SGCN, the subtype's rank among similar systems and its value to SGCN. Also included is a general list of prioritized threats and potential conservation actions. To aid the reader in reviewing and using the habitat types for planning and management purposes, the following is a guide to material included in the description of each subtype:

1. THE SUBTYPE CODE AND NAME

2. THE VALUE TO SPECIES OF GREATEST CONSERVATION NEED

1.1 Dry Hardwood Forests

- **Value to SGCN - 70**
- **Rank - 7th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

Each subtype received a score called a Value to SGCN. These Values were derived from the number and Tier level of SGCN associated with each subtype (see description of Tiers in *Criteria for Selecting and Prioritizing SGCN*). They indicate the relative importance of various habitat subtypes to SGCN and provide guidance in predicting were actions will benefit more and/or higher tier SGCN. Gastropods, insects and marine fishes were deemed insufficiently known to warrant status evaluations comparable to evaluations of vertebrates, mussels, and crayfish and did not contribute to the subtype value determinations. Therefore the Values to SGCN attributed to some subtypes are lower than expected. Lower than expected Values related to lack of information are most apparent in some marine habitat subtypes. Additional work must be performed to include species from underrepresented groups in future iterations of this strategy.

Since Value to SGCN is derived from the number and Tier level of the species attributed to a habitat subtype, it does not in all instances indicate rarity or level of threat to a subtype. It may be important to consider rarity ranks assigned by the NHP or other indications of value when assessing conservation need and implementing actions. Some SGCN are restricted to subtypes with relatively low values that may not benefit or could be negatively affected by conflicting actions performed in subtypes with higher values. Values are not an indication of the type of actions recommended. Recommended conservation actions will vary for each habitat subtype. For an explanation of how Values were determined, see *Ranking Habitats* in Chapter II.

3. RANK

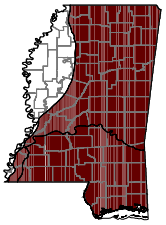
The Values to SGCN are most useful when comparing related habitat subtypes. Three major complexes of related habitat subtypes have been identified for value comparisons.

These complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe. The Rank is based on the Value to SGCN and is listed for each subtype indicating the relative importance of that subtype within one of the three complexes to SGCN.

4. DESCRIPTION

The subtypes are defined by factors such as soil type, water availability, vegetation, water chemistry, region and stream size.

5. LOCATION, SIZE, CONDITION AND CONSERVATION STATUS



This section identifies the ecoregion(s) where the habitat occurs (see Chapter III for a description of Upper East Gulf Coastal Plain - UEGCP, East Gulf Coastal Plain - EGCP, Northern Gulf of Mexico - NGM and Mississippi River Alluvial Plain - MSRAP Ecoregions) A general range **map** indicating areas where areas of Mississippi where the habitat may occur is also included. For streams, the map indicates the boundaries of the entire drainage area. An **estimate of the (size) acreage** of subtype in the state is provided based on satellite based land cover classification extrapolated from the MARIS data base and from the USDA Forest Service statistics from their Southern Research Station Bulletin and should be used for planning purposes only. Descriptions of **conditions** were excerpted from NHP data. The **Conservation Status** (also called Conservation Priority Ranks) was taken from NatureServe's description of ecological communities and was included to indicate the rarity (critically imperiled, imperiled, vulnerable to extirpation or extinction, apparently secure or demonstrably widespread, abundant and secure) of subtypes that could easily be crosswalked with NatureServe's ecological community types. A discussion on interpreting NatureServe Conservation Status Ranks is included in Appendix XII.

6. SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH EACH SUBTYPE

Each section lists the SGCN by group, their scientific and common names and the Tier level (one through four). Tiers are described in Chapter II.

7. THREATS TO THE COMMUNITY

A prioritized (high, medium, low) list of threats or problems affecting each subtype is defined. Threats are described in Chapter II.

8. PRIORITY CONSERVATION ACTIONS

A list of recommended actions is included for each subtype. Actions are described in Chapter II.

Part 3. Habitat Types and Sub-Types

The following is a list of all habitat types and subtypes described for Mississippi's Species of Greatest Conservation Need.

HABITAT TYPE/ SUBTYPE CODES	MISSISSIPPI WILDLIFLE HABITAT TYPE / SUBTYPE NAME
1	**DRY-MESIC UPLAND FORESTS/WOODLANDS**
1.1	Dry Hardwood Forests
1.2	Dry Longleaf Pine Forests
1.3	Dry-Mesic Hardwood Forests
1.4	Dry-Mesic Shortleaf/Loblolly Pine Forests
2	**AGRICULTURE FIELDS, HAY AND PASTURE LANDS, OLD FIELDS, PRAIRIES, CEDAR GLADES AND PINE PLANTATIONS**
2.1	Northeast Prairie/Cedar Glades
2.2	Jackson Prairie
2.3	Hay and Pasture Lands
2.4	Pine Plantations
2.5	Old Fields and Young Hardwoods (Shrublands)
2.6	Agriculture Fields (Row Crops, etc.)
3	**MESIC UPLAND FORESTS**
3.1	Beech/Magnolia Forests
3.2	Mesic Longleaf Pine Savanna/Forests
3.3	Loess Hardwood Forests
3.4	Lower Slope/High Terrace Hardwood Forests
4	**BOTTOMLAND HARDWOOD FORESTS**
4.1	Bottomland Hardwood Forests
5	**RIVERFRONT FORESTS/HERBLANDS/SANDBARS**
5.1	Cottonwood/Black Willow/River Birch Woodlands
5.2	Sandbars
6	**WET PINE SAVANNAS/FLATWOODS**
6.1	Wet Pine Savannas
6.2	Slash Pine Flatwoods

7 SPRING SEEPS
7.1 Hardwood Seeps
7.2 Pine Seeps

8 BOGS
8.1 Pitcherplant Flat/Bogs

9 INLAND FRESHWATER MARSHES
9.1 Freshwater Marshes

10 SWAMP FORESTS
10.1 Bald Cypress/Gum Swamp Forests
10.2 Small Stream Swamp Forests

11 LACUSTRINE (LENTIC) COMMUNITIES
11.1 Oxbow Lakes
11.2 Reservoirs
11.3 Artificial Ponds
11.4 Ephemeral (Temporary) Ponds
11.5 Beaver Ponds

12 STREAMS (LOTIC COMMUNITIES)
12.1 Mississippi River

12.2 Northeast Hills, Tennessee River Drainage
- 12.2.a Northeast Hills Small Streams
- 12.2.b Northeast Hills Medium Streams

12.3 Tombigbee Drainage
- 12.3.a Tombigbee Small Streams
- 12.3.b Tombigbee Medium Streams
- 12.3.c Tombigbee Large Streams

12.4 Lower Mississippi North Drainage (LMND) Hatchie and Wolf Systems
- 12.4.a LMND Small Streams
- 12.4.b LMND Medium Streams

12.5 Upper Coastal Plain, Yazoo Drainage
- 12.5.a Yazoo Small Streams

12.5.b Yazoo Loess Hills Streams
12.5.c Yazoo Medium Streams
12.5.d Yazoo Large Streams

12.6 Big Black River Drainage
12.6.a Big Black Small Streams
12.6.b Big Black Loess Hills Streams
12.6.c Big Black Medium Streams
12.6.d Big Black Large Streams

12.7 Upper Coastal Plain, Pearl River Drainage
12.7.a Pearl River Small Streams
12.7.b Pearl River Medium Streams
12.7.c Pearl River Large Streams

12.8 Mississippi Alluvial Plain (MAP)
12.8.a MAP Small Streams
12.8.b MAP Medium Streams
12.8.c MAP Large Streams

12.9 Lower Coastal Plain, Pearl Drainage
12.9.a Pearl Small Streams
12.9.b Pearl Small Blackwater Streams
12.9.c Pearl Medium Streams
12.9.d Pearl Medium Blackwater Streams
12.9.e Pearl Large Streams

12.10 Pascagoula Drainage
12.10.a Pascagoula Small Streams
12.10.b Pascagoula Small Blackwater Streams
12.10.c Pascagoula Medium Streams
12.10.d Pascagoula Medium Blackwater Streams
12.10.e Pascagoula Large Streams

12.11 Coastal Rivers Drainage
12.11.a Coastal Small Blackwater Streams
12.11.b Coastal Medium Blackwater Streams

12.12 Lake Ponchartrain Drainage
12.12.a Lake Ponchartrain Small Streams
12.12.b Lake Ponchartrain Small Blackwater Streams

12.12.c Lake Ponchartrain Medium Streams
12.12.d Lake Ponchartrain Medium Blackwater Streams
12.12.e Lake Ponchartrain Large Streams

12.13 Lower Mississippi South Drainage
12.13.a Lower Mississippi South Drainage Small Streams
12.13.b Lower Mississippi South Drainage Medium Streams
12.13.c Lower Mississippi South Drainage Large Streams

13 UPLAND MARITIME AND ESTUARINE FRINGE HABITATS
13.1 Barrier Island Uplands
13.2 Man-Made Beaches
13.3 Barrier Island Wetlands
13.4 Mainland Beaches
13.5 Barrier Island Beaches
13.6 Shell Middens and Estuarine Shrublands
13.7 Maritime Woodlands

14 ESTUARY AND MISSISSIPPI SOUND (INSIDE OR ASSOCIATED WITH BARRIER ISLANDS)
14.1 Estuarine Bays, Lakes and Tidal Streams
14.2 Mississippi Sound
14.3 Estuarine Marshes
14.4 Barrier Island Passes
14.5 Salt Pannes
14.6 Seagrass Beds
14.7 Mollusk Reefs

15 MARINE HABITATS (OUTSIDE BARRIER ISLANDS)
15.1 Marine Habitats (Smooth Bottoms)
15.2 Hard Bottoms and Oceanic Reefs
15.3 Artificial Reefs

16 URBAN AND SUBURBAN LANDS
16.1 Urban and Suburban Lands
16.2 Buildings, Bridges, Overpasses, etc.

17 MISCELLANEOUS (ROCK OUTCROPS, CAVES)

17.1 Rock Outcrops

17.2 Caves

1. DRY TO MESIC (DRY TO MODERATELY MOIST) UPLAND FORESTS/WOODLAND

Upland forests of this type have limited nutrient and/or moisture availability due to the nature of the soils, which are shallow, coarse-textured and well drained. Subtypes of this category include dry to moderately moist hardwood and pine forest associations. Mixed pine-hardwood habitats are classified as either pine or hardwood subtypes, depending on whether pines or hardwoods are more abundant. Fire played an important role in maintaining these habitats by reducing densities of young saplings, recycling nutrients and oxidizing ground litter.

This type includes four subtypes: 1.1 Dry Hardwood Forests, 1.2 Dry Longleaf Pine Forests, 1.3 Dry-Mesic Hardwood Forests and 1.4 Dry-Mesic Shortleaf/Loblolly Pine Forests.

GENERAL CONDITION

Ecosystems can be lost or impoverished in basically two ways. The most obvious kind of loss is **quantitative** such as the conversion of a natural forest to a cotton field or to a parking lot. Quantitative losses can be measured easily by a decline in extent of a discrete ecosystem type (i.e., one that can be mapped). The second kind of loss is **qualitative** and involves a change or degradation in the structure, function, or composition of an ecosystem. At some level of degradation, an ecosystem ceases to be natural. For example, a tract of oak-hickory woodlands may be high-graded by removing the largest, healthiest, and frequently, the genetically superior trees. Qualitative changes may be expressed quantitatively but in less precise terms than estimates of habitat conversion. In some cases, as in the conversion of an old-growth forest to a pine plantation, the qualitative changes in structure and function are sufficiently severe to qualify as complete habitat loss. General forest cover statistics indicate a larger percentage of the Mississippi landscape is occupied by pine, hardwood or mixed forest types. However, the condition of the forest, whether cutover, natural, semi-natural or cultivated, is usually not available.

Although there are no estimates of the losses of Dry-Mesic Upland Forests/Woodlands in Mississippi, it is possible to envisage their overall condition by understanding the extent of development pressure generated on these habitats. Historically, large areas of upland hardwood and pine forest were converted to agricultural croplands and pasture. The tracts that were chosen were selected from the areas containing the most productive landforms and soils. Most landforms of the coastal plain are not excessively steep or isolated and are therefore accessible to either timber management or agricultural usage.

Today, typical upland forests lack a diverse understory and exhibit very high stem densities. Many commercially managed forests have been converted to pine plantations and, on national forest lands, the trend for the past 50 years has been to promote pine reproduction over that of indigenous hardwood trees. Furthermore, upland forests of Mississippi benefit from prescribed burning. However, timberlands and protected forestlands, such as national wildlife refuges and lands adjacent to Corps of Engineers' reservoirs, are somewhat degraded due to limited exposure to fire, though continued efforts to increase usage on national forest lands are promising. Also, reproduction for some important trees, such as several oak species, is hampered by current management systems.

In general, it is likely that more than 90 percent of upland forests (Habitat Types 1 and 3) of Mississippi have been severely degraded or lost and the condition of the remaining could only be regarded as fair. For comparison estimates are available from adjacent states: in the coastal plain of Tennessee, there has been a 90 percent loss of upland hardwoods, and in Louisiana, there has been a 50-75 percent loss of southern mesophytic forests, calcareous forests, hardwood slope forests and a 50 percent loss of cedar woodlands. With an increased interest in conservation, through sustainable forestry practices such as the single tree select cut system of timber harvesting, and a renewed interest in forest restoration on private and public lands, these systems may improve.

1.1 Dry Hardwood Forests

- **Value to SGCN - 70**
- **Rank - 7th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

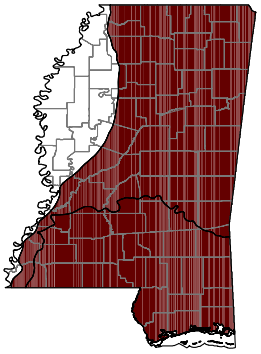
DESCRIPTION

The dry hardwoods subtype includes oak-cedar woodlands and dry upper slope oak-hickory forests. They occupy dry upland slopes and ridge tops with nutrient poor soils of various textures. Characteristic species of this subtype are oaks (post, southern red, blackjack and white) and hickories (mockernut and sand). Shortleaf and loblolly pines are commonly intermingled with the hardwoods. Representative understory species include farkleberry, oaks (seedlings, saplings), white ash and flowering dogwood. Within this subtype distinctive Chestnut oak woodlands are found on sandy or shallow soils over sandstone/ limestone in the northeastern part of Mississippi. Oak-cedar woodlands are found on moderately shallow soils of uplands within the blackland regions of northeast and central Mississippi, where Selma

chalk or calcareous marls constitute the subsoil. Post oak woodlands are similarly found in the uplands of the northeast prairie region and elsewhere on deeper acid soils, often over calcareous substrates.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP,UEGP



Range of Dry Hardwood Forests

Dry hardwood forests are found on small, 50-100 acre patches on ridgetops and uplands that form the divides between watersheds through the northern half of the state. It is estimated that **400,000 acres** of this subtype exists in Mississippi. Mesic hardwood and pine forests are situated below this community on mid-slopes. Stands of dry hardwood forests are interspersed with agriculture and commercial timberlands, homesteads and urban centers.

Conversion of additional areas of dry hardwood forests to pine plantations, pastureland, urban and suburban development is a significant threat. Ridgetops are used for transportation corridors and the secondary development that is associated with roads. Dry hardwood forests are highly fragmented and considered to be in poor condition due to lack of fire management.

Dry hardwood forests are **imperiled** in the state because of rarity due to extensive conversion of these lands. Few stands are known to be in good condition and few are protected from conversion to other uses. Continuation of these threats will likely lead to additional declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH DRY HARDWOOD FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Thryomanes bewickii*	Bewick's Wren	1
	Dendroica cerulea	Cerulean Warbler	2
	Hylocichla mustelina	Wood Thrush	3
	Piranga olivacea	Scarlet Tanager	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Dendroica discolor	Prairie Warbler	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Myotis septentrionalis	Northern Myotis	2
	Peromyscus polionotus	Oldfield Mouse	2
	Ursus americanus	Black Bear	2
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Spilogale putorius	Eastern Spotted Skunk	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4

Reptiles	*Pituophis melanoleucus lodingi*	Black Pine Snake	1
	Gopherus polyphemus	Gopher Tortoise	2
	Micrurus fulvius	Eastern Coral Snake	2
	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Pituophis melanoleucus melanoleucus	Northern Pine Snake	3
	Masticophis flagellum	Eastern Coachwhip	3

THREATS TO DRY HARDWOOD FOREST COMMUNITIES

Altered Fire Regime	high
Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	high
Road Construction/Management	high
Urban/Suburban Development	high
Over Exploitation/Incidental Capture	medium
Agricultural Conversion	medium
Air-borne Pollutants	low
Industrial Development	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

1.2 Dry Longleaf Pine Forests

- **Value to SGCN - 87**
- **Rank - 2nd of 29 of Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

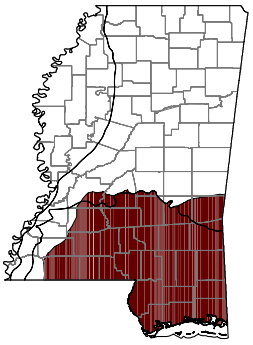
Sandhill longleaf pine, longleaf pine-blackjack oak and longleaf pine-saw palmetto forests collectively represent this subtype. They are found on mid and upper slopes, shoulder slopes and ridge tops. Soils are dry, well-drained to excessively well-drained sands and sandy loams. Two-thirds or more of the canopy trees are longleaf pine. The subtype includes both savanna and forest types. Several dozen less abundant species, such as turkey oak, sand post oak and flowering dogwood, may be present. Drought tolerant forbs (non-grassy herbaceous plants) are often isolated on these upland sites and are heavily dependent on prescribed fire, which prevents excessive shrub encroachment.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

The dry longleaf pine forest subtype is found on scattered ridgetops and isolated sandy uplands in the southern part of the state. The uplands are insular patches situated within a matrix of mesic pine forests and habitats converted to other uses (plantations, suburban, etc...). The size of the patches range from 50 to 1,000 acres. Little is known about the size of area of the dry longleaf pine forests subtype in the state, but it is estimated that the community has a total area **of 40,000 acres.**

The upland sites that support this community have been used for road corridors,



Range of Dry Longleaf Pine Forests

sand sources and homesites; fires suppression, lack of controlled burning and conversion to other land uses, including pine plantations have serious qualitative and quantitative decline of this community. However, Little Florida Conservation Site on DeSoto National Forest is in excellent condition as are some other areas devoted to the protection of the gopher tortoise.

This subtype is considered **critically imperiled** in the state because of extreme rarity (few occurrences) and extensive degradation.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH DRY LONGLEAF PINE FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana sevosa*	Mississippi Gopher Frog	1
	Pseudacris ornata	Ornate Chorus Frog	2
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Picoides borealis	Red-Cockaded Woodpecker	2
	Aimophila aestivalis	Bachman's Sparrow	2
	Columbina passerina	Common Ground-Dove	2
	Ammodramus savannarum	Grasshopper Sparrow	2
	Ammodramus leconteii	Le Conte's Sparrow	2
	Colinus virginianus	Northern Bobwhite	3
	Sitta pusilla	Brown-Headed Nuthatch	3
	Dendroica discolor	Prairie Warbler	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Spilogale putorius	Eastern Spotted Skunk	2
Mammals	*Lasionycteris noctivagans*	Silver-Haired Bat	4
Reptiles	*Ophisaurus mimicus*	Mimic Glass Lizard	1
	Pituophis melanoleucus lodingi	Black Pine Snake	1
	Gopherus polyphemus	Gopher Tortoise	2
	Micrurus fulvius	Eastern Coral Snake	2
	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Masticophis flagellum	Eastern Coachwhip	3

Drymarchon couperi	Eastern Indigo Snake	4
Heterodon simus	Southern Hognose Snake	4

THREATS TO DRY LONGLEAF PINE FOREST COMMUNITIES

Altered Fire Regime	high
Conversion to Pasture	high
Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	high
Road Construction/Management	high
Urban/Suburban Development	high
Incompatible Resource Extraction Practices	medium
Over Exploitation/Incidental Capture	medium
Agricultural Conversion	low
Recreation Activities	low
Miscellaneous Threats Described:	
Loss or Disturbance to Ephemeral Ponds	not ranked

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing

regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

1.3 Dry to Mesic (dry to moderately moist) Hardwood Forests

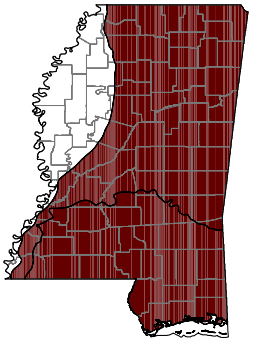
- **Value to SGCN - 66**
- **Rank - 9th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

This hardwood type refers to a collection of dry to moderately moist mixed oak, oak-pine and mixed hardwood communities. This subtype is found on gentle to moderate mid and lower slopes with deeper soils. Nutrient and moisture availability is somewhat higher and more available throughout the growing season. Soils are often moist, moderately-well-drained to well-drained and fine to loamy in texture. With its rapid ability to reseed and grow, white oak is one of the most important oaks and tends to dominate many stands in Mississippi. Loblolly pine, pignut hickory and water oak are also common. Other oaks, such as post, Shumard and northern red, exhibit lower reproductive rates and their abundance has probably decreased over time. Under standard forest management schemes, these species are less competitive than white oak and pines. Species have different environmental preferences within the mesic forest type: Shumard oak prefers fine textured soils; white ash, circumneutral soils; and tuliptree tulip poplar, areas with ample available moisture. Smaller or subcanopy trees and shrubs may include beech, hop hornbeam, flowering dogwood and sourwood. The maritime live oak forest habitat type, although considered an upland forest type, has been included with the maritime forests subtype (13.7).

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP



Range of Dry to Mesic (dry to moderately moist) Hardwood Forests

Tracts of the dry-mesic hardwood forests subtype range in size from 50 to 1,000 acres, a majority of which are located in northern part of the state. The tracts are found within a complex of pine and hardwood forests. The Tombigbee National Forest contains some prime examples of this forest type. It is estimated that there are **over a million acres** of this forest subtype in the Mississippi.

Many tracts containing this forest subtype have been converted to pine production areas. Very few forests of this subtype are managed with prescribed burns. Where fire management is used, there is a significant reduction in the density of shrubs and small trees and an improvement in herbaceous ground cover.

This subtype is **vulnerable** in the state due to significant historical losses and recent conversion to other uses; lack of seasonally appropriate burning has resulted in deterioration of remaining tracts.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH DRY-MESIC HARDWOOD FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Thryomanes bewickii*	Bewick's Wren	1
	Dendroica cerulea	Cerulean Warbler	2
	Hylocichla mustelina	Wood Thrush	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Oporornis formosus	Kentucky Warbler	3
	Piranga olivacea	Scarlet Tanager	3
	Scolopax minor	American Woodcock	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Myotis grisescens	Gray Myotis	2
	Myotis septentrionalis	Northern Myotis	2
	Ursus americanus	Black Bear	2
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
Reptiles	*Lampropeltis triangulum syspila*	Red Milk Snake	2
	Eumeces anthracinus pluvialis	Southern Coal Skink	2
	Micrurus fulvius	Eastern Coral Snake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2

Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
Lampropeltis getula nigra	Black Kingsnake	3
Masticophis flagellum	Eastern Coachwhip	3
Drymarchon couperi	Eastern Indigo Snake	4

THREATS TO DRY-MESIC HARDWOOD FOREST COMMUNITIES

Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	medium
Urban/Suburban Development	medium
Air-borne Pollutants	low
Industrial Development: Locally Important	low
Incompatible Grazing Practices: Locally Important	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

1.4 Dry to Mesic (dry to moderately moist) Shortleaf/Loblolly Pine Forests

- **Value to SGCN - 64**
- **Rank - 11th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

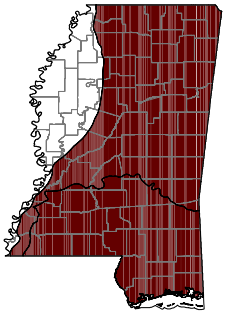
Typical features of this habitat type are upland hills and flats, which contain soils with moderate depth and acidity and low to moderate fertility and moisture. Managed and semi-natural stands of pines form the dominant cover type for much of the dry and mesic uplands of Mississippi. Pine plantations are discussed in section 2.4. Shortleaf pine historically dominated upper slopes and droughty ridge tops along watershed boundaries in the cooler northern half of the state. Naturally occurring loblolly pine existed in pine and mixed hardwood-pine stands on moist upland flats, mid/lower slopes of drainageways and high stream terraces in areas merging with longleaf pine region and extending through central and northern Mississippi. Post oak, blackjack oak, scarlet oak and hickory, along with other hardwoods, were commonly mixed with the pine on the drier sites with shortleaf pine often mixed with loblolly pine. Loblolly pine contributes more than 40 to 100 percent of the tree cover on lower slopes and flats. Often subcanopy hardwood trees make up an additional 40 percent of the total cover. Hardwoods, including southern red oak, post oak, white oak, upland laurel oak, blackgum and sweetgum, are mixed with pine on better sites and make up about 80 percent of the subcanopy. Magnolia, shortleaf pine, tulip tree, hickories, oaks and other trees represent the remaining 20 percent. Herbaceous species become scarce in dense managed stands.

With the lack of fire management, a dense growth of hardwood trees, shrubs and vines pervade many pine stands and thick litter accumulates on the forest floor. On the mesic sites, pines receive considerable competition from vines, shrubs and hardwoods hardwood saplings and trees, especially during the early stages of forest regeneration. Pines quickly outgrow competitors and the extra shading reduces the presence and vigor of others. Shrubs readily regrow after cool season fires. In today's cutover forests, hardwood trees are mostly relegated to subcanopy stature due to their slow growth. Being shade-tolerant they are more tolerant of shading and persist beneath the pine canopy. Loblolly and shortleaf pine generally have a shorter life span than most hardwoods, and with time, pine trees age and they again become competitive. As gaps form in the canopy from aging pine trees, hardwood trees gain stature at a faster rate. After about 75 years or more, if undisturbed by human activities, hardwoods gain dominance, while pines are reduced to snags by insect damage or old age and subsequently are felled by windstorms.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

Natural stands of dry-mesic shortleaf/loblolly pine forests are found in small and large patches throughout the central and northern part of Mississippi. Shortleaf pine forests are usually found in smaller patches on narrow ridgetops. The pine stands are interspersed with plantations, cutover areas and hardwood stands. There are approximately **2.2 million acres** of this subtype in Mississippi, (7.2% of state land area).



Range of Dry-Mesic (dry to moderately moist) Shortleaf/ Loblolly Pine Forests

Increased stocking densities and lack of fire has decreased the quality of this extensive and widespread subtype. Some mature stands are managed by thinning and controlled burns. These thinned stands have a more productive ground cover and prove more valuable for wildlife. Many of the better managed stands are found in state wildlife management areas.

Dry-mesic shortleaf/loblolly pine forests are apparently **secure,** but there is some cause for long-term concern due to insufficient use of prescribed fire and increased stocking density for timber production.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH DRY-MESIC SHORTLEAF/LOBLOLLY PINE FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Picoides borealis	Red-Cockaded Woodpecker	2
	Aimophila aestivalis	Bachman's Sparrow	2
	Sitta pusilla	Brown-Headed Nuthatch	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Colinus virginianus	Northern Bobwhite	3
	Dendroica discolor	Prairie Warbler	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Scolopax minor	American Woodcock	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Spilogale putorius	Eastern Spotted Skunk	2
	Lasionycteris noctivagans	Silver-Haired Bat	4
Reptiles	*Pituophis melanoleucus lodingi*	Black Pine Snake	1
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Gopherus polyphemus	Gopher Tortoise	2
	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2

Pituophis melanoleucus melanoleucus	Northern Pine Snake	3
Lampropeltis getula nigra	Black Kingsnake	3
Masticophis flagellum	Eastern Coachwhip	3

THREATS TO DRY-MESIC SHORTLEAF/LOBLOLLY PINE FOREST COMMUNITIES

Forestry Conversion	high
Incompatible Forestry Practices	high
Altered Fire Regime	high
Invasive Species	medium
Urban/Suburban Development	medium
Road Construction/Management	medium
Air-borne Pollutants	low
Industrial Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

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2. AGRICULTURE FIELDS, HAY AND PASTURE LANDS, OLD FIELDS, PRAIRIES, CEDAR GLADES AND PINE PLANTATIONS

This habitat category includes naturally occurring prairies and the artificial constructs of agriculture and forestry (cropland, pasture, pine and hardwood plantations, young hardwoods and old clearcuts). These subtypes occupy a wide range of landforms, soils and moisture conditions.

This type includes six subtypes: 2.1 Northeast Prairie/Cedar Glades, 2.2 Jackson Prairie, 2.3 Hay and Pasture Lands, 2.4 Pine Plantations, 2.5 Old Fields and Young Hardwoods (Shrublands) and 2.6 Agriculture Fields.

GENERAL CONDITION:

There are no accurate records of historical acreage for the Northeast Prairie of Mississippi; however, estimates suggest that approximately 100,000 acres once existed in northeast Mississippi, some of which included Indian old fields. Jackson Prairie is small in size and extent covering less than 1,000 acres, possibly five to ten percent of the prairie that once existed in the region. These remnant prairies range from a few acres to over 100 acres in size. The largest prairie is known as Harrell Prairie Hill Botanical Area, USDA Forest Service, near the city of Forest. Osborn Prairie northeast of Starkville is one of the best remaining remnants of the Blackbelt prairie community in the state.

Historically, the prairies were converted to agriculture uses by the early settlers. A majority of the Blackbelt and Jackson prairies remain under cultivation for cropland and pasturage, or have degraded into cedar glades or grassy fields or have converted to woodland. Some areas exhibit erosion scars, chalk outcrops and weedy aspects. Some gullied lands are being re-graded and converted to fescue pastures. Prairie vegetation is still found on many of the eroded sites, although much is in poor condition. The prairies that exist today occur on forest edges, in pastures, utility corridor rights-of-way and road ditches that are maintained in grass by mowing.

A large percentage of the land surface area of Mississippi is in various stages of regeneration following logging, cropping, or natural disasters, such as catastrophic fires or windstorms. Recent land use/land cover classification studies based on satellite imagery indicate that from 34 to 49 percent of Mississippi is non-forested and is dominated by shrubs, small trees, or herbs. The land use/land cover estimates indicate that there are over four million acres of scrub-shrub habitat and nearly seven million acres of pasture/grassland. Mississippi has more than five million acres of cropland, of which less than 500,000 acres are fallow. The amount of non-cultivated land has increased since 1982; conversely the acreage of

cultivated land has decreased, due mainly in part to the USDA's Conservation Reserve Program (CRP) initiated in the 1985 Farm Bill. Similarly the amount of pasturage has decreased to approximately 3.7 million acres. As agriculture lands go out of production, there has been steady increase in the acreage of pine plantations. Surveys from 1994 indicated that more than four million acres in Mississippi were maintained in pine plantations, of which nearly half were 15 years or younger.

2.1 Northeast Prairie/Cedar Glades

- **Value to SGCN - 61**
- **Rank - 14th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

A portion of land historically supported native prairie vegetation in the blackbelt prairie region, which extends from the Tennessee border in an inverted arc through Mississippi to eastern Alabama. Some prairies occurred on nearly level, deep, somewhat poorly drained clay soils. Attractive to the first settlers entering the state, these flat prairies, some of which were Indian old fields, were quickly converted to crop and pasture lands. No examples of this prairie type are currently known. Another prairie type was found on mostly shallow soils of gentle to moderately steep areas. The soils are derived from the underlying Selma chalk, a calcareous stratum of the Cretaceous Period deposited over 65 million years ago. On such areas that were farmed during early settlement, erosion became a serious problem, as soils eroded away to expose the underlying grayish-white chalk layer along gullies and occasionally wide patches. These marginal agricultural lands were subsequently abandoned and left as old fields or converted to pastures. In addition to early abandonment of marginal lands, many subsistence farms were later discontinued for economic reasons. Other lands associated with these operations were left fallow, pastured or planted with trees.

Prairie herbs and eastern red cedar shrubs were able to reestablish on the old fields. The clay soils are dark brown, alkaline and relatively high in organic matter. Eastern red cedar shrublands or cedar-oak woodlands often surround patches of prairies. The prairies of these shallow, eroded soils support a moderate to low density of grasses. Little bluestem, the dominant grass and other graminoids (grasses and sedges), including Cherokee sedge, yellow Indian grass, Florida paspalum and dropseed, produce most of the vegetative cover. However, many forbs, including a large number of rare species, add to their diversity. Prairie forbs include the prairie goldenrod, healalldowny pagoda plant, diamondflower, white and purple prairie clovers, purple and yellow prairie coneflowers, rosin weeds, gayfeathers, false foxglove and a variety of asters.

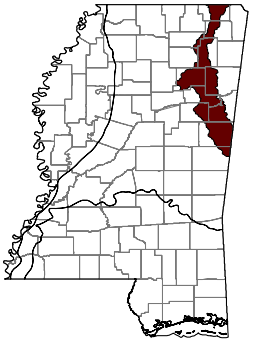
Eastern red cedar trees in a mosaic of prairie grasses and forbs form cedar thickets or glades on many

abandoned fields and cutover areas of the blackbelt prairie region. Cedar thickets are occasionally found in the Jackson prairie region and other parts of the state. The community is often found on hilly uplands with shallow, eroded, calcareous soils related to outcropping. Shading, heavy cedar litter or shallow soils reduce the amount of herbaceous cover, causing a barren appearance in places. Cherokee sedge is frequently found among with redcedar. Many prairie grasses or forbs will occur scattered in openings and along the edges of cedar patches. A variety of shrubs or small trees such as Chickasaw plum, chinkapin oak, Osage orange, eastern redbud and Carolina buckthorn may also be found.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

UEGCP

Very small patches of northeast prairie (1 to 100 acres) remain in the northeastern part of the state. Many are situated along road and power line corridors or on eroded old fields. Cedar glades are more abundant and cover wider expanses (approximately 1,000 acres) of former crop or pasture land. Parcels of this subtype are scattered through the northeastern blackbelt region and occasionally in the Pontotoc hills region. The subtype is commonly situated on areas with shallow soils over chalk. Total area of this subtype is estimated at **15,000 acres** in Mississippi**.**



Range of Northeast Prarie/Cedar Glades

Northeast prairie/cedar glades are generally regarded to be in poor condition because of habitat conversion and a lack of ecosystem management on the remaining parcels. Prescribed fire is necessary to maintain the prairie species. Erosion has been extensive on areas with shallow soils. The community usually shows a lack of diversity and vigor due to the shallow soil. Agriculture uses have caused extensive declines to these prairies. An exotic grass, pitted beardgrass, is becoming established on some prairie sites.

The prairie community of this subtype is **critically imperiled** in the state due to its extreme rarity resulting from having a restricted range, agricultural conversion and a lack of management on the few extant prairie sites. Cedar glades, which are regarded as a degraded form of the prairie community, are vulnerable to decline because of conversions of many sites to improved pasturelands.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH NORTHEAST PRAIRIE/CEDAR GLADES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana areolata*	Crawfish Frog	2
Birds	*Thryomanes bewickii*	Bewick's Wren	1
	Ammodramus savannarum	Grasshopper Sparrow	2
	Aimophila aestivalis	Bachman's Sparrow	2
	Columbina passerina	Common Ground-Dove	2

	Ammodramus leconteii	Le Conte's Sparrow	2
	Asio flammeus	Short-Eared Owl	2
	Scolopax minor	American Woodcock	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Tyto alba	Common Barn-Owl	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Colinus virginianus	Northern Bobwhite	3
	Dendroica discolor	Prairie Warbler	3
Crustaceans	*Procambarus pogum*	Bearded Red Crayfish	1
	Procambarus hagenianus vesticeps	A Crayfish	2
Mammals	*Lasiurus cinereus*	Hoary Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Spilogale putorius	Eastern Spotted Skunk	2
Reptiles	*Ophisaurus attenuatus*	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Masticophis flagellum	Eastern Coachwhip	3

THREATS TO NORTHEAST PRAIRIE/CEDAR GLADE COMMUNITY

Agricultural Conversion	high
Altered Fire Regime	high
Conversion to Pasture: Historical	high
Incompatible Agricultural Practices	high
Invasive Species	high
Incompatible Grazing Practices	high
Urban/Suburban Development	medium
Forestry Conversion	low
Recreation Activities	low
Miscellaneous Threats Described:	
Threatened by Degraded Prairie	not ranked

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

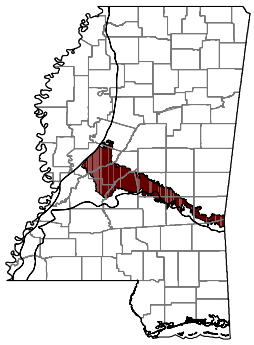
A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

2.2 Jackson Prairie

- **Value to SGCN - 51**
- **Rank - 17th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

The Jackson prairie, located in central Mississippi, is the second region of blackland prairie soils found in the state. It extends along a band of Eocene-aged strata (deposited approximately 35 million years ago) from Yazoo City to the Wayne County-Alabama border. Remnant prairie openings are nested within extensively forested uplands, mostly restricted to the Bienville National Forest. The soil is largely comprised of eroded Maytag soils that are derived from deposits of marls of the Yazoo clay. The soil series is situated on gentle to moderately sloping uplands of well-drained, alkaline soil, which are composed largely of clays that exhibit high shrink and swell characteristics. Much of the original prairie habitat was historically cultivated by early Indian tribes and later by settlers. Of the scattered prairies that remain, a diverse complement of grasses and forbs similar to the composition of prairies of the northeast prairie is found. In areas not managed with prescribed fire, eastern redcedar, white ash and sweetgum readily invade the prairie openings, eventually shading out many of the diagnostic prairie herbs. For this reason, prairies require the use of prescribed fire to prevent shrub and tree encroachment and to invigorate the native perennial herbs and grasses.



Range of Jackson Prairie

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

Very small patches of this subtype (1 to 100 acres) remain in the central part of

the state. Many are situated on small openings in a matrix of hardwood and pine forestlands of the Bienville National Forest. Cedar glades are less frequently encountered in this region. The prairies are estimated to encompass **1,000 acres** in aggregate.

Although considered to have been rare even prior to European settlement of the region, this subtype is significantly reduced in total acreage. Many of the known prairie openings are located on the Bienville National Forest and are being managed as wildlife areas maintained by periodic controlled burns. Larger prairie sites near Forest and Lake, Mississippi, were converted to agriculture cropland many years ago. The spring season burns have improved the vigor and productivity of the warm season grasses but also may have reduced overall abundance of forbs, many of which are set back in their growth cycle by spring burning.

This community is **critically imperiled** in the state because of extreme rarity and its vulnerability to additional decline caused by shrub encroachment, seasonally inappropriate burning regime and invasion by exotic vegetation.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH JACKSON PRAIRIE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Aimophila aestivalis*	Bachman's Sparrow	2
	Ammodramus leconteii	Le Conte's Sparrow	2
	Ammodramus savannarum	Grasshopper Sparrow	2
	Asio flammeus	Short-Eared Owl	2
	Columbina passerina	Common Ground-Dove	2
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Colinus virginianus	Northern Bobwhite	3
	Dendroica discolor	Prairie Warbler	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Scolopax minor	American Woodcock	3
	Tyto alba	Common Barn-Owl	3
Crustaceans	*Procambarus barbiger*	Jackson Prairie Crayfish	1
Mammals	*Lasiurus cinereus*	Hoary Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Spilogale putorius	Eastern Spotted Skunk	2
Reptiles	*Ophisaurus attenuatus*	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Masticophis flagellum	Eastern Coachwhip	3

THREATS TO JACKSON PRAIRIE COMMUNITY

Agricultural Conversion: Historical	high
Altered Fire Regime	high
Conversion to Pasture: Historical	high
Incompatible Agricultural Practices	high
Invasive Species	high
Incompatible Grazing Practices	high
Urban/Suburban Development	medium
Livestock Feedlots/Operations	medium
Recreation Activities	low
Miscellaneous Threats Described:	
Threatened By Degraded Prairie	not ranked

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution,

erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

2.3 Hay and Pasture Lands

- **Value to SGCN - 48**
- **Rank - 19th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

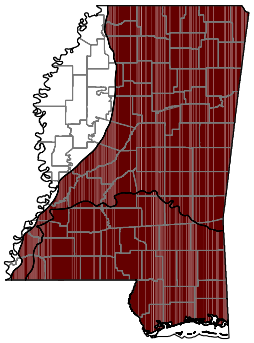
Hay lands and improved pastures may be seeded to produce bahia grass, fescue, Bermuda grass and other varieties. Many areas including hay lands, vacant fields, roadsides and yards are maintained by periodic mowing during the growing season. Mowing reduces their overall value for wildlife by eliminating vegetative cover and reducing insect concentrations and seed production. Areas not mowed support a larger number of ruderal herbs including annual ragweed, Canada goldenrod, annual marsh elder and Queen Anne's lace.

Pasturelands are often improved by liming and fertilizing and planting more productive grass varieties, such as fescue and Bermuda grass. Other unimproved pastures that are heavily grazed contain a variety of native and domestic grasses and weeds. Some weeds that are unpalatable will increase in grazed pastures. If left ungrazed or managed by mowing, trees and shrubs quickly invade and form brushy thickets and eventually woodlands.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP

Hay and pasture lands are distributed similarly to agricultural lands, but are more extensive, as they are estimated to cover more than **21 percent of the state.** They often occur on less productive soils and steeper hill slopes. They are concentrated in agricultural districts of the state with the exception of the Mississippi Delta, which is dedicated largely to row crop agriculture. Pine and hardwood forests, pine plantations and cutover areas often adjoin this subtype.



Range of Hay and Pasture Lands

Hay and pasture lands are habitats used to raise forage for domestic livestock. These open lands are available for use by wildlife, but are only marginally attractive to most of SGCN. Cultural practices which leave sufficient stubble on pasture and hayfields provide additional cover and ensure better grass vigor. Overgrazing increases erosion potential and allows unpalatable weeds and exotics to invade the pastures.

Hay and pasture lands are considered common, widespread and abundant in the state and are **secure** from significant declines in extent or quality.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH HAY AND PASTURE LANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Columbina passerina	Common Ground-Dove	2
	Ammodramus savannarum	Grasshopper Sparrow	2
	Ammodramus leconteii	Le Conte's Sparrow	2
	Asio flammeus	Short-Eared Owl	2
	Scolopax minor	American Woodcock	3
	Tyto alba	Common Barn-Owl	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Colinus virginianus	Northern Bobwhite	3
Crustaceans	*Procambarus barbiger*	Jackson Prairie Crayfish	1
Mammals	*Lasiurus cinereus*	Hoary Bat	2
	Myotis lucifugus	Little Brown Myotis	2
Mammals	*Spilogale putorius*	Eastern Spotted Skunk	2
Reptiles	*Ophisaurus attenuatus*	Slender Glass Lizard	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Gopherus polyphemus	Gopher Tortoise	2
	Masticophis flagellum	Eastern Coachwhip	3

THREATS TO SGCN ASSOCIATED WITH HAY AND PASTURE LAND COMMUNITIES

Altered Fire Regime	high
Forestry Conversion	high
Invasive Species	high
Incompatible Agricultural Practices	high
Incompatible Grazing Practices	medium
Urban/Suburban Development	medium
Industrial Development	low
Road Construction/Management	low
Agricultural Conversion	not ranked
Miscellaneous Threats Described:	
Improper Management	not ranked

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Initiate propagation program or establish nest box program for selected SGCN.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

2.4 Pine Plantations

- **Value to SGCN - 60**
- **Rank - 15th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

A wide range of upland habitats are suitable for growing pines in Mississippi. They grow best in moist, moderately acid soils. Loblolly, and less frequently, shortleaf pine have been planted over extensive areas of the state and presently occupy a wide variety of landforms and soil types. Slash pine plantations are popular in the piney woods region of southern Mississippi. Pine plantations have replaced large acreages of natural hardwood and longleaf pine forests. In Mississippi and much of the southeastern United States, loblolly pine is the preferred tree of the forest industry because of its rapid growth. Its distribution and abundance is much greater today than in presettlement forests.

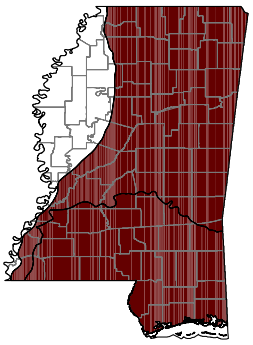
Young plantations contain stands of pine that have trees averaging less than 15 feet tall. Southern yellow pines take about ten to fifteen years to reach tree size (15-18 feet) to overtop other competitive shrubs and trees. Rate of pine growth depends on such factors as soil type, type of land treatment, stocking density and competition from other species. During initial growth stages, young pines are vigorous but less competitive. After the pines become established, the ground is heavily shaded and becomes littered with a thick mat of pine needles, which insulates the soil and prevents other herbs, shrubs and trees from growing in the stand. However, shrubs and trees persist in pine stands, even those

with high pine stocking rates. Even-aged stands often form a closed canopy that strongly restricts competition. However, once a stand is thinned, more light will reach the forest floor and herb and shrubs will return. Longer term rotations will allow pines sufficient time to mature. As trees are thinned in mature pine stands, herbs and shrubs will become more productive.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

In all upland regions of the state except the Mississippi Delta, parts of the loess hills and the blackbelt regions, there has been significant conversion of forest and abandoned croplands to pine plantations, which are estimated to cover almost 14 percent of the state (over **4 million acres**). Parcels range widely in size but can reach several thousand acres in extent on the most suitable areas. Blocks of plantations are interspersed with natural regeneration forests, shrublands, croplands and urban/suburban areas.



Range of Pine Plantations

Pine tree density is significantly higher in plantations and the understory cover is reduced accordingly. Some birds find plantations suitable for foraging habitat, and deer and turkey use the heavy cover for concealment. Understory productivity increases as plantations are thinned. Establishing hardwood trees, leaving mature mast trees in the plantation, decreasing stocking densities and using controlled burns to manage brush encroachment can improve the pine plantations for wildlife.

Plantations are a **secure** subtype as they are common, widespread, and abundant in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH PINE PLANTATIONS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana areolata*	Crawfish Frog	2
	Bufo nebulifer	Gulf Coast Toad	3
Birds	*Aimophila aestivalis*	Bachman's Sparrow	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Colinus virginianus	Northern Bobwhite	3
	Scolopax minor	American Woodcock	3
	Dendroica discolor	Prairie Warbler	3
	Hylocichla mustelina	Wood Thrush	3
	Oporornis formosus	Kentucky Warbler	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Sitta pusilla	Brown-Headed Nuthatch	3
Mammals	*Myotis lucifugus*	Little Brown Myotis	2
	Zapus hudsonius	Meadow Jumping Mouse	2
	Spilogale putorius	Eastern Spotted Skunk	2

Reptiles	*Eumeces anthracinus pluvialis*	Southern Coal Skink	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Gopherus polyphemus	Gopher Tortoise	2
	Lampropeltis triangulum syspila	Red Milk Snake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2
	Lampropeltis getula nigra	Black Kingsnake	3
	Masticophis flagellum	Eastern Coachwhip	3
	Drymarchon couperi	Eastern Indigo Snake	4

THREATS TO SGCN ASSOCIATED WITH PINE PLANTATION COMMUNITIES

Incompatible Forestry Practices	high
Invasive Species	high
Urban/Suburban Development	medium
Industrial Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

2.5 Old Fields and Young Hardwoods (Shrublands)

- **Value to SGCN - 50**
- **Rank - 18th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

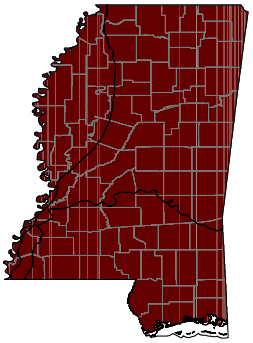
Old fields or fallow lands contain a variety of annual and perennial weeds. Grasses such as purpletop tridens, velvet panicum, bristlegrass, bahia grass and Johnson grass often flourish in these areas. Ideal growing conditions in the spring bring a flush of ephemeral herbs to mowed areas, waste places, vacant lots and roadsides. Spring grasses include bluegrass, Bermuda grass, cheatgrass, cattail sedge, little barley, little bentgrass and perennial ryegrass. Some of the common forbs are: bittercress, butterweed, bedstraw, buttercup, chervil, chickweed, clover, cornsalad, corn speedwell, crowpoison, dandelion, fleabane, forget-me-not, garlic, lyre-leaf sage, plantain, spotted medick and toadflax. If fields and grassy openings are left unattended over several years, many vines, shrubs and trees such as gallberry, possumhaw, eastern red cedar, Chinese privet, rattan-vine, persimmon, eastern baccharis, pines and hardwoods steadily advance into these areas. Herbs, vines and shrubs flourish as nutrients and light becomes available after logging.

During the succession back to forest cover, the herb phase commonly lasts from one to several years. Annual grasses and herbs are the first to invade exposed or cleared areas. Perennial grasses, forbs and vines such as greenbriers and blackberries are prolific as other shrubs become established. Shrubs, coppicing hardwoods (originating from roots or suckers) and seedling hardwoods then overshadow the openings and reduce the abundance of herbs.

Within five to ten years, shrubs and trees regain dominance. Scrub vegetation often contains a wide variety of opportunistic and invasive species like poison ivy, Japanese honeysuckle and Chinese privet. The southern upland type includes red maple, inkberry, yaupon, southern bayberry, various oak species and blueberries. The northern scrub-shrub type contains a variety of trees, shrubs, woody vines, including devil's walking stick, American beautyberry, common persimmon, sassafras, sweetgum, hickory, oaks (particularly water oak), sumac, winged elm, grapevine, Virginia creeper and poison ivy. Wetland scrub-shrub vegetation contains an abundance of vines including ladies' eardrops, grape, trumpet creeper, peppervine, Japanese honeysuckle and an assortment of shrubs, i.e., red maple, hickory, blackgum, giant cane, buttonbush, planer tree, ash, possumhaw, Chinese privet, sugarberry and hawthorn. The vegetation is deemed a forest once trees reach an average height of 15 feet tall. Trees that have wind dispersed seeds such as pines, sweetgum, ash, winged elm and red maple encroach into old-field openings. Hickories and oaks, which are dispersed by animals, are often prevalent.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP



Range of Old Fields and Young Hardwoods (Shrublands)

Shrublands include cutover areas dominated by young hardwoods and shrub species released following canopy removal and old fields. Cutover areas are generally interspersed with pine and hardwood forest lands, and old fields are more commonly embedded in a landscaped dominated by agricultural fields and pasturelands. These early-successional, shrub-dominated communities occupy about 16 percent of Mississippi (approximately **five million acres)**.

The vegetation of this subtype is in transition as trees gain coverage and dominance of the stand. Wildlife species that thrive in open shrubland habitats are usually common; however, some, including the gopher tortoise and bobwhite quail, will use them until they become so congested with young trees and shrubs that herbaceous vegetation is shaded out. Shrublands are particularly susceptible to invasion by aggressive, exotic vegetation such as cogongrass.

Shrublands are common, widespread, and abundant in the state and are considered **secure** from significant decline.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH OLD FIELDS AND YOUNG HARDWOODS (SHRUBLANDS)

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Thryomanes bewickii	Bewick's Wren	1
	Aimophila aestivalis	Bachman's Sparrow	2
	Passerina ciris	Painted Bunting	2
	Dendroica discolor	Prairie Warbler	3
	Colinus virginianus	Northern Bobwhite	3
	Scolopax minor	American Woodcock	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Lanius ludovicianus	Loggerhead Shrike	3
Mammals	*Spilogale putorius*	Eastern Spotted Skunk	2
	Peromyscus polionotus	Oldfield Mouse	2
Reptiles	*Gopherus polyphemus*	Gopher Tortoise	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2
	Lampropeltis getula nigra	Black Kingsnake	3
	Masticophis flagellum	Eastern Coachwhip	3
	Drymarchon couperi	Eastern Indigo Snake	4

THREATS TO OLD FIELDS AND YOUNG HARDWOOD (SHRUBLANDS)

Altered Fire Regime	high
Forestry Conversion	high
Invasive Species	high
Urban/Suburban Development	medium
Agricultural Conversion	low
Industrial Development	low
Road Construction/Management	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

2.6 Agriculture Fields

- **Value to SGCN - 45**
- **Rank - 20th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

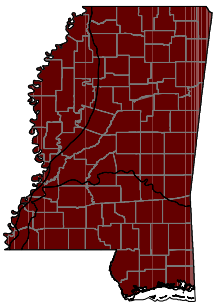
DESCRIPTION

According to the National Agriculture Statistical Service, in 2002 Mississippi had over 11 million acres of land in farms, about 33 percent of the total land area of

Mississippi. The amount and type of herbaceous cover will depend on many factors including field usage, crop types and frequency of agricultural treatments. The Natural Resources Conservation Service estimates that 55 percent of Mississippi's farmland is cropland and produces such commodities as cereal, beans, cotton, vegetables and oil seed. Cereal crops include corn, sorghum, and winter wheat.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP



Range of Agriculture Fields

Most of the upland areas of the state that were of suitable soil type and slope were farmed at one time. Many of the more productive areas continue to be farmed. Croplands are the dominant land use in the Mississippi Delta, a region of approximately five million acres, where 85 percent of the bottomland forests were cleared for farming. The blackland prairie region also supports large farm communities, while other regions with steeper terrain and less suitable soil have smaller farming districts generally restricted to alluvial lands of rivers and gentle topographic relief. Croplands encompass approximately **18 percent of land area of Mississippi**.

Although modern agriculture techniques, chemicals and fertilizers increase crop yields, they generally reduce the availability of cover and food sources for wildlife. "Clean" farming practices are somewhat detrimental to wildlife because there is very little byproduct for food or cover. Areas such as field edges, weedy patches and wet areas remain attractive to some wildlife species. If fields are left vacant after harvest, the fields temporarily provide sources of food for wildlife, which scavenge for weed seeds and unharvested grains.

Some farmers enhance the attractiveness of their fields by setting aside patches of unharvested crops for wildlife, or maintain fields in early succession by disking sod bound fields to manage for bobwhite quail and mourning dove. Quail, which are in considerable decline, are dependent on the availability of open fields that insure ample cover and seed production from annual grasses and forbs. Agriculture fields surrounding the Sandhill Crane National Wildlife Refuge are often used by the Mississippi sandhill crane in the winter and spring seasons. Urban/suburban expansion into these agriculture lands has reduced their availability to cranes as foraging habitat.

Agriculture fields are common and widespread in the state and are **unlikely to show any significant decline in acreage,** but some farming techniques are reducing the quality of these lands for wildlife.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH AGRICULTURE FIELDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Grus canadensis pulla	Mississippi Sandhill Crane	1
	Columbina passerina	Common Ground-Dove	2
	Asio flammeus	Short-Eared Owl	2
	Tyto alba	Common Barn-Owl	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Colinus virginianus	Northern Bobwhite	3
Mammals	*Lasiurus cinereus*	Hoary Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Spilogale putorius	Eastern Spotted Skunk	2
Reptiles	*Ophisaurus attenuatus*	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Gopherus polyphemus	Gopher Tortoise	2
	Lampropeltis getula nigra	Black Kingsnake	3
	Masticophis flagellum	Eastern Coachwhip	3

THREATS TO SGCN ASSOCIATED WITH AGRICULTURE FIELD (ROW CROPS, ETC.)

Invasive Species	high
Incompatible Agricultural Practices	high
Urban/Suburban Development: Locally Important	medium
Industrial Development: Locally Important	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Initiate propagation program or establish nest box program for selected SGCN.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

3. MESIC (MODERATELY MOIST) UPLAND FORESTS

Upland forests that are not limited by nutrient or moisture availability are considered moderately moist. Landforms supporting this type are those positioned on the middle to lower slopes, low flats, or protected draws. The soils are usually deeper, moderately fertile, consist of loam or clay and have higher moisture holding capacities than those of dry to moderately moist categories. Hydric features, characteristics of wetland soils, are normally not found in the upper horizons of these soils. Plant communities of mesic habitats include beech/magnolia, loess hills and lower slope or high terrace hardwoods.

This type includes four subtypes: 3.1 Beech/Magnolia Forests, 3.2 Mesic Longleaf Pine Savanna/ Forests, 3.3 Loess Hardwood Forests and 3.4 Lower Slope/High Terrace Hardwood Forests.

GENERAL CONDITION:

The diversity of the hardwood and pine forest communities have decreased due to land clearing, overcutting, introduction of invasive species, especially Chinese privet, erosion and the suppression of fire over long periods. Being situated on gently sloping landscapes with relatively deep and fertile soil, the mesic forest types were more likely to be converted to agriculture. The loess forests of Mississippi, which are found on steeper terrain, have remained somewhat intact. However, development surrounding the urban centers of Memphis, Vicksburg and Natchez is causing significant fragmentation of the loess forest community.

Mesic longleaf forests once formed an extensive blanket across the uplands of the piney woods region but were logged during the last two centuries. Second growth forests, many of which were converted to other pines, now occupy the undulating hills and plains of the region. Because of the current emphasis on timber production, longleaf pine stands are even-aged and have much higher stocking densities. Although significant land conversion has occurred, longleaf forests are common on national forest lands and some private holdings. Many areas have lost their coverage of beech/magnolia trees. However, beech and magnolia remain the dominant trees in isolated coves, draws and on steeper terrain, especially across the loess hills south of Vicksburg, in patches on national forest lands and on bluffs or upper terraces of major river systems. Forest management practices that prevent logging in streamside zones, designed to help improve water quality of streams, also help conserve lower slope/high terrace hardwood forests. The expansion of terrace hardwoods onto slopes is a modern condition resulting from the suppression of fire. Conditions described for dry-mesic upland forests also apply to these forest communities.

3.1 Beech/Magnolia Forests

- **Value to SGCN - 62**
- **Rank - 13th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

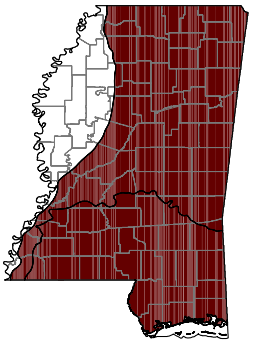
DESCRIPTION

This forest type is found on deep soils of stream terraces, deep loess of protected slopes along draws and areas of coarse-textured sandy or gravelly substrates that receive seepage from adjacent uplands. Substrates generally remain moist throughout the growing season. Since beech and magnolia are of limited commercial value, other species of trees are promoted after logging. Beech and magnolia trees are found as common sub-canopy trees of some mature pine and hardwood stands of the southern loess hills. If allowed to recover after clearing, a beech/magnolia forest may take a century to reestablish itself. Other important trees of this community include white oak, tulip poplartree, sweetgum, water oak and spruce pine. Sub-canopy trees may include bigleaf magnolia, ironwood, sourwood, American holly and flowering dogwood. Six magnolia species may be encountered in this forest type: southern magnolia — the most common upland magnolia, sweetbay, pyramid, cucumber tree, big leaf and rarely, umbrella magnolia. Florida anise, witch-hazel, wild azalea, Elliot's blueberry and giant cane are common understory constituents.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

Beech/magnolia forests over **80,000 acres** in isolated small to medium sized patches (100 to 1,000 acres) throughout the southern part of the state, but are most commonly encountered in the loess bluff region. The community occurs on isolated steep hilly areas or blufflands, protected coves and along mid and lower slopes of ravines, draws and river valleys. Adjoining upland support or originally supported mesic hardwood forest in the loess hills and expansive pinelands in the piney woods region.



Range of Beech/ Magnolia Forests

Beech/magnolia forests require over 70 to 100 years to reach maturity. Due to extensive logging, this community has been lost at many sites, and may only support successional vegetation at others. Some protected areas in the Homochitto National Forest, Desoto National Forest and Clark Creek Natural Area present interesting examples of this subtype.

Formerly widespread and abundant, this subtype is **critically imperiled** in the state because of extreme rarity (few occurrences) and has disappeared in many areas due to logging, site conversion and urbanization.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BEECH/MAGNOLIA FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Plethodon websteri*	Webster's Salamander	2
Birds	*Hylocichla mustelina*	Wood Thrush	3
	Oporornis formosus	Kentucky Warbler	3
	Piranga olivacea	Scarlet Tanager	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Ursus americanus luteolus	Louisiana Black Bear	1
	Myotis grisescens	Gray Myotis	2
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
	Puma concolor coryi	Florida Panther	4
Reptiles	*Eumeces anthracinus pluvialis*	Southern Coal Skink	2
	Lampropeltis triangulum syspila	Red Milk Snake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Lampropeltis getula nigra	Black Kingsnake	3

THREATS TO BEECH/MAGNOLIA FOREST COMMUNITIES

Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	high
Incompatible Resource Extraction Practices	medium
Urban/Suburban Development	medium
Recreation Activities	low
Road Construction/Management	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

3.2 Mesic (Moderately Moist) Longleaf Pine Savanna/Forests

- **Value to SGCN - 72**
- **Rank - 6th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

This forest type occurs on deep, well-drained to moderately well-drained, permeable soils on uplands and stream terraces of the piney woods region in southern Mississippi, a region which receives 60 inches of precipitation annually. The historical longleaf pine forest extended from the wetlands of the coast to the mixed pine-hardwood forests of central Mississippi and from the border of Alabama to the loess hills. Fires maintained forests and savannas of massive, well-spaced longleaf pine trees. Combustible leaf litter and grassy understory carried natural wildfires through the longleaf region. Sampling of virgin forests over a century ago indicated that tree densities averaged about 100 per acre, or 400 square feet per tree. With the wider spacing of trees, ample sunlight was able to reach the forest floor and support a diverse cover of herbs.

While many stands are pure longleaf pine, loblolly and slash pine are common in others. Blackjack, post oak and southern red oak trees are also locally common. In some stands not managed with fire, dense shrub and vine thickets, reaching six to fifteen feet in height, will shade out the normally rich

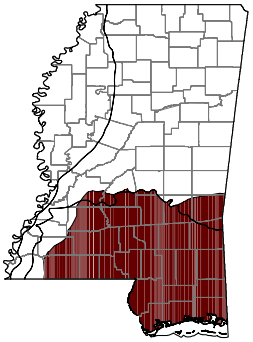
assemblage of herbs. Trees and shrubs that increase dramatically with a lack of prescribed fire include slash pine, sweetgum, red maple, large gallberry, inkberry, yaupon, titi and common sweetleaf. Fire tolerant shrubs include farkleberry, southern bayberry, flameleaf sumac and dwarf huckleberry.

Over 100 species per quarter acre are found on the richest fire maintained sites with shrubs, grasses and forbs, accounting for one-third of the ground cover. The most important plant groups are the grasses, asters and legumes. Little and slender bluestem grass and wiregrass are especially important in mesic longleaf forests. Other prominent species are cutover muhly, panic grass, paspalum and toothache grass. Narrowleaf silkgrass, one flowered honeycombhead, anise-scented goldenrod and stiff sunflower are representative of the numerous forbs encountered.

LOCATION, SIZE CONDITION AND CONSERVATION STATUS

UEGCP, EGCP

Mesic longleaf pine savanna/forests were the most extensive community type of the piney woods region of southern Mississippi. Only a fraction of the original forest remains (about three percent). Some large tracts of this subtype are found on the De Soto National Forest and a few private holdings. Bogs are embedded within this habitat in some areas. Many sites in the piney woods have been converted to commercial timber production and are typically planted in off-site species such as loblolly or slash pine. Tracts supporting this subtype range up to 10,000 acres in size (such as the area surrounding White Plains), but many tracts are much smaller. Total acreage of the subtype is estimated to be **67,000 acres.**



Range of Mesic (Moderately Moist) Longleaf Pine Savanna/ Forests

High quality stands of this community consist of low to moderately dense forest cover with a highly diverse understory. Urbanization and proliferation of roads within surrounding private lands has increased the difficulty of properly managing this habitat with prescribed fire. The diversity and quality of the mesic pinelands deteriorates if fire is not regularly applied. Brush encroachment is especially troublesome for managers of this community. Spring season burns tend to favor grasses over forbs and causes a reduction in forb abundance and seed production. Dormant season burning will not effectively control stem proliferation of shrubs and sapling hardwoods, and may in fact encourage an increase in stem density over time.

Mesic longleaf pine forests are **imperiled** in the state because most of the once extensive community has been converted to other cover types. Although some losses are still occurring, foresters are in the process of replanting large acreages of longleaf pine in the piney woods region. Because of the presence of roads, human dwellings and the aggressively invasive cogongrass, prescribed fire is becoming more difficult to apply.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MESIC LONGLEAF PINE SAVANNA/FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana sevosa*	Mississippi Gopher Frog	1
	Pseudacris ornata	Ornate Chorus Frog	2
Birds	*Falco sparverius paulus*	Southeastern American Kestrel	1
	Coturnicops noveboracensis	Yellow Rail	1
	Picoides borealis	Red-Cockaded Woodpecker	2
	Ammodramus henslowii	Henslow's Sparrow	2
	Ammodramus savannarum	Grasshopper Sparrow	2
	Sitta pusilla	Brown-Headed Nuthatch	3
	Colinus virginianus	Northern Bobwhite	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Lasiurus intermedius	Northern Yellow Bat	2
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
	Puma concolor coryi	Florida Panther	4
Reptiles	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake	2
	Micrurus fulvius	Eastern Coral Snake	2
	Ophisaurus attenuatus	Slender Glass Lizard	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Masticophis flagellum	Eastern Coachwhip	3
	Drymarchon couperi	Eastern Indigo Snake	4

THREATS TO MESIC LONGLEAF PINE SAVANNA/FOREST COMMUNITIES

Altered Fire Regime	high
Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	high
Road Construction/Management	high
Industrial Development	medium
Urban/Suburban Development	medium
Air-borne Pollutants	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

3.3 Loess Hardwood Forests

- **Value to SGCN - 65**
- **Rank - 10th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

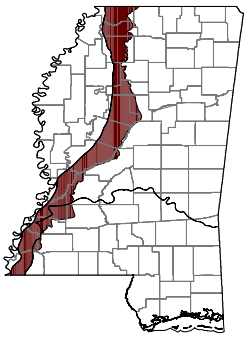
DESCRIPTION

The loess hills region is a range of steep, highly dissected hills and bluffs situated along the eastern flanks of the Mississippi River alluvial plain. Deep silty soils were formed from wind carried (aeolian) sediments along a narrow band extending from Louisiana northward into Tennessee. The band of silt reaches hundreds of feet in depth near the alluvial plain and gradually diminishes towards the east, finally becoming inconsequential about 50 miles away from the river. At the eastern edge of the region, the loess soils are present on lowlands but missing from hill tops where it has been removed by erosion. Memphis and Natchez soil series are the most prevalent soils of the loess or brown loam region. They are characterized as deep, moderately permeable, well-drained silty soils. Slopes are often steep and can range up to 45 percent and occasionally form sheer cliffs. They have moderate fertility and moisture holding capacity. Important trees of the area include many types of hardwoods, especially cherrybark oak, but also water oak, swamp chestnut oak, tulip poplartree, Florida maple, eastern hophornbean, ironwood, sassafras, pignut hickory and two-wing silverbell. Beech and magnolia are less important. Sweetgum, sugarberry, boxelder and red maple are probably more common now than before settlement. They have replaced some of the more traditional climax trees that were once abundant in the diverse virgin forests such as American basswood and black walnut. Due to the abundance of walnut, Vicksburg's early settlement was named Walnut Hills. Important common small trees, shrubs and vines include pawpaw, red buckeye, flowering dogwood, northern spicebush, oakleaf hydrangea and grape vines.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

UEGCP, EGCP

Loess hardwood forests are found on large tracts of up to 10,000 acres in the loess bluff region of the state. Total acreage of this subtype is approximately **300,000 acres**. Encroachment of homesteads into otherwise undeveloped areas, agriculture and clearcutting, conversion of hardwood forests to pinelands and invasion by the forest-topping invasive kudzu have contributed to the destruction and fragmentation of this forest type. Adjoining ridgetops support dry/mesic hardwood forests (1.3) and larger streams support lower slope/high terrace hardwood forests (3.4).



Range of Loess Hardwood Forests

Historically, the region experienced widespread agriculture development, even in steep areas.

Consequently much of the region was exposed to significant erosion on the slopes and grossly excessive sedimentation in adjoining terraces and in streams. The silty loess soils are highly erodible in nature. Subsequent to this erosion cycle, much of the region was abandoned with respect to agricultural pursuits, allowing return of forest cover. Some areas have recovered to such an extent that it is difficult to discern that they were cultivated. The steepest areas remain the least likely to have been previously cultivated and maintain some of the highest diversity. Some lands are managed for hardwood timberland, but the risk of erosion during logging of these sites is often high. Chinese privet, an exotic shrub, has thoroughly infiltrated these forests, and is especially abundant in forests surrounding urban areas.

The loess hardwood forest is **imperiled** in the state because of extensive habitat modification following erosion problems caused by historical agricultural conversion, and because of the current threat of additional fragmentation resulting from homesteading and urbanization around population centers. Invasion of exotic shrubs and kudzu, and effects associated with commercial timber management (this includes conversion to pine forests and regeneration problems following clearcutting or high-grading of hardwood forests) are other factors that render this subtype vulnerable to additional decline.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOESS HARDWOOD FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Plethodon websteri*	Webster's Salamander	2
Birds	*Dendroica cerulea*	Cerulean Warbler	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Oporornis formosus	Kentucky Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Piranga olivacea	Scarlet Tanager	3
	Hylocichla mustelina	Wood Thrush	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
		Migrant Songbirds	
Fish	*Phoxinus erythrogaster*	Southern Redbelly Dace	2
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Myotis austroriparius	Southeastern Myotis	1
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4

	Puma concolor coryi	Florida Panther	4
Reptiles	*Lampropeltis triangulum syspila*	Red Milk Snake	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2

THREATS TO LOESS HARDWOOD FOREST COMMUNITIES

Forestry Conversion	high
Incompatible Forestry Practices	high
Invasive Species	high
Incompatible Agricultural Practices	high
Miscellaneous Threats Described: Erosion	high
Urban/Suburban Development	medium
Road Construction/Management: Management	medium
Recreation Activities	low
Incompatible Grazing Practices	low
Incompatible Resource Extraction Practices	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN

and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

3.4 Lower Slope/High Terrace Hardwood Forests

- **Value to SGCN - 76**
- **Rank - 5th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

The moderately moist and occasionally wet (palustrine) hardwood forest habitats of this type are found on lower slopes and high terraces of streams and rivers of Mississippi. Small drainageways, floodplains, stream terraces, levees, low moist plains, and some lower slopes are landforms that support this vegetation type. The lowlands have soils ranging in textures from clay and silt to, occasionally, sandy loam. The coarser textured soils are usually found on ancient secondary terraces. Although these landforms sometimes flood, they often have deeper soils and receive lateral subsurface seepage and surface runoff from adjacent uplands. Their low position on the landscape ensures that the habitat remains moist during the growing season. This habitat type often has an elevated water table during the late winter and early spring. However, the water table will drop precipitously during early spring growth.

Forests include mixed hardwood, sweetgum – mixed oak and hardwood pine types. Important species include sweetgum, water oak, cherrybark oak, white oak, swamp chestnut oak, willow oak, and pignut hickory, bitternut hickory and shagbark hickory that include pignut, bitternut and shagbark. Loblolly and spruce pine are locally common. Shrub and small tree associates include ironwood, winged elm, red maple, possumhaw, sugarberry, pawpaw, common sweetleaf and giant cane. Partridge berry, netted chainfern, jack-in-the-pulpit, common lady fern, small-spike false nettle, jumpseed, mayapple and wild petunia are representatives of the herb layer.

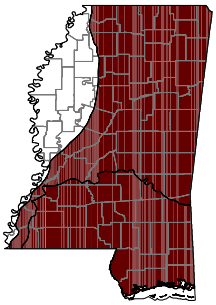
Of historical significance are the canebrakes of the Mississippi riverine areas of the state, especially in the Delta region. Extensive, impenetrable giant cane thickets that were apparently mostly devoid of trees formed along the levees of stream corridors. Historical documents noted fires of canebrakes sounded like "a barrage of musket fire" as the cane-stems exploded when heated. The intense fires apparently killed larger trees and subsequently prevented their reestablishment. With fertile soil and

lack of trees, canebrakes were among the first lands selected for farming by early settlers. Furthermore, cane regrowth after burns provided quality forage for livestock. Because of their rapid conversion to agriculture, little is known about the ecology of these areas.

A few localities in the Delta still contain canebrakes, but they have become dense with trees creating a sparser, less vigorous growth of giant cane. Of particular note is the extirpation of the Bachman's warbler, which was last heard in canebrakes, its required habitat.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP



Range of Lower Slope/ High Terrace Hardwood Forests

The lower slope/high terrace hardwood forests subtype is found in narrow linear patches along small creeks, where flooding is minimal and/or of brief duration. On larger streams and rivers, they are situated on high terraces and levees, and are bounded at the lower end of the mesosere by the wetter bottomland forest type and at the higher end of the mesosere by moist upland areas. They occur in irregular patches, from 100 to 10,000 acres in size. Nearly **900,000** acres of this subtype are estimated to occur in Mississippi.

Being somewhat drier than bottomland forests (subtype 4.1), these forests have experienced a greater degree of conversion, fragmentation, and logging pressure. These habitats are valued because of their high productivity. Many areas that formerly supported this subtype have been converted to pine plantations.

This subtype is **vulnerable** in the state due to its somewhat restricted distribution, and by recent and widespread declines caused by increased logging pressure, conversion to other uses and fragmentation (particularly around urban areas).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER SLOPE/HIGH TERRACE HARDWOOD FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Plethodon websteri*	Webster's Salamander	2
	Rana areolata	Crawfish Frog	2
Birds	*Dendroica cerulea*	Cerulean Warbler	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Euphagus carolinus	Rusty Blackbird	2
	Oporornis formosus	Kentucky Warbler	3
	Scolopax minor	American Woodcock	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Protonotaria citrea	Prothonotary Warbler	3

	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Hylocichla mustelina	Wood Thrush	3
	Vermivora bachmanii	Bachman's Warbler	4
	Campephilus principalis	Ivory-Billed Woodpecker	4
		Migrant Songbirds	
Fish	*Phoxinus erythrogaster*	Southern Redbelly Dace	2
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Ursus americanus luteolus	Louisiana Black Bear	1
	Myotis septentrionalis	Northern Myotis	2
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
	Puma concolor coryi	Florida Panther	4
Reptiles	*Lampropeltis triangulum syspila*	Red Milk Snake	2
	Lampropeltis calligaster calligaster	Prairie Kingsnake	2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	2
	Lampropeltis getula nigra	Black Kingsnake	3

THREATS TO LOWER SLOPE/HIGH TERRACE HARDWOOD FOREST COMMUNITIES

Incompatible Forestry Practices	high
Invasive Species	high
Forestry Conversion	high
Operation of Dams/Impoundments	medium
Incompatible Grazing Practices	low
Urban/Suburban Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

4. BOTTOMLAND HARDWOOD FORESTS

Bottomland hardwood forests occur in river floodplains that receive periodic inundation from rivers during heavy rainfall events. Bottomland terraces are irregularly flooded for durations of several days to a month or more. On these lowland sites, the water table remains elevated during the winter and spring seasons and soils remain moist through much of the growing season. Their soils are less acidic and are enriched by the influx of nutrients and sediments during floods. Bottomland forests are considered palustrine. The palustrine habitats are composed of hydrophytic plants that grow and persist despite periodic low oxygen conditions in the soil.

This type includes one subtype: 4.1 Bottom Hardwood Forests.

GENERAL CONDITION

Bottomland hardwood forests and swamps make up parts of three habitats (Habitat Types 4, 5, and 10). Bottomland hardwood forests and swamps were once common in the Southeast. During the last century, the most dramatic wetland loss in the entire nation occurred in forested wetlands of the Lower Mississippi River Alluvial Plain region, which includes the Mississippi Delta region. Of an estimated 24 million acres of the original bottomland hardwood forests, only 5.2 million acres (22 percent) remained in 1978. Fifty-six percent of southern bottomland hardwood and bald cypress forests were lost between 1900 and 1978. Only fifteen percent of the Mississippi Delta remained forested and the largest segment remaining is the complex of forests about 100,000 acres in size within and surrounding the Delta National Forest. The largest patches of bottomland forests are the wet bottomland types that contain few tree species

However, significant areas of bottomland hardwood forests remain in the Mid-South region, mainly situated in the Mississippi River Valley. By classifying the forests into Society of American Forest cover types, it is estimated that over 2.5 million acres of moderately wet bottomland forest and over 0.6 million acres of very wet bottomland forest remain in the lower part of the Mississippi River Alluvial Plain within Mississippi, Arkansas and Louisiana.

The primary cause of bottomland hardwood losses has been conversion of these lands to agricultural production. Additional losses have been caused by construction and operation of flood control structures and reservoirs, surface mining, and urban development. The moderately wet forest types are increasingly fragmented due to improved road access, increased agriculture usage (i.e., pastures and

fencing) and closer proximity to development. The wetter tracts are less fragmented but also have lost many of their original functions. They are somewhat less vulnerable to disturbances because moisture conditions prevented access to these lands. Human activities along streams have had, and continue to have, a negative impact in this habitat.

4.1. Bottomland Hardwood Forests

- **Value to SGCN - 83**
- **Rank - 3rd of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

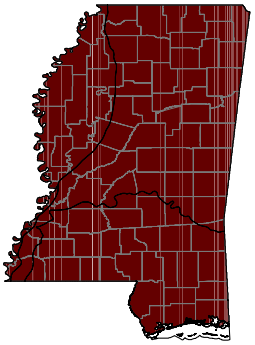
DESCRIPTION

Moderately wet bottomland hardwood forests are found on fertile, fine textured clay or loam soils of floodplains, stream terraces and wet lowland flats. The Sharkey Soil Series is the most prevalent soil type supporting this community. The series consists of extensive flats of very deep, poorly and very poorly drained, very slowly permeable alluvial clays. Sugarberry-American elm-green ash, sweetgum-mixed oak, and Nutall oak-American elm-pecan are representative communities of the low terrace (moderately wet) bottomland hardwood forest type. Prevalent trees include willow, water, overcup, and Nuttall oaks, pecan, sugarberry, American elm, green ash, and sweetgum. Other subcanopy species include possumhaw, stiff dogwood, boxelder, dwarf palmetto and giant cane.

Though prominent in the Mississippi River alluvial plain, wet bottomland forest type occurs elsewhere along streams in Mississippi. Wet bottomland hardwood forests are found on landforms such as floodplain backwater depressions, swales, low terraces and wet flats that are exposed to flooding of greater frequency and duration. Substrates are fine textured because river flows are slow or stagnant when deposition occurs. The clayey or loamy soils help to hold water for longer periods. Water hickory - overcup oak forest type is found on the wettest sites and at the edges of swamp depressions and oxbow lakes, while willow oak, water oak and swamp laurel oak are found on wet clay flats. Small trees and shrubs may include silver maple, planer tree, swamp privet, dwarf palmetto, American snowbell and possumhaw. Wet bottomland hardwoods contain some of the best remaining habitats for bats. Studies have shown that old-growth bottomland hardwood forests are critical habitat for 11 of 18 bat species found in the Southeast.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP



Range of Bottomland Hardwood Forests

The bottomland hardwood forests subtype occurs in linear patches on floodplains along creeks and rivers. Several large patches of 50,000 - 100,000 acres are found along lowland stretches of the Pascagoula and Pearl River and in the Mississippi Delta; however the total acreage of bottomland hardwood forests along smaller rivers is substantial. Collectively, bottomland hardwood forests make up almost seven percent of the state's land area (about **two million acres**). Except in the Mississippi Delta, where they occur within wide expanses of agriculture land, these forests are adjoined by upland hardwood and pine forests, urban lands and smaller agricultural holdings.

Bottomland hardwood forest losses have been primarily attributed to the conversion of land to agricultural production; however, construction and operation of flood control structures, reservoir creation, surface mining, urban development and exotic weeds and insects are also negatively affecting these forests. Due to drainage efforts, levee construction, improved road access, increased agricultural usage and closer proximity to development, the remaining bottomland hardwood forests are fragmented and many no longer perform provide flood water storage, nutrient trapping, groundwater recharge and wildlife habitat. However, due to flooding frequency this habitat is difficult to convert into other uses, and many patches of bottomland forest have been conserved because of their increasing value for outdoor recreation such as fishing, hunting, and hiking.

Bottomland hardwood forests are **vulnerable** in the state due to widespread conversion in the past; other factors that contribute to fragmentation and reduce function could lead to further declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BOTTOMLAND HARDWOOD FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Egretta caerulea*	Little Blue Heron	2
	Mycteria americana	Wood Stork	2
	Elanoides forficatus	Swallow-Tailed Kite	2
	Dendroica cerulea	Cerulean Warbler	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Euphagus carolinus	Rusty Blackbird	2
	Eudocimus albus	White Ibis	2
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Hylocichla mustelina	Wood Thrush	3
	Protonotaria citrea	Prothonotary Warbler	3
	Oporornis formosus	Kentucky Warbler	3
	Anhinga anhinga	Anhinga	3

	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Anas rubripes	American Black Duck	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
	Vermivora bachmanii	Bachman's Warbler	4
		Migrant Songbirds	1
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Ursus americanus luteolus	Louisiana Black Bear	1
	Myotis lucifugus	Little Brown Myotis	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Ursus americanus	Black Bear	2
	Lasiurus cinereus	Hoary Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
	Puma concolor coryi	Florida Panther	4
Reptiles	*Lampropeltis getula nigra*	Black Kingsnake	3

THREATS TO BOTTOMLAND HARDWOOD FOREST COMMUNITIES

Agricultural Conversion	high
Channel Modification	high
Forestry Conversion	high
Incompatible Agricultural Practices	high
Invasive Species	high
Miscellaneous Threats Described	high
Operation of Dams/Impoundments: Levees, Etc.	high
Incompatible Forestry Practices	medium
Incompatible Resource Extraction Practices	medium
Incompatible Water Quality: Trash, Pollution	medium
Groundwater and Surface Water Withdrawal	medium
Road Construction/Management	medium
Industrial Development	low
Recreation Activities	low
Urban/Suburban Development	low
Incompatible Grazing Practices	low
Over Exploitation/Incidental Capture	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

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5. RIVERFRONT PALUSTRINE (MOIST) FLOODPLAIN FORESTS/HERBLANDS/SANDBARS

Riverfront soils are lower in organic matter and have higher pH than soils of other bottomland hardwoods. New soils in accretion zones range from fine clay to coarse sand, depending on flow velocities at the time of sediment deposition. Backwater areas contain finer textured substrates and point bars are sandier. The moisture level of riverfront substrates depends on river stage, which is usually high in the spring, causing saturation or flooding, and low in the fall, bringing dryer conditions.

Flooding along the riverfront areas reworks sediments from river banks, sandbars and point bars to form new channels, submerging some areas and building new lands elsewhere. Wet exposed mineral soils provide open habitats for cottonwood and willow to germinate. The dominant trees of these areas germinate best in exposed mineral soil, grow rapidly once river levels fall and must tolerate submersion and sediment accumulation. Sedimentation degrades aquatic habitats and kills aquatic organisms, including fish. Riverfront forests, which control shoreline erosion and intercept eroded soil from upland areas, effectively reduce the amount of sediment reaching rivers and streams.

This type includes two subtypes: 5.1 Cottonwood/Black Willow/River Birch Woodlands, and 5.2 Sandbars.

GENERAL CONDITION:

Dams, channelization, manmade levees and other modifications have restricted the extent of riverfront forests. Bank erosion-accretion process has been slowed or eliminated along leveed and stabilized portions of the Mississippi River. The modified river environment has inhibited riverfront cottonwood and willow community regeneration.

Although much diminished after river diking, dredging, revetment and channelization projects, the lands between the Mississippi River and its levees still contain the long swaths of riverfront forests. It is estimated that over 500,000 acres of cottonwood-willow forest remains in the Lower Mississippi River alluvial plain within Mississippi, Arkansas and Louisiana. Rivers confined to the western portion of the state and flow into the Mississippi River, such as the Big Black and Sunflower, are dramatically impacted by the stages of the Mississippi River, which significantly alters their rate of flow and sediment deposition.

Sandbars are dynamic lotic features that generally persist in the presence of many human activities.

However, some activities reduce or increase the amounts of these habitats and significantly alter their stability. Native plants and exotic weeds such as cogongrass can invade and vegetate sandbars, making them unsuitable for nesting turtles.

5.1 Cottonwood/Black Willow/River Birch Woodlands

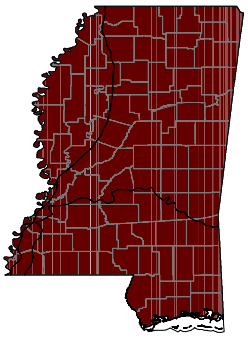
- **Value to SGCN - 58**
- **Rank - 16th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

Black willow and eastern cottonwood are the dominant species of riverfront communities along the Mississippi River Alluvial Plain and the Big Black River, but American sycamore and river birch may dominate other riverfront communities. Boxelder, sugarberry and silver maple are also commonly present. The riverfront forests may last for over 50 years before the canopy trees begin to senesce (age and decline). In time theyse forests gradually become more diverse in shrubs, vines and herbs.

Common shrubs include eastern swamp privet, planer tree and sandbar willow. Vines are often plentiful along shorelines and openings in the canopy. Some of the common ones include: peppervine, trumpet creeper, climbing hempvine, oneseed bur cucumber, poison ivy and riverbank grape. Because of the length and frequency of flooding, herbaceous cover is often rather sparse. Some of the common herbs include careless weed, halberdleaf rosemallow, whitestar, rough cocklebur, Virginia dayflower and balloon vine.

After the riverfront floodplain has stabilized for several years or more, other bottomland species that tolerate shading, such as green ash, American elm and sugarberry become established. As succession continues and/or if the river shifts laterally away from its former bank, a more stable landscape enables the forest to succeed to other bottomland forest types that prefer soils higher in organic matter.



Range of Cottonwood/ Black Willow/River Birch Woodlands

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP

The cottonwood/black willow/river birch woodlands subtype covers **80,000 acres** and is especially prominent in the batture lands of the Mississippi River, where cottonwood and willow are found in extensive linear patches. The subtype also occurs in smaller patches along other rivers of the state. It

flourishes along channels where nutrient poor mineral soils are exposed after flooding. The woodlands are replaced by bottomland hardwood forests as the distance increases from the main channel.

The subtype has declined in some areas because of flood control projects which have altered the natural flow regimen of southern river systems. Loss of the scouring action of streams subsequent to impoundment reduces the hydrologic forces that rework the channel, and which expose the mineral soils necessary for the germination and establishment of cottonwood and black willow trees. However, myriad channelization projects have destabilized other drainage systems, resulting in loss of bare mineral soil available for colonization by these species.

The cottonwood/black willow/river birch forest is **vulnerable** in the state due to modification of drainage hydrographs which produce seedbeds for these species.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH COTTONWOOD/BLACK WILLOW/RIVER BIRCH WOODLANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Dendroica cerulea*	Cerulean Warbler	2
	Haliaeetus leucocephalus	Bald Eagle	2
	Egretta caerulea	Little Blue Heron	2
	Euphagus carolinus	Rusty Blackbird	2
	Eudocimus albus	White Ibis	2
	Mycteria americana	Wood Stork	2
	Anhinga anhinga	Anhinga	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Pandion haliaetus	Osprey	3
	Protonotaria citrea	Prothonotary Warbler	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4

THREATS TO COTTONWOOD/BLACK WILLOW/RIVER BIRCH WOODLAND COMMUNITIES

Channel Modification	high
Invasive Species	high
Operation of Dams/Impoundments	high
Recreation Activities	high
Incompatible Resource Extraction Practices	medium
Groundwater and Surface Water Withdrawal	low
Industrial Development	low
Incompatible Grazing Practices	low
Over Exploitation/Incidental Capture	low
Second Home/Vacation Home Development	low
Urban/Suburban Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

5.2 Sandbars

- **Value to SGCN - 37**
- **Rank - 23rd of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

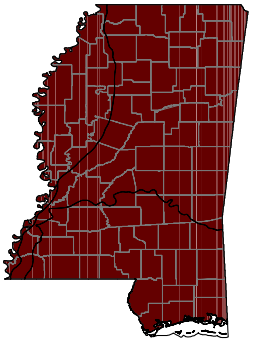
DESCRIPTION

Sandbars are formed along rivers and creeks by high spring stream flows that churn and distribute coarse sediments along bends and points of the stream channel. They serve as important habitats for several birds and reptiles. During spring and summer, the interior least tern utilizes open sandbars of the Mississippi River as nesting habitat. Sandbars are open, non-vegetated and warm during the summer. The exposed sands are loose and less prone to crusting or hardening. This is the preferred habitat for many species of turtles for depositing and incubating their eggs. High soil temperature is critically important for normal egg development to occur.

LOCATION, SIZE CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP

Sandbars occur along most free flowing streams of Mississippi and in most watersheds where flow rates are sufficient to rework coarse sediments. **Several thousand acres** of sandbards are expected to exist in the state, but, because of their small and variable size, which changes with water levels, it is difficult to get an accurate figure.



Range of Sandbars

Inundation consequent to impoundment has destroyed many sandbar reaches, but headcutting triggered by sand and gravel mining and dredging has increased the acreage of sandbars in other drainages. Cogongrass, tallow trees and other exotic weeds have invaded sandbar habitat; this is a particularly severe problem in the southern part of the state.

Sandbars are often created as a result of streambed destabilization and are larger and more **common** than

in the past. While there are no accurate figures of the extent of sandbars, it is apparent that they have value to SGCN and should be considered when development projects are proposed.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SANDBARS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Sterna antillarum athalassos*	Interior Least Tern	2
	Limosa fedoa	Marbled Godwit	2
	Charadrius melodus	Piping Plover	2
	Calidris canutus	Red Knot	2
	Pelecanus erythrorhynchos	American White Pelican	3
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
		Migrant Shorebirds	
Reptiles	*Graptemys nigrinoda*	Black-Knobbed Map Turtle	2
	Graptemys pulchra	Alabama Map Turtle	2
	Graptemys gibbonsi	Pascagoula Map Turtle	2
	Graptemys oculifera	Ringed Map Turtle	2
	Graptemys flavimaculata	Yellow-Blotched Map Turtle	2

THREATS TO SANDBAR COMMUNITIES

Channel Modification	high
Operation of Dams/Impoundments	high
Recreation Activities	high
Incompatible Resource Extraction Practices	high
Invasive Species	high
Over Exploitation/Incidental Capture	high

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

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6. WET PINE SAVANNAS / FLATWOODS

Wet pine savannas and flatwoods are found on low, wet, rain-fed coastal flats, foot slopes, depressions, and along drainageways. Wet pine savannas receive moisture through precipitation and are not subject to riverine flooding. Soils are composed of highly weathered, acidic, infertile substrates. The high precipitation and low evapotranspiration rates during the winter and spring season along the coast creates a surplus of moisture that gradually percolates through the soil profile. Nutrient-deficient soils develops on these wet flats because nutrients released by weathering are insufficient to replace those removed by leaching.

This type includes two subtypes: 6.1 Wet Pine Savannas, and 6.2 Slash Pine Flatwoods.

GENERAL CONDITION

It is estimated that less than five percent of the original acreage of wet pine savanna habitat remains in the Atlantic/Gulf Coastal Plain making it one of the most endangered ecosystems in the country. The lack of prescribed burns has had a dramatic negative impact on the size and distribution of wet pine savannas. Fire suppression allowed pines and shrubs to invade and out-compete the native savanna plants. In the 1960s and 1970s, much of the remaining open savanna was converted to pine plantation by planting and ditching (bedding); the latter disrupted the natural water regime. Additional urbanization of the three coastal counties of Mississippi caused significant losses of this habitat. The savannas of Sandhill Crane National Wildlife Refuge are considered the last remaining large patches of this diverse community.

Slash pine flatwoods have also been adversely impacted by timber harvest, clear-cutting and plantation monoculture. If fire is excluded, the open, herbaceous character of pine flatwoods ground cover is lost, while evergreen shrubs increase in dominance. Contributing to these factors is the dry mat of acidic pine needles which inhibit the growth of most herbaceous species.

6.1 Wet Pine Savannas

- **Value to SGCN - 45**
- **Rank - 20th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

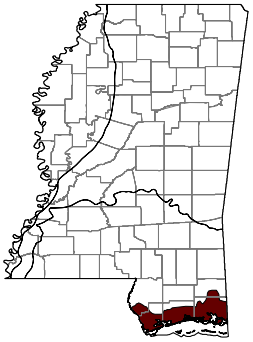
DESCRIPTION

Wet pine savannas are not associated with riverine floodplains, but are found on broad coastal flats and sloping plains that annually receive over 60 inches of rainfall and remain saturated for long periods during the growing season. Seepage zones are commonly observed along lower slopes. The coastal region receives ample growing season rainfall from frequent convective thunderstorms, resulting in the surface horizon remaining saturated for extended periods because of the slow permeability of subsoils.

The herbaceous ground cover of the wet savannas are exceptionally diverse in stands that are in good condition. Ample sunlight and rainfall create ideal growing conditions, but a lack of soil nutrients prevents any one species or suite of species from dominating. Of more than 200 understory plants, two-thirds are graminoids and one-third consist of forbs and ferns. Prominent groups of herbs include grasses, asters, sedges, pipeworts, pitcherplants and lilies. Common grasses include beaksedge, toothache grass, switchgrass and three-awn. Forbs include rayless goldenrod, one flowered honeycombhead, sunflowers, pitcherplants, meadowbeauties, sundews and orchids.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP



Range of Wet Pine Savannas

Several large patches of the Wet pine savannas subtype have been protected and others are being restored within the 19,000 acre, Sandhill Crane National Wildlife Refuge. Only a few other wet pine savanna habitats remain outside the refuge, such as the Lakeshore Savanna managed by The Nature Conservancy and the Grand Bay National Wildlife Refuge. Wet pine savannas cover approximately **80,000 acres** in Mississippi and occur on wetland flats where soils become waterlogged from heavy winter/spring rainfall and frequent thunderstorms during the summer. Adjoining lowlands support swamp vegetation and some uplands support mesic longleaf pine forests. Development on surrounding private lands is rapidly enveloping the public lands. Pine plantations are commonly encountered in the vicinity of the refuge.

It is estimated that less than five percent of the original acreage of wet pine savannas exist at this time. The Mississippi Sandhill Crane National Wildlife Refuge contains some of the largest remaining tracts of this unique ecosystem. The disappearance of the other areas is due to urban development and their conversion to pine plantations.

Wet Pine Savannas are **imperiled** in Mississippi because of rarity due to their having a very restricted range and very few remaining stands. Lands devoted to timber production are continuing to decline because of the increase in shrub density.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH WET PINE SAVANNAS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Coturnicops noveboracensis*	Yellow Rail	1
	Falco sparverius paulus	Southeastern American Kestrel	1
	Grus canadensis pulla	Mississippi Sandhill Crane	1
	Ammodramus henslowii	Henslow's Sparrow	2
	Ammodramus leconteii	Le Conte's Sparrow	2
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Scolopax minor	American Woodcock	3
	Sitta pusilla	Brown-Headed Nuthatch	3
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Lasiurus cinereus	Hoary Bat	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Lasionycteris noctivagans	Silver-Haired Bat	4
	Puma concolor coryi	Florida Panther	4

THREATS TO WET PINE SAVANNA COMMUNITIES

Altered Fire Regime	high
Forestry Conversion: Pine Plantations	high
Incompatible Forestry Practices: Bedding	high
Industrial Development	high
Urban/Suburban Development	high
Invasive Species	high
Groundwater and Surface Water Withdrawal	high
Road Construction/Management	high
Recreation Activities	medium

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies

and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

6.2 Slash Pine Flatwoods

- **Value to SGCN - 42**
- **Rank - 22nd of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

Pine flatwoods are limited to moist, poorly drained sites, which occasionally occur on ridge crest depressions, but more commonly, along lower slopes and broad flats, at the headwaters of streams, on wet peaty soils and on low terraces of major streams. Moisture determines the dominant pine species with slash replacing longleaf on wetter sites. Scattered loblolly pine may also be present in the canopy. In many instances the soils are nutrient poor and wet. On wetter situations, the pines are stunted and stressed by the wet conditions. Soils of pine flatwoods have restricted permeability in their subsurface horizons, causing long periods of saturation.

Red maple, sweetbay and tuliptree, common as low shrubs and trees in the subcanopy, occasionally attain a height that reaches into the canopy. If fire is not frequently prescribed, the shrub layer can become dense and impenetrable, with titi, buckwheat tree, gallberries and bayberries. Pitcherplants, St. John's-wort and numerous grasses often occur on exposed, open patches where water pools or recent burns have killed shrubs. Frequency of fire determines the height and density of the shrub layer while soil type appears to influence the presence of buckwheat tree. Associated with the Atmore soil series, the buckwheat tree dominates the understory and in some instances reaches diameters of over six inches and heights of over 25 feet. If fire is excluded, the open, herbaceous character of the pitcher plant flat is lost and titi thickets, consisting of evergreen shrubs, become dominant. Titi thickets are most prevalent on sandy soil in draws and flats along drainageways and creeks of the lower coastal plain. They are situated in seepage zones on lower slopes of sandy uplands and along creek channels with high water tables. The shrubs aggressively encroach into moist uplands if fire is suppressed.

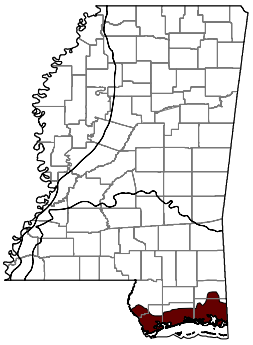
Swamp titi and buckwheat tree are the most common shrubs. Other common shrubs are fetterbush, large gallberry and bayberry. Shrubby swamp trees, including sweetbay, blackgum and slash pine, are often sprinkled throughout the thickets. Ground surfaces are fully shaded and usually exhibit an accumulation of litter. Large amounts of leaf litter often become trapped in branches and build up on the ground. These conditions limit the presence of herbs.

Titi thickets are an association of shrubs, vines and small trees that persist until being felled by logging or consumed by fire. Stands often become an impenetrable mass of thorny vines (mostly catbrier) woven throughout the dense shrubbery. Thickets can be virtually inaccessible by humans until plants

become older, taller and more widely spaced. Shrubs become trees with large trunk dimensions and heights over 25 to 40 feet.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP



Range of Slash Pine Flatwoods

These forests are often situated on broad lowland flats and along drainages which dissect low hilly uplands that support mesic longleaf pine forests. They occur in moderate sized patches, from 50 to 1,000 acres in size. The forests adjoin swamp forests near larger creeks. There are approximately **150,000 acres** of this subtype.

This subtype is often in poor condition because of the lack of prescribed fire to control shrub encroachment. The stands become impenetrable thickets if fire is not allowed. There are significant acreages of this subtype still intact, albeit in poor to fair condition. Commercial timberlands of this subtype are often bedded and planted to pine to increase the timber production.

This community is **vulnerable** in the state because of recent and widespread declines in the extent of this subtype; a lack of fire has allowed many of these stands to become impenetrable shrub thickets.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SLASH PINE FLATWOODS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Amphiuma pholeter*	One-Toed Amphiuma	1
Birds	*Picoides borealis*	Red-Cockaded Woodpecker	2
	Scolopax minor	American Woodcock	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Sitta pusilla	Brown-Headed Nuthatch	3
	Dendroica discolor	Prairie Warbler	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
Crustaceans	*Procambarus fitzpatricki*	Spiny-Tailed Crayfish	1
Mammals	*Ursus americanus luteolus*	Louisiana Black Bear	1
	Lasiurus intermedius	Northern Yellow Bat	2
	Lasiurus cinereus	Hoary Bat	2
	Myotis lucifugus	Little Brown Myotis	2
	Ursus americanus	Black Bear	2
	Puma concolor coryi	Florida Panther	4
Reptiles	*Regina rigida deltae*	Delta Crayfish Snake	2
	Regina rigida sinicola	Gulf Crayfish Snake	3

THREATS TO SLASH PINE FLATWOOD COMMUNITIES

Altered Fire Regime	high
Urban/Suburban Development	high
Invasive Species	high
Road Construction/Management	high
Groundwater and Surface Water Withdrawal	high
Incompatible Forestry Practices	medium
Industrial Development	medium
Agricultural Conversion	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

7. SPRING SEEPS

Springs form when groundwater resurfaces after flowing laterally over less permeable substrates, which place the water table above the spring. Cracks or sloping impermeable strata tend to direct the flow towards the spring head. Springs were important watering points for early settlers but also have ecological importance, especially by providing a moist environment for amphibians. Today, some springs produce commercial spring water. Spring seeps often contain rare plants and may be the only wetlands available to local animal populations during droughts. Larger spring-fed wetlands are considered in swamp, bog or other wetland categories within this document. Spring seeps occur throughout the state and are categorized into hardwood or pine seeps.

This type includes two subtypes: 7.1 Hardwood Seeps and 7.2 Pine Seeps.

GENERAL CONDITION

Seeps occur throughout Mississippi but are infrequently found in the blackland and interior flatwoods regions of the state. They are more abundant in regions with steep terrain such as the Loess Hills, Tennessee River hills, and the rolling hills of the longleaf pine region. The number of seeps in Mississippi is unknown and no study of their condition is available. The Mississippi NHP has documented a limited number of spring seeps. Some seeps are destroyed during highway construction by cutting through the vein that provides moisture or by intentionally capping with impermeable materials in efforts to preserve the roadbed. Surrounding land uses will affect the condition of spring seeps. In one instance for example, a seep which supplied moisture to a highly diverse bog was destroyed by the removal of sand and gravel from a nearby hill. Surface and gully erosion will reduce moisture availability to springs by changing subsurface flow patterns. In some instances seeps are less likely to be impacted by humans, as the nature of the saturated soils makes it difficult to carry out standard logging practices or imprudent to construct buildings within the seepage zone.

Additional efforts are needed to insure that spring seeps remain a vital part of wildlife habitat in Mississippi.

7.1 Hardwood Seeps

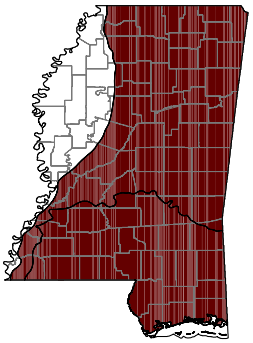
- **Value to SGCN - 83**
- **Rank - 4th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

Soils of hardwood seeps are often saturated throughout the year. The habitat supports wetland grasses, sedges, herbs and an abundance of ferns. Ferns frequently encountered are netted chainfern, royal fern, cinnamon fern and common lady fern. Other herbs include giant cane, crossvine, bristly stalked sedge, climbing hydrangea and roundleaf goldenrod. Wetland shrubs found clustered around seeps include Virginia sweetspire, poison sumac and possumhaw. Common trees are sweetbay, blackgum, red maple and tuliptree.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP



Range of Hardwood Seeps

Hardwood seeps are scattered throughout the state where water bearing substrates produce outflows. They occur as small wetland patches (1 to 10 acres in size) in draws and along lower hill-slopes. They are surrounded by upland hardwoods or open fields and pastures. The flow rate of the springs and the size of wetlands that accompany the springs can vary dramatically. Vegetation of spring heads depends on the duration of soil saturation and the slope of landforms supporting it. The affect of spring water temperature and water chemistry on the flora and fauna of springs still need to be explored. While no accurate figures exists, it is estimated that there are **500 to thousands of acres** of hardwood seeps in the state.

Some hardwood seeps have been damaged by development in the surrounding uplands, where changes in subsurface water flow have resulted. Others may have been drained by ditching to reduce the size of wetlands. Many survive as disturbed communities while others still persist undisturbed and in stable communities. Because of their widespread and sporadic occurrence, little is known about their overall condition.

Wet calcareous cliffs are **vary rare**, only occurring in the Tennessee River Hills Region (far northeastern part of the state). The more widespread hardwood seeps are considered **vulnerable** due to a lack of high quality spring sites that have been documented.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH HARDWOOD SEEPS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Gyrinophilus porphyriticus*	Spring Salamander	2
	Hemidactylium scutatum	Four-Toed Salamander	2
	Plethodon websteri	Webster's Salamander	2
	Plethodon ventralis	Southern Zigzag Salamander	2
	Pseudotriton montanus	Mud Salamander	2
	Pseudotriton ruber	Red Salamander	3
	Pseudacris brachyphona	Mountain Chorus Frog	3
	Plethodon ainsworthi	Baysprings Salamander	4
Birds	*Dendroica cerulea*	Cerulean Warbler	2
	Euphagus carolinus	Rusty Blackbird	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Scolopax minor	American Woodcock	3
	Oporornis formosus	Kentucky Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Protonotaria citrea	Prothonotary Warbler	3
	Piranga olivacea	Scarlet Tanager	3
		Migrant Songbirds	
Fish	*Phoxinus erythrogaster*	Southern Redbelly Dace	2
	Rhinichthys atratulus	Blacknose Dace	2
	Etheostoma kennicotti	Stripetail Darter	2
	Etheostoma nigripinne	Blackfin Darter	2
	Clinostomus funduloides	Rosyside Dace	3
	Etheostoma asprigene	Mud Darter	3
	Etheostoma flabellare	Fantail Darter	3
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Myotis grisescens	Gray Myotis	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Myotis sodalis	Indiana Or Social Myotis	4
Reptiles	*Regina rigida deltae*	Delta Crayfish Snake	2
	Regina rigida sinicola	Gulf Crayfish Snake	3

THREATS TO HARDWOOD SEEP COMMUNITIES

Forestry Conversion	medium
Groundwater and Surface Water Withdrawal	medium
Incompatible Resource Extraction Practices	medium
Incompatible Forestry Practices	low
Road Construction/Management	low

Urban/Suburban Development	low
Invasive Species	low
Incompatible Grazing Practices	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

7.2 Pine Seeps

- **Value to SGCN - 48**
- **Rank - 19th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

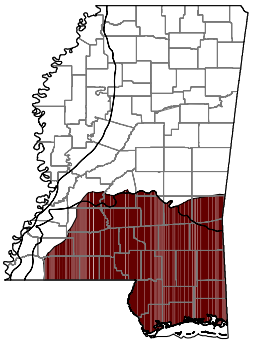
DESCRIPTION

Pine seeps have a similar composition to bog habitats described in habitat type 8 and a somewhat similar complement of ferns as found in hardwood seeps. Pine seeps are named after the piney woods region of the state where they are found. The overstory typically includes slash pine but there may be a large presence of other swamp species such as sweetbay and blackgum. Virginia chainfern and poison sumac are particularly common.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

UEGCP, EGCP

Pine seeps are found in a variety of habitats and are often surrounded by pine timberland. They are usually small in size, less than one acre, but the spring waters may feed larger wetland complexes nearby. It is estimated that about **500 acres** of pine seeps exist in Mississippi.



Range of Pine Seeps

Pine seeps may be destroyed if they are in the way of some developments, such as highway construction, and alternatives to conserve the spring are not apparent. Hill top sand and gravel mining and surface and gully erosion will affect the subsurface flows that feed springheads. Sometimes seeps are less likely to be impacted by humans because of construction hazards in seepage zones. Little is known about the number or overall condition of pine seeps. Pine seeps are highly regarded as wildlife habitat.

Pine seeps are considered **imperiled** in the state because of their average small size and vulnerability to further decline due to land use changes and other developments.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH PINE SEEPS

GROUP	*SCIENTIFIC NAME*	COMMON NAME	TIER
Amphibians	*Hemidactylium scutatum*	Four-Toed Salamander	2
	Plethodon websteri	Webster's Salamander	2
	Pseudotriton ruber	Red Salamander	3
Birds	*Scolopax minor*	American Woodcock	3
Crustaceans	*Procambarus barbiger*	Jackson Prairie Crayfish	1
	Procambarus cometes	Mississippi Flatwoods Crayfish	1
	Procambarus connus	Carrollton Crayfish	1
	Procambarus fitzpatricki	Spiny-Tailed Crayfish	1

	Fallicambarus burrisi	Burris' Burrowing Crawfish	1
	Fallicambarus byersi	Lavender Burrowing Crayfish	2
Mammals	*Myotis grisescens*	Gray Myotis	2
	Myotis septentrionalis	Northern Myotis	2
	Myotis lucifugus	Little Brown Myotis	2
	Myotis sodalis	Indiana Or Social Myotis	4
Reptiles	*Regina rigida deltae*	Delta Crayfish Snake	2
	Regina rigida sinicola	Gulf Crayfish Snake	3

THREATS TO PINE SEEP COMMUNITIES

Altered Fire Regime	high
Forestry Conversion	high
Invasive Species	high
Groundwater and Surface Water Withdrawal	high
Incompatible Forestry Practices	high
Road Construction/Management	medium
Incompatible Resource Extraction Practices	low
Urban/Suburban Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

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8. BOGS

Bogs require sublateral seepage flow from adjacent uplands. Rainfall will perch and seep laterally down slope where moisture resurfaces on gentle slopes and flats. Bogs are found on flats, swales, toe slopes and on terraces of rivulets and creeks.

Bogs usually occur as small patches, but can extend across extensive flats or continue along hill slopes for mile, if sufficiently supported by a series of seepage zones. Paradoxically, they can occur on elevated positions on some landscapes. The flora of large bogs is similar to wet pine savannas. However, bogs tend to be situated in swales and depressions where soils are wetter and contain a higher amount of organic matter. They are also seepage-fed and are small in size. Wet savannas are found on wide flats or gentle slopes usually near the coast. They are ombrotrophic, or precipitation-fed, are larger and may include some uplands. Exposure to fire and prolonged soil saturation influence the amount of shrub cover in bogs.

This type includes one subtype: 8.1 Pitcherplant Flat/Bogs.

GENERAL CONDITION

The primary conditions adversely impacting these habitats are logging activities and the lack of prescribed burns. Without fire, bogs become inaccessible due to the thick lattice produced by a network of vines and shrubs. Other forestry practices are harmful to bogs. Bedding is a practice that creates deep furrows in series across the boggy wetlands. The practice drains soggy lowlands and provides an elevated berm for trees to root. It severely alters the quality of the wetland and dramatically changes the composition of the bog vegetation. Bedding is often accompanied with dense plantings of pine and the elimination of fire, which subsequently leads to dramatic increases in shrub growth. In Louisiana, 25 to 50 percent of the hillside seepage bogs have been destroyed. There has been a 97 percent loss of Gulf Coast pitcher plant bogs.

8.1 Pitcherplant Flat/Bogs

- **Value to SGCN - 44**
- **Rank - 21st of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

Herb, quaking and shrub bogs are often sandy or mucky seepage areas that, due to their wetness and exposure to fire, remain treeless or nearly so. Wet, acidic, anoxic conditions of the substrates prevent trees from encroaching and the ones that do are often stunted. Quaking bogs have deep organic, mucky soils occasionally reaching depths greater than six feet. They are called quaking because they "tremble" under foot traffic. These bogs often have a thick layer of slowly decomposing peat (Sphagnum).

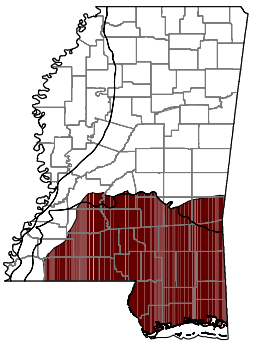
Bog communities have an exceptionally diverse flora and some contain endemic crawfish and a variety of other invertebrate species. Clubmosses, bracken fern and several other plant species that occur at spring seeps are typically found in bogs. Some of the more consistently represented species include plants from the aster, orchid, yelloweyed grass, pitcherplant, sundew, pipewort and butterwort families. Yellow trumpet pitcherplant, tenangle pipewort, goldencrest, water cowbane, one flowered honeycombhead, rayless goldenrod, chaffhead, deathcamus, pink sundew, false asphodel, yellow meadowbeauty, milkwort and many others are sprinkled among a diverse mixture of grasses and sedges. The large variety of graminoids include many beaksedges, longleaf threeawn, toothachegrass, purple silky scale, nutrushes and muhly, bluestem and panic grasses, among many others add to the diversity of bogs.

Important bog shrubs are coastal sweetpepperbush, large gallberry, inkberry, myrtle dahoon, bayberries and blueberries; bog trees, including sweetbay, blackgum, slash pine and pond cypress, take on a shrubby form with a few scattered, stunted, tree-sized individuals.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

Pitcher plant flats/bogs are embedded within the longleaf pine ecosystem where soils become periodically saturated and there is an influx of moisture from uplands. They occur in a variety of sizes (one to one hundred acres), landscapes, and slope positions. There are about **10,000 acres** of this habitat remaining in Mississippi.



Range of Pitcherplant/ Flat bogs

There has been a 97 percent loss of pitcher plant bogs along the Gulf Coast. The U.S. Forest Service has a management policy of controlled burns to

maintain a significant number of the remaining bogs found on the DeSoto National Forest. The condition of many bogs is declining due to shrub encroachment, drainage, pond development, bedding and urban development in surrounding uplands.

Pitcherplant flats/bogs are **imperiled** in the state because of rarity due to a very restricted range and steep declines due to drainage, forest site preparation practices (bedding) and lack of burning on significant numbers of these unique wetlands.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH PITCHERPLANT FLAT/BOGS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Amphiuma pholeter*	One-Toed Amphiuma	1
Birds	*Grus canadensis pulla*	Mississippi Sandhill Crane	1
	Coturnicops noveboracensis	Yellow Rail	1
	Ammodramus henslowii	Henslow's Sparrow	2
	Ammodramus leconteii	Le Conte's Sparrow	2
	Scolopax minor	American Woodcock	3
	Lanius ludovicianus	Loggerhead Shrike	3
Crustaceans	*Fallicambarus burrisi*	Burris' Burrowing Crawfish	1
	Fallicambarus gordoni	Camp Shelby Burrowing Crawfish	1
	Fallicambarus danielae	Speckled Burrowing Crayfish	1
	Fallicambarus byersi	Lavender Burrowing Crayfish	2
	Procambarus shermani	A Crayfish	3
Reptiles	*Regina rigida deltae*	Delta Crayfish Snake	2
	Regina rigida sinicola	Gulf Crayfish Snake	3

THREATS TO PITCHERPLANT FLAT/BOG COMMUNITIES

Altered Fire Regime	high
Invasive Species	high
Groundwater and Surface Water Withdrawal	high
Miscellaneous Threats Described	high
Incompatible Forestry Practices	high
Urban/Suburban Development	high
Forestry Conversion	medium
Industrial Development	medium
Recreation Activities	medium

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

9. INLAND FRESHWATER MARSHES

It is estimated that there are approximately 50,000 acres of inland freshwater marshes. Freshwater marsh communities are found along the shores of natural and artificial ponds, beaver dams, lakes and reservoirs; in cleared floodplains, roadside ditches, swales and depressions; within openings in swamp forests; and in wetlands of pastures and old fields. The substrates are composed of fine textured clays, silts or loams that have slow permeability.

This type includes one subtype: 9.1 Freshwater Marshes.

CONDITION

Many of the state's freshwater marshes were lost between the 1780's and mid 1980's due to land use changes. Fewer marshes are available today to filter impurities, reduce runoff and recharge ground water supplies. Mississippi wetlands have been and continue to be a source of timber and the cleared, fertile lands have become productive farmland. Programs stemming from federal Farm Bill legislation such as the Conservation and Wetland Reserve Programs have reduced the rate of marsh loss. The Mississippi NHP identifies and inventories priority wetlands.

The quality of freshwater marshes has also declined due to the cumulative effects of hydrologic changes, pollutants and exotic species. Land clearing around marshes has led to an increase in runoff, erosion, sedimentation and water temperatures in marshes. Stream channel alterations and levees have reduced the frequency and duration of flood interaction with marshes. Exotic plants that alter marsh habitats and reduce species diversity, such as water hyacinth and giant salvinia, are increasingly encountered in marshes.

9.1 Freshwater Marshes

- **Value to SGCN - 63**
- **Rank - 12th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

Throughout Mississippi, marshy habitat has been created by

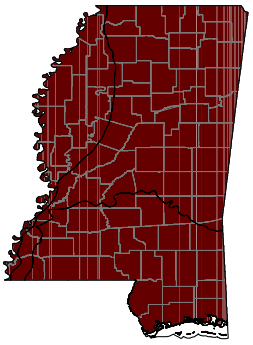
water control structures, which manage stream discharges. When used for flood control, reservoirs are deeply flooded during the spring. During the summer and fall seasons, as water is evaporated and released at the dam, wide drawdown zones that resemble marsh habitat are formed. The zones along the periphery of the upper reaches of the reservoirs support large acreages of marsh and wetland scrub communities. Some mudflats form during the late summer when water recedes from flooded riverine habitats during the drier seasons of the year. The mudflats have been identified as important stopover points for migrating shorebirds, which are regularly monitored at several locations throughout Mississippi. Marshes are also created when wet bottomland or swamp forests are logged or opened by natural disturbances. Unless artificially maintained, bottomland marshes represent a successional phase lasting until trees and shrubs regain dominance. The longer a marsh persists, the more likely its diversity will increase.

Marsh vegetation around lakes and ponds extends from the edge of saturated soils to a water depth of around six feet. It exhibits a pattern of species zonation corresponding to water depth. The vegetated zone normally does not extend beyond a six foot depth unless certain exotics, such as hydrilla, are present. The deeper zones contain a variety of emergent aquatic plants such as pondweed, watershield, sacred lotus and waterlily. Additional floating plants like duckweed, watermeal and bladderwort are present. Shallower water and mucky saturated soils along the shoreline contain a diversity of aquatic vascular species such as bulrushes, giant cutgrass, pickerel weed, cattail, rosemallow and primrose willow along with numerous other graminoids and herbs. Other typical species include valley redstem, cardinal flower, aquatic milkweed, jewelweed, common rush, hempvine, redtop panicgrass, camphor pluchea, swamp smartweed, waterpod and lizard's tail. Coastal freshwater marshes contain a different mix of species that includes white waterlily, irisleaf yelloweyed grass and jointed spikesedge. Introduced exotic weeds such as alligatorweed, giant salvinia, hydrilla, water lettuce, Eurasian milfoil and water hyacinth tend to overwhelm marshlands by their rapid and abundant growth.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP

Freshwater marshes are usually found in small patches. Some marshlands may be quite large in extent, up to 1,000 acres, if associated with large water control structures such as dams and diversions. Large marsh habitats are found on the upper end of reservoirs. Freshwater marshes occur throughout the state but are more commonly found in lowlands and floodplains, especially in the Mississippi Delta. They are adjacent to a variety of agricultural, forested and urban lands. There are approximately **50,000 acres** of freshwater marsh in the state.



Range of Freshwater Marshes

Fifty to seventy five percent of freshwater marsh habitats are estimated to have been lost in the central Gulf states. The quality of freshwater marshes has also declined due to a variety of causes including the

cumulative effects of land clearing, erosion and sedimentation, hydrologic changes, pollutants and exotic species. Large areas of wetlands have been created by water control structures but these tend to be of lower quality and often heavily impacted by alligator weed or other exotics.

Freshwater marshes are **vulnerable** in the state due to widespread historical and recent declines; however other factors as mentioned above have negatively affected the quality of the remaining marsh habitat.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH FRESHWATER MARSHES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Migrant Shorebirds	1
	Coturnicops noveboracensis	Yellow Rail	1
	Laterallus jamaicensis	Black Rail	1
	Eudocimus albus	White Ibis	2
	Mycteria americana	Wood Stork	2
	Rallus elegans	King Rail	2
	Sterna antillarum athalassos	Interior Least Tern	2
	Egretta caerulea	Little Blue Heron	2
	Anas fulvigula	Mottled Duck	2
	Asio flammeus	Short-Eared Owl	2
	Elanoides forficatus	Swallow-Tailed Kite	2
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Botaurus lentiginosus	American Bittern	3
	Anas rubripes	American Black Duck	3
	Pelecanus erythrorhynchos	American White Pelican	3
	Anhinga anhinga	Anhinga	3
	Ixobrychus exilis	Least Bittern	3
	Anas acuta	Northern Pintail	3
	Porphyrula martinica	Purple Gallinule	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
Fish	*Fundulus dispar*	Northern Starhead Topminnow	2
	Enneacanthus gloriosus	Bluespotted Sunfish	3

THREATS TO FRESHWATER MARSH COMMUNITIES

Channel Modification	high
Groundwater and Surface Water Withdrawal	high
Incompatible Agricultural Practices	high
Operation of Dams/Impoundments	high

Invasive Species	high
Miscellaneous Threats Described	high
Incompatible Water Quality	medium
Urban/Suburban Development	medium
Agricultural Conversion	low
Incompatible Forestry Practices	low
Road Construction/Management	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

10. SWAMP FORESTS

There are about 600,000 acres of swamp habitat in Mississippi, equivalent to about two percent of the state land area. Oxbow lakes, low floodplain terraces, bottomland flats, backwater areas or springheads are common areas to find swamp forest vegetation. The soils of swales or depressions are seasonally to semi-permanently flooded and remain saturated for long periods throughout the year. Under this classification, two swamp forest subtypes occur in Mississippi. Bald cypress/blackgum/ water tupelo swamps are found in depressions associated with riverine floodplains. The second subtype, small stream swamp forests, include wet pond cypress depressions, white cedar swamps and bay swamp forests.

This type includes two subtypes: 10.1 Bald Cypress/Gum Swamp Forests and 10.2 Small Stream Swamp Forests.

GENERAL CONDITION

The state was once covered with mostly unbroken forest, but centuries of land clearing and development have seriously impacted southern swamplands. Fifteen percent of the land surface area of the Southeastern United States was once wetland as compared to five percent nationwide. The Southeast accounted for about 47 percent of the total wetland area and 65 percent of the forested wetland area of the conterminous United States. Despite dramatic losses, such as those documented in the previous bottomland forest section, the region currently accounts for about 36 percent of all wetlands and 60 percent to 65 percent of all forested wetlands. Although loss rates have declined recently, most wetland acreage lost every year in the United States is still from southern forested wetlands. Annual loss rates of forested wetlands for the period from 1960 to 1975 was estimated to average 3.1 percent in Arkansas, 0.9 percent in Louisiana, and 0.5 percent in Mississippi. US Forest Service inventories completed by the early 1990's indicate continued annual loss rates of 0.7 percent and 1.0 percent for the oak-gum-cypress forest type in the Louisiana and Mississippi portions of the Lower Mississippi River Alluvial Plain. Estimates of one million acres of cypress-tupelo swamp remain in the Lower Mississippi River Valley, within the states of Louisiana, Arkansas and Mississippi.

In the past, wetlands have been regarded as a menace and a hindrance to land development and were considered mere wastelands, made valuable only if drained. During the mid-19th century, Congress passed the Swamp Lands Acts of 1849, 1850, and 1860, granting swamp and periodically flooded bottomlands to the states. Five southern states received 40 million acres for draining. Most wetlands

were drained for conversion to agriculture. Large-scale federal navigation, flood-control, and drainage projects have played a large role in these conversions by making previously flood-prone lands dry enough for planting crops. The increase in the population of the South also has accelerated the rate of wetland losses. Conditions around the state range from losses of around 80 percent in the Delta to more natural conditions in parts of the Pascagoula River watershed. The Pascagoula is the largest unimpeded main stem river in the lower 48 states surrounded largely by bottomland hardwoods and coastal marsh.

10.1 Bald Cypress/Gum Swamp Forests

- **Value to SGCN - 67**
- **Rank - 8th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

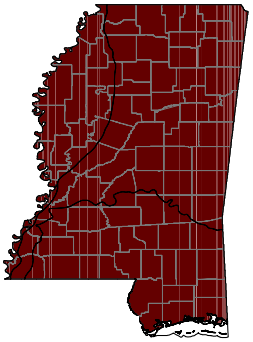
DESCRIPTION

Oxbow lakes, low floodplain terraces, bottomland flats, backwater areas or springheads are common areas to find swamp-forest vegetation. The soils of swales or depressions are seasonally to semi-permanently flooded and remain saturated for long periods throughout the year. These swamps contain a variety of mixtures and densities of bald cypress, blackgum, water tupelo and other hardwood trees. Silver and red maple, persimmon, green ash, ironwood and water oak are occasional associates. Shrubs may include buttonbush, eastern swampprivet and Virginia sweetspire. A suite of herbs similar to those listed in the marsh section are also present, and their abundance is greatly influenced by shade. Whitegrass, waterwillow, swamp sedge and opposite-leaf spotflower are persistent in shady swamps. Some swamp wetlands are shrubby, containing large patches of buttonbush, swamp privet and/or planertree.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP, MSRAP

The bald cypress/gum swamp forests subtype is found in a wide range of sizes, generally conforming to the size of the depression in which they occur. The swamps occur around oxbow lakes and along abandoned stream channels. They often occur along abandoned riverine channels that transect cropland areas in the Mississippi Delta and in the batture lands along the Mississippi River. They also are situated in smaller backwater areas of creeks in other parts of the state, where they occur adjacent to other bottomland hardwood forest types.



Range of Bald Cypress/Gum Swamp Forests

About **400,000 acres** of this forest type is found in the state (1.3 percent of Mississippi).

The annual losses of forested wetlands in Mississippi during the 1960's and 1970's were estimated to be about 0.5 percent per year. Fragmentation, developments near swamp lands and logging of mature stands has reduced the quality of this subtype.

Bald cypress/gum swamp forests are considered **vulnerable** in the state due to historic widespread declines and recent losses caused by a wide range of developments that create additional isolation and fragmentation.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BALD CYPRESS/GUM SWAMP FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Mycteria americana*	Wood Stork	2
	Elanoides forficatus	Swallow-Tailed Kite	2
	Egretta caerulea	Little Blue Heron	2
	Euphagus carolinus	Rusty Blackbird	2
	Eudocimus albus	White Ibis	2
	Protonotaria citrea	Prothonotary Warbler	3
	Anhinga anhinga	Anhinga	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Seiurus motacilla Louisiana	Waterthrush	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
Fish	*Notropis melanostomus*	Blackmouth Shiner	1
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Ursus americanus luteolus	Louisiana Black Bear	1
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Ursus americanus	Black Bear	2
	Myotis sodalis	Indiana Or Social Myotis	4
	Puma concolor coryi	Florida Panther	4
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO BALD CYPRESS/GUM SWAMP FOREST COMMUNITIES

Channel Modification	high
Incompatible Forestry Practices	high
Invasive Species	high
Groundwater and Surface Water Withdrawal	high
Operation of Dams/Impoundments	medium
Incompatible Agricultural Practices	medium
Over Exploitation/Incidental Capture	medium
Incompatible Water Quality	low
Road Construction/Management	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

10.2 Small Stream Swamp Forests

- **Score - 91**
- **Rank - 1st of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

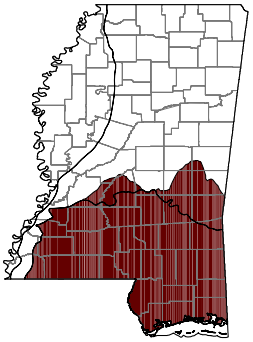
The lower gulf coastal plain has a dense network of brooks, creeks and rivers. The uplands serve as infiltration zones that produce seepage beds along lower slopes and intervening drainages. Many of the smaller creeks are not deeply incised because of low coastland relief and the lack of stream headcutting. Their floodplains are often protected by a dense mat of interwoven roots, especially those of sweetbay and blackgum. The poorly drained sandy and loamy soils hold moisture through dry seasons and most droughts. The wettest zones of the seepage areas and creek channels support a growth of sphagnum moss. The anoxic, acidic conditions prevent decomposition of leaf litter and help in the formation of organic muck soils.

The bay forest swamp occupies semi-permanently saturated sandy or humic, acid soils. Species composition varies depending on moisture and soil characteristics. Sweetbay and blackgum are the most common trees. Pond cypress is locally common on wetter sites near the coast. Red maple, slash pine, sweetgum, tuliptree, swamp laurel oak and water oak are also common. Longleaf pine, spruce pine and beech are occasionally encountered. There are often extensive thickets of shrubs and small trees including swamp titi, large gallberry, bayberry, American holly, azalea, blueberries and Florida anise. Bay swamps usually have a scant cover of herbs due to the heavy shading of the tree and shrub layers and contain patches of sphagnum moss. Waterwillow, giant cane, panic grass, cinnamon fern and netted chainfern are sprinkled throughout the community. Titi thickets can be created by logging small stream swamp forests and wet savannas. Exposing the lower shrub layer to sunlight allow the shrubs to flourish and increase in density that can limit the regeneration of swamp trees. Unless the thickets are burned or

mechanically chopped, they persist for long periods. Thickets may succeed to swamp forest vegetation once larger trees overtop the titi shrubs.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP



Range of Small Stream Swamp Forests

Small stream swamp forests consist of several communities that are situated on bottomlands of small streams in the in the piney woods region and cover approximately **50,000 acres**. The patches are long narrow wetland habitats, which may reach up to 1,000 acres in size. They are often transected by transportation and power line corridors. They are situated between the stream channel and pine forests on the adjacent uplands.

Wetlands are afforded greater protection from logging on national forest lands and less frequently on private lands where streamside management zones are established. Establishment of pine plantations on adjacent uplands can also reduce the quality of these swamp forest habitats because they occur in narrow patches. Excessive intrusion and fragmentation that is occurring in urban and suburban lands has cause additional deterioration of small stream swamp forests. Headcutting, a process in which downcutting of the streambed accelerates the drainage of swampy lowlands, is a detriment to small stream swamps. With a lack of periodic fires to reduce shrub densities, these forests become inaccessible thickets of evergreen shrubs. White cedar swamp forests, one of the rarest communities of this subtype, have been severely degraded in southern Mississippi by road building and logging.

The pond cypress swamp forest, another community of this subtype is also very rare because their range is limited. The community that makes up a majority of this subtype is **vulnerable** to further decline due to a lack of prescribed fires and encroachment and fragmentation caused by urbanization. Other less extensive communities of this subtype are considered **very rare** (white cedar swamp forest and pond cypress swamps) and **critically imperiled**.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SMALL STREAM SWAMP FORESTS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Amphiuma pholeter*	One-Toed Amphiuma	1
	Rana heckscheri	River Frog	1
Birds	*Egretta caerulea*	Little Blue Heron	2
	Euphagus carolinus	Rusty Blackbird	2
	Elanoides forficatus	Swallow-Tailed Kite	2
	Eudocimus albus	White Ibis	2
	Mycteria americana	Wood Stork	2
	Protonotaria citrea	Prothonotary Warbler	3

	Anas rubripes	American Black Duck	3
	Scolopax minor	American Woodcock	3
	Anhinga anhinga	Anhinga	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Oporornis formosus	Kentucky Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Campephilus principalis	Ivory-Billed Woodpecker	4
		Migrant Songbirds	
Fish	*Notropis melanostomus*	Blackmouth Shiner	1
	Etheostoma zonifer	Backwater Darter	1
	Fundulus dispar	Northern Starhead Topminnow	2
	Heterandria formosa	Least Killifish	3
	Leptolucania ommata	Pygmy Killifish	4
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Ursus americanus luteolus	Louisiana Black Bear	1
	Lasiurus cinereus	Hoary Bat	2
	Myotis grisescens	Gray Myotis	2
	Lasiurus intermedius	Northern Yellow Bat	2
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Myotis septentrionalis	Northern Myotis	2
	Ursus americanus	Black Bear	2
	Puma concolor coryi	Florida Panther	4

THREATS TO SMALL STREAM SWAMP FOREST COMMUNITIES

Channel Modification	high
Invasive Species	high
Altered Fire Regime	high
Forestry Conversion: Locally Important	medium
Incompatible Forestry Practices	medium
Incompatible Agricultural Practices	medium
Road Construction/Management	medium
Incompatible Water Quality	low
Urban/Suburban Development	low
Operation of Dams/Impoundments	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

11. LACUSTRINE (LENTIC) COMMUNITIES

Lacustrine refers to open bodies of freshwater situated in depressions or dammed river channels. They are also referred to as lentic or standing water systems. These habitats consist of reservoirs, oxbow lakes, semi-permanent ponds, ephemeral ponds and beaver ponds. In 2004, around 1,450 publicly owned lakes, reservoirs and ponds (>25 acres) covered approximately 246,000 acres. The largest reservoirs include flood-control impoundments in the Yazoo Basin and the Ross Barnett Reservoir, a water supply lake near Jackson.

This type includes five subtypes: 11.1 Oxbow Lakes, 11.2 Reservoirs, 11.3 Artificial Ponds, 11.4 Ephemeral (Temporary) Ponds and 11.5 Beaver Ponds.

GENERAL CONDITION

Unlike most other types, the amount of lentic habitat increases faster than it is lost due to new construction, especially ponds which increased nearly 13 percent in the last decade. The conditions of lentic communities vary depending on the intensity of adjacent land uses and their proximity to urban areas. Lakes are impacted by shoreline alterations or urbanization around larger reservoirs, such as Ross Barnett Reservoir. Delta oxbows are heavily impacted, primarily due to intensive land use practices. However, stream channel alterations, levees, deforestation and water diversions impact the natural progression of oxbow lakes by modifying runoff and accelerating sediment accumulation. Some oxbows in Mississippi remain natural in form and function such as the 50 oxbows that occur within the 50,000 acre tract of conservation lands in the Deaton Preserve (The Nature Conservancy) and Pascagoula River and Ward Bayou State Wildlife Management Areas.

Urbanization, pollution and land-use practices have generally increased levels of toxins and nutrients in lakes. Data collected by the Mississippi Department of Environmental Quality (MDEQ) is being used to develop nutrient criteria but a preliminary review showed no compelling evidence of impairment in 2004 (formal assessment pending). Currently there are five lake habitats under fish consumption advisories for mercury or PCB. Although DDT in fish tissue has decreased ten-fold since it was banned in 1972, levels in the Delta remain among the highest in the nation resulting in an advisory being issued for the entire Delta in 2001. Nearly 80 percent of the lakes on MDEQ's 303(d) list of impaired waters are oxbow habitats in the Delta. Common causes for these lakes not meeting their designated use are pesticides, nutrients and sediments.

From 1999-2003, 47 percent of the fish kills investigated by MDEQ were associated with low dissolved oxygen, 10 percent with nutrient overloads and 5 percent with pesticides. Fish kills in certain oxbows are expected each year due to low dissolved oxygen.

Exotic species, some of which are quite aggressive, now present a threat to native lentic communities. Particular types of concern include aquatic plants (hydrilla), fish (Asian carp) and zebra mussels. Exotic zooplankton species are also reportedly present in Mississippi lakes. The exotics could impact the low-end of the food chain for many fishes including sport fish and filter feeders such as paddlefish.

Since very few new oxbow lakes can be expected to be created naturally, long-term management approaches for the lakes that already exist are needed. Artificial restraints and other impacts on many streams alter the natural association of streams with their oxbows. Management approaches that integrate various stakeholders will be important in the future to effectively preserve oxbow habitats. Recent efforts toward reforestation and best management practices in forestry and agriculture have helped to reclaim landscapes around streams and oxbows.

11.1 Oxbow Lakes

- **Value to SGCN - 86**
- **Rank - 6th of 18 Lotic and Lentic Systems**

DESCRIPTION

Oxbow lakes provide important habitat for aquatic species and a wide range of recreational opportunities. Oxbow lakes are created naturally over extended time periods as streams abandon their old channels. Manmade alterations such as channelization may also convert old stream channels into oxbow lakes. Natural formation involves gradual loss of connectivity with the stream as sediment fills the ends of old channels. During periods of low stream flow, smaller pools in oxbow lakes may develop lethal conditions for species that are intolerant of high water temperature and low oxygen levels. Manmade weirs placed near the outflows of oxbow lakes can retain lake levels after stream levels decrease. For example, the weir project in 2002 on Tunica Cutoff, an oxbow along the Mississippi River, greatly improved fishery resources by increasing water depths during the summer and fall growing season.

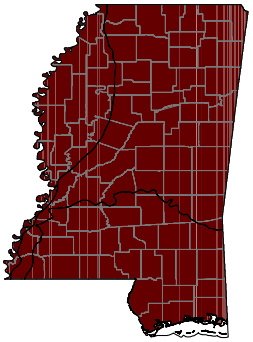
Oxbow lakes support a variety of fish, amphibians, reptiles, mammals, and wading and shorebirds. Although floods often cover oxbow lakes and allow fish to move freely in and out, the exchange of nutrients from rivers and their watersheds to the oxbow lakes is the most important factor determining higher fish abundance. Frequency, duration and timing of floods are important considerations in the

natural function of oxbow lakes. Natural fluctuations of water level in oxbow lakes benefit many species throughout the food chain, including invertebrates, fish, ospreys and alligators.

General habitat characteristics of oxbow lakes can often be associated with age. As lakes migrate further away from their mother streams over time, they tend to become shallower, more turbid and can be expected to contain fish species more adapted to shallow habitats with low oxygen. Younger oxbow lakes that maintain a higher degree of connectivity with streams tend to be deeper and clearer with a fish assemblage composed of more fish-eating species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGP, MSRAP



Range of Oxbow Lakes

The total acreage the Oxbow lakes subtype is approximately **70,000 acres**. Oxbows can be found on most small and medium sized creeks and rivers but are most common along the largest river systems, especially in the ancient deltaic plain of the Mississippi River. The lakes are surrounded by swamp and other bottomland hardwood forests.

Oxbow lakes are formed by rivers that abandon their channels and form new ones. If the rivers are confined by water control structures, additional oxbow lakes are prevented from forming. Older ones gradually fill in and become swamp habitats. Some of the lakes found in the Delta may have high concentrations of DDT pesticides in their bottom sediments. There are no other significant concerns regarding the condition of this habitat.

Oxbow lakes are **vulnerable** in the state due to potential declines caused by water control structures that have been installed on many of Mississippi's waterways

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH OXBOW LAKES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Migrant Shorebirds	1
	Egretta caerulea	Little Blue Heron	2
	Eudocimus albus	White Ibis	2
	Mycteria americana	Wood Stork	2
	Haliaeetus leucocephalus	Bald Eagle	2
	Sterna antillarum athalassos	Interior Least Tern	2
	Elanoides forficatus	Swallow-Tailed Kite	2
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Pandion haliaetus	Osprey	3
	Protonotaria citrea	Prothonotary Warbler	3
	Anas rubripes	American Black Duck	3

	Pelecanus erythrorhynchos	American White Pelican	3
	Anhinga anhinga	Anhinga	3
	Aythya affinis	Lesser Scaup	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
Fish	*Notropis chalybaeus*	Ironcolor Shiner	1
	Notropis melanostomus	Blackmouth Shiner	1
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Notropis amnis	Pallid Shiner	2
	Pteronotropis welaka	Bluenose Shiner	2
	Polyodon spathula	Paddlefish	3
	Atractosteus spatula	Alligator Gar	3
	Ictiobus niger	Black Buffalo	3
	Enneacanthus gloriosus	Bluespotted Sunfish	3
	Etheostoma asprigene	Mud Darter	3
	Stizostedion canadense	Sauger	3
	Stizostedion vitreum	Walleye	3
	Leptolucania ommata	Pygmy Killifish	4
Mammals	*Myotis grisescens*	Gray Myotis	2
Mussels	*Arcidens confragosus*	Rock Pocketbook	2
	Quadrula nodulata	Wartyback	2
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO OXBOW LAKE COMMUNITIES

Channel Modification	high
Groundwater and Surface Water Withdrawal	high
Incompatible Agricultural Practices	high
Incompatible Water Quality	high
Invasive Species	high
Operation of Dams/Impoundments	medium
Over Exploitation/Incidental Capture	medium
Forestry Conversion	low
Incompatible Forestry Practices	low
Incompatible Grazing Practices	low
Industrial Development	low
Road Construction/Management	low
Second Home/Vacation Home Development	low
Urban/Suburban Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

11.2 Reservoirs

- **Value to SGCN - 44**
- **Rank - 12th of 18 of Lotic and Lentic**

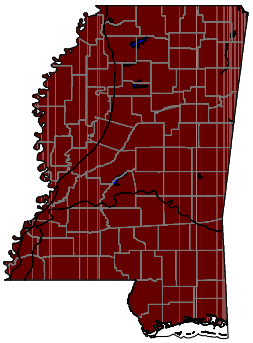
DESCRIPTION

Man-made reservoirs are water bodies impounded for the purpose of navigation, flood control, recreation and water supply. A reservoir conforms

to the original topography of the valley and floodplain. Substrates usually consist of muddy silt and clay sediments. In the upper reaches, reservoirs form marshy, shallow flats or conform to the stream channel. Flow is often sluggish and sedimentation increases over time. The marshy littoral (nearshore) and open water habitats are attractive for wildlife. Land use and vegetation cover within the watershed surrounding the reservoir will affect its water quality. Almost one percent of the land area of Mississippi is in reservoirs.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGP, MSRAP



Range of Reservoirs

Flood control dams have been constructed on several large rivers and creeks in the state. Some reservoirs are relatively large, with the largest, Ross Barnett Reservoir, being 30,000 acres in size. The Corps of Engineers managed reservoirs (i.e., Grenada, Arkabutla and Sardis) are rimmed with federally managed woodland and recreational sites. Residential areas often are situated adjacent to the reservoirs. Woodlands surround most reservoir shores except where streams enter them. At the mouths of feeder streams, a large area of marshland habitat is often encountered. Sometimes urban centers are located nearby. There are approximately **200,000 acres** of this subtype in Mississippi.

Large open water bodies often have significant problems with shorebank erosion. There is little opportunity for marsh plants to become established because wave action and shifting sediments prevent them from doing so, except in some of the most protective coves. Drawdown of flood control reservoirs leaves wide unvegetated shorelines exposed and barren. Water quality is quite high in Mississippi reservoirs due to the abundant freshwater inflow.

The reservoir subtype is **common, widespread, and abundant** in the state and is not vulnerable to significant declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH RESERVOIRS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Migrant Shorebirds	1
	Haliaeetus leucocephalus	Bald Eagle	2
	Sterna antillarum athalassos	Interior Least Tern	2
	Pelecanus erythrorhynchos	American White Pelican	3
	Aythya affinis	Lesser Scaup	3
	Pandion haliaetus	Osprey	3
Fish	*Ichthyomyzon castaneus*	Chestnut Lamprey	2
	Notropis amnis	Pallid Shiner	2
	Moxostoma macrolepidotum	Shorthead Redhorse	2

	Polyodon spathula	Paddlefish	3
	Atractosteus spatula	Alligator Gar	3
	Ictiobus niger	Black Buffalo	3
	Stizostedion canadense	Sauger	3
	Stizostedion vitreum	Walleye	3
	Ambloplites rupestris	Rock Bass	4
Mammals	*Myotis grisescens*	Gray Myotis	2
Mussels	*Quadrula rumphiana*	Ridged Mapleleaf	2
	Potamilus alatus	Pink Heelsplitter	3

THREATS TO SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH RESERVOIR COMMUNITIES

Operation of Dams/Impoundments	high
Incompatible Water Quality	medium
Urban/Suburban Development	medium
Second Home/Vacation Home Development	medium
Channel Modification	low
Incompatible Agricultural Practices	low
Incompatible Forestry Practices	low
Incompatible Grazing Practices	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

11.3 Artificial Ponds

- **Value to SGCN - 33**
- **Rank - 15th of 18 Lotic and Lentic Systems**

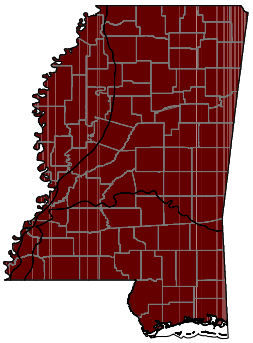
DESCRIPTION

Throughout Mississippi there are an abundance of small impoundments built as borrow pits, flood control structures, recreational fishing ponds, farm ponds or catfish ponds. Catfish ponds, which are concentrated in the Delta region, often rely on wells for maintaining water levels. Farm and residential area ponds are usually created by positioning dams across small drainageways or in depressions where runoff accumulates. The contributing drainage area needs to be large enough to maintain a suitable water level during dry periods but must not be so large that expensive overflow structures are needed and water releases occurs too frequently. Farm ponds are often fringed by marsh herbs, crops, pastures and forestlands, but many are also found in residential areas. They provide habitat for fish and a variety of other aquatic species and are frequented by shore and wading birds during winter drawdown and provide refuge during drought periods.

The artificial ponds are often managed as commercial or private recreational fish production areas and are not usually managed for ducks or other aquatic animals. Most modern farm ponds are too deep for waterfowl use and are built with steep sides to reduce the growth of aquatic vegetation. A good pond for fishing is usually not a good pond for ducks. The introduction of black carp in catfish ponds is a controversial issue in Mississippi because of the potential of this exotic species escaping from the aquaculture ponds and becoming established in natural water bodies. Artificial ponds provide habitat for shore and wading birds during drought periods and winter drawdown.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS **EGCP, UEGP, MSRAP**

Mississippi has more than 130,000 farm ponds totaling **230,000 acres**, ranging in size from one-half acre to five acres. Management of artificial ponds, such as herbicide treatment of aquatic weeds and adding pond bottom structure, is often designed to improve recreational fishing opportunities. Artificial ponds are **widespread and abundant** and are not considered likely to decline in extent or value to wildlife in the future.



Range of Artificial Ponds

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL PONDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana areolata*	Crawfish Frog	2
Birds		Migrant Shorebirds	1
	Mycteria americana	Wood Stork	2
	Egretta caerulea	Little Blue Heron	2
	Limosa fedoa	Marbled Godwit	2
	Eudocimus albus	White Ibis	2
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Anhinga anhinga	Anhinga	3
	Calidris alpina	Dunlin	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Calidris mauri	Western Sandpiper	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3

THREATS TO ARTIFICIAL POND COMMUNITIES

Incompatible Agricultural Practices	medium
Incompatible Grazing Practices	medium
Livestock Feedlots/Operations	medium
Incompatible Water Quality	medium
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Provide public education about conservation of SGCN and/or their habitats.


Photo courtesy of MDWFP.

11.4 Ephemeral (Temporary) Ponds

- **Value to SGCN - 119**
- **Rank - 3rd of 18 Lotic and Lentic Systems**

DESCRIPTION

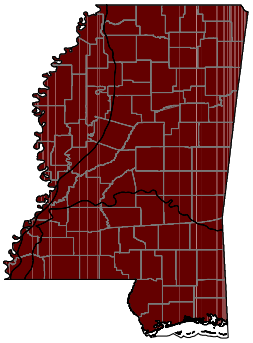
Ephemeral ponds, also referred to as spring ponds or vernal pools, are temporary wetlands that hold water during the winter-spring season but normally dry out by late summer. They can be classified by their vegetative cover as marshes or swamps, but their special designation is necessary due to their importance to many species.

Ephemeral ponds commonly form along moderate to larger size streams, but many are also be found in disturbed habitats, such as ditches, croplands or other such depressions. As seasonal high flows peak and subsequently recede from the floodplain into the stream channel, ponds temporarily form in floodplain depressions. They serve as important breeding habitats for many crustaceans and amphibians and provide significant energy sources to birds, mammals and reptiles that feed on fish trapped in these pools.

Grady ponds are naturally occurring ephemeral ponds of the lower coastal plain. They are found in ancient abandoned deltaic stream channels, on the upper reaches of small tributaries, and in upland depressions apparently caused by the subsidence of underlying strata. Several of the ponds were formed by alluvial processes on wide flats of ancient riverine floodplains. Minor scroll lines of the ancient rivers are evident today. The ephemeral ponds are located in minor distributaries channels of the old stream systems that no longer connect to local drainages. Other ponds occur in swales along the far upper reaches of small drainageways of wide coastal flats. In such instances the depressions will periodically connect with stream systems but considering the gentle local relief and the low stream flow, connectivity to the stream system is brief and accessibility by fish is minimal. Essentially, the amount of flow through the swales is very low and less likely to be utilized by predatory fish. If fish gain access to the ponds, their occupancy is short-lived because the ponds usually dry up during the fall. In addition, some of the swales may have formed through local subsidence of uplands on ridge tops and side ridges independent of streams. These upland ponds have greater importance to smaller species of amphibians than riverine derived ponds because the latter are more shaded and subject to periodic flooding that threatens tadpole survival. Ephemeral ponds are dependent on fire to maintain open, herbaceous habitat, which is ideal for breeding amphibians. Grady ponds are essential to the survival of the endangered and endemic dusky gopher frog.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGP, MSRAP



Range of Ephemeral (Temporary) Ponds

Ephemeral ponds, located in small depressions in floodplains and uplands, are usually associated with bottomland hardwoods or swamp forests in the lowlands and pinelands in the uplands, but can be surrounded by open pasture or cultivated land. During the wet season the temporary ponds may cover large areas on lowland flats but are significantly reduced in size and number in the dry season.

Rapid urbanization in the southern part of the state has reduced the quality of many ephemeral ponds and has increased the potential for the introduction of waterborne diseases into the ponds. Fragmentation of habitat surrounding the ponds and lack of fire to help maintain their integrity has reduced the quality of these ponds.

Grady ponds are **critically imperiled** in the state because of extreme rarity and because of rapid urbanization and fragmentation that have contributed to significant declines of this subtype. Other ephemeral ponds are **vulnerable** because of disruption of streamflow caused by water control structures.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH EPHEMERAL (TEMPORARY) PONDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana sevosa*	Mississippi Gopher Frog	1
	Hemidactylium scutatum	Four-Toed Salamander	2
	Pseudacris ornata	Ornate Chorus Frog	2
	Rana areolata	Crawfish Frog	2
	Bufo nebulifer	Gulf Coast Toad	3
	Pseudacris brachyphona	Mountain Chorus Frog	3
	Ambystoma tigrinum	Tiger Salamander	4
Birds	*Grus canadensis pulla*	Mississippi Sandhill Crane	1
	Coturnicops noveboracensis	Yellow Rail	1
	Laterallus jamaicensis	Black Rail	1
		Migrant Shorebirds	1
	Eudocimus albus	White Ibis	2
	Mycteria americana	Wood Stork	2
	Egretta caerulea	Little Blue Heron	2
	Anas fulvigula	Mottled Duck	2
	Calidris canutus	Red Knot	2
	Charadrius melodus	Piping Plover	2
	Limosa fedoa	Marbled Godwit	2
	Rallus elegans	King Rail	2
	Sterna antillarum athalassos	Interior Least Tern	2

	Scolopax minor	American Woodcock	3
	Anhinga anhinga	Anhinga	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Calidris alpina	Dunlin	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Calidris mauri	Western Sandpiper	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Anas acuta	Northern Pintail	3
	Anas rubripes	American Black Duck	3
	Aythya affinis	Lesser Scaup	3
	Botaurus lentiginosus	American Bittern	3
	Ixobrychus exilis	Least Bittern	3
	Porphyrula martinica	Purple Gallinule	3
Crustaceans	*Cambarellus diminutus*	Least Crayfish	2
	Cambarellus lesliei	A Crayfish	2
Fish	*Notropis chalybaeus*	Ironcolor Shiner	1
	Notropis melanostomus	Blackmouth Shiner	1
	Pteronotropis welaka	Bluenose Shiner	2
	Fundulus jenkinsi	Saltmarsh Topminnow	2
	Heterandria formosa	Least Killifish	3
	Enneacanthus gloriosus	Bluespotted Sunfish	3
	Leptolucania ommata	Pygmy Killfish	4
Mammals	*Myotis grisescens*	Gray Myotis	2
Reptiles	*Deirochelys reticularia miaria*	Western Chicken Turtle	3

THREATS TO EPHEMERAL (TEMPORARY) POND COMMUNITIES

Agricultural Conversion	high
Channel Modification	high
Incompatible Agricultural Practices	high
Invasive Species	high
Operation of Dams/Impoundments	high
Incompatible Forestry Practices	high
Road Construction/Management	medium
Urban/Suburban Development	medium
Recreation Activities	medium
Incompatible Water Quality	medium
Industrial Development	low
Second Home/Vacation Home Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

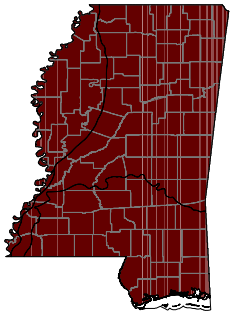
A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

11.5 Beaver Ponds

- **Value to SGCN - 16**
- **Rank - 17th of 18 Lotic and Lentic**

DESCRIPTION

The beaver is considered a keystone species, because it changes the environment by creating favorable new habitats for other species. Beavers impound small streams to provide access to upland food sources, to create habitat for aquatic plants suitable as food and to provide protection for freestanding lodges or tunnel dens. Substrates usually consist of muddy silt and clay sediments. Flow is often sluggish and sedimentation increases over time. Beaver ponds provide habitat for various species of fish and some amphibians are more abundant in these ponds. A variety of birds and mammals feed on the fish inhabiting the ponds. Ospreys and other birds will feed on the wetlands created by the dam and often will forage or nest in dead snag trees that are killed by flooding. Otters frequent the ponds in search for prey. In the Southeastern United States, beavers can cause extensive damage to valuable timberland by flooding bottomland forests and eating tree seedlings. The beavers' favorite tree of Southeastern forests is sweetgum. Control measures are often adopted to reduce the damage caused to forestlands and roads. However, landowners whose own economic or recreational interests are benefited by beaver may be reluctant to allow beavers to be removed from their lands.



Range of Beaver Ponds

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGP, MSRAP

With the abundance of small creeks in Mississippi, there are many opportunities for beaver to develop small impoundments. These impoundments resemble small

wetland swamp or marsh habitats. They usually are surrounded by bottomland hardwood forests. It is roughly estimated that **5,000 acres** of beaver ponds are found in Mississippi.

Beavers are considered a pest species because of their potential to flood significant areas of forest, agriculture and developed land. Wildlife control measures are being taken by agriculture authorities to prevent the increase of the beaver population on Mississippi creeks and rivers.

Beaver Ponds, are **secure** in the state, although continual beaver control programs reduce the potential for an increase in the number of ponds.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BEAVER PONDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Euphagus carolinus*	Rusty Blackbird	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Anas rubripes	American Black Duck	3
	Scolopax minor	American Woodcock	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Protonotaria citrea	Prothonotary Warbler	3
	Melanerpes erythrocephalus	Red-Headed Woodpecker	3

THREATS TO BEAVER POND COMMUNITIES

Incompatible Agricultural Practices	medium
Incompatible Grazing Practices	medium
Incompatible Water Quality	medium
Livestock Feedlots/Operations	low
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

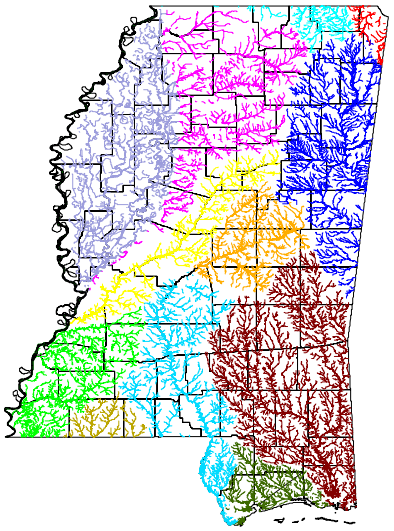
A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

12. STREAMS (LOTIC COMMUNITIES)

A classification system was developed based primarily on major drainages in the state as well as regional differences in soil type and topography that influence stream form and habitat characteristics. Stream size was used to develop another level of classification within regions. Channel size influences community structure in and around a stream. Lack of a formal classification system necessitated this logical grouping of stream habitats. A wide diversity of mussels, fishes, amphibians and reptiles require lotic (flowing water) habitats for their survival. Stream riparian zones support some of the most dynamic wildlife assemblages compared to any other habitat. Healthy riparian zones also help stabilize stream banks and provide organic input and woody structure into stream channels. Mississippi has about 14,000 miles and 350,000 acres of perennial streams. The Geographic Names Information System lists almost 5,000 named streams that flow within or through the state and subdivides them into 52 hydrologic units. For the purposes of this CWCS, streams (lotic or flowing water systems) are classified into 13 major drainages and then into smaller subtypes by stream size.

This habitat type includes thirteen subtypes: 12.1 Mississippi River, 12.2 Northeast Hills, Tennessee River Drainage, 12.3 Tombigbee Drainage, 12.4 Lower Mississippi North Drainage (LMND) Hatchie and Wolf Systems, 12.5 Upper Coastal Plain, Yazoo Drainage, 12.6 Big Black River Drainage, 12.7 Upper Coastal Plain, Pearl River Drainage, 12.8 Mississippi Alluvial Plan (MAP), 12.9 Lower Coastal Plain, Pearl Drainage, 12.10 Pascagoula Drainage, 12.11 Coastal Rivers Drainage, 12.12 Lake Ponchartrain Drainage and 12.13 Lower Mississippi South Drainage.



Major Stream Drainages of Mississippi

GENERAL CONDITION

Streams throughout Mississippi have been subjected to a wide array of alterations. Stream channels have been widened, deepened, desnagged and straightened through channelization projects for flood control. This has resulted in shortening of streams, increases in stream gradient and loss of habitat for animals both in and near the streams. Levees now prevent many streams and rivers from spreading over

flood plains. Dams have been placed on numerous streams for flood control, water supply for municipalities and industry, navigation and recreation. These dams restrict movement of animals and alter hydrologic characteristics of the rivers on which they are built. The major tributaries of the upper Yazoo River (Coldwater, Tallahatchie, Yocona and Yalobusha) have flood control dams. The Pearl River system is now divided by Ross Barnett Dam which effectively restricts passage of fishes upstream from the dam. Construction of the Tennessee-Tombigbee Waterway created an unnatural connection between two separate drainages and altered the Tombigbee drainage. The Tombigbee River is now a series of navigation pools impounded by multiple locks and dams, which bears little resemblance to the original Tombigbee River. The only portion of the Tennessee River which borders Mississippi in the northeast corner, is impounded by Pickwick Dam. Numerous smaller weirs and lowhead dams exist on streams throughout the state.

Land use practices in forestry and agriculture have resulted in vast increases in sediment deposition in streams as well as increasing erosion. Headcutting, which can be caused by stream channel alteration, has resulted in long stretches of stream erosion and bank destabilization which move progressively upstream. Many streams throughout the state show the effects of headcutting. Most of these streams have broad, shallow channels with unstable substrate and little or no canopy cover. Drainage of wetlands and removal of groundwater for irrigation has caused a decrease in the water table in some areas, especially in the Delta region. This has caused extremely low flows in streams during dry periods. Streams have been receptacles for sewage, industrial waste and agricultural runoff. The Mississippi Department of Environmental Quality (2004) lists many factors which affect water quality in streams, including organic enrichment, pesticide contamination, sedimentation and siltation, mercury contamination and pathogens.

12.1 Mississippi River

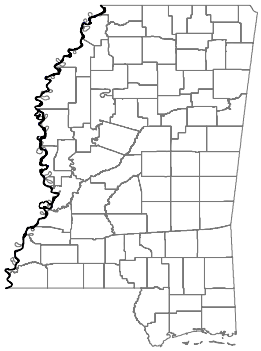
- **Value to SGCN - 46**
- **Rank - 11th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

MSRAP

The Mississippi River is the largest river in the United States, draining about one-third of the land mass in the lower 48 states. The upstream drainage area of the Mississippi at Natchez is over 1,200,000 square miles. The Mississippi River as it borders Mississippi is a large, deep river with primarily sand or sand and gravel substrate. There are often large sand bars in the river bends. Many alterations have been made on the river, including cutting off of bendways to shorten the channel, and extensive channel stabilization with rip rap, articulated concrete mattress (ACM), wing dams and dikes. Channels have also been dredged, and

an extensive levee system contains floodwaters. Despite these modifications, the river has a unique fauna, for which research has been limited.



Mississippi River

CONDITION AND CONSERVATION STATUS

Because the Mississippi River is a very important artery for commerce and trade, it is constantly modified to maintain navigation channels. The channel has been shortened by cutting off bendways. Dikes are used to direct flow of the river to maintain channels. The river's banks and the riverbed itself are armored with rip-rap and concrete to prevent erosion. Floodwaters are held in check by extensive levees. However, the sheer size of the Mississippi River makes it a dynamic and important biotic system, and one that is challenging to study.

Because this river subtype is under constant modification it should be considered **vulnerable** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MISSISSIPPI RIVER

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Haliaeetus leucocephalus*	Bald Eagle	2
	Sterna antillarum athalassos	Interior Least Tern	2
	Pelecanus erythrorhynchos	American White Pelican	3
Fish	*Scaphirhynchus albus*	Pallid Sturgeon	1
	Cycleptus elongatus	Blue Sucker	2
	Noturus flavus	Stonecat	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Fundulus dispar	Northern Starhead Topminnow	2
	Stizostedion canadense	Sauger	3
	Stizostedion vitreum	Walleye	3
	Ictiobus niger	Black Buffalo	3
	Atractosteus spatula	Alligator Gar	3
	Polyodon spathula	Paddlefish	3
	Macrhybopsis gelida	Sturgeon Chub	4
	Macrhybopsis meeki	Sicklefin Chub	4
	Platygobio gracilis	Flathead Chub	4
Mussels	*Potamilus capax*	Fat Pocketbook	1
	Potamilus alatus	Pink Heelsplitter	3
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO MISSISSIPPI RIVER

Channel Modification	high
Incompatible Agricultural Practices	high
Incompatible Resource Extraction Practices	high
Incompatible Water Quality	high
Invasive Species	high
Headcutting	high
Incompatible Forestry Practices	medium
Industrial Development	medium
Over Exploitation/Incidental Capture	medium
Incompatible Grazing Practices	low
Operation of Dams/Impoundments	low
Urban/Suburban Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Small Stream Northeast Hills/Tennessee River Drainage

12.2. Northeast Hills, Tennessee River Drainage

- **Value to SGCN - 140**
- **Rank - 2nd of 18 Lotic and Lentic Systems**

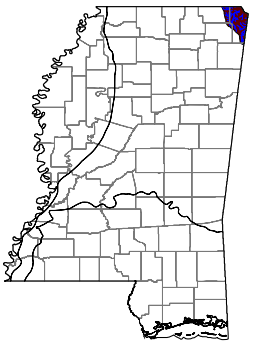
DESCRIPTION AND LOCATION

UEGCP

The tributaries of the Tennessee River in the fall line hills of northeast Mississippi are unique among Mississippi streams. They are characterized by relatively high gradient and extensive areas of coarse substrate ranging from gravel to boulders, as well as exposed areas of bedrock. These streams are also faunally distinct with numerous species occurring only in this relatively small region within the state. Small and medium categories are described as follows:

CONDITION AND CONSERVATION STATUS

There are very few streams in this subtype because very little of the Tennessee drainage lies within Mississippi's borders. Some of these streams (e.g. Cedar Creek) as well as many smaller streams have been channelized. Also their flow regimes have been modified by impoundments, some of which lie outside of Mississippi. However, many of these streams have a variety of aquatic habitats which support unique and diverse faunas.



Northeast Hills, Tennessee River Drainage

Because of the unique fauna occurring in these streams, the relatively small area where these streams occur and past alterations that have occurred in these streams, they are considered **vulnerable** in the state.

12.2a. Small streams. Streams of this type are drainage basins of less than 75 square miles and often occur in the headwaters of larger streams. These streams typically have extensive canopy and low flow rates. Substrate, water depth and other microhabitat characteristics vary among streams and among reaches within these streams.

12.2b. Medium streams. These drainage basins do not exceed 1,000 square miles. These streams of this type typically have less canopy, higher flow rates and more microhabitat types than small streams. Substrates vary from fine silt to boulders and bedrock under deep and shallow runs, riffles, deep pools and backwater areas. These streams may also have periodically inundated floodplains, which may be important for the survival of some species in the stream.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH NORTHEAST HILLS, TENNESSEE RIVER DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Cryptobranchus alleganiensis*	Hellbender	1
	Gyrinophilus porphyriticus	Spring Salamander	2
	Pseudotriton ruber	Red Salamander	3
Crustaceans	*Orconectes etnieri*	A Crayfish	2
	Procambarus ablusus	A Crayfish	2
	Orconectes validus	A Crayfish	3
Fish	*Moxostoma carinatum*	River Redhorse	2
	Cyprinella whipplei	Steelcolor Shiner	2
	Notropis micropteryx	Rosyface Shiner	2
	Phenacobius mirabilis	Suckermouth Minnow	2
	Cyprinella galactura	Whitetail Shiner	2
	Etheostoma blennioides	Greenside Darter	2
	Moxostoma anisurum	Silver Redhorse	2
	Moxostoma macrolepidotum	Shorthead Redhorse	2
	Percina evides	Gilt Darter	2
	Notropis boops	Bigeye Shiner	2
	Rhinichthys atratulus	Blacknose Dace	2
	Etheostoma duryi	Black Darter	2
	Etheostoma nigripinne	Blackfin Darter	2
	Etheostoma zonistium	Bandfin Darter	2
	Cottus carolinae	Banded Sculpin	2
	Etheostoma kennicotti	Stripetail Darter	2
	Moxostoma duquesnei	Black Redhorse	2
	Percina phoxocephala	Slenderhead Darter	2
	Clinostomus funduloides	Rosyside Dace	3
	Lythrurus fasciolaris	Rosefin Shiner	3
	Cyprinella spiloptera	Spotfin Shiner	3

	Etheostoma flabellare	Fantail Darter	3
	Etheostoma rufilineatum	Redline Darter	3
	Ictiobus niger	Black Buffalo	3
	Moxostoma erythrurum	Golden Redhorse	3
	Stizostedion vitreum	Walleye	3
	Noturus exilis	Slender Madtom	4
	Ambloplites rupestris	Rock Bass	4
Mussels	*Cyclonaias tuberculata*	Purple Wartyback	1
	Epioblasma brevidens	Cumberlandian Combshell	1
	Epioblasma triquetra	Snuffbox	1
	Fusconaia barnesiana	Tennessee Pigtoe	1
	Lexingtonia dolabelloides	Slabside Pearlymussel	1
	Ligumia recta	Black Sandshell	1
	Quadrula cylindrica cylindrica	Rabbitsfoot	1
	Arcidens confragosus	Rock Pocketbook	2
	Ellipsaria lineolata	Butterfly	2
	Lampsilis cardium	Plain Pocketbook	2
	Strophitus undulatus	Squawfoot	2
	Lasmigona complanata complanata	White Heelsplitter	3
	Potamilus alatus	Pink Heelsplitter	3
	Ptychobranchus fasciolaris	Kidneyshell	3
	Truncilla truncata	Deertoe	3
Reptiles	*Regina septemvittata*	Queen Snake	2

THREATS TO NORTHEAST HILLS, TENNESSEE RIVER DRAINAGE

Incompatible Agricultural Practices	high
Incompatible Forestry Practices	high
Incompatible Water Quality	high
Operation of Dams/Impoundments	high
Agricultural Conversion	medium
Channel Modification	medium
Incompatible Grazing Practices	medium
Invasive Species	medium
Forestry Conversion	low
Incompatible Resource Extraction Practices	low
Industrial Development	low
Livestock Feedlots/Operations	low
Road Construction/Management	low
Second Home/Vacation Home Development	low
Urban/Suburban Development	low
Recreation Activities: Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

12.3 – 12.7 UPPER COASTAL PLAIN

The Upper Coastal Plain region covers most of the northern half of Mississippi. Portions of the Tombigbee, Pearl, Big Black, Yazoo and Lower Mississippi North drainages lie in this region. Stream characteristics such as size, gradient, and the and substrate type vary in this region. Streams in this region are separated into four categories: small, loess hills, medium and large.

Small Stream, Tombigbee River Drainage

12.3. Tombigbee Drainage

- **Value to SGCN - 184**
- **Rank - 1st of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

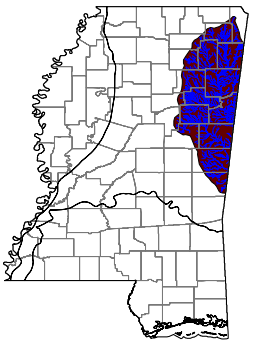
UEGCP

Streams in this category are tributaries of the Tombigbee River, which has been highly modified by construction of the Tennessee-Tombigbee Waterway. Fauna found nowhere else in the state inhabit streams in this region. The streams of this drainage fall into three size categories: small, medium and large.

CONDITION AND CONSERVATION STATUS

The Tombigbee drainage has been highly modified by the construction of the Tennessee-Tombigbee Waterway. The waterway is a series of impoundments and canals with locks ands dams for navigation. This has effectively isolated many tributaries by creating a lentic barrier between lotic systems. Many of the lotic tributaries have been altered by channelization. Headcutting, erosion, and sedimentation are often a problem, even in unchannelized reaches.

Because of the large number of species of concern in this drainage, and the disturbed state of the drainage, it is considered **imperiled** in the state.



Tombigbee Drainage

12.3a. Small streams. (see 12.2a for definition).

12.3b. Medium streams. (see 12.2b for definition).

12.3c. Large Streams. Large streams have drainage basins greater than 1,000 square miles, typically have little canopy cover and contain a wide array of microhabitat types ranging from deep runs and pools to

shallow riffles. Survival of some species may depend on off channel habitats and prolonged flooding over alluvial plains.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH TOMBIGBEE DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Crustaceans	*Hobbseus cristatus*	A Crayfish	1
	Hobbseus orconectoides	Oktibbeha Rivulet Crayfish	1
	Hobbseus petilus Tombigbee	Rivulet Crayfish	1
	Orconectes mississippiensis	A Crayfish	1
	Procambarus lagniappe	Lagniappe Crayfish	1
	Hobbseus prominens	A Crayfish	2
	Orconectes jonesi	A Crayfish	2
	Procambarus lecontei	Mobile Crayfish	2
	Cambarus girardianus	A Crayfish	3
Fish	*Percina lenticula*	Freckled Darter	1
	Alosa alabamae	Alabama Shad	1
	Crystallaria asprella	Crystal Darter	1
	Noturus munitus	Frecklebelly Madtom	1
	Scaphirhynchus suttkusi	Alabama Sturgeon	1
	Etheostoma zonifer	Backwater Darter	1
	Moxostoma carinatum	River Redhorse	2
	Cycleptus meridionalis	Southeastern Blue Sucker	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Stizostedion sp 1	Southern Walleye	2
	Notropis candidus	Silverside Shiner	2
	Notropis edwardraneyi	Fluvial Shiner	2
	Ammocrypta meridiana	Southern Sand Darter	2
	Cyprinella callistia	Alabama Shiner	2
	Etheostoma lachneri	Tombigbee Darter	2
	Fundulus dispar	Northern Starhead Topminnow	2
	Polyodon spathula	Paddlefish	3
	Hypentelium etowanum	Alabama Hog Sucker	3
	Etheostoma rupestre	Rock Darter	3
	Percina kathae	Mobile Logperch	3
	Moxostoma erythrurum	Golden Redhorse	3
Mussels	*Elliptio arca*	Alabama Spike	1
	Elliptio arctata	Delicate Spike	1
	Epioblasma penita	Southern Combshell	1
	Lampsilis perovalis	Orange-Nacre Mucket	1
	Lasmigona complanata alabamensis	Alabama Heelsplitter	1
	Ligumia recta	Black Sandshell	1

	Medionidus acutissimus	Alabama Moccasinshell	1
	Obovaria jacksoniana	Southern Hickorynut	1
	Obovaria unicolor	Alabama Hickorynut	1
	Pleurobema decisum	Southern Clubshell	1
	Pleurobema perovatum	Ovate Clubshell	1
	Strophitus connasaugaensis	Alabama Creekmussel	1
	Anodontoides radiatus	Rayed Creekshell	2
	Arcidens confragosus	Rock Pocketbook	2
	Ellipsaria lineolata	Butterfly	2
	Lampsilis straminea straminea	Rough Fatmucket	2
	Quadrula rumphiana	Ridged Mapleleaf	2
	Strophitus subvexus	Southern Creekmussel	2
	Uniomerus caroliniana	Florida Pondhorn	2
	Uniomerus declivis	Tapered Pondhorn	2
	Pleurobema curtum	Black Clubshell	4
	Pleurobema marshalli	Flat Pigtoe	4
	Pleurobema taitianum	Heavy Pigtoe	4
	Potamilus inflatus	Inflated Heelsplitter	4
	Quadrula metanevra	Monkeyface	4
	Quadrula stapes	Stirrupshell	4
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2
	Graptemys nigrinoda	Black-Knobbed Map Turtle	2
	Graptemys pulchra	Alabama Map Turtle	2

THREATS TO TOMBIGBEE DRAINAGE

Channel Modification	high
Incompatible Agricultural Practices	high
Incompatible Forestry Practices	high
Incompatible Resource Extraction Practices	high
Industrial Development	high
Operation of Dams/Impoundments	high
Headcutting	high
Agricultural Conversion	medium
Forestry Conversion	medium
Incompatible Grazing Practices	medium
Incompatible Water Quality	medium
Invasive Species	medium
Road Construction/Management	medium
Urban/Suburban Development	medium
Livestock Feedlots/Operations	medium
Groundwater and Surface Water Withdrawal	low

Over Exploitation/Incidental Capture	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Medium stream, Lower Mississippi North Delta Drainage.

12.4 Lower Mississippi North Drainage (Hatchie and Wolf River Systems)

- **Value to SGCN - 24**
- **Rank - 16th of 18 Lotic and Lentic**

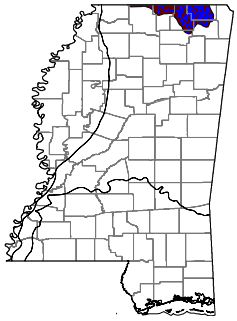
DESCRIPTION AND LOCATION

UEGCP

Although most systems in this drainage occur outside of Mississippi, the upper portions of the Hatchie and Wolf River systems in North Mississippi are part of this drainage. The portions of these systems that lie in Mississippi are relatively small, with upstream drainage areas less than 1,000 square miles.

CONDITION AND CONSERVATION STATUS.

Much of the Lower Mississippi North has been channelized in the past. There are very few unmodified streams in the drainage in Mississippi. However, because of the species of concern which occur in the remaining habitat, this habitat is considered **vulnerable.**


Lower Mississippi North Drainage (Hatchie and Wolf River systems)

12.4a. Small streams. (see 12.2a for definition).

12.4b. Medium streams. (see 12.2b for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER MISSISSIPPI NORTH DRAINAGE (LMND) HATCHIE AND WOLF SYSTEMS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Crustaceans	*Orconectes etnieri*	A Crayfish	2
	Procambarus ablusus	A Crayfish	2
Fish	*Noturus gladiator*	Piebald Madtom	1
	Cyprinella whipplei	Steelcolor Shiner	2
	Etheostoma asprigene	Mud Darter	3
Mussels	*Elliptio dilatata*	Spike	1
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO LOWER MISSISSIPPI NORTH DRAINAGE (LMND) HATCHIE AND WOLF SYSTEMS

Channel Modification	high
Incompatible Agricultural Practices	high
Headcutting	high

Incompatible Forestry Practices	medium
Incompatible Grazing Practices	medium
Incompatible Water Quality	medium
Incompatible Resource Extraction Practices	low
Invasive Species	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Large stream, Yazoo River Drainage.

12.5. Upper Coastal Plain, Yazoo Drainage

- **Value to SGCN - 53**
- **Rank - 10th of 18 Lotic and Lentic Systems**

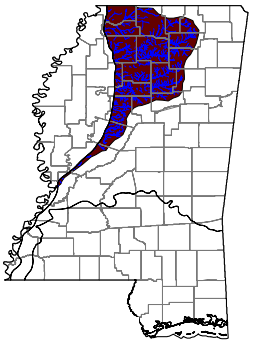
DESCRIPTION AND LOCATION

UEGCP

These streams are tributaries of the Yazoo River which lie east of the Mississippi alluvial plain. Portions of the Tallahatchie, Yocona, Yalobusha and Coldwater occur in this region, as well as many smaller tributaries of the Yazoo River. Many streams in this region have been modified by channelization, construction of diversion canals, desnagging and construction of flood control dams.

CONDITION AND CONSERVATION STATUS

Many streams in the upper Yazoo drainage have been channelized. Much of the surrounding lands have been converted to agriculture. The four main tributaries to the Yazoo River (Coldwater, Tallahatchie, Yocona and Yalobusha rivers) have been impounded by flood control reservoirs.



Upper Coastal Plain, Yazoo Drainage

The stream habitat that remains in this drainage is considered to be **vulnerable** because of extensive alteration caused by channelization, agricultural use of surrounding lands and impoundments.

12.5.a. Small streams. (see 12.2.a for definition).

12.5.b. Loess Hills Streams. These are small streams that are confined to the loess hills region of Mississippi, and are tributaries of the Big Black, Yazoo or Mississippi rivers.

12.5.c. Medium streams. (see 12.2.b for definition).

12.5.d. Large Streams. (see 12.3.c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UPPER COASTAL PLAIN, YAZOO DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Crustaceans	*Hobbseus yalobushensis*	A Crayfish	1
	Orconectes hartfieldi	A Crayfish	1
	Procambarus lylei	Shutispear Crayfish	1
Fish	*Noturus gladiiators*	Piebald Madtom	1

	Etheostoma raneyi	Yazoo Darter	1
	Cyprinella whipplei	Steelcolor Shiner	2
	Phoxinus erythrogaster	Southern Redbelly Dace	2
	Cycleptus elongatus	Blue Sucker	2
	Percina phoxocephala	Slenderhead Darter	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Notropis amnis	Pallid Shiner	2
	Etheostoma asprigene	Mud Darter	3
	Ictiobus niger	Black Buffalo	3
	Atractosteus spatula	Alligator Gar	3
	Polyodon spathula	Paddlefish	3
	Notropis sabinae	Sabine Shiner	3
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO UPPER COASTAL PLAIN, YAZOO DRAINAGE

Channel Modification	high
Incompatible Agricultural Practices	high
Incompatible Water Quality	high
Operation of Dams/Impoundments	high
Headcutting	high
Incompatible Forestry Practices	medium
Urban/Suburban Development	medium
Forestry Conversion: Forestry Conversion	medium
Groundwater and Surface Water Withdrawal	low
Invasive Species	low
Incompatible Resource Extraction Practices	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Loess hills stream, Big Black River Drainage

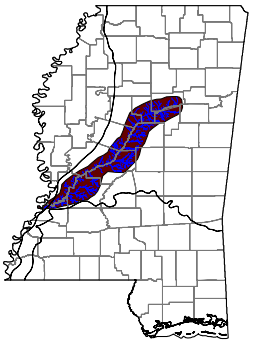
12.6. Big Black River Drainage

- **Value to SGCN - 66**
- **Rank - 8th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

UEGCP

The Big Black River lies south and east of the Yazoo River. This river has not been modified as extensively as some other large rivers in the state, although many of its tributaries have been channelized. Headcutting has destabilized much of the Big Black River in recent years.



Big Black River Drainage

CONDITION AND CONSERVATION STATUS

Many tributaries of the Big Black River have been channelized. The main stem has not, but has experienced extensive erosion in recent years, greatly destabilizing the stream channel. Agriculture and other land-use practices on

adjacent lands also impact the Big Black and its tributaries.

Because of its high conservation priority rank and the decline in quality of stream habitats in this drainage, the Big Black Drainage is considered **imperiled** in Mississippi.

12.6.a. Small streams. (see 12.2a for definition).

12.6.b. Loess Hills Streams. (see 12.5b for definition).

12.6.c. Medium streams. (see 12.2b for definition).

12.6.d. Large Streams. (see 12.3c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BIG BLACK RIVER DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Fish	*Noturus gladiiator*	Piebald Madtom	1
	Cycleptus elongatus	Blue Sucker	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Fundulus dispar	Northern Starhead Topminnow	2
	Notropis amnis	Pallid Shiner	2
	Etheostoma asprigene	Mud Darter	3
	Ictiobus niger	Black Buffalo	3
	Polyodon spathula	Paddlefish	3
	Notropis sabinae	Sabine Shiner	3
	Moxostoma erythrurum	Golden Redhorse	3
	Ammocrypta clara	Western Sand Darter	4
Mussels	*Obovaria jacksoniana*	Southern Hickorynut	1
	Pleurobema rubrum	Pyramid Pigtoe	1
	Quadrula cylindrica cylindrica	Rabbitsfoot	1
	Anodontoides radiatus	Rayed Creekshell	2
	Arcidens confragosus	Rock Pocketbook	2
	Ellipsaria lineolata	Butterfly	2
	Lampsilis cardium	Plain Pocketbook	2
	Quadrula nodulata	Wartyback	2
	Uniomerus declivis	Tapered Pondhorn	2
	Lampsilis siliquoidea	Fatmucket	3
	Truncilla truncata	Deertoe	3
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO BIG BLACK RIVER DRAINAGE

Agricultural Conversion	high
Channel Modification	high
Incompatible Agricultural Practices	high
Incompatible Forestry Practices	high
Incompatible Water Quality	high
Headcutting	high
Incompatible Grazing Practices	medium
Urban/Suburban Development	medium
Groundwater and Surface Water Withdrawal	low
Incompatible Resource Extraction Practices	low
Industrial Development	low
Road Construction/Management	low
Over Exploitation/Incidental Capture	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Large Stream, Upper Coastal Plain, Pearl Drainage

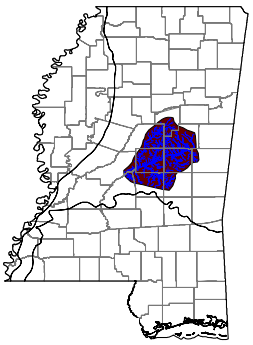
12.7. Upper Coastal Plain, Pearl River Drainage

- **Value to SGCN - 41**
- **Rank - 14th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

UEGCP

This portion of the Pearl River Drainage lies north of Jackson Mississippi. The Pearl River and the Yockanookany River are major systems in this region. The Pearl River has been highly modified by the construction of Ross Barnett Dam and by a smaller lowhead dam in Leake County.



Upper Coastal Plain, Pearl River Drainage

CONDITION AND CONSERVATION STATUS

The main stem of the Pearl River is impounded by Ross Barnett Reservoir. Tributaries have been impacted by channel modification and land use practices. One major tributary, the Yockanookany River, has been extensively channelized. Pollutants are a problem in some reaches of the Pearl and the Yockanookany, as indicated by fish consumption advisories on these waters.

The upper Pearl Drainage is considered **vulnerable** to further degradation.

12.7a. Small streams. (see 12.2a for definition).

12.7b. Medium streams. (see 12.2b for definition).

12.7c. Large streams. (see 12.3c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UPPER COASTAL PLAIN, PEARL RIVER DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAMEM	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Crustaceans	*Hobbseus attenuatus*	Pearl Rivulet Crayfish	1
	Hobbseus valleculus	Choctaw Rivulet Crayfish	1
	Procambarus elegans	A Crayfish	2
Fish	*Fundulus dispar*	Northern Starhead Topminnow	2
Mussels	*Elliptio arctata*	Delicate Spike	1
	Obovaria unicolor	Alabama Hickorynut	1
	Anodontoides radiatus	Rayed Creekshell	2
	Pleurobema beadleianum	Mississippi Pigtoe	2
	Lasmigona complanata complanata	White Heelsplitter	3
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2
	Graptemys oculifera	Ringed Map Turtle	2
	Graptemys gibbonsi	Pascagoula Map Turtle	2

THREATS TO UPPER COASTAL PLAIN, PEARL RIVER DRAINAGE

Channel Modification	high
Operation of Dams/Impoundments	high
Recreation Activities	high
Incompatible Water Quality	medium
Incompatible Forestry Practices	medium
Incompatible Agricultural Practices	medium
Incompatible Resource Extraction Practices	low
Headcutting	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Medium Stream, Mississippi Alluvial Plan.

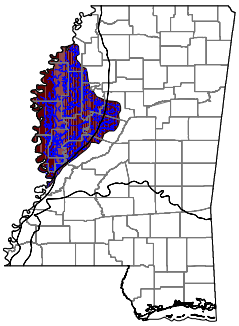
12.8. Mississippi Alluvial Plain

- **Value to SGCN - 73**
- **Rank - 7th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

MSRAP

Although the Mississippi alluvial plain is most prominent just north of Vicksburg to the Tennessee state line, it continues along the Mississippi River down to the Louisiana state line. In north-central Mississippi the alluvial plain at its widest point stretches from the Mississippi River eastward approximately 70 miles. In general, these are low gradient streams with fine substrate and sparse patches of gravel. Streams in this region have been highly modified for flood control and agricultural development. This region does, however, contain species found nowhere else in Mississippi. Three categories of streams are: small, medium and large.



Mississippi Alluvial Plain

CONDITION AND CONSERVATION STATUS

Streams in the Mississippi alluvial plain have been extensively modified for flood control and agricultural development. Many streams have been converted to straight canals to improve drainage. Weirs and lowhead dams block many streams. Diversion canals have been constructed to divert water from streams during high flow. Overall water quality is lower in this area than anywhere else in the state, with a region-wide advisory regarding fish consumption and numerous consumption bans in some waters of the alluvial plain because of high pesticide levels. Dewatering of the alluvial plain has resulted in extremely low flows in some streams. For example, the Sunflower River flow rate often drops below the 7Q10 flow rate established by the U.S. Geological Survey.

The Mississippi alluvial plain is considered **critically imperiled** because of its high conservation priority rank and the widespread degradation of stream habitats in this region.

12.8.a. Small streams. (similar to 12.2a definition, but low gradient and fine substrate).

12.8.b. Medium streams. (similar to 12.2b definition, but low gradient and fine substrate).

12.8.c. Large streams. (similar to 12.3c definition, but low gradient and fine substrate).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MISSISSIPPI ALLUVIAL PLAN (MAP)

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Fish	*Fundulus dispar*	Northern Starhead Topminnow	2
	Atractosteus spatula	Alligator Gar	3
	Polyodon spathula	Paddlefish	3
	Ictiobus niger	Black Buffalo	3
Mussels	*Actinonaias ligamentina*	Mucket	1
	Elliptio dilatata	Spike	1
	Lampsilis hydiana	Louisiana Fatmucket	1
	Ligumia recta	Black Sandshell	1
	Plethobasus cyphyus	Sheepnose	1
	Pleurobema rubrum	Pyramid Pigtoe	1
	Potamilus capax	Fat Pocketbook	1
	Quadrula cylindrica cylindrica	Rabbitsfoot	1
	Anodontoides radiatus	Rayed Creekshell	2
	Arcidens confragosus	Rock Pocketbook	2
	Ellipsaria lineolata	Butterfly	2
	Lampsilis cardium	Plain Pocketbook	2
	Quadrula nodulata	Wartyback	2
	Strophitus undulatus	Squawfoot	2
	Uniomerus caroliniana	Florida Pondhorn	2
	Uniomerus declivis	Tapered Pondhorn	2

	Lampsilis siliquoidea	Fatmucket	3
	Truncilla truncata	Deertoe	3
	Cyprogenia aberti	Western Fanshell	4
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO MISSISSIPPI ALLUVIAL PLAN (MAP) DRAINAGE

Agricultural Conversion	high
Channel Modification	high
Groundwater and Surface Water Withdrawal	high
Incompatible Agricultural Practices	high
Incompatible Water Quality	high
Operation of Dams/Impoundments	high
Invasive Species	high
Over Exploitation/Incidental Capture	medium

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

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12.9 – 12.13 THE LOWER COASTAL PLAIN

The Lower Coastal Plain covers most of the south half of Mississippi. The lower Pearl, Pascagoula, coastal rivers (Jordan, Wolf, Biloxi), tributaries of the Lower Mississippi River South (Bayou Pierre, Homochitto, and Buffalo Rivers) and a portion of the Lake Pontchartrain system are found in this region. A unique feature of this region is the numerous blackwater streams, which are found primarily in southeast Mississippi, east of the Pearl River. Streams in this region are divided into five categories: small, small blackwater, medium, medium blackwater and large.

Small blackwater stream, Lower Coastal Plain, Pearl Drainage.

12.9. Lower Coastal Plain, Pearl Drainage

- **Value to SGCN - 105**
- **Rank - 5th of 18 of Lotic and Lentic Systems**

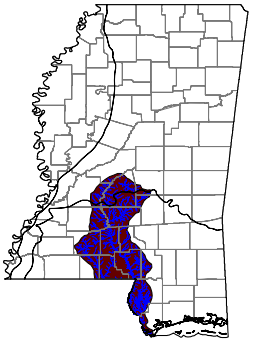
DESCRIPTION AND LOCATION

NGM, EGCP

This area includes the Pearl River and its tributaries downstream from Jackson, Mississippi to the Gulf of Mexico. Downstream from Marion County, Mississippi, the Pearl River forms the boundary between Louisiana and Mississippi. The Pearl River splits downstream from Bogalusa, Louisiana into the East and West Pearl. The West Pearl, which carries most of the flow, lies entirely in Louisiana. The East Pearl carries only a fraction of the flow. Impacts to streams in this drainage vary. Headcutting, channel modification, industrial pollution, increased sedimentation and changes in land use practices have altered stream habitats in this region.

CONDITION AND CONSERVATION STATUS

The lower Pearl River drainage is impacted by Ross Barnett Reservoir which is upstream. Reaches of the river and some of its tributaries have been channelized, but to a lesser extent than streams in northern Mississippi. However, streams in this drainage suffer some of the same impacts of increased erosion, increased sedimentation and impacts from surrounding land use. Much of the flow of the main stem of the Pearl River is diverted just south of Bogalusa, Louisiana to the West Pearl, which lies entirely within Louisiana.



Lower Coastal Plain, Pearl Drainage

Because of the high conservation rank of this drainage, it is considered **vulnerable** in the state.

12.9.a. Small streams. (see 12.2a for definition).

12.9.b. Small blackwater streams. These streams are small, usually low gradient sluggish streams with dark, tannin-stained water. Although the waters are darkly stained, they are relatively clear.

12.9.c. Medium streams. (see 12.2b for definition).

12.9.d. Medium blackwater streams. These streams are similar in size to the other medium streams but they have dark, tannin-stained waters.

12.9.e. Large streams. (see 12.3c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER COASTAL PLAIN, PEARL DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton montanus*	Mud Salamander	2
Birds	*Elanoides forficatus*	Swallow-Tailed Kite	2
		Migrant Songbirds	
Crustaceans	*Procambarus bivittatus*	Ribbon Crayfish	2
	Procambarus penni	Pearl Blackwater Crayfish	2
Fish	*Notropis chalybaeus*	Ironcolor Shiner	1
	Percina lenticula	Freckled Darter	1
	Alosa alabamae	Alabama Shad	1
	Crystallaria asprella	Crystal Darter	1
	Noturus munitus	Frecklebelly Madtom	1
	Morone saxatilis	Striped Bass	2
	Pteronotropis welaka	Bluenose Shiner	2
	Moxostoma carinatum	River Redhorse	2
	Cycleptus meridionalis	Southeastern Blue Sucker	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Fundulus dispar	Northern Starhead Topminnow	2
	Heterandria formosa	Least Killfish	3
	Ictiobus niger	Black Buffalo	3
	Atractosteus spatula	Alligator Gar	3
	Polyodon spathula	Paddlefish	3
Mussels	*Elliptio arca*	Alabama Spike	1
	Elliptio arctata	Delicate Spike	1
	Ligumia recta	Black Sandshell	1
	Obovaria jacksoniana	Southern Hickorynut	1
	Obovaria unicolor	Alabama Hickorynut	1
	Anodontoides radiatus	Rayed Creekshell	2
	Arcidens confragosus	Rock Pocketbook	2
	Pleurobema beadleianum	Mississippi Pigtoe	2
	Lasmigona complanata complanata	White Heelsplitter	3

Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2
	Graptemys oculifera	Ringed Map Turtle	2
	Graptemys gibbonsi	Pascagoula Map Turtle	2
	Farancia erytrogramma	Rainbow Snake	2

THREATS TO LOWER COASTAL PLAIN, PEARL DRAINAGE

Channel Modification	high
Incompatible Forestry Practices	high
Incompatible Resource Extraction Practices	high
Incompatible Water Quality	high
Operation of Dams/Impoundments	high
Urban/Suburban Development	high
Livestock Feedlots/Operations	high
Headcutting	high
Forestry Conversion	medium
Incompatible Grazing Practices	medium
Second Home/Vacation Home Development	medium
Industrial Development	medium
Incompatible Agricultural Practices	low
Invasive Species	low
Road Construction/Management	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Small blackwater stream, Pascagoula River Drainage.

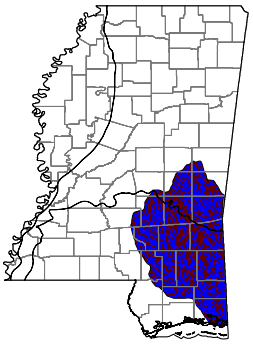
12.10. Pascagoula Drainage

- **Value to SGCN - 118**
- **Rank - 4th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

NGM, EGCP, UEGCP

The Pascagoula drains much of the southeastern quarter of Mississippi. Streams in this drainage have not been modified to the extent of streams in other areas of the state, although some of the smaller streams have been channelized. There is also a flood control reservoir on Okatibbee Creek in the upper Chickasawhay system. As in other areas of the state, some streams are experiencing accelerated rates of erosion and sedimentation, possibly due to land use changes. Many streams in this drainage are classified as blackwater streams.



Pascagoula Drainage

CONDITION AND CONSERVATION STATUS

The Pascagoula drainage is largely free flowing, with only a few small impoundments on tributaries. Channel modification in the Pascagoula drainage has been less extensive than in some other drainages in the state. However,

increased erosion and sedimentation have caused degradation in some areas of this drainage. Industrial development, agriculture, livestock and forestry practices may have impacts as well.

Because of its high conservation priority rank, the Pascagoula drainage is considered **vulnerable** in the state.

12.10.a. Small streams. (see 12.2.a for definition).

12.10.b. Small blackwater streams. (see 12.9.b for definition).

12.10.c. Medium streams. (see 12.2.b for definition).

12.10.d. Medium blackwater streams. (see 12.9.d for definition).

12.10.e. Large streams. (see 12.3.c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH PASCAGOULA DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana heckscheri*	River Frog	1
	Pseudotriton montanus	Mud Salamander	2
	Pseudotriton ruber	Red Salamander	3
	Plethodon ainsworthi	Baysprings Salamander	4
Birds	*Elanoides forficatus*	Swallow-Tailed Kite	2
	Haliaeetus leucocephalus	Bald Eagle	2
		Migrant Songbirds	
Crustaceans	*Cambarellus diminutus*	Least Crayfish	2
	Cambarellus lesliei	A Crayfish	2
Fish	*Notropis melanostomus*	Blackmouth Shiner	1
	Percina aurora	Pearl Darter	1
	Acipenser oxyrinchus desotoi	Gulf Sturgeon	1
	Notropis chalybaeus	Ironcolor Shiner	1
	Percina lenticula	Freckled Darter	1
	Alosa alabamae	Alabama Shad	1
	Morone saxatilis	Striped Bass	2
	Pteronotropis welaka	Bluenose Shiner	2
	Moxostoma carinatum	River Redhorse	2
	Cycleptus meridionalis	Southeastern Blue Sucker	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Enneacanthus gloriosus	Bluespotted Sunfish	3
	Atractosteus spatula	Alligator Gar	3
	Polyodon spathula	Paddlefish	3
	Leptolucania ommata	Pygmy Killfish	4
Mussels	*Elliptio arca*	Alabama Spike	1

	Elliptio arctata	Delicate Spike	1
	Obovaria jacksoniana	Southern Hickorynut	1
	Obovaria unicolor	Alabama Hickorynut	1
	Anodontoides radiatus	Rayed Creekshell	2
	Pleurobema beadleianum	Mississippi Pigtoe	2
	Uniomerus declivis	Tapered Pondhorn	2
	Lasmigona complanata complanata	White Heelsplitter	3
Reptiles	*Pseudemys alabamensis*	Alabama Redbelly Turtle	1
	Macrochelys temminckii	Alligator Snapping Turtle	2
	Graptemys flavimaculata	Yellow-Blotched Map Turtle	2
	Graptemys gibbonsi	Pascagoula Map Turtle	2
	Farancia erytrogramma	Rainbow Snake	2
	Regina septemvittata	Queen Snake	2

THREATS TO PASCAGOULA DRAINAGE

Incompatible Forestry Practices	high
Invasive Species	high
Forestry Conversion	medium
Incompatible Resource Extraction Practices	medium
Incompatible Water Quality	medium
Industrial Development	medium
Livestock Feedlots/Operations	medium
Over Exploitation/Incidental Capture:	medium
Recreation Activities	medium
Road Construction/Management	medium
Second Home/Vacation Home Development	medium
Urban/Suburban Development	medium
Channel Modification	low
Groundwater and Surface Water Withdrawal	low
Incompatible Agricultural Practices	low
Operation of Dams/Impoundments	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Limit bulk-heading along coastal drainages.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Medium blackwater stream, Coastal Rivers Drainage.

12.11. Coastal Rivers Drainage

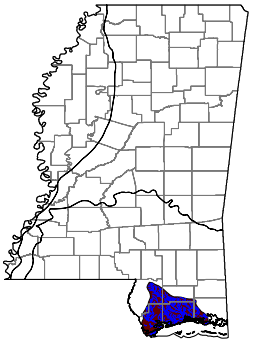
- **Value to SGCN - 42**
- **Rank - 12th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

NGM, EGCP

These small rivers, the Wolf, Jourdan, Tchoutacabouffa, Biloxi Rivers and their tributaries, make up the coastal rivers

drainage. Each is a separate river emptying into the Mississippi Sound, between the Pearl and Pascagoula rivers. All are blackwater streams. These streams have not been as heavily impacted by human activity as streams in some other areas of the state, although increased land development in the southern part of the state is a threat to these systems.



Coastal Rivers Drainage

CONDITION AND CONSERVATION STATUS

These streams have received fewer disturbances than streams in some other areas of the state, although there may be impacts from industrial and residential development, forestry and localized channelization of streams.

The coastal drainages are **apparently secure** in the state. They are less disturbed than some other streams in the state. However, future development may increase negative impacts.

12.11.a. Small blackwater streams. (see 12.9.b for definition).

12.11.b. Medium blackwater streams. (see 12.9.d for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH THE COASTAL RIVERS DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Rana heckscheri*	River Frog	1
	Pseudotriton montanus	Mud Salamander	2
Crustaceans	*Cambarellus diminutus*	Least Crayfish	2
Fish	*Notropis chalybaeus*	Ironcolor Shiner	1
	Morone saxatilis	Striped Bass	2
	Pteronotropis welaka	Bluenose Shiner	2
	Enneacanthus gloriosus	Bluespotted Sunfish	3
	Heterandria formosa	Least Killfish	3
	Atractosteus spatula	Alligator Gar	3
Mussels	*Pleurobema beadleianum*	Mississippi Pigtoe	2
	Uniomerus declivis	Tapered Pondhorn	2
Reptiles	*Pseudemys alabamensis*	Alabama Redbelly Turtle	1
	Macrochelys temminckii	Alligator Snapping Turtle	2
	Farancia erytrogramma	Rainbow Snake	2

THREATS TO COASTAL RIVERS DRAINAGE

Second Home/Vacation Home Development	high
Urban/Suburban Development	high
Road Construction/Management	high
Incompatible Forestry Practices	high

Invasive Species	medium
Incompatible Water Quality	low
Industrial Development	low
Recreation Activities	low
Channel Modification	low
Incompatible Agricultural Practices	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Limit bulk-heading along coastal drainages.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Large stream, Lake Ponchartrain Drainage.

12.12 Lake Ponchartrain Drainage

- **Value to SGCN - 24**
- **Rank - 16th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

EGCP

These are generally small to medium sized streams in southwestern Mississippi which drain into Lake Ponchartrain. The lower portions of the larger streams lie in Louisiana.

CONDITION AND CONSERVATION STATUS

Streams in this drainage have been impacted by localized channelization and construction of small impoundments. Because of the relatively low conservation ranking of these streams, they are **apparently secure** in the state.

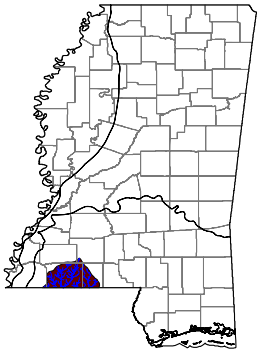
12.12a. Small streams. (see 12.2a for definition).

12.12b. Small blackwater streams. (see 12.9b for definition).

12.12c. Medium streams. (see 12.2b for definition).

12.12d. Medium blackwater streams. (see 12.9d for definition).

12.12e. Large streams. (see 12.3c for definition).



Lake Ponchartrain Drainage

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LAKE PONCHARTRAIN DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Fish	*Alosa alabamae*	Alabama Shad	1
	Fundulus euryzonus	Broadstripe Topminnow	2
Mussels	*Obovaria jacksoniana*	Southern Hickorynut	1
	Obovaria unicolor	Alabama Hickorynut	1
	Anodontoides radiatus	Rayed Creekshell	2

	Pleurobema beadleianum	Mississippi Pigtoe	2
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO LAKE PONCHARTRAIN DRAINAGE

Incompatible Resource Extraction Practices	high
Incompatible Forestry Practices	high
Headcutting	high
Incompatible Grazing Practices	medium
Incompatible Water Quality	medium
Recreation Activities: Recreation Activities	medium
Incompatible Agricultural Practices	low
Operation of Dams/Impoundments	low
Urban/Suburban Development	low
Invasive Species	low
Channel Modification	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

Small stream, Lower Mississippi South Drainage.

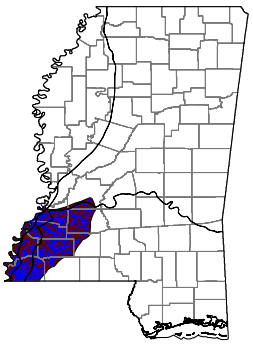
12.13 Lower Mississippi South Drainage

- **Value to SGCN - 56**
- **Rank - 9th of 18 Lotic and Lentic Systems**

DESCRIPTION AND LOCATION

EGCP, UEGCP

This drainage contains tributaries of the Mississippi River, including Bayou Pierre, Homochitto and Buffalo River systems. These systems lie primarily outside of the Mississippi alluvial plain. Streams in this drainage are divided into three categories: small, medium and large.



Lower Mississippi South Drainage

CONDITION AND CONSERVATION STATUS

Streams of the Lower Mississippi South drainage have been severely affected by extreme headcutting in recent years, causing extensive erosion, sedimentation and channel destabilization. This has caused widening of stream channels, elimination of canopy cover and general degradation of stream habitats. Agricultural and forestry practices may also have impacts.

Because of these impacts the streams of the Lower Mississippi South drainage are considered **imperiled** in the state.

12.13.a. Small streams. (see 12.2.a for definition).

12.13.b. Medium streams. (see 12.2.b for definition).

12.13.c. Large streams. (see 12.3c for definition).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER MISSISSIPPI SOUTH DRAINAGE

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Pseudotriton ruber*	Red Salamander	3
Crustaceans	*Procambarus penni*	Pearl Blackwater Crayfish	2
Fish	*Etheostoma rubrum*	Bayou Darter	1
	Crystallaria asprella	Crystal Darter	1
	Moxostoma carinatum	River Redhorse	2
	Phoxinus erythrogaster	Southern Redbelly Dace	2
	Ichthyomyzon castaneus	Chestnut Lamprey	2
	Etheostoma asprigene	Mud Darter	3
	Stizostedion canadense	Sauger	3
	Moxostoma erythrurum	Golden Redhorse	3
Mussels	*Obovaria jacksoniana*	Southern Hickorynut	1
	Potamilus capax	Fat Pocketbook	1
	Anodontoides radiatus	Rayed Creekshell	2
	Lampsilis cardium	Plain Pocketbook	2
	Quadrula nodulata	Wartyback	2
	Strophitus undulatus	Squawfoot	2
	Uniomerus declivis	Tapered Pondhorn	2
	Lampsilis siliquoidea	Fatmucket	3
Reptiles	*Macrochelys temminckii*	Alligator Snapping Turtle	2

THREATS TO LOWER MISSISSIPPI SOUTH DRAINAGE

Incompatible Forestry Practices	high
Incompatible Resource Extraction Practices	high
Recreation Activities	high
Headcutting	high
Channel Modification	medium
Incompatible Grazing Practices	medium
Incompatible Water Quality	medium
Incompatible Agricultural Practices	low
Operation of Dams/Impoundments	low
Road Construction/Management	low
Urban/Suburban Development	low
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

13. UPLAND MARITIME AND ESTUARINE FRINGE

Petit Bois, Horn, Ship (East and West) and Cat Islands in Mississippi and Dauphin Island in Alabama form a chain of barrier islands in the North central Gulf Region. In Mississippi, the islands are situated about 12 miles from the mainland where they form the south shore of Mississippi Sound. The islands serve as the boundary between the marine and estuarine systems of Mississippi's coastal wetlands. Waters north of the islands are considered estuarine. The Sound, which ranges in salinity from nearly fresh to 30 parts per thousand (ppt), serves as a large mixing zone for fresh and marine waters.

The barrier islands were formed by westward drift (often called "Longshore Drift") of sands from the Floridian shores, movement that continues today, although channel dredging for shipping lanes causes some disruption of sand movement and probably reduces the amount of deposition along the islands. The extent of this westward drift is exemplified by the movement of Petit Bois Island, which connected to Dauphin Island in the 1700's and is now located about four miles west of Dauphin Island. Round and Deer Islands are mainland remnants isolated by rising sea level. Some of their habitats are similar to the barrier islands and may be included in island habitat descriptions below.

This type includes seven subtypes: 13.1 Barrier Island Uplands, 13.2 Man-Made Beaches, 13.3 Barrier Island Wetlands, 13.4 Mainland Beaches, 13.5 Barrier Island Beaches, 13.6 Shell Middens and Estuarine Shrublands and 13.7 Maritime Woodlands.

GENERAL CONDITION

Many of the barrier island habitats, parts of which are considered wilderness, remain in good condition, but hurricanes have caused overwash and additional destabilization of the fragile dune systems. The barrier islands are gradually diminishing in size by wave erosion and reduced sand accretion. Exotic weeds, which have gained footholds on the mainland in pine flatwoods and savannas, live oak woodlands and shell middens, as well as on the islands, continue to reduce the condition of these landscapes.

Like other coastal states, the use of coastal areas as industrial, urban and residential centers has disturbed much of the natural landscape surrounding coastal wetlands in Mississippi. Over half of the U.S. population lives within 50 miles of the coast and this population is growing at a much faster rate than inland regions. This rapid urbanization of our coasts has destroyed a significant amount of coastal wetlands and fringe habitats, degraded coastal water quality and severely stressed other coastal

ecosystems. A healthy coastal economy depends on healthy coastal ecosystems. Refer to Section 14, Estuary and Mississippi Sound, for additional discussion on conditions of coastal habitats.

13.1 Barrier Island Uplands

- **Value to SGCN - 87**
- **Rank - 4th of 17 of Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

The dry island subtype includes dry to mesic meadows and inland dune systems. Habitats consist of excessively well-drained, mostly deep soils composed of windblown sand. Some upland areas are periodically overwashed by storm surges. The most erosive sections of the islands are directly adjacent to the beaches where there is the least amount of vegetation cover and greatest exposure to wind. As flats and berms along the backbeach become desiccated, the sand particles are less cohesive and readily drift on windy days. Wind erosion, salt spray and exposure to excessive heat keeps the areas sparsely vegetated. Slightly inland from the shore, a series of vegetated linear swales and dune ridges parallel the coastline. The dunes are either semi-stable and display some active sand movement or stable and firm.

The stable dunes, also called relict dunes, have a crust that is strengthened by the presence of microscopic organisms. Excessive pedestrian traffic on hiking trails will disturb relict dunes, causing them to erode, but they can also be buried by encroaching dunes. Backbeaches and semi-stable dunes commonly support a sparse cover of a variety of graminoids, including gulf bluestem, Leconte's flatsedge, sea oats, panic grass, dropseed and umbrella sedge. Common herbs are squareflower, poorjoe, pineland scalypink, Dixie sandmat, camphorweed, coastal sands frostweed and beach morning glory. The dry meadows are dominated by southern umbrellasedge, torpedo grass, broomsedge bluestem, needlepod rush, panic grass and contain lesser amounts of saltmeadow cordgrass. Relict dunes are dominated by shrubby species: wild rosemary, woody goldenrod, prickly pear, saw palmetto and occasionally sand live oak.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Barrier island uplands consist of long narrow segments of land that are surrounded by brackish or marine water. The uplands are exposed to frequent strong winds and tidal storm surges. The upland substrates are sandy and dry. Each of the five islands support a total of **6,000 acres** in long contiguous

patches, each up to 1,000 acres in size. Adjacent habitats include barrier island wetlands and ponds.

Barrier island uplands are gradually being diminished by a lack of sand aggradations, which are necessary to compensate for normal losses cause by wind and wave action during storms. The size of the relict dunes has been diminished and apparently the amount of area occupied by mobile sand dunes is increasing. Some areas have exotic weeds (cogongrass). However, the islands are protected as a national park by federal statues and some areas are designated as "wilderness".

Range of Barrier Island Uplands

This subtype is considered **imperiled** in the state because of rarity due to its very restricted range; exotic weeds and loss of territory due to natural erosion processes make this community vulnerable to further declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND UPLANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Charadrius wilsonia*	Wilson's Plover	1
	Haematopus palliatus	American Oystercatcher	1
	Charadrius alexandrinus tenuirostris	Southeastern Snowy Plover	1
		Migrant Songbirds	1
	Haliaeetus leucocephalus	Bald Eagle	2
	Sterna nilotica	Gull-Billed Tern	2
	Rynchops niger	Black Skimmer	2
	Dendroica cerulea	Cerulean Warbler	2
	Columbina passerina	Common Ground-Dove	2
	Sterna antillarum	Least Tern	2
	Passerina ciris	Painted Bunting	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Asio flammeus	Short-Eared Owl	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Egretta caerulea	Little Blue Heron	2
	Egretta rufescens	Reddish Egret	2
	Eudocimus albus	White Ibis	2
	Pandion haliaetus	Osprey	3
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Tyto alba	Common Barn-Owl	3
	Oporornis formosus	Kentucky Warbler	3
	Lanius ludovicianus	Loggerhead Shrike	3

	Seiurus motacilla	Louisiana Waterthrush	3
	Protonotaria citrea	Prothonotary Warbler	3
	Piranga olivacea	Scarlet Tanager	3
	Hylocichla mustelina	Wood Thrush	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Dendroica discolor	Prairie Warbler	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Vermivora bachmanii	Bachman's Warbler	4
Reptiles	*Masticophis flagellum*	Eastern Coachwhip	3

THREATS TO BARRIER ISLAND UPLAND COMMUNITIES

Invasive Species	high
Recreation Activities	low
Altered Fire Regime	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

13.2 Man-Made Beaches

- **Value to SGCN - 52**
- **Rank - 9th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

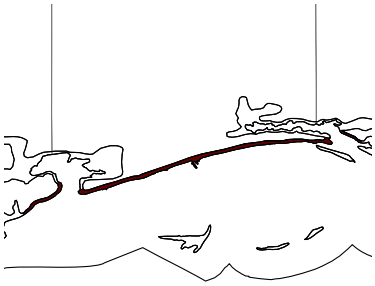
Artificial sand beaches are often less than 200 feet wide and are accompanied by a cement seawall that minimizes erosion along the mainland. Wind and wave action gradually work the sand back into the Mississippi Sound. Tons of replenishing sand are periodically pumped from nearshore areas. Invertebrates associated with natural sand shores recolonize artificial beaches after the treatments have been completed. Resident and migratory birds contribute greatly to the diversity found along artificial sand beaches.

A component of the beaches are ephemeral habitats called "bryozoans" or floating colonies. These are seasonally important and provide structural habitat and nutrient and carbon sources that are used by invertebrates, fishes and birds.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Man-made beaches are confined to a few long segments along the north shore of the Mississippi Sound. All man-made beaches are adjacent to transportation corridors and urban or residential areas. Mississippi's highly engineered coastline totals 80 miles in length, of which 36 miles are artificial beaches with a total area of approximately **700 acres**.



Range of Man-Made Beaches

Storm surges and beach clean-up operations reduce the availability of this habitat for wildlife. Some efforts are being implemented to reduce the amount of sand erosion and banking on nearby roadways. Other efforts are being implemented to protect the small colonies of nesting least terns.

Man-made beaches are **secure** in the state because they are constructed habitats that did not exist prior to development of the coastal urban centers.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MAN-MADE BEACHES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Charadrius wilsonia*	Wilson's Plover	1
	Haematopus palliatus	American Oystercatcher	1
	Charadrius alexandrinus tenuirostris	Southeastern Snowy Plover	1
		Migrant Shorebirds	1
	Egretta rufescens	Reddish Egret	2
	Charadrius melodus	Piping Plover	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Limosa fedoa	Marbled Godwit	2
	Calidris canutus	Red Knot	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
	Egretta thula	Snowy Egret	3

THREATS TO MAN-MADE BEACHES

Recreation Activities: Pier Construction high

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

13.3 Barrier Island Wetlands

- **Value to SGCN - 106**
- **Rank - 2nd of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

Wet habitats of the barrier island chain include a variety of low flats, linear depressions, swales, ponds and intertidal zones. They occur along the seashore or at slightly higher elevations. Linear-ridged sand dunes form the depressions in which the wetlands occur. Associated wetland communities are freshwater marshes, saltmarshes, salt meadows, estuarine shrublands and slash pine woodlands. They receive freshwater drainage from uplands and/or ocean processes. Smooth cordgrass and black needlerush are found in brackish areas.

Slightly elevated above brackish marshes are the salt meadow habitats, which are dominated by salt meadow cordgrass and torpedo grass. Saltmarsh morning glory, dotted smartweed, umbrellasedge, bushy goldentop and poorjoe are common forbs. The estuarine shrublands contain an abundance of eastern baccharis, southern bayberry and yaupon, which range in height from three to eight feet tall. Saltmarsh cordgrass and torpedo grass form a rather continuous ground cover within these shrublands. The island's pinelands are found on low flats, along pond shores and within swales of the linear dune systems. They are composed of dense to open stands of slash pine and often contain an abundance of shrubs such as yaupon, saw palmetto, southern bayberry and occasionally, sand live oak. Herbs include bushy goldentop, erect centella, manyflower marsh pennywort, seaside primrosewillow, saltmarsh morning glory and Maryland meadowbeauty.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

The wetlands, estimated to cover about **4,000 acres**, are found throughout the islands and cover nearly half of the island. The wetland complexes probably range from about 50 to 1,000 acres each in size.

Range of Barrier Island Wetlands

Barrier island wetlands remain in good condition because they are under public ownership and are not threatened by development initiatives. Unfortunately the exotic weed, torpedo grass, has become well established. The wetlands are being threatened by natural forces, especially hurricane

storms, but also a lack of aggradations of sands is leading to a loss of some wetlands.

Habitats are generally considered **imperiled** because of rarity due to very restricted range. Several of the communities making up this subtype are considered vulnerable because of a gradual decrease in wetland surface area and the presence of exotic weeds. However the wetlands are protected from further development and are maintained as a protected park by the National Park Service.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND WETLANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Charadrius wilsonia*	Wilson's Plover	1
	Charadrius alexandrinus tenuirostris	Southeastern Snowy Plover	1
	Haematopus palliatus	American Oystercatcher	1
		Migrant Songbirds	1
	Haliaeetus leucocephalus	Bald Eagle	2
	Rynchops niger	Black Skimmer	2
	Dendroica cerulea	Cerulean Warbler	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Egretta caerulea	Little Blue Heron	2
	Anas fulvigula	Mottled Duck	2
	Ammodramus nelsoni	Nelson's Sharp-Tailed Sparrow	2
	Passerina ciris	Painted Bunting	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Ammodramus maritimus	Seaside Sparrow	2
	Asio flammeus	Short-Eared Owl	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Eudocimus albus	White Ibis	2
	Charadrius melodus	Piping Plover	2
	Egretta rufescens	Reddish Egret	2
	Limosa fedoa	Marbled Godwit	2
	Pandion haliaetu s	Osprey	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Tyto alba	Common Barn-Owl	3
	Oporornis formosus	Kentucky Warbler	3
	Seiurus motacilla Louisiana	Waterthrush	3
	Protonotaria citrea	Prothonotary Warbler	3
	Piranga olivacea	Scarlet Tanager	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Helmitheros vermivorus	Worm-Eating Warbler	3

	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Dendroica discolor	Prairie Warbler	3
	Hylocichla mustelina	Wood Thrush	3
	Botaurus lentiginosus	American Bittern	3
	Ixobrychus exilis	Least Bittern	3
Reptiles	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin	2
	Nerodia clarkii clarkii	Gulf Salt Marsh Snake	2

THREATS TO BARRIER ISLAND WETLAND COMMUNITIES

Invasive Species	high
Altered Fire Regime	low
Miscellaneous Threats Described: Marine Litter	low
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

13.4 Mainland Natural Beaches

- **Value to SGCN - 69**
- **Rank - 5th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

Natural beaches of the mainland are predominantly found at the mouths of rivers, such as the Pearl and Pascagoula

Rivers. Their substrates are muddy in texture because they originate from the eroding intertidal marshes, where the shoreline retreats several feet every year. However, a few significant segments of sand or shell beach exist along the mainland, such as along the Rigolets Islands. The Rigolets are a group of small marshy islands occurring on the borders of Mississippi and Alabama. Additional sand beaches are found at Point aux Chenes, southwest of the mouth of Graveline Bayou, southeast of the mouth Davis Bayou in Jackson County, on Big Island in Back Bay of Biloxi in Harrison County and between the mouth of Bayou Caddy and Landmark Bayou in Hancock County. A few smaller beaches occur in other areas. These coarse-textured beaches are very important nesting areas for the Mississippi diamondback terrapin.

In addition to beaches of the larger coastal water bodies, mud and sandy mud shores line the tidal streams of the coastal estuaries. These shorelines have similar ecological functions as mud flats. Mud shores harbor numerous microorganisms such as phytoplankton, fungi, bacteria and protozoans that serve as an important food source for benthic invertebrates (polychaetes, mollusks and crustaceans), which in turn support mid and upper level consumers such as crabs, shorebirds, shrimp and fish. Wading and shorebirds are especially dependent on mud shores. Herons, egrets, sandpipers, plovers, godwits, willets, terns, gulls, ducks and osprey frequent this habitat.

A component of beach habitats in Mississippi are ephemeral habitats or "bryozoans"-floating colonies. These are seasonally important and provide structural habitat and nutrient and carbon sources that are used by invertebrates, fishes and wading birds.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Mainland beaches are narrow linear intertidal areas that extend along bayous, bays and tidal rivers. They form the interface between subtidal areas and intertidal marshes and occasionally directly adjoin uplands. On average, mud flats and muddy shorelines cover about **1,000 acres** along approximately 300 miles of tidal stream. During high tide they become submerged, and at low tide they reemerge and expand in size.

Range of Mainland Natural Beaches

Natural subsidence is occurring in coastal areas and documented sea level increases are causing beachline erosion along the estuarine marshlands of the state. Storm surges create additional shoreline erosion. Due to these forces, the habitat is always in a state of transition. Urbanization is encroaching on some beaches where bulkheading and vegetation clearing is taking place.

This subtype is **imperiled** in the state because of its rarity and due to very restricted range; subsidence, sea level rise, hurricanes, and urbanization are other factors that make the subtype vulnerable to further decline.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MAINLAND BEACHES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Charadrius wilsonia*	Wilson's Plover	1
	Haematopus palliatus	American Oystercatcher	1
	Laterallus jamaicensis	Black Rail	1
	Egretta rufescens	Reddish Egret	2
	Charadrius melodus	Piping Plover	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Limosa fedoa	Marbled Godwit	2
	Calidris canutus	Red Knot	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Egretta caerulea	Little Blue Heron	2
	Eudocimus albus	White Ibis	2
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Pelecanus erythrorhynchos	American White Pelican	3
		Migrant Shorebirds	
Reptiles	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin	2

THREATS TO MAINLAND BEACH COMMUNITIES

Industrial Development	high
Channel Modification: Maintenance Dredging	high
Invasive Species: Fire Ants	high
Miscellaneous Threats Described: Excessive Nest Depredation	high
Urban/Suburban Development	medium

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through

purchase, easements or MOAs.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

13.5 Barrier Island Beaches

- **Value to SGCN - 58**
- **Rank - 8th of 17 of Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

The intertidal beach is considered to have two parts; the foreshore, or swash zone, where waves break in moderate weather and the backshore, where waves break during storm surges and high tides. Tropical storms strike the Mississippi coast several times annually and hurricanes, on average, about once every five or six years causing significant beach erosion. The northern shores are often narrow, more steeply sloped and may locally exhibit vertical sand cliffs. They are somewhat protected from massive waves generated by storms striking from the open ocean. The beaches consist of well-sorted, fine to coarse sand containing large quantities of quartz and minor amounts of shell and heavy minerals. Both shorelines experience erosion and accretion on an on-going basis, as prevailing currents move sand westward. Sand movement and storms have caused the islands to decrease in size over the past century. The backshore is the landward end of the beach where strand lines form and serve as a transition zone to the vegetated landscape. Strand lines are places where sand berms up and seaborne debris and dead animals accumulate. Beach vegetation is usually very sparse and confined to the upper edges of the backshore. Sea oats, beach morning glory and gulf bluestem are the most capable of tolerating the harsh conditions of the backshore. A few animals, such as the ghost crab, amphipods and various insects, are permanent residents.

A component of beaches in Mississippi are ephemeral habitats called "bryozoans" or floating colonies. These are seasonally important and provide structural habitat and nutrient and carbon sources that are used by invertebrates, fishes and wading birds.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Narrow bands of intertidal beach habitat circumscribe the barrier islands. Contiguous segments of this habitat range up to 100 acres in size. The beaches mark the interface between subtidal areas and marsh or dry sandy uplands. There are about **500 acres** of this habitat in the state.

Barrier Island Beaches

The beaches are largely considered intact because very limited development has occurred on the islands. Natural forces continue to erode and aggrade these habitats making them a place of constant transition.

Barrier island beaches are **imperiled** in the state because of rarity due to very restricted range. However, additional steep declines of this habitat are not apparent at this time.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND BEACHES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Migrant Shorebirds	1
	Charadrius alexandrinus tenuirostris	Southeastern Snowy Plover	1
	Charadrius wilsonia	Wilson's Plover	1
	Haematopus palliatus	American Oystercatcher	1
	Charadrius melodus	Piping Plover	2
	Sterna antillarum	Least Tern	2
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna nilotica	Gull-Billed Tern	2
	Limosa fedoa	Marbled Godwit	2
	Calidris canutus	Red Knot	2
	Egretta rufescens	Reddish Egret	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
	Egretta thula	Snowy Egret	3
Reptiles	*Caretta caretta*	Loggerhead; Cabezon	2
	Malaclemys terrapin pileata	MS Diamondback Terrapin	2

THREATS TO BARRIER ISLAND BEACH COMMUNITIES

Recreation Activities high

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

13.6 Shell Middens and Estuarine Shrublands

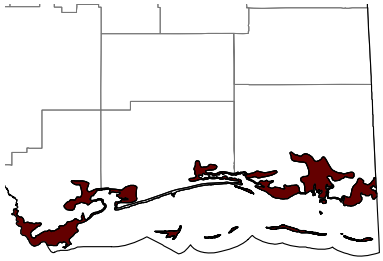
- **Value to SGCN - 64**
- **Rank - 7th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

Rare shell midden habitats that support a unique shrub community occur along intertidal marsh fringes and on small islands within the marsh. The breakdown of the oyster shell on middens creates unique soil conditions, which support a characteristic plant community. Other more extensive estuarine shrublands occupy a zone just above the salt meadows. Here the transition from one to the other may be abrupt or gradual, blending into the salt meadows as they form the final zone of tidal vegetation. They also occur in other less tidally influenced zones, such as wide areas along the eastern shore of St. Louis Bay. Estuarine shrublands are dominated by eastern baccharis, southern bayberry and bigleaf sumpweed. Plants found on shell middens include southern red cedar, coral bean, buckthorn, red buckeye, yucca and prickly pear.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM



Range of Shell Middens and Estuarine Shrublands

Estuarine shrublands are found in small linear patches that follow the shoreline of estuarine marshes and adjoin upland areas. Shell middens occur along edges of bayous as small circular patches, about one acre in size. Some bays have wide extensive areas (100 acres) of this type (east side of St. Louis Bay). Total acreage of this subtype is estimated to be about **5,000 acres**. The habitat is adjoined by forested or developed uplands and maritime forests.

Some shell middens are infested with cogongrass while those not surrounded by marsh lands are exposed to shoreline erosion. Estuarine shrublands are apparently stable communities and seem to be in good condition. However, not being exposed to periodic wildfire as in presettlement times may have a deleterious affect on the subtype. Nutrient loads of estuarine waters may have resulted in a change in abundance and/or dominance of some of the associated shrub species.

Shell middens are critically **imperiled** in the state because of extreme rarity and other forces, such as exotic weeds and wave action make this subtype especially vulnerable to further decline. Other estuarine shrublands are not imperiled but are **vulnerable** to decline by urbanization, lack of exposure to periodic fires, and higher nutrient level of adjacent water bodies.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SHELL MIDDENS AND ESTUARINE SHRUBLANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Haematopus palliatus*	American Oystercatcher	1
		Migrant Songbirds	1
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Dendroica cerulea	Cerulean Warbler	2
	Eudocimus albus	White Ibis	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Dendroica discolor	Prairie Warbler	3
	Egretta thula	Snowy Egret	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Hylocichla mustelina	Wood Thrush	3

	Lanius ludovicianus	Loggerhead Shrike	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
	Oporornis formosus	Kentucky Warbler	3
	Pandion haliaetus	Osprey	3
	Piranga olivacea	Scarlet Tanager	3
	Protonotaria citrea	Prothonotary Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
Reptiles	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin	2

THREATS TO SHELL MIDDEN AND ESTUARINE SHRUBLAND COMMUNITIES

Recreation Activities	high
Invasive Species	high
Miscellaneous Threats Described: Archeological Exploration	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

13.7 Maritime Woodlands

- **Value to SGCN - 67**
- **Rank - 6th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

The maritime slash pine flatwood/savannas community marks a scenic backdrop to the intertidal marshes along Mississippi's coastline. This community occupies ancient low shoreline beach ridges and low flats situated immediately inland from the tidal marshes. It is also found on the terrace levees of many tidal creeks, occasionally extending into the midst of sprawling black needlerush

marshes. In accompaniment with the pine flatwoods, are coastal live oak woodlands situated on prominent coastal cheniers and ancient beach ridges that straddle the coast line. The liveoak woodlands are comprised of native live and upland laurel oaks and contain an understory often dominated by saw palmetto. Most of the coastal upland habitat has been urbanized. Therefore it is likely that the maritime liveoak forest is one of the rarest communities found in Mississippi.

Soils of the coastal pinelands are deep, poorly drained and slowly permeable. The landform is level to nearly level stream terraces and lowland flats of the coastal plain. They are grayish brown, have fine loamy textures, and are saturated during the winter and spring. Small depressions and some flat areas are ponded for several days during wet seasons. A seasonally high water table is within several inches of the soil surface from December through April. The wet conditions produce mottles of yellowish brown colors. The soils have very strongly acid to strongly acid reactions throughout their profile. The liveoak woodlands are found on deep sand ridges.

Slash pine along with the dominant understory species of this community can tolerate seasonally wet or saturated soils, including saturation due to periodic storm surges of brackish water. The community is delineated from other coastal slash pine woodlands by the dominance of saltmeadow cordgrass in its understory. Saltmeadow cordgrass relinquishes its dominance a short distance inland, but occasionally the species will persist several miles inland along creek channels and bayous.

Purple bluestem, button eryngo, switchgrass, Jamaica swamp sawgrass, and gulf coast swallow-wort are common associates. Southern bayberry, eastern baccharis and yaupon shrubs are commonly encountered in this community. The community is fire dependent and can become brushy and inaccessible to pedestrian traffic during long intervals between burns. Maritime woodlands, including maritime liveoak forests provide essential points for neotropical migrants staging their trans-Gulf journey in the fall and recuperating upon their return in the spring.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Situated in highly urbanized coastal areas, maritime woodlands have been significantly depleted by widespread development. Areas of this subtype are usually less than 100 acres but may extend in a narrow band along the shoreline for several miles. Some of the wettest areas near the Hancock County marsh and within the Grand Bay National Estuarine Research Reserve remain intact and provide prime examples of this subtype. The liveoak woodlands have been extensively developed, but a few pockets remain on some large private holdings.

Range of Maritime Woodlands

Extensive areas of maritime woodlands have been developed for other uses. Of the remaining areas, much of which is under public ownership, are in good condition. Woodlands found on private lands are vulnerable to commercial development or intensive forest management. Cogongrass is rampant across the range of this community and has invaded much of the road sides and woodlands in the vicinity. Its increased presence makes the maritime woodlands especially vulnerable to new infestations of this pandemic weed.

This subtype is **critically imperiled** in the state due to its extreme rarity and because of the threats of urbanization and exotic weeds that contribute to further declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MARITIME WOODLANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Bufo nebulifer*	Gulf Coast Toad	3
Birds	*Coturnicops noveboracensis*	Yellow Rail	1
	Falco sparverius paulus	Southeastern American Kestrel	1
		Migrant Songbirds	1
	Dendroica cerulea	Cerulean Warbler	2
	Columbina passerina	Common Ground-Dove	2
	Passerina ciris	Painted Bunting	2
	Limnothlypis swainsonii	Swainson's Warbler	2
	Aimophila aestivalis	Bachman's Sparrow	2
	Ammodramus henslowii	Henslow's Sparrow	2
	Ammodramus savannarum	Grasshopper Sparrow	2
	Caprimulgus carolinensis	Chuck-Will's-Widow	3
	Oporornis formosus	Kentucky Warbler	3
	Seiurus motacilla	Louisiana Waterthrush	3
	Dendroica discolor	Prairie Warbler	3
	Protonotaria citrea	Prothonotary Warbler	3
	Piranga olivacea	Scarlet Tanager	3
	Hylocichla mustelina	Wood Thrush	3
	Helmitheros vermivorus	Worm-Eating Warbler	3
	Colinus virginianus	Northern Bobwhite	3
	Lanius ludovicianus	Loggerhead Shrike	3
	Scolopax minor	American Woodcock	3
	Vermivora bachmanii	Bachman's Warbler	4
Reptiles	*Pseudemys alabamensis*	Alabama Redbelly Turtle	1
	Rhadinaea flavilata	Pine Woods Snake	1
	Heterodon simus	Southern Hognose Snake	4

THREATS TO MARITIME WOODLAND COMMUNITIES

Invasive Species	high
Second Home/Vacation Home Development	high
Altered Fire Regime	medium
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

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14. ESTUARY AND MISSISSIPPI SOUND (INSIDE OR ASSOCIATED WITH BARRIER ISLANDS)

Estuarine habitats include subtidal and intertidal areas. Subtidal habitats include the water column and benthic areas below extreme low water of spring tides. Texture of the substrate, salinity and water depth are important parameters that distinguish subtidal habitats from one another. With the exception of some of the barrier island lagoons, they have variable salinity levels. Estuarine areas that are partially enclosed by the mainland include embayments, lakes and tidal streams. Barrier island ponds or lagoons fit within this group. Over 300 Mississippi tidal creeks and riverine bayous cover approximately 5,500 acres. Coastal areas are also served by eight tidally influenced rivers that extend through estuarine habitat for over 85 miles and cover an estimated 4,500 acres. The total surface area of Mississippi Sound is approximately 500,000 acres; 25 percent is classified as nearshore habitat, less than two meters (6.5 feet) deep and 75 percent as offshore habitat.

Salt, brackish and intermediate marshes and salt pannes account for most of the intertidal marsh habitat of Mississippi, which totals almost 70,000 acres. Fire has been an important factor influencing the vegetation of the marshes, estuarine shrublands and maritime flatwoods.

Areas that support or have supported seagrasses in the past are classified as seagrass beds. Seagrasses are aquatic vascular plants that grow in shallow submerged estuarine waters. Non-vascular macroscopic algae beds are a rare community included in this category. Seagrass beds are recognized as one of the most important, diverse and productive communities of coastal waters.

This type includes seven subtypes: 14.1 Estuarine Bays, Lakes, and Tidal Streams, 14.2 Mississippi Sound, 14.3 Estuarine Marshes, 14.4 Barrier Island Passes, 14.5 Salt Pannes, 14.6 Seagrass Beds and 14.7 Mollusk Reefs.

GENERAL CONDITION

According to reports of the NOAA National Sea Grant College Program, "nearly half of the nation's coastal wetlands have been lost, and wetland losses in some states exceed 90 percent". Gulf coast states possess the largest proportion of coastal wetlands remaining (17,000 square miles), yet these areas are also disappearing rapidly due to coastal development. Beaches, dunes, seagrasses, coral reefs, oyster reefs and other valuable habitats face significant pressures. Loss and deterioration of coastal habitats, especially estuaries and wetlands, have dramatically affected U.S. fishery stocks. Landings of estuarine-dependent fishes are down.

Issues affecting the coastal estuaries are the Gulf "Dead Zone;" the impacts of metropolitan sewage outflows on coastal waters; and the causes and effects of toxic chemical contamination of oysters and mussels. Furthermore, wetland losses are affecting the function of coastal ecosystems by contributing to nutrient enrichment of coastal waters and the occurrence of harmful algal blooms, such as red and brown tides.

Particularly on the mainland, pressure on coastal wetland habitats has dramatically increased over the past 50 years. A significant percentage of coastal wetlands have been destroyed by filling and dredging. By 1972, 12 percent of the intertidal marshes of Mississippi had been drained, filled or fragmented. Regarding salt pannes, approximately 400 acres exist within the coastal estuary. The pannes, though rarely found in Hancock and Harrison Counties, may have been more abundant in the past. In Jackson County condition of the pannes appears to be stable. However, some losses of this habitat have occurred due to an increase in seawater levels (or subsidence) and beach erosion.

Subtidal areas are affected by nutrients and pollutants that mainly enter the water from terrestrial sources, especially urbanized areas. In some areas the pollution and nutrients from runoff and faulty septic systems have increased significantly. In other areas, heavy metal and chemical releases from industrial plants have been detrimental to aquatic species. Some bays, lakes and tidal streams are enclosed and somewhat protected from wind and tides. These areas are more likely to become stagnant during calm weather. The reduced mixing could lead to a segregation or increase in pollution gradient creating hypoxia and fish kills. Hypoxic conditions can also occur in smaller areas because of oxygen depletion and may also cause fish kills

Seagrass beds formerly covered an estimated 19,000 acres, but recent estimates indicate that only a fraction of the original beds exist today. The extensive losses of seagrass beds is due to a variety of causes, including hurricane damage, a decline in water quality and destruction of the beds by channel maintenance, dredging, commercial fishery trawling, recreational fishing activities and even damage from anchor dragging by recreational watercraft. Mollusk reefs are affected by salinity levels and water quality. Pollution control within the coastal waters and watersheds of tributary streams is paramount to the continuance of healthy and productive oyster reefs. Coastal environments provide some of the most attractive living areas in the nation. It will continue to be a challenge to protect these areas for present and future generations so that they may continue to enjoy the numerous benefits of a healthy wetland ecosystem along the Mississippi coast. Over 90,000 acres of land have been designated by the Mississippi Department of Marine Resources as coastal preserve habitat, much of which is tidal marsh, creeks and lakes.

14.1 Estuarine Bays, Lakes and Tidal Streams

- **Value to SGCN - 100**
- **Rank - 3rd of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

The term embayment refers to large, protected, low energy, subtidal areas that are enclosed on three sides by land. Mississippi has two such embayments, St. Louis Bay and Biloxi Bay. The bays range in depth from one to ten feet, except in minor channel segments where the depth reaches 30 feet. The textures of bottom substrates range from muddy sand to sandy mud. Bays are partially-mixed to well-mixed systems, depending on the season and experience tidal surges of one to one and one-half feet on average, but occasionally reach four feet. Salinity levels are in a constant state of flux depending on the ebb and flow of the tides and weather systems impacting the region and season. Additional parameters defining these waters include turbidity, pH, dissolved oxygen, nutrients and chlorophyll levels. The muddy bottoms support a diverse group of benthic life forms, mainly polychaetes, mollusks, insects and crustaceans, many of which prefer the bays over other estuarine areas. Numerous species inhabit the coastal bay waters, and the most economically important are anchovies, catfish, sea trout, spot, croaker, shrimp and blue crabs. Bays and bayous are important foraging areas for many birds such as loons, grebes, pelicans, herons, gulls and terns.

Besides coastal bays, coastal ponds and lakes contribute additional open water estuarine habitat. There are over 100 coastal estuarine ponds of many different sizes totaling almost 4,000 acres. Examples include Bangs Lake and Graveline Bayou in Jackson County. The lakes are usually very shallow, from one to ten feet deep and contain a similar complement of aquatic species to those found in bays. The small, circular or oval ponds and lagoons of the barrier islands also number in the hundreds. Due to their shallow nature and differences in connectivity, they exhibit a wider range of temperatures and salinity levels than mainland ponds. The ponds harbor a diverse group of fishes and birds. When exposed to hurricane winds, these ponds are radically changed through overwash, erosion and species exchanges.

Mississippi's tidal streams can be classified into three general types: tidal marsh creeks, coastal tidal creeks and riverine estuary bayous. Tidal marsh creeks primarily drain estuarine marshes. Coastal tidal creeks serve as minor conduits for freshwater discharge from surrounding uplands. Riverine estuary bayous serve as interdistributary channels within riverine estuaries. Substrates are usually muddy sand or sandy. Salinity, pH and turbidity change along a gradient that extends from the upper reaches of tidal

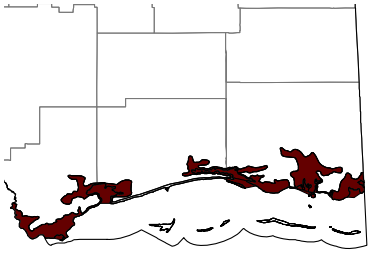
creeks to their outlets. Important animal groups inhabiting tidal creeks include mollusks, crustaceans, other invertebrates, salt tolerant reptiles, fishes, mammals, birds and others. Examples are oysters, blue crabs, shrimp, drum, mullet, diamondback terrapin, marsh hen, otter and raccoon.

Portions of the river channels affected by tides or by salt water intrusion, called the salt wedge (a layer of denser saltwater underlying a less dense layer of fresh water), are called tidal river habitats. The tidal river channels along the Mississippi coast have a wide range of flow rates, widths and depths. Substrates range in texture from sand along segments with higher flow rates to mud along sluggish segments. A large complement of fish and bird species are also encountered in tidal river habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Tidally affected streams, lakes, and bays extending along the Mississippi Sound, form a complex of subtidal estuarine communities that range in size from 100 to 10,000 acres in size. **About 34,000 acres** of this subtype are found in the state. Several large complexes of this subtype occur within the bays and the riverine deltas of the Mississippi coast. These tidal areas serve as major conduits for freshwater inflow and are important avenues for water movement through brackish marshes. The water bodies are usually nestled within brackish marsh habitats but occasionally adjoin maritime forest or urbanized properties. Further inland, the riverine estuaries adjoin bottomland hardwood forests.



Range of Estaurine Bays Lakes and Tidal Streams

The quality of estuarine bays, lakes and tidal streams is dependent on the water quality of the region. In the past they were exposed to very high levels of industrial pollution. Water pollution is monitored more judiciously today, but water quality issues persist in this highly developed region. Stagnation during drought can cause fish kills. Higher pollution loads lead to increased possibility of algae blooms and anoxic conditions that lead to fish kills.

This subtype is considered **vulnerable** in the state due to its restricted range and potential declines due to pollution loads in these waters and increased urbanization in the surrounding area.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ESTUARINE BAYS, LAKES, AND TIDAL STREAMS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Haematopus palliatus*	American Oystercatcher	1
	Charadrius wilsonia	Wilson's Plover	1
		Migrant Shorebirds	1

	Eudocimus albus	White Ibis	2
	Anas fulvigula	Mottled Duck	2
	Haliaeetus leucocephalus	Bald Eagle	2
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Limosa fedoa	Marbled Godwit	2
	Calidris canutus	Red Knot	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Anas rubripes	American Black Duck	3
	Pelecanus erythrorhynchos	American White Pelican	3
	Calidris alpina	Dunlin	3
	Aythya affinis	Lesser Scaup	3
	Anas acuta	Northern Pintail	3
	Pandion haliaetus	Osprey	3
	Calidris mauri	Western Sandpiper	3
Fish	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon	1
	Alosa alabamae	Alabama Shad	1
	Fundulus jenkinsi	Saltmarsh Topminnow	2
	Fundulus dispar	Northern Starhead Topminnow	2
	Morone saxatilis	Striped Bass	2
	Atractosteus spatula	Alligator Gar	3
	Heterandria formosa	Least Killfish	3
	Enneacanthus gloriosus	Bluespotted Sunfish	3
	Leptolucania ommata	Pygmy Killfish	4
Mammals	*Trichechus manatus*	Manatee	2
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Pseudemys alabamensis	Alabama Redbelly Turtle	1
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin	2
	Nerodia clarkii clarkii	Gulf Salt Marsh Snake	2

THREATS TO ESTUARINE BAYS, LAKES, AND TIDAL STREAM COMMUNITIES

Over Exploitation/Incidental Capture: Terrapins, Etc.	high
Urban/Suburban Development	high
Channel Modification: Maintenance Dredging	high
Incompatible Water Quality	high
Miscellaneous Threats Described: Oil/Chemical Spills	high
Industrial Development: Bulkheading	medium
Invasive Species	medium
Miscellaneous Threats Described: Altered Hydrology	medium

Miscellaneous Threats Described: Bulkheading	medium
Miscellaneous Threats Described: Marine Litter and Overboard Discharge	medium
Recreation Activities	low
Road Construction/Management	low
Second Home/Vacation Home Development	low
Operation of Dams/Impoundments: Including Construction	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Limit bulk-heading along coastal drainages.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Continue to restrict/monitor scientific collection of SGCN.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

14.2 Mississippi Sound (Smooth Bottom)

- **Value to SGCN - 58**
- **Rank - 8th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

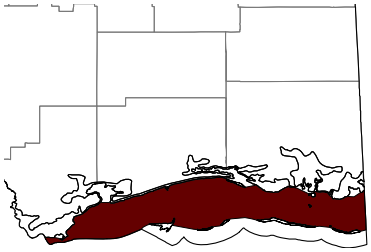
The Mississippi Sound is considered a lagoon of marine origin whereas embayments are likely drowned river valleys. The term "sound" is defined as a water body extending parallel to the coast that is separated from the open ocean by land. A chain of barrier islands serves as the outer boundary of the Mississippi Sound. Based on hydrological differences among sections of the Sound, it is considered to have three zones. The West Sound is fed by higher freshwater inflows. The Central Sound is an area of poor circulation, little freshwater inflow and experiences extensive tidal flushing. The East Sound is dominated by water inflow from the Mobile Bay and Petit Bois Pass. General westward current movement on both the northern and southern shores of the Sound is sufficient to induce appreciable sand movement along the shoreline. Salinity levels are within the polyhaline range and are typically lowest along the mainland where levels fluctuate more widely. Seven habitat types have been described for the Mississippi Sound. They are classified on the basis of differences in depth and texture of substrate. Each supports a discrete assemblage of benthic organisms that help to define the ecological communities. Nearshore communities are those with depths less than 6.5 feet; offshore communities have depths greater than 6.5 feet. The near- and off-shore zones are subclassified into three types: mud, sandy mud and sand bottom types. The seventh habitat type of the Sound is the tidal pass, which is discussed in subtype 14.4 (Barrier Island Passes). The Mississippi Sound supports important stocks of fish and invertebrates, providing foraging areas for many bird species including federally endangered brown pelicans, porpoises, marine turtles such as the Atlantic Ridley and loggerhead and occasionally manatees.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

The Mississippi Sound is a linear body of water about 12 miles wide that extends the length of the state into Alabama. It is comprised of a variety of subtidal habitats that are recognized by their differences in depth and substrate texture. The Sound is circumscribed by a variety of subtidal and intertidal estuarine

habitats, natural beaches and man-made beaches that form the boundary between the Sound and an extensive coastal metropolitan area. The part of Mississippi Sound in the state is nearly **400,000 acres** in size.



Range of Mississippi Sound (Smooth Bottom)

The condition of the habitats of the Mississippi Sound are largely dependent on the quality of the waters entering the Sound and the degree of impact caused by shippers, fishermen, and recreationists using the Sound. Pollutants, such as heavy metals and hydrocarbons, and high nutrient loads, which originate from agricultural lands and population centers, enter the Sound and reduce the quality of the habitat for wildlife species. With increased usage by recreational and commercial fishermen, there is a greater chance of overfishing of this habitat.

The Mississippi Sound is apparently secure as a wildlife habitat although there is some **cause for long-term concern** due to an increased nutrient and pollution load entering the Sound.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH THE MISSISSIPPI SOUND

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Rynchops niger*	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Aythya affinis	Lesser Scaup	3
		Pelagic Birds	1
Fish	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon	1
	Alosa alabamae	Alabama Shad	1
	Fundulus jenkinsi	Saltmarsh Topminnow	2
	Morone saxatilis	Striped Bass	2
	Atractosteus spatula	Alligator Gar	3
Mammals	*Trichechus manatus*	Manatee	2
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Caretta caretta	Loggerhead; Cabezon	2
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin	2
	Chelonia mydas	Green Turtle	3
	Dermochelys coriacea	Leatherback; Tinglar	3
	Eretmochelys imbricata	Hawksbill; Carey	4

THREATS TO MISSISSIPPI SOUND

Incompatible Water Quality	high
Over Exploitation/Incidental Capture	high
Incompatible Resource Extraction Practices: Mining Sand for Beaches	high
Miscellaneous Threats Described: Trawler Damage	high
Channel Modification: Maintenance Dredging	medium
Invasive Species	medium
Miscellaneous Threats Described: Altered Hydrology	medium
Miscellaneous Threats Described: Oil/Chemical Spills	medium
Miscellaneous Threats Described: Marine Litter and Overboard Discharge	medium
Industrial Development	medium
Recreation Activities	low
Urban/Suburban Development	low
Operation of Dams/Impoundments: West Pearl Diversion, Etc.	Low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

14.3 Estuarine Marshes

- **Value to SGCN - 107**
- **Rank - 1st of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

Intertidal salt, brackish and tidal freshwater marshes create a fringe along the coast and barrier islands and cover substantial lowland flats along mouths of streams and bays. Tidal marshes are situated on organic muck substrates that are often interlaced to varying degrees with mineral horizons that were likely deposited during storm surges. Some levees and reworked mineral sediments are situated along the mouths of larger coastal streams. Saltmarshes are characterized by their low position within the tidal zone and their increased exposure to higher water salinities. Salt pannes or flats represent a zone of sandy hypersaline soil within saltmarsh vegetation. They are discussed in subtype 14.5.

Saltmarsh vegetation can be classified into several zones of elevation. The lowest zone situated at sea level or slightly below is composed of frequently flooded smooth cordgrass marshes that form a narrow fringe of green shimmering spikes along exposed shorelines and outer sections of tidal creeks and bays. The plants are often partially submerged and are flooded on a daily basis. With a slight increase in elevation, frequently flooded marshes are superseded by irregularly flooded marshes. Irregularly flooded saline marshes are situated at intermediate levels, just above mean high water of the tidal zone. They are dominated by black needlerush, which forms a near monoculture of thick, tall, dark olive green, sharply-pointed leaves. The intermediate marsh covers broad estuarine flats.

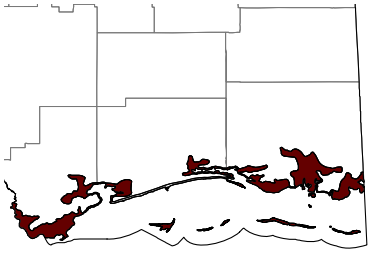
At supratidal levels, a zone of saltmeadow cordgrass is encountered. Brackish marshes differ somewhat from saltmarshes. They are situated in areas of moderate salinity and experience greater protection from storm surges. These moderating influences enable the establishment of a higher diversity of plants. In contrast to salt marshes, tidal creeks within the brackish marsh zone are usually fringed with wildrice and/or big cordgrass, especially along the bayous of riverine estuaries. Oligohaline marshes are

positioned near major sources of freshwater and are largely protected from major storm surges. Sawgrass is the dominant species, but a comparatively high diversity of plants is present. Tidal freshwater marshes contain the most diverse complement of emergent sedges, grasses and forbs of all tidal marsh types. However, they are minor in extent only occupying about 1,000 acres. Arrowhead, switchgrass, beaksedge and spikerush are commonly encountered. Estuarine shrublands, including rare shell midden habitats (discussed in 13.6), occur along intertidal marsh fringes and on small islands within the marsh. The estuarine shrublands occupy a zone just above the salt meadows, where the transition from one to the other may be abrupt or gradual, blending into the salt meadows as they form the final zone of tidal vegetation. Just inland from the normal tidally influenced areas are non-tidal habitats including maritime pine flatwoods, non-tidal swamps and freshwater marshes.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Estuarine marshes are found in four large patches (greater than 10,000 acres) at the edge of the Mississippi Sound on active or historic riverine deltas. They are also found in narrow fringes along bays and isolated bayous. Many of the adjacent habitats are highly urbanized residential or commercial areas (including an oil refinery). Adjacent habitats that are undeveloped consist of estuarine shrubland or maritime forest/savanna.



Range of Estuarine Marshes

Estuarine marshes except those peripheral to urban areas are generally in good condition. Erosion is occurring along some exposed shorelines. Some of the natural ecological processes, such as wildfire, are likely reduced during modern times.

Estuarine marshes are generally considered **imperiled** in the state because of rarity due to a very restricted range. Several of the communities making up this subtype are considered **vulnerable** because of the rapid urbanization occurring around them. Fortunately, many areas that support these habitats are found in state sanctioned coastal preserves that provide perpetual protection.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ESTUARINE MARSHES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Laterallus jamaicensis*	Black Rail	1
	Charadrius wilsonia	Wilson's Plover	1
	Haematopus palliatus	American Oystercatcher	1
	Coturnicops noveboracensis	Yellow Rail	1
		Migrant Shorebirds	1
	Rallus elegans	King Rail	2
	Asio flammeus	Short-Eared Owl	2

	Ammodramus maritimus	Seaside Sparrow	2
	Ammodramus nelsoni	Nelson's Sharp-Tailed Sparrow	2
	Haliaeetus leucocephalus	Bald Eagle	2
	Rynchops niger	Black Skimmer	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna nilotica	Gull-Billed Tern	2
	Sterna antillarum	Least Tern	2
	Egretta caerulea	Little Blue Heron	2
	Limosa fedoa	Marbled Godwit	2
	Anas fulvigula	Mottled Duck	2
	Calidris canutus	Red Knot	2
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Eudocimus albus	White Ibis	2
	Botaurus lentiginosus	American Bittern	3
	Anas rubripes	American Black Duck	3
	Pelecanus erythrorhynchos	American White Pelican	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Calidris alpina	Dunlin	3
	Ixobrychus exilis	Least Bittern	3
	Anas acuta	Northern Pintail	3
	Pandion haliaetus	Osprey	3
	Porphyrula martinica	Purple Gallinule	3
	Egretta thula	Snowy Egret	3
	Egretta tricolor	Tricolored Heron	3
	Calidris mauri	Western Sandpiper	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
Fish	*Fundulus jenkinsi*	Saltmarsh Topminnow	2
Reptiles	*Pseudemys alabamensis*	Alabama Redbelly Turtle	1
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin	2
	Nerodia clarkii clarkii	Gulf Salt Marsh Snake	2

THREATS TO ESTUARINE MARSHES

Miscellaneous Threats Described: Altered Hydrology	high
Channel Modification	high
Over Exploitation/Incidental Capture: Terrapins	high
Incompatible Water Quality	high
Invasive Species	high
Miscellaneous Threats Described: Marine Litter	high
Second Home/Vacation Home Development	medium
Urban/Suburban Development	medium
Road Construction/Management	low

Groundwater and Surface Water Withdrawal: Ground and Surface Water Withdrawal	low
Operation of Dams/Impoundments: Including Construction	low
Recreation Activities: Bank Erosion From Wake	low
Industrial Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Limit bulk-heading along coastal drainages.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Control exotic and invasive species (plant and animal).

A Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

14.4 Barrier Island Passes

- **Value to SGCN - 36**
- **Rank - 11th of 17 Marine, Estuarine and Estuarine Fringe Systems**

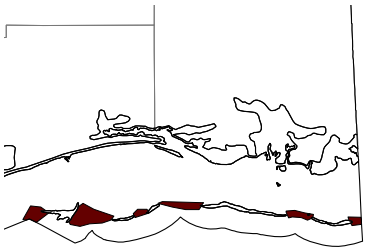
DESCRIPTION

An additional Mississippi Sound type is the tidal pass, a habitat type defined for areas between the barrier islands where there is an enhanced tidal current. The surge through the tidal passes creates strong currents that inhibit the accumulation of finer sediments. The bottom substrates of tidal passes are regarded as clean sandy bottoms. The tidal passes serve as major conduits for the exchange of water and faunal recruitment between estuarine and marine waters. Benthic communities within these areas are sufficiently different to warrant separation from the other communities of the Mississippi Sound.

LOCATION, SIZE, CONDITION AND CONSERVATION PRIORITY

NGM

The barrier island passes subtype is confined to the natural tidal flow channels found between the barrier islands. Tidal currents, which are much stronger in the pass areas, create sandy bottom habitats because muddy sediments are unable to settle from the water column. There are an estimated **500 acres** of this subtype in the state.



Range of Barrier Island Passes

Some of the passes have been dredged to allow large ship travel.
The dredging may have disrupted the westward drift of sand movement along the southern shores of the islands. Other factors that may have degraded this habitat are considered to have a minor impact on this subtype.

Barrier island passes are considered **secure** in the state because few impacts are known at this time.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND PASSES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Pelagic Birds	1
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Pelecanus occidentalis	Brown Pelican	2
	Sterna antillarum	Least Tern	2

	Sterna nilotica	Gull-Billed Tern	2
	Pandion haliaetus	Osprey	3
Fish	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon	1
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Caretta caretta	Loggerhead; Cabezon	2
	Dermochelys coriacea	Leatherback; Tinglar	3
	Chelonia mydas	Green Turtle	3

THREATS TO BARRIER ISLAND PASSES

Channel Modification	high
Over Exploitation/Incidental Capture	high
Incompatible Resource Extraction Practices	low
Industrial Development	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Encourage proper disposal and cleanup of waste and litter.

A Miscellaneous conservation actions as described: Ensure adequate mitigation.

14.5 Salt Pannes

- **Value to SGCN - 47**
- **Rank - 10th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

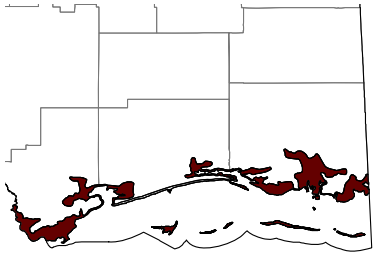
At various intervals along the transition from the intermediate to high marsh zones salt pannes are present, especially within the Grand Bay National

Estuarine Research Reserve and on the east end of Deer Island. The pannes are infrequently flooded and are exposed for long periods. Some pannes are situated on sloping ground but receive sublateral flow from high marsh zones, evidently a source of additional salts. During periods of exposure moisture is evaporated and soluble salts build up to lethal levels for most plants in the upper soil horizons. The community usually supports a few short halophytic plants including saltwort, glasswort, turtleweed, seepweed, and saltgrass. Where salinity is extremely high the pannes become barren.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Approximately **400 acres** of salt pannes exist within the coastal estuary in Mississippi. Small patches of a few acres to several dozen acres are mainly found in the Grand Bay National Estuarine Research Reserve and along the eastern end of Deer Island. The patches are surrounded by estuarine marsh habitat.



Range of Salt Pannes

Salt pannes are sparsely vegetated zones that appear to be in good condition, but their historical character is unknown and therefore it is not possible to make a comparison of their original condition. They may be less well vegetated than in the past, and succulent species may be less common today than in the past. General subsidence of the Grand Bay marshes will eventually change the hydrology of these areas likely allowing additional flushing of salts. This would enable taller marsh herbs to invade the salt pannes.

Salt pannes are **critically imperiled** in the state because of extreme rarity. Other factors that may contribute to further declines in this community are not well understood.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SALT PANNES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Laterallus jamaicensis*	Black Rail	1
	Charadrius wilsonia	Wilson's Plover	1
	Sterna nilotica	Gull-Billed Tern	2
	Ammodramus maritimus	Seaside Sparrow	2
	Ammodramus nelsoni	Nelson's Sharp-Tailed Sparrow	2
	Egretta caerulea	Little Blue Heron	2
	Eudocimus albus	White Ibis	2
	Sterna antillarum	Least Tern	2
	Sterna maxima	Royal Tern	2
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
	Egretta thula	Snowy Egret	3

	Egretta tricolor	Tricolored Heron	3
	Nycticorax nycticorax	Black-Crowned Night-Heron	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	3
Reptiles	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake	2
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin	2

THREATS TO SALT PANNES

Incompatible Water Quality	high
Miscellaneous Threats Described: Altered Hydrology	high
Recreation Activities: ATV'S	medium
Air-borne Pollutants	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

14.6 Seagrass Beds

- **Value to SGCN - 25**
- **Rank - 13th of 17 Marine, Estuarine and Estuarine Fringe**

DESCRIPTION

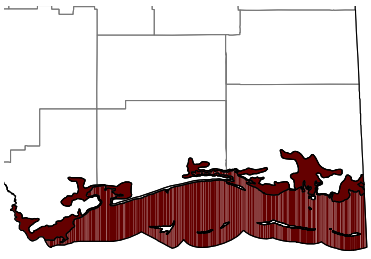
Mississippi coastal waters contain three submergent bed types: barrier island seagrass, widgeon grass and American wildcelery beds. The types can be distinguished by differences in species composition, habitat requirements and location within the estuary. Barrier island seagrass beds originally contained three species of seagrasses: shoal, turtle and manatee grasses. Several of these have become very rare or have disappeared altogether. The beds occur in less turbid, moderately saline habitats of the nearshore zone north of the barrier islands. Widgeon grass or *Ruppia* beds occur in shallow and moderately turbid waters that are lower in salinity. The beds are found in bays, along bayous, on mudflats and occasionally in barrier island ponds. Their abundance in Mississippi waters has fluctuated dramatically over time due to damage caused by hurricanes, which eliminated them from many areas. Recently widgeon grass has returned to many of the areas in which it once existed. American wildcelery or tapegrass prefers freshwater or oligohaline waters and can be found growing on muddy substrates in the upper reaches of many estuarine bayous and streams flowing into coastal bays and the Mississippi Sound. The lower limits of wildcelery are near the mouths of coastal streams. American wildcelery forms beds of submerged strap- or ribbon-like leaves from several inches to several feet in length. Wildcelery is occasionally found growing with widgeon grass. Seagrass beds provide habitat for numerous aquatic species. Productivity of the beds can be continued by maintaining or improving local water quality and by reducing the mechanical damage to the beds.

Although not technically a seagrass bed, the macroscopic algae bed community is mentioned here to recognize that it once occurred in Mississippi waters. They still exist in waters off the southern Florida coast. Macroscopic algae beds were observed near Cat Island but have not been recorded in recent years. Algae beds are predominantly composed of macrophytic red algae that are attached to benthic shell material. They grow to a height of about two feet.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Seagrass beds are found in a variety of shallow subtidal habitats in bays, bayous and rivers along the coastal mainland and in the Mississippi Sound. Seagrasses require fairly clear water for sunlight to penetrate to a depth where the plants are attached and growing. It is estimated that approximately **2,000 acres** of this subtype are found in the state.



Range of Seagrass Beds

Only a fraction of the original barrier island seagrass beds exist today. Seagrass beds were quite luxuriant prior to going into serious decline due to damages caused by Hurricane Camille. Since then they have been increasing somewhat in abundance along the coastal mainland in areas of lower salinity levels. Those that occur just north of the barrier islands remain sparsely populated and only a remnant of their original extent. Hurricane damage, a decline in water quality and destruction of the beds by channel maintenance, dredging, commercial and recreation boat traffic are factors which have contributed to the extensive losses of this community. Seagrass beds of widgeon grass and tape grass found along the coastal mainlands and in tidal creeks and rivers seem to be recovering from earlier declines.

Seagrass Beds are **imperiled** in the state because of rarity due to very restricted range and steep declines due to several factors mentioned above.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SEAGRASS BEDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Pelecanus occidentalis*	Brown Pelican	2
	Anas acuta	Northern Pintail	3
	Anas rubripes	American Black Duck	3
	Aythya affinis	Lesser Scaup	3
Fish	*Atractosteus spatula*	Alligator Gar	3
Mammals	*Trichechus manatus*	Manatee	2
Reptiles	*Pseudemys alabamensis*	Alabama Redbelly Turtle	1
	Lepidochelys kempii	Kemp's or Atlantic Ridley	1
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin	2

THREATS TO SEAGRASS BEDS

Incompatible Water Quality	high
Recreation Activities: Prop Scarring	high
Channel Modification	high
Over Exploitation/Incidental Capture	high
Miscellaneous Threats Described: Salinity Regime	high
Miscellaneous Threats Described: Trawler Damage	high
Industrial Development: Indirect Effects	medium
Second Home/Vacation Home Development: Indirect Impacts	medium
Urban/Suburban Development: Indirect Impacts	medium
Operation of Dams/Impoundments: Including Construction	low
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Miscellaneous conservation actions as described: Map potential habitats

14.7 Mollusk Reefs

- **Value to SGCN - 17**
- **Rank - 14th of 17 Marine, Estuarine and Estuarine Fringe Systems**

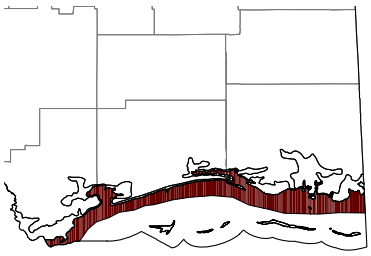
DESCRIPTION

Mollusk or oyster reefs are beds of oysters that range in thickness from the width of a single oyster to a width of six or more feet. Most of the sediments associated with oyster reefs consist of sandy mud or gravelly muddy sand. Oysters require a hard substrate for attachment, i.e., other shell material, wood or rock. Once attachment is secure, the oysters can perpetuate themselves by building on the shells of other

animals. Weather events, water depth, temperature, salinity, turbidity, nutrient availability, accumulation of heavy metals and substrate type are factors affecting oyster growth. They generally prefer moderate levels of nutrients, temperature, etc., for proper growth. Large fluctuations in salinity can lead to die-off. Oyster reefs create habitat and shelter that is beneficial to hundreds of other species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM



Range of Mollusk Reefs

Mollusk reefs are found in small and large patches on the Mississippi Sound bottom and in the bays along the coast of the mainland. Some of them have been created by seeding of additional shell. Oysters prefer moderately saline waters and are exposed to additional predators when salinity rises significantly. Oyster reef acreage is estimated to be approximately **10,000 to 12,000 acres** and has increased slightly over the past two decades. According to the Mississippi Department of Marine Resources, about 7,400 acres are located in the western Mississippi Sound, and the remainder are uncharted or hidden reefs. The MDMR has planted over 1,000 acres of oysters from 1997 - 2005. Productive oyster reefs are dependent on water quality.

Pollution that enters the Sound is detrimental to the viability of the oyster reefs. With the increases in population in the coastal urban areas, there is an increased potential for an increased level of pollutants and nutrients in the water. Oyster harvesters are major advocates for improving water quality of the Sound.

Mollusk reefs are **vulnerable** in the state due to the increased potential for pollutants in coastal waters.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MOLLUSK REEFS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Haematopus palliatus*	American Oystercatcher	1
	Calidris canutus	Red Knot	2
	Eudocimus albus	White Ibis	2
	Calidris alpina	Dunlin	3
	Calidris mauri	Western Sandpiper	3
Reptiles	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin	2

THREATS TO MOLLUSK REEF COMMUNITIES

Incompatible Water Quality	high
Channel Modification	high

Over Exploitation/Incidental Capture	high
Industrial Development	high
Invasive Species	high
Operation of Dams/Impoundments: Including Construction	medium

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage buffers and improve land use practices adjacent to streams (SMZs) and other aquatic/ wetland habitats.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

15. MARINE HABITATS (OUTSIDE BARRIER ISLANDS)

Marine habitats of the Mississippi Gulf Coast occur in the region beyond the barrier islands within the western third of the Mississippi-Alabama continental shelf. Nearshore and offshore regions of the shelf are roughly two million acres in size. The shelf extends southward along a gradual sloping plain of unconsolidated sand, muddy sand and mud substrates for a distance of approximately 100 miles. It gradually deepens from the shallows off the barrier islands to a depth of 600 feet along the outer continental shelf. Over the ages, the continental shelf has been the recipient of many thousands of feet of sediment deposition from past and present major river systems. The Mississippi River historically emptied into Mississippi waters. The Chandeleur Islands are the remnants of its ancient delta. Salinity levels of the water column exceed 30 parts per thousand and turbidity is higher than in Floridian waters. Most of the time, oxygen levels of the water are sufficient. On occasion a massive current system streaming from tropical regions east of the South American continent, called the Loop Current, penetrates the region and brings oceanic fauna that can include invasive species. During abnormal current shifts, nutrient-enriched water from the Mississippi River may drift into the region and cause hypoxic conditions. Along with estuarine areas, these northern Gulf waters are known as the "Fertile Fisheries Crescent", an area of remarkably productive fisheries.

For the purposes of the CWCS, discussion of marine habitats is generally limited to those located within the three mile territorial boundaries of Mississippi.

This type includes three subtypes: 15.1 Marine Habitats (Smooth Bottoms), 15.2 Hard Bottoms and Oceanic Reefs and 15.3 Artificial Reefs.

GENERAL CONDITION

A renewed effort in conservation of the rich commercial fishery and shellfish resources of the "Fertile Fisheries Crescent" and a potential for additional exploitation of the mineral resources of the northeastern Gulf of Mexico has led to several large ecological research studies on the Mississippi -

Alabama Continental Shelf. The studies defined environmental character, affects of the Loop current, complex species-environment relationships, species distribution and major fish and shrimp assemblages. Total fishes of northern Gulf of Mexico excluding the southern Florida reef habitats number around 1,200 species; almost 400 species are found within the Mississippi - Alabama Continental Shelf. The reef areas attract a large number and variety of fishes.

Unfortunately, marine areas are losing some of their productivity because of the loss of tidal marsh habitats and overfishing. The small area of reef habitat and the long time required for many commercial reef fish to reach maturity makes overfishing a problem. The soft bottom areas are also vulnerable to overfishing. In addition, oil spills and other pollutants that persist in the open seas decrease the quality of marine habitats.

During the 1970s and 1980s scientists at Dauphin Island Sea Lab found small, isolated patches of lag deposits composed of shell and rock gravel that that occasionally included pebble to cobble sized sandstone and siderite clasts. These hard bottoms within territorial waters of Mississippi as well as those in Alabama were continually in burial-exhuming cycles, exposed and covered up and were particularly influenced by tropical and winter storm events. There is no significant hard bottom in Mississippi territorial waters.

15.1 Marine Habitats (Smooth Bottoms)

- **Value to SGCN - 28**
- **Rank - 12th of 17 Marine, Estuarine and Estuarine Fringe Systems**

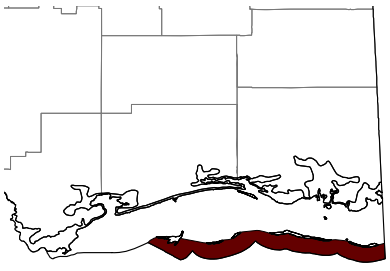
DESCRIPTION

A large diversity of species inhabit the marine waters and reside in or on the bottom substrates. Over 370 species of fish and an abundance of mollusks, polychaetes, crustaceans and echinoderms, among others, can be found. The prodelta fan of soft sedimentary mud extends eastward from the Birdsfoot Delta of the Mississippi River. It is a zone of sedimentation that has smothered the development of reefs in the western part of the region. Benthic creatures such as urchins are found in abundance on the fan.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

For the purposes of the CWCS, marine habitats only extend to the state jurisdictional limit of three miles beyond the outer shores of the barrier island chain. This stretch of marine habitat forms the upper shore face where sediments are larger grained and well sorted. In deeper water below the breaker zone, the sediments are



Range of Maritime Habitats (Smooth Bottoms)

mixed and contain more silt and clay. There are about **100,000 acres** of this subtype in state jurisdictional waters.

Contentions affecting the quality of this habitat are water pollution and dredging. Oil and gas exploration and shipping increase the chances of oil spills in the vicinity of the barrier island shores.

Marine habitats are apparently **secure** but there is some cause for long-term concern due to the increased potential for oil spills.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MARINE HABITATS (SMOOTH BOTTOMS)

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Pelagic Birds	1
	Sterna maxima	Royal Tern	2
	Sterna sandvicensis	Sandwich Tern	2
	Sterna antillarum	Least Tern	2
	Sterna nilotica	Gull-Billed Tern	2
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Caretta caretta	Loggerhead; Cabezon	2
	Dermochelys coriacea	Leatherback; Tinglar	3
	Chelonia mydas	Green Turtle	3
	Eretmochelys imbricata	Hawksbill; Carey	4

THREATS TO MARINE HABITATS (SMOOTH BOTTOMS)

Over Exploitation/Incidental Capture	high
Invasive Species: Jellyfish	medium
Miscellaneous Threats Described: Oil/Chemical Spills	medium
Miscellaneous Threats Described: Marine Litter and Overboard Discharge	medium
Industrial Development: Exploratory Drilling, Pipelines, LNG	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Improve environmental review and permit process and oversight and enforcement of existing

regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Encourage proper disposal and cleanup of waste and litter.

A Miscellaneous conservation actions as described: Contingency plan for oil/chemical spills

15.2 Hard Bottoms and Oceanic Reefs

- **Value to SGCN - 12**
- **Rank - 15th of 17 Marine, Estuarine and Estuarine Fringe Systems**

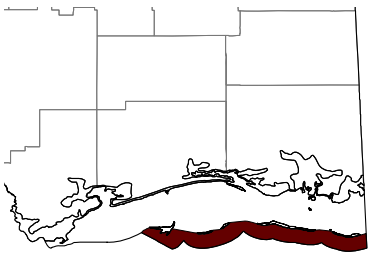
DESCRIPTION

A very small portion of the bottom of marine habitats within Mississippi's jurisdictional waters is composed of rock outcrops and consolidated features. These sections of the shelf are called reef and inter-reef bottoms. The linear segments represent ancient shoreline ridges of cemented sand, shell and gravel. Although the hard bottom habitats lie mostly east of the Mississippi coast, i.e. south of Mobile Bay and around Desoto Canyon, some calcareous outcrops occur south of Biloxi in 60 feet of water and along most of the continental shelf edge within the 150 to 300 foot depth. The linear reef and inter-reef sections along the shelf edge are part of a system of reefs that ring the Gulf of Mexico. The reefs contain topographic features of irregular small depressions and mounts reaching to 30 feet in height. They serve as important spawning areas for many fish species and support commercial and recreational fisheries. The reefs contain an intriguing list of aquatic animals including many types of corals, sponges, crinoids, bryozoans, alcyonarians and oysters.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Few hard bottom and oceanic reefs are known to occur in state jurisdictional waters. Only small, isolated patches of lag deposits composed of shell and rock gravel are found off the barrier islands. Most hard bottoms are primarily found in deeper waters on the mid- and outer continental shelf.



Range of Hard Bottoms and Oceanic Reefs

The high popularity of oceanic deep sea fishing has increased the potential for overfishing of hard bottom and oceanic reef areas. Oil exploration in the vicinity increases the potential of exposure of these areas to pollution and disturbances and physical damage to bottom dwelling species, including delicate coral formations.

Hard bottoms and oceanic reefs are considered **vulnerable** in the state due to increased potential for over-fishing, physical damage to delicate bottom dwelling species and exposure to pollution.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH HARD BOTTOMS AND OCEANIC REEFS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Pelagic Birds	1
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Caretta caretta	Loggerhead; Cabezon	2
	Eretmochelys imbricata	Hawksbill; Carey	4

THREATS TO HARD BOTTOMS AND OCEANIC REEFS

Over Exploitation/Incidental Capture	high
Miscellaneous Threats Described: Oil/Chemical Spills	medium
Miscellaneous Threats Described: Marine Litter and Overboard Discharge	medium
Industrial Development: Pipelines, LNG	low
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Encourage proper disposal and cleanup of waste and litter.

A Miscellaneous conservation actions as described: Contingency plan for oil/chemical spills

15.3 Artificial Reefs

- **Value to SGCN - 12**
- **Rank - 15th of 17 Marine, Estuarine and Estuarine Fringe Systems**

DESCRIPTION

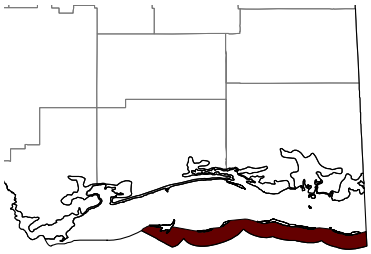
Artificial reefs are structures, usually with hard surfaces, that are intentionally placed in the water to provide conditions attractive to fish and invertebrates. In marine waters off the coast of Mississippi, several artificial reefs (also called "fish havens") have been created to enhance sportfishing. These "fish havens" were constructed out of several types of materials: sunken liberty ships and military equipment and concrete rubble. Studies for the siting of additional artificial reefs in the northern Gulf of Mexico have been completed.

One of the liberty ships, called the Waterhouse Reef, was sunk in 1975 about eight kilometers south of the western end of Horn Island, in 14 meters of water. Around 31 primary (obligative) reef fish moved into the newly created reef habitat. With the addition of 29 facultative species that colonized the area, a total of 60 species occupied the reef after two years.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM

Artificial reefs have been established on the lower shore face south of the barrier islands and cover less than **100 acres**. Their positioning and establishment requires approval by federal and state agencies, including the Mississippi Department of Marine Resources.



Range of Artificial Reefs

Artificial reefs consist of essentially inert discarded materials. There are no concerns for the condition of these habitats.

Artificial reefs are not vulnerable to further decline and are considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL REEFS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds		Pelagic Birds	1
Reptiles	*Lepidochelys kempii*	Kemp's or Atlantic Ridley	1
	Caretta caretta	Loggerhead; Cabezon	2
	Eretmochelys imbricata	Hawksbill; Carey	4

THREATS TO SPECIES OF GREATEST CONSERVATION NEED USING ARTIFICIAL REEFS

Over Exploitation/Incidental Capture	high
Miscellaneous Threats Described: Oil/Chemical Spills	medium
Miscellaneous Threats Described: Marine Litter and Overboard Discharge	medium
Incompatible Water Quality	low
Invasive Species	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Control exotic and invasive species (plant and animal).

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

A Encourage proper disposal and cleanup of waste and litter.

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16. URBAN AND SUBURBAN LANDS

Urban and suburban land is comprised of areas of intensive usage with much of the land covered by structures and pavement. Included in this category are cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and areas such as those occupied by shopping centers, industrial and commercial complexes and institutions that may, in some instances, be isolated from urban areas. Land use categories included within this type are single and multiple family residential zones, public and institutional space, office parks and retail areas, transportation, utility and communication infrastructure and recreational and conservation areas. In one study it was estimated that 36,000 acres of urban land (within city limits) in Mississippi consists of hardwood or pine overstory. According to land use/land cover estimates, there are between 0.4 and 0.7 million acres of urban land in Mississippi (1 to 2 percent of the total).

This type includes two subtypes: 16.1 Urban and Suburban Lands and 16.2 Buildings, Bridges, Overpasses, etc.

GENERAL CONDITION

Urban lands contain a concentration of economic activities that have various deleterious effects on the environment, such as water and air pollution, solid waste disposal, increased runoff and loss of infiltration, due to large areas covered by buildings and pavement. The vegetation of urban areas is severely fragmented and composed of many weedy species. These economic centers affect surrounding rural areas when residential areas sprawl beyond the city boundaries. There is also an increase in the demand for resources from the surrounding areas. Developments that are concentrated within the urban centers are often detrimental to native wildlife species; some being critically affected by high levels of pollution or the changes that occurred in water quality of the local rivers and creeks. Some species, such as the mocking bird, prefer open, fragmented habitats. However, most of the rare species tend to avoid urban areas, if possible, or are extirpated from developed areas due to a deterioration of their habitat.

16.1 Urban and Suburban Lands

- **Value to SGCN - 11**
- **Rank - 27th of 29 of Inland Terrestrial Complexes**

(Terrestrial, Wetland, Subterranean and Anthropogenic)

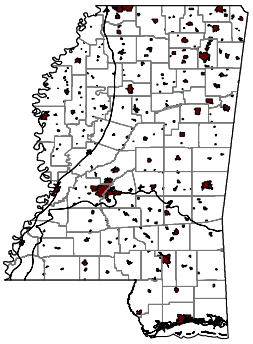
DESCRIPTION

A growing portion of the total land mass of Mississippi, nearly two percent of the state, is regarded as urban or suburban land. Urban and suburban lands contain numerous residential, commercial and industrial buildings, extensive paved areas and are heavily impacted by construction activities. With the increased concentration of people in urban and suburban areas, there is an increase in: reliance on purchased goods, appliances, and synthetic packaging; volume of waste products to dispose; in air and water pollution from industrial as well as residential sources, such as pesticides and fertilizers used on gardens and lawns. With the higher percentage of paved surfaces, there is also an increased amount of runoff and flash flooding, causing a degradation of water quality of streams below these areas. Vacant lots, landscaped yards, vegetable gardens and fruit orchards, and wooded areas along drainages provide some habitats beneficial to wildlife. There are numerous native and migratory animals that spend part or all of their lives inside the city limits. An animal's response to urbanization depends on its natural habits. Habitat generalists, such as mockingbirds, house wrens, mourning doves and grackles may actually increase in urban environments. These birds tend to be edge species, short-distance migrants which are seed-eating or omnivorous by nature. These habitat generalists and others, including such mammals as opossums, raccoons and squirrels, are able to find food and shelter in a variety of ways and can survive quite well in simplified urban habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM, EGCP, UEGCP, MSRAP

Urban and suburban lands encompass one to two percent of the land area of Mississippi, nearly **400,000 acres** of land. Urban lands are defined by the high percentage of impervious surfaces — pavement, buildings, and parking lots — that are developed there. The urban centers have populations that range in sizes from a few thousand to nearly a million people in the coastal metropolitan band of cities, extending from Ocean Springs in the east to Waveland at the western border. The urban lands are surrounded by less developed areas usually consisting hardwood and pine forests and cutover areas, agriculture fields and wetlands along the creeks and rivers.



Range of Urban and Suburban Lands

SGCN species are rarely found in urban and suburban areas partially due to the loss of habitat for these species and the increased pollution levels that occurs in these areas. However, some species of wildlife,

especially birds have thrived in urban settings and may be more common than in presettlement times. Urban lands may contain parks and possibly functional riverine bottomlands that provide corridors and stopping points for migratory birds.

Urban and suburban lands are **secure** because this habitat is common, widespread and abundant in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH URBAN AND SUBURBAN LANDS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Bufo nebulifer*	Gulf Coast Toad	3
Birds	*Thryomanes bewickii*	Bewick's Wren	1
	Columbina passerina	Common Ground-Dove	2
	Tyto alba	Common Barn-Owl	3

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Limit bulk-heading along coastal drainages.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Initiate propagation program or establish nest box program for selected SGCN.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Develop/improve urban/suburban/infrastructure land use development planning/zoning to address SGCN habitats.

A Reduce wetland filling and ensure/encourage local, comparable mitigation for wetland loss and maintain updated flood zone maps.

A Provide public education about conservation of SGCN and/or their habitats.

A Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.

16.2 Buildings, Bridges, Overpasses, Etc..

- **Value to SGCN - 13**
- **Rank - 25th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

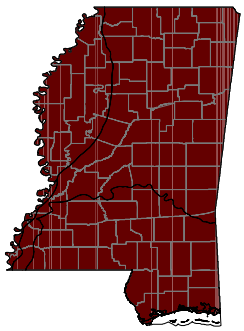
DESCRIPTION

Structures such as buildings, bridges and overpasses can provide habitat for several bird and bat species. The structures serve as nesting or roosting sites. Buildings provide safe havens from predators and protection from harsh environmental conditions such as cold, wind and rain. However, these structures are highly susceptible to disturbance such as decay of abandoned buildings and human disturbances from traffic and rebuilding efforts. As a result, bridges and buildings often do not provide a permanent roosting site for many bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

NGM, EGCP, UEGCP, MSRAP

Buildings are mostly concentrated in urban centers. Some are found in isolated areas such as bridges along major road systems. There are thousands of buildings in the state. Acreage of this type is combined in that of urban and suburban lands subtype.



Range of Buildings, Bridges, Overpasses

Buildings are made of impervious materials and cause increased amount of runoff. There are no significant threats or problems concerning the condition of this habitat. Development of this subtype usually results in the loss of other more valuable wildlife habitat.

Buildings are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BUILDINGS, BRIDGES, OVERPASSES, ETC.

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Birds	*Thryomanes bewickii*	Bewick's Wren	1
	Tyto alba	Common Barn-Owl	3

Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2

THREATS TO SPECIES USING BUILDINGS, BRIDGES AND OVERPASSES

Over Exploitation/Incidental Capture	high
Road Construction/Management	high
Miscellaneous Threats Described: Incompatible Bridge Design	high
Miscellaneous Threats Described: Timing of Bridge Maintenance	high
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Discourage incompatible recreational uses.

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17. ROCK OUTCROPS AND CAVES

Rock outcrops and caves are localized features of the landscape, which do not fit within other habitat categories, but need to be included in the classification to insure representation. These unique landscape features provide habitat for certain animals.

This type includes two subtypes: 17.1 Rock Outcrops and 17.2 Caves.

GENERAL CONDITION

There is currently no conservation protection for rock outcrops or caves in Mississippi. Many of these are on private lands and funding for protection (i.e.- gating of caves, security from public intrusion) is limited. As a result, human disturbances such as noise, vandalism, and fires in caves are common place and detrimental to the species residing there. Natural disturbances, such as cave-ins are also damaging to species reliant on this habitat type. Knowledge regarding the condition of caves and rock outcrops is hindered due to a lack of monitoring and communication with private land holders.

17.1 Rock Outcrops

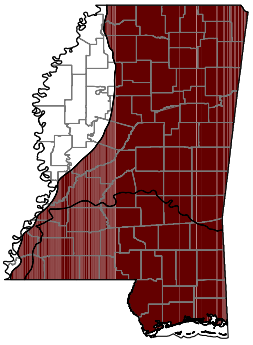
- **Value to SGCN - 12**
- **Rank - 26th of 29 of Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

DESCRIPTION

The soil mantle of the gulf coastal plain is derived largely from sedimentary strata deposition when the state was submerged under a great sea. Most of the landscape supports deep soils that developed from these sedimentary materials. Few sandstone and limestone rock layers exist near the ground surface and only rarely do they outcrop. They mainly occur along steep hill slopes, ravines or river channels where soils have eroded away. Some of the regions containing rock outcrops include the Tennessee River hills, Jackson prairie and loess bluffs. Although of minor extent, the rock outcrops provide quality habitat for several species of animals. Chalk outcrops are commonly found in the blackbelt prairie, but they are not known to have any special significance as habitat for animals.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP



Range of Rock Outcrops

Substrates of the coastal plain in Mississippi consists almost entirely unconsolidated sediments. A few geologic formations in the state yield rock formations. These formations usually outcrop within steep terrain or along major river valleys and occur in most upland regions of the state. There are approximately **500 acres** of this subtype in Mississippi.

Rock outcrops are sometimes impacted when hill tops are mined for rock and gravel. Removal of trees in and around rock outcrops will reduce the quality of this habitat for some amphibians and reptiles.

Rock outcrops are **imperiled** in the state because of rarity, due to very few known fields. Rock outcrops are vulnerable to further decline because they are desirable for mining and building sites.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ROCK OUTCROPS

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Aneides aeneus*	Green Salamander	2
	Plethodon ventralis	Southern Zigzag Salamander	2
	Plethodon websteri	Webster's Salamander	2
Mammals	*Spilogale putorius*	Eastern Spotted Skunk	2

THREATS TO ROCK OUTCROP COMMUNITIES

Incompatible Resource Extraction Practices: Historic	high
Road Construction/Management	high
Recreation Activities	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

17.2 Caves

- **Value to SGCN - 23**
- **Rank - 24th of 29 Inland Terrestrial Complexes**
  (Terrestrial, Wetland, Subterranean and Anthropogenic)

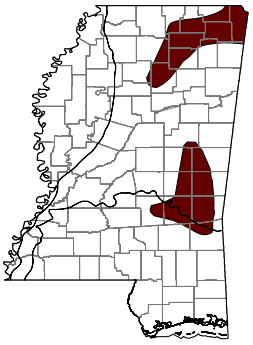
DESCRIPTION

Mississippi has several dozen solution caves, which were created either when the area was submerged under the sea or by water flowing along cracks through the sedimentary strata. In such situations, the limestone goes into solution upon contact with acidic water. Approximately 65 caves can be found in Mississippi the majority of which are found along the Vicksburg Group-Forest Hill Formation. This physiographic feature is a belt of lime-bearing, Oligocene strata that roughly bisects the state east to west and includes portions of Wayne, Clark, Jones, Jasper, Smith and Rankin Counties. Caves can provide habitat for several species of bats and amphibians. However, human disturbances such as vandalism and fires in caves have made many of these unsuitable roosts for bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

EGCP, UEGCP

Caves are found very rarely in some sandstone and limestone formations, including the Forest Hills Formation and the Tennessee River Hills. The caves are usually associated to upland hardwood forests. There are only a few acres of this subterranean subtype (**less than 100 acres**).



Range of Caves

For caves to function as suitable habitats for wildlife species, provisions to prevent human disturbances such as noise, vandalism and camp fires are warranted. Additional monitoring of caves would help assess the quality of this habitat and its popularity to bat species.

Caves are **imperiled** in the state because of rarity due to very restricted numbers and due to a deterioration of cave habitats caused by human disturbances.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH CAVES

GROUP	SCIENTIFIC NAME	COMMON NAME	TIER
Amphibians	*Eurycea lucifuga*	Cave Salamander	2
	Gyrinophilus porphyriticus	Spring Salamander	2
Mammals	*Myotis austroriparius*	Southeastern Myotis	1
	Myotis lucifugus	Little Brown Myotis	2
	Myotis grisescens	Gray Myotis	2
	Myotis septentrionalis	Northern Myotis	2
	Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	2
	Myotis sodalis	Indiana Or Social Myotis	4

THREATS TO CAVE COMMUNITIES

Recreation Activities	high
Over Exploitation/Incidental Capture: Scientific Collection	medium
Incompatible Water Quality	low
Incompatible Resource Extraction Practices	low
Miscellaneous Threats Described: Altered Air Flow, Trash, Waste	low
Groundwater and Surface Water Withdrawal	low
Forestry Conversion	low
Agricultural Conversion	low

PRIORITY CONSERVATION ACTIONS

A Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.

A Discourage/limit human access in highly critical areas and special habitats, when possible.

A Develop/implement/continue recovery plans for individual SGCN.

A Encourage restoration and improved management of altered/degraded habitat when possible.

A Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion and water quality issues.

A Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.

A Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.

A Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.

A Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.

A Limit/discourage surface and ground water withdrawals that are not sustainable and significantly alter flow, depth or salt intrusion.

A Provide public education about conservation of SGCN and/or their habitats.

A Discourage incompatible recreational uses.

A Improve enforcement of existing species protection regulations.

A Continue to restrict/monitor scientific collection of SGCN.

A Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.

A Encourage proper disposal and cleanup of waste and litter.

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CHAPTER V:

STATUS AND TREND MONITORING AND SURVEY AND RESEARCH NEEDS

Evaluating the effectiveness Mississippi's CWCS will be accomplished through an approach which incorporates short-term performance measures of actions implemented, progress toward goals and additional planning, and long-term monitoring status of SGCN populations their habitats and key biological communities. The extent to which the strategy is implemented and actions performed should provide initial indications of effectiveness of the CWCS. Examples of initial indicators may include acres or stream miles enhanced or protected, conservation plans completed and basic research and survey projects initiated or completed. Due to limited baseline information and the strategic scope of this document, performance measures are necessarily broad and must realistically remain adaptive as new information becomes available and methods improve. Over the next ten years as data become more available and the CWCS is "stepped down" into more detailed species, habitat or community specific conservation plans, target performance benchmarks should be developed and pursued.

Significant changes in status of SGCN, habitat and biological communities are generally evident only through longer-term monitoring. However, baseline information must be established to most effectively assess changes over time. Substantial baseline information is currently available for some SGCN and key communities. Information available for others is limited and must be acquired before changes may be adequately tracked. This need for additional baseline information must be addressed early in the implementation of the CWCS. A list of identified survey and research needs is includes at the end of this chapter.

Numerous programs, projects and plans to monitor species, habitat, communities and conservation actions currently exist and will be used as a foundation for monitoring the CWCS. Although MDWFP regularly performs these activities, many others are carried out through other international, national, regional, state and local programs. To effectively monitor the success of Mississippi's CWCS implementation, it is essential that the efforts of all stakeholders be identified, coordinated and included.

Monitoring Species

The Mississippi Natural Heritage Program (NHP) maintains a Biological Conservation Database (BCD) of species occurrence records that is used to track species population trends over time. All records in this BCD are currently being prepared for transfer into an updated and more powerful Biotics 4 format under the guidance of NatureServe, the international heritage program parent organization. The transfer is expected to be completed by December 2005. In preparation for this data transfer the MNHP has been in the process of updating and field verifying all records currently stored in the database. The MNHP database will serve as a primary centralized repository for information related to SGCN and will be responsible for acquiring, managing and disseminating information for monitoring SGCN under the CWCS. Information related to species status will be collected through agency sponsored species surveys and inventories and MDWFP Scientific Collection Permit reports and incorporated into the MNHP database annually. Additional information available through other sources such as scientific literature, governmental agency technical reports, conservation organizations and academic experts will be solicited and added into the database when possible.

Monitoring status of individual species is necessary but may be relatively costly and time consuming. Methodologies that monitor species guilds and/or use indicator species can be less extensive and more cost-effective to perform. These are recommended when monitoring individual species is less feasible. Alternative monitoring tools discussed in this section will be used for monitoring species in situations limited by the need for additional information.

Monitoring Habitat

Mississippi's CWCS recognizes the importance of dedicating resources to conservation of individual species with unique requirements for long-term survival. However, traditional conservation methods that focus on single species may fail to capture important information related to complex interactions between target and non-target species and their environments. To facilitate greater return on investments, a primary goal of this strategy is to identify common threats and apply conservation actions to benefit biological communities with greater numbers and higher priority SGCN. Assessing the success of these actions will require monitoring changes at the level of community, habitat or guild. Monitoring changes to quantity of areas affected by actions may be the most feasible short-term method of monitoring actions related to communities and habitats. Upon implementation of the CWCS,

estimates of stream miles and acres of key habitat improved, restored, placed in conservation programs or otherwise protected will be the primary indicators of success.

Effectively monitoring changes in condition or quality of habitat can be problematic due to the need for a better understanding of our biological systems and improved more cost-effective methodologies to assess them. Monitoring programs such as those performed by the Mississippi Department of Environmental Quality (MDEQ) contribute significantly to our ability to monitor land, air and water quality. Successful implementation of CWCS should be reflected in environmental and community data collected by agencies and organizations such as MDEQ, The Nature Conservancy (TNC), the U. S. Geological Survey (USGS), the U. S. Environmental Protection Agency (EPA), the U. S. Fish and Wildlife Service (USFWS), the USDA Natural Resources Conservation Service (NRCS), the U. S. Forest Service (USFS) and others.

Land cover assessments and geographic information system (GIS) programs are important for monitoring key habitats. Information available from the Mississippi GAP Analysis Program, Aquatic GAP, the Mississippi Automated Resource Information Center (MARIS), U SGS, the Mississippi Department of Marine Resource's Coastal Resource Management Program (CRMP), NatureServe and others can be used to track landscape changes over time. These programs are especially valuable for remotely assessing status of private lands. Although programs provide a strong foundation for tracking habitats, further refinement to mapping and GIS capabilities is needed to meet CWCS long-term goals. Land cover information must be updated periodically to be useful in tracking long-term changes.

Because the CWCS is statewide strategy developed to provide guidance to facilitate conservation on all public and private lands. Inclusion of monitoring activities performed by all public and private individuals and entities is essential. Information from the Landowner Incentive Program (LIP), Farm Bill conservation programs such as the Conservation Reserve Program (CRP), the Wetland Reserve Program (WRP) and the Wildlife Habitat Incentives Program (WHIP), Ducks Unlimited (DU) and the Joint Ventures partnerships, the Forest Legacy Program and others such as The Nature Conservancy's Conservation Area Partnerships that facilitate conservation practices should provide indications of success action on private lands. Organizations and agencies such as the NRCS and the USDA Farm Services Agency (FSA), Mississippi Forestry Commission (MFC), the Mississippi Soil and Water Conservation Commission (MSWCC) and Wildlife Mississippi work closely with landowners and can be valuable resources for assessing accomplishments on private lands. Several lands trusts have also been established in the state and can provide information related to private lands.

Existing Monitoring

Capturing necessary information to effectively monitor the CWCS will depend on a coordinated effort of all stakeholders. It is critical for success to further strengthen partnerships established through the CWCS Advisory Committee and pursue new cooperative efforts to monitor success. A system for

acquiring data from partners and compiling and disseminating this information to stakeholders and the pubic must be developed.

Although many existing monitoring programs have been identified further work to incorporate these will be needed during the implementation of the CWCS. A database of conservation actions and monitoring activities performed by partners is needed to document progress and identify gaps. When possible protocols for standard data collection and monitoring should be adopted or developed.

Protocols for monitoring certain taxonomic groups have been developed by various organizations such as Partners In Flight (PIF), Partners in Amphibian and Reptile Conservation (PARC), The American Fisheries Society (AFS) and others. The CWCS recommends the continued development and adoption of recognized standardized monitoring protocols.

Monitoring Actions

Significant changes in status of species and condition of habitat potentially resulting from conservation actions may become evident only through long-term monitoring. Until these can be adequately assessed, monitoring the number and extent of actions performed will be the most effective method to determine successful implementation of the CWCS.

Performance indicators useful for tracking actions have been identified, and information based on these indicators will be compiled annually for use in reporting and for adaptive management. Within three to five years this information will be evaluated to determine whether the CWCS has been effectively implemented and priority objectives are being addressed.

Although overlap occurs, recommended conservation actions have been generally categorized into four types as indicated in Chapter II, *Approach and Methods*: 1) applied research, status surveys, inventories; 2) habitat and species management and protection; 3) education and outreach; 4) planning and policy. Potential performance indicators which may be enumerated for each of these categories are summarized below:

POTENTIAL PERFORMANCE INDICATORS

1. **Research, Status Survey and Inventories**
    - Research projects initiated or completed
    - Status surveys initiated or completed
    - Populations, species, guilds or areas or monitored
    - New or verified NHP element records occurrences
    - Air, water, soil quality assessments performed

2. **Habitat and Species Management and Protection**
    - Acres or stream miles protected
    - Acres or stream miles restored
    - Acres or stream miles enhanced
    - Acres placed under conservation agreements
    - Threats removed
    - Species or individuals added to area

3. **Education and Outreach**
    - Educational events held
    - Individuals reached
    - Educational tools/publications produced
    - Websites developed or updated
    - Reports and publications completed
    - Public/stakeholder surveys performed

4. **Planning and Policy**
    - Species added to or removed from SGCN list
    - Planning events
    - Plans completed or revised
    - Sampling protocols/data standards established
    - Projects funded
    - Partnerships/cooperative agreements established
    - Information exchanges performed
    - Threats assessed/updated
    - Population or habitat goals developed or reached
    - Mapping updates completed
    - Permits issued, reviewed, commented on
    - Technical guidance provided

Survey and Research Needs

Limited base knowledge of many SGCN, habitats and biological communities presents a significant obstacle for the most effective conservation of SGCN in Mississippi. Additional survey and inventory work (e.g. distribution, population, biodiversity assessments) and biological research (e.g. life history, reproduction, recruitment, competition, predation, habitat selection, disease studies) have been identified as primary needs for most SGCN and their habitats. Comprehensive lists of specific research and survey needs have not been developed for this CWCS; however, some major needs were identified by the Expert Team who responded to the surveys performed in 2003 (see Appendix III for survey). A list of

these needs is presented in Appendix XIII. A summary of this information, which should be considered preliminary, is presented below by the three systems: 1) Marine and Estuarine, 2) Lotic and Lentic, and 3) Terrestrial, Wetland, Subterranean and Anthropogenic.

1. MARINE AND ESTUARINE SYSTEMS SURVEY AND RESEARCH NEEDS

Fishes and Invertebrates

- Develop list of marine/estuarine fishes/invertebrates of greatest conservation need using the marine faunal inventory developed by the University of Southern Mississippi's Gulf Coast Research Lab.
- Perform status surveys of potential marine/estuarine fishes/invertebrates of greatest conservation need.

Reptiles

- Conduct status surveys of turtles of SGCN.
- Determine distribution of Kemp's Ridley turtles and determine whether these turtles over winter in deep channels.
- Study impacts of non-point source pollution on turtle SGCN.
- Determine the impacts of shrimp trawlers on seagrass beds habitat used by turtles.
- Conduct necropsies of all turtles found dead on beaches and in coastal waters to determine causes of death.
- Study frequency of incidental hooking of turtles by recreational fisherman fishing offshore oil rigs.

Birds

- Update presence and abundance records of species using coastal areas. Specifically determine the status of birds using barrier island and mainland beaches.
- Conduct additional status surveys/research in demography (including home range studies/winter status surveys).
- Perform studies related to breeding biology, productivity, survival, estimates of nesting abundance and success.
- Monitor known populations.
- Compare present extent of habitat versus historical levels.
- Assess needs to eradicate introduced species and invasive predators.

2. LOTIC AND LENTIC SYSTEMS SURVEY AND RESEARCH NEEDS

Crustaceans

- Conduct status surveys to document ranges and abundances.
- Develop list of SGCN.

Mussels

- Conduct status surveys for riverine mussels to determine range and abundance for smaller streams in the state (especially within Tombigbee drainage), Bayou Pierre drainage, large Delta rivers (i.e. Coldwater River), the lower Pearl River and headwater streams.
- Monitor known populations for evidence of decline or recovery. Monitoring is recommended specifically for larger streams.
- Conduct phylogenetic analysis of *Lampsilis cardium/satura* complex.
- Determine effects of poor water quality on a statewide basis, but especially for streams that support a high diversity of mussel species.
- Assess and monitor the effects of agriculture usage of ground water on the Mississippi Delta streams especially in the Sunflower River basin streams.
- Assess and monitor the effects of industrial water withdrawals especially the Tennessee-Tombigbee drainage.
- Phylogenetic analysis is recommended for *Strophitus* sp., *Uniomerus* sp., the *cardium/satuna* complex, the *Obovaria subrotunda/unicolor/jacksoniana* complex, and several Delta mussels.
- It is recommended that captive propagation be implemented for some mussel species (i.e. *Quadrula metanevra*) to enable their reintroduction into stream systems where previously extirpated.

Fishes

- Perform status surveys and monitoring within historic ranges and previously non-sampled areas, and in specific large river systems (Yazoo, Big Black, Pascagoula, Pearl Rivers and Mississippi deep water habitats).
- Establish programs to monitor fish populations after baseline studies and status surveys were completed.
- Determine habitat quality (habitat assessment) and species' habitat requirements (habitat association), including relationship of habitat to life cycle stages.
- Develop more detailed life histories of fish species (age, movement, growth and fecundity).
- Perform genetic analyses of certain poorly studied species (Mobile versus Mississippi River basin strains and a particular species, *Stizostedion vitreum*), and continue ongoing genetic research of critically imperiled species.
- Develop programs to reintroduce species extirpated from parts of their range, where possible.
- Interview commercial fishermen about observations and types of fish harvested.

Amphibians

- Perform additional surveys (especially during breeding periods and in areas where species were previously reported that have not been verified in recent years).
- Compare status of Mississippi populations with those of neighboring states.
- Additional widespread and thorough status surveys are needed to improve the conservation status

of this group.

Reptiles

- Perform status surveys and basic research to determine abundance, survival rates, distribution beyond known collection sites, habitat use and movements. More survey work in small streams was suggested.
- Determine effects of endocrine mimicking chemicals in streams.
- Determine degree of exploitation of reptiles by trot line fishing.

Birds

- Continue statewide program that effectively monitors the occurrence and success of bald eagle nests.
- Continue to monitor other SGCN birds (i.e., population surveys of osprey, Christmas bird counts and document of species numbers and nesting success of colonial water birds).

3. TERRESTRIAL, WETLAND, SUBTERRANEAN AND ANTHROPOGENIC SYSTEMS SURVEY AND RESEARCH NEEDS

Crustaceans

- Conduct status surveys, and population monitoring.
- Perform life history studies.
- Complete taxonomic revisions on several species.
- Identify habitat requirements.
- Develop list of SGCN.

Amphibians

- Perform monitoring and status surveys to determine population sizes, and ranges.
- Develop statewide range maps of amphibian populations.
- Determine habitat requirements.
- Conduct population status surveys of cave species.
- Survey for potential range extensions of *Plethodon websteri* in areas with appropriate soil and cover types east of the Pearl River in central Mississippi.
- Continue monitoring dusky gopher frog population. Rehabilitate potential breeding ponds to provide suitable habitat and develop propagation and re-dispersal program for this species. Explore potential for management of this species on private lands. Develop methods for controlling effects of anuraperkinsus disease.

Reptiles

- Status surveys are recommended to determine status and trends of reptile SGCN.
- Develop regional population monitoring programs.
- Study the effects of fire ants on reptiles, their eggs and offspring and further investigate the potential for use of biological controls (i.e. phorid flies) on fire ant colonies.
- Study the effects of site preparation and timber harvesting on reptile SGCN.
- Explore the potential for reintroduction of the gopher tortoise and other SGCN into portions of their former range.
- Reintroduce the southern hognose snake and eastern indigo snake into coastal areas.
- Determine the relative distributions of *Regina rigida deltae* and *R. R. sinicola*.

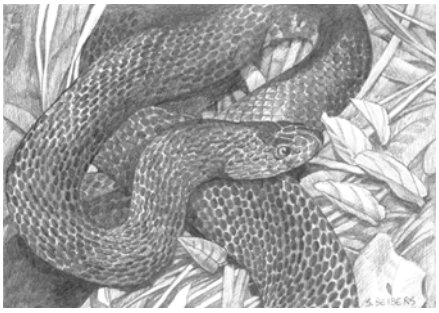
Birds

- Conduct population status surveys.
- Perform studies of breeding, reproduction, nesting success and survival.
- Study the influence of cowbird activities on bird SGCN in Mississippi.
- Determine distribution, movement and habitat preferences of bird species in the state.
- Implement studies of breeding and over-winter status surveys (especially within Pearl and Pascagoula watersheds) and determine the importance of Mississippi habitats for less well known wintering birds
- Determine food availability for some of the poorly known species and food requirements of juvenile birds.
- Determine the significance of crawfish as prey for the Mississippi sandhill crane.
- Increase focus on monitoring of colonial water bird nesting areas.
- Study the merits of applying predator controls around colonial nesting areas.
- Determine whether breeding populations of wood stork in Mexico, Florida, and Georgia are distinct (if found to be distinct, reconsider status of Mississippi populations).
- Monitor populations of birds which frequent catfish ponds and develop ways to prevent predation on commercial catfish ponds.
- Study river regimen and watershed characteristics as relating to sand bar genesis and stability and determine methods to manage sandbars to allow their use by bird species.
- Study how field border management affects birds during the breeding season.
- Continue implementation of the Lower Mississippi Valley Joint Venture.
- Nest box and translocation programs are recommended for recovery of the red cockaded woodpecker.
- Participate in the northern bobwhite quail initiative to address the decline in numbers of this species across the state.

Mammals

- Perform status/distributional surveys of mammal SGCN.
- Perform status surveys (fall/winter, breeding season or yearlong, etc) of bats.
- Determine effects of landscape pattern on bat migration routes.
- Study effects of pesticides on populations of bat prey animals.
- Document buildings and bridges that harbor significant maternity bat populations so that repair or replacement work may be scheduled during non-maternity periods.
- Continue studies to assess black bear status and distribution. Pursue potential for propagation and reintroduction activities. Investigate potential for establishment of forested corridors to improve opportunities for bears to disperse from established populations.

CHAPTER VI:
REVIEW AND REVISION OF MISSISSIPPI'S CWCS



The USFWS requires establishment of procedures to review the CWCS at intervals not to exceed ten years. MDWFP proposes to complete a comprehensive revision of the CWCS in ten years (by 2015) with an interim five-year review for certain species and habitats identified by the Technical Committee and Expert Team as likely to benefit from or require a shorter review period. In addition, we recognize that for this CWCS to meet its intended goal to improve biodiversity in Mississippi we must consider Mississippi's CWCS "a living document" and process, and we must continually update, refine and revise the data and recommendations herein. Thus, it is our intention to review, evaluate and update sections annually where possible. In order to accomplish this MDWFP further proposes to enlist the assistance of the CWCS Advisory Committee in the annual, five and ten-year review process by making this Committee a long-term standing committee along with the Technical and Steering Committees originally established for this process. The continued involvement of the Advisory Committee will allow MDWFP to collaborate with its many existing and potential conservation partners and interested stakeholders in the future development of the CWCS and to further refine and improve this CWCS with their assistance and guidance.

This review process will be synchronized with MDWFP's annual budget planning cycle. MDWFP will also use its existing annual performance reports for Federal Aid projects and State Wildlife Grants (SWG) funds to document progress on CWCS-related activities.

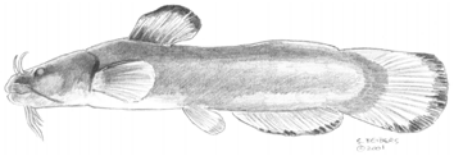
MDWFP will incorporate the data compiled for this effort into Mississippi's new Natural Heritage Program database (Biotics) by the end of calendar year 2005 and any changes in status of species and their habitats will be entered annually in this database and spatially. The SWG Coordinator and Technical Committee are responsible for implementing the annual review and evaluation of the CWCS and will report annually to the Executive Director and the Advisory Committee.

The SWG Coordinator and Technical Committee will conduct an annual, five and ten year assessment using the original eight elements, along with other guidance and criteria as they become available. The Steering Committee will oversee the review and revision process and will ensure that the CWCS continues to follow the eight elements.

The following is a proposed calendar for review and revision of Mississippi's CWCS

FY 2006	Approval of CWCS by USFWS and Congress Establish permanent Advisory, Technical and Steering Committees Complete move to Biotics Incorporate CWCS into MDWFP Strategic Plan
FY 2007	Hire SWG Coordinator and provide first Annual Review with Advisory Committee Identify Conservation Priority Areas for State and Potential Partners for Implementing Conservation Actions
FY 2008	Annual Review with Advisory Committee
FY 2009	Annual Review with Advisory Committee
FY 2010	Five Year Review and Revision
FY 2011	Annual Review with Advisory Committee
FY 2012	Annual Review with Advisory Committee
FY 2013	Annual Review with Advisory Committee Begin Ten Year Comprehensive Revision
FY 2014	Annual Review with Advisory Committee Continue with Ten Year Comprehensive Revision
FY 2015	Complete and submit Second Version of CWCS

GLOSSARY OF TERMS



anadromous: species that migrate from estuarine or marine areas into freshwater to spawn.

anthropogenic: relating to, or resulting from the influences of human beings on nature.

barrier island: an island located in close proximity to the mainland, but between it and the open ocean or sea; often composed of shifting sands and forming a barrier to tidal surges from storms that would otherwise damage the mainland.

benthic: relating to, or of the bottom surfaces of water.

biodiversity: the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

bog: wetland ecosystem characterized by acidic conditions, the accumulation of peat and dominance of sphagnum moss.

bottomland: low-lying alluvial land near a river.

by-catch: the portion of fishing catch that is discarded as unwanted or commercially unusable.

canopy: a forest's upper-most stratum; consists of a network of branches and leaves and forms a covering that blocks sunlight from lower plants.

channelization: the modification of a channel by clearing, excavation, realignment, lining, or other means to increase its capacity for water flow.

clearcutting: the removal of all the trees on a site for the purpose of utilization and to provide for regeneration of an even-aged stand of trees, usually of a species requiring full sunlight for proper development and growth.

community: collectively, all of the organisms inhabiting a common environment and interacting with each other and their environment.

cuesta: a hill or ridge with a steep face on one side and a gentle slope on the other.

ecoregion: relatively large unit of land delineated by large-scale abiotic and biotic factors that broadly shape the structure and function of biological communities within them.

endangered species: a species or subspecies in danger of extinction throughout all or a significant portion of its range, as rated and listed by the USFWS.

endemic (endemism): species restricted to a particular geographic area; usually a single drainage, or an ecological section.

estuarine: of or relating to an estuary, which is an inlet or arm of the sea, especially the lower portion or wide mouth of a river where salty tide meets freshwater current.

exotic species: (also commonly called alien, non-indigenous, or non-native): a species occurring outside of its native range.

extant: still living or present.

extirpation: elimination of a species in part of its range.

floodplain: low, relatively flat land adjoining inland and/or coastal waters, which is subject to periodic flooding.

forb: non-grassy, herbaceous plants, other than grass, sedge or rush.

forest: an assemblage of woody vegetation typically attaining positions in a plant community at the tallest level; attains height and diameter growth of canopy-layer trees within established averages for the species.

fragmentation: the process by which a landscape is broken into small islands of forest within a mosaic of other forms of land use or ownership

fresh-water: water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids.

geomorphology: a science that deals with the land and submarine relief features of the earth's surface and seeks a genetic interpretation of them; physiography.

graminoids: grasses and grass-like plants such as sedges and rushes.

habitat: the specific place(s) where a particular plant or animal lives

hydric soil: a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic (oxygen-lacking) conditions that favor the growth and regeneration of hydrophytic vegetation.

hydrology: the science dealing with the study of water on the surface of the land, in soil and underlying rocks and in the atmosphere.

impoundments: human-engineered and dammed lakes, ponds and reservoirs.

introduced species: a species whose existence in a given area is due to human action or activity; this activity has led to its dispersal across natural geographic barriers and/or has produced conditions favorable to its growth and spread.

invasive species: a species occurring outside of its native range and whose introduction does or is likely

to cause harm or threaten the survival of native species.

karst: an area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.

lentic: pertaining to standing water, as in lakes and ponds.

loess: soil material transported and deposited by wind and consisting of predominantly silt-sized particles.

lotic: pertaining to flowing water, as in rivers and streams.

mast: the fruit of flowering trees used by wildlife for food.

mesic: describing sites with a moderate amount of moisture, which support plants that require a moderate amount of moisture.

mesophyte: plant that grows under medium conditions of moisture.

mussel: an aquatic bivalve mollusk.

neotropical migratory birds: birds which migrate to the neotropics (South and Central America and the Caribbean) during the winter, but breed and nest in North America.

pelagic: referring to species that spend the majority of their lives on or in the open ocean, beyond the near-shore coastal zone (less than three miles offshore).

pine plantation: Stands that have been artificially regenerated by planting or direct seeding and with a southern yellow pine.

point source pollution: contamination or impairment from a known specific point of origination, such as sewer outfalls or pipes.

pyric: resulting from, induced by, or associated with burning.

rare: a classification reflecting a species' scarcity in a given area. Rare plants, animals and eventually communities) are assigned rarity ranks according to The Nature Conservancy's global ranking system.

reforestation: Area of land previously classified as forest that is regenerated by seeding, planting trees, or natural regeneration.

relict: an organism or species of an earlier time surviving in an environment that has undergone considerable change.

riparian zone/riparian area: the area of land on either side of streams, channels, rivers, or other water bodies. These areas are normally distinctly different from the surrounding lands because of unique soil and vegetation characteristics (e.g., wetter soil than adjacent soil conditions where aquatic vegetative communities thrive).

senescent: the process of becoming old.

species richness: the cumulative number of species.

substrate: bottom material in lakes, streams and rivers.

succession: the slow orderly progression of change in community composition during development of vegetation in any area, from initial colonization to the attainment of the climax typical of a particular

geographic area.

successional: replacement of populations in a habitat through a regular progression to a stable state.

tributary: a stream feeding a larger stream, river, or lake.

watershed: the area of land above a given point on a stream that contributes water to the volume of a body of surface water; also referred to as a drainage basin.

wetlands: those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

wildlife: any species of wild, free-ranging fauna including fish, and also fauna in captive breeding programs the objective of which is to reintroduce individuals of a depleted indigenous species in a previously occupied range.

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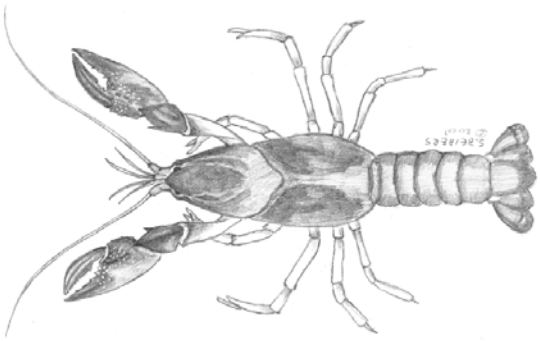

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While this first version of Mississippi's CWCS is a visible product of the hard work and long hours of planning, it is merely one result of the important process that has begun to improve biodiversity in our state. Of more value is the new collaboration among resource agencies, organizations, business and academia that began with the development of the Advisory Committee. The ultimate test of this strategy will be the success of future partnerships that evolve from this planning process to implement the recommendations of this CWCS.

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Dickie Walters
Melvin Warren
Ed Wester
Andrew Whitehurst
Ron Wieland
Shaun Williamson
Christine Willis
Jeff Wilson
Nick Winstead
Mark Woodrey
Paul Yokely
Brad Young
Donna Yowell

Agencies, Organizations, Corporations and Academia

Alabama Department of Conservation and Natural Resources
Alabama Malacological Research Center
American Fisheries Society, Mississippi Chapter
Audubon Society
Coastal Research and Extension Center, Mississippi State University
Cobb Institute of Archaeology
Defenders of Wildlife
Delta Wildlife
Department of Biological Sciences, Mississippi State University
Department of Biological Sciences, University of Alabama
Department of Biological Sciences, University of Southern Mississippi
Department of Biology, University of Mississippi
Department of Coastal Sciences, University of Southern Mississippi
Department of Forestry and Natural Resources, Clemson
Department of Wildlife and Fisheries, Mississippi State University

Ducks Unlimited
Environmental Coalition of Mississippi
Environmental Defense Fund
Environmental Protection Agency, Gulf of Mexico Program
Federal Highway Administration, Mississippi Division
Gulf Coast Research Lab, University of Southern Mississippi
Institute for Compatible Development
International Association of Fish and Wildlife Agencies
International Paper
Land Trust for the Mississippi Coastal Plain
Louisiana Department of Wildlife and Fisheries
Louisiana Sea Grant College Program, Louisiana State University
Lower Mississippi River Conservation Commission
Lower Mississippi Valley Joint Venture
Mississippi Department of Agriculture and Commerce
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Department of Transportation
Mississippi Department of Wildlife, Fisheries and Parks
Mississippi Department of Wildlife, Fisheries and Parks Foundation
Mississippi Farm Bureau Federation
Mississippi Fish and Wildlife Foundation
Mississippi Forestry Association
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi Museum of Natural Science
Mississippi Museum of Natural Science Foundation
Mississippi Ornithological Society
Mississippi Soil and Water Conservation Society
Mississippi Urban Forest Council
Mississippi Wildlife Federation
NASA, Stennis Space Center
National Wildlife Federation
Oikos Enterprises, LLC
Plum Creek Timber Company, Inc.
Ponchartrain Institute for Environmental Sciences, University of New Orleans
Soil and Water Conservation Commission
Southern Hardwoods Lab
The Nature Conservancy, Mississippi Chapter

The Nature Conservancy, Tennessee Chapter
US Army Corps of Engineers, Vicksburg and Mobile Districts
US Fish and Wildlife Service
US Forest Service
US Geological Survey - Water Resources Division
US Navy, Naval Air Station, Meridian
USAE Research and Development Center, Environmental Lab
USDA Animal and Plant Health Inspection Services
USDA Farm Services Agency
USDA Natural Resources Conservation Service
USDA NRCS Wildlife Habitat Management Institute
Watkins, Ludlam, Stennis
Weyerhaeuser Company
Wolf River Conservancy, Tennessee

We want to extend very special thanks to the organizations and agencies who, at a national level, provided guidance, data, advice and input throughout the process, including the Audubon Society, Defenders of Wildlife, International Association of Fish and Wildlife Agencies, National Wildlife Federation, The Nature Conservancy, U.S. Fish and Wildlife Service and the Organization of Wildlife Planners.

We want to thank MDWFP Executive Director Dr. Sam Polles, MMNS Executive Director Elizabeth Hartfield and the Mississippi Commission on Wildlife Fisheries and Parks for their commitment to this process and for all their support and encouragement throughout the development of this CWCS.

Thanks also to Latoya Turner, Meredith Montgomery, Corey Wright and Rebecca Gruenberg for their assistance in data acquisition, data entry, document preparation and meeting facilitation.

Mississippi's CWCS was organized and typeset by Elizabeth Barber and Kim Smith of Barber and Mann, Inc.

APPENDIX I:

IAFWA GUIDING PRINCIPLES

State Wildlife Conservation Strategies:

GUIDING PRINCIPLES

The International Association of Fish and Wildlife Agencies recommends the following guiding principles for the States, the U.S. Fish and Wildlife Service, and their conservation partners to consider and apply while developing Comprehensive Wildlife Conservation Plans to meet their obligations under the State Wildlife Grant (SWG) and the Wildlife Conservation Strategies under the Wildlife Conservation and Restoration (WCRP) programs.

These Guiding Principles identify goals, objectives, and actions to strive for over time. Few if any will be fully realized in any State under what is hopefully just the first round of conservation program development under SWG and WCRP. Some things must occur from the outset, because they are legally required and/or because they are essential to success. Clearly, broad-scale public participation is an example of one such area. Among the diverse stakeholders in this effort are: private, local, State, and Federal agencies and governments, NGOs, etc.

The Plan-Strategy provides an opportunity for the State wildlife agency to provide effective and visionary leadership in conservation. The Plan-Strategy can identify the measures that will be used, the results achieved, and the threats and needs that remain with regard to wildlife and wildlife habitat. It is also an opportunity to address broader issues and programs, including environmental and wildlife-related education, outdoor recreation, and wildlife-related law enforcement. These other areas can constrain, or enhance, wildlife conservation efforts, and funding and public support for wildlife conservation can be increased, or at least stretched, by involving partners that share those interests.

A: PLANNING PROCESS AND PARTNERSHIPS

1. Involve multiple staff levels within each agency, and broad public-private partnerships, to develop and implement the Plan-Strategy.
2. Involve partners that have the authorities necessary to ensure that the Plan-Strategy addresses the full range of issues at hand.
3. Build capacity for cooperative engagement among all partners in the effort, and make sure that it is productive, so trust and confidence grow, and organizational and interpersonal relationships become

strengths of the Plan-Strategy.

4. Share responsibility and credit for planning and implementation among all partners, who collectively share responsibility for success of the Plan-Strategy.

5. Focus on efficiency and effectiveness, so the value added in planning and implementation is commensurate to the funds invested.

6. Ensure that the planning processes and the resultant Plans-Strategies are dynamic — so they can be improved and updated efficiently as new information is gained.

7. Communicate effectively with stakeholders, other partners, and the public, early and often.

8. The planning processes, and the decisions made during planning, should be obvious to those who read and use the Plan-Strategy, and repeatable – document the processes and the decisions so the next planning cycle can build on this one.

B. FOCUS AND SCOPE

1. Base the Plan-Strategy in the principles of "best science," "best management practices," and "adaptive management," with measurable goals, objectives, strategies, approaches, and activities that are complete, realistic, feasible, logical, and achievable. Describe these processes and practices sufficiently that partners understand what they entail and how they should function.

2. Address the broad range of wildlife and associated habitats, with appropriate priority placed on those species of greatest conservation need and taking into account the relative level of funding available for conservation of those species.

3. Integrate and address wildlife-related issues statewide, across jurisdictions and interests, and coordinate with parallel efforts in other States and countries.

4. Combine landscape/ecosystem/habitat-based approaches and smaller-scale approaches (e.g. focal, keystone, and/or indicator species; guilds; species of special concern) for planning and implementation.

5. Make the Plan-Strategy an effective, long-lasting blueprint for conservation that provides a broad vision and priorities, so a broad array of organizations, including other government agencies and NGOs, can help realize the vision. The Plan-Strategy should have sufficient flexibility to respond to the full spectrum of conditions and circumstances likely to be encountered within the planning area.

C. FORMAT AND CONTENT

1. Make the Plan-Strategy readable, understandable, and useful, with well-defined issues, short and long-term goals and objectives, strategies, and realistic measures of performance that enable State agencies and their partners to demonstrate accountability.

2. Make full and effective use of relevant existing information; in particular, integrate appropriate

elements of other plans and initiatives (such as Partners-in- Flight and the many regional and other plans), databases, GIS layers, records, reports, other information sources, and management information systems that overlap or complement these Plans-Strategies.

3. Identify knowledge gaps, as well as areas of knowledge, to help focus future efforts to improve understanding and planning, but do not allow a lack of information to inappropriately limit necessary short-term application of the best available science and good judgment in decision-making.

4. Make the Plan-Strategy spatially explicit, to the extent feasible and appropriate, with a full complement of GIS and other maps, figures, and other graphics, as well as appropriate text to provide sufficient detail and consistency in describing species and habitat conditions, conservation needs, conservation recommendations, and other issues/actions, so it can be used effectively by all partners.

5. Use "threats analyses," "risk and stressor assessments," and other techniques to help set priorities for goals, objectives, strategies, and activities.

6. In addition to wildlife, address factors that can have substantial impact on wildlife conservation, such as management of invasive species, wildlife-related and conservation-related education, law enforcement, and outdoor recreation.

7. Include a comprehensive glossary, so partners and the public have a shared and common understanding of key terms used in the Plan-Strategy.

8. Develop an updatable information system to monitor Plan-Strategy implementation and the status and trends of wildlife and habitat.

9. Consider wildlife conservation-related education and wildlife-associated recreation as tools that can help accomplishing conservation goals.

D. COMPLETION, OUTCOMES, AND AVAILABILITY

1. Provide annual written progress updates on the planning effort and progress to IAFWA's CARA Implementation Committee each September, in addition to annual performance reports that must be submitted to the U.S. Fish and Wildlife Service pursuant to Federal Aid guidelines.

2. Ensure that the Plan-Strategy clearly and definitively meets State obligations to Congress under the WCRP and SWG legislation, and to the U.S. Fish and Wildlife Service with regard to Federal Aid administration.

3. Provide sufficient documentation in or with the Plan-Strategy to facilitate public understanding of the decisions that are made, how and why they were made.

4. Make the Plan-Strategy a driving force in guiding activities under diverse wildlife and habitat conservation initiatives, and usable for helping to inform land-use decision-making.

5. Make the Plan-Strategy readily available to the public in a variety of media.
6. Provide a mechanism for reporting accomplishments and tracking progress so local partners are aware of both.
7. Ensure that the Plan-Strategy can be implemented, i.e. that it is administratively and politically feasible, and that there are sufficient resources (funding and staff) among the partners to accomplish significant gains at a large scale, and within an appropriate time frame, to preserve our Nation's wildlife heritage.

Final: *September 27, 2002*

The International Association of Fish and Wildlife Agencies
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(202) 624-7890 ▪ www.iafwa.org ▪ www.teaming.com

APPENDIX II:

COMMITTEES, EXPERT TEAM AND AGENCIES INVOLVED IN THE DEVELOPMENT OF THE CWCS

The primary responsibility for developing the CWCS was given to the Mississippi Museum of Natural Science (MMNS) which functions as MDWFP's non-game wildlife program and includes the Natural Heritage Program (NHP). Over the past two years the MDWFP Conservation Resources Director, Charles Knight, managed all aspects of the CWCS development in concert with a contract CWCS Coordinator, Elizabeth Rooks-Barber. Early in the process, three committees (Technical, Steering and Advisory Committees) and a team of wildlife experts (Expert Team) were established to guide this effort and develop the first version of this CWCS for the state of Mississippi. The following is a list of the committee members.

The **Technical Committee** was composed of MDWFP wildlife, fisheries and museum biologists. They gathered and analyzed information needed to identify Mississippi's species and habitats of greatest conservation need, threats/limiting factors and potential conservation actions. They met every three to four weeks over a period of two years, and significant correspondence and work occurred between meetings.

Chris Alonzo*
Elizabeth Barber
Bubba Hubbard
Bill Johnson*
Charles Knight
Tom Mann
Scott Peyton
Alison Sherman
Kathy Shelton
Heather Sullivan
Randy Spencer
Jenny Thompson*
Nick Winstead

*No longer on MDWFP staff but participated in part of the CWCS development process.

The Technical Committee coordinated their efforts with an **Expert Team** composed of 47 biologists in the state and region with expertise on the SGCN who provided additional input on species, habitats, threats and conservation actions via an extensive survey. These experts also gave feedback individually to members of the Technical Committee on an as needed basis, and many members of this Team served on the Advisory Committee. Individuals who served as the Expert Team were:

Ms. Alison Sherman
Dr. Arnie Eversole
Mr. Austin Trousdale
Mr. Billy Justus
Dr. Bob Jones
Mr. Brad Young
Ms. Carol Brown
Dr. Cathy Shropshire
Mr. Chester Martin
Dr. Darren Miller
Mr. Dave Richardson
Dr. Deborah Epperson
Ms. Diane Tyrone
Mr. Don Bales
Mr. Ed Wester
Dr. Frank Moore
Dr. Glenn Parsons
Dr. James Lazell
Dr. Jan Hoover
Dr. Jeanne C. Jones
Ms. Jenny Thompson
Dr. Jerry Jackson
Dr. Joseph H. K. Pechmann
Ms. Kathy Shelton
Dr. Mark Woodrey
Dr. Martin T. O'Connell
Mr. Mary Stevens
Dr. Melvin Warren
Mr. Mike Sisson
Dr. Paul Hamel
Mr. Paul Hartfield
Mr. Paul Yokley, Jr.
Mr. Peter Scott Floyd, Sr.
Dr. Richard Seigel
Dr. Ron Altig
Dr. Scott Hereford
Mr. Stefan Woltmann
Dr. Stephen T. Ross
Dr. Steve Dinsmore
Mr. Stuart W. McGregor
Mr. Terence Lee Schiefer
Dr. Todd Slack
Mr. Tom Mann
Dr. Tom Pullen
Dr. Wendell R. Haag
Dr. Wes Burger
Ms. Kris Godwin

A **Steering Committee** composed of MDWFP management (wildlife, fisheries and museum administrators) and the CWCS coordinators worked to ensure overall coordination of plan development and incorporation of the eight required elements. They approved plan formatting, plans for stakeholder and public involvement, plan review and revision and agency approval process. They met on as needed basis, usually every quarter. During the development of the CWCS, MDWFP was also in the early stages of revising its agency strategic plan. Three of the five strategic plan committee members served on the CWCS Steering Committee. The following is a list of Steering Committee members.

Elizabeth Barber
Don Brazil
Larry Castle
Ron Garavelli
Elizabeth Hartfield
Bubba Hubbard
Charles Knight
Kathy Shelton
Randy Spencer

In early 2004, MDWFP invited by personal invitation, e-mail, web announcements and mail, representatives from over 290 natural resources agencies, conservation organizations, agriculture and forest products industries, technical experts, conservation educators and academics as well as individuals and additional MDWFP district and other staff to participate in a large working stakeholder group called the **Advisory Committee**. This Advisory Committee met quarterly beginning in the summer of 2004, and corresponded in between working meetings to review and develop sections of the strategy. Their role was to provide input and advice during the development of the strategy: to recommend existing plans or strategies for incorporation; and to review and comment on drafts of the strategy prior to submission. All Advisory Committee meetings were also posted on the MDWFP website and the public was invited to participate as well. Meetings were held in August 2004, November 2004, March 2005 and June 2005. During these meetings, state CWCS Coordinators shared information on designation of SGCN and habitats, identification of threats to SGCN and their habitats, potential conservation actions and opportunities for collaboration with other agencies and organizations. Committee members provided in put on all aspects of the plan and many participated in working groups.

Below is a list of 179 active participants in the CWCS Advisory Committee. Active members of the Advisory Committee were individuals who attended meetings and/or reviewed parts of the CWCS draft and submitted comments via mail or e-mail if they could not attend meetings.

Skipper Anding
Ray Aycock
Don Bales
Elizabeth Barber
Jeffrey Barger
David Barnes
Claiborne Barnwell
Marilyn Barrett-O'Leary
Brent Bailey
Rich Betchel
Laura Beiser
Mike Beiser
Don Brazil
Mike Buchanan
Chris Bucciantini
Wes Burger
Carol Brown
Kacy Campbell
Jayne Buttross
Rafael Calderon
Larry Castle
David Chadwick
Glynda Clardy
Jeff Clark
Bobby Cochran
Daniel Coggin
Chris Cole
Trey Cooke
Meg Cooper
Jim Copeland
Jeff DeMatteis
Dale Diaz
Foster Dickard
Rick Dillard
Steve Dinsmore
Daniel Drennan
Blaine Elliott
Deborah Epperson
Arnie Eversol
Robbie Fisher
Peter Scott Floyd

Marvin Cannon
Jarrod Fogarty
Doug Fruge
Ron Garavelli
Al Garner
Bob Gassaway
Dave Godwin
Kris Godwin
Dave Golden
Rebecca Gruenberg
Rick Guffey
Wendell Haag
Ed Hackett
Glenn Ray Harris
Kit Hart
Paul Hartfield
Libby Hartfield
Danny Hartley
Yen Hoang
Tom Holder
Linda Holden
Jeff Holmes
Bubba Hubbard
Edmund Keiser
Sandie Kilpatrick
Charles Knight
Brian Kreiser
Paul Hamel
Scott Hereford
Linda Holden
Jan Hoover
Noel Hughes
Jerry Jackson
Joe Jewell
Don Jackson
Nicole Jimenez
Bill Johnson
Jeanne Jones
Bob Jones
Billy Justus
Wendell King
Bernard Kuhajda
James Lazell
Bruce Leopold
Jim Lipe
Jeffrey Lotz
Ron Magee
Chris May
Tom Mann
Chester Martin
Steve Melton
Darren Miller
Jim Miller
Kelly Mitchell
Angela Moore
Frank Moore
Allan Mueller
Ronnie Myers
Ron Nassar
Martin O'Connell
Dan O'Keefe
Larry Oldham
Walter Passmore
Glenn Parsons
Evan Peacock
Harriet Perry
Joseph Pechmann
Mark Peterson
Scott Peyton
Lynn Porter
Erik Porche
Jason Price
Larry Pugh
Tom Pullen
Carl Qualls
Cynthia Ramseur
Gil Ray
Bradley Randall

Marty Jones
Sam Riffell
Dave Richardson
Avery Rollins
Jackie Rollins
Josh Rowell
Richard Rummel
Dave Ruple
Jake Schaefer
Don Seay
Richard Seigel
Ron Seiss
Douglas Shelton
Kathy Shelton
Alison Sherman
Cathy Shropshire
Tommy Shropshire
Mike Sisson
Tom Sinclair
Todd Slack
Darlene Slater
Kevin Sloan
Kim Smith
Larry J. Smith
Georgia Spencer
Randy Spencer
Delmer Stamps
Judy Steckler
Rebecca Stowe
Mary Stevens
Bob Strader
Heather Sullivan
Rob Sutter
Christopher Taylor
Jenny Thompson
Austin Trousdale
Keith Turner
LaToya Turner
Bob Tyler
Diane Tyrone
Ronnie Ulmer
Mary Beth Van Pelt
Barbara Viskup
Nicole Vickey
Francisco Viella
Kristi Walski
Dickie Walters
Melvin Warren
Ed Wester
Andrew Whitehurst
Ron Wieland
Shaun Williamson
Christine Willis
Jeff Wilson
Nick Winstead
Mark Woodrey
Paul Yokely
Brad Young
Donna Yowell

COORDINATION WITH OTHER AGENCIES

Development of this CWCS was accomplished in coordination with a variety of public wildlife agencies, universities, conservation organizations and land managers in Mississippi. This coordination was ensured by inclusion of representatives of these agencies and organizations on the Advisory Committee, through individual and organization briefings and presentations and through contact with the Expert Team and Technical Committee. Conservation planning documents and tools provided by other agencies were gathered and incorporated into this CWCS where possible. Other interested parties also contributed to the process through comments via the MDWFP CWCS website. Agencies and organizations that provided input in the development of the CWCS is listed below.

AGENCIES

Alabama Department of Conservation and Natural Resources
Environmental Protection Agency, Gulf of Mexico Program
Federal Highway Administration, Mississippi Division
Louisiana Department of Wildlife and Fisheries
Mississippi Department of Agriculture and Commerce
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Department of Transportation
Mississippi Department of Wildlife, Fisheries and Parks
Mississippi Forestry Commission
Mississippi Museum of Natural Science
NASA, Stennis Space Center
US Army Corps of Engineers, Vicksburg and Mobile Districts
USAE Research and Development Center, Environmental Lab
USDA Farm Services Agency
USDA Natural Resources Conservation Service
USDA NRCS Wildlife Habitat Management Institute
USDA Animal and Plant Health Inspection Services
US Fish and Wildlife Service
US Forest Service
US Geological Survey - Water Resources Division
US Navy, Naval Air Station, Meridian
Mississippi Soil and Water Conservation Commission

ORGANIZATIONS/CORPORATIONS

American Fisheries Society, Mississippi Chapter
Audubon Society
Delta Wildlife
Ducks Unlimited
Defenders of Wildlife
Environmental Coalition of Mississippi
Environmental Defense Fund
International Association of Fish and Wildlife Agencies
International Paper
Institute for Compatible Development
Land Trust for the Mississippi Coastal Plain
Lower Mississippi River Conservation Commission
Lower Mississippi Valley Joint Venture
Mississippi Department of Wildlife, Fisheries and Parks Foundation
Mississippi Farm Bureau Federation
Mississippi Forestry Association
Mississippi Land Trust
Mississippi Fish and Wildlife Foundation
Mississippi Museum of Natural Science Foundation
Mississippi Wildlife Federation
Mississippi Ornithological Society
Mississippi Soil and Water Conservation Society
Mississippi Urban Forest Council
National Wildlife Federation
The Nature Conservancy, Mississippi Chapter
The Nature Conservancy, Tennessee Chapter
Oikos Enterprises, LLC
Plum Creek Timber Company, Inc.
Wolf River Conservancy, Tennessee
Watkins, Ludlam, Stennis
Weyerhaeuser Company

UNIVERSITIES AND RESEARCH CENTERS

Alabama Malacological Research Center
Coastal Research and Extension Center, Mississippi State University
Cobb Institute of Archaeology
Department of Biological Sciences, University of Alabama
Department of Biological Sciences, Mississippi State University
Department of Wildlife and Fisheries, Mississippi State University
Department of Biology, University of Mississippi
Department of Biological Sciences, University of Southern Mississippi
Department of Coastal Sciences, University of Southern Mississippi
Department of Forestry and Natural Resources, Clemson
Gulf Coast Research Lab, University of Southern Mississippi
Louisiana Sea Grant College Program, Louisiana State University
Ponchartrain Institute for Environmental Sciences, University of New Orleans
Southern Hardwoods Lab

APPENDIX III:

SURVEY – *Evaluation of Species of Greatest Conservation Need in Mississippi*

GUIDELINES FOR COMPLETING EVALUATION FORMS

We are using the Mississippi Natural Heritage Program - Animals of Special Concern tracking list as a baseline for evaluating and prioritizing the species, habitats and biological communities of greatest conservation concern, however, additional species may be included for evaluation. A blank form has been provided for this purpose.

We are asking that you complete the evaluations based on your professional experience and scientific opinion. If you feel that you do not have sufficient knowledge about a particular species, do not complete its form. If you feel that you do not have sufficient knowledge about a particular question, do not complete that question.

Guidelines are provided in italics

EVALUATION OF SPECIES OF GREATEST CONSERVATION NEED IN MISSISSIPPI

I. Species, Common Name, Heritage Program Ranks, Federal and State Listed Status:

A form is provided for each species currently included on the Natural Heritage Program - List of Special Animals. A blank form has been provided and may be copied to include additional species. It is not necessary for you to determine current rankings for additional species.

II. Species Population Status Assessment

A. Knowledge within the scientific community of population status (*circle one*):

High Medium Low

High - Status is known within the state.
Medium - Status is known in some areas, but the status is not known statewide.
Low- Little to none is known about the status within the state.

B. Population status if known (*circle one*): Increasing Stable Declining

Increasing- Population is increasing.
Stable- Population is stable.
Declining- Population is declining.

C. Your recommendation for Natural Heritage Program State Rank (*circle one*):

S1 S2 S3 S4 S5 SH SR SU SX Other_____

See enclosed Definition of Ranks

D. Should this species be added to or removed from the Mississippi Endangered Species List (*circle one*)?

Added Removed No change recommended

E. Justification if you are Recommending a <u>Change</u> of Natural Heritage Program State Rank or a Change of Mississippi Endangered Species Status:

If you recommend a change of State Rank or recommend adding or removing a species to or from the Natural Heritage Program - List of Special Animals or Mississippi State Endangered List, please include a justification for your recommendation.

III. <u>Species Distribution and Habitat/Biological Community Assessment</u>

A. Knowledge within the scientific community of distribution and key habitat/community types in state (*circle one*):

High Medium Low

High - The distribution is known within the state.
Medium - Some places are known where the species can be found, but its distribution statewide is not known.
Low- Little to nothing is known about the distribution within the state.

B. Key habitat/community types (*please prioritize 1-5*)
(*if all Sub-types within a Type apply, only score Type*):

TYPES	SUB-TYPES	
___Dry Upland Forests.....	___Dry hardwoods	___Mesic hardwoods
	___Dry longleaf pine	___Dry shortleaf/loblolly pine
___Dry Mesic Prairie/Glade/Barrens.....	___Northeast prairie	___Jackson prairies
	___Cedar glades	___Mesic shortleaf/loblolly pine
___Mesic Upland Forests.....	___Beech/magnolia	___Loess hardwoods
	___Mesic longleaf/savanna	___Lower slope/high terrace hardwoods

___Mesic Palustrine Forests.....___Bottomland hardwoods ___Slash/longleaf pine flatwoods

___Riverfront Forests/Herblands..... ___Cottonwood/black willow/river birch

___Wet Palustrine Forests.....___Wet bottomland hardwood ___Wet savanna

___Springs, Seepage Slopes/Cliffs, Caves..... ___Wooded spring seep ___Pine seep
___ Cave

___Shrub Wetlands, Pocosin, Herb Bog..... ___Pitcher plant flat bog ___Titi shrub thicket

___Inland Freshwater Marshes..... ___Freshwater marsh

___Swamp Forests..... ___Bald cypress/blackgum ___Small stream swamp forest

___Lacustrine Communities..... ___Oxbow lake ___Artificial pond
___Reservoir ___Ephemeral pond

___Rivers and Riverine Communities..... ___Alluvial creek ___Alluvial river
___Blackwater creek/river
___High to medium gradient/coarser substrate stream
___Medium to lower gradient/fine substrate stream

___Upland Maritime and Estuarine Fringe..... ___Island dry ___Island wet
___Man-made beach ___Mainland beach

___Submerged Marine..... ___Seagrass beds ___ mollusk reef __Other_____

___Estuarine and Mississippi Sound..... ___Estuarine lakes, tidal creeks, tidal channels ___Mississippi sound

___Other_____

___Other_____

___Other_____

Please provide priority number for this species' key habitat/community type in space provided. Limit to top five or fewer. Number I is the highest priority and Number 5 is the lowest priority.

If all Sub-types within a Type apply please only score Type.

C. Status of key habitat/community types if known (*circle one*): Increasing Stable Declining

Increasing- Key habitat/community types are increasing in area or quality within the state.
Stable- Key habitat/community types are stable within the state.
Declining- Key habitat/community type are declining in area or quality within the state.

IV. Species Population Management Assessment

A. Knowledge within the scientific community of threats/limiting factors/problems affecting species (*circle one*):

High Medium Low

High - Much is known about the threats/limiting factors/problems affecting species.
Medium - Some is known about threats/limiting factors/problems, but reasons for population changes are not fully understood.
Low- Little to nothing is known about the threats/limiting factors/problems affecting the species.

B. Major threats/limiting factors/problems affecting species (*please prioritize 1-5*):

____Agricultural Conversion
____Air-borne Pollutants
____Altered Fire Regime
____Channel Modification
____Conversion to Pasture
____Forestry Conversion
____Groundwater Withdrawal
____Incompatible Agricultural Practices
____Incompatible Forestry Practices
____Incompatible Grazing Practices
____Over Exploitation/Incidental Capture
____Other _____
____Other _____
____Incompatible Resource Extraction Practices
____Incompatible Water Quality
____Industrial Development
____Invasive Species
____Livestock Feedlots/Operations
____Operation of Dams/Impoundments
____Recreation Activities
____Second Home/Vacation Home Development
____Urban/Suburban Development
____Road Construction/Management
____Other _____
____Other _____

Please provide priority number in space provided. Limit to top five or fewer. Number I is the highest priority and Number 5 is the lowest priority.

. . .

C. Your recommendation for actions necessary to conserve species (prioritized) and feasibility of success of actions:

(A few examples of possible actions recommended include: status surveys, additional research, habitat management, introduced species eradication, providing habitat corridors, species propagation, reintroduction, other. You may be broad or narrow in making you recommendations)

1. _____High Medium Low

2. _____High Medium Low

3. _____High Medium Low

4. No actions recommended _____: Not Feasible Currently Protected Other_____

A few examples of possible actions recommended include: status surveys, additional research, habitat management, introduced species eradication, providing habitat corridors, species propagation, reintroduction, other. You may be broad or narrow in making recommendations.

Blank number 1 is highest priority and blank number 3 is lowest priority.

High- It is very likely that this action can be achieved and/or will have a positive impact on the species.

Medium- It is somewhat likely that this action can be achieved and/or will have a positive impact on the species.

Low- It is unlikely that this action can be achieved and/or will have a positive impact on the species.

If no action is recommended please mark in space provided and circle primary reason.

V. Comments:

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APPENDIX IV:

PRESENTATIONS AND MEETINGS REGARDING MISSISSIPPI'S CWCS

In an effort to inform the public and stakeholders about the development of Mississippi's CWCS and to invite involvement and comments, presentations were provided upon request to any individual, organization, company or agency. The following is a list of those presentations as well as meetings where CWCS Coordinators met with other state coordinator to share information and collaborate on the development of their respective strategies. All Technical, Advisory and Steering Committee meetings are listed as well.

- April 22 -23, 2003 - State Comprehensive Wildlife Conservation Planners Meeting in Atlanta, Georgia
- June 13, 2003 - Briefing of conservation organizations in Mississippi. Attendees represented Audubon, The Nature Conservancy, Mississippi Fish and Wildlife Foundation and the Mississippi Wildlife Federation.
- June 2003 - Mississippi Department of Transportation Briefing - Regional Natural Resource Based Alliances
- August 25, 2003 - Technical Committee Meeting
- September 16, 2003 - Surveys distributed to Expert Team
- September 17- 18, 2003 - Southeastern Association of Fish and Wildlife Agencies (SEAFWA) Ad Hoc CWCS Committee Meeting in Montgomery, Alabama
- December 2 - 3, 2003 - SSENRLG - Environmental Partnering Meeting
- January 20- 24, 2004 - State Wildlife Grants/CWCS National Meeting, Canyon of the Eagles, Texas
- February 4, 2004 - Technical Committee Meeting
- February 11, 2004 - Steering Committee Meeting
- February 17, 2004 - Technical Committee Meeting
- February 24, 2004 - Species Evaluation Surveys due from Expert Team

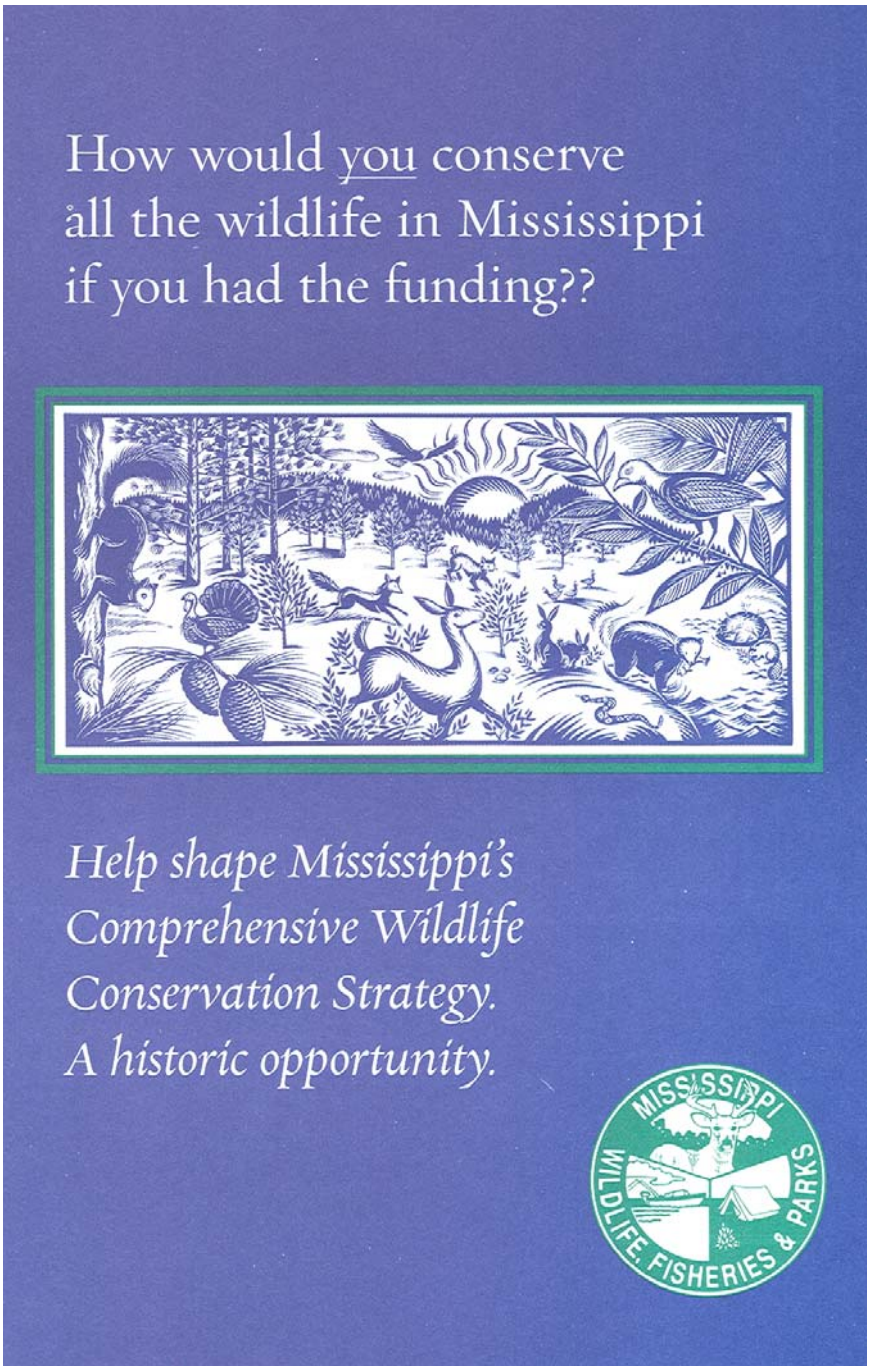
- March 22, 2004 - Technical Committee Meeting
- March 22, 2004 - Briefing with USFWS Federal Aid Coordinators
- March 23, 2004 - Joint meeting with Landowner Incentive Program Coordinators (LIP)
- March 9, 2004 - Conference Call with SEAFWA Adhoc Committee
- May 7, 2004 - Meeting with Partners in Flight Coordinator
- May 10, 2004 - Joint meeting with US Forest Service staff revising State Forest Management Plan
- May 20, 2004 - Technical Committee Meeting
- May 26, 2006 - Meeting with Southeastern Aquatic Resources Partnership contact for Mississippi
- June 16, 2004 - Technical Committee Meeting
- June 25, 2004 - GIS Meeting with MDWFP GIS staff
- June 30, 2004 - Technical Committee Meeting
- July 12 - 14, 2004 - SEAFWA Ad Hoc Committee Meeting in Atlanta
- July 19, 2004 - Technical Committee Meeting
- July 20 - 21, 2004 - Presentation and coordination with Mississippi Bat Working Group
- August 1- 4, 2005 - International Association of Fish and Wildlife Agencies (IAFWA) One Year Out Conference for CWCS, Nebraska City, Nebraska
- August 9, 2004 - Technical Committee Meeting
- August 18, 2004 - Steering Committee Meeting
- August 20, 2004 - Advisory Committee Meeting
- September 3, 2004 - Technical Committee Meeting
- September 8, 2004 - Presentation to Mississippi Forestry Association Wildlife and Environmental Committee
- September 14, 2004 - Mississippi All Bird Conservation Workshop Presentation on CWCS
- September 22, 2004 - Meeting with USFS and Conservation Southeast Staff regarding using SGCN in Species Viability database for revision of State Forest Management Plan
- October 8, 2004 - Technical Committee Meeting
- October 13, 2004 - Meeting with border state's CWCS planners in Vicksburg

- October 21, 2004 - Presentation to USDA NRCS and FSA State Technical Committee Members regarding CWCS
- November 3, 2004 - Technical Committee Meeting
- November 10, 2004 - Technical Committee Meeting
- November 19, 2004 - Advisory Committee Meeting
- December 3, 2004 - Presentation on CWCS to Mississippi Wildlife Federation Board and Affiliates
- December 17, 2004 - Steering Committee Meeting
- December 30, 2004 - Meeting with Executive Director, Mississippi Wildlife Federation
- January 10 -12, 2005 - SEAFWA Ad Hoc Working Group Meeting in Ridgeland, SC
- January 26, 2005 - Briefing for MDWFP Wildlife and Fisheries staff
- February 9 - 11, 2005 - American Fisheries Society, MS Chapter presentation
- February 10, 2005 - Update to Mississippi Bat Working Group
- February 16, 2005 - Technical Committee Meeting
- February 23, 2005 - Meeting with CWCS Marine Committee in Biloxi, MS
- March 7, 2005 - Technical Committee Meeting
- March 16, 2005 - Technical Committee Meeting
- March 24, 2005 - Technical Committee Meeting
- March 29, 2005 - Advisory Committee Meeting and Meeting of Marine, Aquatic and Terrestrial Committees
- April 7, 2005 - Steering Committee Meeting and Joint meeting with LIP
- April 26, 2005 - Technical Committee Meeting
- May 20, 2005 - Meeting with Marine Committee in Biloxi, MS
- June 20, 2005 - Technical Committee Meeting
- June 30, 2005 - Advisory Committee Meeting
- July 7, 2005 - Technical Committee Meeting
- July 11, 2005 - Technical Committee Terrestrial Meeting
- July 12, 2005 - Technical Committee Aquatic Meeting
- July 27, 2005 - Presentation to Forest Legacy Committee at Mississippi Forestry Commission

- August 22, 2005 - Meeting with MDWFP Executive Director to review draft CWCS and discuss submission
- September 22, 2005 - Executive Summary submitted to Mississippi Commission on Wildlife, Fisheries and Parks

APPENDIX V:

MISSISSIPPI'S CWCS PROMOTIONAL BROCHURE



Mississippi's CWCS Promotional Brochure

Mississippi's Wildlife Conservation Strategy "Blueprint" For The Future.

Why a Conservation Blueprint?

Attempting a piecemeal approach to conserving our nation's and state's wildlife is a little like building your house without an architectural blueprint or enough materials. You do the best you can but, down the road, you end up spending more money just to fix the problems.

Until now, state fish and wildlife agencies have tried to conserve hundreds of species of fish and wildlife on shoestring budgets. While game species' conservation has fared well, thanks to the sales of hunting and fishing licenses and user fees on gear, the rest of our nation's wildlife has lacked secure and adequate funding for long-term conservation.

The result? An endangered species list that already tops 1000 nationwide and continues to grow. We need to take action now.

The "conservation blueprint" —or strategy— is your opportunity to act. It has the potential to transform wildlife conservation efforts for all species from opportunistic to strategic, piecemeal to holistic, and crisis-driven to proactive.

The good news...State Wildlife Grants

Thanks to the untiring efforts of the 3000 member groups of the Teaming With Wildlife Coalition, Congress passed the *State Wildlife Grants* program in 2001. New federal dollars are funneling into states to prevent species and habitats from becoming endangered.

How do we get the dollars?

States are receiving matching federal funds today as long as they complete a comprehensive wildlife conservation strategy (plan) by October 2005. *A finished strategy is the key to millions of dollars in future funding.*

Not Just Another Plan

Money and *scale* set this strategy apart from other plans that collect dust on shelves:

Money:
The actions defined by the strategy will receive millions of federal funds annually for implementation.

Scale:
Strategies are being produced by every state, the territories, Puerto Rico and the District of Columbia. Together, the strategies will provide a collective approach for safeguarding our wildlife legacy—efficiently and cost-effectively.

Mississippi's CWCS Promotional Brochure

Who's taking the lead?

MDWFP is the lead in Mississippi. Each state fish and wildlife agency is charged with completing a conservation strategy for that state's wildlife, not just for the agency.

That's why we need you or your organization to help us design and carry out the strategy.

Who should participate?

- Biologists and ecologists
- Local governments
- Conservation groups
- Universities
- Private landowners
- State, federal and tribal agencies

Why you're needed:

A strategy is only as good as its components. We need your expertise, your ideas, and your priorities. To be effective, the strategy must be shaped by the people who know the nooks and crannies of the state, and who understand the issues, challenges and threats to our precious wildlife.

What's in it for you?

This is the one planning effort you don't want to miss. Mississippi's strategy will guide the future of wildlife conservation and associated funding. By participating, you will expand networks and coalitions for conserving our wildlife resources. This is your chance to make history!

A win:win approach

This strategy is not about more regulations, but all about positive ways to conserve wildlife and habitats:

- Saving millions of taxpayer dollars by saving species before they become endangered.
- Working to prevent conflicts over development and critical habitat and wildlife.
- Investing in outdoor recreation and nature tourism (the fastest growing segment of tourism) by taking care of the resource.
- Passing on a healthy wildlife legacy to children.

What will Mississippi's Wildlife Conservation Strategy look like?

The strategy will serve as the plan of action for Mississippi's wildlife conservation and funding. The primary purpose is to target species of greatest conservation need. However, the plan will address the full array of wildlife and habitats—taking advantage of good work already done in the state and filling in gaps.

Think of the strategy as a health check and prescription for wellness—a key to preventing life-threatening illnesses. Congress requires eight elements be included in this prescription for a healthy wildlife future. Those are:

1. *What's here now?*—distribution and abundance of wildlife species. Focus on low and declining species that are indicators of the health of the state's wildlife.
2. *Health check*—location and condition of habitats that are vital to conserving priority species.
3. *Threats*—identifying problems that may harm wildlife species and habitat, and priority research for conservation actions.
4. *Actions*—prescriptions and priorities for conserving wildlife species and habitats.
5. *Monitoring*—how to assess and measure effectiveness of conservation actions.
6. *Review*—assessment at intervals not to exceed 10 years.
7. *Coordination*—involvement of federal, state, local agencies and Indian tribes that manage lands or programs affecting wildlife.
8. *Public participation*—required by law and essential for success in developing and carrying out plans.

You are needed now—and later too!

Mississippi's CWCS Promotional Brochure

Fast Facts

Why We Need Funding for Wildlife

MDWFP and its sister agencies around the country have a terrific track record for recovering species in trouble, such as turkey, deer, elk and trout. Historically, these agencies have had the funding to manage 14 percent of our wildlife—those species hunted or fished for—but have lacked consistent, adequate funding for the remaining 86%—some 2000 species nationwide. The need is as clear as the responsibility for the future of fish and wildlife—it's in all of our hands.

Biodiversity in trouble nationwide

- 1260 Federal threatened and endangered species (USFWS, 2004)
- 31 species proposed for listing (USFWS, 2004)
- 256 species in the pipeline as "candidate species" for listing (USFWS, 2004)
- 37% of freshwater fish species at risk of extinction (USFWS)
- 35% of amphibians that depend on aquatic habitats are rare or imperiled (USFWS)
- 67% of freshwater mussels are rare or imperiled (USFWS Natureserve)
- 105 bird species with declines as high as 75% in the last 30 years and not yet classified as endangered

Fish and Wildlife budgets come up short

- State fish and wildlife agency budgets (total): $1 billion
- State fish and wildlife agency budgets for wildlife diversity and endangered species programs (prior to State Wildlife Grants): $100 million
- Estimate of state wildlife diversity and endangered species program annual needs: $1 billion

State Wildlife Grants – Funding to Date

State Wildlife Grants have already doubled the dollars spent annually on wildlife diversity programs. Mississippi is guaranteed a certain level of funding, determined by land area and human population. While current funding falls short of long-term needs, the millions received so far represent a significant step in the conservation journey—one made possible only through the efforts of thousands of individuals and groups who care about our wildlife legacy.

State Wildlife Grants to date

National: Fiscal year 2001: $50 million
Fiscal year 2002: $85 million
Fiscal year 2003: $65 million
Fiscal year 2004: $70 million

(to see Mississippi's appropriation for each year, visit www.teaming.com)

For more information visit Teaming With Wildlife at www.teaming.com or Mississippi Department of Wildlife, Fisheries and Parks at www.mdwfp.com or Contact Charles Knight, MDWFP
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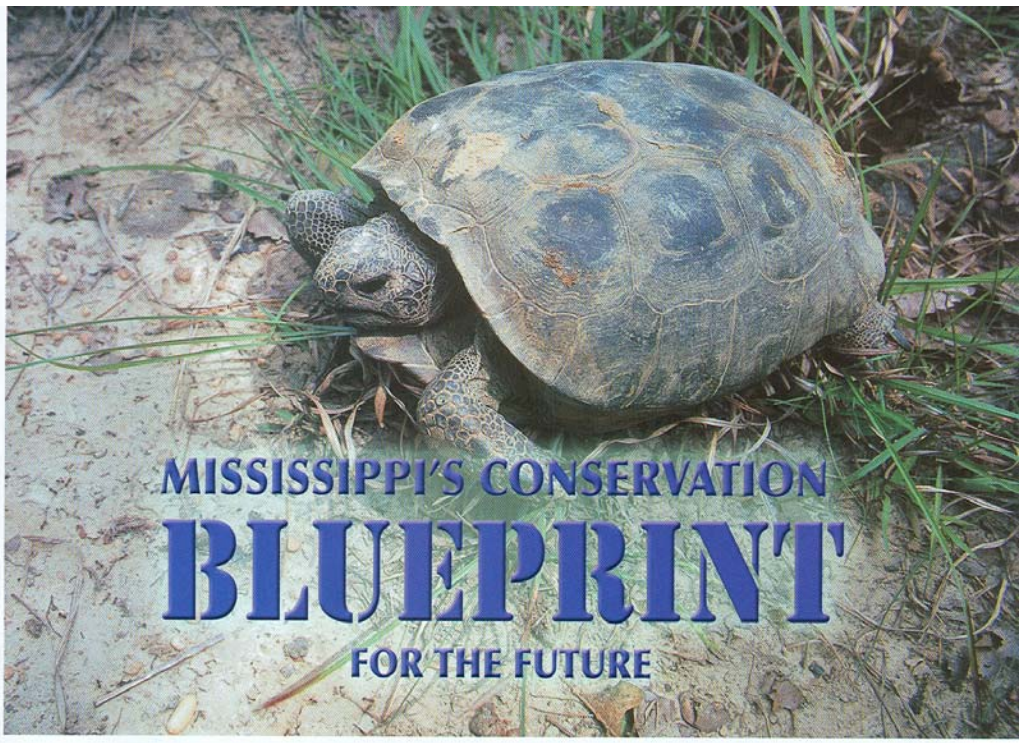
P. 601-354-7303 · F. 601-354-7227
charles.knight@mmns.state.ms.us

APPENDIX VI:

ARTICLES ABOUT MISSISSIPPI'S CWCS

Mississippi Outdoors. September-October 2005



Implementation and development of Mississippi's Comprehensive Wildlife Conservation Strategy will help critters such as this gopher tortoise which is on the federal list of threatened species and on Mississippi's list of endangered species. This tortoise was found on the Marion County Wildlife Management Area south of Columbia.

By Elizabeth Rooks-Barber

How would you conserve Mississippi's wildlife if you had the money? This question is central to the largest conservation planning effort this state and nation have ever attempted.

In 2002 every state and territory in the United States began developing a Comprehensive Wildlife Conservation Strategy (CWCS) after passage of the Wildlife Conservation and Restoration Program. This legislation provides supplemental funding to states for conservation of wildlife species including many non-game animals. Now called State Wildlife Grants (SWG), this new program should benefit "species of greatest conservation need" and their habitats.

The CWCS and SWG are focused on keeping wildlife from becoming endangered. They address some of the funding gaps and provide a clearly defined strategy of conservation actions needed to improve degraded habitat, to develop partnerships with private landowners, and ultimately restore declining fish and wildlife.

Since 2001, Mississippi has received $3,515,343 from SWG. These funds have been devoted to several efforts to protect wildlife diversity such as the state Partners in Flight program.

Much more work is needed and planned as Congress increases future SWG funding. In order to continue receiving this much-needed help in the future, each state must complete

Savanna habitat such a this just inland from the Gulf Coast has been disappearing for years in the wake of development. This type of habitat is the home for federally endangered Mississippi sandhill cranes (inset). The CWCS helps address funding for species of greatest conservation need and their habitats.

and submit a CWCS to Congress by October 2005.

It will serve as that state's plan of action for wildlife conservation and funding. It must include:

1. Distribution and abundance of animal species of greatest conservation need.
2. Location and condition of habitats vital to conserving those species.
3. Identification of threats or problems that may harm those species and their habitats and the priority research needed.
4. Priority conservation actions needed to conserve their habitats.
5. Description of how the state will monitor those actions and measure their effectiveness.
6. A plan for review of the strategy at least every 10 years.
7. Coordination with other state, local, and federal agencies and organizations that manage lands or programs affecting wildlife.
8. Public participation throughout the process.

Mississippi's CWCS is well under way. It is being crafted under the leadership of the Department of Wildlife, Fisheries and Parks. An Advisory Committee of other state, federal, and local resource agencies, conservation and sportsmen's organizations, landowners, agriculture and forest products interests, and technical experts are assisting.

The CWCS Advisory Committee has been meeting regularly to develop the species list. It is prioritizing habitats

important to those species, identifying problems and potential conservation actions, finding opportunities on public and private lands, and crafting a monitoring plan. As the Advisory Committee develops parts of the strategy, they are posted on DWFPs website for public review and comment.

Why a Conservation Blueprint?

Over the years, the DWFP and its sister agencies have tried to conserve hundreds of fish and wildlife species on shoestring budgets. Species in immediate peril of extinction receive some funding through the Endangered Species Act. But this only accounts for about 14 percent of all wildlife species in the country. The other 86 percent have drawn little notice or concern – until recently.

The results? In the U.S. more than 1,200 animals and plants have been listed as threatened or endangered by the federal government. More than 90 are proposed for listing, and another 250 are candidates. In Mississippi, 45 species are already listed.

Congress recognized that despite our best efforts, many wildlife populations continue to decline. Clearly a new approach is needed.

"You might say our strategy is like an architectural plan that identifies species at risk. It maps out realistic conservation actions that will restore and enhance those populations and their habitats," said Charles Knight, Conservation Resources Coordinator at the Mississippi Museum of Natural Science and CWCS project director. "The idea is to recognize the trends early and take steps to protect important habitat before species of concern become critically imperiled and are listed under the Endangered Species Act."

The CWCS takes into consideration existing conservation programs and other planning efforts. "We are trying to incorporate the good work already being done on private lands through successful programs like the Conservation Reserve Program and Wetland Reserve Program coordinated by USDA Natural Resources Conservation Service. We're also receiving input from agencies that manage large tracts of public lands like the U.S. Forest Service and the U.S. Fish and Wildlife Service," Knight said.

As in most states, Mississippi's CWCS is organized geographically into three ecoregions – the Mississippi River Alluvial Plain, the Upper East Gulf Coastal Plain, and the East Gulf Coastal Plain. An ecoregion is a large area of land and water containing geographically distinct assemblages of natural communities.

The species of greatest conservation need are linked to their important habitats, and habitats are ranked based on the largest number of high priority species. Species and habitat data collected through the Mississippi Natural Heritage Program (MNHP) serve as the cornerstone of this effort.

"In 1976, the DWFP partnered with The Nature Conservancy to establish one of the first natural heritage programs in the country," Libby Hartfield, Director of the MMNS said. "The heritage program and its database are maintained at the MMNS. It manages a valuable inventory of rare and endangered plants and animals, habitats, and exemplary communities found in our state."

Heritage biologists track more than 1,500 wildlife species. The information they have collected was used as the foundation of the CWCS species and habitat lists. Biologists around the state and the Southeast helped supply additional information on the population status, threats, habitat conditions, and other criteria that ultimately led to the list of 299 animal species of greatest conservation need used in this first CWCS.

The list includes birds, mammals, fish, mollusks, crustaceans, reptiles, and amphibians listed by state or federal statute as threatened or endangered, ranked by the heritage program as imperiled or vulnerable, or species with low population density, low reproductive potential or narrow geographic distributions. Species identified as a priority under another national plan were also considered.

"Some groups such as marine fishes, marine invertebrates, and insects were not evaluated because there is simply no data on many of them," Knight said. "But they are not excluded from the plan. We're working with the Advisory Committee to recommend survey work and conservation actions that will benefit many of these species."

Knight said that the species and habitat priorities will change over time. "As habitats are improved, some populations should increase and

hopefully will become less of a concern. And as we gather new information, some species may be added."

Wildlife Management for the Future

Each state's CWCS will fit together with others to form a unified national plan. By sustaining these ecosystem communities, the great majority of species can be protected without having to manage each species. It's an efficient approach that avoids expensive last ditch efforts to save species at the brink of collapse.

"This is a turning point in the history of wildlife management in this country," DWFP Chief of Wildlife Larry Castle said. "Sportsmen and women and have traditionally funded wildlife management that allowed our deer, turkey, and other populations to recover and thrive. The additional funding for other species of greatest conservation need is going to enhance our existing management, and is going to allow us to be an agency for all wildlife."

To review and comment on the strategy, go to www.mdwfp.com/cwcs.

Written comments may be sent to Charles Knight, MDWFP, P.O. Box 451, Jackson, MS 39205.

Elizabeth Rooks-Barber is a certified wildlife biologist in Ridgeland working under contract for MDWFP on the Comprehensive Wildlife Conservation Strategy.

Kermit Denver Laird

A CWCS advisory committee has been formed to develop a priority list of declining species and their habitats. With this list they are identifying problems and potential conservation actions, and they are crafting a monitoring plan to keep an eye on species of greatest concern.

Natural Newsline. Mississippi Museum of Natural Science. Vol. 22. No. 2. Spring 2004

HERITAGE NOTES:

Managing More Wildlife Species

In the past the majority of federal funding allocated to states for conservation targeted game fish and wildlife. This funding contributed to the establishment of highly effective management programs that allowed species like whitetail deer and largemouth bass to flourish. Although conservation activities intended for game species indirectly benefited other species, many continued to decline.

The Mississippi Museum of Natural Science lists more than 350 animal species of concern in the state. Species are placed on this list when biological evidence indicates that their continued existence is potentially threatened. Traditionally, the amount of federal funding allocated for the conservation of these species has been less than one percent of the amount of federal dollars available for game species and has focused only on federally endangered species. Lack of federal funding for a full array of wildlife has limited efforts to proactively and comprehensively address Mississippi's species at risk.

Congress began to address this funding gap in 2001. The State Wildlife Grants Program has provided additional support for the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) and particularly strengthens the Museum's long tradition of working with all species in need. It also allows for the strategic prevention of more common species from reaching endangered species status.

The Museum currently is working on a Statewide Comprehensive Wildlife Conservation Strategy that "focuses on species in greatest conservation need." Required by Congress as part of the funding, the strategy must be completed by October 2005.

Mississippi Wildlife. The Mississippi Wildlife Federation. Volume 16. Number 3.

Mississippi's Wildlife Conservation Strategy

"Blueprint" *for the Future*

Until now, state fish and wildlife agencies have tried to conserve hundreds of species of fish and wildlife on shoestring budgets. While game species' conservation has fared well, thanks to the sales of hunting and fishing licenses and user fees on gear, the rest of our nation's wildlife lacked secure and adequate funding for long-term conservation.

In 1996 the Mississippi Wildlife Federation passed a resolution in support of permanent funding for non-game species. Since that time the federation has taken an active role in lobbying Congress to provide such funding. As part of the Teaming With Wildlife Coalition the Mississippi Wildlife Federation joined 3,000 other groups in helping pass the State Wildlife Grants program in 2001. New federal dollars are now funneling into Mississippi to prevent species and habitats from becoming endangered.

In order to continue to receive these finds, the Mississippi Department of Wildlife, Fisheries and Parks must complete a Comprehensive Wildlife Conservation Strategy by October 2005. "The State Wildlife Grant program holds great promise in providing needed funding to help those species in need of protection," said MWF Executive Director Cathy Shropshire. "As a former coordinator of the Wildlife Heritage Program, I am keenly aware of the species and habitats that are declining and the lack of resources to prevent it. Working together we can produce a plan that will identify those species in greatest need of conservation and determine strategies that will assure that those species remain a part of Mississippi's natural world," Shropshire said. "The State Wildlife Grant program provides the mechanism to get this accomplished."

The Mississippi Department of Wildlife, Fisheries and Parks and its sister agencies around the country have a proven record for recovering species in trouble, such as turkey, deer, elk and trout for which they had funding. But these species represent only 14 percent of our wildlife species. The remaining 86 percent — some 200 species nationwide — lacked adequate funding until the State Wildlife Grant Program was established. The primary purpose of the State Wildlife Grant Program is to direct positive actions toward species of greatest conservation need. To accomplish this, the Mississippi Department of Wildlife, Fisheries and Parks is charged with developing a conservation strategy for Mississippi's wildlife. In order to fulfill Congress' requirements, certain elements must be addressed in the strategy.

The first step is to determine what species are here now and how they are doing. The information collected so far is sobering.

In Mississippi there are 86 species listed as endangered. Approximately 1,500 species of animals are tracked by the Mississippi Museum of Natural Science's Natural Heritage Program. Many are common, but some are known or suspected to occur in low numbers. The latter are designated as species of special concern; currently 336 species fall into that category. These include:

- ***25 gastropods***
- ***51 bivalves*** (or more than 60 percent of the mussel species in the state)
- ***38 crawfish and shrimp***
- ***28 insects***
- ***74 fish species*** (approximately 35 percent of the 204 freshwater or diadromous — fish that migrate from fresh to salt water or the reverse — fish species in the state).
- ***18 amphibian species*** (more than 30 percent of the amphibians in the state)
- ***37 reptile species*** (more than half of the reptiles in the state)
- ***49 bird species*** (more than 12 percent of the bird species in the state)
- ***15 mammals*** (nearly 28 percent of the native mammal species in the state) An additional 22 species of animals are on the "watch" list, meaning they have the potential to become species of special concern. We also need to know the health of the habitats these species call home and what the future threats are to these habitats. We know that over 2,500

Natural Newsline. Mississippi Museum of Natural Science. Vol. 22. No. 2. Spring 2004

Director's Corner

The October 2005 completion of Mississippi's Wildlife Conservation Strategy is the key to millions of dollars in federal funding to prevent species and habitats from becoming endangered.

The Museum and the Mississippi Department of Wildlife, Fisheries and Parks join numerous groups in this historic opportunity to shape a plan of action. Involved are biologists, ecologists, local governments, conservation organizations, universities, private landowners, and state, federal, and tribal agencies.

Species of greatest conservation need are the plan's primary target, but the full array of wildlife and habitats will be addressed to leverage and complement good work already occurring.

The MDWFP, lead agency, and the Museum have always been interested in all species—not just animals that are hunted and fished.

The Mississippi Game and Fish Commission was founded in 1932, largely through Francis Cook's organizing conservation-minded citizens to lobby for funding and the first game laws. The Museum was born soon after, and Cook became the first director. Mississippi became one of the first states with a non-game research and education program.

The agency made history in the 1970s by partnering with the Nature Conservancy to establish one of the first natural heritage programs in the nation. The focus on heritage programs and research and collections is central to our blueprint for the future. Public participation, our obligation by law, is essential for success in developing and carrying out our plans.

We need you—now and in the future.

Libby Hartfield

species of plants can be found in Mississippi. Currently there are 384 special concern plants and an additional 37 species are designated "watch" species.

Using the information acquired from experts and the public, it will also be necessary to develop strategies to protect species and habitats and determine how to monitor changes in the future. This will not be an easy task and requires participation from a broad array of constituents, including biologists and ecologists; local governments; conservation groups; universities; private landowners; and state, federal and tribal agencies.

The State Wildlife Gants Program has already doubled the dollars spent annually on wildlife diversity programs in Mississippi. Current studies and projects include:

- ***Establishment of a state Partners in Flight Program to coordinate and facilitate migratory bird conservation efforts within and outside the state.*** Mississippi's participation in this international program is essential for the long-term survival of numerous bird species.
- ***Coordination of black bear recovery activities in Mississippi.*** In addition to trapping and collaring activities, this project is the clearinghouse for important data related to this rare animal in the state.
- ***Stream mussel and fish inventories.*** Surveys of mussels and fishes in selected stream systems in Mississippi are providing important information about distribution, status, and population structure of these animals throughout the state.
- ***Paddlefish Status Survey.*** Paddlefish habitats in the Mississippi Tennessee- Tombigbee Waterway and primary tributaries necessary for spawning success are being evaluated.

In addition, much more needs to be done. Through the State Wildlife Grants Program, Mississippi is guaranteed a certain level of funding, determined by land area and human population. While current funding falls short of long-term needs, the millions received so far represent a significant step in the conservation journey – one made possible only through the efforts of thousands of individuals and groups who care about our wildlife legacy.

Anyone interested in participating in this planning process or in receiving periodic email updates should contact Charles Knight the Mississippi Museum of Natural Science at 601/354-7303 or charles.knight@mmns.state.ms.us. Additional information is at the website www.mdwfp.com/cwcs.

Wildlife Issues. MDWFP. Spring/Summer 2004.

Comprehensive Wildlife Conservation Strategy for MS

By Randy Spencer

Wildlife Coordinator / randys@mdwfp.state.ms.us

Mississippians understandably tend to take healthy populations of game species for granted. Like our fellow sportspersons in all 50 states, we have benefited from the enormously successful Federal Aid in Sportfish and Wildlife Restoration programs. The 1937 Pittman Robertson (Wildlife Restoration) Act and the corresponding 1950 Dingell-Johnson (Sportfish Restoration) Act, have ensured the conservation and sustainable use of important wildlife species fished or hunted by millions of sportspersons across the country by providing stable, dedicated funding sources for their management. Sportsmen have also supported management by funding state wildlife agencies through hunting and fishing license revenues. Many nongame species have been positively impacted by traditional game management programs because they often rely on the same habitats. However, there is a huge gap in federal funding for the many species not addressed by hunting and fishing fees and excise taxes.

Nationally, many wildlife species are in trouble and over 1,000 species are on the federal Threatened and Endangered Species list. The number of listed species has doubled in the last ten years, with many more potential candidates. The lack of focus of federal resources on the conservation of many of these species prior to their decline is a major contributing factor. Many species will continue to decline in the future unless resources are provided for proactive efforts.

When species are listed, the federal dollars needed to protect or restore them are much more than would have been required to prevent their decline in the first place. Annual federal expenditures for the recovery of listed

species has increased by more than six fold over the past ten years to an expenditure level of over $300 million, and that does not include land acquisition or spending on State listed species. We clearly need a program to address problems early to avoid costly, intensive measures for recovery of these species.

In reaction to the identified need for resources to reverse the rate of endangered species listings, Congress first provided funding to states for this purpose in 2001 with the Wildlife Conservation and Restoration Program. Funds were allocated to the State fish and wildlife agencies on the basis of land area and human population to help the plight of wildlife species in greatest conservation need. In 2002 and 2003, funds were provided through the State Wildlife Grants (SWG) Program. The apportionment for the states and territories in 2003 was over $57 million, with Mississippi's share totaling over $662 thousand. To access these funds, states must match 25% of project costs for planning or 50% for implementation projects.

To be able to participate in SWG, state agencies must agree to submit a Comprehensive Wildlife Conservation Strategy (CWCS) by October 1, 2005. Mississippi, like all other states and territories, has committed to this effort. The purpose of the CWCS is to provide direction for wildlife conservation at a state level, with a focus on the species with the greatest conservation need and their habitats. It must consider the broad range of wildlife and associated habitats of the state, and cut across all jurisdictions. Threats or problems facing these species and their habitats and proposed conservation actions to sustain these species are also to be included. Within these guidelines, there are eight required elements to each CWCS.

What's here now? — distribution and abundance of wildlife species. Focus on low and declining species that are indicators of the health of the state's wildlife.

Health check — location and condition of habitats that are vital to conserving priority species.
Threats — identifying problems that may harm wildlife species and habitat, and priority research for conservation actions.

Actions — prescriptions and priorities for conserving wildlife species and habitats

Monitoring — how to assess and measure effectiveness of conservation actions.

Review — assessment at intervals not to exceed ten years

Coordination — involvement of federal, state, local agencies and Indian tribes that manage lands or programs affecting wildlife.

Public participation — required by law and essential for success in developing and carrying out plans. You are needed now — and later too!

The process is well underway in Mississippi, but over the next several months we will be soliciting input from the public and various potential partners. It is realistically a "once-in-a-lifetime" opportunity that the development of the CWCS provides. It creates an atmosphere to bring all agencies, organizations, and the public together under one umbrella to plot the course of future wildlife conservation. If SWG can enjoy similar successes to Federal Aid in Sport Fish and Wildlife Restoration, we can reverse the decline of many wildlife species by pooling our resources and talents in this timely partnership. For more information contact Charles Knight at 601-354-7303 or charles.knight@mmns.state.ms.us. **WI**

Mississippi's Comprehensive Wildlife Conservation Strategy Update

By Elizabeth Barber, Charles Knight, and Larry Castle

As a result of the Teaming with Wildlife Coalition's advocacy efforts, Congress passed the State Wildlife Grants (SWG) program in 2001. Since then, new federal dollars have been funneled to states to prevent species and habitats from becoming endangered. To make the best use of SWG funds, Congress charged each state with developing a statewide Comprehensive Wildlife Conservation Strategy (CWCS) focused on species of greatest conservation need (SGCN). These strategies provide the essential foundation for the future of all wildlife conservation and a stimulus to engage the wildlife agencies and conservation partners to strategically think about their individual and coordinating roles in prioritizing conservation efforts.

Mississippi's strategy is being developed by the MDWFP with a diverse group of technical experts, agencies, and stakeholders. The effort is being coordinated by Charles Knight, Conservation Biology Coordinator at the Museum of Natural Science in concert with an internal Technical and Steering Committee, a large external Advisory Committee, and a broad list of taxonomic experts.

Our approach includes eight elements required by Congress: 1) distribution and abundance of species, with a focus on low and declining species that are indicators of biodiversity and health; 2) location and condition of key habitats vital to conserving SGCN; 3) identification of problems that adversely affect SGCN, and research and survey priorities; 4) actions necessary to conserve SGCN and their habitats; 5) plans to monitor the effectiveness of conservation actions; 6) procedures to review the CWCS; 7) coordination with other agencies and stakeholders; and, 8) broad public participation.

"This is not just another planning effort," said Knight. "All states and territories are putting together these strategies and coordinating their efforts with the help of the International Association of Fish and Wildlife Agencies and the U.S. Fish and Wildlife Service. It is perhaps the largest conservation planning effort ever undertaken in this country and is linked to a new funding source for these species of greatest conservation need."

Mississippi's SGCN, which includes 299 animals, was developed using the Natural Heritage Program's Animals of Special Concern track list. Threatened and endangered species and some species with low population density, low reproductive potential, and narrow geographic distributions were also added. Eighteen habitat types and 94 subtypes are being prioritized based on the number of SGCN using those habitats. Threats, conservation actions, research and survey needs, and monitoring are being identified by surveys of scientists, by species recovery plans and other planning tools, and through existing monitoring protocols.

The CWCS will be completed by October 2005 and submitted to the U.S. Fish and Wildlife Service for their review and approval. For updates and additional information on the CWCS, go to www.mdwfp.com/cwcs or contact Charles Knight at 601-354-7303. **WI**

About the Authors: Elizabeth Barber is a wildlife biologist consultant working with the MDWFP on the CWCS, Charles Knight is the MDWFP Director of Conservation Biology, and Larry Castle is the MDWFP Chief of Wildlife.

APPENDIX VII:

WILDLIFE HABITAT TYPES AND SUBTYPES BY ECOREGION

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS **NGM** = Northern Gulf of Mexico **ECGP** = East Gulf Coastal Plain **UEGCP** = Upper East Gulf Coastal Plain **MSRAP** = Mississippi River Alluvial Plain			
		NGM	EGCP	UEGCP	MSRAP
1	**Dry-Mesic Upland Forests/Woodlands**		▲	▲	
1.1	Dry Hardwood Forests		▲	▲	
1.2	Dry Longleaf Pine Forests		▲	▲	
1.3	Dry-Mesic Hardwood Forests		▲	▲	
1.4	Dry-Mesic Shortleaf/Loblolly Pine Forests		▲	▲	
2	**Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations**		▲	▲	▲
2.1	Northeast Prairie/Cedar Glades			▲	
2.2	Jackson Prairie		▲	▲	
2.3	Hay and Pasture Lands		▲	▲	▲
2.4	Pine Plantations		▲	▲	
2.5	Old Fields and Young Hardwoods (Shrublands)		▲	▲	▲
2.6	Agriculture Fields (Row Crops, etc.)		▲	▲	▲
3	**Mesic Upland Forests**		▲	▲	
3.1	Beech/Magnolia Forests		▲	▲	
3.2	Mesic Longleaf Pine Savanna/Forests		▲	▲	
3.3	Loess Hardwood Forests		▲	▲	
3.4	Lower Slope/High Terrace Hardwood Forests		▲	▲	
4	**Bottomland Hardwood Forests**		▲	▲	▲
4.1	Bottomland Hardwood Forests		▲	▲	▲
5	**Riverfront Forests/Herblands/Sandbars**		▲	▲	▲
5.1	Cottonwood/Black Willow/River Birch Woodlands		▲	▲	▲
5.2	Sandbars		▲	▲	▲
6	**Wet Pine Savannas/Flatwoods**		▲		
6.1	Wet Pine Savannas		▲		
6.2	Slash Pine Flatwoods		▲		
7	**Spring Seeps**		▲	▲	
7.1	Hardwood Seeps		▲	▲	
7.2	Pine Seeps		▲	▲	
8	**Bogs**		▲	▲	
8.1	Pitcherplant Flat/Bogs		▲	▲	
9	**Inland Freshwater Marshes**		▲	▲	▲
9.1	Freshwater Marshes		▲	▲	▲
10	**Swamp Forests**		▲	▲	▲
10.1	Bald Cypress/Gum Swamp Forests		▲	▲	▲
10.2	Small Stream Swamp Forests		▲	▲	

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS **NGM** = Northern Gulf of Mexico **ECGP** = East Gulf Coastal Plain **UEGCP** = Upper East Gulf Coastal Plain **MSRAP** = Mississippi River Alluvial Plain			
		NGM	EGCP	UEGCP	MSRAP
11	**Lacustrine (Lentic) Communities**		▲	▲	▲
11.1	Oxbow Lakes		▲	▲	▲
11.2	Reservoirs		▲	▲	▲
11.3	Artificial Ponds		▲	▲	▲
11.4	Ephemeral (Temporary) Ponds		▲	▲	▲
11.5	Beaver Ponds		▲	▲	▲
12	**Streams (Lotic Communities)**	▲	▲	▲	▲
12.1	**Mississippi River**				▲
12.2	**Northeast Hills, Tennessee River Drainage**			▲	
12.2.a	Northeast Hills Small Streams			▲	
12.2.b	Northeast Hills Medium Streams			▲	
12.3	**Tombigbee Drainage**			▲	
12.3.a	Tombigbee Small Streams			▲	
12.3.b	Tombigbee Medium Streams			▲	
12.3.c	Tombigbee Large Streams			▲	
12.4	**Lower Mississippi North Drainage (LMND) Hatchie and Wolf Systems**			▲	
12.4.a	LMND Small Streams			▲	
12.4.b	LMND Medium Streams			▲	
12.5	**Upper Coastal Plain, Yazoo Drainage**			▲	
12.5.a	Yazoo Small Streams			▲	
12.5.b	Yazoo Loess Hills Streams			▲	
12.5.c	Yazoo Medium Streams			▲	
12.5.d	Yazoo Large Streams			▲	
12.6	**Big Black River Drainage**			▲	
12.6.a	Big Black Small Streams			▲	
12.6.b	Big Black Loess Hills Streams			▲	
12.6.c	Big Black Medium Streams			▲	
12.6.d	Big Black Large Streams			▲	
12.7	**Upper Coastal Plain, Pearl River Drainage**			▲	
12.7.a	Pearl River Small Streams			▲	
12.7.b	Pearl River Medium Streams			▲	
12.7.c	Pearl River Large Streams			▲	
12.8	**Mississippi Alluvial Plain (MAP)**				▲
12.8.a	MAP Small Streams				▲
12.8.b	MAP Medium Streams				▲
12.8.c	MAP Large Streams				▲
12.9	**Lower Coastal Plain, Pearl Drainage**	▲	▲		
12.9.a	Pearl Small Streams		▲		
12.9.b	Pearl Small Blackwater Streams		▲		
12.9.c	Pearl Medium Streams		▲		
12.9.d	Pearl Medium Blackwater Streams		▲		
12.9.e	Pearl Large Streams	▲	▲		
12.10	**Pascagoula Drainage**		▲	▲	
12.10.a	Pascagoula Small Streams		▲	▲	

HABITAT TYPE/ SUBTYPE CODES	HABITAT TYPE/SUBTYPE NAME	ECOREGIONS **NGM** = Northern Gulf of Mexico **ECGP** = East Gulf Coastal Plain **UEGCP** = Upper East Gulf Coastal Plain **MSRAP** = Mississippi River Alluvial Plain			
		NGM	**EGCP**	**UEGCP**	**MSRAP**
12.10.b	Pascagoula Small Blackwater Streams		▲		
12.10.c	Pascagoula Medium Streams		▲	▲	
12.10.d	Pascagoula Medium Blackwater Streams		▲		
12.10.e	Pascagoula Large Streams	▲	▲	▲	
12.11	**Coastal Rivers Drainage**	▲	▲		
12.11.a	Coastal Small Blackwater Streams		▲		
12.11.b	Coastal Medium Blackwater Streams	▲	▲		
12.12	**Lake Ponchartrain Drainage**		▲		
12.12.a	Lake Ponchartrain Small Streams		▲		
12.12.b	Lake Ponchartrain Small Blackwater Streams		▲		
12.12.c	Lake Ponchartrain Medium Streams		▲		
12.12.d	Lake Ponchartrain Medium Blackwater Streams		▲		
12.12.e	Lake Ponchartrain Large Streams		▲		
12.13	**Lower Mississippi South Drainage**		▲	▲	
12.13.a	Lower Mississippi South Drainage Small Streams		▲	▲	
12.13.b	Lower Mississippi South Drainage Medium Streams		▲	▲	
12.13.c	Lower Mississippi South Drainage Large Streams		▲	▲	
13	**Upland Maritime and Estuarine Fringe Habitats**	▲			
13.1	Barrier Island Uplands	▲			
13.2	Man-Made Beaches	▲			
13.3	Barrier Island Wetlands	▲			
13.4	Mainland Beaches	▲			
13.5	Barrier Island Beaches	▲			
13.6	Shell Middens and Estuarine Shrublands	▲			
13.7	Maritime Woodlands	▲			
14	**Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)**	▲			
14.1	Estuarine Bays, Lakes and Tidal Streams	▲			
14.2	Mississippi Sound	▲			
14.3	Estuarine Marshes	▲			
14.4	Barrier Island Passes	▲			
14.5	Salt Pannes	▲			
14.6	Seagrass Beds	▲			
14.7	Mollusk Reefs	▲			
15	**Marine Habitats (Outside Barrier Islands)**	▲			
15.1	Marine Habitats (Smooth Bottoms)	▲			
15.2	Hard Bottoms and Oceanic Reefs	▲			
15.3	Artificial Reefs	▲			
16	**Urban and Suburban Lands**	▲	▲	▲	▲
16.1	Urban and Suburban Lands	▲	▲	▲	▲
16.2	Buildings, Bridges, Overpasses, etc.	▲	▲	▲	▲
17	**Miscellaneous (Rock Outcrops, Caves)**		▲	▲	
17.1	Rock Outcrops		▲	▲	
17.2	Caves		▲	▲	

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APPENDIX VIII:

MISSISSIPPI'S SPECIES OF GREATEST CONSERVATION NEED BY ECOREGION

GROUP	*SCIENTIFIC NAME*	COMMON NAME	UEGCP*	EGCP*	MSRAP*	NGM*	TIER**
Amphibians	*Ambystoma tigrinum*	Tiger Salamander	Yes				4
	Amphiuma pholeter	One-Toed Amphiuma		Yes			1
	Aneides aeneus	Green Salamander	Yes				2
	Bufo nebulifer	Gulf Coast Toad	Yes	Yes	Yes	Yes	3
	Cryptobranchus alleganiensis	Hellbender	Yes				1
	Eurycea lucifuga	Cave Salamander	Yes				2
	Gyrinophilus porphyriticus	Spring Salamander	Yes				2
	Hemidactylium scutatum	Four-Toed Salamander	Yes	Yes			2
	Plethodon ainsworthi	Baysprings Salamander		Yes			4
	Plethodon ventralis	Southern Zigzag Salamander	Yes				2
	Plethodon websteri	Webster's Salamander	Yes				2
	Pseudacris brachyphona	Mountain Chorus Frog	Yes				3
	Pseudacris ornata	Ornate Chorus Frog		Yes			2
	Pseudotriton montanus	Mud Salamander		Yes			2
	Pseudotriton ruber	Red Salamander	Yes	Yes			3
	Rana areolata	Crawfish Frog	Yes				2
	Rana heckscheri	River Frog		Yes			1
	Rana sevosa	Mississippi Gopher Frog		Yes			1
Birds	*Aimophila aestivalis*	Bachman's Sparrow	Yes	Yes			2
	Ammodramus henslowii	Henslow's Sparrow		Yes			2
	Ammodramus leconteii	Le Conte's Sparrow	Yes	Yes	Yes		2
	Ammodramus maritimus	Seaside Sparrow		Yes		Yes	2
	Ammodramus nelsoni	Nelson's Sharp-Tailed Sparrow		Yes		Yes	2
	Ammodramus savannarum	Grasshopper Sparrow	Yes	Yes	Yes		2
	Anas acuta	Northern Pintail	Yes	Yes	Yes	Yes	3
	Anas fulvigula	Mottled Duck		Yes		Yes	2
	Anas rubripes	American Black Duck	Yes	Yes	Yes	Yes	3
	Anhinga anhinga	Anhinga	Yes	Yes	Yes		3
	Asio flammeus	Short-Eared Owl	Yes	Yes	Yes	Yes	2
	Aythya affinis	Lesser Scaup	Yes	Yes	Yes	Yes	3
	Botaurus lentiginosus	American Bittern	Yes	Yes	Yes	Yes	3
	Calidris alpina	Dunlin	Yes	Yes	Yes	Yes	3
	Calidris canutus	Red Knot		Yes		Yes	2
	Calidris mauri	Western Sandpiper	Yes	Yes	Yes	Yes	3
	Campephilus principalis	Ivory-Billed Woodpecker	Yes	Yes	Yes		4
	Caprimulgus carolinensis	Chuck-Will's-Widow	Yes	Yes	Yes	Yes	3
	Charadrius alexandrinus tenuirostris	Southeastern Snowy Plover		Yes		Yes	1
	Charadrius melodus	Piping Plover	Yes	Yes	Yes	Yes	2
	Charadrius wilsonia	Wilson's Plover		Yes		Yes	1
	Colinus virginianus	Northern Bobwhite	Yes	Yes	Yes		3
	Columbina passerina	Common Ground-Dove	Yes	Yes	Yes		2
	Coturnicops noveboracensis	Yellow Rail	Yes	Yes		Yes	1
	Dendroica cerulea	Cerulean Warbler	Yes	Yes		Yes	2
	Dendroica discolor	Prairie Warbler	Yes	Yes	Yes	Yes	3
	Egretta caerulea	Little Blue Heron	Yes	Yes	Yes	Yes	2
	Egretta rufescens	Reddish Egret		Yes		Yes	2

GROUP	SCIENTIFIC NAME	COMMON NAME	UEGCP	EGCP	MSRAP	NGM	TIER
	Egretta rufescens	Reddish Egret		Yes		Yes	2
	Egretta thula	Snowy Egret	Yes	Yes	Yes	Yes	3
	Egretta tricolor	Tricolored Heron	Yes	Yes	Yes	Yes	3
	Elanoides forficatus	Swallow-Tailed Kite	Yes	Yes	Yes		2
	Eudocimus albus	White Ibis	Yes	Yes	Yes	Yes	2
	Euphagus carolinus	Rusty Blackbird	Yes	Yes	Yes		2
	Falco sparverius paulus	Southeastern American Kestrel		Yes			1
	Grus canadensis pulla	Mississippi Sandhill Crane		Yes			1
	Haematopus palliatus	American Oystercatcher		Yes		Yes	1
	Haliaeetus leucocephalus	Bald Eagle	Yes	Yes	Yes	Yes	2
	Helmitheros vermivorus	Worm-Eating Warbler	Yes	Yes	Yes	Yes	3
	Hylocichla mustelina	Wood Thrush	Yes	Yes	Yes	Yes	3
	Ixobrychus exilis	Least Bittern	Yes	Yes	Yes	Yes	3
	Lanius ludovicianus	Loggerhead Shrike	Yes	Yes	Yes		3
	Laterallus jamaicensis	Black Rail	Yes	Yes		Yes	1
	Limnothlypis swainsonii	Swainson's Warbler	Yes	Yes	Yes	Yes	2
	Limosa fedoa	Marbled Godwit		Yes		Yes	2
	Melanerpes erythrocephalus	Red-Headed Woodpecker	Yes	Yes	Yes		3
	Mycteria americana	Wood Stork	Yes	Yes	Yes		2
	Nycticorax nycticorax	Black-Crowned Night-Heron	Yes	Yes	Yes	Yes	3
	Nycticorax violaceus	Yellow-Crowned Night-Heron	Yes	Yes	Yes	Yes	3
	Oporornis formosus	Kentucky Warbler	Yes	Yes	Yes	Yes	3
	Pandion haliaetus	Osprey	Yes	Yes	Yes	Yes	3
	Passerina ciris	Painted Bunting	Yes	Yes	Yes	Yes	2
	Pelecanus erythrorhynchos	American White Pelican	Yes	Yes	Yes	Yes	3
	Pelecanus occidentalis	Brown Pelican		Yes		Yes	2
	Picoides borealis	Red-Cockaded Woodpecker	Yes	Yes			2
	Piranga olivacea	Scarlet Tanager	Yes	Yes	Yes	Yes	3
	Porphyrula martinica	Purple Gallinule	Yes	Yes	Yes	Yes	3
	Protonotaria citrea	Prothonotary Warbler	Yes	Yes	Yes	Yes	3
	Rallus elegans	King Rail	Yes	Yes	Yes	Yes	2
	Rynchops niger	Black Skimmer	Yes	Yes		Yes	2
	Scolopax minor	American Woodcock	Yes	Yes	Yes	Yes	3
	Seiurus motacilla	Louisiana Waterthrush	Yes	Yes	Yes	Yes	3
	Sitta pusilla	Brown-Headed Nuthatch	Yes	Yes	Yes		3
	Sterna antillarum	Least Tern	Yes	Yes		Yes	2
	Sterna antillarum athalassos	Interior Least Tern			Yes		2
	Sterna maxima	Royal Tern		Yes		Yes	2
	Sterna nilotica	Gull-Billed Tern	Yes	Yes		Yes	2
	Sterna sandvicensis	Sandwich Tern		Yes		Yes	2
	Thryomanes bewickii	Bewick's Wren	Yes	Yes	Yes		1
	Tyto alba	Common Barn-Owl	Yes	Yes	Yes		3
	Vermivora bachmanii	Bachman's Warbler		Yes		Yes	4
Crustaceans	*Cambarellus diminutus*	Least Crayfish		Yes			2
	Cambarellus lesliei	A Crayfish		Yes			2
	Cambarus girardianus	A Crayfish	Yes				3
	Cambarus latimanus	A Crayfish	Yes				2
	Fallicambarus burrisi	Burris' Burrowing Crawfish		Yes			1
	Fallicambarus byersi	Lavender Burrowing Crayfish		Yes			2
	Fallicambarus danielae	Speckled Burrowing Crayfish		Yes			1
	Fallicambarus gordoni	Camp Shelby Burrowing Crawfish		Yes			1
	Hobbseus attenuatus	Pearl Rivulet Crayfish	Yes				1
	Hobbseus cristatus	A Crayfish	Yes				1
	Hobbseus orconectoides	Oktibbeha Rivulet Crayfish	Yes				1
	Hobbseus petilus	Tombigbee Rivulet Crayfish	Yes				1
	Hobbseus prominens	A Crayfish	Yes				2
	Hobbseus valleculus	Choctaw Rivulet Crayfish	Yes				1

GROUP	SCIENTIFIC NAME	COMMON NAME	UEGCP	EGCP	MSRAP	NGM	TIER
	Hobbseus yalobushensis	A Crayfish	Yes				1
	Orconectes etnieri	A Crayfish	Yes				2
	Orconectes hartfieldi	A Crayfish		Yes			1
	Orconectes jonesi	A Crayfish		Yes			2
	Orconectes mississippiensis	A Crayfish	Yes				1
	Orconectes validus	A Crayfish	Yes				3
	Procambarus ablusus	A Crayfish	Yes				2
	Procambarus barbiger	Jackson Prairie Crayfish	Yes	Yes			1
	Procambarus bivittatus	Ribbon Crayfish		Yes			2
	Procambarus cometes	Mississippi Flatwoods Crayfish	Yes				1
	Procambarus connus	Carrollton Crayfish	Yes				1
	Procambarus elegans	A Crayfish	Yes				2
	Procambarus fitzpatricki	Spiny-Tailed Crayfish		Yes			1
	Procambarus hagenianus vesticeps	A Crayfish	Yes				2
	Procambarus lagniappe	Lagniappe Crayfish	Yes				1
	Procambarus lecontei	Mobile Crayfish		Yes			2
	Procambarus lylei	Shutispear Crayfish	Yes				1
	Procambarus penni	Pearl Blackwater Crayfish		Yes			2
	Procambarus pogum	Bearded Red Crayfish	Yes				1
	Procambarus shermani	A Crayfish		Yes			3
Fishes	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon	Yes	Yes		Yes	1
	Alosa alabamae	Alabama Shad	Yes	Yes		Yes	1
	Ambloplites rupestris	Rock Bass	Yes				4
	Ammocrypta clara	Western Sand Darter	Yes				4
	Ammocrypta meridiana	Southern Sand Darter	Yes				2
	Atractosteus spatula	Alligator Gar	Yes	Yes	Yes	Yes	3
	Clinostomus funduloides	Rosyside Dace	Yes				3
	Cottus carolinae	Banded Sculpin	Yes				2
	Crystallaria asprella	Crystal Darter	Yes	Yes			1
	Cycleptus elongatus	Blue Sucker	Yes	Yes	Yes		2
	Cycleptus meridionalis	Southeastern Blue Sucker	Yes	Yes			2
	Cyprinella callistia	Alabama Shiner	Yes				2
	Cyprinella galactura	Whitetail Shiner	Yes				2
	Cyprinella spiloptera	Spotfin Shiner	Yes				3
	Cyprinella whipplei	Steelcolor Shiner	Yes	Yes			2
	Enneacanthus gloriosus	Bluespotted Sunfish	Yes	Yes		Yes	3
	Etheostoma asprigene	Mud Darter	Yes	Yes	Yes		3
	Etheostoma blennioides	Greenside Darter	Yes				2
	Etheostoma duryi	Black Darter	Yes				2
	Etheostoma flabellare	Fantail Darter	Yes				3
	Etheostoma kennicotti	Stripetail Darter	Yes				2
	Etheostoma lachneri	Tombigbee Darter	Yes				2
	Etheostoma nigripinne	Blackfin Darter	Yes				2
	Etheostoma raneyi	Yazoo Darter	Yes				1
	Etheostoma rubrum	Bayou Darter		Yes			1
	Etheostoma rufilineatum	Redline Darter	Yes				3
	Etheostoma rupestre	Rock Darter	Yes				3
	Etheostoma zonifer	Backwater Darter	Yes				1
	Etheostoma zonistium	Bandfin Darter	Yes				2
	Fundulus dispar	Northern Starhead Topminnow	Yes	Yes	Yes	Yes	2
	Fundulus euryzonus	Broadstripe Topminnow		Yes			2
	Fundulus jenkinsi	Saltmarsh Topminnow		Yes		Yes	2
	Heterandria formosa	Least Killifish		Yes		Yes	3
	Hypentelium etowanum	Alabama Hog Sucker	Yes				3
	Ichthyomyzon castaneus	Chestnut Lamprey	Yes	Yes	Yes		2
	Ictiobus niger	Black Buffalo	Yes	Yes	Yes		3
	Leptolucania ommata	Pygmy Killifish		Yes		Yes	4

GROUP	SCIENTIFIC NAME	COMMON NAME	UEGCP	EGCP	MSRAP	NGM	TIER
	Lythrurus fasciolaris	Rosefin Shiner	Yes				3
	Macrhybopsis gelida	Sturgeon Chub			Yes		4
	Macrhybopsis meeki	Sicklefin Chub			Yes		4
	Morone saxatilis	Striped Bass	Yes	Yes	Yes	Yes	2
	Moxostoma anisurum	Silver Redhorse	Yes				2
	Moxostoma carinatum	River Redhorse	Yes	Yes			2
	Moxostoma duquesnei	Black Redhorse	Yes				2
	Moxostoma erythrurum	Golden Redhorse	Yes	Yes			3
	Moxostoma macrolepidotum	Shorthead Redhorse	Yes				2
	Notropis amnis	Pallid Shiner	Yes				2
	Notropis boops	Bigeye Shiner	Yes				2
	Notropis candidus	Silverside Shiner	Yes				2
	Notropis chalybaeus	Ironcolor Shiner		Yes	Yes		1
	Notropis edwardraneyi	Fluvial Shiner	Yes				2
	Notropis melanostomus	Blackmouth Shiner	Yes	Yes			1
	Notropis micropteryx	Rosyface Shiner	Yes				2
	Notropis sabinae	Sabine Shiner	Yes				3
	Noturus exilis	Slender Madtom	Yes				4
	Noturus flavus	Stonecat			Yes		2
	Noturus munitus	Frecklebelly Madtom	Yes	Yes			1
	Noturus gladiator	Piebald Madtom	Yes				1
	Percina aurora	Pearl Darter	Yes	Yes			1
	Percina evides	Gilt Darter	Yes				2
	Percina kathae	Mobile Logperch	Yes				3
	Percina lenticula	Freckled Darter	Yes	Yes			1
	Percina phoxocephala	Slenderhead Darter	Yes				2
	Phenacobius mirabilis	Suckermouth Minnow	Yes				2
	Phoxinus erythrogaster	Southern Redbelly Dace	Yes		Yes		2
	Platygobio gracilis	Flathead Chub			Yes		4
	Polyodon spathula	Paddlefish	Yes	Yes	Yes		3
	Pteronotropis welaka	Bluenose Shiner		Yes			2
	Rhinichthys atratulus	Blacknose Dace	Yes				2
	Scaphirhynchus albus	Pallid Sturgeon			Yes		1
	Scaphirhynchus suttkusi	Alabama Sturgeon	Yes				1
	Stizostedion canadense	Sauger	Yes	Yes	Yes		3
	Stizostedion sp 1	Southern Walleye	Yes	Yes	Yes		2
	Stizostedion vitreum	Walleye	Yes	Yes			3
Mammals	*Corynorhinus rafinesquii*	Rafinesque's Big-Eared Bat	Yes	Yes	Yes		2
	Lasionycteris noctivagans	Silver-Haired Bat	Yes				4
	Lasiurus cinereus	Hoary Bat	Yes		Yes		2
	Lasiurus intermedius	Northern Yellow Bat		Yes			2
	Mustela frenata	Long-Tailed Weasel	Yes	Yes			3
	Myotis austroriparius	Southeastern Myotis	Yes	Yes	Yes		1
	Myotis grisescens	Gray Myotis	Yes	Yes			2
	Myotis lucifugus	Little Brown Myotis		Yes			2
	Myotis septentrionalis	Northern Myotis	Yes				2
	Myotis sodalis	Indiana Or Social Myotis	Yes				4
	Peromyscus polionotus	Oldfield Mouse	Yes	Yes	Yes		2
	Puma concolor coryi	Florida Panther	Yes	Yes	Yes		4
	Spilogale putorius	Eastern Spotted Skunk	Yes				2
	Trichechus manatus	Manatee		Yes		Yes	2
	Ursus americanus	Black Bear	Yes				2
	Ursus americanus luteolus	Louisiana Black Bear	Yes	Yes	Yes		1
	Zapus hudsonius	Meadow Jumping Mouse	Yes				2
Mussels	*Actinonaias ligamentina*	Mucket			Yes		1
	Anodontoides radiatus	Rayed Creekshell		Yes			2
	Arcidens confragosus	Rock Pocketbook	Yes		Yes		2

GROUP	SCIENTIFIC NAME	COMMON NAME	UEGCP	EGCP	MSRAP	NGM	TIER
	Cyclonaias tuberculata	Purple Wartyback	Yes				1
	Cyprogenia aberti	Western Fanshell			Yes		4
	Ellipsaria lineolata	Butterfly	Yes		Yes		2
	Elliptio arca	Alabama Spike	Yes	Yes			1
	Elliptio arctata	Delicate Spike	Yes	Yes			1
	Elliptio dilatata	Spike	Yes		Yes		1
	Epioblasma brevidens	Cumberlandian Combshell	Yes				1
	Epioblasma penita	Southern Combshell	Yes				1
	Epioblasma triquetra	Snuffbox	Yes				1
	Fusconaia barnesiana	Tennessee Pigtoe	Yes				1
	Lampsilis cardium	Plain Pocketbook	Yes	Yes			2
	Lampsilis hydiana	Louisiana Fatmucket		Yes			1
	Lampsilis perovalis	Orange-Nacre Mucket	Yes				1
	Lampsilis siliquoidea	Fatmucket			Yes		3
	Lampsilis straminea straminea	Rough Fatmucket	Yes				2
	Lasmigona complanata alabamensis	Alabama Heelsplitter	Yes				1
	Lasmigona complanata complanata	White Heelsplitter	Yes	Yes			3
	Lexingtonia dolabelloides	Slabside Pearlymussel	Yes				1
	Ligumia recta	Black Sandshell	Yes	Yes			1
	Medionidus acutissimus	Alabama Moccasinshell	Yes				1
	Medionidus mcglameriae	Tombigbee Moccasinshell	Yes				4
	Obovaria jacksoniana	Southern Hickorynut	Yes	Yes			1
	Obovaria unicolor	Alabama Hickorynut	Yes	Yes			1
	Plethobasus cyphyus	Sheepnose			Yes		1
	Pleurobema beadleianum	Mississippi Pigtoe	Yes	Yes			2
	Pleurobema curtum	Black Clubshell	Yes				4
	Pleurobema decisum	Southern Clubshell	Yes				1
	Pleurobema marshalli	Flat Pigtoe	Yes				4
	Pleurobema perovatum	Ovate Clubshell	Yes				1
	Pleurobema rubrum	Pyramid Pigtoe	Yes		Yes		1
	Pleurobema taitianum	Heavy Pigtoe	Yes				4
	Potamilus alatus	Pink Heelsplitter	Yes				3
	Potamilus capax	Fat Pocketbook			Yes		1
	Potamilus inflatus	Inflated Heelsplitter	Yes				4
	Ptychobranchus fasciolaris	Kidneyshell	Yes				3
	Quadrula cylindrica cylindrica	Rabbitsfoot	Yes		Yes		1
	Quadrula metanevra	Monkeyface	Yes				4
	Quadrula nodulata	Wartyback	Yes		Yes		2
	Quadrula rumphiana	Ridged Mapleleaf	Yes				2
	Quadrula stapes	Stirrupshell	Yes				4
	Strophitus connasaugaensis	Alabama Creekmussel	Yes				1
	Strophitus subvexus	Southern Creekmussel	Yes				2
	Strophitus undulatus	Squawfoot	Yes	Yes			2
	Truncilla truncata	Deertoe	Yes		Yes		3
	Uniomerus caroliniana	Florida Pondhorn		Yes			2
	Uniomerus declivis	Tapered Pondhorn	Yes	Yes	Yes		2
Reptiles	*Caretta caretta*	Loggerhead; Cabezon		Yes		Yes	2
	Chelonia mydas	Green Turtle		Yes		Yes	3
	Crotalus adamanteus	Eastern Diamondback Rattlesnake		Yes			2
	Deirochelys reticularia miaria	Western Chicken Turtle			Yes		3
	Dermochelys coriacea	Leatherback; Tinglar		Yes		Yes	3
	Drymarchon couperi	Eastern Indigo Snake		Yes			4
	Eretmochelys imbricata	Hawksbill; Carey		Yes		Yes	4
	Eumeces anthracinus pluvialis	Southern Coal Skink	Yes	Yes			2
	Farancia erytrogramma	Rainbow Snake	Yes	Yes			2
	Gopherus polyphemus	Gopher Tortoise	Yes	Yes			2

GROUP	SCIENTIFIC NAME	COMMON NAME	UEGCP	EGCP	MSRAP	NGM	TIER
	Graptemys flavimaculata	Yellow-Blotched Map Turtle		Yes			2
	Graptemys gibbonsi	Pascagoula Map Turtle	Yes	Yes			2
	Graptemys nigrinoda	Black-Knobbed Map Turtle	Yes				2
	Graptemys oculifera	Ringed Map Turtle	Yes	Yes			2
	Graptemys pulchra	Alabama Map Turtle	Yes				2
	Heterodon simus	Southern Hognose Snake		Yes		Yes	4
	Lampropeltis calligaster calligaster	Prairie Kingsnake			Yes		2
	Lampropeltis calligaster rhombomaculata	Mole Kingsnake	Yes	Yes			2
	Lampropeltis getula nigra	Black Kingsnake	Yes				3
	Lampropeltis triangulum syspila	Red Milk Snake	Yes		Yes		2
	Lepidochelys kempii	Kemp's or Atlantic Ridley		Yes		Yes	1
	Macrochelys temminckii	Alligator Snapping Turtle	Yes	Yes	Yes	Yes	2
	Malaclemys terrapin pileata	Mississippi Diamondback Terrapin		Yes		Yes	2
	Masticophis flagellum	Eastern Coachwhip		Yes		Yes	3
	Micrurus fulvius	Eastern Coral Snake		Yes			2
	Nerodia clarkii clarkii	Gulf Salt Marsh Snake		Yes		Yes	2
	Ophisaurus attenuatus	Slender Glass Lizard	Yes	Yes			2
	Ophisaurus mimicus	Mimic Glass Lizard		Yes			1
	Pituophis melanoleucus lodingi	Black Pine Snake		Yes			1
	Pituophis melanoleucus melanoleucus	Northern Pine Snake	Yes				3
	Pseudemys alabamensis	Alabama Redbelly Turtle		Yes		Yes	1
	Regina rigida deltae	Delta Crayfish Snake		Yes			2
	Regina rigida sinicola	Gulf Crayfish Snake		Yes			3
	Regina septemvittata	Queen Snake	Yes	Yes			2
	Rhadinaea flavilata	Pine Woods Snake		Yes		Yes	1

* ECOREGIONS OF MISSISSIPPI

UEGCP = Upper East Gulf Coastal Plain Ecoregion
EGCP = East Gulf Coastal Plain Ecoregion
NGM = Northern Gulf of Mexico Ecoregion
MSRAP = Mississippi River Alluvial Plain Ecoregion

** TIER DESCRIPTIONS

Tier 1 - Species that are in need of immediate conservation action and/or research because of extreme rarity, restricted distribution, unknown or decreasing population trends, specialized habitat needs and/or habitat vulnerability. Some species may be considered critically imperiled and at risk of extinction/extirpation.

Tier 2 - Species that are in need of timely conservation action and/or research because of rarity, restricted distribution, unknown or decreasing population trend, specialized habitat needs or habitat vulnerability or significant threats.

Tier 3 - Species that are of less immediate conservation concern, but are in need of planning and effective management due to unknown or decreasing population trends, specialized habitat needs or habitat vulnerability.

Tier 4 - Species listed as extirpated from Mississippi, of historical occurrence only, or accidental. While no conservation action or research is recommended at this time, these species remain a SGCN in the event that taxa may be rediscovered or reintroduced from populations existing outside the state.

APPENDIX IX:

PELAGIC AND MIGRATORY BIRD SPECIES OF CONCERN INCLUDED AS GROUPS IN MISSISSIPPI'S WILDLIFE HABITAT SUBTYPES

The species listed in this Appendix are migratory through or rare visitors to Mississippi. They are included as groups in an effort to acknowledge the importance of Mississippi's habitats to the conservation and survival of the species.

The **pelagic species**, with the exception of the Magnificent Frigatebird (*Fregata magnificens*) are rare visitors to Mississippi. We included these species based on their status as highly imperiled or of high concern in the *North American Waterbird Conservation Plan, Version 1*. As our strategy evolves and we gain further knowledge into the importance of Mississippi's marine habitats, we will be better prepared to take the necessary steps to ensure Mississippi's part in the conservation of these species.

The **shorebirds** included in this list received a status of highly imperiled or of high concern in the 2004 *High Priority Shorebird* list from the *U.S. Shorebird Conservation Plan*. Some of these species do winter in Mississippi, however based on expert opinion, they did not warrant inclusion in the Species of Greatest Conservation Need list developed for this version of Mississippi's CWCS. By including these species as a group, we recognize the responsibility Mississippi has in protecting and/or managing habitat for migratory shorebirds, especially in the Mississippi Alluvial Valley.

Mississippi is an important migration route for many **neotropical migrant songbirds**. Radar from the Pascagoula River basin shows wave after wave of migrants moving up the river to their northern breeding grounds. Additionally, the Mississippi Gulf Coast is the last staging area for migrants as they embark on the fall southerly trans-gulf migration, and is the first landfall for the northerly trans-gulf migration. All of the species in this group had a combined conservation score of ≥ 12 or a population trend of ≥ 4 in the *Partners in Flight North American Landbird Conservation Plan*. Because Because some of these species occur in Mississippi for a relatively short period of time during migration they were not included in our SGCN list. However they were considered as a group in the prioritization of habitats.

Pelagics

Greater Shearwater	*Puffinus gravis*
Audubon's Shearwater	*Puffinus lherminieri*
Band-rumped Storm-Petrel	*Oceanodroma castro*
Magnificent Frigatebird	*Fregata magnificens*
Bridled Tern	*Sterna anaethetus*

Migrant Shorebirds

American Golden-Plover	*Pluvialis dominica*
Solitary Sandpiper	*Tringa solitara*
Upland Sandpiper	*Bartramia longicauda*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew	*Numenius americanus*
Hudsonian Godwit	*Limosa haemastica*
Ruddy Turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Short-billed Dowitcher	*Limnodromus griseus*
Buff-breasted Sandpiper	*Tryngites subruficollis*
Wilson's Phalarope	*Phalaropus tricolor*

Migrant Songbirds

Yellow-billed Cuckoo	*Coccyzus americanus*
Whip-poor-will	*Caprimulgus vociferus*
Eastern Wood-pewee	*Contopus virens*
Acadian Flycatcher	*Empidonax virescens*
Eastern Kingbird	*Tyrannus tyrannus*
Veery	*Catharus fuscescens*
Swainson's Thrush	*Catharus guttatus*
Blue-winged Warbler	*Vermivora pinus*
Golden-winged Warbler	*Vermivora chrysoptera*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Cape May Warbler	*Dendroica tigrina*
Black-throated Blue Warbler	*Dendroica caerulescens*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
Connecticut Warbler	*Oporornis agilis*
Wilson's Warbler	*Wilsonia pusilla*
Canada Warbler	*Wilsonia canadensis*
Hooded Warbler	*Wilsonia citrina*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Dickcissel	*Spiza americana*
Bobolink	*Dolichonyx oryzivorus*
Baltimore Oriole	*Icterus galbula*

APPENDIX X:

VALUE OF HABITATS

Each wildlife habitat subtype received a score called a **Value to SGCN**. These Values were derived from the number and Tier level of SGCN associated with each subtype (see description of Tiers in Criteria for Selection of SGCN in Chapter II). They indicate the relative importance of various habitat subtypes to SGCN and provide guidance in predicting were actions will benefit more and/or higher tier SGCN. Values are most useful when comparing related habitat subtypes. Three major complexes of related habitat subtypes have been identified for value comparisons. **These complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe**. Values for subtypes within each complex are provided on the following pages and again in each subtype's description.

Gastropods, insects and marine fishes were deemed insufficiently known to warrant status evaluations comparable to evaluations of vertebrates, mussels, and crayfish and did not contribute to the subtype value determinations. Therefore the Values to SGCN attributed to some subtypes are lower than expected. Lower than expected Values related to lack of information are most apparent in some marine habitat subtypes. Additional work must be performed to include species from underrepresented groups in future iterations of this strategy.

Since Value to SGCN is derived from the number and Tier level of the species attributed to a habitat subtype, it does not in all instances indicate rarity or level of threat to a subtype. It may be important to consider rarity ranks assigned by Mississippi's Natural Heritage Program or other indications of value when assessing conservation need and implementing actions. Some SGCN are restricted to subtypes with relatively low values that may not benefit or could be negatively affected by conflicting actions performed in subtypes with higher values. Values are not an indication of the type of actions recommended. Recommended conservation actions will vary for each habitat subtype.

The Value was determined by taking list of species for each subtype and their Tier and assigning a weighted value to the Tier Level. Thus, species in Tier 1 received a Value of 4 (the inverse of the Tier); Tier 2 species received a Value of 3, and so on.

EXAMPLE OF HOW VALUE TO SGCN WAS DETERMINED FOR 1.1 DRY HARDWOOD FORESTS

SCIENTIFIC & COMMON NAME	Value to SGCN	TIER
THRYOMANES BEWICKII (BEWICK'S WREN)	4	1
DENDROICA CERULEA (CERULEAN WARBLER)	3	2
CAPRIMULGUS CAROLINENSIS (CHUCK-WILL'S-WIDOW)	2	3
DENDROICA DISCOLOR (PRAIRIE WARBLER)	2	3
HELMITHEROS VERMIVORUS (WORM-EATING WARBLER)	2	3
HYLOCICHLA MUSTELINA (WOOD THRUSH)	2	3
PIRANGA OLIVACEA (SCARLET TANAGER)	2	3
URSUS AMERICANUS LUTEOLUS (LOUISIANA BLACK BEAR)	4	1
LASIURUS CINEREUS (HOARY BAT)	3	2
LASIURUS INTERMEDIUS (NORTHERN YELLOW BAT)	3	2
MYOTIS LUCIFUGUS (LITTLE BROWN MYOTIS)	3	2
MYOTIS SEPTENTRIONALIS (NORTHERN MYOTIS)	3	2
PEROMYSCUS POLIONOTUS (OLDFIELD MOUSE)	3	2
SPILOGALE PUTORIUS (EASTERN SPOTTED SKUNK)	3	2
URSUS AMERICANUS (BLACK BEAR)	3	2
LASIONYCTERIS NOCTIVAGANS (SILVER-HAIRED BAT)	1	4
MYOTIS SODALIS (INDIANA OR SOCIAL MYOTIS)	1	4
PITUOPHIS MELANOLEUCUS LODINGI (BLACK PINE SNAKE)	4	1
CROTALUS ADAMANTEUS (EASTERN DIAMONDBACK RATTLESNAKE)	3	2
GOPHERUS POLYPHEMUS (GOPHER TORTOISE)	3	2
LAMPROPELTIS CALLIGASTER CALLIGASTER (PRAIRIE KINGSNAKE)	3	2
LAMPROPELTIS CALLIGASTER RHOMBOMACULATA (MOLE KINGSNAKE)	3	2
MICRURUS FULVIUS (EASTERN CORAL SNAKE)	3	2
OPHISAURUS ATTENUATUS (SLENDER GLASS LIZARD)	3	2
MASTICOPHIS FLAGELLUM (EASTERN COACHWHIP)	2	3
PITUOPHIS MELANOLEUCUS MELANOLEUCUS (NORTHERN PINE SNAKE)	2	3
TOTAL VALUE OF DRY HARDWOOD FORESTS TO SGCN	**70**	

COMPARISON OF VALUES OF HABITAT SUBTYPES BY SYSTEM

The Values to SGCN were derived from the number and Tier level of SGCN associated with each subtype. They indicate the relative importance of various habitat subtypes to SGCN and provide guidance in predicting were actions will benefit more and/or higher tier SGCN. Values are most useful when comparing related habitat subtypes. Three major complexes of related habitat subtypes have been identified for value comparisons. **These complexes are: 1) Terrestrial (Terrestrial, Wetland, Subterranean and Anthropogenic subtypes); 2) Lotic and Lentic (Streams and Lacustrine subtypes); and 3) Marine, Estuarine and Estuarine Fringe**. Values for all subtypes in descending order and within each complex are provided in the following four tables and again in each subtype's description.

ALL SUBTYPES RANKED FROM HIGHEST TO LOWEST VALUE TO MISSISSIPPI'S SGCN

CODE	SUBTYPE NAME	VALUE TO SGCN*
12.3	Tombigbee Drainage	184
12.2	Northeast Hills , Tennessee River Drainage	140
11.4	Ephemeral (Temporary) Ponds	119
12.10	Pascagoula Drainage	118
14.3	Estuarine Marshes	107
13.3	Barrier Island Wetlands	106
12.9	Lower Coastal Plain, Pearl Drainage	105
14.1	Estuarine Bays, Lakes and Tidal Streams	100
10.2	Small Stream Swamp Forests	91
1.2	Dry Longleaf Pine Forests	87
13.1	Barrier Island Uplands	87
11.1	Oxbow Lakes	86
4.1	Bottomland Hardwood Forests	83
7.1	Hardwood Seeps	83
3.4	Lower Slope/High Terrace Hardwood Forests	76
12.8	Mississippi Alluvial Plain (MAP)	73
3.2	Mesic Longleaf Pine Savanna/Forests	72
1.1	Dry Hardwood Forests	70
13.4	Mainland Beaches	69
10.1	Bald Cypress/Gum Swamp Forests	67
13.7	Maritime Woodlands	67
1.3	Dry-Mesic Hardwood Forests	66
12.6	Big Black River Drainage	66
3.3	Loess Hardwood Forests	65
1.4	Dry-Mesic Shortleaf/Loblolly Pine Forests	64
13.6	Shell Middens and Estuarine Shrublands	64
9.1	Freshwater Marshes	63
3.1	Beech/Magnolia Forests	62
2.1	Northeast Prairie/Cedar Glades	61

CODE	SUBTYPE NAME	VALUE TO SGCN*
2.4	Pine Plantations	60
5.1	Cottonwood/Black Willow/River Birch Woodlands	58
13.5	Barrier Island Beaches	58
14.2	Mississippi Sound	58
12.13	Lower Mississippi South Drainage	56
12.5	Upper Coastal Plain, Yazoo Drainage	53
13.2	Man-Made Beaches	52
2.2	Jackson Prairie	51
2.5	Old Fields and Young Hardwoods (Shrublands)	50
2.3	Hay and Pasture Lands	48
7.2	Pine Seeps	48
14.5	Salt Pannes	47
12.1	Mississippi River	46
2.6	Agriculture Fields (Row Crops)	45
6.1	Wet Pine Savannas	45
8.1	Pitcher Plant Flat/Bogs	44
11.2	Reservoirs	44
6.2	Slash Pine Flatwoods	42
12.11	Coastal Rivers Drainage	42
12.7	Upper Coastal Plain, Pearl River Drainage	41
5.2	Sandbars	37
14.4	Barrier Island Passes	36
11.3	Artificial Ponds	33
15.1	Marine Habitats (Smooth Bottoms)	28
14.6	Seagrass Beds	25
12.4	Lower Mississippi North Drainage (LMND) Hatchie And Wolf Systems	24
12.12	Lake Ponchartrain Drainage	24
17.2	Caves	23
14.7	Mollusk Reefs	17
11.5	Beaver Ponds	16
16.2	Buildings, Bridges, Overpasses, Etc.	13
15.2	Hard Bottoms and Oceanic Reefs	12
15.3	Artificial Reefs	12
17.1	Rock Outcrops	12
16.1	Urban And Suburban Lands	11

LOTIC AND LENTIC SYSTEMS IN MISSISSIPPI

SUBTYPE CODE	SUBTYPE NAMES	VALUE TO SGCN	RANK AMONG LOTIC & LENTIC SYSTEMS
12.3	Tombigbee Drainage	184	1
12.2	Northeast Hills , Tennessee River Drainage	140	2
11.4	Ephemeral (Temporary) Ponds	119	3
12.10	Pascagoula Drainage	118	4
12.9	Lower Coastal Plain, Pearl Drainage	105	5
11.1	Oxbow Lakes	86	6
12.8	Mississippi Alluvial Plain (MAP)	73	7
12.6	Big Black River Drainage	66	8
12.13	Lower Mississippi South Drainage	56	9
12.5	Upper Coastal Plain, Yazoo Drainage	53	10
12.1	Mississippi River	46	11
11.2	Reservoirs	44	12
12.11	Coastal Rivers Drainage	42	13
12.7	Upper Coastal Plain, Pearl River Drainage	41	14
11.3	Artificial Ponds	33	15
12.12	Lake Ponchartrain Drainage	24	16
12.4	Lower Mississippi North Drainage (LMND) Hatchie And Wolf Systems	24	16
11.5	Beaver Ponds	16	17

*The Value to SGCN is a raw score used to determine the importance of subtypes to assemblages of Mississippi's SGCN. The Value is determined by the number and tier level of SGCN associated with each subtype.

COMPARISON OF VALUES OF SUBTYPES TO SGCN BY TERRESTRIAL, WETLAND, SUBTERRANEAN, ANTHROPOGENIC SYSTEMS IN MISSISSIPPI

CODE	HABITAT SUBTYPE NAME	VALUE TO SGCN*	RANK AMONG TERRESTRIAL SYSTEMS
10.2	Small Stream Swamp Forests	91	1
1.2	Dry Longleaf Pine Forests	87	2
4.1	Bottomland Hardwood Forests	83	3
7.1	Hardwood Seeps	83	4
3.4	Lower Slope/High Terrace Hardwood Forests	76	5
3.2	Mesic Longleaf Pine Savanna/Forests	72	6
1.1	Dry Hardwood Forests	70	7
10.1	Bald Cypress/Gum Swamp Forests	67	8
1.3	Dry-Mesic Hardwood Forests	66	9
3.3	Loess Hardwood Forests	65	10
1.4	Dry-Mesic Shortleaf/ Loblolly Pine Forests	64	11
9.1	Freshwater Marshes	63	12
3.1	Beech/Magnolia Forests	62	13
2.1	Northeast Prairie/Cedar Glades	61	14
2.4	Pine Plantations	60	15
5.1	Cottonwood/Black Willow/ River Birch Woodlands	58	16
2.2	Jackson Prairie	51	17
2.5	Old Fields and Young Hardwoods (Shrublands)	50	18
2.3	Hay and Pasture Lands	48	19
7.2	Pine Seeps	48	19
6.1	Wet Pine Savannas	45	20
2.6	Agriculture Fields (Row Crops)	45	20
8.1	Pitcher Plant Flat/Bogs	44	21
6.2	Slash Pine Flatwoods	42	22
5.2	Sandbars	37	23
17.2	Caves	23	24
16.2	Buildings, Bridges, Overpasses, Etc.	13	25
17.1	Rock Outcrops	12	26
16.1	Urban And Suburban Lands	11	27

*The Value to SGCN is a raw score used to determine the importance of subtypes to assemblages of Mississippi's SGCN. The Value is determined by the number and tier level of SGCN associated with each subtype.

COMPARISON OF VALUES OF SUBTYPE TO SGCN BY MARINE AND ESTUARINE (INCLUDING ESTUARINE FRINGE AND MARITIME WOODLANDS) SYSTEMS IN MISSISSIPPI

CODE	HABITAT SUBTYPE NAME	VALUE TO SGCN*	RANK AMONG MARINE AND ESTUARINE SYSTEMS
14.3	Estuarine Marshes	107	1
13.3	Barrier Island Wetlands	106	2
14.1	Estuarine Bays, Lakes and Tidal Streams	100	3
13.1	Barrier Island Uplands	87	4
13.4	Mainland Beaches	69	5
13.7	Maritime Woodlands	67	6
13.6	Shell Middens and Estuarine Shrublands	64	7
13.5	Barrier Island Beaches	58	8
14.2	Mississippi Sound	58	8
13.2	Man-Made Beaches	52	9
14.5	Salt Pannes	47	10
14.4	Barrier Island Passes	36	11
15.1	Marine Habitats (Smooth Bottoms)	28	12
14.6	Seagrass Beds	25	13
14.7	Mollusk Reefs	17	14
15.2	Hard Bottoms and Oceanic Reefs	12	15
15.3	Artificial Reefs	12	15

*The Value to SGCN is a raw score used to determine the importance of subtypes to assemblages of Mississippi's SGCN. The Value is determined by the number and tier level of SGCN associated with each subtype.

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APPENDIX XI:

CROSSWALK OF CWCS HABITAT TYPES AND SUBTYPES WITH ECOLOGICAL COMMUNITY TYPES

SUBTYPE NAME	HABITAT TYPE NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Dry Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.492	East Gulf Coastal Plain Dry Chalk Bluff
Dry Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.502	East Gulf Coastal Plain Limestone Forest
Dry Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.483	East Gulf Coastal Plain Northern Dry Upland Hardwood Forest
Dry Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.482	East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland
Dry Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.560	Southern Coastal Plain Dry Upland Hardwood Forest
Dry Longleaf Pine Forests	Dry-Mesic Upland Forests/Woodlands	CES203.496	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland
Dry-Mesic Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.502	East Gulf Coastal Plain Limestone Forest
Dry-Mesic Hardwood Forests	Dry-Mesic Upland Forests/Woodlands	CES203.477	East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest
Dry-Mesic Shortleaf/ Loblolly Pine Forests	Dry-Mesic Upland Forests/Woodlands	CES203.506	East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest
Dry-Mesic Shortleaf/ Loblolly Pine Forests	Dry-Mesic Upland Forests/Woodlands	CES203.557	East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods
Northeast Prairie/Cedar Glades	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	CES203.478	East Gulf Coastal Plain Black Belt Calcareous Prairie and Woodland
Jackson Prairie	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	CES203.555	East Gulf Coastal Plain Jackson Prairie and Woodland
Hay and Pasture Lands	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	NOEQUIV	NO EQUIVALENT
Pine Plantations	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	NOEQUIV	NO EQUIVALENT
Old Fields and Young Hardwoods (Shrublands)	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	NOEQUIV	NO EQUIVALENT
Agriculture Fields (Row Crops)	Agriculture Fields, Hay and Pasture Lands, Old Fields, Prairies, Cedar Glades and Pine Plantations	NOEQUIV	NO EQUIVALENT
Beech/Magnolia Forests	Mesic Upland Forests	CES203.556	East Gulf Coastal Plain Southern Loess Bluff Forest
Beech/Magnolia Forests	Mesic Upland Forests	CES203.476	East Gulf Coastal Plain Southern Mesic Slope Forest
Mesic Longleaf Pine Savanna/Forests	Mesic Upland Forests	CES203.496	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Loess Hardwood Forests	Mesic Upland Forests	CES203.481	East Gulf Coastal Plain Northern Loess Bluff Forest
Loess Hardwood Forests	Mesic Upland Forests	CES203.556	East Gulf Coastal Plain Southern Loess Bluff Forest
Lower Slope/High Terrace Hardwood Forests	Mesic Upland Forests	CES203.196	Mississippi River High Floodplain (Bottomland) Forest
Lower Slope/High Terrace Hardwood Forests	Mesic Upland Forests	CES203.501	Southern Coastal Plain Hydric Hammock
Bottomland Hardwood Forests	Bottomland Hardwood Forests	CES203.489	East Gulf Coastal Plain Large River Floodplain Forest
Bottomland Hardwood Forests	Bottomland Hardwood Forests	CES203.559	East Gulf Coastal Plain Small Stream and River Floodplain Forest
Bottomland Hardwood Forests	Bottomland Hardwood Forests	CES203.196	Mississippi River High Floodplain (Bottomland) Forest
Bottomland Hardwood Forests	Bottomland Hardwood Forests	CES203.195	Mississippi River Low Floodplain (Bottomland) Forest
Cottonwood/Black Willow/ River Birch Woodlands	Riverfront Forests/Herblands/ Sandbars	CES203.190	Mississippi River Riparian Forest
Sandbars	Riverfront Forests/Herblands/ Sandbars	NOEQUIV	NO EQUIVALENT
Wet Pine Savannas	Wet Pine Savannas/Flatwoods	CES203.192	East Gulf Coastal Plain Treeless Savanna and Wet Prairie
Slash Pine Flatwoods	Wet Pine Savannas/Flatwoods	CES203.192	East Gulf Coastal Plain Treeless Savanna and Wet Prairie
Hardwood Seeps	Spring Seeps	CES203.554	East Gulf Coastal Plain Northern Seepage Swamp
Pine Seeps	Spring Seeps	NOEQUIV	NO EQUIVALENT
Pitcher Plant Flat/Bogs	Bogs	CES203.385	East Gulf Coastal Plain Interior Shrub Bog
Pitcher Plant Flat/Bogs	Bogs	CES203.078	Southern Coastal Plain Herbaceous Seepage Bog
Freshwater Marshes	Inland Freshwater Marshes	CES203.558	East Gulf Coastal Plain Northern Depression Pondshore
Freshwater Marshes	Inland Freshwater Marshes	CES203.504	East Gulf Coastal Plain Southern Depression Pondshore
Bald Cypress/Gum Swamp Forests	Swamp Forests	CES203.558	East Gulf Coastal Plain Northern Depression Pondshore
Bald Cypress/Gum Swamp Forests	Swamp Forests	CES203.504	East Gulf Coastal Plain Southern Depression Pondshore
Bald Cypress/Gum Swamp Forests	Swamp Forests	CES203.490	Lower Mississippi River Bottomland Depression
Small Stream Swamp Forests	Swamp Forests	CES203.559	East Gulf Coastal Plain Small Stream and River Floodplain Forest
Small Stream Swamp Forests	Swamp Forests	CES203.493	Southern Coastal Plain Blackwater River Floodplain Forest
Small Stream Swamp Forests	Swamp Forests	CES203.505	Southern Coastal Plain Seepage Swamp and Baygall
Oxbow Lakes	Lacustrine Communities	CES203.490	Lower Mississippi River Bottomland Depression

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Reservoirs	Lacustrine Communities	NOEQUIV	NO EQUIVALENT
Artificial Ponds	Lacustrine Communities	NOEQUIV	NO EQUIVALENT
Ephemeral (Temporary) Ponds	Lacustrine Communities	CES203.558	East Gulf Coastal Plain Northern Depression Pondshore
Ephemeral (Temporary) Ponds	Lacustrine Communities	CES203.504	East Gulf Coastal Plain Southern Depression Pondshore
Ephemeral (Temporary) Ponds	Lacustrine Communities	CES203.384	Southern Coastal Plain Nonriverine Basin Swamp
Ephemeral (Temporary) Ponds	Lacustrine Communities	CES203.251	Southern Coastal Plain Nonriverine Cypress Dome
Beaver Ponds	Lacustrine Communities	NOEQUIV	NO EQUIVALENT
Mississippi River	Streams	CES203.	NO EQUIVALENT
Northeast Hills , Tennessee River Drainage	Streams	CES203.	NO EQUIVALENT
Tombigbee Drainage	Streams	CES203.	NO EQUIVALENT
Lower Mississippi North Drainage (LMND) Hatchie And Wolf Systems	Streams	CES203.	NO EQUIVALENT
Upper Coastal Plain, Yazoo Drainage	Streams	CES203.	NO EQUIVALENT
Big Black River Drainage	Streams	CES203.	NO EQUIVALENT
Upper Coastal Plain, Pearl River Drainage	Streams	CES203.	NO EQUIVALENT
Mississippi Alluvial Plain (MAP)	Streams	CES203.	NO EQUIVALENT
Lower Coastal Plain, Pearl Drainage	Streams	CES203.	NO EQUIVALENT
Pascagoula Drainage	Streams	CES203.	NO EQUIVALENT
Coastal Rivers Drainage	Streams	CES203.	NO EQUIVALENT
Lake Ponchartrain Drainage	Streams	CES203.	NO EQUIVALENT
Lower Mississippi South Drainage	Streams	CES203.	NO EQUIVALENT
Barrier Island Uplands	Upland Maritime and Estuarine Fringe Habitats	CES203.500	East Gulf Coastal Plain Dune and Coastal Grassland
Man-Made Beaches	Upland Maritime and Estuarine Fringe Habitats	CES203.303	Mississippi Sound Salt and Brackish Tidal Marsh
Barrier Island Wetands	Upland Maritime and Estuarine Fringe Habitats	CES203.500	East Gulf Coastal Plain Dune and Coastal Grassland
Barrier Island Wetands	Upland Maritime and Estuarine Fringe Habitats	CES203.503	East Gulf Coastal Plain Maritime Forest
Barrier Island Wetands	Upland Maritime and Estuarine Fringe Habitats	CES203.258	Southeastern Coastal Plain Interdunal Wetland

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Mainland Beaches	Upland Maritime and Estuarine Fringe Habitats	CES203.266	Florida Panhandle Beach Vegetation
Barrier Island Beaches	Upland Maritime and Estuarine Fringe Habitats	CES203.266	Florida Panhandle Beach Vegetation
Shell Middens and Estuarine Shrublands	Upland Maritime and Estuarine Fringe Habitats	CES203.303	Mississippi Sound Salt and Brackish Tidal Marsh
Maritime Woodlands	Upland Maritime and Estuarine Fringe Habitats	CES203.375	East Gulf Coastal Plain Near-Coast Pine Flatwoods
Maritime Woodlands	Upland Maritime and Estuarine Fringe Habitats	CES203.513	Mississippi Delta Maritime Forest
Maritime Woodlands	Upland Maritime and Estuarine Fringe Habitats	CES203.494	Southern Coastal Plain Oak Dome and Hammock
Estuarine Bays, Lakes and Tidal Streams	Estuarine Habitats incl. Mississippi Sound	NOEQUIV	NO EQUIVALENT
Mississippi Sound	Estuarine Habitats incl. Mississippi Sound	NOEQUIV	NO EQUIVALENT
Estuarine Marshes	Estuarine Habitats incl. Mississippi Sound	CES203.299	East Gulf Coastal Plain Tidal Wooded Swamp
Estuarine Marshes	Estuarine Habitats incl. Mississippi Sound	CES203.303	Mississippi Sound Salt and Brackish Tidal Marsh
Barrier Island Passes	Estuarine Habitats incl. Mississippi Sound	NOEQUIV	NO EQUIVALENT
Salt Pannes	Estuarine Habitats incl. Mississippi Sound	CES203.303	Mississippi Sound Salt and Brackish Tidal Marsh
Seagrass Beds	Estuarine Habitats incl. Mississippi Sound	CES203.263	Northern Gulf of Mexico Seagrass Bed
Mollusk Reefs	Estuarine Habitats incl. Mississippi Sound	NOEQUIV	NO EQUIVALENT
Marine Habitats (Smooth Bottoms)	Marine Habitats (Outside Barrier Islands)	NOEQUIV	NO EQUIVALENT
Hard Bottoms and Oceanic Reefs	Marine Habitats (Outside Barrier Islands)	NOEQUIV	NO EQUIVALENT
Artificial Reefs	Marine Habitats (Outside Barrier Islands)	NOEQUIV	NO EQUIVALENT
Urban And Suburban Lands	Urban And Suburban Lands	NOEQUIV	NO EQUIVALENT
Buildings, Bridges, Overpasses, Etc.	Urban And Suburban Lands	NOEQUIV	NO EQUIVALENT
Rock Outcrops	Miscellaneous (Rock Outcrops, Caves)	NOEQUIV	NO EQUIVALENT
Caves	Miscellaneous (Rock Outcrops, Caves)	NOEQUIV	NO EQUIVALENT
No Sub-Type Recorded		CES203.	NO EQUIVALENT

APPENDIX XII:

INTERPRETING NATURE SERVE CONSERVATION STATUS RANK

Conservation Status Ranks are mentioned in the descriptions of conditions for each Subtype in Chapter IV. Below is an explanation of these terms.

The conservation status of a species or community is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global), N = National, and S = Subnational). The numbers have the following meaning:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure.

For example, G1 would indicate that a species is critically imperiled across its entire range (i.e., globally). In this sense the species as a whole is regarded as being at very high risk of extinction. A rank of S3 would indicate the species is vulnerable and at moderate risk within a particular state or province, even though it may be more secure elsewhere. Extinct or missing species and ecological communities are designated with either an "X" (presumed extinct or extirpated) if there is no expectation that they still survive, or an "H" (possibly extinct or extirpated) if they are known only from historical records but there is a chance they may still exist. Other variants and qualifiers are used to add information or indicate any range of uncertainty. See the following conservation status rank definitions for complete descriptions of ranks and qualifiers.

Status Assessment Criteria

Use of standard criteria and rank definitions makes NatureServe conservation status ranks comparable across organism types and political boundaries. Thus, G1 has the same basic meaning whether applied to a salamander, a moss species, or a forest community. Similarly, an S1 has the same meaning whether applied to a species or community in Manitoba, Minnesota, or Mississippi. This standardization in turn allows NatureServe scientists to use the subnational ranks assigned by local natural heritage programs to help determine and refine global conservation status ranks. Status assessments are based on a

combination of quantitative and qualitative information. Criteria for assigning ranks serve as guidelines, however, rather than arithmetic rules. The assessor's overall knowledge of the species or community allows them to weigh each factor in relation to the others, and to consider all pertinent information. The general factors considered in assessing species and ecological communities are similar, but the relative weight given to each factor differs.

For species, the following factors are considered in assessing conservation status:

- total number and condition of occurrences (e.g., populations)
- population size
- range extent and area of occupancy
- short- and long-term trends in the above factors
- scope, severity, and immediacy of threats
- number of protected and managed occurrences
- intrinsic vulnerability
- environmental specificity

For ecological communities, the association level generally is the classification unit assessed and ranked (see Classification of Ecological Communities at www.natureserve.org for an explanation of the classification hierarchy). Only global conservation status ranks are currently available for ecological communities on *NatureServe Explorer*. The primary factors for assessing community status are: Species known in an area only from historical records are ranked as either H (possibly extirpated/possibly extinct) or X (presumed extirpated/presumed extinct). Other codes, rank variants, and qualifiers are also allowed in order to add information about the element or indicate uncertainty. See the lists of conservation status rank definitions for complete descriptions of ranks and qualifiers.

- total number of occurrences (e.g., forest stands)
- total acreage occupied by the community.

Secondary factors include the geographic range over which the community occurs, threats, and integrity of the occurrences. Because detailed information on these factors may not be available, especially for poorly understood or inventoried communities, preliminary assessments are often based on the following:

- geographic range over which the community occurs
- long-term trends across this range
- short-term trend (i.e., threats)
- degree of site/environmental specificity exhibited by the community
- imperilment or rarity across the range as indicated by subnational ranks assigned by local natural heritage programs.

Relationship to Other Status Designations

NatureServe conservation status ranks are a valuable complement to legal status designations assigned by government agencies such as the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in administering the U.S. Endangered Species Act (ESA), and the Canadian Wildlife Service in administering the Species at Risk Act (SARA). NatureServe status ranks, and the documentation that support them, are often used by such agencies in making official determinations, particularly in the identification of candidates for legal protection. Because NatureServe assessment procedures and subsequent lists of imperiled and vulnerable species have different criteria, evidence requirements, purposes, and taxonomic coverage than official lists of endangered and threatened species, they do not necessarily coincide.

The IUCN Red List of threatened species is similar in concept to NatureServe's global conservation status assessments. Due to the independent development of these two systems, however, minor differences exist in their respective criteria and implementation. Recent studies indicate that when applied by experienced assessors using comparable information, the outputs from the two systems are generally concordant. NatureServe is an active participant in the IUCN Red List Programme, and in the region covered by *NatureServe Explorer*, NatureServe status ranks and their underlying documentation often form a basis for Red List threat assessments.

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APPENDIX XIII:

SURVEY AND RESEARCH NEEDS

The following is a preliminary prioritized (high, medium, low) list of species related research and survey recommendations compiled from expert surveys.

Crustaceans

CAMBARUS GIRARDIANUS (A CRAYFISH)
- HIGH — Plan and conduct species status surveys

FALLICAMBARUS BURRISI (BURRIS' BURROWING CRAWFISH)
- MEDIUM — Plan and conduct species status surveys
- MEDIUM — Additional survey work: habitat modeling

FALLICAMBARUS BYERSI (LAVENDER BURROWING CRAYFISH)
- HIGH — Plan and conduct species status surveys
- HIGH — Additional survey work: habitat modeling

FALLICAMBARUS DANIELAE (SPECKLED BURROWING CRAYFISH)
- HIGH — Plan and conduct species status surveys
- HIGH — Additional survey work: habitat modeling

FALLICAMBARUS GORDONI (CAMP SHELBY BURROWING CRAWFISH)
- HIGH — Additional population monitoring

PROCAMBARUS BARBIGER (JACKSON PRAIRIE CRAYFISH)
- HIGH — Plan and conduct species status surveys

PROCAMBARUS COMETES (MISSISSIPPI FLATWOODS CRAYFISH)
- HIGH — Plan and conduct species status surveys

PROCAMBARUS CONNUS (CARROLLTON CRAYFISH)
- HIGH — Plan and conduct species status surveys
- HIGH — Taxonomic work (taxonomic revision)

PROCAMBARUS FITZPATRICKI (SPINY-TAILED CRAYFISH)
- HIGH — Specific research: the species role as prey for the Mississippi sandhill crane
- HIGH — Plan and conduct species status surveys
- HIGH — Additional survey work: habitat modeling

PROCAMBARUS POGUM (BEARDED RED CRAYFISH)
- MEDIUM — Plan and conduct species status surveys

Mussels

ACTINONAIAS LIGAMENTINA (MUCKET)

MEDIUM	Additional survey work: surveys in large Delta rivers (e.g.Coldwater)
MEDIUM	Plan and conduct species status surveys

ANODONTOIDES RADIATUS (RAYED CREEKSHELL)

HIGH	Additional survey work in headwater streams
MEDIUM	Plan and conduct species status surveys
MEDIUM	Study life history of species

CYCLONAIAS TUBERCULATA (PURPLE WARTYBACK)

LOW	Plan and conduct species status surveys

CYPROGENIA ABERTI (WESTERN FANSHELL)

LOW	Plan and conduct species status surveys

ELLIPTIO ARCA (ALABAMA SPIKE)

HIGH	Additional genetic research
MEDIUM	Plan and conduct species status surveys

ELLIPTIO ARCTATA (DELICATE SPIKE)

MEDIUM	Plan and conduct species status surveys

ELLIPSARIA LINEOLATA (BUTTERFLY)

LOW	Monitor species population trends and determine quantity, condition and context of suitable habitat

EPIOBLASMA BREVIDENS (CUMBERLANDIAN COMBSHELL)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

EPIOBLASMA PENITA (SOUTHERN COMBSHELL)

HIGH	Additional genetic research

EPIOBLASMA TRIQUETRA (SNUFFBOX)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

FUSCONAIA BARNESIANA (TENNESSEE PIGTOE)

MEDIUM	Plan and conduct species status surveys

LAMPSILIS HYDIANA (LOUISIANA FATMUCKET)

MEDIUM	Plan and conduct species status surveys

LAMPSILIS PEROVALIS (ORANGE-NACRE MUCKET)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

MEDIUM Plan and conduct species status surveys

LAMPSILIS SILIQUOIDEA (FATMUCKET)
MEDIUM Additional survey work in smaller streams

LAMPSILIS STRAMINEA STRAMINEA (ROUGH FATMUCKET)
MEDIUM Additional genetic research
MEDIUM Plan and conduct species status surveys

LASMIGONA COMPLANATA ALABAMENSIS (ALABAMA HEELSPLITTER)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat (Tombigbee drainage)

LASMIGONA COMPLANATA COMPLANATA (WHITE HEELSPLITTER)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat (Pearl, Pascagoula and MS River drainages)

LIGUMIA RECTA (BLACK SANDSHELL)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat

POTAMILUS ALATUS (PINK HEELSPLITTER)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM Plan and conduct species status surveys

MEDIONIDUS ACUTISSIMUS (ALABAMA MOCCASINSHELL)
HIGH Additional genetic research
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM Plan and conduct species status surveys

OBOVARIA JACKSONIANA (SOUTHERN HICKORYNUT)
HIGH Additional genetic research (conduct phylogenetic analysis of the *Obovania subrotunda/unicolor/jacksoniana* complex)
MEDIUM Plan and conduct species status surveys & monitoring
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat

OBOVARIA UNICOLOR (ALABAMA HICKORYNUT)
HIGH Additional genetic research (conduct phylogenetic analysis of the *Obovania subrotunda/unicolor/jacksoniana* complex)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM Plan and conduct species status surveys

PLETHOBASUS CYPHYUS (SHEEPNOSE)
HIGH Additional survey work: surveys in large Delta rivers (e.g.Coldwater)

PLEUROBEMA BEADLEIANUM (MISSISSIPPI PIGTOE)

HIGH	Additional genetic research (clarify identification of this species through genetic work then reassess status)
MEDIUM	Taxonomic work (clarify taxonomy)
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys

PLEUROBEMA CURTUM (BLACK CLUBSHELL)

LOW	Plan and conduct species status surveys & monitoring
LOW	Determine habitat characteristics/ species habitat needs (geomorphic study)
LOW	Monitor species population trends and determine quantity, condition and context of suitable habitat

PLEUROBEMA DECISUM (SOUTHERN CLUBSHELL)

HIGH	Additional genetic research
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys

PLEUROBEMA MARSHALLI (FLAT PIGTOE)

LOW	Additional survey work

PLEUROBEMA PEROVATUM (OVATE CLUBSHELL)

HIGH	Additional genetic research
MEDIUM	Specific research: identify host fish
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys

PLEUROBEMA RUBRUM (PYRAMID PIGTOE)

HIGH	Additional genetic research (conduct phylogenetic research on this species to determine relatedness of Delta populations to others)
HIGH	Additional survey work: surveys in large Delta rivers (e.g.Coldwater)
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys

PLEUROBEMA TAITIANUM (HEAVY PIGTOE)

LOW	Additional survey work

POTAMILUS INFLATUS (INFLATED HEELSPLITTER)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys
MEDIUM	Additional survey work in lower Pearl River

POTAMILUS CAPAX (FAT POCKETBOOK)

MEDIUM	Plan and conduct species status surveys

QUADRULA CYLINDRICA CYLINDRICA (RABBITSFOOT)

MEDIUM	Plan and conduct species status surveys & monitoring
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

QUADRULA NODULATA (WARTYBACK)

MEDIUM	Plan and conduct species status surveys & monitoring
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

QUADRULA METANEVRA (MONKEYFACE)

MEDIUM	Plan and conduct species status surveys

QUADRULA RUMPHIANA (RIDGED MAPLELEAF)

HIGH	Additional genetic research: conduct phylogenetic analysis of *Lampsilis cardium/satuna* complex
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys
MEDIUM	Additional survey work in large streams

QUADRULA STAPES (STIRRUPSHELL)

MEDIUM	Taxonomic work (population taxonomic studies)

STROPHITUS CONNASAUGAENSIS (ALABAMA CREEKMUSSEL)

HIGH	Additional genetic research
MEDIUM	Plan and conduct species status surveys
MEDIUM	Taxonomic work
MEDIUM	Additional survey work in smaller tributaries

STROPHITUS SUBVEXUS (SOUTHERN CREEKMUSSEL)

MEDIUM	Additional genetic research
MEDIUM	Taxonomic work (population taxonomic studies)
LOW	Additional survey work in Bayou Pierre

STROPHITUS UNDULATUS (SQUAWFOOT)

MEDIUM	Plan and conduct species status surveys & monitoring
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Additional survey work in smaller streams

UNIOMERUS CAROLINIANA (FLORIDA PONDHORN)

MEDIUM	Taxonomic work
MEDIUM	Plan and conduct species status surveys (in small streams)

UNIOMERUS DECLIVIS (TAPERED PONDHORN)

HIGH	Additional genetic research (conduct phylogenetic analysis of genus *Uniomerus*)
MEDIUM	Plan and conduct species status surveys

Fishes

ACIPENSER OXYRINCHUS DESOTOI (GULF STURGEON)

HIGH	Plan and conduct species status surveys
HIGH	Additional survey work: identify & protect spawning sites
MEDIUM	Additional research appropriate to understand species and habitats (support existing research in Pascagoula and Pearl River drainage)

ALOSA ALABAMAE (ALABAMA SHAD)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

AMBLOPLITES RUPESTRIS (ROCK BASS)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

AMMOCRYPTA CLARA (WESTERN SAND DARTER)

MEDIUM	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

AMMOCRYPTA MERIDIANA (SOUTHERN SAND DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

ATRACTOSTEUS SPATULA (ALLIGATOR GAR)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
HIGH	Determine habitat characteristics/ species habitat needs
MEDIUM	Additional survey work: movement studies

CLINOSTOMUS FUNDULOIDES (ROSYSIDE DACE)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

COTTUS CAROLINAE (BANDED SCULPIN)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

CYCLEPTUS ELONGATUS (BLUE SUCKER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Additional survey work: status survey in Yazoo & Big Black

CYCLEPTUS MERIDIONALIS (SOUTHEASTERN BLUE SUCKER)

MEDIUM	Plan and conduct species status surveys

CYPRINELLA CALLISTIA (ALABAMA SHINER)

MEDIUM	Determine habitat characteristics/ species habitat needs
MEDIUM	Plan and conduct species status surveys

CYPRINELLA GALACTURA (WHITETAIL SHINER)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

CYPRINELLA WHIPPLEI (STEELCOLOR SHINER)

MEDIUM	Determine habitat characteristics/ species habitat needs
MEDIUM	Plan and conduct species status surveys

CRYSTALLARIA ASPRELLA (CRYSTAL DARTER)

HIGH	Plan and conduct species status surveys
MEDIUM	Additional research appropriate to understand species and habitats

ENNEACANTHUS GLORIOSUS (BLUESPOTTED SUNFISH)

HIGH	Plan and conduct species status surveys

ETHEOSTOMA ASPRIGENE (MUD DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA BLENNIOIDES (GREENSIDE DARTER)

HIGH	Plan and conduct species status surveys
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

ETHEOSTOMA DURYI (BLACK DARTER)

HIGH	Plan and conduct species status surveys
HIGH	Additional research appropriate to understand species and habitats

ETHEOSTOMA FLABELLARE (FANTAIL DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA KENNICOTTI (STRIPETAIL DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA LACHNERI (TOMBIGBEE DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA NIGRIPINNE (BLACKFIN DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA RANEYI (YAZOO DARTER)

MEDIUM	Determine habitat characteristics/ species habitat needs
MEDIUM	Plan and conduct species status surveys

ETHEOSTOMA RUBRUM (BAYOU DARTER)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

ETHEOSTOMA RUFILINEATUM (REDLINE DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA RUPESTRE (ROCK DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

ETHEOSTOMA ZONIFER (BACKWATER DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

ETHEOSTOMA ZONISTIUM (BANDFIN DARTER)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

FUNDULUS EURYZONUS (BROADSTRIPE TOPMINNOW)

MEDIUM	Plan and conduct species status surveys

FUNDULUS JENKINSI (SALTMARSH TOPMINNOW)

HIGH	Plan and conduct species status surveys
HIGH	Study life history of species

HETERANDRIA FORMOSA (LEAST KILLIFISH)

MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

HYPENTELIUM ETOWANUM (ALABAMA HOG SUCKER)

MEDIUM	Determine habitat characteristics/ species habitat needs
MEDIUM	Plan and conduct species status surveys

ICHTHYOMYZON CASTANEUS (CHESTNUT LAMPREY)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs (life history stages)

ICTIOBUS NIGER (BLACK BUFFALO)
MEDIUM Plan and conduct species status surveys

LEPTOLUCANIA OMMATA (PYGMY KILLIFISH)
MEDIUM Plan and conduct species status surveys
MEDIUM Determine habitat characteristics/ species habitat needs

MACRHYBOPSIS GELIDA (STURGEON CHUB)
HIGH Additional research appropriate to understand species and habitats
HIGH Plan and conduct species status surveys

MACRHYBOPSIS MEEKI (SICKLEFIN CHUB)
HIGH Additional research appropriate to understand species and habitats
HIGH Plan and conduct species status surveys

MORONE SAXATILIS (STRIPED BASS)
HIGH Additional research appropriate to understand species and habitats

MOXOSTOMA ANISURUM (SILVER REDHORSE)
HIGH Plan and conduct species status surveys

MOXOSTOMA CARINATUM (RIVER REDHORSE)
MEDIUM Plan and conduct species status surveys
MEDIUM Additional survey work: status survey of large river habitat

MOXOSTOMA DUQUESNEI (BLACK REDHORSE)
HIGH Plan and conduct species status surveys

MOXOSTOMA ERYTHRURUM (GOLDEN REDHORSE)
MEDIUM Plan and conduct species status surveys

MOXOSTOMA MACROLEPIDOTUM (SHORTHEAD REDHORSE)
MEDIUM Plan and conduct species status surveys

NOTROPIS AMNIS (PALLID SHINER)
HIGH Plan and conduct species status surveys
MEDIUM Determine habitat characteristics/ species habitat needs

NOTROPIS BOOPS (BIGEYE SHINER)
MEDIUM Plan and conduct species status surveys

NOTROPIS CANDIDUS (SILVERSIDE SHINER)
HIGH Plan and conduct species status surveys
MEDIUM Determine habitat characteristics/ species habitat needs

NOTROPIS CHALYBAEUS (IRONCOLOR SHINER)
MEDIUM Plan and conduct species status surveys

NOTROPIS EDWARDRANEYI (FLUVIAL SHINER)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

NOTROPIS MELANOSTOMUS (BLACKMOUTH SHINER)

HIGH	Plan and conduct species status surveys
MEDIUM	Study life history of species (life history data needed age, growth, fecundity)

NOTROPIS SABINAE (SABINE SHINER)

MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

NOTURUS EXILIS (SLENDER MADTOM)

MEDIUM	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Additional survey work: extensive survey of historic localities

NOTURUS FLAVUS (STONECAT)

HIGH	Plan and conduct species status surveys
MEDIUM	Additional survey work: extensive survey in Mississippi River deep water habitat

NOTURUS MUNITUS (FRECKLEBELLY MADTOM)

MEDIUM	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

NOTURUS GLADIATOR (PIEBALD MADTOM)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs
MEDIUM	Additional survey work, especially in the Big Black River

PERCINA AURORA (PEARL DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

PERCINA EVIDES (GILT DARTER)

HIGH	Plan and conduct species status surveys
MEDIUM	Additional research to understand species and habitats (study habitat associations)
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat

PERCINA KATHAE (MOBILE LOGPERCH)

MEDIUM	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

PERCINA LENTICULA (FRECKLED DARTER)

HIGH	Additional research appropriate to understand species and habitats

MEDIUM	Plan and conduct species status surveys

PERCINA PHOXOCEPHALA (SLENDERHEAD DARTER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

PHENACOBIUS MIRABILIS (SUCKERMOUTH MINNOW)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

PLATYGOBIO GRACILIS (FLATHEAD CHUB)

MEDIUM	Plan and conduct species status surveys

POLYODON SPATHULA (PADDLEFISH)

HIGH	Plan and conduct species status surveys
HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Additional genetic research (if fish in Mobile and Mississippi races are genetically extinct)
MEDIUM	Additional survey work: creek surveys in large river systems to access population; survey commercial fisherman

PTERONOTROPIS WELAKA (BLUENOSE SHINER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

RHINICHTHYS ATRATULUS (BLACKNOSE DACE)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

SCAPHIRHYNCHUS ALBUS (PALLID STURGEON)

HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

SCAPHIRHYNCHUS SUTTKUSI (ALABAMA STURGEON)

MEDIUM	Plan and conduct species status surveys

STIZOSTEDION CANADENSE (SAUGER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
MEDIUM	Determine habitat characteristics/ species habitat needs

STIZOSTEDION SP 1 (SOUTHERN WALLEYE)

HIGH	Plan and conduct species status surveys
HIGH	Additional genetic research
MEDIUM	Determine habitat characteristics/ species habitat needs

STIZOSTEDION VITREUM (WALLEYE)

HIGH	Additional research appropriate to understand species and habitats

HIGH	Plan and conduct species status surveys
MEDIUM	Additional genetic research

Amphibians

AMBYSTOMA TIGRINUM (TIGER SALAMANDER)

MEDIUM	Additional survey work
MEDIUM	Breeding status surveys: need widespread survey for this species during likely breeding period in habitats that support the salamander in neighboring states

AMPHIUMA PHOLETER (ONE-TOED AMPHIUMA)

MEDIUM	Plan and conduct species status surveys
MEDIUM	Additional research appropriate to understand species and habitats

ANEIDES AENEUS (GREEN SALAMANDER)

HIGH	Plan and conduct species status surveys
HIGH	Additional research appropriate to understand species and habitats

BUFO NEBULIFER (GULF COAST TOAD)

HIGH	Plan and conduct species status surveys

EURYCEA LUCIFUGA (CAVE SALAMANDER)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Conduct population estimates

GYRINOPHILUS PORPHYRITICUS (SPRING SALAMANDER)

MEDIUM	Plan and conduct species status surveys

HEMIDACTYLIUM SCUTATUM (FOUR-TOED SALAMANDER)

HIGH	Plan and conduct species status surveys

PLETHODON AINSWORTHI (BAYSPRINGS SALAMANDER)

LOW	Plan and conduct species status surveys

PLETHODON VENTRALIS (SOUTHERN ZIGZAG SALAMANDER)

MEDIUM	Plan and conduct species status surveys

PLETHODON WEBSTERI (WEBSTER'S SALAMANDER)

HIGH	Plan and conduct species status surveys (map statewide populations)
MEDIUM	Additional survey work particularly on appropriate soil a cover types east of the Pearl River in central Mississippi

PSEUDACRIS BRACHYPHONA (MOUNTAIN CHORUS FROG)

HIGH	Plan and conduct species status surveys

PSEUDACRIS ORNATA (ORNATE CHORUS FROG)

HIGH	Additional survey work needed especially at ephemeral pond sites
HIGH	Additional research appropriate to understand species and habitats

MEDIUM Specific research on terrestrial habitat requirements

PSEUDOTRITON RUBER (RED SALAMANDER)
HIGH Plan and conduct species status surveys (map statewide populations)

RANA AREOLATA (CRAWFISH FROG)
HIGH Plan and conduct species status surveys (areas species previously reported)

RANA HECKSCHERI (RIVER FROG)
MEDIUM Additional survey work needed

RANA SEVOSA (MISSISSIPPI GOPHER FROG)
HIGH Specific research on terrestrial habitat requirements and on perkinson like disease
HIGH Specific research: supplemental rearing of tadpoles in artificial ponds and release of metamorphs
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM Evaluate diseases in population/species (anuraperuinsus disease)

Reptiles

CARETTA CARETTA (LOGGERHEAD; CABEZON)
HIGH Additional research appropriate to understand species and habitats
HIGH Plan and conduct species status surveys
HIGH Forensics (evaluate causes of death) (necropsy all dead turtles)

CROTALUS ADAMANTEUS (EASTERN DIAMONDBACK RATTLESNAKE)
HIGH Conduct population estimates
MEDIUM Plan and conduct species status surveys
MEDIUM Additional research appropriate to understand species and habitats

DEIROCHELYS RETICULARIA MIARIA (WESTERN CHICKEN TURTLE)
HIGH Plan and conduct species status surveys

DERMOCHELYS CORIACEA (LEATHERBACK; TINGLAR)
HIGH Additional research appropriate to understand species and habitats
HIGH Forensics (evaluate causes of death) (necropsy all dead turtles)
HIGH Additional survey work: identify nesting sites

EUMECES ANTHRACINUS PLUVIALIS (SOUTHERN COAL SKINK)
MEDIUM Plan and conduct species status surveys

FARANCIA ERYTROGRAMMA (RAINBOW SNAKE)
MEDIUM Additional research appropriate to understand species and habitats
HIGH Plan and conduct species status surveys
MEDIUM Additional survey work: better survey techniques needed to assay population status

GRAPTEMYS FLAVIMACULATA (YELLOW-BLOTCHED MAP TURTLE)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat (water quality)
HIGH	Plan and conduct species status surveys
HIGH	Specific research: more research needed on possible endocrine mimicking chemicals in paper plant effluent

GRAPTEMYS GIBBONSI (PASCAGOULA MAP TURTLE)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

GRAPTEMYS NIGRINODA (BLACK-KNOBBED MAP TURTLE)

HIGH	Determine habitat characteristics/ species habitat needs (also movement studies)
HIGH	Conduct population estimates
MEDIUM	Additional survey work: distribution & occurrence surveys

GRAPTEMYS PULCHRA (ALABAMA MAP TURTLE)

HIGH	Conduct population estimates
HIGH	Additional survey work
MEDIUM	Specific research: studies of movement
MEDIUM	Determine habitat characteristics/ species habitat needs

LAMPROPELTIS CALLIGASTER RHOMBOMACULATA (MOLE KINGSNAKE)

MEDIUM	Review status/scientific knowledge of species in surrounding states

LAMPROPELTIS TRIANGULUM SYSPILA (RED MILK SNAKE)

MEDIUM	Plan and conduct species status surveys

LEPIDOCHELYS KEMPII (KEMP'S OR ATLANTIC RIDLEY)

HIGH	Forensics (evaluate causes of death) (necropsy all dead turtles)
HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys
HIGH	Determine habitat characteristics/ species habitat needs (in shore usage)

MACROCHELYS TEMMINCKII (ALLIGATOR SNAPPING TURTLE)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys: abundance, distribution and survival
HIGH	Conduct population estimates
HIGH	Additional survey work: age size assay needed populations statewide; determine degree of trotline fishing

MALACLEMYS TERRAPIN PILEATA (MISSISSIPPI DIAMONDBACK TERRAPIN)

HIGH	Conduct population estimates

MICRURUS FULVIUS (EASTERN CORAL SNAKE)

HIGH	Additional survey work: more drift fence surveys needed in good habitat to better evaluate likely abundance

NERODIA CLARKII CLARKII (GULF SALT MARSH SNAKE)
HIGH Plan and conduct species status surveys

OPHISAURUS ATTENUATUS (SLENDER GLASS LIZARD)
MEDIUM Additional survey work: need more effective survey method

PITUOPHIS MELANOLEUCUS LODINGI (BLACK PINE SNAKE)
MEDIUM Plan and conduct species status surveys
MEDIUM Specific research: research needed to determine effects of site preparation and timber harvesting.

PITUOPHIS MELANOLEUCUS MELANOLEUCUS (NORTHERN PINE SNAKE)
HIGH Plan and conduct species status surveys

PSEUDEMYS ALABAMENSIS (ALABAMA REDBELLY TURTLE)
HIGH Additional research appropriate to understand species and habitats
HIGH Conduct population estimates
HIGH Plan and conduct species status surveys
HIGH Additional survey work upstream of known collection sites

REGINA RIGIDA DELTAE (DELTA CRAYFISH SNAKE)
HIGH Additional survey work to determine relative distribution of *R.R. detae vs R.R. sinicola*

REGINA RIGIDA SINICOLA (GULF CRAYFISH SNAKE)
HIGH Additional research appropriate to understand species and habitats

REGINA SEPTEMVITTATA (QUEEN SNAKE)
HIGH Additional survey work in small streams for this species

RHADINAEA FLAVILATA (PINE WOODS SNAKE)
MEDIUM Additional research appropriate to understand species and habitats
MEDIUM Plan and conduct species status surveys

Birds

AIMOPHILA AESTIVALIS (BACHMAN'S SPARROW)
HIGH Plan and conduct species status surveys

AMMODRAMUS HENSLOWII (HENSLOW'S SPARROW)
HIGH Additional survey work to determine statewide status

AMMODRAMUS LECONTEII (LE CONTE'S SPARROW)
MEDIUM Additional survey work to determine importance of state as winter location
MEDIUM Plan and conduct species status surveys

AMMODRAMUS MARITIMUS (SEASIDE SPARROW)
HIGH Breeding status surveys (coast wide status survey breeding/wintering season)

MEDIUM Plan and conduct species status surveys

AMMODRAMUS NELSONI (NELSON'S SHARP-TAILED SPARROW)
MEDIUM Additional survey work: conduct winter status survey in coastal areas

AMMODRAMUS SAVANNARUM (GRASSHOPPER SPARROW)
HIGH Specific research: relationship of field border management to birds during breeding season
MEDIUM Breeding status surveys: conduct statewide breeding status surveys
MEDIUM Plan and conduct species status surveys

ANAS FULVIGULA (MOTTLED DUCK)
HIGH Breeding status surveys
HIGH Additional survey work: status survey aerial & ground, both breeding & winter
HIGH Plan and conduct species status surveys
HIGH Specific research on habitat use, reproduction, movement in Mississippi

ASIO FLAMMEUS (SHORT-EARED OWL)
MEDIUM Monitor species population trends and determine quantity, condition and context of suitable habitat

CAMPEPHILUS PRINCIPALIS (IVORY-BILLED WOODPECKER)
MEDIUM Additional survey work

CHARADRIUS ALEXANDRINUS TENUIROSTRIS (SOUTHEASTERN SNOWY PLOVER)
MEDIUM Additional survey work: year round status survey of barrier island, and mainland beaches
HIGH Plan and conduct species status surveys

CHARADRIUS MELODUS (PIPING PLOVER)
HIGH Additional survey work: determine winter habitat use/home range size
HIGH Additional survey work: conduct yearly winter survey
MEDIUM Plan and conduct species status surveys

CHARADRIUS WILSONIA (WILSON'S PLOVER)
HIGH Plan and conduct species status surveys
HIGH Breeding status surveys: studies of reproduction and survival
MEDIUM Breeding status surveys: conduct coast wide breeding status survey

COLINUS VIRGINIANUS (NORTHERN BOBWHITE)
HIGH Additional survey work: conduct call counts statewide
MEDIUM Plan and conduct species status surveys

COLUMBINA PASSERINA (COMMON GROUND-DOVE)
HIGH Plan and conduct species status surveys

DENDROICA CERULEA (CERULEAN WARBLER)
MEDIUM Plan and conduct species status surveys
HIGH Monitor species population trends and determine quantity, condition and context of suitable habitat

DENDROICA DISCOLOR (PRAIRIE WARBLER)

MEDIUM	Plan and conduct species status surveys

EGRETTA CAERULEA (LITTLE BLUE HERON)

HIGH	Plan and conduct species status surveys (colonial watershed survey)
MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat (colonial water bird nesting sites)

EGRETTA RUFESCENS (REDDISH EGRET)

HIGH	Breeding status surveys (breeding/winter status survey)
MEDIUM	Plan and conduct species status surveys

ELANOIDES FORFICATUS (SWALLOW-TAILED KITE)

HIGH	Plan and conduct species status surveys
HIGH	Breeding status surveys
MEDIUM	Additional survey work: track records on Mississippi River
MEDIUM	Additional survey work: status survey in Pearl and Pascagoula watersheds

EUDOCIMUS ALBUS (WHITE IBIS)

MEDIUM	Plan and conduct species status surveys

FALCO SPARVERIUS PAULUS (SOUTHEASTERN AMERICAN KESTREL)

HIGH	Breeding status surveys (conduct breeding status survey)
HIGH	Plan and conduct species status surveys

GRUS CANADENSIS PULLA (MISSISSIPPI SANDHILL CRANE)

MEDIUM	Specific research: research food availability
HIGH	Additional research appropriate to understand species and habitats (continue on-going research)

HALIAEETUS LEUCOCEPHALUS (BALD EAGLE)

HIGH/MED	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Breeding status surveys
LOW	Conduct population estimates

HELMITHEROS VERMIVORUS (WORM-EATING WARBLER)

MEDIUM	Additional survey work: distribution of this species is poorly understood; need state wide status survey
MEDIUM	Plan and conduct species status surveys

HAEMATOPUS PALLIATUS (AMERICAN OYSTERCATCHER)

MEDIUM	Breeding status surveys
MEDIUM	Plan and conduct species status surveys

LATERALLUS JAMAICENSIS (BLACK RAIL)

HIGH	Breeding status surveys in breeding, and in non-breeding seasons
MEDIUM	Plan and conduct species status surveys

LIMNOTHLYPIS SWAINSONII (SWAINSON'S WARBLER)

HIGH	Breeding status surveys (breeding status survey)
MEDIUM	Plan and conduct species status surveys

MELANERPES ERYTHROCEPHALUS (RED-HEADED WOODPECKER)

MEDIUM	Specific research: where good acorn crops occur these birds winter; where competition with starlings and house sparrows is low, they reproduce well
LOW	Plan and conduct species status surveys

MYCTERIA AMERICANA (WOOD STORK)

MEDIUM	Plan and conduct species status surveys

PANDION HALIAETUS (OSPREY)

MEDIUM	Breeding status surveys to asses numbers and distribution of breeding osprey
MEDIUM	Additional survey work: water bird surveys, and eagle surveys, Christmas bird counts

PASSERINA CIRIS (PAINTED BUNTING)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Plan and conduct species status surveys

PELECANUS ERYTHRORHYNCHOS (AMERICAN WHITE PELICAN)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat (winter populations, food taken, methods to prevent birds from causing damage)
MEDIUM	Plan and conduct species status surveys

PELECANUS OCCIDENTALIS (BROWN PELICAN)

MEDIUM	Breeding status surveys: research needed on where Mississippi birds come from and breed
MEDIUM	Plan and conduct species status surveys

PICOIDES BOREALIS (RED-COCKADED WOODPECKER)

HIGH	Monitor species population trends and determine quantity, condition and context of suitable habitat
MEDIUM	Breeding status surveys

PIRANGA OLIVACEA (SCARLET TANAGER)

LOW	Plan and conduct species status surveys

RALLUS ELEGANS (KING RAIL)

HIGH	Plan and conduct species status surveys
MEDIUM	Statewide breeding status surveys

RYNCHOPS NIGER (BLACK SKIMMER)

HIGH	Plan and conduct species status surveys
HIGH	Breeding status surveys (baseline research on reproduction, survival, movement in Mississippi)

MEDIUM	Specific research: conduct productivity studies of nesting populations
MEDIUM	Specific research: breeding biology

SITTA PUSILLA (BROWN-HEADED NUTHATCH)

MEDIUM	Plan and conduct species status surveys

STERNA ANTILLARUM ATHALASSOS (INTERIOR LEAST TERN)

HIGH	Monitor species population trends and determine quantity, condition and context of suitable habitat
HIGH	Specific research: additional research efforts of flow management on connectivity of sandbars to mainland
HIGH	Plan and conduct species status surveys
HIGH	Specific research on reproduction, movement, survival in MS

STERNA ANTILLARUM (LEAST TERN)

HIGH	Monitor species population trends and determine quantity, condition and context of suitable habitat (determine productivity estimates for coastal populations)
MEDIUM	Additional survey work: productivity survey
HIGH	Additional survey work: demography study of mainland and island colonies
HIGH	Breeding status surveys: information on reproduction, movements, survival in Mississippi
HIGH	Plan and conduct species status surveys

STERNA MAXIMA (ROYAL TERN)

HIGH	Plan and conduct species status surveys

STERNA NILOTICA (GULL-BILLED TERN)

HIGH	Additional survey work as explained in the comments: survey for nesting areas
HIGH	Additional survey work: systemic status survey
HIGH	Plan and conduct species status surveys

THRYOMANES BEWICKII (BEWICK'S WREN)

MEDIUM	Monitor species population trends and determine quantity, condition and context of suitable habitat (monitor nests and identify food brought to young, nest success, cowbird susceptibility)

Mammals

CORYNORHINUS RAFINESQUII (RAFINESQUE'S BIG-EARED BAT)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys especially in northern and coastal regions of state
HIGH	Specific research: additional research on forest management compatibility

LASIURUS INTERMEDIUS (NORTHERN YELLOW BAT)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

HIGH	Specific research (e.g. effects of pesticides on populations of prey)

LASIONYCTERIS NOCTIVAGANS (SILVER-HAIRED BAT)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys including fall and winter surveys
MEDIUM	Specific research (e.g.., extent of migration through MS and habitats used)
MEDIUM	Breeding status surveys

MYOTIS AUSTRORIPARIUS (SOUTHEASTERN MYOTIS)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

MYOTIS GRISESCENS (GRAY MYOTIS)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

MYOTIS LUCIFUGUS (LITTLE BROWN MYOTIS)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

MYOTIS SEPTENTRIONALIS (NORTHERN MYOTIS)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

MYOTIS SODALIS (INDIANA OR SOCIAL MYOTIS)

HIGH	Additional research appropriate to understand species and habitats
MEDIUM	Plan and conduct species status surveys

PEROMYSCUS POLIONOTUS (OLDFIELD MOUSE)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

URSUS AMERICANUS (BLACK BEAR)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

URSUS AMERICANUS LUTEOLUS (LOUISIANA BLACK BEAR)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys

ZAPUS HUDSONIUS (MEADOW JUMPING MOUSE)

HIGH	Additional research appropriate to understand species and habitats
HIGH	Plan and conduct species status surveys